

TENSILE ANGLE BRACKET FOR BUILDINGS

TIMBER FRAME AND CLT

Ideal for timber frame and CLT because of the optimized nailing patterns. Certified configurations with the presence of bedding grout, base plate or concrete kerb.

TIMBER-TO-TIMBER CONFIGURATION

Exceptional strength values also for installation in timber-to-timber configuration. Possibility of installation with passing bolts or with VGS screws or HBS PLATE.

CERTIFICATION WITH GAP

Certification with raised installation opens up numerous application possibilities for solving non-standard connections or managing tolerances in innovative ways.

SERVICE CLASS

SC1 SC2

MATERIAL

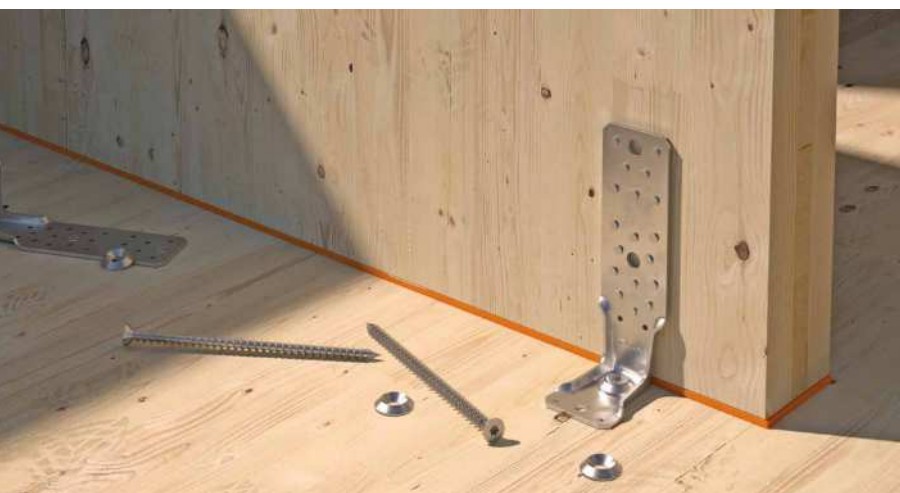
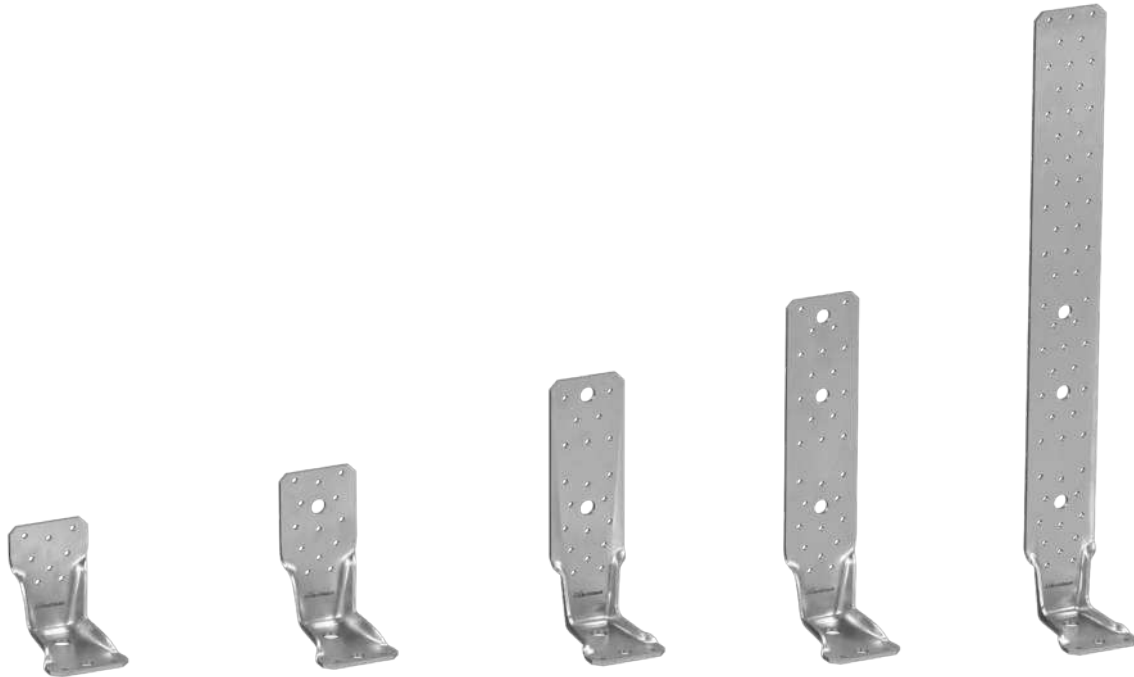
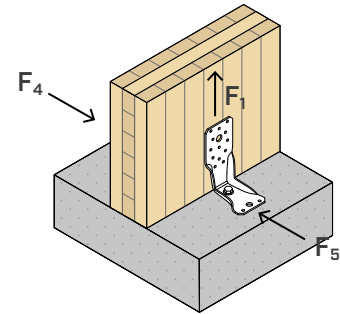
S250
Z275

WKR9530: carbon steel S250GD+Z275

S235
Fe/Zn12c

WKR13535 | WKR21535 | WKR28535 |
WKR53035:
S235 + Fe/Zn12c carbon steel

EXTERNAL LOADS



FIELDS OF USE

Tension joints with small to 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



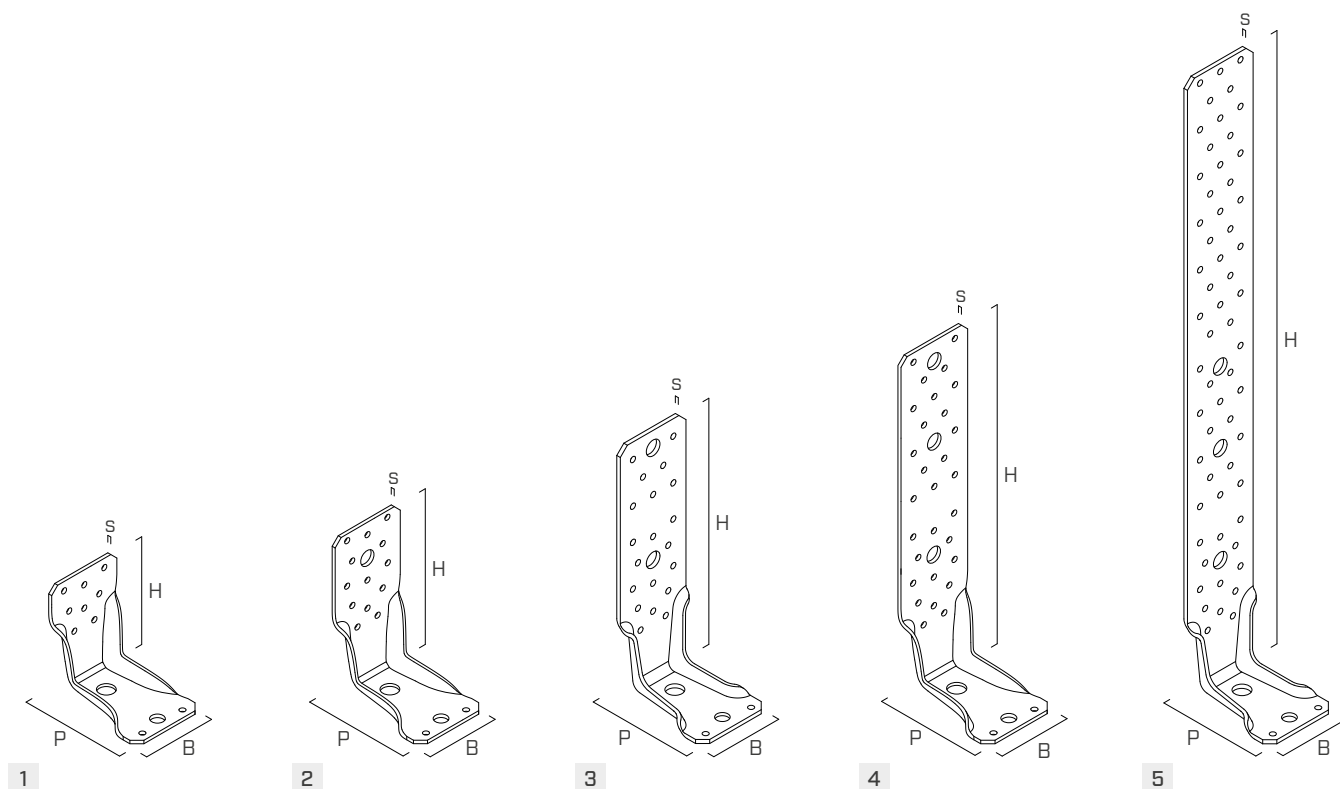
RAISED WALL

Partial nailing patterns allow installation on timber frame or CLT walls in the presence of concrete kerb up to 370 mm high.

PREFABRICATION

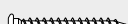
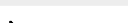
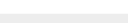
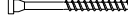
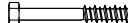
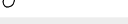
On prefabricated timber frame walls, it is possible to pre-install the anchor in the concrete and the angle bracket on the wall. With a MUT 6334 joint nut and threaded rod, it is possible to complete the connection on site, managing all installation tolerances as best as possible.

CODES AND DIMENSIONS



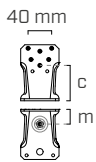
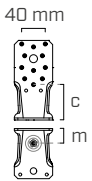
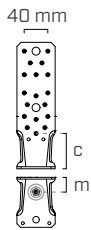
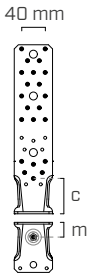
CODE	B	P	H	s	B	P	H	s	$n_V \varnothing 5$ $n_V \varnothing 0.20$	$n_H \varnothing 14$ $n_H \varnothing 0.56$	$n_H \varnothing 11$ $n_H \varnothing 0.44$	$n_V \varnothing 13,5$ $n_V \varnothing 0.53$			pcs
	[mm]	[mm]	[mm]	[mm]	[in]	[in]	[in]	[in]	[pcs]	[pcs]	[pcs]	[pcs]			
1 WKR9530	65	85	95	3	2 9/16	3 3/8	3 3/4	0.12	8	1	1	-	●	●	25
2 WKR13535	65	85	135	3,5	2 9/16	3 3/8	5 5/16	0.14	13	1	1	1	●	●	25
3 WKR21535	65	85	215	3,5	2 9/16	3 3/8	8 7/16	0.14	20	1	1	2	●	●	25
4 WKR28535	65	85	287	3,5	2 9/16	3 3/8	11 5/16	0.14	29	1	1	3	●	●	25
5 WKR53035	65	85	530	3,5	2 9/16	3 3/8	20 7/8	0.14	59	1	1	3	●	●	10

FASTENERS

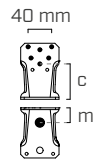
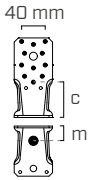
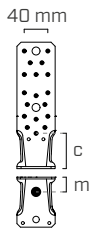
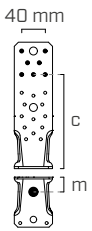
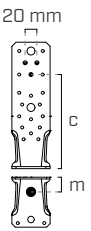
type	description		d [mm]	support
LBA	high bond nail		4	
LBS	round head screw		5	
VGS	fully threaded countersunk screw		11-13	
HUS	turned washer		11-13	
HBS PLATE	pan head screw		10-12	
AB1	CE1 expansion anchor		12	
SKR	screw-in anchor		M12	
VIN-FIX	vinyl ester chemical anchor		M12	
HYB-FIX	hybrid chemical anchor		M12	
EPO-FIX	epoxy chemical anchor		M12	
ULS13373	washer		M12	

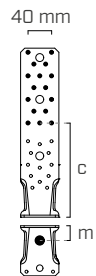
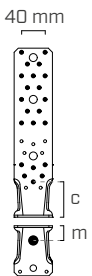
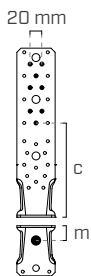
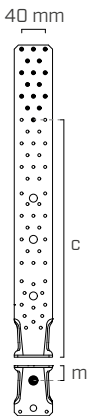
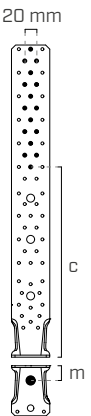
FASTENING PATTERNS

TIMBER-TO-TIMBER

WKR9530	WKR13535	WKR21535	WKR28535
			
pattern 2	pattern 2	pattern 2	pattern 3

TIMBER-TO-CONCRETE

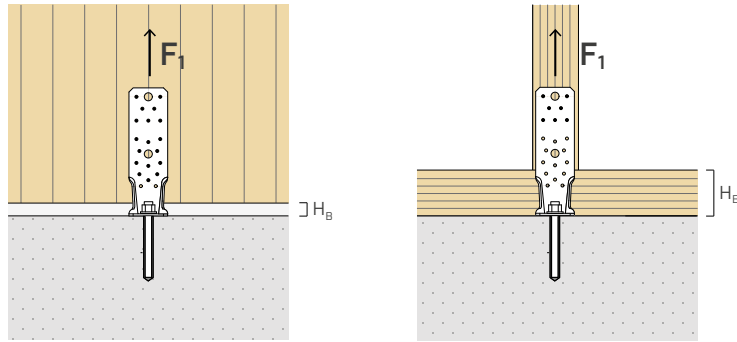
WKR9530	WKR13535	WKR21535		
				
pattern 1	pattern 1	pattern 1	pattern 3	pattern 4

WKR28535			WKR53035	
				
pattern 1	pattern 2	pattern 4	pattern 1	pattern 2

CODE	configuration	fastening holes Ø5		m [mm]	support	
		n _v [pcs]	c [mm]			
WKR9530	pattern 1	6	60	25	-	●
	pattern 2	6	60		●	-
WKR13535	pattern 1	11	60		-	●
	pattern 2	11	60		●	-
WKR21535	pattern 1	18	60		-	●
	pattern 2	18	60		●	-
	pattern 3	7	160		-	●
	pattern 4	3	160		-	●
WKR28535	pattern 1	16	160		-	●
	pattern 2	22	60		-	●
	pattern 3	22	60		●	-
	pattern 4	8	160		-	●
WKR53035	pattern 1	16	400		-	●
	pattern 2	16	320		-	●

■ INSTALLATION

MAXIMUM HEIGHT OF THE INTERMEDIATE H_B LAYER



CODE	configuration	$H_{B \max}$ [mm]			
		CLT		C/GL	
		nails LBA Ø4	screws LBS Ø5	nails LBA Ø4	screws LBS Ø5
WKR9530	pattern 1	20	30	-	-
	pattern 2				
WKR13535	pattern 1	20	30	-	-
	pattern 2				
WKR21535	pattern 1	20	30	-	-
	pattern 2				
	pattern 3	120	130	100	85
	pattern 4				
WKR28535	pattern 1	120	130	100	85
	pattern 4	20	30	-	-
	pattern 2				
WKR53035	pattern 1	360	370	340	325
	pattern 2	280	270	260	245

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, shown in the minimum distance table.

MINIMUM DISTANCES

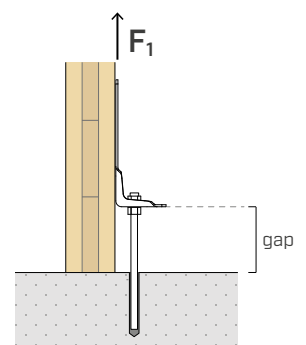
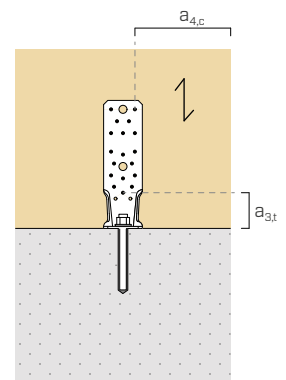
TIMBER			nails LBA Ø4	screws LBS Ø5
C/GL	$a_{4,c}$	[mm]	$\geq 12,5^{(*)}$	$\geq 12,5^{(*)}$
	$a_{3,t}$	[mm]	≥ 60	≥ 75
CLT	$a_{4,c}$	[mm]	≥ 12	$\geq 12,5$
	$a_{3,t}$	[mm]	≥ 40	≥ 30

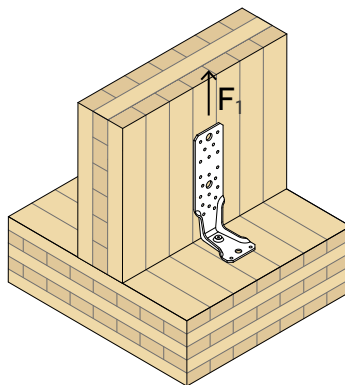
- C/GL: minimum distances for solid timber or glulam consistent with EN 1995:2014 according to ETA considering a timber density $\rho_k \leq 420 \text{ kg/m}^3$.
- CLT minimum distances for Cross Laminated Timber according to ÖNORM EN 1995:2014 (Annex K) for nails and ETA-11/0030 for screws.

(*) In case of installation on studs of reduced width ($12,5 \text{ mm} \leq a_{4,c} < 5d$), the load-bearing resistance $R_{1,k \text{ timber}}$ must be calculated with reference to ETA-22/0089 - Annex A.

INSTALLATION WITH GAP

In the presence of F_1 tensile forces, installation of the angle bracket raised above the bearing surface is possible. This makes it possible, for example, to install the angle bracket even with an intermediate H_B layer (bedding grout, base plate or concrete kerb) greater than $H_{B \max}$. It is advisable to add a lock nut under the horizontal flange to prevent any tension in the connection caused by over-tightening the nut.





TIMBER STRENGTH

CODE	configuration	fastening holes Ø5			R _{1,k timber} ⁽¹⁾ [kN]	K _{1,ser} [kN/mm]
		type	Ø x L [mm]	n _V [pcs]		
WKR9530	pattern 2	LBA	Ø4 x 60	6	15,0	R _{1,k timber} /4
		LBS	Ø5 x 50		13,3	
WKR13535	pattern 2	LBA	Ø4 x 60	11	28,3	
		LBS	Ø5 x 50		24,6	
WKR21535	pattern 2	LBA	Ø4 x 60	18	47,0	
		LBS	Ø5 x 50		40,3	
WKR28535	pattern 3	LBA	Ø4 x 60	22	57,6	
		LBS	Ø5 x 50		49,3	

STRENGTH ON STEEL SIDE

connector	WKR	R _{1,k screw,head} ^(*)	
		[kN]	Y _{steel}
VGS Ø11 + HUS 10 VGS Ø13 + HUS 12	WKR9530 / WKR13535 / WKR21535 / WKR28535	R _{tens,k}	Y _{M2}
HBS PLATE Ø10	WKR9530	20,0	
	WKR13535 / WKR21535 / WKR28535	21,0	
HBS PLATE Ø12	WKR9530	27,0	
	WKR13535 / WKR21535 / WKR28535	29,0	

(*) The values in the table refer to a punching shear failure of the connector in the horizontal flange.

STRENGTH ON ANCHOR SYSTEM SIDE

Strength values of some of the possible fastening solutions.

CODE	configuration	k _t //	fastening holes Ø14	
			type ⁽²⁾	R _{1,k,screw,ax} ⁽³⁾ [kN]
WKR9530	pattern 2	1,05	HBS PLATE Ø10x140 HBS PLATE Ø10x180	13,9 18,9
WKR13535	pattern 2	1,05	HBS PLATE Ø12x140 HBS PLATE Ø12x200	16,7 24,2
WKR21535	pattern 2	1,10	VGS Ø11x150 + HUS10 VGS Ø11x200 + HUS10	19,5 26,4
WKR28535	pattern 3	1,10	VGS Ø13x150 + HUS12 VGS Ø13x200 + HUS12	23,0 31,2

NOTES

⁽¹⁾ Installation with nails and screws of shorter length than proposed in the table is possible. In this case, the bearing capacity values R_{1,k timber} must be multiplied by the following reductive factor k_F:

- for nails

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

- for screws

$$k_F = \min \left\{ \frac{F_{v,short,Rk}}{2,39 \text{ kN}}; \frac{F_{ax,short,Rk}}{2,90 \text{ kN}} \right\}$$

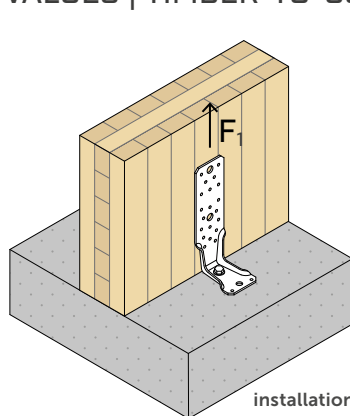
F_{v,short,Rk} = characteristic shear strength of the nail or screw

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

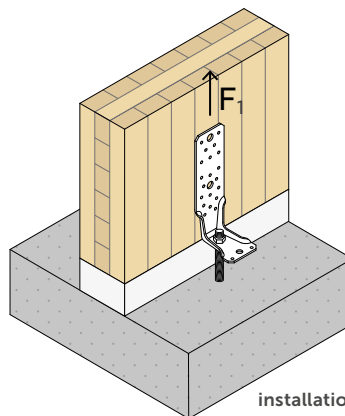
In case of installation on studs of reduced width (12,5 mm ≤ a_{4,c} < 5d), the load-bearing resistance R_{1,k timber} must be calculated with reference to ETA-22/0089 - Annex A. The same formulation also applies in the case of LVL studs.

⁽²⁾ If there are design requirements such as F₁ stresses of different amounts, or depending on the thickness of the floor slab, it is possible to use Ø11 and Ø13 VGS screws with HUS10 and HUS12 washers and Ø10 and Ø12 HBS PLATE screws of different lengths than those proposed in the table (see the "TIMBER SCREWS AND DECK FASTENING" catalogue).

⁽³⁾ The R_{1,k,screw,ax} values can be consulted in the "TIMBER SCREWS AND DECK FASTENING".



installation without gap



installation with gap

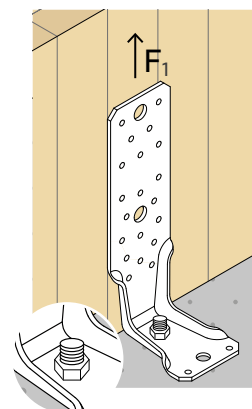
TIMBER STRENGTH

CODE	configuration	type	fastening holes Ø5		R _{1,k timber} ⁽¹⁾ [kN]	K _{1,ser} [kN/mm]
			Ø x L [mm]	n _v [pcs]		
WKR9530	pattern 1	LBA	Ø4 x 60	6	15,0	R _{1,k timber} / 4
		LBS	Ø5 x 50		13,3	
WKR13535	pattern 1	LBA	Ø4 x 60	11	28,3	
		LBS	Ø5 x 50		24,6	
WKR21535	pattern 1	LBA	Ø4 x 60	18	47,0	
		LBS	Ø5 x 50		40,3	
	pattern 3	LBA	Ø4 x 60	7	18,7	
		LBS	Ø5 x 50		15,8	
	pattern 4	LBA	Ø4 x 60	3	8,0	
		LBS	Ø5 x 50		6,8	
WKR28535	pattern 1	LBA	Ø4 x 60	16	37,3	
		LBS	Ø5 x 50		36,0	
	pattern 2	LBA	Ø4 x 60	22	57,6	
		LBS	Ø5 x 50		49,3	
	pattern 4	LBA	Ø4 x 60	8	21,3	
		LBS	Ø5 x 50		18,0	
WKR53035	pattern 1-2	LBA	Ø4 x 60	16	42,6	
		LBS	Ø5 x 50		36,0	

STRENGTH ON STEEL SIDE WITHOUT WASHER

CODE	configuration	R _{1,k,bolt,head} ^(*)		Y _{steel}
		no gap [kN]	gap [kN]	
WKR9530	pattern 1	26	8,3	YM2
WKR13535	pattern 1		19	
WKR21535	pattern 1		19	
	pattern 3-4		-	
WKR28535	pattern 1-4		-	
	pattern 2		19	
WKR53035	pattern 1-2		-	

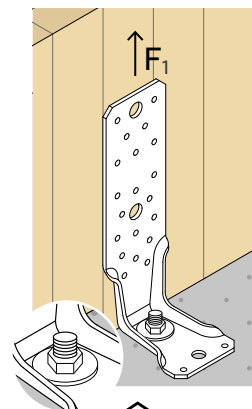
(*) The values R_{1,k,bolt,head} refer to a punching shear failure of the connector in the horizontal flange.



STRENGTH ON STEEL SIDE WITH WASHER ULS13373

CODE	configuration	R _{1,k,bolt,head} ^(*)		Y _{steel}
		no gap [kN]	gap [kN]	
WKR9530	pattern 1	26	16	YM2
WKR13535	pattern 1	37	35	
WKR21535	pattern 1		35	
	pattern 3-4		-	
WKR28535	pattern 1-4		-	
	pattern 2		35	
WKR53035	pattern 1-2		-	

(*) The values R_{1,k,bolt,head} refer to a punching shear failure of the connector in the horizontal flange.



CONCRETE STRENGTH

Strength values of some of the possible fastening solutions. For additional solutions, different from those indicated in the table, it is possible to use the My Project software available at www.rothoblaas.com.

The values shown in the table have been determined taking into account the contribution of the coefficient $k_{t//}$ in the calculations.

CODE	configuration on concrete	fastening holes Ø14		R _{1,d} concrete no gap				R _{1,d} concrete gap	
		type	Ø x L [mm]	pattern 1 [kN]	pattern 2 [kN]	pattern 3 [kN]	pattern 4 [kN]	pattern 1 [kN]	pattern 2 [kN]
WKR9530 WKR13535	uncracked	VIN-FIX 5.8	M12 x 195	26,6	-	-	-	28,0	-
		SKR	12 x 90	10,1	-	-	-	-	-
		AB1	M12 x 115	11,7	-	-	-	-	-
	cracked	VIN-FIX 5.8	M12 x 195	19,5	-	-	-	20,5	-
		HYB-FIX 5.8	M12 x 195	26,7	-	-	-	28,0	-
		AB1	M12 x 115	9,4	-	-	-	-	-
	seismic	HYB-FIX 8.8	M12 x 195	14,6	-	-	-	15,4	-
			M12 x 245	18,1	-	-	-	19,0	-
		EPO-FIX 8.8	M12 x 195	23,6	-	-	-	24,8	-
WKR21535	uncracked	VIN-FIX 5.8	M12 x 195	25,4	-	19,3	19,3	28,0	-
		SKR	12 x 90	9,6	-	7,3	9,6	-	-
		AB1	M12 x 115	11,2	-	12,6	12,6	-	-
	cracked	VIN-FIX 5.8	M12 x 195	18,6	-	14,1	14,1	20,5	-
		HYB-FIX 5.8	M12 x 195	25,5	-	19,3	19,3	28,0	-
		AB1	M12 x 115	8,9	-	7,4	7,4	-	-
	seismic	HYB-FIX 8.8	M12 x 195	14,0	-	10,6	10,6	15,4	-
			M12 x 245	17,3	-	13,1	13,1	19,0	-
		EPO-FIX 8.8	M12 x 195	22,5	-	17,1	17,1	24,8	-
WKR28535	uncracked	VIN-FIX 5.8	M12 x 195	19,3	25,4	-	19,3	-	28,0
		SKR	12 x 90	7,3	9,6	-	9,6	-	-
		AB1	M12 x 115	8,5	16,6	-	12,6	-	-
	cracked	VIN-FIX 5.8	M12 x 195	14,1	18,6	-	14,1	-	20,5
		HYB-FIX 5.8	M12 x 195	19,3	25,5	-	19,3	-	28,0
		AB1	M12 x 115	6,8	9,7	-	7,4	-	-
	seismic	HYB-FIX 8.8	M12 x 195	10,6	14,0	-	10,6	-	15,4
			M12 x 245	13,1	17,3	-	13,1	-	19,0
		EPO-FIX 8.8	M12 x 195	17,1	22,5	-	17,1	-	24,8
WKR53035	uncracked	VIN-FIX 5.8	M12 x 195	19,3	19,3	-	-	-	-
		SKR	12 x 90	7,3	9,6	-	-	-	-
		AB1	M12 x 115	8,5	12,6	-	-	-	-
	cracked	VIN-FIX 5.8	M12 x 195	14,1	14,1	-	-	-	-
		HYB-FIX 5.8	M12 x 195	19,3	19,3	-	-	-	-
		AB1	M12 x 115	6,8	7,4	-	-	-	-
	seismic	HYB-FIX 8.8	M12 x 195	10,6	10,6	-	-	-	-
			M12 x 245	13,1	13,1	-	-	-	-
		EPO-FIX 8.8	M12 x 195	17,1	17,1	-	-	-	-

NOTES

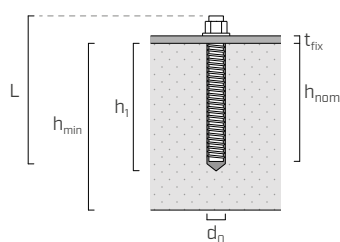
- The gap installation must be carried out with only chemical anchors and pre-cut INA threaded rod or MGS to be cut to size.

ANCHORS INSTALLATION PARAMETERS

anchor type	$\varnothing \times L$ [mm]	h_{ef} [mm]	h_{nom} [mm]	h_1 [mm]	d_0 [mm]	h_{min} [mm]
VIN-FIX 5.8	M12 x 195	170	170	175	14	200
HYB-FIX 5.8	M12 x 195	170	170	175	14	200
HYB-FIX 8.8	M12 x 195	170	170	175	14	200
	M12 x 245	210	210	215	14	250
EPO-FIX 8.8	M12 x 195	170	170	175	14	200
SKR	12 x 90	64	87	110	10	200
AB1	M12 x 115	70	85	105	14	200

Precut INA threaded rod, with nut and washer.

MGS threaded rod class 8.8 to be cut to size: for more information, see the "PLATES AND CONNECTORS FOR TIMBER" catalogue, available in the "Catalogues" section of the website www.rothoblaas.com.



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_1

Fastening elements to the concrete through anchors not listed in the table, shall be verified according to the load acting on the anchors, which can be evaluated through the $k_{t//}$ coefficients. The axial load acting on the anchor can be obtained as follows:

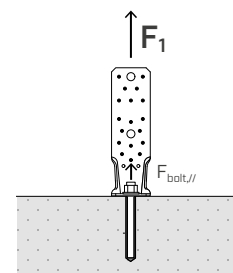
$$F_{bolt//,d} = k_{t//} \cdot F_{1,d}$$

$k_{t//}$ coefficient of eccentricity

$F_{1,d}$ axial load on the WKR angle bracket

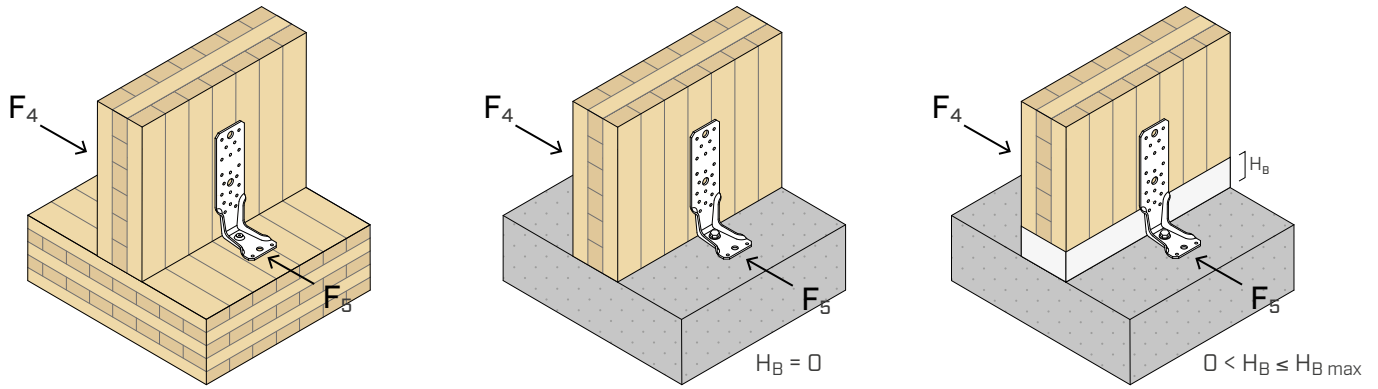
The anchor check is satisfied if the design tensile strength, obtained considering the boundary effects, is greater than the design external load: $R_{bolt//,d} \geq F_{bolt//,d}$.

CODE	INSTALLATION WITHOUT GAP		INSTALLATION WITH GAP	
	configuration	$k_{t//}$	configuration	$k_{t//}$
WKR9530	pattern 1-2	1,05	pattern 2	1,00
WKR13535	pattern 1-2	1,05	pattern 2	
WKR21535	pattern 1-2	1,10	pattern 2	
	pattern 3-4	1,45	pattern 2	
WKR28535	pattern 2-3	1,10	pattern 3	-
	pattern 1-4	1,45		
WKR53035	pattern 1-2	1,45	-	



NOTES

⁽¹⁾ Valid for the strength values shown in the table.



TIMBER-TO-TIMBER

CODE	configuration	fastening holes Ø5			H _B = 0		l _{BL} ⁽²⁾ [mm]
		type	Ø x L [mm]	n _V [pcs]	R _{4,k} timber ⁽¹⁾ [kN]	R _{5,k} timber ⁽¹⁾ [kN]	
WKR9530	pattern 2	LBA	Ø4 x 60	6	14,7	2,6	70,0
		LBS	Ø5 x 50		14,1	3,4	
WKR13535	pattern 2	LBA	Ø4 x 60	11	18,3	2,6	
		LBS	Ø5 x 50		17,2	3,6	
WKR21535	pattern 2	LBA	Ø4 x 60	18	23,0	2,6	
		LBS	Ø5 x 50		21,1	3,6	
WKR28535	pattern 3	LBA	Ø4 x 60	22	25,6	2,6	
		LBS	Ø5 x 50		23,4	3,6	

TIMBER-TO-CONCRETE

CODE	configuration	fastening holes Ø5			H _B = 0		0 < H _B ≤ H _B max		l _{BL} ⁽²⁾ [mm]
		type	Ø x L [mm]	n _V [pcs]	R _{4,k} timber ⁽¹⁾ [kN]	R _{5,k} timber ⁽¹⁾ [kN]	R _{4,k} timber ⁽¹⁾ [kN]	R _{5,k} timber ⁽¹⁾ [kN]	
WKR9530	pattern 1	LBA	Ø4 x 60	6	14,7	2,6	11,3	2,6	70,0
		LBS	Ø5 x 50		14,1	3,4	10,7	3,4	
WKR13535	pattern 1	LBA	Ø4 x 60	11	18,3	2,6	14,9	2,6	70,0
		LBS	Ø5 x 50		17,2	3,6	13,8	3,6	
WKR21535	pattern 1	LBA	Ø4 x 60	18	23,0	2,6	19,6	2,6	70,0
		LBS	Ø5 x 50		21,1	3,6	17,7	3,6	
WKR28535	pattern 1	LBA	Ø4 x 60	16	21,7	1,0	13,0	0,9	160,0
		LBS	Ø5 x 50		20,0	1,0	11,3	0,9	
	pattern 2	LBA	Ø4 x 60	22	25,6	2,6	22,3	2,6	70,0
		LBS	Ø5 x 50		23,4	3,6	20,0	3,6	
WKR53035	pattern 1	LBA	Ø4 x 60	16	21,7	0,3	11,5	0,3	343,0
		LBS	Ø5 x 50		20,0	0,3	9,8	0,3	
	pattern 2	LBA	Ø4 x 60	16	21,7	0,3	11,5	0,3	423,0
		LBS	Ø5 x 50		20,0	0,3	9,8	0,3	

NOTES

⁽¹⁾ Installation with nails and screws of shorter length than proposed in the table is possible. In this case, the bearing capacity values R_{4,k} timber and R_{5,k} timber must be multiplied by the following reductive factor k_F:

- for nails

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

- for screws

$$k_F = \min \left\{ \frac{F_{v,short,Rk}}{2,39 \text{ kN}} ; \frac{F_{ax,short,Rk}}{2,90 \text{ kN}} \right\}$$

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

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

In the case of F_{5,Ed} stress, it is required to verify for the simultaneous shear action on the F_{v,Ed} anchor and the additional extraction component F_{ax,Ed}:

$$F_{ax,Ed} = \frac{F_{5,Ed} \cdot l_{BL}}{25 \text{ mm}}$$

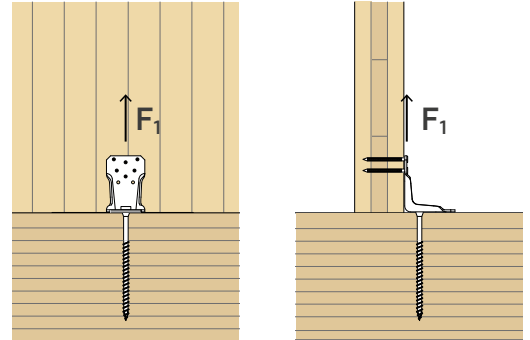
l_{BL} = distance between the last row of at least two connectors and the bearing surface

- The R_{4,k} timber resistance is limited by the lateral R_{v,k} resistance of the base connector.
- Refer to ETA-22/0089 for K_{4,ser} stiffness values in timber-to-timber configuration.

CALCULATION EXAMPLES | DETERMINING RESISTANCE R_{1d}

TIMBER-TO-TIMBER

Project data	
Service class	SC1
Load duration	instantaneous
Connector	
Configuration	pattern 2
Fastening on timber	nails LBA Ø4 x 60 mm
Screw selection	
HBS PLATE	Ø10 x 140 mm
Pre-drilling hole	without pre-drilled hole



EN 1995:2014

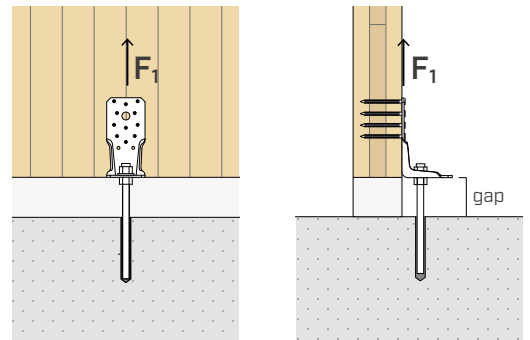
$k_{mod} = 1,1$
 $\gamma_M = 1,3$
 $\gamma_{M2} = 1,25$
 $k_{t//} = 1,05$
 $R_{1,k, timber} = 15,0 \text{ kN}$
 $R_{1,k, screw, head} = 20,0 \text{ kN}$
 $R_{1,k, screw, ax} = 13,9 \text{ kN}$

$$R_{1,d} = \min \left\{ \begin{array}{l} \frac{R_{1,k, timber} \cdot k_{mod}}{\gamma_M} = 12,7 \text{ [kN]} \\ \frac{R_{1,k, screw, head}}{\gamma_{M2}} = 16,0 \text{ [kN]} \\ \frac{R_{1,k, screw, ax} \cdot k_{mod}}{k_{t//} \gamma_M} = 11,2 \text{ [kN]} \end{array} \right.$$

$R_{1,d} = 11,2 \text{ kN}$ ✓

TIMBER-TO-CONCRETE | INSTALLATION WITH GAP

Project data	
Service class	SC1
Load duration	instantaneous
Connector	
Configuration	pattern 1 with gap
Fastening on timber	nails LBA Ø4 x 60 mm
Anchor choice	
VIN-FIX anchor	M12 x 195 (5.8 steel class)
Uncracked concrete	



EN 1995:2014

$k_{mod} = 1,1$
 $\gamma_M = 1,3$
 $\gamma_{M2} = 1,25$
 $R_{1,k, timber} = 28,3 \text{ kN}$
 $R_{1,k, bolt, head} = 19,0 \text{ kN}$
 $R_{1,d, concrete} = 28,0 \text{ kN}$

$$R_{1,d} = \min \left\{ \begin{array}{l} \frac{R_{1,k, timber} \cdot k_{mod}}{\gamma_M} = 23,95 \text{ [kN]} \\ \frac{R_{1,k, bolt, head}}{\gamma_{M2}} = 15,2 \text{ [kN]} \\ R_{1,d, concrete} = 28,0 \text{ [kN]} \end{array} \right.$$

$R_{1,d} = 15,2 \text{ kN}$ ✓

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:

TIMBER-TO-CONCRETE INSTALLATION

$$R_d = \min \left\{ \begin{array}{l} \frac{R_{k, \text{timber}} \cdot k_{mod}}{Y_M} \\ \frac{R_{k, \text{bolt, head}}}{Y_{M2}} \\ R_{d, \text{concrete}} \end{array} \right.$$

TIMBER-TO-TIMBER INSTALLATION

$$R_d = \min \left\{ \begin{array}{l} \frac{R_{k, \text{timber}} \cdot k_{mod}}{Y_M} \\ \frac{R_{k, \text{screw, ax}}}{k_{t/j}} \cdot \frac{k_{mod}}{Y_M} \\ \frac{R_{k, \text{screw, head}}}{Y_{M2}} \end{array} \right.$$

The coefficients k_{mod} , Y_M and Y_{M2} should be taken according to the current regulations used for the calculation.

- The use of nails is allowed in accordance with EN 14592, in this case the bearing capacity values $R_{1,k \text{ timber}}$ must be multiplied by the following reductive factor k_{rid} :

$$k_{rid} = \min \left\{ \frac{F_{v, EN 14592, Rk}}{2,83 \text{ kN}} ; \frac{F_{ax, EN 14592, Rk}}{1,39 \text{ kN}} \right\}$$

- 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 $\rho_k = 350 \text{ kg/m}^3$ was considered for the calculation process. For higher ρ_k values, the strength on timber side can be converted by the k_{dens} value:

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

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

- 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 $\alpha_{sus} = 0,6$. For chemical anchors it is assumed that the annular space between the anchor and the plate hole is filled ($\alpha_{gap} = 1$).
- 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-25/0860 (M12).

NOTES

- ⁽¹⁾ Installation with nails and screws of a shorter length than proposed in the table is possible by multiplying the load-bearing capacity values $R_{1,k \text{ timber}}$ by the following reductive factor k_F :

- for nails

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

- for screws

$$k_F = \min \left\{ \frac{F_{v, short, Rk}}{2,39 \text{ kN}} ; \frac{F_{ax, short, Rk}}{2,90 \text{ kN}} \right\}$$

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

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

- In the presence of an H_B intermediate layer (levelling mortar, sill or platform) with nails on CLT and $a_{3,t} < 60 \text{ mm}$, the $R_{1,k \text{ timber}}$ values in the table must be multiplied by a 0,93 coefficient.
- If there are design requirements such as the presence of an intermediate H_B layer (levelling mortar, sill or platform) greater than $H_{B \text{ max}}$, the installation of the angle bracket raised above the bearing surface (gap installation) is allowed.

INTELLECTUAL PROPERTY

- A WKR model is protected by the Registered Community Design RCD 015032190-0024.