

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 CONDITION



MATERIAL

S250
Z275

NINO: carbon steel S250GD + Z275

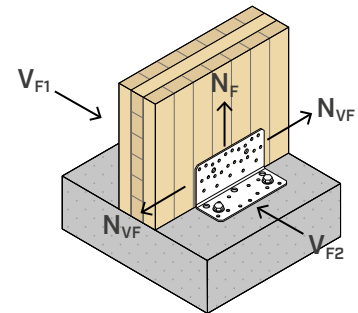
S350
Z275

NINO15080S: S350GD + Z275 carbon steel

S235
Fe/Zn12c

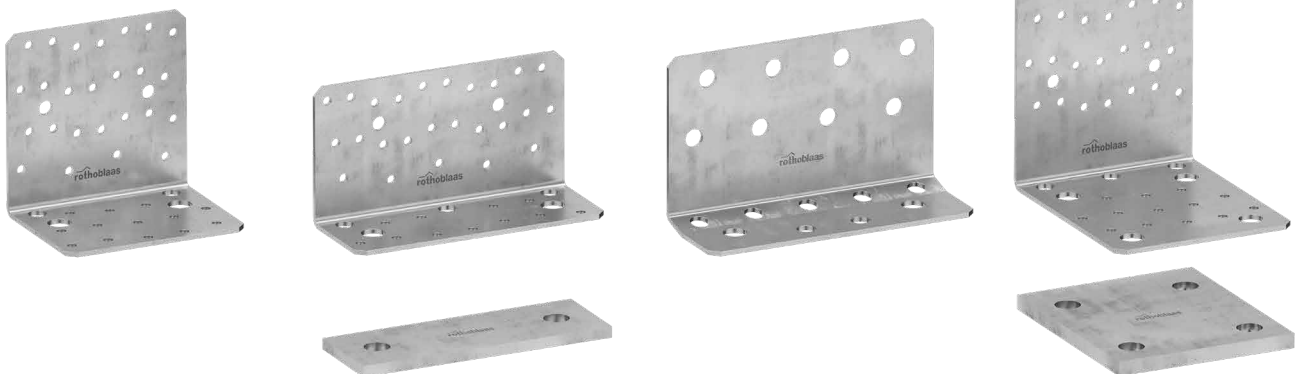
NINO WASHER: S235 + Fe/Zn12c carbon steel

EXTERNAL LOADS



CANADIAN DESIGN VALUES

USA, EU and more design values available online.



FIELDS OF USE

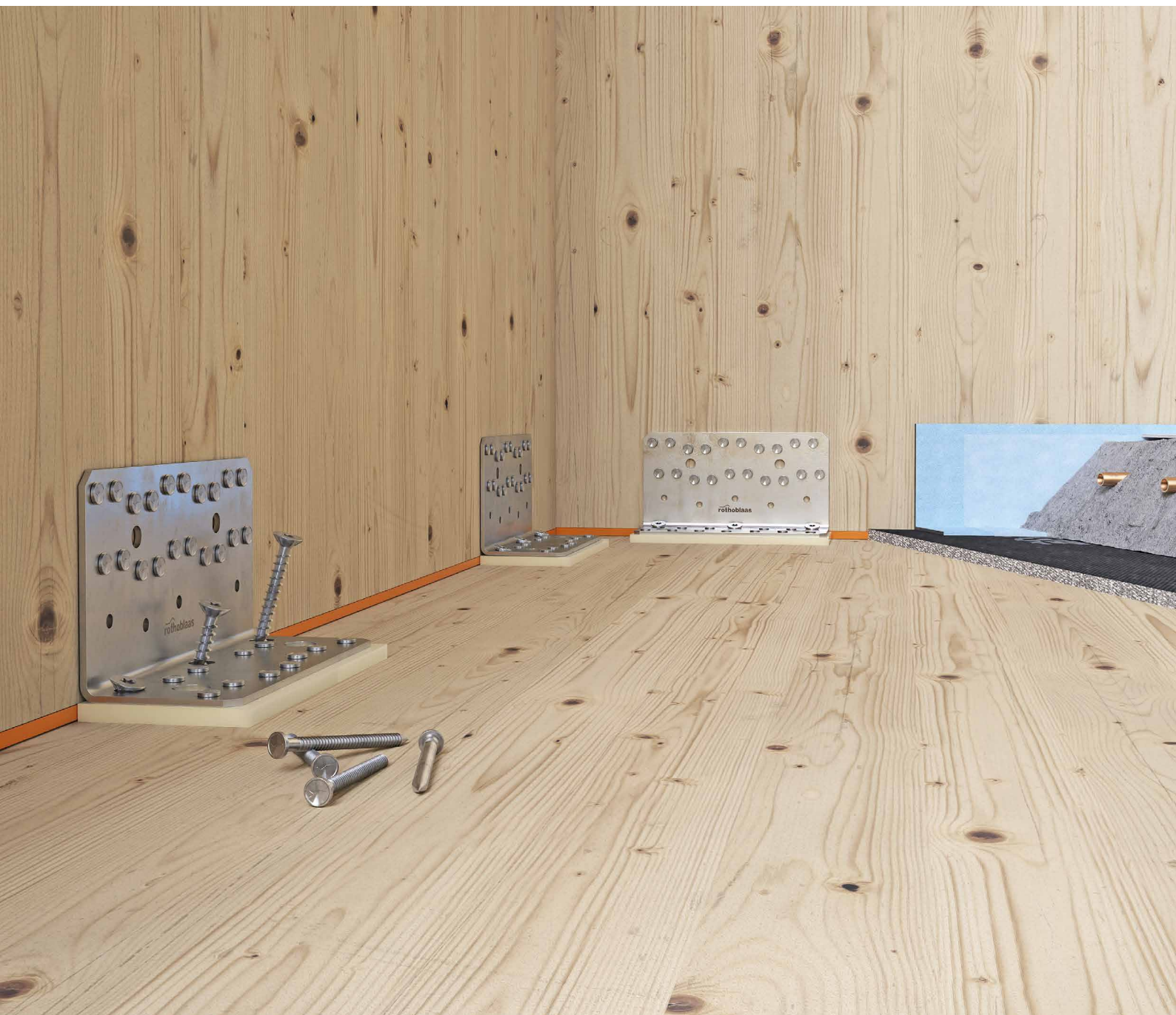
Shear and tension joints with small-medium stress.

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

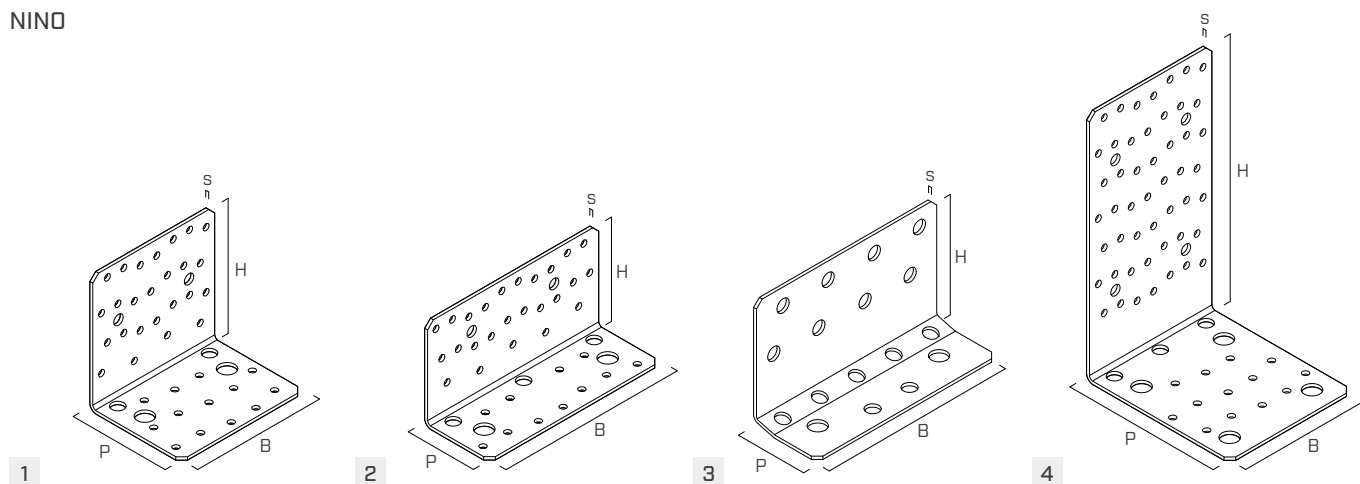
A single type of angle bracket for shear and tensile forces. It can be integrated into the floor or false ceiling panels.

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.

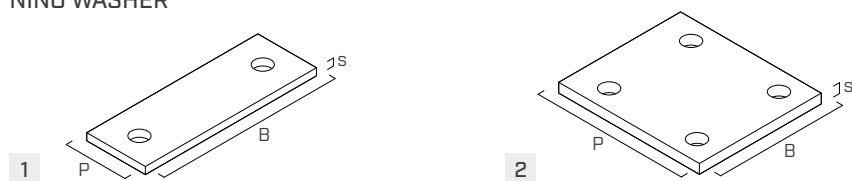
CODES AND DIMENSIONS

NINO



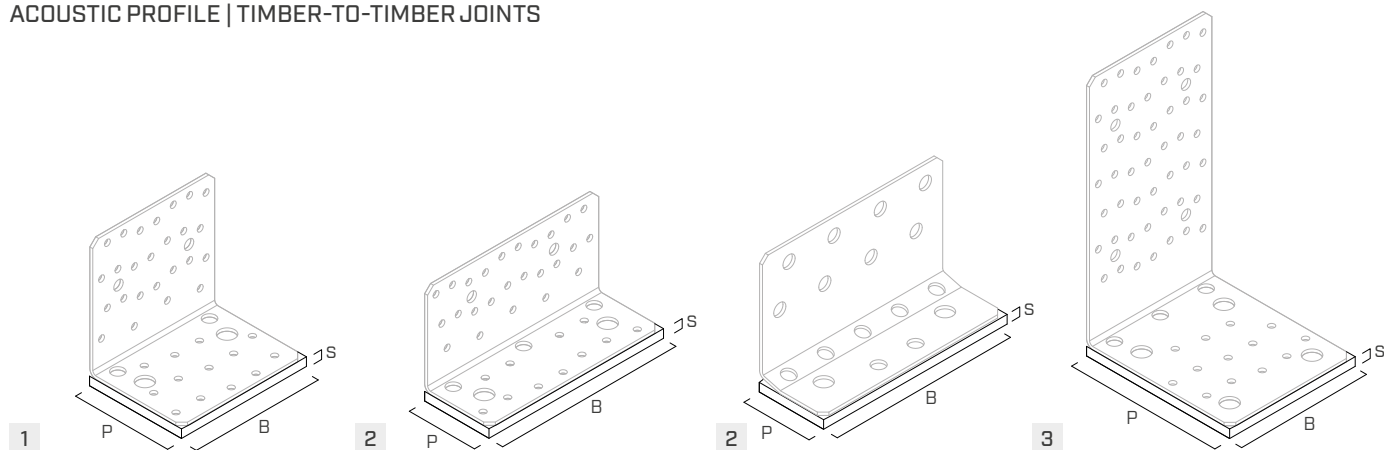
CODE	B	P	H	s	B	P	H	s	nØ5 nØ0.20	n _H Ø10 n _H Ø0.40	n _H Ø13 n _H Ø0.52	nØ11 nØ0.44			pcs
	[mm]	[mm]	[mm]	[mm]	[in]	[in]	[in]	[in]	[pcs]	[pcs]	[pcs]	[pcs]			
1 NINO100100	104	78	100	2,5	4 1/8	3 1/16	4	0.10	25 + 13	2	2	-	●	●	10
2 NINO15080	146	55	77	2,5	5 3/4	2 3/16	3 1/16	0.10	25 + 11	3	2	-	●	●	10
3 NINO15080S	156	55	94	2,5	6 1/8	2 3/16	3 11/16	0.10	-	-	2	8+5	●	●	10
4 NINO100200	104	122	197	3	4 1/8	4 13/16	7 3/4	0.12	49 + 13	3	4	-	●	●	10

NINO WASHER



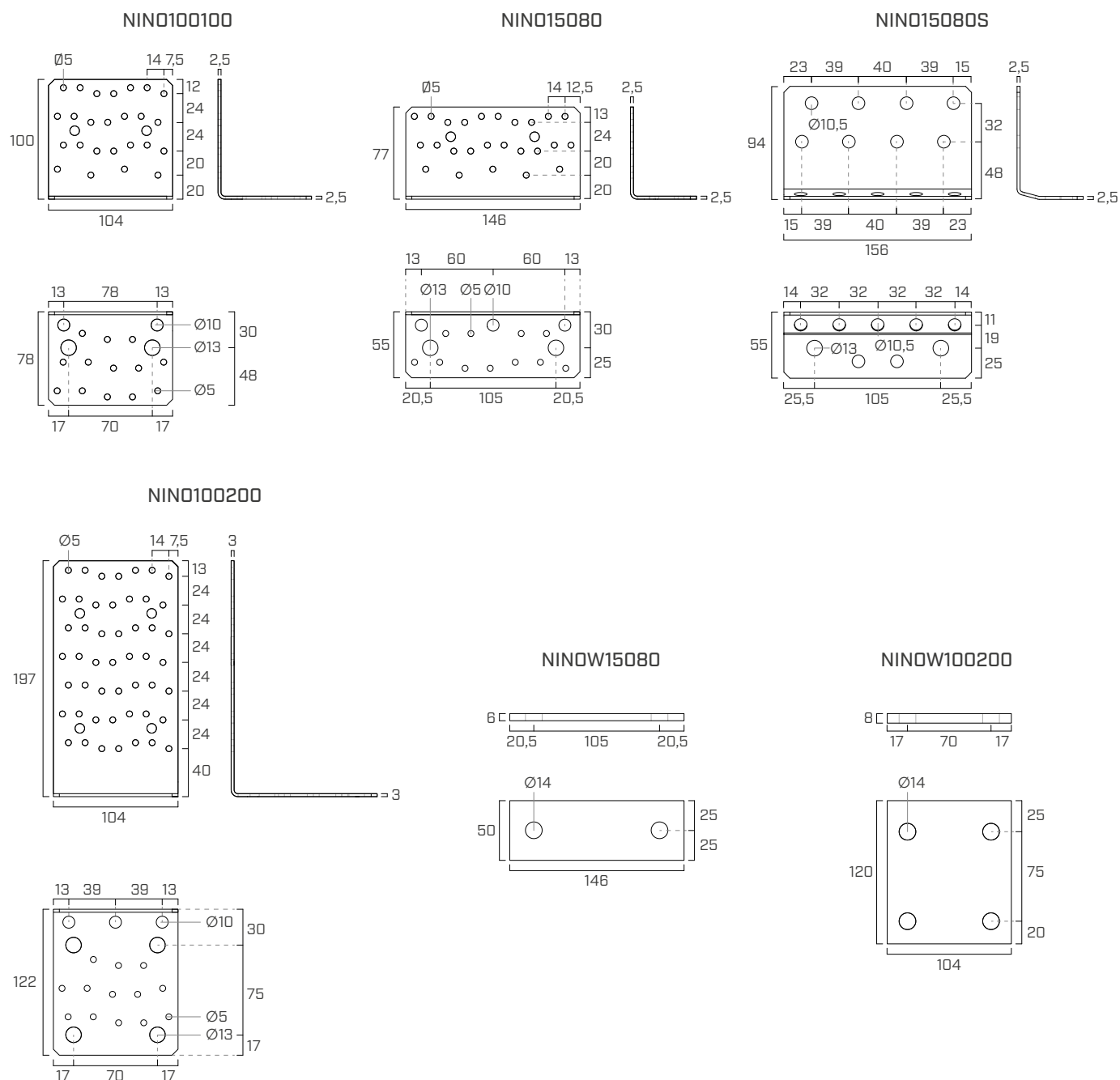
CODE	NINO15080	NINO100200	B	P	s	B	P	s	n _H Ø14 n _H Ø0.56		pcs
			[mm]	[mm]	[mm]	[in]	[in]	[in]	[pcs]		
1 NINOW15080	●	-	146	50	6	5 3/4	1 15/16	0.24	2	●	10
2 NINOW100200	-	●	104	120	8	4 1/8	4 3/4	0.31	4	●	10

ACOUSTIC PROFILE | TIMBER-TO-TIMBER JOINTS

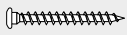
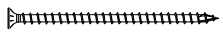
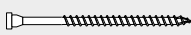
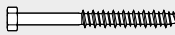
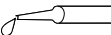
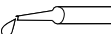


CODE	NINO100100	NINO15080	NINO100200	B	P	s	B	P	s		pcs
		NINO15080S		[mm]	[mm]	[mm]	[in]	[in]	[in]		
1 XYL3580105	●	-	-	105	80	6	4 1/8	3 1/8	0.24	●	1
2 XYL3555150	-	●	-	150	55	6	6	2 3/16	0.24	●	1
3 XYL35120105	-	-	●	105	120	6	4 1/8	4 3/4	0.24	●	1

GEOMETRY



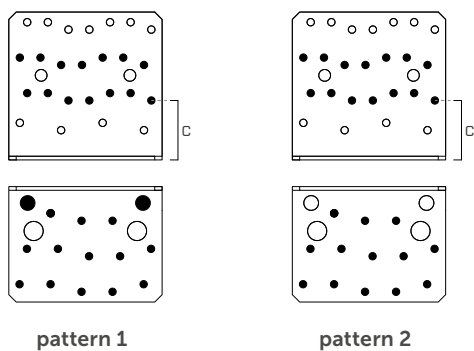
FASTENERS

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

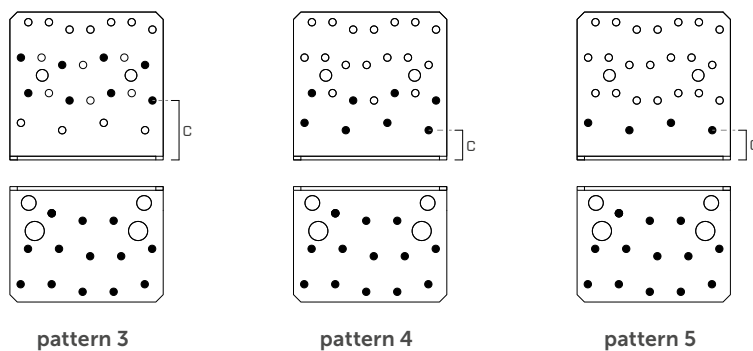
FASTENING PATTERNS

NINO100100 | TIMBER-TO-TIMBER

INSTALLATION ON CLT

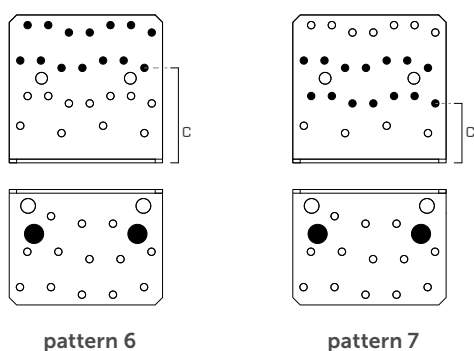


INSTALLATION ON TIMBER FRAME

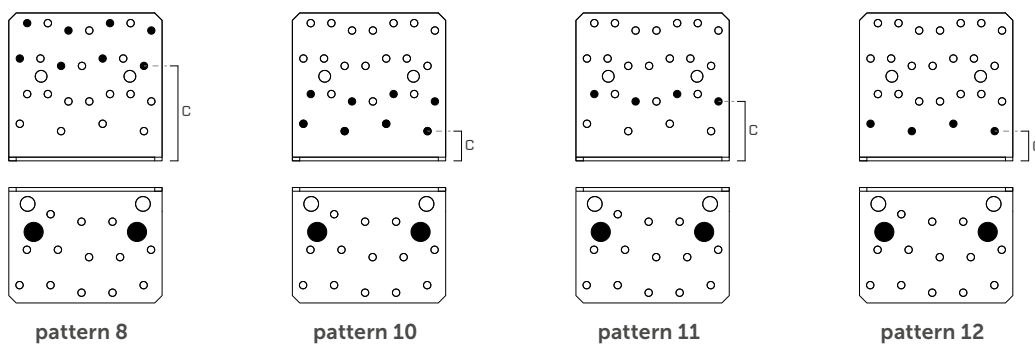


NINO100100 | TIMBER-TO-CONCRETE

INSTALLATION ON CLT



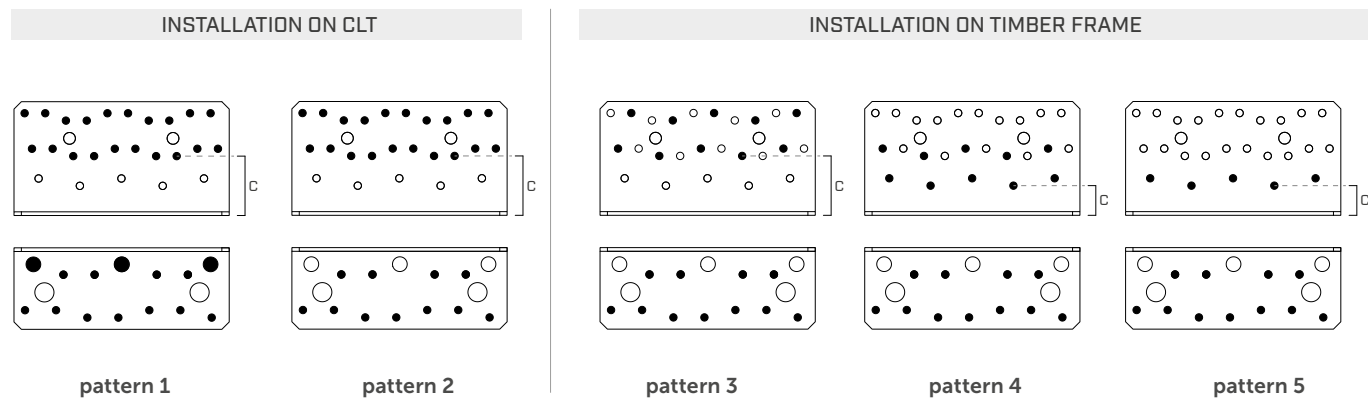
INSTALLATION ON TIMBER FRAME



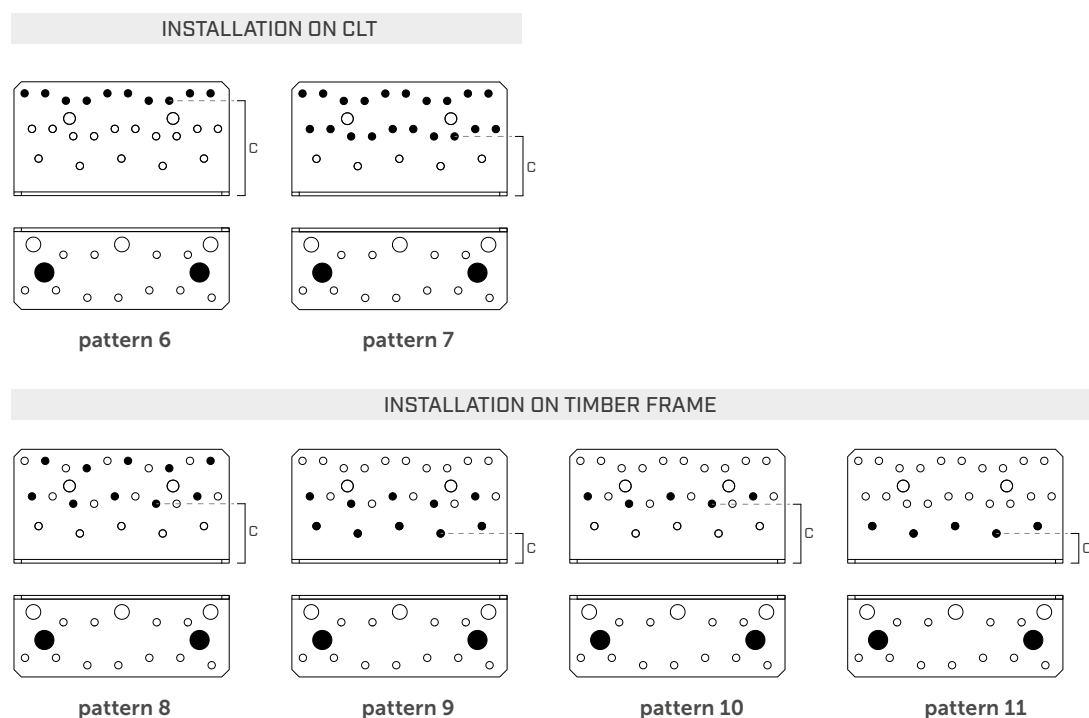
CODE	configuration	fastening holes Ø5		fastening holes Ø10	fastening holes Ø13	c [mm]	support	
		n _V [pcs]	n _H [pcs]	n _H [pcs]	n _H [pcs]			
NINO100100	pattern 1	14	13	2	-	40	●	-
	pattern 2	14	13	-	-	40	●	-
	pattern 3	8	13	-	-	40	●	-
	pattern 4	8	13	-	-	20	●	-
	pattern 5	4	13	-	-	20	●	-
	pattern 6	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



NINO15080 | TIMBER-TO-CONCRETE

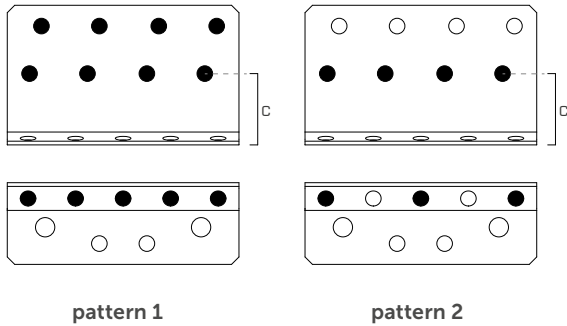


CODE	configuration	fastening holes Ø5		fastening holes Ø10	fastening holes Ø13	c [mm]	support	
		n _v [pcs]	n _H [pcs]	n _H [pcs]	n _H [pcs]			
NINO15080	pattern 1	20	11	3	-	40	●	-
	pattern 2	20	11	-	-	40	●	-
	pattern 3	10	11	-	-	40	●	-
	pattern 4	10	11	-	-	20	●	-
	pattern 5	5	11	-	-	20	●	-
	pattern 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

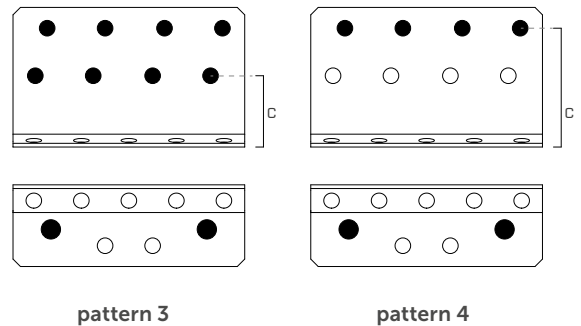
NINO15080S | TIMBER-TO-TIMBER

INSTALLATION ON CLT



NINO15080S | TIMBER-TO-CONCRETE

INSTALLATION ON CLT

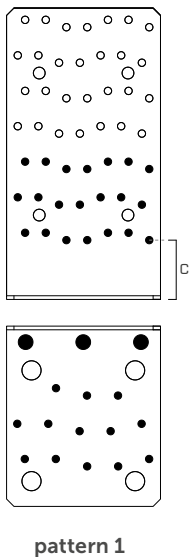


CODE	configuration	fastening holes Ø10,5		fastening holes Ø13	c [mm]	support	
		n _V [pcs]	n _H [pcs]	n _H [pcs]			
NINO15080S	pattern 1	8	5	-	48	●	-
	pattern 2	4	3	-	48	●	-
	pattern 3	8	-	2	48	-	●
	pattern 4	4	-	2	80	-	●

FASTENING PATTERNS

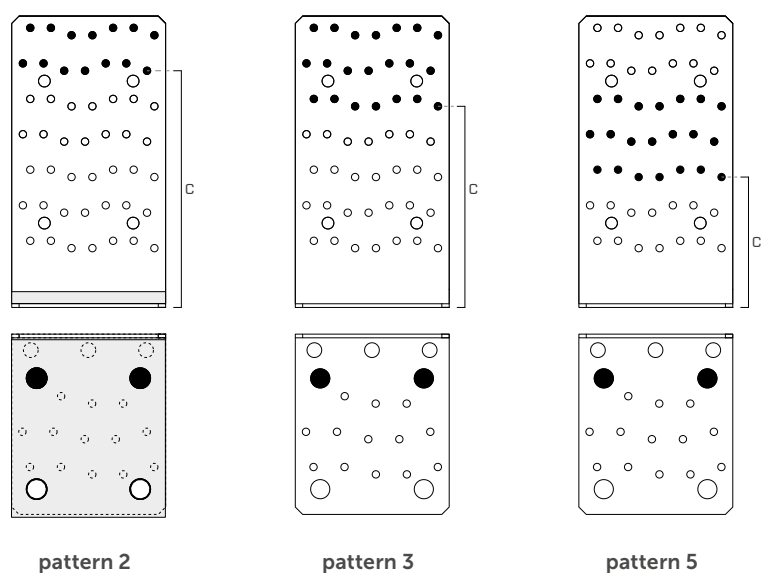
NINO100200 | TIMBER-TO-TIMBER

INSTALLATION ON CLT



NINO100200 | TIMBER-TO-CONCRETE

INSTALLATION ON CLT



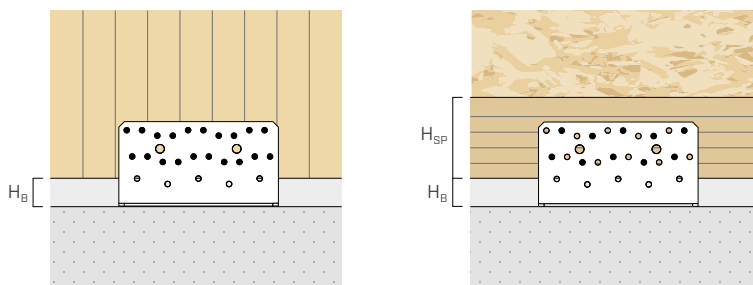
CODE	configuration	fastening holes Ø5		fastening holes Ø10	fastening holes Ø13	c [mm]	support	
		n _V [pcs]	n _H [pcs]	n _H [pcs]	n _H [pcs]			
NINO100200	pattern 1	21	13	3	-	40	●	-
	pattern 2 ^(*)	14	-	-	2	160	-	●
	pattern 3	21	-	-	2	136	-	●
	pattern 5	21	-	-	2	88	-	●

^(*) Installation with washer NINOW100200.

■ INSTALLATION

MAXIMUM HEIGHT OF THE INTERMEDIATE H_B LAYER

NINO brackets may be installed with an intermediate HB layer consisting of levelling mortar, a sill, or a timber platform beam. The height of the HB layer and the minimum platform thickness, $H_{SP,min}$, shall be determined in accordance with the timber fastening and edge distance requirements specified in CSA O86.



Greater acoustic comfort in your timber home.

XYLOFON is the very high-performance resilient profile that ensures acoustic comfort in timber structures and houses. Made of a polyurethane compound, it is available in 6 versions, according to the load it must support. Tested and certified for use as a decoupling and mechanical interruption layer between structural elements, it reduces the transmission of airborne and structural noise (up to more than 15 dB). **Rely on the best performing acoustic profile on the market.**



Scan the QR code and find out more about
the technical features of XYLOFON

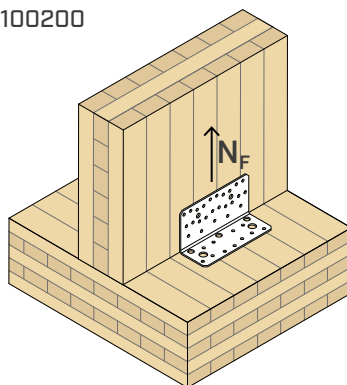


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STRUCTURAL VALUES | TIMBER-TO-TIMBER | N_F

NINO100100 | NINO15080 | NINO15080S | NINO100200

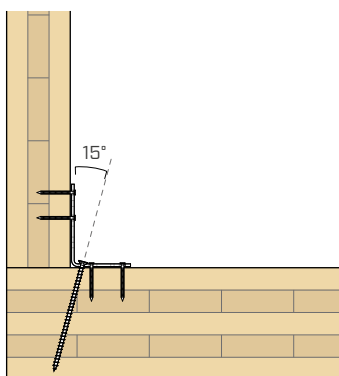


TIMBERSTRENGTH

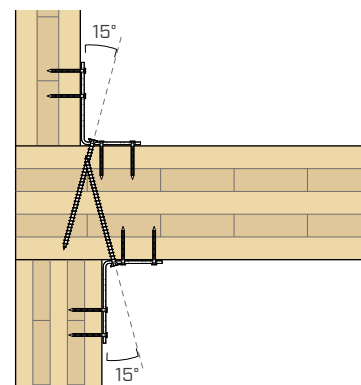
TIMBER-STRENGTH						TIMBER-STEEL			
CODE	configuration on timber	fastening holes				Nr ⁽²⁾⁽³⁾ factored lateral resistance (K _D =1.15)			K _{ser} ⁽⁴⁾ [kN/mm]
		type	Ø x L [mm]	n _V [pcs]	n _H [pcs]	E3 G = 0.35 [kN]	E1 and V2 G = 0.42 [kN]	E2 and V1 G = 0.49 [kN]	
NINO100100	pattern 1 ⁽¹⁾	LBA	Ø4 x 60	14	13 + 2 VGS Ø9 x 140	13,9	13,9	13,9	3,33
		LBS	Ø5 x 50			13,9	13,9	13,9	
	pattern 2	LBA	Ø4 x 60	14	13	2,6	3,1	3,5	2,95
		LBS	Ø5 x 50			4,1	4,1	4,1	
NINO15080	pattern 1 ⁽¹⁾	LBA	Ø4 x 60	20	11 + 3 VGS Ø9 x 140	19,9	23,0	26,0	6,58
		LBS	Ø5 x 50			19,9	23,0	26,0	
	pattern 2	LBA	Ø4 x 60	20	11	1,6	1,8	2,1	2,00
		LBS	Ø5 x 50			5,3	5,4	5,4	
NINO15080S	pattern 1	HBS PLATE	Ø8 x 100	8	5	16,5	19,1	21,6	9,98
	pattern 2	HBS PLATE	Ø8 x 100	4	3	9,9	11,5	13,0	6,40
NINO100200	pattern 1 ⁽¹⁾	LBA	Ø4 x 60	21	13 + 3 VGS Ø9 x 140	21,5	24,9	28,2	8,24
		LBS	Ø5 x 50			21,5	24,9	28,2	8,24

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.



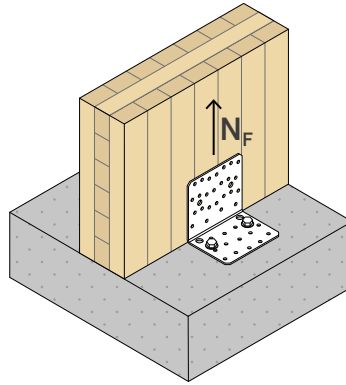
Example: installation of a NINO15080 angle bracket with inclined VGS screws



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 $\varnothing 9$ VGS screws of length ≥ 140 mm.



TIMBERSTRENGTH

configuration on timber	fastening holes Ø5			TIMBER-STEEL			K _{ser} ⁽⁴⁾ [kN/mm]
	type	Ø x L [mm]	n _v [pcs]	Nr ⁽²⁾⁽³⁾ factored lateral resistance (K _D =1.15) E3 G = 0.35 [kN]	E1 and V2 G = 0.42 [kN]	E2 and V1 G = 0.49 [kN]	
pattern 6-7	LBA	Ø4 x 60	14	10,1	10,1	10,1	0,78
	LBS	Ø5 x 50	14	10,1	10,1	10,1	0,78

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	fastening holes Ø13			R _{concrete} ⁽⁴⁾ [kN]	k _t / ⁽⁶⁾ [kN]
	type	Ø x L [mm]	n _H [pcs]		
uncracked	VIN-FIX 5.8	M12 x 140	2	19,5	1,21
cracked	VIN-FIX 5.8	M12 x 195	2	15,9	1,21
seismic	HYB-FIX 8.8	M12 x 195	2	15,0	1,21
		M12 x 245		19,4	
	EPO-FIX 8.8	M12 x 195	2	15,5	1,21

ANCHORS INSTALLATION PARAMETERS

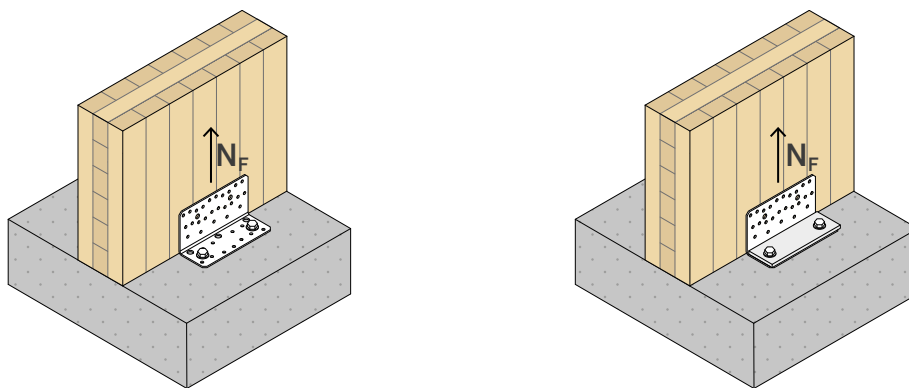
anchor type		d ₀	h _{ef}	h _{nom}	h ₁	h _{min}
type	Ø x L [mm]	[mm]	[mm]	[mm]	[mm]	[mm]
VIN-FIX 5.8	M12 x 140	14	115	115	115	200
	M12 x 195		170	170	175	200
HYB-FIX 8.8	M12 x 195	14	170	170	175	200
	M12 x 245		220	220	225	250
EPO-FIX 8.8	M12 x 195	14	170	170	175	200

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.

GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 24.



TIMBERSTRENGTH

configuration on timber	fastening holes Ø5			no washer				washer			
				Nr ⁽²⁾⁽³⁾ factored lateral resistance (K _D =1.15)			K _{ser} ⁽⁴⁾ [kN/mm]	Nr ⁽²⁾⁽³⁾ factored lateral resistance (K _D =1.15)			K _{ser} ⁽⁴⁾ [kN/mm]
	type	Ø x L [mm]	n _v [pcs]	E3 G = 0.35 [kN]	E1 and V2 G = 0.42 [kN]	E2 and V1 G = 0.49 [kN]		E3 G = 0.35 [kN]	E1 and V2 G = 0.42 [kN]	E2 and V1 G = 0.49 [kN]	
pattern 6	LBA	Ø4 x 60	10	10,6	10,6	10,6	0,92	11,8	12,9	13,9	3,11
	LBS	Ø5 x 50		10,6	10,6	10,6		12,6	14,0	15,4	
pattern 7	LBA	Ø4 x 60	20	10,6	10,6	10,6	0,92	17,9	17,9	17,9	3,11
	LBS	Ø5 x 50		10,6	10,6	10,6		17,9	17,9	17,9	

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	fastening holes Ø13			no washer		washer	
	type	Ø x L [mm]	n_H [pcs]	$R_{concrete}^{(5)}$ [kN]	$k_{t//}$ [kN]	$R_{concrete}^{(5)}$ [kN]	$k_{t//}^{(5)}$ [kN]
uncracked	VIN-FIX 5.8	M12 x 195	2	33,8	1,38	16,9	1,75
cracked	VIN-FIX 5.8	M12 x 195	2	18,8	1,38	9,3	1,75
	HYB-FIX 5.8	M12 x 195		36,2		15,1	
seismic	HYB-FIX 8.8	M12 x 195	2	14,3	1,38	9,1	1,75
		M12 x 245		18,6		11,8	
	EPO-FIX 8.8	M12 x 195	2	22,2		9,5	

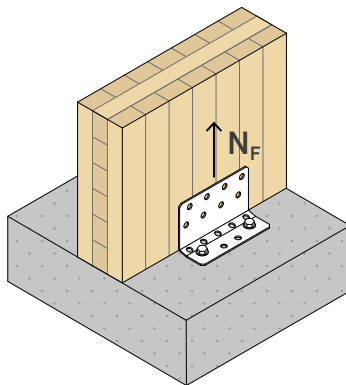
ANCHORS INSTALLATION PARAMETERS

anchor type		d_0 [mm]	no washer				washer			
			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	14	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	14	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.

GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 24.



TIMBERSTRENGTH

configuration on timber	fastening holes Ø10,5			TIMBER-STEEL			K _{ser} ⁽⁴⁾ [kN/mm]
	type	Ø x L [mm]	n _V [pcs]	Nr ⁽²⁾⁽³⁾ factored lateral resistance (K _D =1.15) E3 G = 0.35 [kN]	E1 and V2 G = 0.42 [kN]	E2 and V1 G = 0.49 [kN]	
pattern 3	HBS PLATE	Ø8 x 100	8	14,0	14,0	14,0	4,58
pattern 4	HBS PLATE	Ø8 x 100	4	12,9	14,0	14,0	3,68

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	type	fastening holes Ø13 Ø x L [mm]	n _H [pcs]	R _{concrete} ⁽⁵⁾ [kN]	k _{t//} ⁽⁶⁾ [kN]
uncracked	VIN-FIX 5.8	M12 x 195	2	21,7	1,36
cracked	VIN-FIX 5.8	M12 x 195	2	12,0	1,36
	HYB-FIX 5.8	M12 x 195		19,5	
seismic	HYB-FIX 8.8	M12 x 195	2	11,7	1,36
		M12 x 245		15,1	
	EPO-FIX 8.8	M12 x 195	2	12,2	

ANCHORS INSTALLATION PARAMETERS

anchor type		d ₀	h _{ef}	h _{nom}	h ₁	h _{min}
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
VIN-FIX 5.8	M12 x 195	14	170	170	175	200
HYB-FIX 5.8/8.8	M12 x 195	14	170	170	175	200
	M12 x 245		220	220	225	240
EPO-FIX 8.8	M12 x 195	14	170	170	175	200

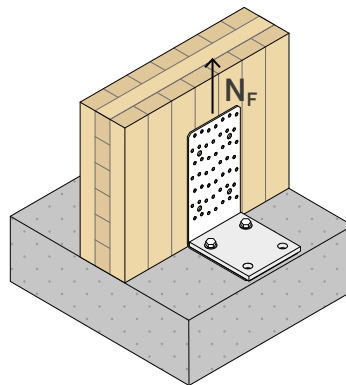
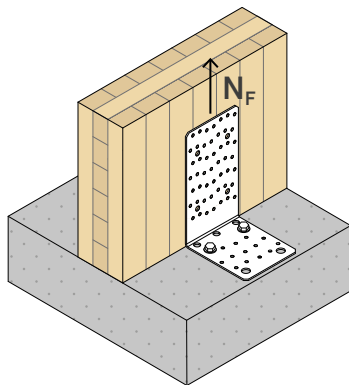
Precut INA threaded rod, with nut and washer: see page 562.
MGS threaded rod class 8.8 to be cut to size: see page 174.

GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 24.

STRUCTURAL VALUES | TIMBER-TO-CONCRETE | N_F

NINO100200 | NINO100200 + NINOW100200



TIMBERSTRENGTH

configuration on timber	fastening holes Ø5			no washer				washer			
				N _r ⁽²⁾⁽³⁾			K _{ser} ⁽⁴⁾	N _r ⁽²⁾⁽³⁾			K _{ser} ⁽⁴⁾
	type	Ø x L [mm]	n _V [pcs]	E3 G = 0.35 [kN]	E1 and V2 G = 0.42 [kN]	E2 and V1 G = 0.49 [kN]		E3 G = 0.35 [kN]	E1 and V2 G = 0.42 [kN]	E2 and V1 G = 0.49 [kN]	
pattern 2	LBA	Ø4 x 60	14	-	-	-	-	16,5	18,0	19,5	4,34
	LBS	Ø5 x 50		-	-	-	-	17,6	19,7	21,1	3,66
pattern 3	LBA	Ø4 x 60	21	10,6	10,6	10,6	0,92	-	-	-	-
	LBS	Ø5 x 50		10,6	10,6	10,6	0,92	-	-	-	-
pattern 5	LBA	Ø4 x 60	21	10,6	10,6	10,6	0,92	-	-	-	-
	LBS	Ø5 x 50		10,6	10,6	10,6	0,92	-	-	-	-

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 _{concrete} ⁽⁵⁾ [kN]	k _{t/} ⁽⁶⁾	R _{concrete} ⁽⁵⁾ [kN]	k _{t/} ⁽⁶⁾
uncracked	VIN-FIX 5.8	M12 x 195	2	24,0	1,11	21,6	1,23
	HYB-FIX 5.8	M12 x 195		44,1		39,8	
cracked	VIN-FIX 5.8	M12 x 195	2	13,2	1,11	11,9	1,23
	HYB-FIX 5.8	M12 x 195		22,0		19,9	
seismic	HYB-FIX 8.8	M12 x 195 M12 x 245	2	13,2 17,1	1,11	11,9 15,4	1,23
	EPO-FIX 8.8	M12 x 195	2	13,9	1,11	12,5	1,23

ANCHORS INSTALLATION PARAMETERS

anchor type		d ₀	no washer				washer			
			h _{ef}	h _{nom}	h ₁	h _{min}	h _{ef}	h _{nom}	h ₁	h _{min}
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
VIN-FIX 5.8	M12 x 195	14	170	170	175	200	165	165	170	200
HYB-FIX 5.8	M12 x 195	14	170	170	175	200	165	165	170	200
HYB-FIX 8.8	M12 x 195	14	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	14	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.

GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 24.

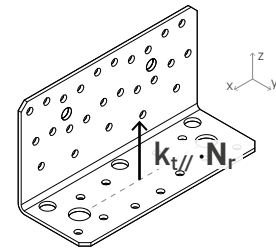
ANCHORS VERIFICATION FOR STRESS LOADING N_F

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).

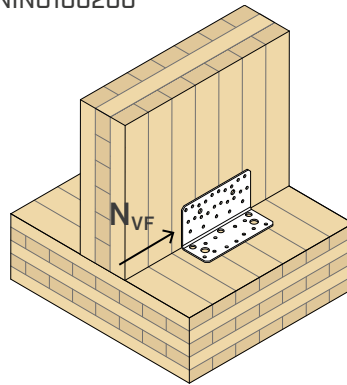
The anchor group must be verified for:

$$R_{\text{concrete}} = k_{t//} \times N_r$$



STRUCTURAL VALUES | TIMBER-TO-TIMBER | N_{VF}

NINO100100 | NINO15080 | NINO15080S | NINO100200

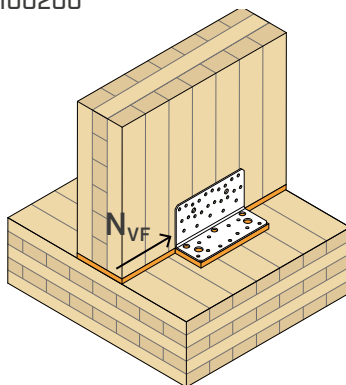


TIMBER STRENGTH

CODE	configuration on timber	fastening holes				no XYLOFON $N_{Vr}^{(2)(3)}$ factored resistance ($K_D=1.15$)			$K_{ser}^{(4)}$ [kN/mm]
		type	$\varnothing \times L$ [mm]	n_v [pcs]	n_H [pcs]	E3 $G = 0.35$ [kN]	E1 and V2 $G = 0.42$ [kN]	E2 and V1 $G = 0.49$ [kN]	
NINO100100	pattern 1 ⁽¹⁾	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	14	13 + 2 VGS $\varnothing 9 \times 140$	12,9 9,2	14,1 10,2	15,2 11,2	7,62 3,70
	pattern 2	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	14	13	8,6 4,8	9,4 5,4	10,1 6,0	3,44 1,90
	pattern 3	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	8	13	3,5 3,8	3,9 4,2	4,2 4,6	1,96 1,80
	pattern 4	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	8	13	4,9 4,8	5,6 5,4	6,4 6,0	2,26 1,90
	pattern 5	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	4	13	4,1 4,4	4,5 4,9	4,9 5,4	1,96 1,80
NINO15080	pattern 1 ⁽¹⁾	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	20	11 + 3 VGS $\varnothing 9 \times 140$	22,3 15,9	24,4 17,7	26,3 19,4	7,62 5,52
	pattern 2	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	20	11	6,5 5,9	7,5 6,6	8,5 7,4	3,10 2,62
	pattern 3	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	10	11	6,5 5,9	7,5 6,6	8,5 7,4	2,66 2,46
	pattern 4	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	10	11	6,5 5,9	7,5 6,6	8,5 7,4	3,10 2,62
	pattern 5	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	5	11	5,4 5,8	5,9 6,4	6,4 7,0	2,54 2,24
NINO15080S	pattern 1	HBS PLATE	$\varnothing 8 \times 100$	8	5	8,0	9,2	10,3	7,00
	pattern 2	HBS PLATE	$\varnothing 8 \times 100$	4	3	6,9	7,8	8,6	5,16
NINO100200	pattern 1 ⁽¹⁾	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	21	13 + 3 VGS $\varnothing 9 \times 140$	16,9 12,1	18,5 13,5	20,0 14,8	4,45 3,12

STRUCTURAL VALUES | TIMBER-TO-TIMBER | N_{VF}

NINO100100 | NINO15080 | NINO15080S | NINO100200



TIMBER STRENGTH

CODE	configuration on timber	fastening holes				XYLOFON $N_{Vr}^{(2)(3)}$ factored resistance ($K_D=1.15$)			$K_{ser}^{(4)}$ [kN/mm]
		type	$\varnothing \times L$ [mm]	n_V [pcs]	n_H [pcs]	E3 $G = 0.35$ [kN]	E1 and V2 $G = 0.42$ [kN]	E2 and V1 $G = 0.49$ [kN]	
NINO100100	pattern 1 ⁽¹⁾	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	14	13 + 2 VGS $\varnothing 9 \times 140$	11,7 8,4	12,8 9,4	13,8 10,3	6,92 3,38
	pattern 2	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	14	13	4,7 3,7	5,1 4,2	5,5 4,7	1,88 1,48
	pattern 3	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	8	13	3,2 2,9	3,5 3,3	3,8 3,6	1,78 1,48
	pattern 4	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	8	13	4,1 3,7	4,7 4,2	5,3 4,7	1,88 1,48
	pattern 5	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	4	13	3,8 3,6	4,1 4,1	4,4 4,4	1,78 1,48
NINO15080	pattern 1 ⁽¹⁾	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	20	11 + 3 VGS $\varnothing 9 \times 140$	20,2 14,7	22,1 16,4	23,9 18,0	6,92 5,10
	pattern 2	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	20	11	5,5 4,6	6,3 5,2	7,1 5,7	2,60 2,04
	pattern 3	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	10	11	6,0 4,8	6,9 5,4	7,8 6,0	2,46 2,02
	pattern 4	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	10	11	5,5 4,6	6,3 5,2	7,1 5,7	2,60 2,04
	pattern 5	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	5	11	5,0 5,1	5,5 5,7	5,9 6,3	2,36 2,00
NINO15080S	pattern 1	HBS PLATE	$\varnothing 8 \times 100$	8	5	8,0	9,2	10,3	7,00
	pattern 2	HBS PLATE	$\varnothing 8 \times 100$	4	3	6,9	7,8	8,6	5,16
NINO100200	pattern 1 ⁽¹⁾	LBA LBS	$\varnothing 4 \times 60$ $\varnothing 5 \times 50$	21	13 + 3 VGS $\varnothing 9 \times 140$	11,9 11,1	13,0 12,4	14,0 13,6	3,12 2,87

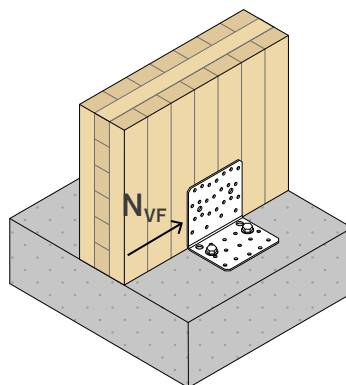
NOTES

The load-bearing capacity values listed are valid for installation with $\varnothing 9$ VGS screws of length ≥ 140 mm.

GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 24.

NIN0100100



TIMBER STRENGTH

configuration on timber	fastening holes Ø5			$N_{Vr}^{(2)(3)}$ factored lateral resistance ($K_D=1.15$)			$K_{ser}^{(4)}$ [kN/mm]
	type	Ø x L [mm]	n_V [pcs]	E3 $G = 0.35$ [kN]	E1 and V2 $G = 0.42$ [kN]	E2 and V1 $G = 0.49$ [kN]	
pattern 6	LBA	Ø4 x 60	14	7,1	7,8	8,4	3,62
	LBS	Ø5 x 50		7,6	8,5	9,3	1,44
pattern 7	LBA	Ø4 x 60	14	8,6	9,4	10,1	3,62
	LBS	Ø5 x 50		9,2	10,2	11,2	1,96
pattern 8	LBA	Ø4 x 60	8	4,6	5,1	5,5	1,16
	LBS	Ø5 x 50		5,0	5,5	6,1	0,98
pattern 10	LBA	Ø4 x 60	8	7,3	8,0	8,6	2,24
	LBS	Ø5 x 50		7,8	8,7	9,5	1,88
pattern 11	LBA	Ø4 x 60	4	3,4	3,7	4,0	4,65
	LBS	Ø5 x 50		3,6	4,0	4,4	2,10
pattern 12	LBA	Ø4 x 60	4	4,1	4,5	4,9	4,65
	LBS	Ø5 x 50		4,4	4,9	5,4	3,15

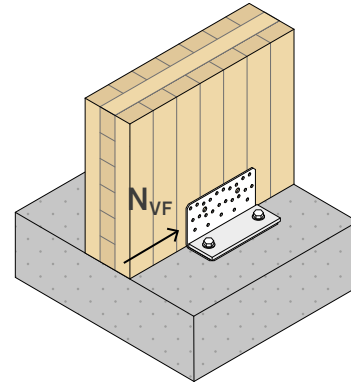
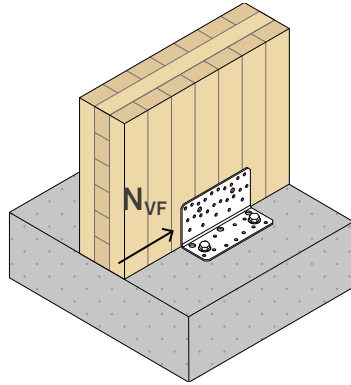
CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	type	fastening holes Ø13 Ø x L [mm]	n_H [pcs]	$R_{V \text{ concrete}}$ [kN]	$e_y^{(7)}$ [mm]
uncracked	VIN-FIX 5.8	M12 x 140	2	44,4	30
	SKR	12 x 90		16,4	
	AB1	M12 x 100		18,6	
cracked	VIN-FIX 5.8	M12 x 140	2	28,0	30
	HYB-FIX 5.8	M12 x 140		31,7	
	SKR	12 x 90		11,7	
	AB1	M12 x 100		13,3	
seismic	HYB-FIX 8.8	M12 x 140	2	23,8	30
		M12 x 195		39,1	
	EPO-FIX 8.8	M12 x 140		23,8	
	SKR	12 x 90		8,8	
	AB1	M12 x 100		9,9	

GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 24.



TIMBER STRENGTH

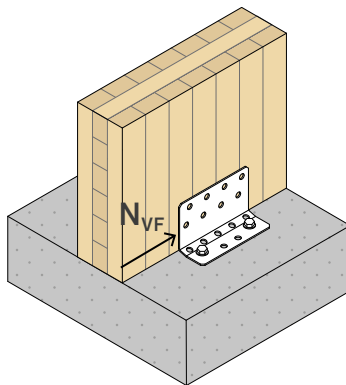
configuration on timber	fastening holes Ø5			no washer			washer		
				$N_{Vr}^{(2)(3)}$			$N_{Vr}^{(2)(3)}$		
				factored lateral resistance ($K_D=1.15$)			factored lateral resistance ($K_D=1.15$)		
	type	Ø x L [mm]	n_V [pcs]	E3 G = 0.35 [kN]	E1 and V2 G = 0.42 [kN]	E2 and V1 G = 0.49 [kN]	E3 G = 0.35 [kN]	E1 and V2 G = 0.42 [kN]	E2 and V1 G = 0.49 [kN]
pattern 6	LBA	Ø4 x 60	10	7,1	7,7	8,3	8,8	9,6	10,3
	LBS	Ø5 x 50		7,6	8,4	9,3	9,4	10,4	11,5
pattern 7	LBA	Ø4 x 60	20	14,9	16,3	17,5	17,7	19,4	20,9
	LBS	Ø5 x 50		15,9	17,7	19,4	18,9	21,1	23,2
pattern 8	LBA	Ø4 x 60	10	7,6	8,3	9,0	9,0	9,8	10,6
	LBS	Ø5 x 50		8,1	9,0	9,9	9,6	10,7	11,7
pattern 9	LBA	Ø4 x 60	10	9,4	10,3	11,1	10,3	11,3	12,1
	LBS	Ø5 x 50		10,0	11,2	12,3	11,0	12,3	13,5
pattern 10	LBA	Ø4 x 60	5	4,6	5,0	5,4	5,2	5,7	6,1
	LBS	Ø5 x 50		4,9	5,5	6,0	5,5	6,2	6,8
pattern 11	LBA	Ø4 x 60	5	5,4	5,9	6,4	5,6	6,2	6,6
	LBS	Ø5 x 50		5,8	6,4	7,0	6,0	6,7	7,4

CONCRETE STRENGTH

configuration on concrete	fastening holes Ø13			no washer	washer		$e_y^{(7)}$ [mm]	pattern 6 $e_z^{(7)}$ [mm]
				$R_{V \text{ concrete}}^{(5)}$ [kN]	pattern 6 $R_{V \text{ concrete}}^{(5)}$ [kN]	pattern 7-8-9-10-11 $R_{V \text{ concrete}}^{(5)}$ [kN]		
uncracked	VIN-FIX 5.8	M12 x 140	2	52,5	23,1	49,2	30	66,5
	VIN-FIX 8.8	M12 x 195		62,4	31,6	62,4		
	SKR	12 x 90		19,3	18,4	19,3		
	AB1	M12 x 100 M12 x 120		21,9 -	- 19,9	- 21,9		
cracked	VIN-FIX 5.8	M12 x 140	2	29,2	12,5	28,0	30	66,5
	VIN-FIX 8.8	M12 x 195		-	18,4	41,4		
	HYB_FIX 8.8	M12 x 195		37,5	18,7	35,2		
	SKR	12 x 90		13,8	12,6	13,8		
	AB1	M12 x 100 M12 x 120		15,7 -	- 14,2	- 15,7		
seismic	HYB-FIX 8.8	M12 x 140 M12 x 195	2	28,1 40,4	12,0 18,0	26,4 40,4	30	66,5
	EPO-FIX 8.8	M12 x 140		28,1	12,4	26,4		
	SKR	12 x 90		10,4	-	10,4		
	AB1	M12 x 120		11,8	-	11,8		

GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 24.



TIMBER STRENGTH

configuration on timber	fastening holes Ø5			$N_{VF}^{(2)(3)}$ factored lateral resistance ($K_D=1.15$)		
	type	Ø x L [mm]	n_V [pcs]	E3 G = 0.35 [kN]	E1 and V2 G = 0.42 [kN]	E2 and V1 G = 0.49 [kN]
pattern 3	HBS PLATE	Ø8 x 100	8	16,9	18,8	20,6
pattern 4	HBS PLATE	Ø8 x 100	4	8,2	9,1	10,0

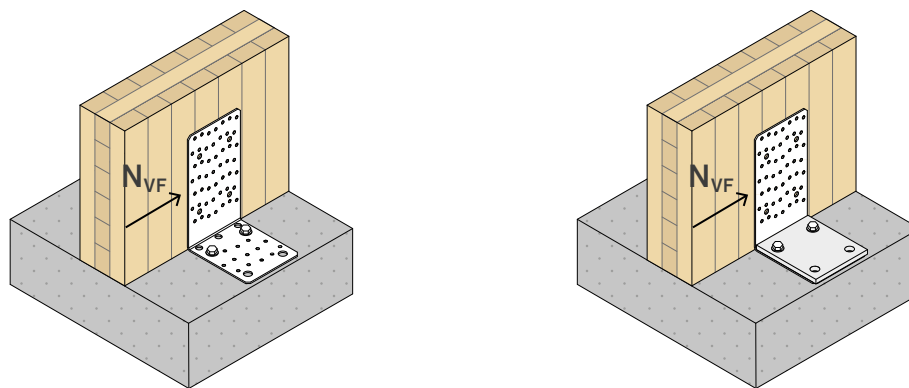
CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	fastening holes Ø13			$R_{V \text{ concrete}}^{(5)}$ [kN]	$e_y^{(7)}$ [mm]
	type	Ø x L [mm]	n_H [pcs]		
uncracked	VIN-FIX 5.8	M12 x 140	2	52,5	30
	VIN-FIX 8.8	M12 x 195		62,4	
	SKR	12 x 90		19,3	
	AB1	M12 x 100		21,9	
cracked	VIN-FIX 5.8	M12 x 140	2	29,2	30
	HYB-FIX 8.8	M12 x 140		37,5	
	SKR	12 x 90		13,8	
	AB1	M12 x 100		15,7	
seismic	HYB-FIX 8.8	M12 x 140	2	28,1	30
	EPO-FIX 8.8	M12 x 195		42,3	
		M12 x 140		28,1	
	SKR	12 x 90		10,4	
	AB1	M12 x 120		11,8	

GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 24.



TIMBER STRENGTH

configuration on timber	fastening holes Ø5			no washer			washer		
				$N_{VF}^{(2)(3)}$			$N_{VF}^{(2)(3)}$		
				factored lateral resistance ($K_D=1.15$)			factored lateral resistance ($K_D=1.15$)		
	type	Ø x L [mm]	n_V [pcs]	E3 G = 0.35 [kN]	E1 and V2 G = 0.42 [kN]	E2 and V1 G = 0.49 [kN]	E3 G = 0.35 [kN]	E1 and V2 G = 0.42 [kN]	E2 and V1 G = 0.49 [kN]
pattern 2	LBA	Ø4 x 60	14	-	-	-	3,9	4,3	4,7
	LBS	Ø5 x 50		-	-	-	4,2	4,7	5,2
pattern 3	LBA	Ø4 x 60	21	4,1	4,4	4,8	-	-	-
	LBS	Ø5 x 50		4,3	4,8	5,3	-	-	-
pattern 5	LBA	Ø4 x 60	21	6,9	7,5	8,1	-	-	-
	LBS	Ø5 x 50		7,4	8,2	9,0	-	-	-

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions.

configuration on concrete	fastening holes Ø13			no washer pattern 3-5 $R_{V \text{ concrete}}^{(5)}$ [kN]	washer pattern 2 $R_{V \text{ concrete}}^{(5)}$ [kN]	$e_y^{(7)}$ [mm]	pattern 2 $e_z^{(7)}$ [mm]
	type	Ø x L [mm]	n_H [pcs]				
uncracked	VIN-FIX 5.8	M12 x 195	2	62,2	13,6	30	174,5
	VIN-FIX 8.8	M12 x 195		65,4	13,7		
	SKR	12 x 90		19,3	-		
		12 x 110		-	10,4		
	AB1	M12 x 100		19,3	-		
		M12 x 120		-	11,7		
cracked	VIN-FIX 8.8	M12 x 195	2	37,2	13,6	30	174,5
	HYB-FIX 8.8	M12 x 195		62,0	12,7		
	SKR	12 x 90		13,8	-		
		M12 x 100		13,8	-		
	AB1	M12 x 120		-	8,4		
seismic	HYB-FIX 8.8	M12 x 140	2	24,4	-	30	174,5
		M12 x 195		37,2	7,6		
	EPO-FIX 8.8	M12 x 140		25,7	5,4		
		12 x 90		10,3	-		
	AB1	M12 x 120		10,3	-		

NOTES

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

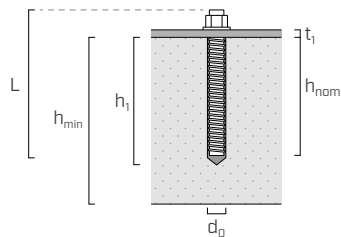
GENERAL PRINCIPLES

For the GENERAL PRINCIPLES of calculation, see page 24.

ANCHORS INSTALLATION PARAMETERS

anchor type		d ₀ [mm]	h _{min} [mm]	no washer			washer		
type	Ø x L [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	200	170	170	175	170	170	175
HYB-FIX 8.8	M12 x 140	14	200	120	120	125	115	115	120
	M12 x 195	14		170	170	175	170	170	175
EPO-FIX 8.8	M12 x 140	14	200	120	120	125	115	115	120
SKR	12 x 90	10	200	64	88	110	64	82	105
	12 x 110	10		-	-	-	64	99	120
AB1	M12 x 115	12	200	70	85	105	-	-	-
	M12 x 125	12		-	-	-	70	85	105

Pre-cut INA class 5.8 / 8.8 threaded rod, including nut and washer.



t₁ thickness of plate
h_{nom} nominal embedment depth
h_{eff} effective anchor embedment depth
h₁ minimum hole depth
d₀ hole diameter in the concrete support
h_{min} concrete minimum thickness

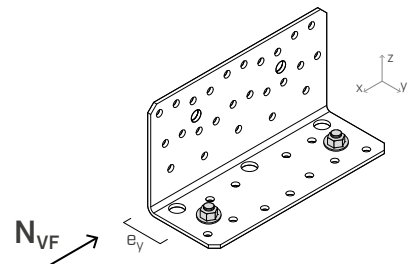
ANCHORS VERIFICATION FOR STRESS LOADING N_{VF}

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:

Shear : N_{VF}
 Moment : N_{VF} · e_y

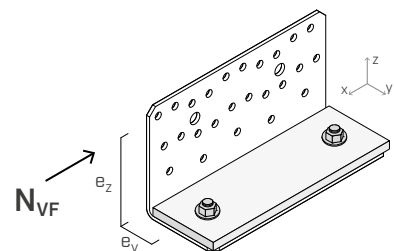


INSTALLATION WITH WASHER

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).

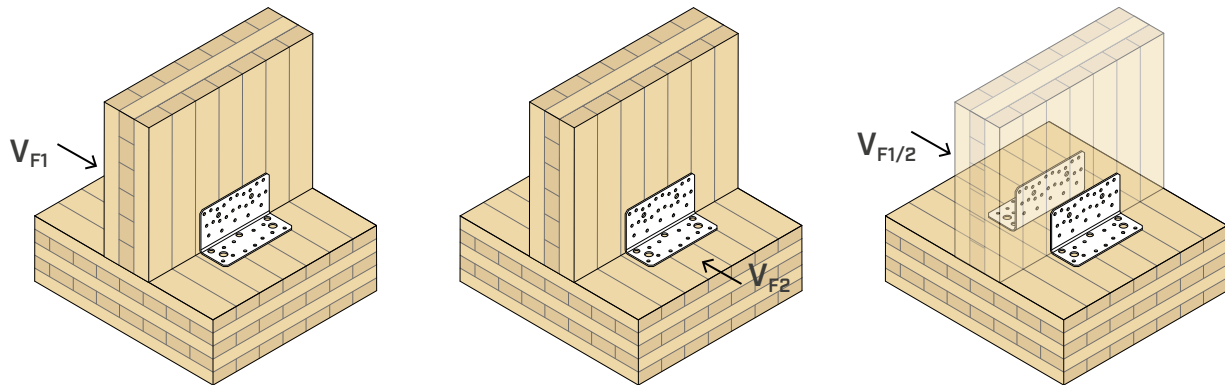
The anchor group must be verified for:

Shear : N_{VF}
 1st Moment : N_{VF} · e_y
 2nd Moment : N_{VF} · e_z



STRUCTURAL VALUES | TIMBER-TO-TIMBER | V_{F1} | $V_{F1/2}$

NINO100100 | NINO15080 | NINO15080S | NINO100200



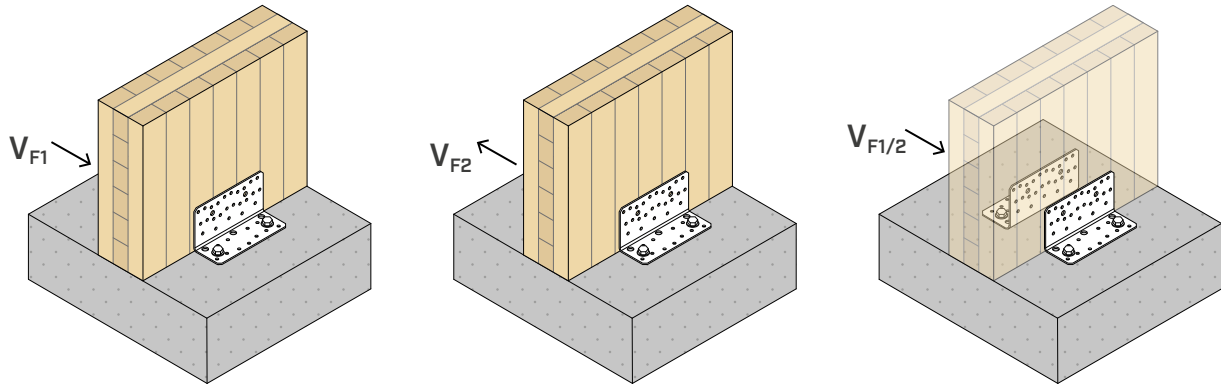
CODE	configuration on timber	fastening holes				V _{r1} factored resistance (K _D =1.15)			V _{r2} factored resistance	V _{r1/2} factored resistance (K _D =1.15)		
		type	Ø x L	n _V	n _H	E3 G = 0.35	E1 and V2 G = 0.42	E2 and V1 G = 0.49		E3 G = 0.35	E1 and V2 G = 0.42	E2 and V1 G = 0.49
			[mm]	[pcs]	[pcs]	[kN]	[kN]	[kN]		[kN]	[kN]	[kN]
NINO 100100	pattern 1	LBA LBS	Ø4 x 60 Ø5 x 50	14	13 + 2 VGS Ø9 x 140	12,5 12,8	14,8 15,2	16,7 17,3	1,8 1,8	14,3 14,6	16,7 17,1	18,6 19,1
	pattern 2	LBA LBS	Ø4 x 60 Ø5 x 50	14	13	12,5 12,8	14,8 15,2	16,7 17,3	1,8 1,8	14,3 14,6	16,7 17,1	18,6 19,1
	pattern 3	LBA LBS	Ø4 x 60 Ø5 x 50	8	13	10,7 10,9	12,9 13,1	14,6 14,9	1,1 1,1	11,9 12,1	14,0 14,3	15,8 16,1
	pattern 4	LBA LBS	Ø4 x 60 Ø5 x 50	8	13	10,7 10,9	12,9 13,1	14,6 14,9	3,7 3,7	14,4 14,6	16,6 16,8	18,3 18,6
	pattern 5	LBA LBS	Ø4 x 60 Ø5 x 50	4	13	9,6 9,6	11,6 11,7	13,3 13,4	3,7 3,7	13,2 13,3	15,3 15,4	16,9 17,1
NINO 15080	pattern 1	LBA LBS	Ø4 x 60 Ø5 x 50	20	11 + 3 VGS Ø9 x 140	16,2 16,2	24,6 24,6	26,9 28,6	1,8 1,8	18,1 18,1	26,4 26,4	28,7 30,4
	pattern 2	LBA LBS	Ø4 x 60 Ø5 x 50	20	11	13,0 13,8	14,2 15,4	15,3 17,0	1,8 1,8	14,8 15,7	16,0 17,3	17,1 18,8
	pattern 3	LBA LBS	Ø4 x 60 Ø5 x 50	10	11	13,0 13,8	14,2 15,4	15,3 17,0	1,8 1,8	14,8 15,7	16,0 17,3	17,1 18,8
	pattern 4	LBA LBS	Ø4 x 60 Ø5 x 50	10	11	13,0 13,8	14,2 15,4	15,3 17,0	3,7 3,7	16,6 17,5	17,8 19,1	18,9 20,6
	pattern 5	LBA LBS	Ø4 x 60 Ø5 x 50	5	11	13,0 13,8	14,2 15,4	15,3 17,0	3,7 3,7	16,6 17,5	17,8 19,1	18,9 20,6
NINO 15080S	pattern 1	HBS PLATE	Ø8 x 100	8	5	14,9	10,3	11,9	1,5	16,4	11,8	13,4
	pattern 2	HBS PLATE	Ø8 x 100	4	3	9,7	10,3	11,8	1,5	11,2	11,8	13,4
NINO 100200	pattern 1	LBA LBS	Ø4 x 60 Ø5 x 50	21	13 + 3 VGS Ø9 x 140	14,6 15,0	17,1 17,7	19,2 20,0	1,8 1,8	16,4 16,8	18,9 19,5	21,0 21,8

NOTES

- The V_{F1} , V_{F2} , V_{F12} values in the table are valid for the acting stress calculation eccentricity $e=0$ (timber elements prevented from rotating).
- For slip modulus K_{ser} R_{for} European wood species, please refer to ETA-22/0089 for 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 | V_{F1} | V_{F2} | $V_{F1/2}$

NINO100100 | NINO15080 | NINO15080S | NINO100200



CODE	configuration on timber	fastening holes			V _{r1}			V _{r2} factored resistance	V _{r1/2}		
					factored resistance (K _D =1.15)				factored resistance (K _D =1.15)		
		type	Ø x L [mm]	n _v [pcs]	E3 G = 0.35 [kN]	E1 and V2 G = 0.42 [kN]	E2 and V1 G = 0.49 [kN]		E3 G = 0.35 [kN]	E1 and V2 G = 0.42 [kN]	E2 and V1 G = 0.49 [kN]
NINO 100100	pattern 6	LBA	Ø4 x 60	14	8,4	10,3	11,9	1,1	9,5	11,5	13,0
		LBS	Ø5 x 50		8,4	10,3	11,9	1,1	9,5	11,5	13,0
	pattern 7	LBA	Ø4 x 60	14	8,4	10,3	11,9	1,8	10,2	12,2	13,7
		LBS	Ø5 x 50		8,4	10,3	11,9	1,8	10,2	12,2	13,7
	pattern 8	LBA	Ø4 x 60	8	8,4	10,3	11,9	1,1	9,5	11,5	13,0
		LBS	Ø5 x 50		8,4	10,3	11,9	1,1	9,5	11,5	13,0
pattern 10	LBA	Ø4 x 60	8	8,4	10,3	11,9	3,7	12,0	14,0	15,5	
	LBS	Ø5 x 50		8,4	10,3	11,9	3,7	12,0	14,0	15,5	
pattern 11	LBA	Ø4 x 60	4	8,4	10,3	11,9	1,8	10,2	12,2	13,7	
	LBS	Ø5 x 50		8,4	10,3	11,9	1,8	10,2	12,2	13,7	
pattern 12	LBA	Ø4 x 60	4	8,4	10,3	11,9	3,7	12,0	14,0	15,5	
	LBS	Ø5 x 50		8,4	10,3	11,9	3,7	12,0	14,0	15,5	
NINO 15080	pattern 6	LBA	Ø4 x 60	10	16,2	23,0	23,0	1,1	17,4	24,1	24,1
		LBS	Ø5 x 50		16,2	23,0	23,0	1,1	17,4	24,1	24,1
	pattern 7	LBA	Ø4 x 60	20	16,2	23,0	23,0	1,8	18,1	24,8	24,8
		LBS	Ø5 x 50		16,2	23,0	23,0	1,8	18,1	24,8	24,8
	pattern 8	LBA	Ø4 x 60	10	16,2	23,0	23,0	1,8	18,1	24,8	24,8
		LBS	Ø5 x 50		16,2	23,0	23,0	1,8	18,1	24,8	24,8
pattern 9	LBA	Ø4 x 60	10	16,2	23,0	23,0	3,7	19,9	26,6	26,6	
	LBS	Ø5 x 50		16,2	23,0	23,0	3,7	19,9	26,6	26,6	
pattern 10	LBA	Ø4 x 60	5	16,2	23,0	23,0	1,8	18,1	24,8	24,8	
	LBS	Ø5 x 50		16,2	23,0	23,0	1,8	18,1	24,8	24,8	
pattern 11	LBA	Ø4 x 60	5	16,2	23,0	23,0	3,7	19,9	26,6	26,6	
	LBS	Ø5 x 50		16,2	23,0	23,0	3,7	19,9	26,6	26,6	
NINO 15080S	pattern 3	HBS PLATE	Ø8 x 100	8	8,4	10,3	11,9	1,5	9,9	11,8	13,4
	pattern 4	HBS PLATE	Ø8 x 100	4	8,4	10,3	11,9	0,9	9,3	11,2	12,8
NINO 100200	pattern 2	LBA	Ø4 x 60	14	8,4	10,3	11,9	0,5	8,8	10,8	12,3
		LBS	Ø5 x 50		8,4	10,3	11,9	0,5	8,8	10,8	12,3
	pattern 3	LBA	Ø4 x 60	21	8,4	10,3	11,9	0,5	8,9	10,9	12,4
		LBS	Ø5 x 50		8,4	10,3	11,9	0,5	8,9	10,9	12,4
pattern 5	LBA	Ø4 x 60	21	8,4	10,3	11,9	0,8	9,2	11,2	12,7	
	LBS	Ø5 x 50		8,4	10,3	11,9	0,8	9,2	11,2	12,7	

NOTES

- The V_{F1} , V_{F2} , $V_{F1/2}$ values in the table are valid for the acting stress calculation eccentricity $e=0$ (timber elements prevented from rotating).
- For slip modulus K_{ser} R for European wood species, please refer to ETA-22/0089 for values in timber-to-timber and timber-to-concrete configuration.

GENERAL PRINCIPLES

- Design values can be obtained from values in the table as follows:

TIMBER-TO-TIMBER INSTALLATION (under tension force N_T):

$$R_{design} = N_r$$

TIMBER-TO-TIMBER INSTALLATION (under tension force N_T):

$$R_{design} = \min \left\{ \begin{array}{l} N_r \\ R_{concrete} \end{array} \right.$$

TIMBER-TO-TIMBER INSTALLATION (under tension force N_{VT}):

$$R_{design} = N_{VT}$$

TIMBER-TO-CONCRETE INSTALLATION (under tension force N_{VT}):

$$R_{design} = \min \left\{ \begin{array}{l} N_{VT} \\ R_{V\ concrete} \end{array} \right.$$

- The resistance values of LBS, HBS, VGS screws are determined according to CSA O86:2024, section 12.12 (self-tapping screws)
- The resistance values of LBA nails are determined according to section 12.9 (nails and spikes).
- The specified bending yield strength for LBA with a 4 mm diameter is $f_{yb} = 645$ MPa, for LBS with a 5 mm diameter is $f_{yb} = 1075$ MPa, for HBS PLATE with a 8 mm diameter is $f_{yb} = 1018$ MPa, and for VGS with a 9 mm diameter is $f_{yb} = 1069$ MPa
- G is the mean relative density according to Table A.12 in CSA O86:2025. Typical wood species considered include Northern species ($G = 0.35$), Spruce-Pine-Fir ($G = 0.42$), Douglas Fir ($G = 0.49$), and Southern Pine ($G = 0.55$).
- The design values of timber are determined for the combined timber-side and steel-side failure.
- 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.
- The calculation of the concrete anchors is performed following CSA A23.3:2024, Annex D.
- The characteristic bond stress of adhesive anchors in cracked and uncracked concrete is taken from European Technical Assessment test reports.
- The bond strength of HYB-FIX and EPO-FIX for seismic design is calculated by multiplying τ_{uncr} by 0.8, according to Section D.6.5.2 in CSA A23.3:2024.
- The calculation process uses C25/30 concrete without considering edge effects.
- Fastening elements to concrete using anchors not listed in the table must be verified according to the load applied to the anchors.
- The strength values are valid for the calculation hypotheses defined in the table; for boundary conditions different from the ones in the table (e.g. minimum distances from the edge), the anchors-to-concrete must be recalculated according to the design requirements.
- For proper installation of screws, it is recommended to refer to the "TIMBER SCREWS AND DECK FASTENING" catalogue.
- 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).

NOTES

- (1) The load-bearing capacity values listed are valid for installation with Ø9 VGS screws of length ≥ 140 mm.
- (2) Values for factored lateral resistance for self-taping screws are determined following the guidelines in Section 12.12 in CSA-O86 2020. Short term load duration factor ($K_D = 1.15$), dry service condition factor ($K_{SF} = 1.0$), and treatment factor ($K_T = 1.0$) are assumed.
- (3) Adjustment factor for connections (J_x) is assumed to be equal to 0.9 for CLT connections.
- (4) The slip modulus of the shear connection, K_{ser} , is measured through testing on European wood species with a density of 350 kg/m^3 .
- (5) The characteristic bond stress of adhesive anchors in cracked and uncracked concrete is based on ETA certifications for VIN-FIX, HYB-FIX, and EPO-FIX chemical anchors.
- (6) The concrete resistance values in the table are determined taking into account the contribution of k_{vj} coefficient in the calculation.
- (7) The concrete resistance values in the table are calculated considering the eccentricity induced by the applied force.

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.