JOKER 100

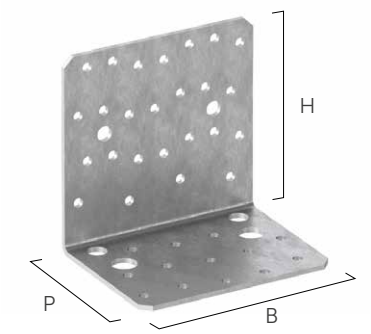
CE ETA-22/0089

ANGLE BRACKET 100 FOR SHEAR AND TENSILE LOADS

- The right angle bracket for all requirements. Outstanding cost-performance ratio
- Partial nailing suitable for CLT or frame walls, possibly with a bedding mortar
- Excellent strength values for forces in all directions, with the possibility of use in timber-to-timber or timber-to-concrete configurations

Data sheet available online

S250 | Zn ELECTRO PLATED



CODE	B [mm]	P [mm]	H [mm]	s [mm]			pcs
JKR100100	104	78	100	2,5	●	●	50

Number of holes:

n_H Ø5	n_H Ø10	n_H Ø13	n_V Ø5	n_V Ø8
13	2	2	25	2

JOKER 150

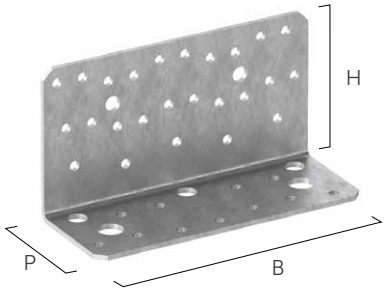
CE ETA-22/0089

ASYMMETRIC ANGLE BRACKET FOR SHEAR AND TENSILE LOADS

- Asymmetrical angle bracket only 55 mm wide, for installation in small spaces. A small angle bracket with surprising performance
- Extremely versatile. On concrete, the additional washer ensures excellent resistance
- Excellent strength values for forces in all directions, with the possibility of use in timber-to-timber or timber-to-concrete configurations

Data sheet available online

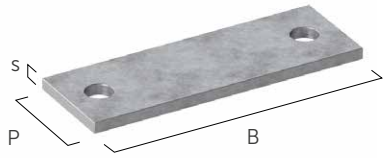
S250 | Zn ELECTRO PLATED



CODE	B [mm]	P [mm]	H [mm]	s [mm]			pcs
JKR15080	146	55	77	2,5	●	●	50

Number of holes:

n_H Ø5	n_H Ø10	n_H Ø13	n_V Ø5	n_V Ø8
11	3	2	25	2



CODE	B [mm]	P [mm]	s [mm]	n Ø14		pcs
NINOW15080	146	50	6	2	●	10

JOKER 200

CE ETA-22/0089

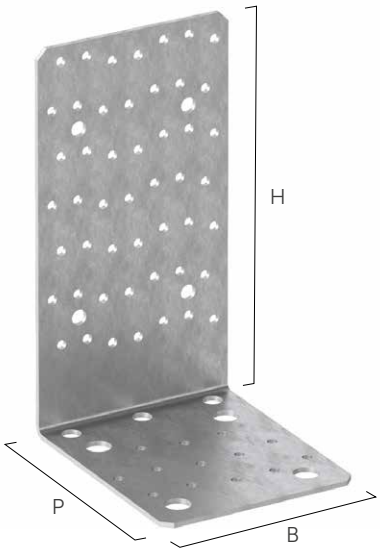
HIGH ANGLE BRACKET FOR SHEAR AND TENSILE LOADS

- High angle bracket, ideal for CLT walls with raised installation (on a kerb or timber platform with a maximum height of 12 cm)
- On concrete, the additional washer provides excellent strength
- Excellent strength values for forces in all directions, with the possibility of use in timber-to-timber or timber-to-concrete configurations

Data sheet available online

S250

Zn ELECTRO PLATED

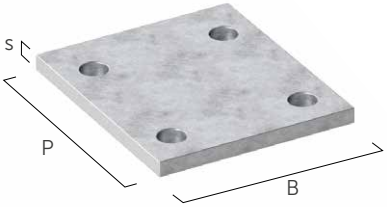


CODE	B [mm]	P [mm]	H [mm]	s [mm]			pcs
JKR100200	104	122	197	3	●	●	25

Number of holes:

n_H Ø5	n_H Ø10	n_H Ø13	n_V Ø5	n_V Ø8
13	3	4	49	4

CODE	B [mm]	P [mm]	s [mm]	n Ø14		pcs
NINOW100200	104	120	8	4	●	10



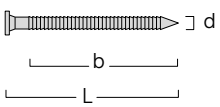
ACOUSTIC PROFILES

TIMBER-TO-TIMBER JOINTS

CODE	JKR100100	JKR100100	JKR100200	B [mm]	P [mm]	s [mm]		pcs
XYL3580105	●	-	-	105	80	6	●	1
XYL3555150	-	●	-	150	55	6	●	1
XYL35120105	-	-	●	105	120	6	●	1

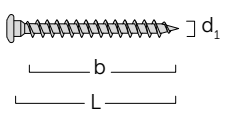
FASTENERS

LBA-HT | ANKER NAIL



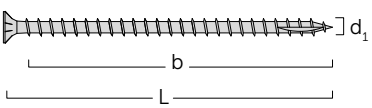
d [mm]	CODE	L [mm]	b [mm]	pcs
4	HT4060	60	50	250

SBL | ROUND-HEAD SCREW AND FLAT UNDERHEAD



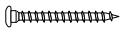
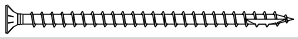
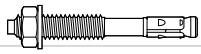
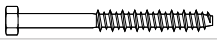
d_1 [mm]	CODE	L [mm]	b [mm]	pcs
5 TX 20	SBL560	60	56	200

VGS | SCREW FOR 45° FASTENING



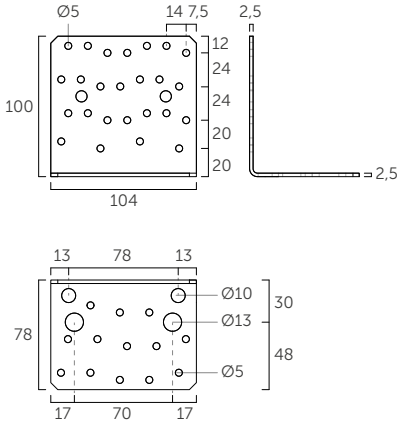
d_1 [mm]	CODE	L [mm]	b [mm]	pcs
9 TX 40	VGS9140	140	130	25

ADDITIONAL PRODUCTS - FASTENING

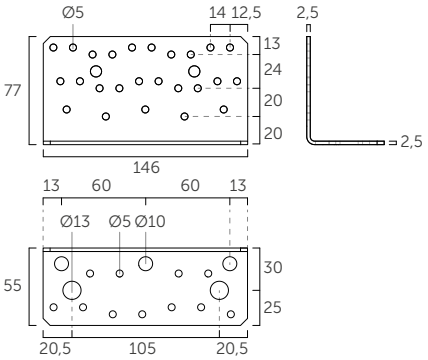
type	description		d [mm]	support
LBA-HT	Anker nail		4	
SBL	round-head screw and flat underhead		5	
VGS	full thread screw		9	
AB1	mechanical anchor		12	
SKR-CE	screw anchor		12	
V-NEX	chemical anchor		M12	
HYB-FIX	chemical anchor		M12	

GEOMETRY

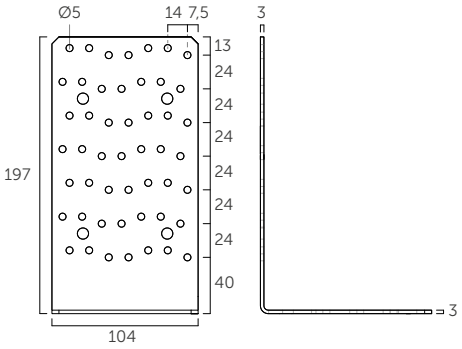
JKR100100



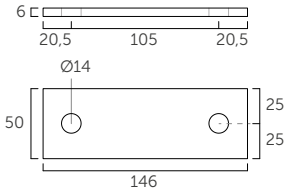
JKR15080



JKR100200



NINOW15080



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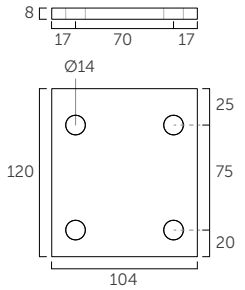


MATERIAL AND DURABILITY

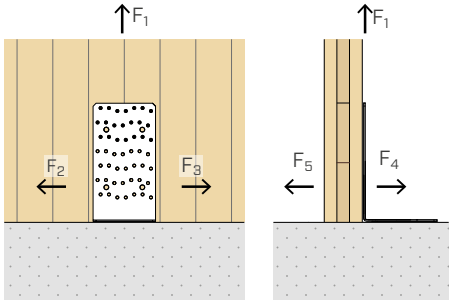
JOKER: S250GD + Z275 steel.
WASHER: S235 zinc plated carbon steel.
To be used in service classes 1 and 2 (EN 1995-1-1).

XYLOFON PLATE: 35-shore polyurethane compound.

FIELD OF USE

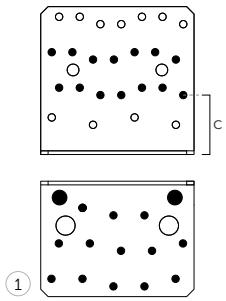
- Timber to concrete joints
- Timber-to-timber joints
- Timber-to-steel joints

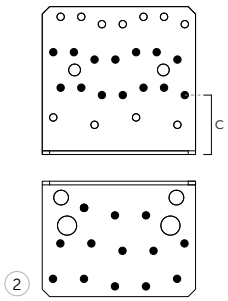
EXTERNAL LOADS



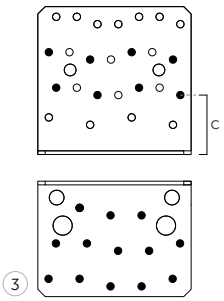
JKR100100 | TIMBER-TO-TIMBER FASTENING DIAGRAMS

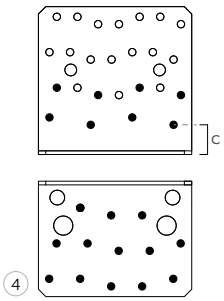
INSTALLATION ON CLT

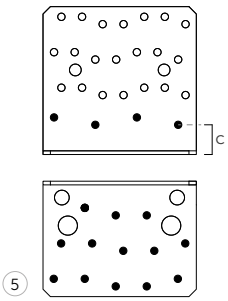




INSTALLATION ON TIMBER FRAME

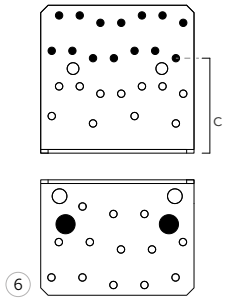


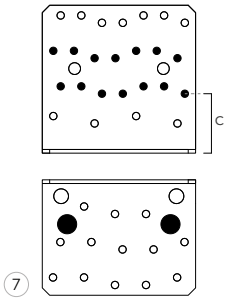




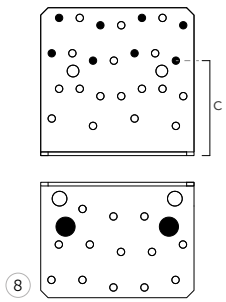
JKR100100 | TIMBER-TO-CONCRETE FASTENING DIAGRAMS

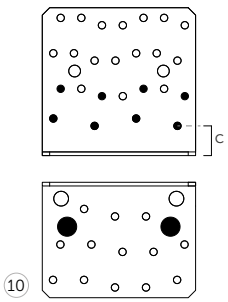
INSTALLATION ON CLT

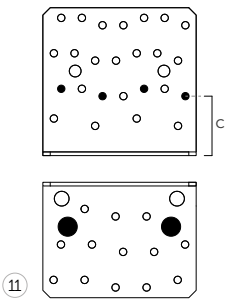


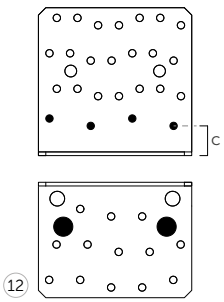


INSTALLATION ON TIMBER FRAME





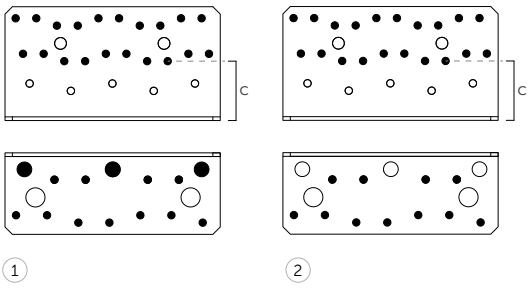




CODE	configuration	holes fastening Ø5		holes fastening Ø10	holes fastening Ø13	c	support	
		n_v	n_H	n_H	n_H			
		pcs	pcs	pcs	pcs	[mm]		
JKR100100	pattern 1	14	13	2	-	40	●	-
	pattern 2	14	13	-	-	40	●	-
	pattern 3	8	13	-	-	40	●	-
	pattern 4	8	13	-	-	20	●	-
	pattern 5	4	13	-	-	20	●	-
	pattern 6	14	-	-	2	64	-	●
	pattern 7	14	-	-	2	40	-	●
	pattern 8	8	-	-	2	64	-	●
	pattern 10	8	-	-	2	20	-	●
	pattern 11	4	-	-	2	40	-	●
	pattern 12	4	-	-	2	20	-	●

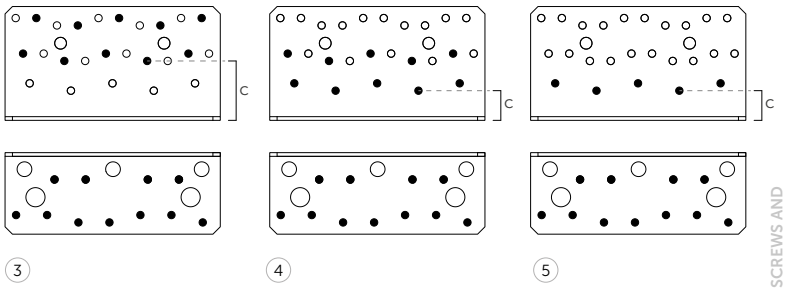
JKR15080 | TIMBER-TO-TIMBER FASTENING DIAGRAMS

INSTALLATION ON CLT



1 2

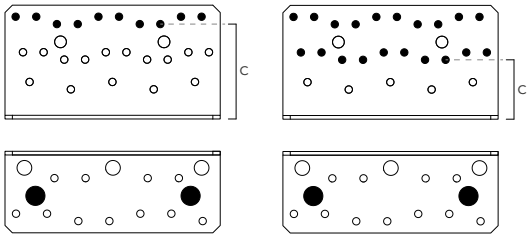
INSTALLATION ON TIMBER FRAME



3 4 5

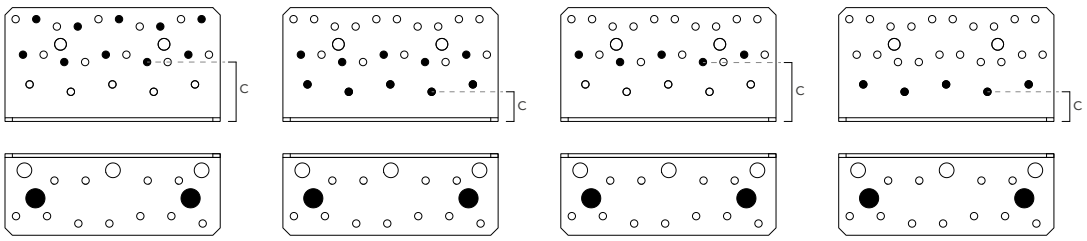
JKR15080 | TIMBER-TO-CONCRETE FASTENING DIAGRAMS

INSTALLATION ON CLT



6 7

INSTALLATION ON TIMBER FRAME

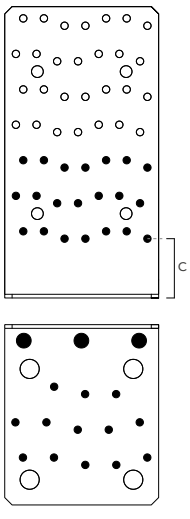


8 9 10 11

CODE	configuration	holes fastening Ø5		holes fastening Ø10	holes fastening Ø13		support	
		n_v	n_H	n_H	n_H	c		
		pcs	pcs	pcs	pcs	[mm]		
JKR15080	pattern 1	20	11	3	-	40	●	-
	pattern 2	20	11	-	-	40	●	-
	pattern 3	10	11	-	-	40	●	-
	pattern 4	10	11	-	-	20	●	-
	pattern 5	5	11	-	-	20	●	-
	pattern 6	10	-	-	2	64	-	●
	pattern 7	20	-	-	2	40	-	●
	pattern 8	10	-	-	2	40	-	●
	pattern 9	10	-	-	2	20	-	●
	pattern 10	5	-	-	2	40	-	●
	pattern 11	5	-	-	2	20	-	●

JKR100200 | TIMBER-TO-TIMBER FASTENING DIAGRAMS

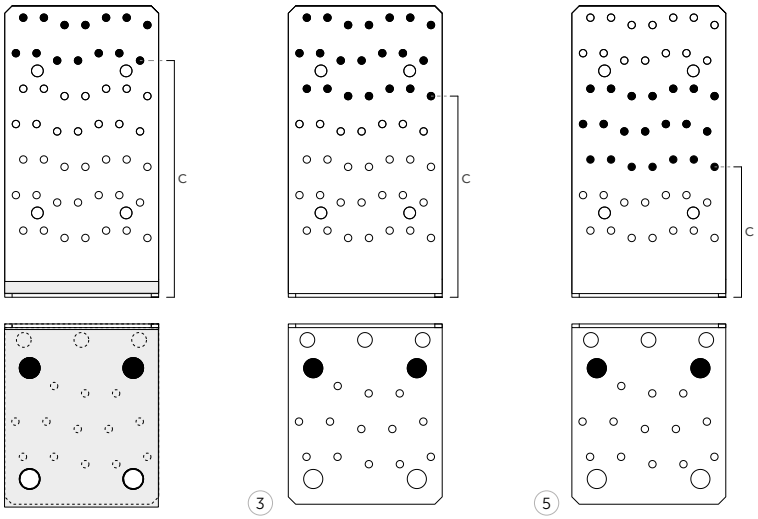
INSTALLATION ON CLT



1

JKR100200 | TIMBER-TO-CONCRETE FASTENING DIAGRAMS

INSTALLATION ON CLT



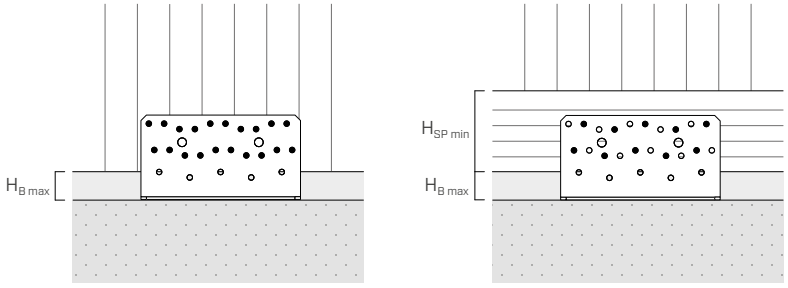
2 3 5

CODE	configuration	holes fastening Ø5		holes fastening Ø10	holes fastening Ø13		support	
		n_V	n_H	n_H	n_H	c		
		pcs	pcs	pcs	pcs	[mm]		
JKR100200	pattern 1	21	13	3	-	40	●	-
	pattern 2 (*)	14	-	-	2	160	-	●
	pattern 3	21	-	-	2	136	-	●
	pattern 5	21	-	-	2	88	-	●

(*) Installation with washer NINOW100200.

INSTALLATION

MAXIMUM HEIGHT OF THE INTERMEDIATE H_B LAYER



JKR100100

configuration	n_v holes Ø5	$H_{B\,max}$ [mm] CLT nails LBA-HT Ø4	CLT screws SBL Ø5	C/GL nails LBA-HT Ø4	C/GL screws SBL Ø5	$H_{SP\,min}$ [mm]
pattern (1)	14	0	10	-	-	-
pattern (2)	14	0	10	-	-	-
pattern (3)	8	-	-	27	27	60
pattern (4)	8	-	-	7	7	60
pattern (5)	4	-	-	7	7	38
pattern (6)	14	24	34	-	-	-
pattern (7)	14	0	10	-	-	-
pattern (8)	8	-	-	51	51	120
pattern (10)	8	-	-	7	7	60
pattern (11)	4	-	-	27	27	60
pattern (12)	4	-	-	7	7	38

JKR15080

configuration	n_v holes Ø5	$H_{B\,max}$ [mm] CLT nails LBA-HT Ø4	CLT screws SBL Ø5	C/GL nails LBA-HT Ø4	C/GL screws SBL Ø5	$H_{SP\,min}$ [mm]
pattern (1)	20	0	10	-	-	-
pattern (2)	20	0	10	-	-	-
pattern (3)	10	-	-	27	27	60
pattern (4)	10	-	-	7	7	60
pattern (5)	5	-	-	7	7	38
pattern (6)	10	24	34	-	-	-
pattern (7)	20	0	10	-	-	-
pattern (8)	10	-	-	27	27	100
pattern (9)	10	-	-	7	7	60
pattern (10)	5	-	-	27	27	60
pattern (11)	5	-	-	7	7	38

JKR100200

configuration	n_v holes Ø5	$H_{B\,max}$ [mm] CLT nails LBA-HT Ø4	CLT screws SBL Ø5
pattern (1)	21	0	10
pattern (2)	14	120	130
pattern (3)	21	96	106
pattern (5)	21	48	58

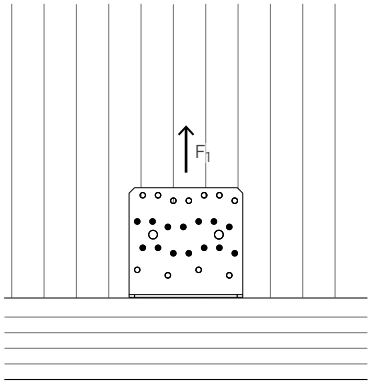
NOTES:

The height of the H_B intermediate layer (levelling mortar, sill or timber platform beam) is determined by taking into account the regulatory requirements for fastenings on timber:

- CLT: minimum distances according to ÖNORM EN 1995-1-1 (Annex K) for nails and ETA 11/0030 for screws.
- C/GL: minimum distances for solid timber or glulam consistent with EN 1995-1-1 according to ETA considering a timber density $\rho_k \leq 420$ kg/m^3.
- The minimum platform thickness $H_{SP\,min}$ was determined by considering $a_{4,c} \geq 13$ mm and $a_{4,t} \geq 13$ mm with a minimum height of 38 mm in accordance with the requirements in ETA 22/0089.

STRUCTURAL VALUES | TENSILE JOINT F_1 |TIMBER-TO-TIMBER

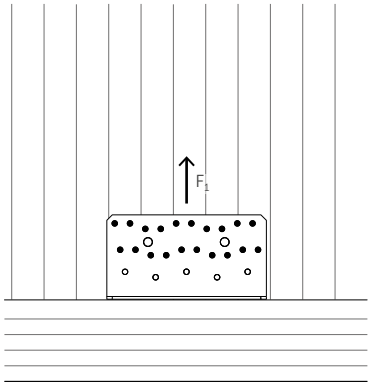
JKR100100



configuration	holes fastening Ø5				$R_{1,k\ timber}$	$K_{1,ser}$
	type	Ø x L [mm]	n_v pcs	n_H pcs	[kN]	[kN/mm]
pattern 1 (1)	LBA nails	Ø4,0 x 60	14	13 + 2 VGS Ø9 x 140	20,0	$R_{1,k\ timber}/6$
	SBL screws	Ø5,0 x 50			20,0	
pattern 2	LBA nails	Ø4,0 x 60	14	13	5,9	$R_{1,k\ timber}/2$
	SBL screws	Ø5,0 x 50			6,8	

STRUCTURAL VALUES | TENSILE JOINT F_1 |TIMBER-TO-TIMBER

JKR15080



configuration	holes fastening Ø5				$R_{1,k\ timber}$	$K_{1,ser}$
	type	Ø x L [mm]	n_v pcs	n_H pcs	[kN]	[kN/mm]
pattern 1 (1)	LBA nails	Ø4,0 x 60	20	11 + 3 VGS Ø9 x 140	39,5(*)	$R_{1,k\ timber}/6$
	SBL screws	Ø5,0 x 50			39,5(*)	
pattern 2	LBA nails	Ø4,0 x 60	20	11	4,0	$R_{1,k\ timber}/2$
	SBL screws	Ø5,0 x 50			6,0	

(*) In the case of installation coupled with an acoustic profile, the $R_{1,k\ timber}$ strength must be assumed to be 37.2 kN.

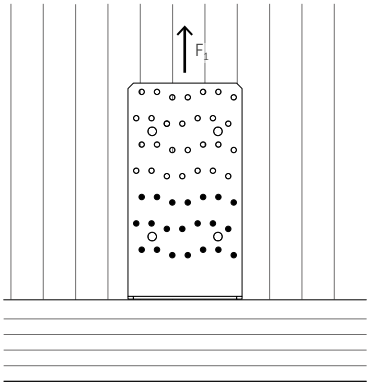
NOTES:

(1) The load-bearing capacity values listed are valid for installation with Ø9 VGS screws of length ≥ 140 mm. For screws of shorter length L, $R_{1,k\ timber}$ must be multiplied by a reduction factor of L/140.

- For angle bracket JKR100100, the strength values listed are also valid for installation with XYLOFON acoustic profile below the horizontal flange.

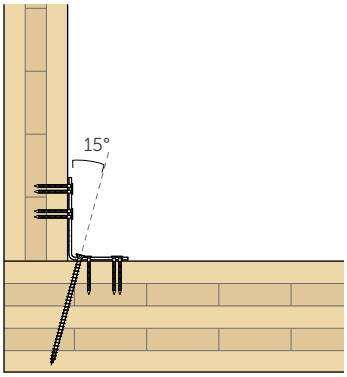
STRUCTURAL VALUES | TENSILE JOINT F_1 |TIMBER-TO-TIMBER

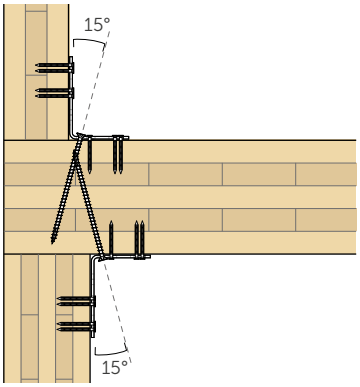
JKR100200



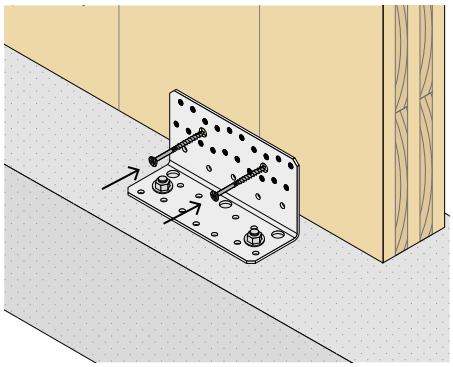
configuration	holes fastening Ø5				$R_{1,k\ timber}$	$K_{1,ser}$
	type	Ø x L	n_v	n_H		
		[mm]	pcs	pcs	[kN]	[kN/mm]
pattern 1 (1)	LBA nails	Ø4,0 x 60	21	13 + 3 VGS Ø9 x 140	41,2	$R_{1,k\ timber}$/5
	SBL screws	Ø5,0 x 50			41,2	

INSTALLATION WITH INCLINED SCREWS | TIMBER-TO-TIMBER





WALL POSITIONING



Positioning of the walls using Ø6 or Ø8 screws to bring the panel closer to the angle bracket.

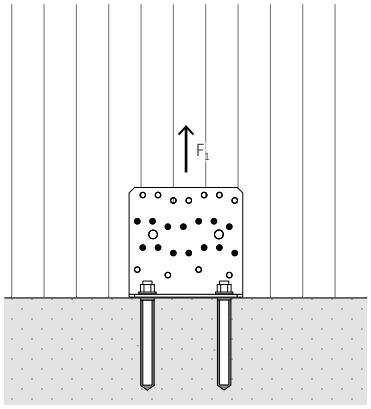
NOTES:

(1) The load-bearing capacity values listed are valid for installation with Ø9 VGS screws of length ≥ 140 mm. For screws of shorter length L, $R_{1,k\ timber}$ must be multiplied by a reduction factor of L/140.

- For JKR100200 angle bracket, the strength values listed are also valid for installation with XYLOFON acoustic profile.

STRUCTURAL VALUES | TENSILE JOINT F_1 | TIMBER-TO-CONCRETE

JKR100100



TIMBER STRENGTH

configuration	TIMBER					CONCRETE		
	holes fastening Ø5			$R_{1,k\ timber}$	$K_{1,ser}$	holes fastening Ø13		$k_{t//}$
	type	Ø x L	n_v			Ø	n_H	
		[mm]	pcs	[kN]	[kN/mm]	[mm]	pcs	
pattern 6-7	LBA nails	Ø4,0 x 60	14	14,0	$R_{1,k\ timber}$/18	M12	2	1,21
	SBL screws	Ø5,0 x 50		14,0				

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	holes fastening Ø13		$R_{1,d\ concrete}$
	type	Ø x L	pattern 6-7
		[mm]	[kN]
• **uncracked**	V-NEX 5.8(1)	M12 x 195	35,8
• **cracked**	V-NEX 5.8	M12 x 195	26,2
	HYB-FIX 5.8(2)	M12 x 195	38,8
• **seismic**	HYB-FIX 8.8	M12 x 195	15,5
		M12 x 245	20,1

CHEMICAL ANCHORS INSTALLATION PARAMETERS

anchor type		d_0	h_{ef}	h_{nom}	h_1	h_{min}
type	Ø x L					
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
V-NEX 5.8	M12 x 195	14	170	170	175	200
HYB-FIX 8.8	M12 x 195		170	170	175	200
	M12 x 245		220	220	225	250

Pre-cut INA class 5.8 / 8.8 threaded rod, including nut and washer.
Concrete-side strength values were calculated assuming a t_{fix} thickness of 2 mm.

NOTES:

(1) V-NEX chemical anchor according to ETA 20/0363.

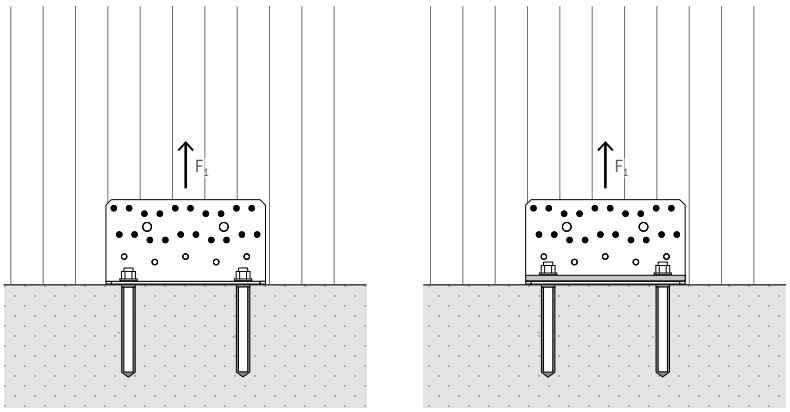
(2) HYB-FIX chemical anchor according to ETA 20/1285.

GENERAL PRINCIPLES:

- For the general principles of calculation, see page 22.

STRUCTURAL VALUES | TENSILE JOINT F_1 | TIMBER-TO-CONCRETE

JKR15080 | JKR15080 + NINOW15080



TIMBER STRENGTH

configuration	TIMBER							CONCRETE			
	holes fastening Ø5			no washer		washer		holes fastening Ø13		no washer	washer
	type	Ø x L	n_v	$R_{1,k\ timber}$	$K_{1,ser}$	$R_{1,k\ timber}$	$K_{1,ser}$	Ø	n_H	$k_{t//}$	$k_{t//}$
		[mm]	pcs	[kN]	[kN/mm]	[kN]	[kN/mm]	[mm]	pcs		
pattern (6)	LBA nails	Ø4,0 x 60	10	14,7	$R_{1,k\ timber}/16$	24,9	$R_{1,k\ timber}/8$	M12	2	1,38	1,75
	SBL screws	Ø5,0 x 50		14,7		20,9					
pattern (7)	LBA nails	Ø4,0 x 60	20	14,7		24,9					
	SBL screws	Ø5,0 x 50		14,7		24,9					

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	holes fastening Ø13		$R_{1,d\ concrete}$	
	type	Ø x L	no washer pattern 6-7	washer pattern 6-7
		[mm]	[kN]	[kN]
• **uncracked**	V-NEX 5.8(1)	M12 x 195	33,8	25,9
• **cracked**	V-NEX 5.8	M12 x 195	18,8	14,4
	HYB-FIX 5.8(2)	M12 x 195	36,2	27,7
• **seismic**	HYB-FIX 8.8	M12 x 195	14,3	10,9
		M12 x 245	18,6	13,9

CHEMICAL ANCHORS INSTALLATION PARAMETERS

anchor type		d_0	no washer				washer			
	[mm]	[mm]	h_{ef} [mm]	h_{nom} [mm]	h_1 [mm]	h_{min} [mm]	h_{ef} [mm]	h_{nom} [mm]	h_1 [mm]	h_{min} [mm]
V-NEX 5.8	M12 x 195	14	170	170	175	200	165	165	170	200
HYB-FIX 8.8	M12 x 195		170	170	175	200	165	165	170	200
	M12 x 245		220	220	225	250	210	210	215	240

Pre-cut INA class 5.8 / 8.8 threaded rod, including nut and washer.
The concrete-side strength values for installation with a washer were calculated assuming a t_{fix} thickness of 8 mm. For installation without washer, a t_{fix} value of 2 mm was assumed.

NOTES:

(1) V-NEX chemical anchor according to ETA 20/0363.

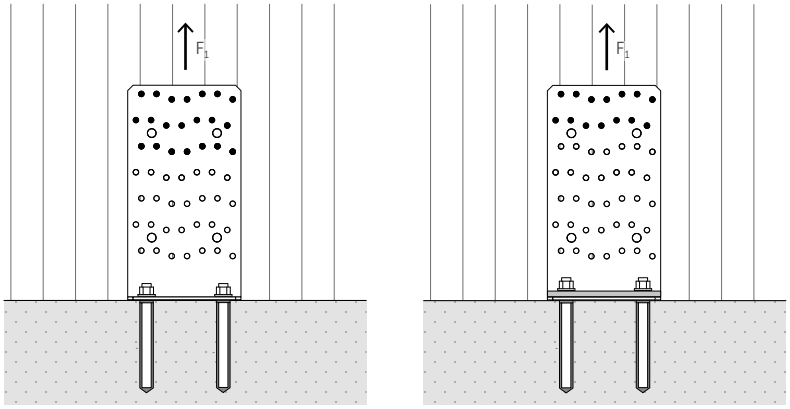
(2) HYB-FIX chemical anchor according to ETA 20/1285.

GENERAL PRINCIPLES:

- For the general principles of calculation, see page 22.

STRUCTURAL VALUES | TENSILE JOINT F_1 | TIMBER-TO-CONCRETE

JKR100200 | JKR100200 + NINOW100200



TIMBER STRENGTH

configuration	TIMBER							CONCRETE			
	holes fastening Ø5			no washer		washer		holes fastening Ø13		no washer	washer
	type	Ø x L	n_v	$R_{1,k\ timber}$	$K_{1,ser}$	$R_{1,k\ timber}$	$K_{1,ser}$	Ø	n_H	$k_{t//}$	$k_{t//}$
		[mm]	pcs	[kN]	[kN/mm]	[kN]	[kN/mm]	[mm]	pcs		
pattern (2)	LBA nails	Ø4,0 x 60	14	-	$R_{1,k\ timber}/16$	34,7	$R_{1,k\ timber}/8$	M12	2	1,11	1,23
	SBL screws	Ø5,0 x 50		-		29,3					
pattern (3)	LBA nails	Ø4,0 x 60	21	14,7		-					
	SBL screws	Ø5,0 x 50		14,7		-					
pattern (5)	LBA nails	Ø4,0 x 60	21	14,7		-					
	SBL screws	Ø5,0 x 50		14,7		-					

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	holes fastening Ø13		$R_{1,d\ concrete}$	
	type	Ø x L	no washer pattern (3)-(5)	washer pattern (2)
		[mm]	[kN]	[kN]
• **uncracked**	V-NEX 5.8(1)	M12 x 195	39,0	34,2
	HYB-FIX 5.8(2)	M12 x 195	50,4	45,5
• **cracked**	V-NEX 5.8	M12 x 195	21,8	19,1
	HYB-FIX 5.8	M12 x 195	42,3	37,0
• **seismic**	HYB-FIX 8.8	M12 x 195	16,4	14,8
		M12 x 245	22,0	18,9

CHEMICAL ANCHORS INSTALLATION PARAMETERS

anchor type		d_0	no washer				washer			
	[mm]	[mm]	h_{ef} [mm]	h_{nom} [mm]	h_1 [mm]	h_{min} [mm]	h_{ef} [mm]	h_{nom} [mm]	h_1 [mm]	h_{min} [mm]
V-NEX 5.8	M12 x 195	14	170	170	175	200	165	165	170	200
HYB-FIX 5.8	M12 x 195		170	170	175	200	165	165	170	200
HYB-FIX 8.8	M12 x 195		170	170	175	200	165	165	170	200
	M12 x 245		220	220	225	250	210	210	215	240

Pre-cut INA class 5.8 / 8.8 threaded rod, including nut and washer.
The concrete-side strength values for installation with a washer were calculated assuming a t_{fix} thickness of 8 mm. For installation without washer, a t_{fix} value of 3 mm was assumed.

NOTES:

(1) V-NEX chemical anchor according to ETA 20/0363.

(2) HYB-FIX chemical anchor according to ETA 20/1285.

GENERAL PRINCIPLES:

- For the general principles of calculation, see page 22.

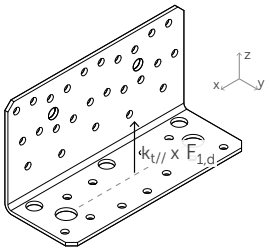
ANCHORS FOR CONCRETE STRESS VERIFICATION F_1

INSTALLATION WITH AND WITHOUT WASHER

Fastening elements to the concrete through anchors shall be verified according to the load acting on the anchor, which can be evaluated through the geometric parameters on the table (k_t).

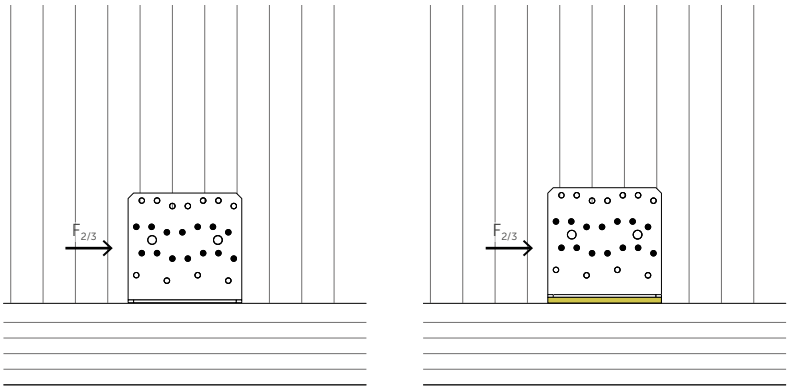
The anchor group must be verified for:

$N_{Sd,z} = k_{t//} \times F_{1,d}$



STRUCTURAL VALUES | SHEAR JOINT $F_{2/3}$ | TIMBER-TO-TIMBER

JKR100100 | JKR100100 + XYL3580105



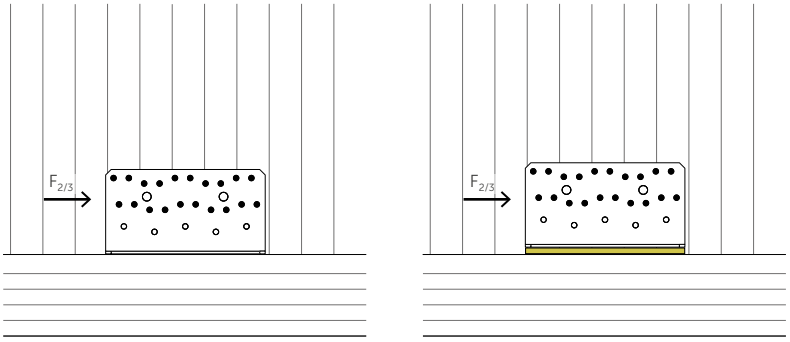
configuration	holes fastening Ø5				$R_{2/3,k\ timber}$		$K_{2/3,ser}$
	type	Ø x L	n_v	n_H	no XYLOFON	XYLOFON	
		[mm]	pcs	pcs	[kN]	[kN]	[kN/mm]
pattern (1)	LBA nails	Ø4,0 x 60	14	13 + 2 VGS Ø9 x 140	38,1	34,6	$R_{2/3,k\ timber}/5$
	SBL screws	Ø5,0 x 50			18,5	16,9	
pattern (2)	LBA nails	Ø4,0 x 60	14	13	17,2	9,4	
	SBL screws	Ø5,0 x 50			9,5	7,4	
pattern (3)	LBA nails	Ø4,0 x 60	8	13	9,8	8,9	
	SBL screws	Ø5,0 x 50			9,1	7,4	
pattern (4)	LBA nails	Ø4,0 x 60	8	13	11,3	9,4	
	SBL screws	Ø5,0 x 50			9,5	7,4	
pattern (5)	LBA nails	Ø4,0 x 60	4	13	9,8	8,9	
	SBL screws	Ø5,0 x 50			9,0	7,4	

GENERAL PRINCIPLES:

- For the general principles of calculation, see page 22.

STRUCTURAL VALUES | SHEAR JOINT $F_{2/3}$ | TIMBER-TO-TIMBER

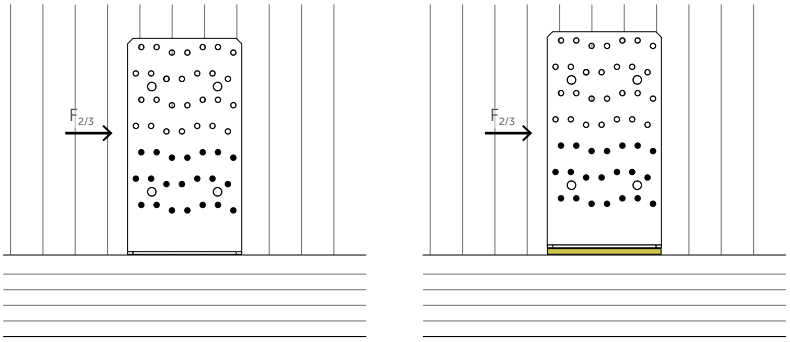
JKR15080 | JKR15080 + XYL3555150



configuration	holes fastening Ø5				$R_{2/3,k\ timber}$		$K_{2/3,ser}$
	type	Ø x L	n_v	n_H	no XYLOFON	XYLOFON	
		[mm]	pcs	pcs	[kN]	[kN]	[kN/mm]
pattern (1)	LBA nails	Ø4,0 x 60	20	11 + 3 VGS Ø9 x 140	38,1	34,6	$R_{2,3,k\ timber}/5$
	SBL screws	Ø5,0 x 50			27,6	25,5	
pattern (2)	LBA nails	Ø4,0 x 60	20	11	15,5	13,0	
	SBL screws	Ø5,0 x 50			13,1	10,2	
pattern (3)	LBA nails	Ø4,0 x 60	10	11	13,3	12,3	
	SBL screws	Ø5,0 x 50			12,3	10,1	
pattern (4)	LBA nails	Ø4,0 x 60	10	11	15,5	13,0	
	SBL screws	Ø5,0 x 50			13,1	10,2	
pattern (5)	LBA nails	Ø4,0 x 60	5	11	12,7	11,8	
	SBL screws	Ø5,0 x 50			11,2	10,0	

STRUCTURAL VALUES | SHEAR JOINT $F_{2/3}$ | TIMBER-TO-TIMBER

JKR100200 | JKR100200 + XYL35120105



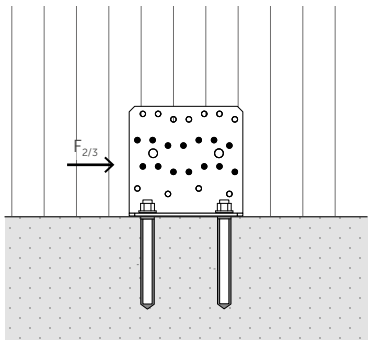
configuration	holes fastening Ø5				$R_{2/3,k\ timber}$		$K_{2/3,ser}$
	type	Ø x L	n_v	n_H	no XYLOFON	XYLOFON	
		[mm]	pcs	pcs	[kN]	[kN]	[kN/mm]
pattern (1)	LBA nails	Ø4,0 x 60	21	13 + 3 VGS Ø9 x 140	26,7	18,7	$R_{2/3,k\ timber}/6$
	SBL screws	Ø5,0 x 50			18,7	17,2	

GENERAL PRINCIPLES:

- For the general principles of calculation, see page 22.

STRUCTURAL VALUES | SHEAR JOINT $F_{2/3}$ | TIMBER-TO-CONCRETE

JKR100100



TIMBER STRENGTH

configuration	TIMBER					CONCRETE		
	holes fastening Ø5			$R_{2/3,k\ timber}$	$K_{2/3,ser}$	holes fastening Ø13		
	type	Ø x L	n_v			Ø	n_H	e_y
		[mm]	pcs	[kN]	[kN/mm]	[mm]	pcs	[mm]
pattern (6)	LBA nails	Ø4,0 x 60	14	18,1	$R_{2/3,k\ timber}/5$	M12	2	30
	SBL screws	Ø5,0 x 50		7,2				
pattern (7)	LBA nails	Ø4,0 x 60	14	18,1				
	SBL screws	Ø5,0 x 50		9,8				
pattern (8)	LBA nails	Ø4,0 x 60	8	5,8				
	SBL screws	Ø5,0 x 50		4,9				
pattern (10)	LBA nails	Ø4,0 x 60	8	11,2				
	SBL screws	Ø5,0 x 50		9,4				
pattern (11)	LBA nails	Ø4,0 x 60	4	9,3	$R_{2/3,k\ timber}/2$			
	SBL screws	Ø5,0 x 50		4,2				
pattern (12)	LBA nails	Ø4,0 x 60	4	9,3				
	SBL screws	Ø5,0 x 50		6,3				

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	holes fastening Ø14		$R_{2/3,d\ concrete}$
	type	Ø x L	
		[mm]	[kN]
• **uncracked**	V-NEX 5.8(1)	M12 x 140	30,3
	SKR-CE(2)	12 x 90	32,1
	AB1(3)	M12 x 100	30,7
• **cracked**	V-NEX 5.8	M12 x 140	26,9
	HYB-FIX 5.8(4)	M12 x 140	30,2
	SKR-CE	12 x 90	22,8
	AB1	M12 x 100	26,5
• **seismic**	HYB-FIX 8.8	M12 x 140	14,8
		M12 x 195	21,0
	SKR-CE	12 x 90	15,2
	AB1	M12 x 100	15,2

NOTES:

(1) V-NEX chemical anchor according to ETA 20/0363.

(2) SKR-CE screw anchor according to ETA 19/0100.

(3) AB1 mechanical anchor according to ETA 17/0481.

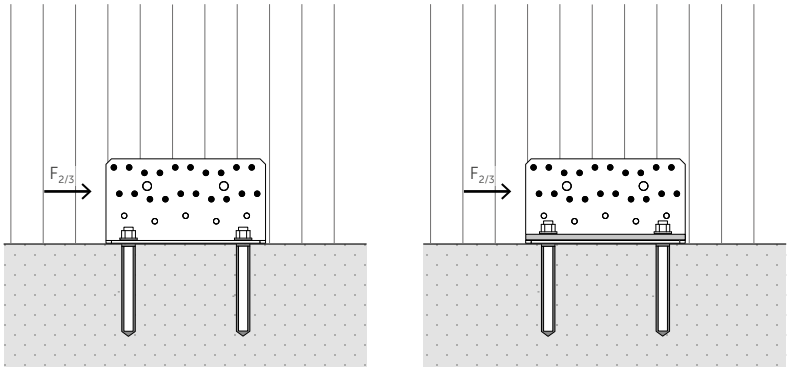
(4) HYB-FIX chemical anchor according to ETA 20/1285.

GENERAL PRINCIPLES:

- For the general principles of calculation, see page 22.

STRUCTURAL VALUES | SHEAR JOINT $F_{2/3}$ | TIMBER-TO-CONCRETE

JKR15080 | JKR15080 + NINOW15080



TIMBER STRENGTH

configuration	TIMBER					CONCRETE			
	holes fastening Ø5			no washer	washer	holes fastening Ø13			pattern (6)
	type	Ø x L	n_v	$R_{2/3,k\ timber}$	$R_{2/3,k\ timber}$	Ø	n_H	e_y	e_z(1)
		[mm]	pcs	[kN]	[kN]	[mm]	pcs	[mm]	[mm]
pattern (6)	LBA nails	Ø4,0 x 60	10	21,1	26,7	M12	2	30	66,5
	SBL screws	Ø5,0 x 50		7,9	7,9				
pattern (7)	LBA nails	Ø4,0 x 60	20	21,3	21,3				
	SBL screws	Ø5,0 x 50		17,9	17,9				
pattern (8)	LBA nails	Ø4,0 x 60	10	11,0	11,0				
	SBL screws	Ø5,0 x 50		9,3	9,3				
pattern (9)	LBA nails	Ø4,0 x 60	10	15,7	15,7				
	SBL screws	Ø5,0 x 50		13,2	13,2				
pattern (10)	LBA nails	Ø4,0 x 60	5	9,3	9,3				
	SBL screws	Ø5,0 x 50		6,0	6,0				
pattern (11)	LBA nails	Ø4,0 x 60	5	10,0	10,0				
	SBL screws	Ø5,0 x 50		8,5	8,5				

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	holes fastening Ø13		$R_{2/3,d\ concrete}$		
	type	Ø x L	no washer	washer pattern (6)	washer pattern (7)-(8)-(9)-(10)-(11)
		[mm]	[kN]	[kN]	[kN]
• **uncracked**	V-NEX 5.8(2)	M12 x 140	34,8	26,5	34,8
	V-NEX 8.8	M12 x 195	47,2	39,2	47,4
	SKR-CE(3)	12 x 90	37,6	15,6	37,6
	AB1(4)	M12 x 100	35,2	-	-
		M12 x 120	-	23,4	35,2
• **cracked**	V-NEX 5.8	M12 x 140	34,4	14,7	33,0
		M12 x 195	-	21,6	34,8
	HYB-FIX 8.8(5)	M12 x 140	47,2	28,5	47,4
	SKR-CE	12 x 90	29,8	7,5	29,8
	AB1	M12 x 100	34,3	-	-
		M12 x 120	-	14,4	34,2
• **seismic**	HYB-FIX 8.8	M12 x 140	18,4	8,8	17,8
		M12 x 195	26,2	13,0	26,1
	SKR-CE	12 x 90	17,5	-	8,8
	AB1	M12 x 120	17,5	-	8,8

NOTES:

(1) For patterns 7-8-9-10-11, eccentricity e_z is assumed to be zero, in accordance with ETA-22/0089.

(2) V-NEX chemical anchor according to ETA 20/0363.

(3) SKR-CE screw anchor according to ETA 19/0100.

(4) AB1 mechanical anchor according to ETA 17/0481.

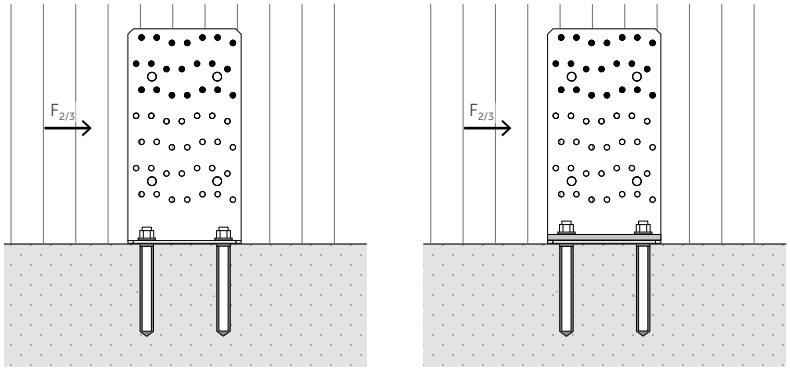
(5) HYB-FIX chemical anchor according to ETA 20/1285.

GENERAL PRINCIPLES:

- For the general principles of calculation, see page 22.

STRUCTURAL VALUES | SHEAR JOINT $F_{2/3}$ | TIMBER-TO-CONCRETE

JKR100200 | JKR100200 + NINOW100200



TIMBER STRENGTH

configuration	TIMBER					CONCRETE			
	holes fastening Ø5			no washer	washer	holes fastening Ø13			pattern (2)
	type	Ø x L	n_v	$R_{2/3,k\ timber}$	$R_{2/3,k\ timber}$	Ø	n_H	e_y	e_z(1)
		[mm]	pcs	[kN]	[kN]	[mm]	pcs	[mm]	[mm]
pattern (2)	LBA nails	Ø4,0 x 60	10	-	11,6	M12	3	30	174,5
	SBL screws	Ø5,0 x 50		-	3,5				
pattern (3)	LBA nails	Ø4,0 x 60	10	10,7	-				
	SBL screws	Ø5,0 x 50		6,0	-				
pattern (5)	LBA nails	Ø4,0 x 60	20	16,9	-				
	SBL screws	Ø5,0 x 50		8,3	-				

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	holes fastening Ø13		$R_{2/3,d\ concrete}$	
	type	Ø x L	no washer pattern (3)-(5)	washer pattern (2)
		[mm]	[kN]	[kN]
• **uncracked**	V-NEX 5.8(2)	M12 x 195	30,3	11,4
	V-NEX 8.8	M12 x 195	41,2	12,5
	SKR-CE(3)	12 x 90	32,0	-
		12 x 110	-	4,8
	AB1(4)	M12 x 100	30,7	-
		M12 x 120	-	7,9
• **cracked**	V-NEX 8.8	M12 x 195	38,1	6,8
	V-NEX 8.8	M12 x 195	41,2	14,3
	SKR-CE	12 x 90	22,9	-
	AB1	M12 x 100	26,4	-
		M12 x 120	-	4,6
• **seismic**	HYB-FIX 8.8(5)	M12 x 140	14,8	-
		M12 x 195	21,0	5,0
	SKR-CE	12 x 90	7,6	-
	AB1	M12 x 100	7,7	-

NOTES:

(1) For patterns 3-5, eccentricity e_z is assumed to be zero.

(2) V-NEX chemical anchor according to ETA 20/0363.

(3) SKR-CE screw anchor according to ETA 19/0100.

(4) AB1 mechanical anchor according to ETA 17/0481.

(5) HYB-FIX chemical anchor according to ETA 20/1285.

GENERAL PRINCIPLES:

- For the general principles of calculation, see page 22.

CHEMICAL ANCHORS INSTALLATION PARAMETERS

JKR100100

anchor type		d_0	h_{ef}	h_{nom}	h_1	h_{min}
type	Ø x L [mm]	[mm]	[mm]	[mm]	[mm]	[mm]
V-NEX 5.8	M12 x 140	14	120	120	125	200
HYB-FIX 5.8	M12 x 140	14	120	120	125	
HYB-FIX 8.8	M12 x 140	14	120	120	125	
	M12 x 195	14	170	170	175	
SKR-CE	12 x 90	10	64	88	110	
AB1	M12 x 100	12	70	80	85	

Pre-cut INA class 5.8 / 8.8 threaded rod, including nut and washer.
Concrete-side strength values were calculated assuming a t_{fix} thickness of 2 mm.

JKR15080

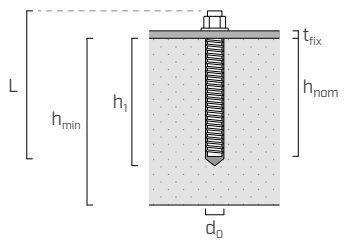
anchor type		d_0	no washer				washer			
			h_{ef}	h_{nom}	h_1	h_{min}	h_{ef}	h_{nom}	h_1	h_{min}
type	Ø x L [mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
V-NEX 5.8	M12 x 140	14	120	120	125	200	115	115	120	200
	M12 x 195	14	170	170	175		170	170	175	
V-NEX 8.8	M12 x 195	14	170	170	175		170	170	175	
HYB-FIX 8.8	M12 x 140	14	120	120	125		115	115	120	
	M12 x 195	14	170	170	175		170	170	175	
SKR-CE	12 x 90	10	64	88	110		64	82	105	
AB1	M12 x 100	12	70	80	85		-	-	-	
	M12 x 120	12	-	-	-		70	80	85	

Pre-cut INA class 5.8 / 8.8 threaded rod, including nut and washer.
The concrete-side strength values for installation with a washer were calculated assuming a t_{fix} thickness of 8 mm. For installation without washer, a t_{fix} value of 2 mm was assumed.

JKR100200

anchor type		d_0	no washer				washer			
			h_{ef}	h_{nom}	h_1	h_{min}	h_{ef}	h_{nom}	h_1	h_{min}
type	Ø x L [mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
V-NEX 5.8	M12 x 195	14	170	170	175	200	165	165	170	200
V-NEX 8.8	M12 x 195	14	170	170	175		165	165	170	
HYB-FIX 8.8	M12 x 140	14	120	120	125		115	115	120	
	M12 x 195	14	170	170	175		165	165	170	
SKR-CE	12 x 90	10	64	87	110		-	-	-	
	12 x 110	10	-	-	-		64	99	120	
AB1	M12 x 100	12	70	80	85		-	-	-	
	M12 x 120	12	-	-	-		70	80	85	

Pre-cut INA class 5.8 / 8.8 threaded rod, including nut and washer.
The concrete-side strength values for installation with a washer were calculated assuming a t_{fix} thickness of 11 mm. For installation without washer, a t_{fix} value of 3 mm was assumed.



t_{fix}	fastened plate thickness
h_{nom}	nominal anchoring depth
h_{ef}	effective anchoring depth
h_1	minimum hole depth
d_0	hole diameter in the concrete support
h_{min}	concrete minimum thickness

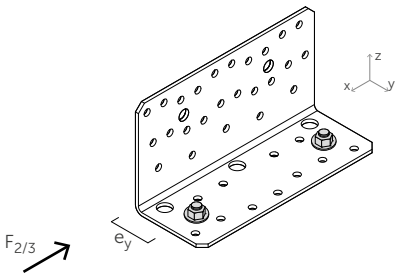
ANCHORS FOR CONCRETE STRESS VERIFICATION F2/3

INSTALLATION WITHOUT WASHER

Fastening elements to the concrete through anchors shall be verified according to the load acting on the anchor, which can be evaluated through the geometric parameters on the table (e).

The anchor group must be verified for:

$V_{Sd,x} = F_{2/3,d}$
$M_{Sd,z} = F_{2/3,d} \times e_y$

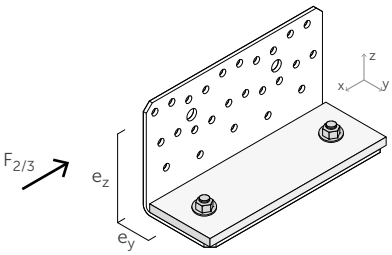


INSTALLATION WITH WASHER

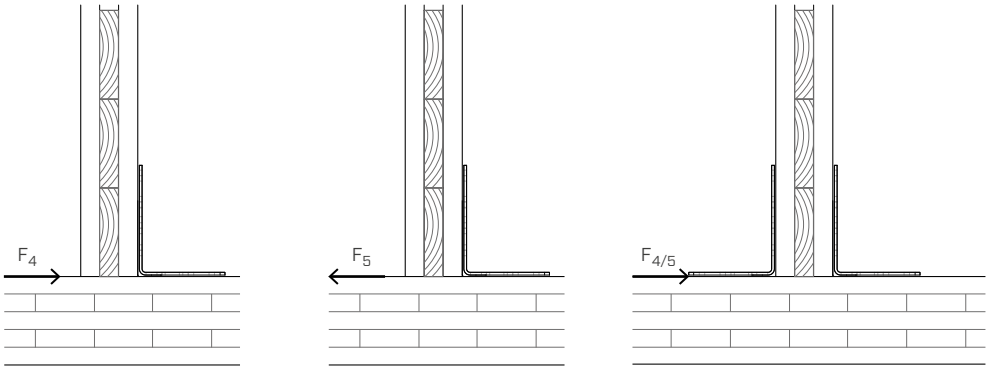
In the case of installation with WASHER, the fastening elements to the concrete through anchors must be verified according to the load acting on the anchor, which can be evaluated through the geometric parameters on the table (e).

The anchor group must be verified for:

$V_{Sd,x} = F_{2/3,d}$
$M_{Sd,z} = F_{2/3,d} \times e_y$
$M_{Sd,y} = F_{2/3,d} \times e_z$



STRUCTURAL VALUES | SHEAR JOINT F_4-F_5 | TIMBER-TO-TIMBER

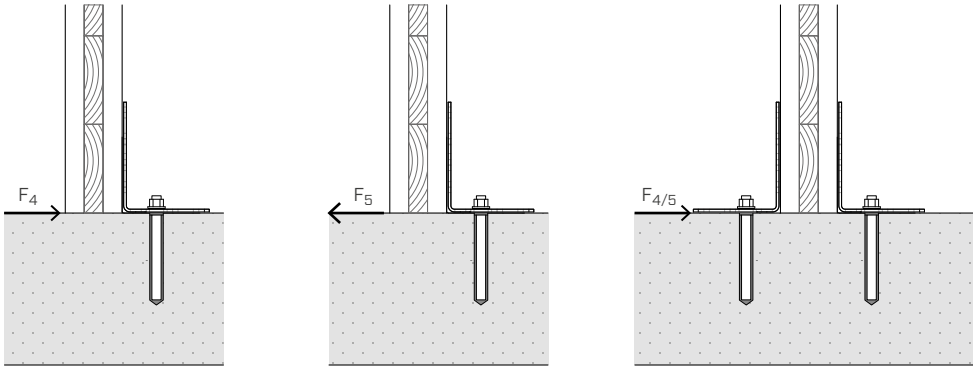


CODE	configuration	holes fastening Ø5				$R_{4,k}$ timber	$R_{5,k}$ timber	$R_{4/5,k}$ timber
		type	Ø x L [mm]	n_v pcs	n_H pcs	[kN]	[kN]	[kN]
JKR100100	pattern (1)	LBA nails	Ø4,0 x 60	14	13 + 2 VGS Ø9 x 140	23,2	1,8	25,0
		SBL screws	Ø5,0 x 50			22,0	1,8	23,8
	pattern (2)	LBA nails	Ø4,0 x 60	14	13	23,2	1,8	25,0
		SBL screws	Ø5,0 x 50			22,0	1,8	23,8
	pattern (3)	LBA nails	Ø4,0 x 60	8	13	7,4	1,8	9,2
		SBL screws	Ø5,0 x 50			7,4	1,8	9,2
	pattern (4)	LBA nails	Ø4,0 x 60	8	13	23,2	3,4	26,6
		SBL screws	Ø5,0 x 50			22,0	3,4	25,4
	pattern (5)	LBA nails	Ø4,0 x 60	4	13	9,2	3,4	12,6
		SBL screws	Ø5,0 x 50			9,2	3,4	12,6
JKR15080	pattern (1)	LBA nails	Ø4,0 x 60	20	11 + 3 VGS Ø9 x 140	22,3	2,5	24,8
		SBL screws	Ø5,0 x 50			21,6	2,5	24,1
	pattern (2)	LBA nails	Ø4,0 x 60	20	11	22,3	2,5	24,8
		SBL screws	Ø5,0 x 50			21,6	2,5	24,1
	pattern (3)	LBA nails	Ø4,0 x 60	10	11	10,2	2,5	12,7
		SBL screws	Ø5,0 x 50			10,2	2,5	12,7
	pattern (4)	LBA nails	Ø4,0 x 60	10	11	18,7	4,8	23,5
		SBL screws	Ø5,0 x 50			17,7	4,8	22,5
	pattern (5)	LBA nails	Ø4,0 x 60	5	11	14,7	4,8	19,5
		SBL screws	Ø5,0 x 50			14,7	4,8	19,5
JKR100200	pattern (1)	LBA nails	Ø4,0 x 60	21	13 + 3 VGS Ø9 x 140	19,1	2,6	21,7
		SBL screws	Ø5,0 x 50			19,1	2,6	21,7

NOTES:

- The F_4, F_5, $F_{4/5}$ values in the table are valid for the acting stress calculation eccentricity e=0 (timber elements prevented from rotating).
- Refer to ETA-22/0089 for $K_{4,ser}$ stiffness values in timber-to-timber and timber-to-concrete configuration.

STRUCTURAL VALUES | SHEAR JOINT F_4-F_5 | TIMBER-TO-CONCRETE



CODE	configuration	holes fastening Ø5			$R_{4,k}$ timber	$R_{5,k}$ timber	$R_{4/5,k}$ timber
		type	Ø x L [mm]	n_v pcs	[kN]	[kN]	[kN]
JKR100100	pattern (6)	LBA nails	Ø4,0 x 60	14	6,2	1,1	7,4
		SBL screws	Ø5,0 x 50		6,2	1,1	7,4
	pattern (7)	LBA nails	Ø4,0 x 60	14	23,2	1,8	25,0
		SBL screws	Ø5,0 x 50		22,0	1,8	23,8
	pattern (8)	LBA nails	Ø4,0 x 60	8	3,8	1,1	5,0
		SBL screws	Ø5,0 x 50		3,8	1,1	5,0
	pattern (10)	LBA nails	Ø4,0 x 60	8	14,4	3,4	17,8
		SBL screws	Ø5,0 x 50		13,6	3,4	17,0
	pattern (11)	LBA nails	Ø4,0 x 60	4	6,3	1,8	8,1
		SBL screws	Ø5,0 x 50		5,9	1,8	7,7
	pattern (12)	LBA nails	Ø4,0 x 60	4	9,2	3,4	12,6
		SBL screws	Ø5,0 x 50		9,2	3,4	12,6
JKR15080	pattern (6)	LBA nails	Ø4,0 x 60	10	8,7	1,6	10,3
		SBL screws	Ø5,0 x 50		8,7	1,6	10,3
	pattern (7)	LBA nails	Ø4,0 x 60	20	22,3	2,5	24,8
		SBL screws	Ø5,0 x 50		21,6	2,5	24,1
	pattern (8)	LBA nails	Ø4,0 x 60	10	10,2	2,5	12,7
		SBL screws	Ø5,0 x 50		10,2	2,5	12,7
	pattern (9)	LBA nails	Ø4,0 x 60	10	18,7	4,8	23,5
		SBL screws	Ø5,0 x 50		17,7	4,8	22,5
	pattern (10)	LBA nails	Ø4,0 x 60	5	8,4	2,5	10,9
		SBL screws	Ø5,0 x 50		7,9	2,5	10,4
	pattern (11)	LBA nails	Ø4,0 x 60	5	11,6	4,8	16,4
		SBL screws	Ø5,0 x 50		11,6	4,8	16,4
JKR100200	pattern (2)	LBA nails	Ø4,0 x 60	14	2,1	0,7	2,8
		SBL screws	Ø5,0 x 50		2,1	0,7	2,8
	pattern (3)	LBA nails	Ø4,0 x 60	21	2,6	0,8	3,4
		SBL screws	Ø5,0 x 50		2,6	0,8	3,4
	pattern (5)	LBA nails	Ø4,0 x 60	21	4,9	1,2	6,1
		SBL screws	Ø5,0 x 50		4,9	1,2	6,1

NOTES:

- The F_4, F_5, $F_{4/5}$ values in the table are valid for the acting stress calculation eccentricity e=0 (timber elements prevented from rotating).
- Refer to ETA-22/0089 for $K_{4,ser}$ stiffness values in timber-to-timber and timber-to-concrete configuration.

GENERAL PRINCIPLES:

- Characteristic values are consistent with EN 1995-1-1 and in accordance with ETA-22/0089. The design values of the anchors for concrete are calculated in accordance with the respective European Technical Assessments. The connection design strength values are obtained from the values on the table as follows:

$$R_d = min \begin{cases} \frac{R_{k,\ timber} \cdot k_{mod}}{\gamma_M} \\ R_{d,\ concrete} \end{cases}$$

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

- The characteristic values of the load-bearing capacity $R_{k,timber}$ are determined for the combined timber-side and steel-side failure.
- Installation with nails and screws of shorter length than proposed in the table is possible. In this case, the bearing capacity values $R_{k\ timber}$ must be multiplied by the following reductive factor k_F:

  - for nails

$$k_F = min \left\{ \frac{F_{v,short,Rk}}{2{,}66\ kN} ; \frac{F_{ax,short,Rk}}{1{,}28\ kN} \right\}$$

  - for screws

$$k_F = min \left\{ \frac{F_{v,short,Rk}}{2{,}25\ kN} ; \frac{F_{ax,short,Rk}}{2{,}63\ kN} \right\}$$

  $F_{v,short,Rk}$ = *characteristic shear strength of the nail or screw*
  $F_{ax,short,Rk}$ = *characteristic withdrawal strength of the nail or screw*

- Dimensioning and verification of timber and concrete elements must be carried out separately. Verify that there are no brittle fractures before reaching the connection strength.
- Structural elements in timber, to which the connection devices are fastened, must be prevented from rotating.
- For the calculation process a timber characteristic density ρ_k = 350 kg/m^3 has been considered. For higher ρ_k values, the strength on timber side can be converted by the k_{dens} value:

$$k_{dens} = \left(\frac{\rho_k}{350} \right)^{0,5} \quad for\ 350\ kg/m^3 \ \leq \rho_k \leq\ 420\ kg/m^3 \qquad k_{dens} = \left(\frac{\rho_k}{350} \right)^{0,5} \quad for\ LVL\ with\ \ \rho_k \leq\ 500\ kg/m^3$$

- In the calculation phase, a strength class of C25/30 concrete with thin reinforcement was considered, in the absence of spacing and distances from the edge and minimum thickness indicated in the tables listing the installation parameters of the anchors used.
- The anchors seismic design was carried out in performance category C2, without ductility requirements on anchors (option a2) elastic design according to EN 1992-4, with α_{sus}= 0,6. For chemical anchors it is assumed that the annular space between the anchor and the plate hole is filled (α_{gap}=1).