NINO

PATENTED | DESIGN REGISTERED | ETA-22/0089

UNIVERSAL ANGLE BRACKET FOR SHEAR AND TENSILE LOADS

VERSATILE
Available in four models to meet multiple fastening requirements for CLT or timber frame walls. ETA-certified strengths with resilient XYLOFON PLATE profile.

A CONDENSATION OF INNOVATION
The timber-to-timber configuration can be installed with LBA nails or LBS screws or HBS PLATE screws. The addition of the optional VGS full thread connectors provides the angle bracket with unimaginable strengths.

SURPRISING STRENGTHS
Excellent strength values for forces in all directions, with the possibility of use in timber-to-timber or timber-to-concrete configurations. On concrete, the additional washer provides surprising strengths.

TIMBER FRAME
Optimised partial nailing allow installation even with the presence of bedding grout. It can also be used on smaller frame walls (38 mm | 2").

SERVICE CLASS SC1 SC2

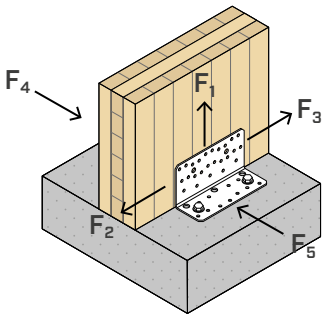
MATERIAL

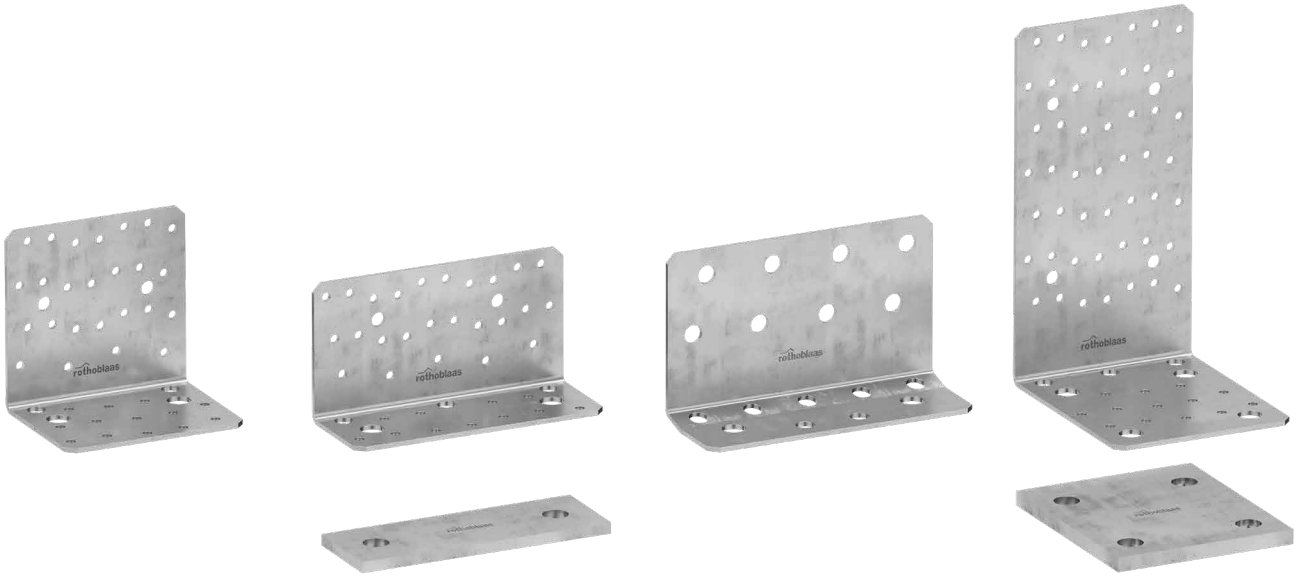
S250 Z275 **NINO**: carbon steel S250GD + Z275

S350 Z275 **NINO15080S**: S350GD + Z275 carbon steel

S235 Fe/Zn12c **NINO WASHER:** S235 + Fe/Zn12c carbon steel

EXTERNAL LOADS





FIELDS OF USE

Shear and tension joints with small-medium stress.
Also optimised for fastening frame walls.
Timber-to-timber, timber-to-concrete and timber-to-steel configurations.

Can be applied to:
- solid timber and glulam
- timber frame
- CLT and LVL panels

A SINGLE AND CONCEALED ANGLE BRACKET

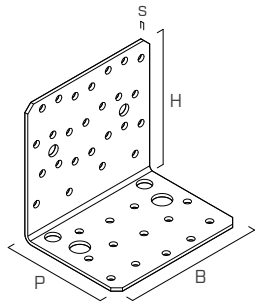
A single type of angle bracket for shear and tensile forces. It can be integrated into the floor or false ceiling panels.

RAISED WALL

Partial nailing patterns allow installation on CLT walls in the presence of a base plate or concrete kerb up to 120 mm high.

CODES AND DIMENSIONS

NINO



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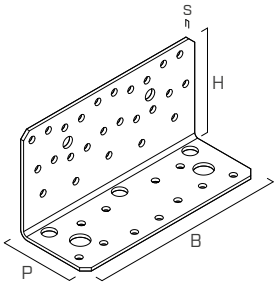

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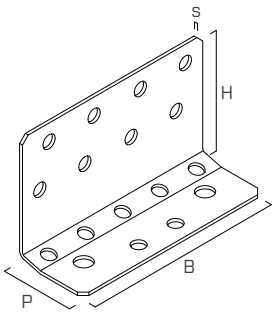

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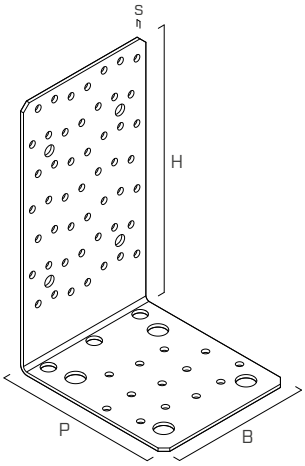
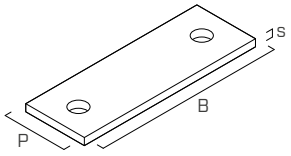


4

	CODE	B [mm]	P [mm]	H [mm]	s [mm]	n Ø5 [pcs]	n_H Ø10 [pcs]	n_H Ø13 [pcs]	n_V Ø10,5 [pcs]			pcs
1	**NINO100100**	104	78	100	2,5	25 + 13	2	2	-	●	●	10
2	**NINO15080**	146	55	77	2,5	25 + 11	3	2	-	●	●	10
3	**NINO15080S**	156	55	94	2,5	-	-	2	8 + 7	●	●	10
4	**NINO100200**	104	122	197	3	49 + 13	3	4	-	●	●	10

NINO WASHER



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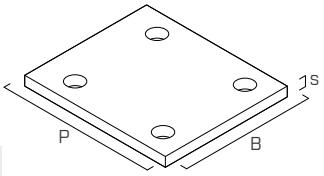
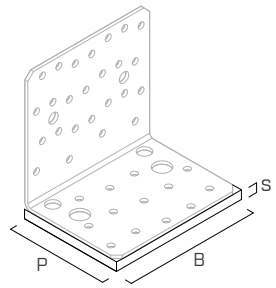


2

	CODE	NINO15080	NINO100200	B [mm]	P [mm]	s [mm]	n_H Ø14 [pcs]		pcs
1	**NINOW15080**	●	-	146	50	6	2	●	10
2	**NINOW100200**	-	●	104	120	8	4	●	10

ACOUSTIC PROFILE | TIMBER-TO-TIMBER JOINTS



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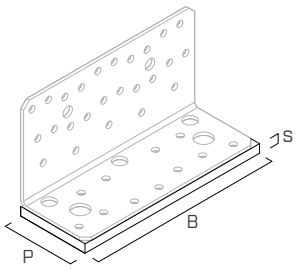

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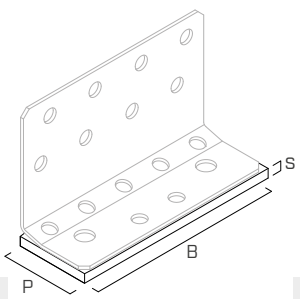

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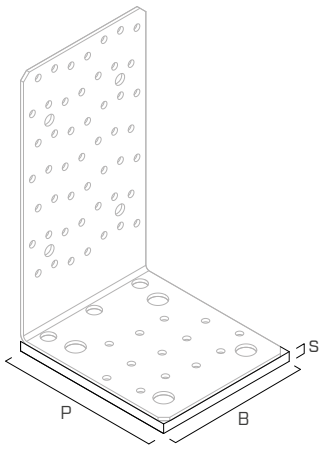


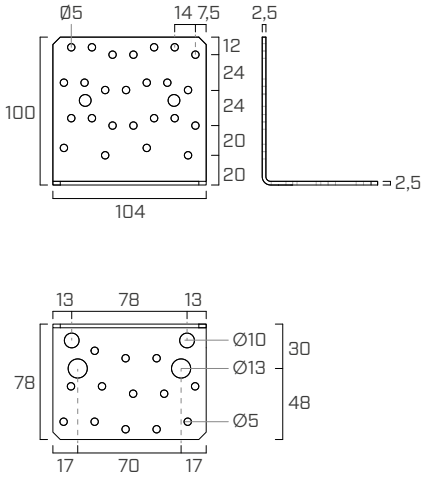
3

	CODE	NINO100100	NINO15080 NINO15080S	NINO100200	B [mm]	P [mm]	s [mm]		pcs
1	**XYL3580105**	●	-	-	105	80	6	●	1
2	**XYL3555150**	-	●	-	150	55	6	●	1
3	**XYL35120105**	-	-	●	105	120	6	●	1

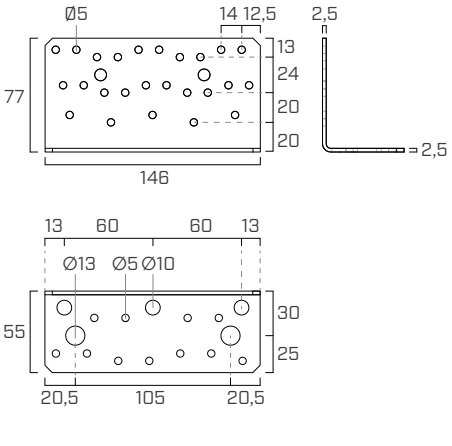
rothoblaas

GEOMETRY

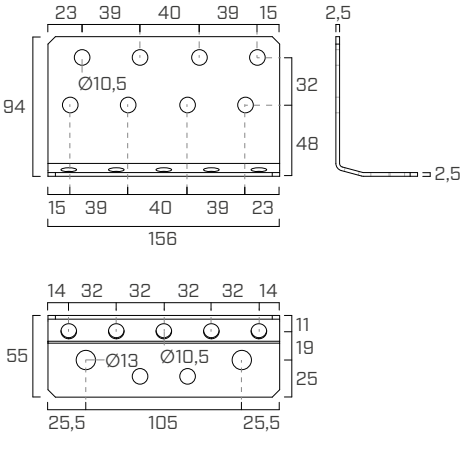
NIN0100100



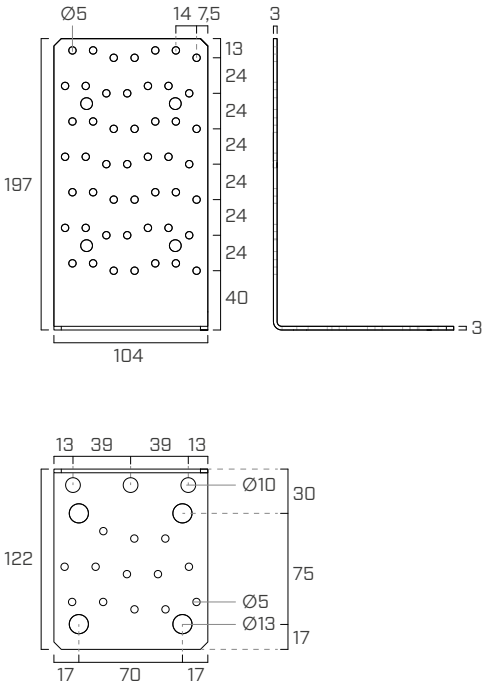
NIN015080



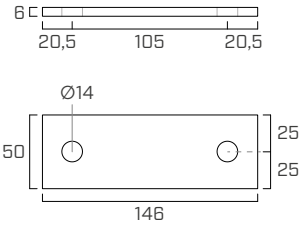
NIN015080S



NIN0100200



NINOW15080



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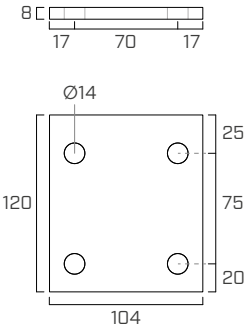


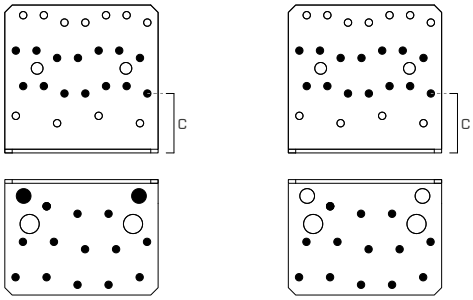
FASTENERS

type	description		d [mm]	support	page
LBA	high bond nail		4		570
LBS	round head screw		5		571
VGS	fully threaded countersunk screw		9		575
HBS PLATE	pan head screw		8		573
AB1	CE1 expansion anchor		12		536
SKR	screw-in anchor		12		528
VIN-FIX	vinyl ester chemical anchor		M12		545
HYB-FIX	hybrid chemical anchor		M12		552
EPO-FIX	epoxy chemical anchor		M12		557

FASTENING PATTERNS

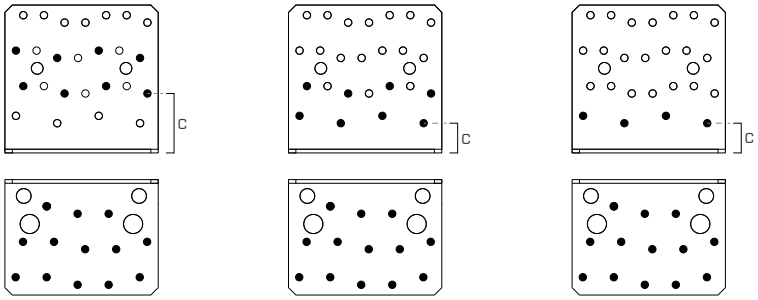
NINO100100 | TIMBER-TO-TIMBER

INSTALLATION ON CLT



pattern 1 pattern 2

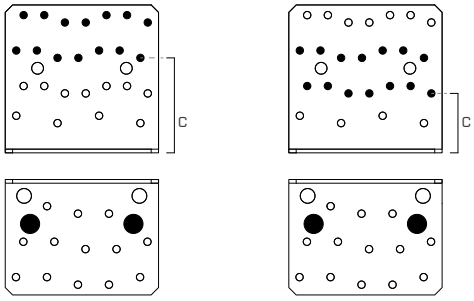
INSTALLATION ON TIMBER FRAME



pattern 3 pattern 4 pattern 5

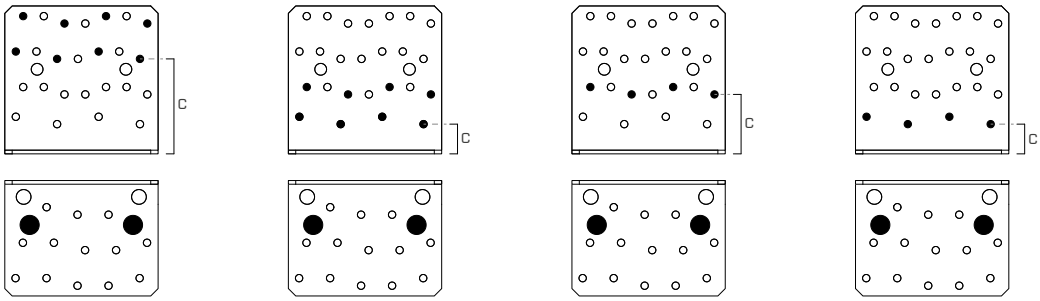
NINO100100 | TIMBER-TO-CONCRETE

INSTALLATION ON CLT



pattern 6 pattern 7

INSTALLATION ON TIMBER FRAME



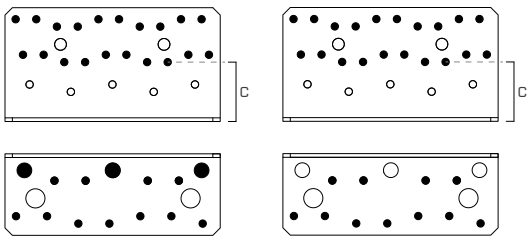
pattern 8 pattern 10 pattern 11 pattern 12

CODE	configuration	fastening holes Ø5		fastening holes Ø10	fastening holes Ø13		support	
		n_V [pcs]	n_H [pcs]	n_H [pcs]	n_H [pcs]	c [mm]		
NINO100100	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	-	●

FASTENING PATTERNS

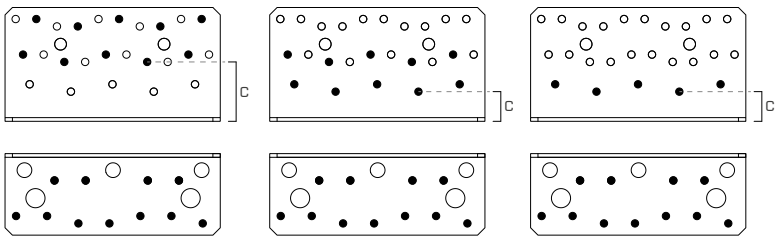
NINO15080 | TIMBER-TO-TIMBER

INSTALLATION ON CLT



pattern 1 pattern 2

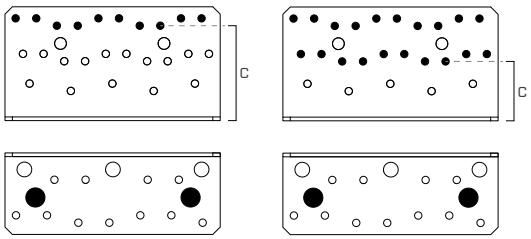
INSTALLATION ON TIMBER FRAME



pattern 3 pattern 4 pattern 5

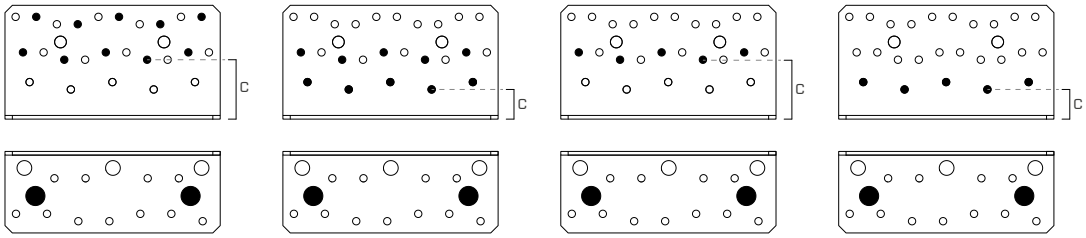
NINO15080 | TIMBER-TO-CONCRETE

INSTALLATION ON CLT



pattern 6 pattern 7

INSTALLATION ON TIMBER FRAME



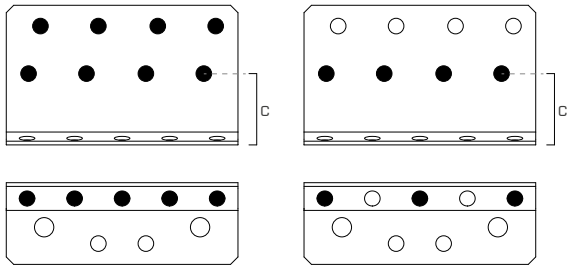
pattern 8 pattern 9 pattern 10 pattern 11

CODE	configuration	fastening holes Ø5		fastening holes Ø10	fastening holes Ø13	c	support	
		n_V [pcs]	n_H [pcs]	n_H [pcs]	n_H [pcs]	[mm]		
NINO15080	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	-	●

FASTENING PATTERNS

NINO15080S | TIMBER-TO-TIMBER

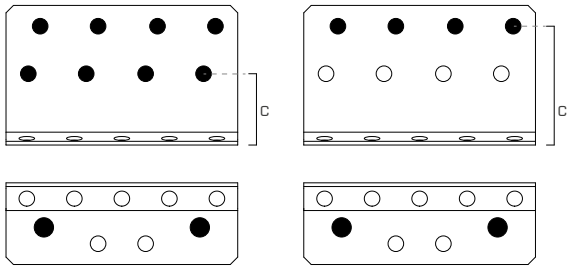
INSTALLATION ON CLT



pattern 1 pattern 2

NINO15080S | TIMBER-TO-CONCRETE

INSTALLATION ON CLT



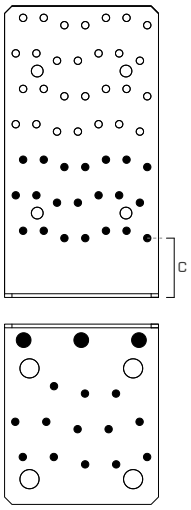
pattern 3 pattern 4

CODE	configuration	fastening holes Ø10,5		fastening holes Ø13	c	support	
		n_V [pcs]	n_H [pcs]	n_H [pcs]	[mm]		
NINO15080S	pattern 1	8	5	-	48	●	-
	pattern 2	4	3	-	48	●	-
	pattern 3	8	-	2	48	-	●
	pattern 4	4	-	2	80	-	●

FASTENING PATTERNS

NINO100200 | TIMBER-TO-TIMBER

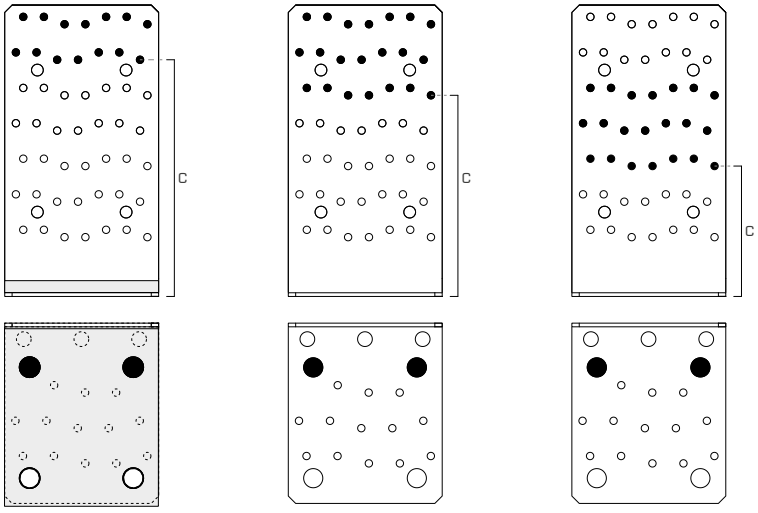
INSTALLATION ON CLT



pattern 1

NINO100200 | TIMBER-TO-CONCRETE

INSTALLATION ON CLT



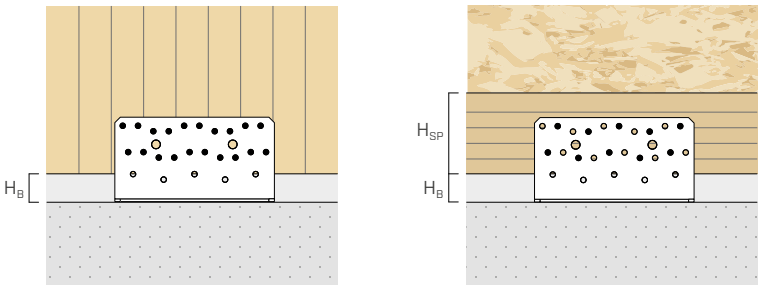
pattern 2 pattern 3 pattern 5

CODE	configuration	fastening holes Ø5		fastening holes Ø10	fastening holes Ø13	c	support	
		n_V [pcs]	n_H [pcs]	n_H [pcs]	n_H [pcs]	[mm]		
NINO100200	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



INSTALLATION ON CLT

CODE	configuration	n_V - Ø	$H_{B\,max}$ [mm]		
			nails	screws	
			LBA Ø4	LBS Ø5	HBS PLATE Ø8
NINO100100	pattern 1	14 - Ø5	0	10	-
	pattern 2	14 - Ø5	0	10	-
	pattern 6	14 - Ø5	24	34	-
	pattern 7	14 - Ø5	0	10	-
NINO15080	pattern 1	20 - Ø5	0	10	-
	pattern 2	20 - Ø5	0	10	-
	pattern 6	10 - Ø5	24	34	-
	pattern 7	20 - Ø5	0	10	-
NINO15080S	pattern 3	8 - Ø10,5	-	-	0
	pattern 4	4 - Ø10,5	-	-	32
NINO100200	pattern 1	21 - Ø5	0	10	-
	pattern 2	14 - Ø5	120	130	-
	pattern 3	21 - Ø5	96	106	-
	pattern 5	21 - Ø5	48	58	-

INSTALLATION ON TIMBER FRAME

CODE	configuration	n_V - Ø	$H_{B\,max}$ [mm]		$H_{SP\,min}$
			nails	screws	
			LBA Ø4	LBS Ø5	[mm]
NINO100100	pattern 3	8 - Ø5	27	27	60
	pattern 4	8 - Ø5	7	7	60
	pattern 5	4 - Ø5	7	7	38
	pattern 8	8 - Ø5	51	51	120
	pattern 10	8 - Ø5	7	7	60
	pattern 11	4 - Ø5	27	27	60
	pattern 12	4 - Ø5	7	7	38
NINO15080	pattern 3	10 - Ø5	27	27	60
	pattern 4	10 - Ø5	7	7	60
	pattern 5	5 - Ø5	7	7	38
	pattern 8	10 - Ø5	27	27	100
	pattern 9	10 - Ø5	7	7	60
	pattern 10	5 - Ø5	27	27	60
	pattern 11	5 - Ø5	7	7	38

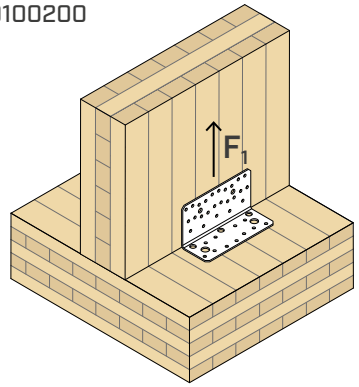
NOTES

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 1995:2014 - Annex K for nails and ETA-11/0030 for screws.
- C/GL: minimum distances for solid timber or glulam consistent with EN 1995:2014 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 | TIMBER-TO-TIMBER | F_1

NINO100100 | NINO15080 | NINO15080S | NINO100200



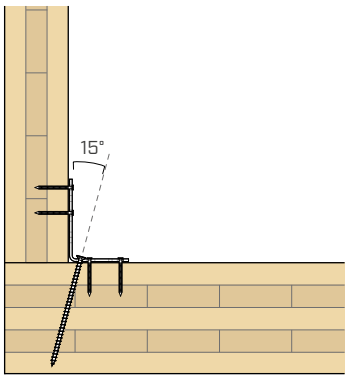
TIMBER STRENGTH

CODE	configuration on timber	fastening holes				$R_{1,k\ timber}$ [kN]	$K_{1,ser}$ [kN/mm]
		type	Ø x L [mm]	n_V [pcs]	n_H [pcs]		
NINO100100	pattern 1(1)	LBA	Ø4 x 60	14	13 + 2 VGS Ø9 x 140	**20,0**	$R_{1,k\ timber}$/6
		LBS	Ø5 x 50			**20,0**	
	pattern 2	LBA	Ø4 x 60	14	13	**5,9**	$R_{1,k\ timber}$/2
		LBS	Ø5 x 50			**6,8**	
NINO15080	pattern 1(1)	LBA	Ø4 x 60	20	11 + 3 VGS Ø9 x 140	**39,5(*)**	$R_{1,k\ timber}$/6
		LBS	Ø5 x 50			**39,5(*)**	
	pattern 2	LBA	Ø4 x 60	20	11	**4,0**	$R_{1,k\ timber}$/2
		LBS	Ø5 x 50			**6,0**	
NINO15080S	pattern 1	HBS PLATE	Ø8 x 100	8	5	**49,9**	$R_{1,k\ timber}$/5
	pattern 2	HBS PLATE	Ø8 x 100	4	3	**32,0**	
NINO100200	pattern 1(1)	LBA	Ø4 x 60	21	13 + 3 VGS Ø9 x 140	**41,2**	$R_{1,k\ timber}$/5
		LBS	Ø5 x 50			**41,2**	

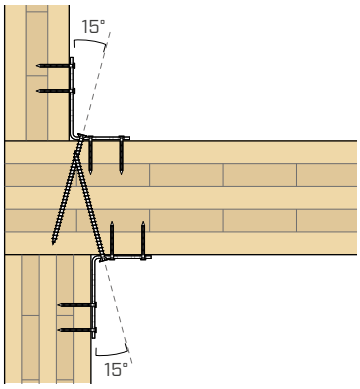
(*) In the case of installation coupled with an acoustic profile, the $R_{1,k\ timber}$ strength must be assumed to be 37.2 kN.

INSTALLATION WITH INCLINED SCREWS | TIMBER-TO-TIMBER

The possibility of installing inclined VGS screws in all models broadens the design possibilities and offers solutions for a wide range of applications, confirming NINO angle brackets as an excellent choice for excellent performance in terms of both shear and tensile loads.



Example: installation of a NINO15080 angle bracket with inclined VGS screws



Example: installation of NINO15080 angle brackets with inclined VGS screws for fastening inter-storey walls with different thickness values

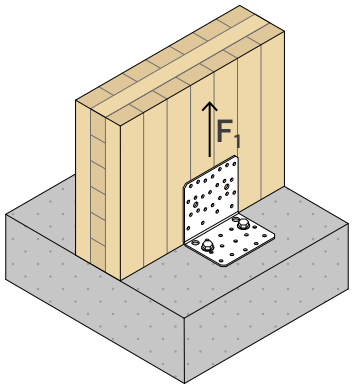
NOTES

(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.

- The strength values listed are also valid for installation with XYLOFON acoustic profile below the horizontal flange.

STRUCTURAL VALUES | TIMBER-TO-CONCRETE | F_1

NINO100100



TIMBER STRENGTH

configuration on timber	fastening holes Ø5 type	Ø x L [mm]	n_V [pcs]	$R_{1,k\ timber}$ [kN]	$K_{1,ser}$ [kN/mm]
pattern 6-7	LBA	Ø4 x 60	14	**14,0**	$R_{1,k\ timber}/18$
	LBS	Ø5 x 50		**14,0**	

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	fastening holes Ø13 type	Ø x L [mm]	n_H [pcs]	$R_{1,d\ concrete}$ [kN]	$k_{t//}$
uncracked	VIN-FIX 5.8	M12 x 140	2	**23,8**	1,21
cracked	VIN-FIX 5.8	M12 x 195		**26,2**	
seismic	HYB-FIX 8.8	M12 x 195		**15,5**	
		M12 x 245		**20,1**	
	EPO-FIX 8.8	M12 x 195		**24,0**	

ANCHORS INSTALLATION PARAMETERS

anchor type type	Ø x L [mm]	d_0 [mm]	h_{ef} [mm]	h_{nom} [mm]	h_1 [mm]	h_{min} [mm]
VIN-FIX 5.8	M12 x 140	14	115	115	115	200
	M12 x 195		170	170	175	200
HYB-FIX 8.8	M12 x 195		170	170	175	200
	M12 x 245		220	220	225	250
EPO-FIX 8.8	M12 x 195		170	170	175	200

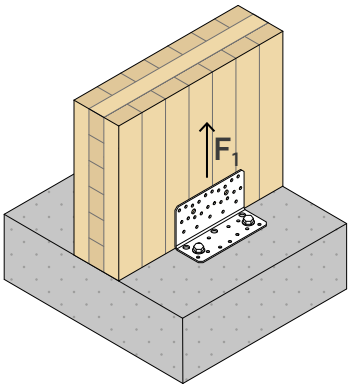
Precut INA threaded rod, with nut and washer: see page 562.
MGS threaded rod class 8.8 to be cut to size: see page 174.
Concrete-side strength values were calculated assuming a t_{fix} thickness of 2 mm.

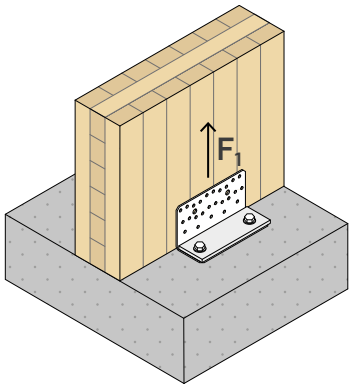
GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 23.

STRUCTURAL VALUES | TIMBER-TO-CONCRETE | F_1

NIN015080 | NIN015080 + NINOW15080





TIMBER STRENGTH

configuration on timber	fastening holes Ø5			no washer		washer	
	type	Ø x L [mm]	n_V [pcs]	$R_{1,k\ timber}$ [kN]	$K_{1,ser}$ [kN/mm]	$R_{1,k\ timber}$ [kN]	$K_{1,ser}$ [kN/mm]
pattern 6	LBA	Ø4 x 60	10	**14,7**	$R_{1,k\ timber}/16$	**24,9**	$R_{1,k\ timber}/8$
	LBS	Ø5 x 50		**14,7**		**20,9**	
pattern 7	LBA	Ø4 x 60	20	**14,7**		**24,9**	
	LBS	Ø5 x 50		**14,7**		**24,9**	

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	fastening holes Ø13			no washer pattern 6-7		washer pattern 6-7	
	type	Ø x L [mm]	n_H [pcs]	$R_{1,d\ concrete}$ [kN]	$k_{t//}$	$R_{1,d\ concrete}$ [kN]	$k_{t//}$
uncracked	VIN-FIX 5.8	M12 x 195	2	**33,8**	1,38	**25,9**	1,75
cracked	VIN-FIX 5.8	M12 x 195		**18,8**		**14,4**	
	HYB-FIX 5.8	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**	
	EPO-FIX 8.8	M12 x 195		**22,2**		**17,0**	

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]
VIN-FIX 5.8	M12 x 195	14	170	170	175	200	165	165	170	200
HYB-FIX 5.8/8.8	M12 x 195		170	170	175	200	165	165	170	200
	M12 x 245		220	220	225	250	210	210	215	240
EPO-FIX 8.8	M12 x 195		170	170	175	200	165	165	170	200

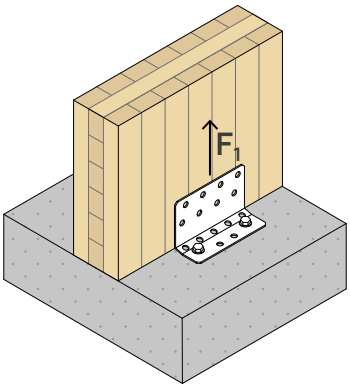
Precut INA threaded rod, with nut and washer: see page 562.
MGS threaded rod class 8.8 to be cut to size: see page 174.
The concrete-side strength values for installation with a washer were calculated assuming a t_{fix} thickness of 8 mm. For installation without washer, a t_{fix} value of 2 mm was assumed.

GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 23.

STRUCTURAL VALUES | TIMBER-TO-CONCRETE | F_1

NIN015080S



TIMBER STRENGTH

configuration on timber	fastening holes Ø10,5 type	Ø x L [mm]	n_V [pcs]	$R_{1,k\ timber}$ [kN]	$K_{1,ser}$ [kN/mm]
pattern 3	HBS PLATE	Ø8 x 100	8	**22,9**	$R_{1,k\ timber}/5$
pattern 4	HBS PLATE	Ø8 x 100	4	**18,4**	

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	fastening holes Ø13 type	Ø x L [mm]	n_H [pcs]	$R_{1,d\ concrete}$ [kN]	$k_{t//}$
uncracked	VIN-FIX 5.8	M12 x 195	2	**34,3**	1,36
cracked	VIN-FIX 5.8	M12 x 195		**19,1**	
	HYB-FIX 5.8	M12 x 195		**36,7**	
seismic	HYB-FIX 8.8	M12 x 195		**14,5**	
		M12 x 245		**18,9**	
	EPO-FIX 8.8	M12 x 195		**22,5**	

ANCHORS INSTALLATION PARAMETERS

anchor type	[mm]	d_0 [mm]	h_{ef} [mm]	h_{nom} [mm]	h_1 [mm]	h_{min} [mm]
VIN-FIX 5.8	M12 x 195	14	170	170	175	200
HYB-FIX 5.8/8.8	M12 x 195		170	170	175	200
	M12 x 245		220	220	225	240
EPO-FIX 8.8	M12 x 195		170	170	175	200

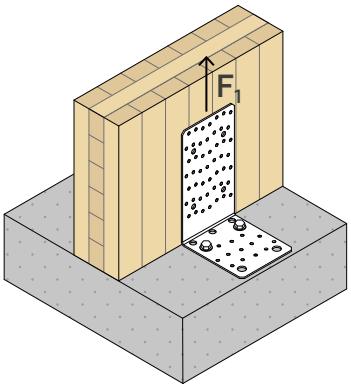
Precut INA threaded rod, with nut and washer: see page 562.
MGS threaded rod class 8.8 to be cut to size: see page 174.
Concrete-side strength values were calculated assuming a t_{fix} thickness of 2 mm.

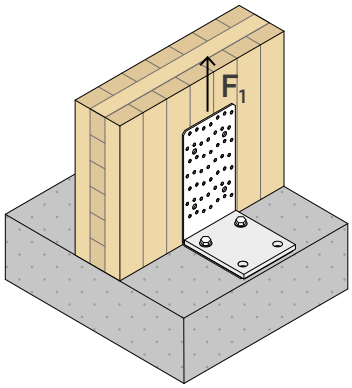
GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 23.

STRUCTURAL VALUES | TIMBER-TO-CONCRETE | F_1

NINO100200 | NINO100200 + NINOW100200





TIMBER STRENGTH

configuration on timber	fastening holes Ø5			no washer		washer	
	type	Ø x L [mm]	n_V [pcs]	$R_{1,k\ timber}$ [kN]	$K_{1,ser}$ [kN/mm]	$R_{1,k\ timber}$ [kN]	$K_{1,ser}$ [kN/mm]
pattern 2	LBA	Ø4 x 60	14	**-**	$R_{1,k\ timber}/16$	**34,7**	$R_{1,k\ timber}/8$
	LBS	Ø5 x 50		**-**		**29,3**	
pattern 3	LBA	Ø4 x 60	21	**14,7**		**-**	
	LBS	Ø5 x 50		**14,7**		**-**	
pattern 5	LBA	Ø4 x 60	21	**14,7**		**-**	
	LBS	Ø5 x 50		**14,7**		**-**	

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	fastening holes Ø13			no washer pattern 3-5		washer pattern 2	
	type	Ø x L [mm]	n_H [pcs]	$R_{1,d\ concrete}$ [kN]	$k_{t//}$	$R_{1,d\ concrete}$ [kN]	$k_{t//}$
uncracked	VIN-FIX 5.8	M12 x 195	2	**39,0**	1,11	**34,2**	1,23
	HYB-FIX 5.8	M12 x 195		**50,4**		**45,5**	
cracked	VIN-FIX 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**	
	EPO-FIX 8.8	M12 x 195		**26,2**		**22,9**	

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]
VIN-FIX 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
EPO-FIX 8.8	M12 x 195		170	170	175	200	165	165	170	200

Precut INA threaded rod, with nut and washer: see page 562.
MGS threaded rod class 8.8 to be cut to size: see page 174.
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.

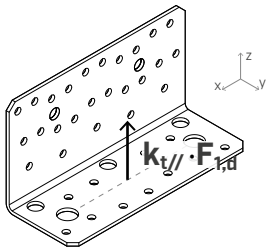
GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 23.

ANCHORS VERIFICATION FOR STRESS LOADING F_1

INSTALLATION WITH AND WITHOUT NINO 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 tabulated geometric parameters (k_t).

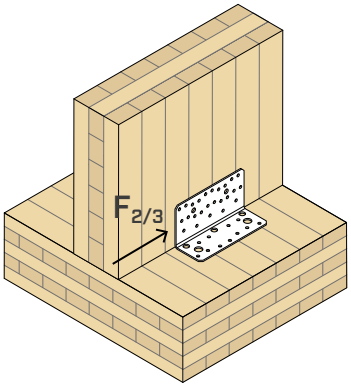


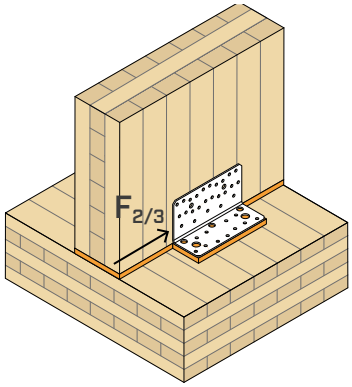
The anchor group must be verified for:

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

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

NINO100100 | NINO15080 | NINO15080S | NINO100200





TIMBER STRENGTH

CODE	configuration on timber	fastening holes type	fastening holes Ø x L [mm]	fastening holes n_V [pcs]	fastening holes n_H [pcs]	no XYLOFON $R_{2/3,k\ timber}$ [kN]	XYLOFON $R_{2/3,k\ timber}$ [kN]	$K_{2/3,ser}$ [kN/mm]
NINO100100	pattern 1(1)	LBA	Ø4 x 60	14	13 + 2 VGS Ø9 x 140	**38,1**	**34,6**	$R_{2/3,k\ timber}/5$
		LBS	Ø5 x 50			**18,5**	**16,9**	
	pattern 2	LBA	Ø4 x 60	14	13	**17,2**	**9,4**	
		LBS	Ø5 x 50			**9,5**	**7,4**	
	pattern 3	LBA	Ø4 x 60	8	13	**9,8**	**8,9**	
		LBS	Ø5 x 50			**9,0**	**7,4**	
	pattern 4	LBA	Ø4 x 60	8	13	**11,3**	**9,4**	
		LBS	Ø5 x 50			**9,5**	**7,4**	
	pattern 5	LBA	Ø4 x 60	4	13	**9,8**	**8,9**	
		LBS	Ø5 x 50			**9,0**	**7,4**	
NINO15080	pattern 1(1)	LBA	Ø4 x 60	20	11 + 3 VGS Ø9 x 140	**38,1**	**34,6**	$R_{2/3,k\ timber}/5$
		LBS	Ø5 x 50			**27,6**	**25,5**	
	pattern 2	LBA	Ø4 x 60	20	11	**15,5**	**13,0**	
		LBS	Ø5 x 50			**13,1**	**10,2**	
	pattern 3	LBA	Ø4 x 60	10	11	**13,3**	**12,3**	
		LBS	Ø5 x 50			**12,3**	**10,1**	
	pattern 4	LBA	Ø4 x 60	10	11	**15,5**	**13,0**	
		LBS	Ø5 x 50			**13,1**	**10,2**	
	pattern 5	LBA	Ø4 x 60	5	11	**12,7**	**11,8**	
		LBS	Ø5 x 50			**11,2**	**10,0**	
NINO15080S	pattern 1	HBS PLATE	Ø8 x 100	8	5	**35,0**	**35,0**	$R_{2/3,k\ timber}/5$
	pattern 2	HBS PLATE	Ø8 x 100	4	3	**25,8**	**25,8**	
NINO100200	pattern 1(1)	LBA	Ø4 x 60	21	13 + 3 VGS Ø9 x 140	**26,7**	**18,7**	$R_{2/3,k\ timber}/6$
		LBS	Ø5 x 50			**18,7**	**17,2**	

NOTES

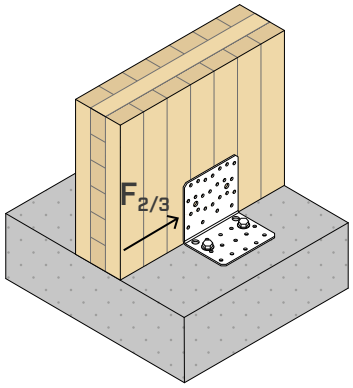
(1) The load-bearing capacity values listed are valid for installation with Ø9 VGS screws of length ≥ 140 mm. For screws of shorter length L, $R_{2/3,k\ timber}$ must be multiplied by a reduction factor of L/140.

GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 23.

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

NINO100100



TIMBER STRENGTH

configuration on timber	fastening holes Ø5 type	Ø x L [mm]	n_V [pcs]	$R_{2/3,k\ timber}$ [kN]	$K_{2/3,ser}$ [kN/mm]
pattern 6	LBA	Ø4 x 60	14	**18,1**	$R_{2/3,k\ timber}/5$
	LBS	Ø5 x 50		**7,2**	
pattern 7	LBA	Ø4 x 60	14	**18,1**	
	LBS	Ø5 x 50		**9,8**	
pattern 8	LBA	Ø4 x 60	8	**5,8**	
	LBS	Ø5 x 50		**4,9**	
pattern 10	LBA	Ø4 x 60	8	**11,2**	
	LBS	Ø5 x 50		**9,4**	
pattern 11	LBA	Ø4 x 60	4	**9,3**	$R_{2/3,k\ timber}/2$
	LBS	Ø5 x 50		**4,2**	
pattern 12	LBA	Ø4 x 60	4	**9,3**	
	LBS	Ø5 x 50		**6,3**	

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

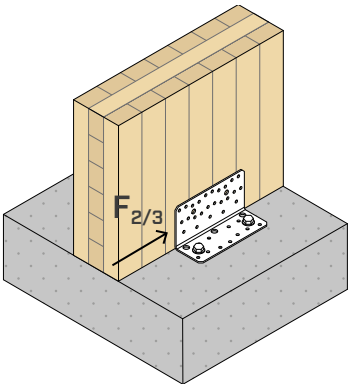
configuration on concrete	fastening holes Ø14 type	Ø x L [mm]	n_H [pcs]	$R_{2/3,d\ concrete}$ [kN]	e_y [mm]
uncracked	VIN-FIX 5.8	M12 x 140	2	**30,3**	30
	SKR	12 x 90		**22,8**	
	AB1	M12 x 100		**30,7**	
cracked	VIN-FIX 5.8	M12 x 140	2	**26,9**	
	HYB-FIX 5.8	M12 x 140		**30,2**	
	SKR	12 x 90		**15,9**	
	AB1	M12 x 100		**26,5**	
seismic	HYB-FIX 8.8	M12 x 140	2	**14,8**	
		M12 x 195		**21,0**	
	EPO-FIX 8.8	M12 x 140		**23,8**	
	SKR	12 x 90		**6,0**	
	AB1	M12 x 100		**7,6**	

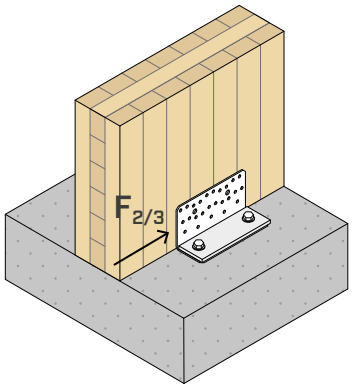
GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 23.

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

NINO15080 | NINO15080 + NINOW15080





TIMBER STRENGTH

configuration on timber	fastening holes Ø5 type	Ø x L [mm]	n_V [pcs]	no washer $R_{2/3,k\ timber}$ [kN]	washer $R_{2/3,k\ timber}$ [kN]
pattern 6	LBA LBS	Ø4 x 60 Ø5 x 50	10	**21,1** **7,9**	**26,7** **7,9**
pattern 7	LBA LBS	Ø4 x 60 Ø5 x 50	20	**21,3** **17,9**	**21,3** **17,9**
pattern 8	LBA LBS	Ø4 x 60 Ø5 x 50	10	**11,0** **9,3**	**11,0** **9,3**
pattern 9	LBA LBS	Ø4 x 60 Ø5 x 50	10	**15,7** **13,2**	**15,7** **13,2**
pattern 10	LBA LBS	Ø4 x 60 Ø5 x 50	5	**9,3** **6,0**	**9,3** **6,0**
pattern 11	LBA LBS	Ø4 x 60 Ø5 x 50	5	**10,0** **8,5**	**10,0** **8,5**

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	fastening holes Ø13 type	Ø x L [mm]	n_H [pcs]	no washer $R_{2/3,d\ concrete}$ [kN]	washer pattern 6 $R_{2/3,d\ concrete}$ [kN]	washer pattern 7-8-9-10-11 $R_{2/3,d\ concrete}$ [kN]	e_y [mm]	pattern 6 e_z[(1)] [mm]
uncracked	VIN-FIX 5.8	M12 x 140	2	**34,8**	**26,5**	**34,8**	30	66,5
	VIN-FIX 8.8	M12 x 195		**47,2**	**39,2**	**47,4**		
	SKR	12 x 90		**29,7**	**13,8**	**29,7**		
	AB1	M12 x 100		**35,2**	-	-		
		M12 x 120		-	**23,4**	**35,2**		
cracked	VIN-FIX 5.8	M12 x 140	2	**34,4**	**14,7**	**33,0**		
		M12 x 195		-	**21,6**	**34,8**		
	HYB-FIX 8.8	M12 x 140		**47,2**	**28,5**	**47,4**		
	SKR	12 x 90		**20,8**	**8,7**	**20,8**		
	AB1	M12 x 100		**34,3**	-	-		
		M12 x 120		-	**14,4**	**34,2**		
seismic	HYB-FIX 8.8	M12 x 140	2	**18,4**	**8,8**	**17,8**		
		M12 x 195		**26,2**	**13,0**	**26,1**		
	EPO-FIX 8.8	M12 x 140		**28,5**	**14,1**	**28,4**		
	SKR	12 x 90		**7,8**	-	**7,8**		
	AB1	M12 x 120		**8,8**	-	**8,8**		

NOTES

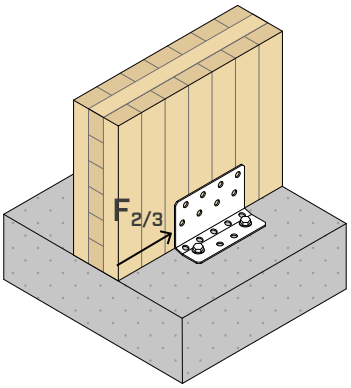
(1) For patterns 7-8-9-10-11, eccentricity e_z is assumed to be zero, in accordance with ETA-22/0089.

GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 23.

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

NINO15080S



TIMBER STRENGTH

configuration on timber	fastening holes Ø10,5 type	Ø x L [mm]	n_V [pcs]	$R_{2/3,k\ timber}$ [kN]
pattern 3	HBS PLATE	Ø8 x 100	8	**41,3**
pattern 4	HBS PLATE	Ø8 x 100	4	**22,6**

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

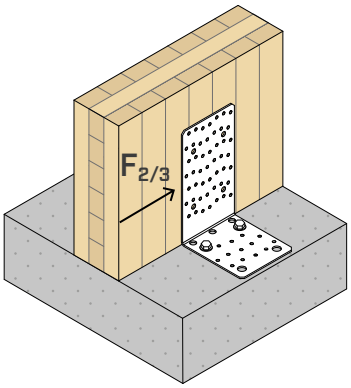
configuration on concrete	fastening holes Ø13 type	Ø x L [mm]	n_H [pcs]	$R_{2/3,d\ concrete}$ [kN]	e_y [mm]
uncracked	VIN-FIX 5.8	M12X140	2	**34,8**	30
	VIN-FIX 8.8	M12X195		**47,2**	
	SKR	12 x 90		**29,7**	
	AB1	M12X100		**35,2**	
cracked	VIN-FIX 5.8	M12X140	2	**34,4**	30
	HYB-FIX 8.8	M12X140		**47,2**	
	SKR	12 x 90		**20,8**	
	AB1	M12X100		**34,3**	
seismic	HYB-FIX 8.8	M12X140	2	**18,4**	30
	EPO-FIX 8.8	M12X195		**26,2**	
		M12X140		**28,5**	
	SKR	12 x 90		**7,8**	
	AB1	M12X120		**8,8**	

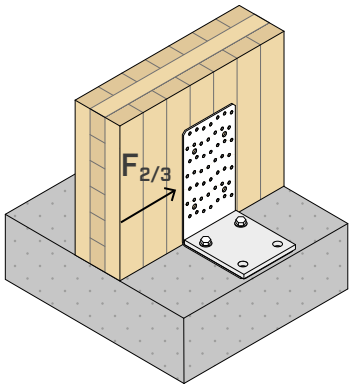
GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 23.

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

NINO100200 | NINO100200 + NINOW100200





TIMBER STRENGTH

configuration on timber	fastening holes Ø5			no washer	washer
	type	Ø x L [mm]	n_V [pcs]	$R_{2/3,k\ timber}$ [kN]	$R_{2/3,k\ timber}$ [kN]
pattern 2	LBA	Ø4 x 60	14	-	**11,6**
	LBS	Ø5 x 50		-	**3,5**
pattern 3	LBA	Ø4 x 60	21	**10,7**	-
	LBS	Ø5 x 50		**6,0**	-
pattern 5	LBA	Ø4 x 60	21	**16,9**	-
	LBS	Ø5 x 50		**8,3**	-

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	fastening holes Ø13			no washer pattern 3-5	washer pattern 2	e_y	pattern 2 e_z[(1)]
	type	Ø x L [mm]	n_H [pcs]	$R_{2/3,d\ concrete}$ [kN]	$R_{2/3,d\ concrete}$ [kN]	[mm]	[mm]
uncracked	VIN-FIX 5.8	M12 x 195	2	**30,3**	**11,4**	30	174,5
	VIN-FIX 8.8	M12 x 195		**41,2**	**12,5**		
	SKR	12 x 90		**22,7**	-		
		12 x 110		-	**4,6**		
	AB1	M12 x 100		**30,7**	-		
		M12 x 120		-	**7,9**		
cracked	VIN-FIX 8.8	M12 x 195	2	**38,1**	**6,8**		
	HYB-FIX 8.8	M12 x 195		**41,2**	**14,3**		
	SKR	12 x 90		**15,9**	-		
	AB1	M12 x 100		**26,4**	-		
		M12 x 120		-	**4,6**		
seismic	HYB-FIX 8.8	M12 x 140	2	**14,8**	-		
		M12 x 195		**21,0**	**5,0**		
	EPO-FIX 8.8	M12 x 140		**23,7**	**5,5**		
	SKR	12 x 90		**6,0**	-		
	AB1	M12 x 100		**7,7**	-		

NOTES

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

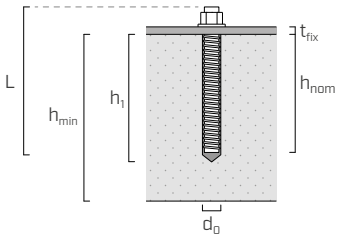
GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 23.

ANCHORS INSTALLATION PARAMETERS

anchor type		d_0	h_{min}	no washer			washer		
type	Ø x L [mm]	[mm]	[mm]	h_{ef} [mm]	h_{nom} [mm]	h_1 [mm]	h_{ef} [mm]	h_{nom} [mm]	h_1 [mm]
VIN-FIX 5.8	M12 x 140	14	200	120	120	125	115	115	120
	M12 x 195	14		170	170	175	170	170	175
VIN-FIX 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
EPO-FIX 8.8	M12 x 140	14		120	120	125	115	115	120
SKR	12 x 90	10		64	88	110	64	82	105
	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.



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

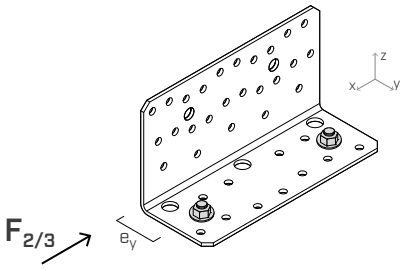
ANCHORS VERIFICATION FOR STRESS LOADING $F_{2/3}$

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 tabulated geometric parameters (e).

The anchor group must be verified for:

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

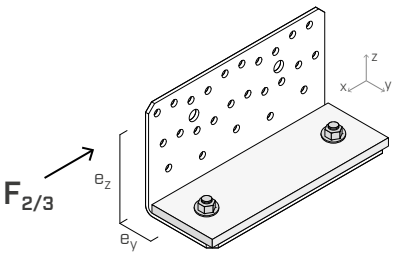


INSTALLATION WITH WASHER

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 tabulated geometric parameters (e).

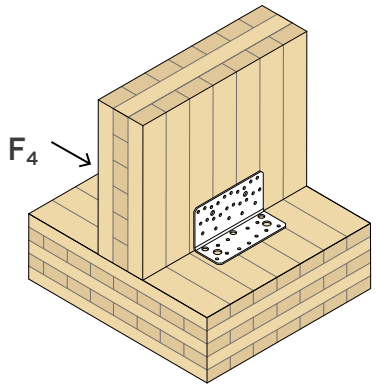
The anchor group must be verified for:

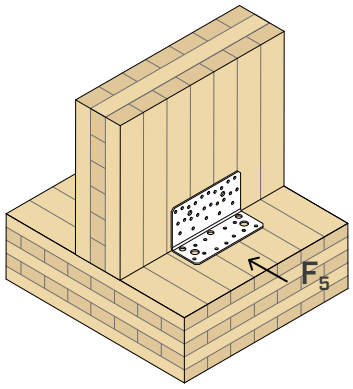
$V_{Sd,x} = F_{2/3,d}$
$M_{Sd,z} = F_{2/3,d} \cdot e_y$
$M_{Sd,y} = F_{2/3,d} \cdot e_z$

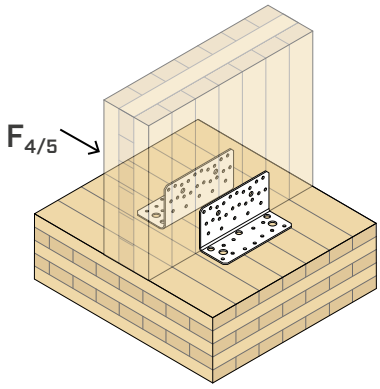


STRUCTURAL VALUES | TIMBER-TO-TIMBER | F_4 | $F_{4/5}$

NINO100100 | NINO15080 | NINO15080S | NINO100200







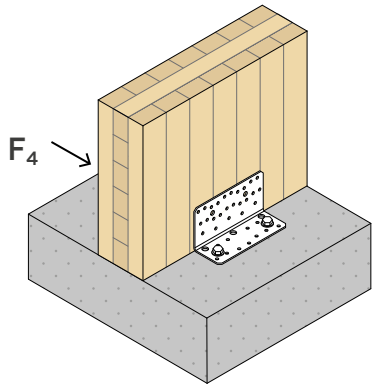
	TIMBER							
CODE	configuration	fastening holes				$R_{4,k\ timber}$	$R_{5,k\ timber}$	$R_{4/5,k\ timber}$
		type	Ø x L [mm]	n_V [pcs]	n_H [pcs]	[kN]	[kN]	[kN]
NINO100100	pattern 1	LBA	Ø4 x 60	14	13 + 2 VGS Ø9 x 140	**23,2**	**1,8**	**25,0**
		LBS	Ø5 x 50			**22,0**	**1,8**	**23,8**
	pattern 2	LBA	Ø4 x 60	14	13	**23,2**	**1,8**	**25,0**
		LBS	Ø5 x 50			**22,0**	**1,8**	**23,8**
	pattern 3	LBA	Ø4 x 60	8	13	**7,4**	**1,8**	**9,2**
		LBS	Ø5 x 50			**7,4**	**1,8**	**9,2**
	pattern 4	LBA	Ø4 x 60	8	13	**23,2**	**3,4**	**26,6**
		LBS	Ø5 x 50			**22,0**	**3,4**	**25,4**
	pattern 5	LBA	Ø4 x 60	4	13	**9,2**	**3,4**	**12,6**
		LBS	Ø5 x 50			**9,2**	**3,4**	**12,6**
NINO15080	pattern 1	LBA	Ø4 x 60	20	11 + 3 VGS Ø9 x 140	**22,3**	**2,5**	**24,8**
		LBS	Ø5 x 50			**21,6**	**2,5**	**24,1**
	pattern 2	LBA	Ø4 x 60	20	11	**22,3**	**2,5**	**24,8**
		LBS	Ø5 x 50			**21,6**	**2,5**	**24,1**
	pattern 3	LBA	Ø4 x 60	10	11	**10,2**	**2,5**	**12,7**
		LBS	Ø5 x 50			**10,2**	**2,5**	**12,7**
	pattern 4	LBA	Ø4 x 60	10	11	**18,7**	**4,8**	**23,5**
		LBS	Ø5 x 50			**17,7**	**4,8**	**22,5**
	pattern 5	LBA	Ø4 x 60	5	11	**14,7**	**4,8**	**19,5**
		LBS	Ø5 x 50			**14,7**	**4,8**	**19,5**
NINO15080S	pattern 1	HBS PLATE	Ø8 x 100	8	5	**18,9**	**2,4**	**21,3**
	pattern 2	HBS PLATE	Ø8 x 100	4	3	**14,2**	**2,4**	**16,6**
NINO100200	pattern 1	LBA	Ø4 x 60	21	13 + 3 VGS Ø9 x 140	**19,1**	**2,6**	**21,7**
		LBS	Ø5 x 50			**19,1**	**2,6**	**21,7**

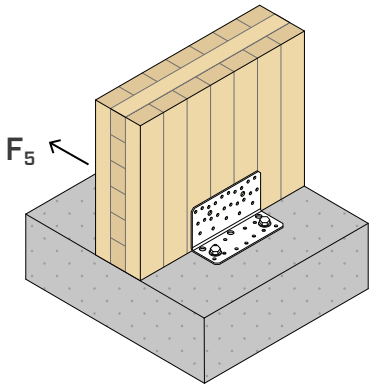
NOTES

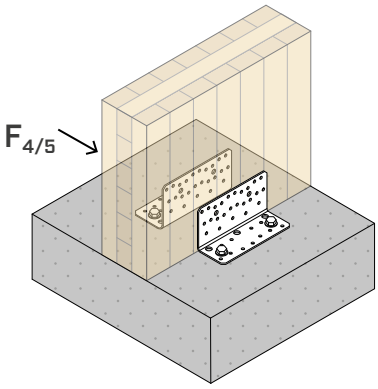
- The F_4, F_5, $F_{4/5}$ values in the table are valid for the acting stress calculation eccentricity e=0 (timber elements prevented from rotating).
- Refer to ETA-22/0089 for $K_{4,ser}$ stiffness values in timber-to-timber and timber-to-concrete configuration.
- The strength values listed are also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

STRUCTURAL VALUES | TIMBER-TO-CONCRETE | F_4 | F_5 | $F_{4/5}$

NINO100100 | NINO15080 | NINO15080S | NINO100200







		TIMBER					
CODE	configuration	fastening holes			$R_{4,k\ timber}$	$R_{5,k\ timber}$	$R_{4/5,k\ timber}$
		type	Ø x L [mm]	n_V [pcs]	[kN]	[kN]	[kN]
NINO100100	pattern 6	LBA	Ø4 x 60	14	**6,2**	**1,1**	**7,4**
		LBS	Ø5 x 50		**6,2**	**1,1**	**7,4**
	pattern 7	LBA	Ø4 x 60	14	**23,2**	**1,8**	**25,0**
		LBS	Ø5 x 50		**22,0**	**1,8**	**23,8**
	pattern 8	LBA	Ø4 x 60	8	**3,8**	**1,1**	**5,0**
		LBS	Ø5 x 50		**3,8**	**1,1**	**5,0**
	pattern 10	LBA	Ø4 x 60	8	**14,4**	**3,4**	**17,8**
		LBS	Ø5 x 50		**13,6**	**3,4**	**17,0**
	pattern 11	LBA	Ø4 x 60	4	**6,3**	**1,8**	**8,1**
		LBS	Ø5 x 50		**5,9**	**1,8**	**7,7**
	pattern 12	LBA	Ø4 x 60	4	**9,2**	**3,4**	**12,6**
		LBS	Ø5 x 50		**9,2**	**3,4**	**12,6**
NINO15080	pattern 6	LBA	Ø4 x 60	10	**8,7**	**1,6**	**10,3**
		LBS	Ø5 x 50		**8,7**	**1,6**	**10,3**
	pattern 7	LBA	Ø4 x 60	20	**22,3**	**2,5**	**24,8**
		LBS	Ø5 x 50		**21,6**	**2,5**	**24,1**
	pattern 8	LBA	Ø4 x 60	10	**10,2**	**2,5**	**12,7**
		LBS	Ø5 x 50		**10,2**	**2,5**	**12,7**
	pattern 9	LBA	Ø4 x 60	10	**18,7**	**4,8**	**23,5**
		LBS	Ø5 x 50		**17,7**	**4,8**	**22,5**
	pattern 10	LBA	Ø4 x 60	5	**8,4**	**2,5**	**10,9**
		LBS	Ø5 x 50		**7,9**	**2,5**	**10,4**
	pattern 11	LBA	Ø4 x 60	5	**11,6**	**4,8**	**16,4**
		LBS	Ø5 x 50		**11,6**	**4,8**	**16,4**
NINO15080S	pattern 3	HBS PLATE	Ø8 x 100	8	**18,9**	**2,3**	**21,3**
	pattern 4	HBS PLATE	Ø8 x 100	4	**14,2**	**1,4**	**15,6**
NINO100200	pattern 2	LBA	Ø4 x 60	14	**2,1**	**0,7**	**2,8**
		LBS	Ø5 x 50		**2,1**	**0,7**	**2,8**
	pattern 3	LBA	Ø4 x 60	21	**2,6**	**0,8**	**3,4**
		LBS	Ø5 x 50		**2,6**	**0,8**	**3,4**
	pattern 5	LBA	Ø4 x 60	21	**4,9**	**1,2**	**6,1**
		LBS	Ø5 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 comply with the EN1995:2014 standard in accordance with ETA-22/0089.
- Design values can be obtained from values in the table as follows:

$$R_d = min \left\{ \begin{array}{l} \frac{R_{k\ timber} \cdot k_{mod}}{\gamma_M} \\ R_{d\ concrete} \end{array} \right.$$

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

$$k_F = min \left\{ \frac{F_{v,short,Rk}}{2,83\ kN} ; \frac{F_{ax,short,Rk}}{1,39\ kN} \right\}$$

  - for screws

$$k_F = min \left\{ \frac{F_{v,short,Rk}}{2,26\ kN} ; \frac{F_{ax,short,Rk}}{2,69\ kN} \right\}$$

  $F_{v,short,Rk}$ = *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 failures before reaching the connection strength.
- Structural elements in timber, to which the connection devices are fastened, must be prevented from rotating.
- A timber density of ρ_k = 350 kg/m^3 was considered for the calculation process. For higher ρ_k values, the strength on timber side can be converted by the k_{dens} value:

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

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

- 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 strength values are valid for the calculation hypothesis defined in the table; for boundary conditions different from the ones in the table (e.g. minimum distances from the edge or different concrete thickness), the concrete-side anchors can be verified using MyProject calculation software according to the design requirements.
- The anchors seismic design was carried out in performance category C2, without ductility requirements on anchors (option a2) elastic design according to EN 1992:2018, 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).
- The product ETAs for the anchors used in the concrete-side strength calculation are indicated below:
  - VIN-FIX chemical anchor according to ETA-20/0363;
  - HYB-FIX chemical anchor according to ETA-20/1285;
  - EPO-FIX chemical anchor according to ETA-23/0419;
  - SKR screw-in anchor according to ETA-24/0024;
  - AB1 mechanical anchor according to ETA-17/0481 (M12).

INTELLECTUAL PROPERTY

- NINO angle brackets are protected by the following patents:
  - EP3.568.535;
  - US10.655.320;
  - CA3.049.483.
- They are also protected by the following Registered Community Designs:
  - RCD 015032190-0016;
  - RCD 015032190-0017;
  - RCD 015032190-0018;
  - RCD 015051914-0001.