

WKR DOUBLE

TENSILE ANGLE BRACKET FOR PREFABRICATED WALLS

PREFABRICATION

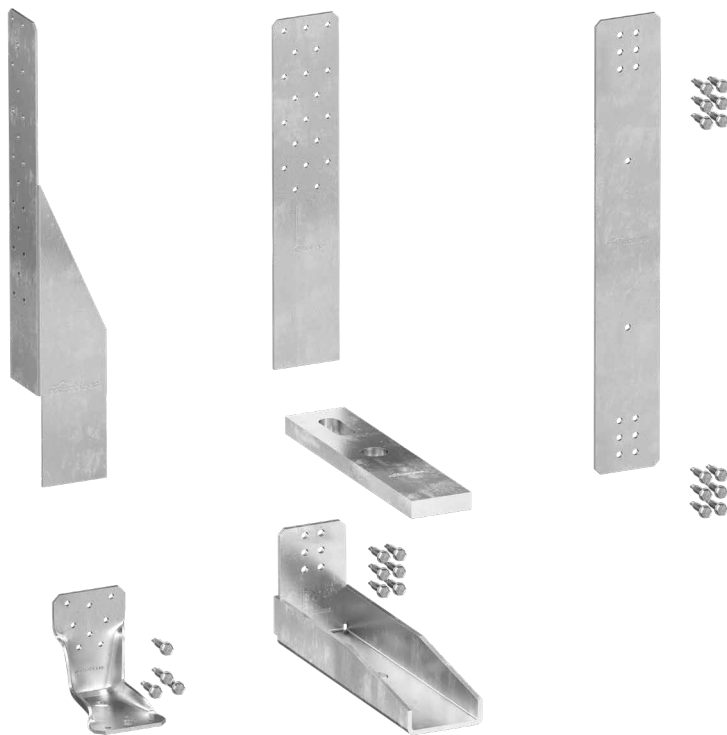
The wall plate allows for pre-assembly in the factory, with the possibility of finishes prefabrication. Fastening on site is carried out using the base angle bracket or inter-storey plate and self-drilling metal screws.

TOLERANCES

On-site management is quick and easy. The numerous models of the base angle bracket allow the wall to be installed on a grout, on a base plate or on a reinforced concrete kerb.

PRE-INSTALLATION

The base angle brackets can be pre-installed on the reinforced concrete foundation. Slotted holes for installing the anchors allow management of installation tolerances.



VIDEO

CE
ETA-22/0089

SERVICE CLASS

SC1 SC2

MATERIAL

S355
Fe/Zn12c

WKR100C: S355 + Fe/Zn12c
carbon steel

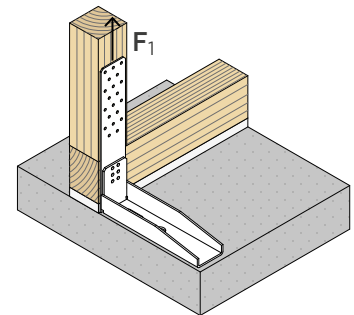
S350
Z275

VERTICAL PLATES: S350GD + Z275
carbon steel

S235
Fe/Zn12c

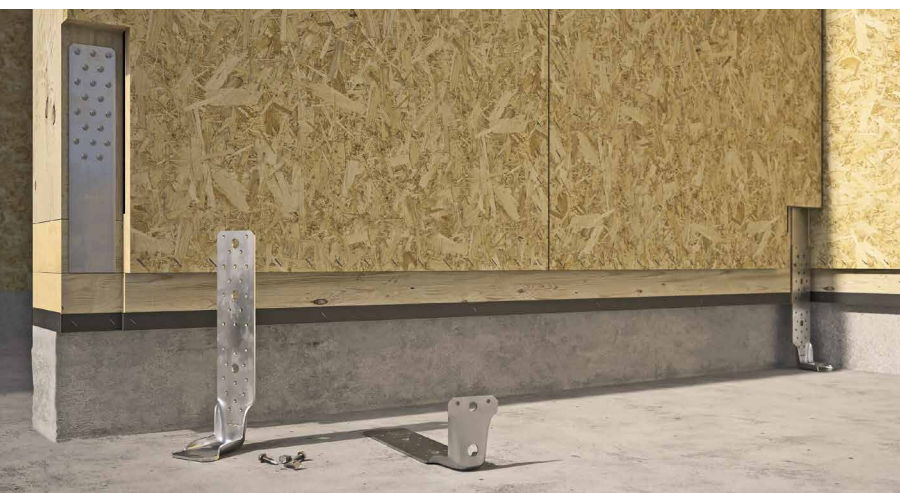
WKR6020: S235 + Fe/Zn12c
carbon steel

EXTERNAL LOADS



VIDEO

Scan the QR Code and watch the video on our YouTube channel



FIELDS OF USE

Tension joints for prefabricated walls.
Optimised for fastening frame walls.
Timber-to-timber and timber-to-concrete configurations.

Can be applied to:

- solid timber and glulam
- timber frame
- CLT and LVL panels



TIMBER-TO-CONCRETE TOLERANCE

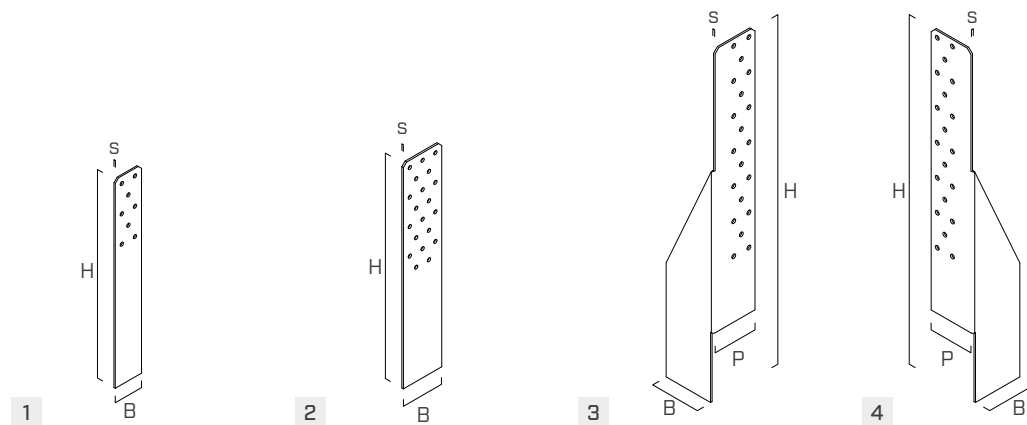
Thanks to the slotted hole for installing the anchor, it is possible to pre-install the bottom plate and subsequently install the walls. The slot allows tolerance management.

TIMBER-TO-TIMBER

The inter-storey plate allows to create the wall-to-wall connection between one storey and the next.

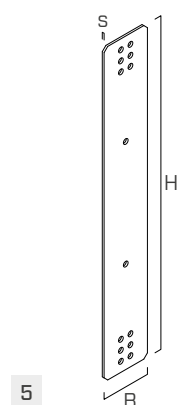
CODES AND DIMENSIONS

WALL PLATE



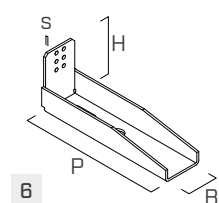
	CODE	B [mm]	P [mm]	H [mm]	s [mm]	n _v Ø5 [pcs]			pcs
1	WKR40	40	-	275	2	8	●	-	10
2	WKR60	60	-	305	2,5	20	●	-	10
3	WKR60L	62	55	403	2	20	●	-	10
4	WKR60R	62	55	403	2	20	●	-	10

INTER-STOREY PLATE



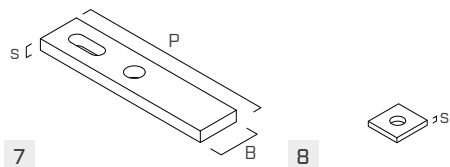
	CODE	B [mm]	H [mm]	s [mm]	n _v Ø6 [pcs]	pcs
5	WKR60T	60	410	2,5	12	10

BASE ANGLE BRACKET



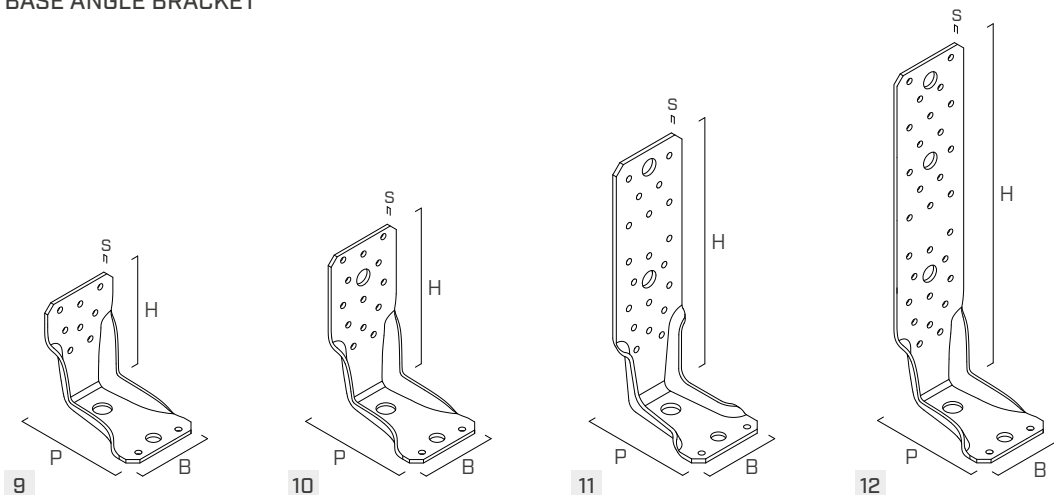
	CODE	B [mm]	P [mm]	H [mm]	s [mm]	n _v Ø6 [pcs]	n _H Ø23 [pcs]	n _H - Ø18 x 30 [pcs]			pcs
6	WKR100C	68	255	100	4	6	1	1	-	●	10

WASHER



	CODE	B [mm]	P [mm]	s [mm]	n _H Ø18	n _H Ø22	n _H Ø23	n _H - Ø18 x 30			pcs
7	WKR6020	54	240	20	-	-	1	1	-	●	1
8	WHTW6016	50	56	6	1	-	-	-	-	●	1
	WHTW6020	50	56	6	-	1	-	-	-	●	1

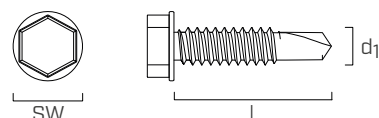
BASE ANGLE BRACKET



	CODE	B [mm]	P [mm]	H [mm]	s [mm]	n _V Ø5	n _H Ø14			pcs
9	WKR9530	65	85	95	3	8	1	-	●	25
10	WKR13535	65	85	135	3,5	13	1	-	●	25
11	WKR21535	65	85	215	3,5	20	1	-	●	25
12	WKR28535	65	85	287	3,5	29	1	-	●	25

SELF-DRILLING SCREW FOR STEEL

CODE	d ₁ [mm]	SW [mm]	L [mm]	pcs
WKRDSREW	6,3	SW10	25	150



FASTENERS

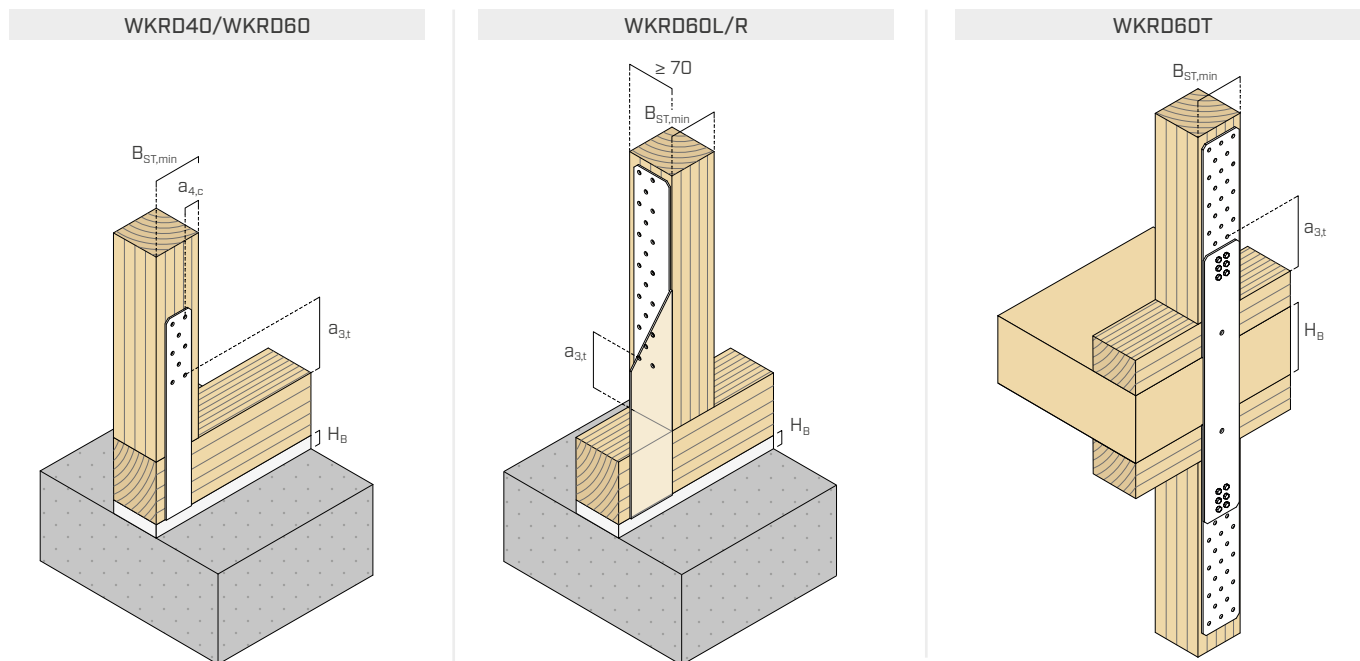
type	description		d [mm]	support
LBA	high bond nail		4	
LBS	round head screw		5	
AB1	CE1 expansion anchor		12-16	
SKR	screw-in anchor		M12-M16	
VIN-FIX	vinyl ester chemical anchor		M12-M16-M20	
HYB-FIX	epoxy chemical anchor		M12-M16-M20	
EPO-FIX	hybrid chemical anchor		M12-M16-M20	
ULS13373	washer		M12	

■ INSTALLATION

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

C/GL: minimum distances for solid timber or glulam. The distance $a_{4,c}$ is reduced in accordance with ETA-22/0089 based on laboratory test results.



wall plate	basic angle bracket	fasteners		$B_{ST,min}$ [mm]	H_B	
		LBA Ø4 LBS Ø5 [pcs]	WKRDSREW Ø6,3 [pcs]		min [mm]	max [mm]
WKRD40	WKR9530	8	4	45	0	40
	WKR13535	8	4		0	74
	WKR21535	8	4		40	114
	WKR28535	8	4		112	210
	WKR100C	8	4		0	67
	WKR100C + WHTW6020	8	4		0	67
	WKR60T	8 + 8	4 + 4		50	320
WKRD60	WKR9530	20	4	65	0	40
	WKR13535	20	4		0	74
	WKR21535	20	4		70	170
	WKR28535	20	4		142	230
	WKR100C + WHTW6016	20	4		0	52
	WKR100C + WKRDW6020	20	6		0	52
	WKR60T	20 + 20	6 + 6		110	300
WKRD60L WKRD60R	WKR9530	20	4	38	0	40
	WKR13535	20	4		0	74
	WKR21535	20	4		70	170
	WKR28535	20	4		120	230
	WKR100C + WHTW6016	20	4		0	52
	WKR100C + WKRDW6020	20	4		0	52
	WKR60T	20 + 20	4 + 4		120	320

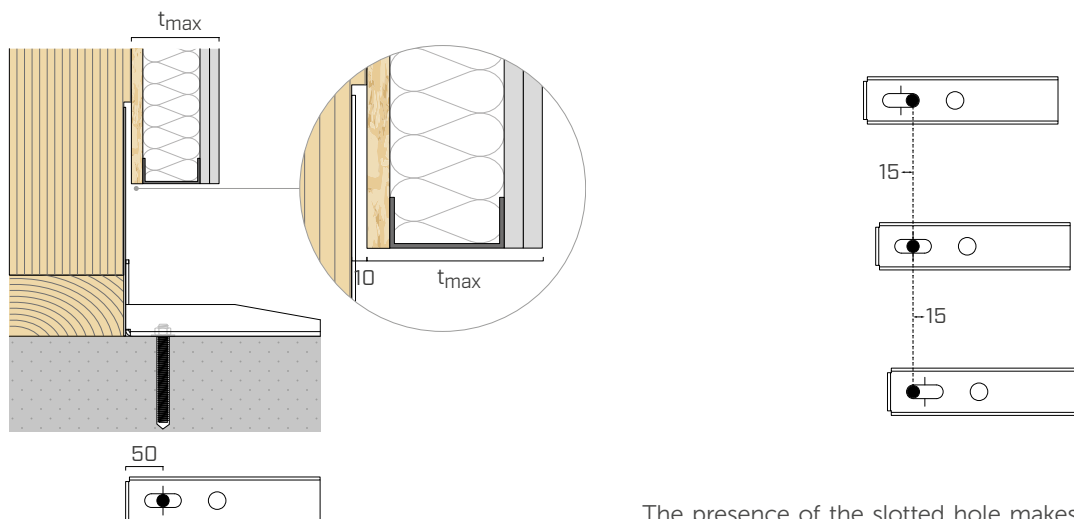
INSTALLATION

INSTALLATION OF WKRD100C BASE ANGLE BRACKETS

Frame walls can be supplied with different levels of prefabrication. Depending on the presence and thickness of the internal finish, the WKRD100C angle bracket can be installed in different ways. The bracket is provided with one slotted hole $\varnothing 18$ and one circular hole $\varnothing 23$.

INSTALLATION OF BASE ANGLE BRACKETS PRIOR TO WALL INSTALLATION

The angle brackets can be pre-installed on the foundation in order to speed up the installation and fastening of the walls. In this configuration, it is advisable to install the anchor in the slotted hole, which then allows any installation tolerances to be compensated for.



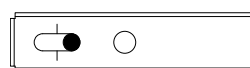
Example: pre-installed M16 anchor in central position for wall with prefabricated internal finish (without thickness limitation).

The presence of the slotted hole makes it possible to compensate for an installation tolerance of ± 15 mm after wall installation. After installation, simply apply the tightening torque required to fully anchor the connection to the ground.

INSTALLATION OF BASE ANGLE BRACKETS AFTER WALL INSTALLATION

The angle brackets can be installed after the walls have been installed. In this case, there are two possible ways of fastening them to the ground:

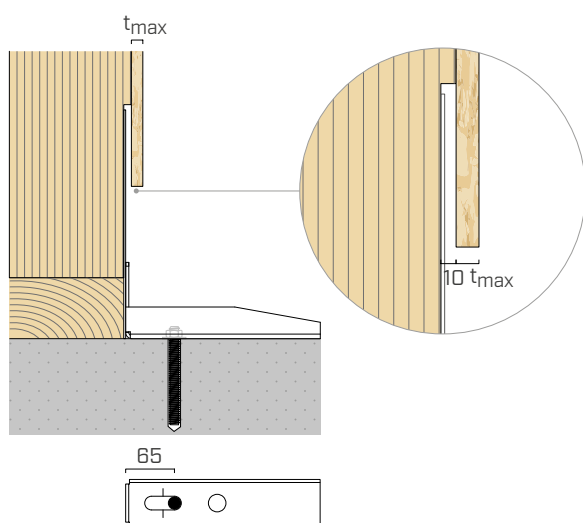
t_{max} [mm]	anchor choice	
	IN	OUT
20	M16	-
80	-	M20



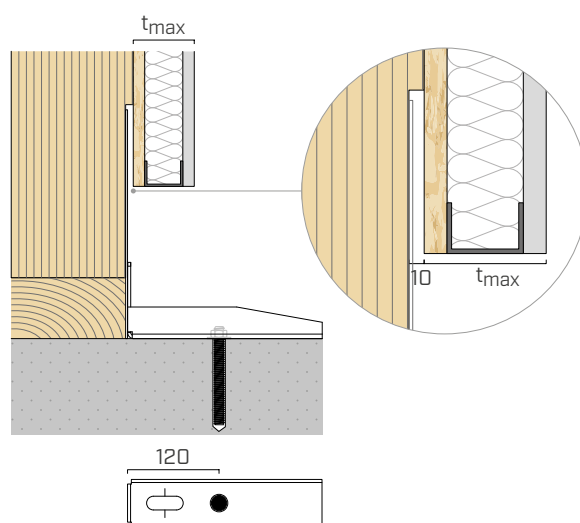
anchor positioned in the internal hole (**IN**)



anchor positioned in the outer hole (**OUT**)



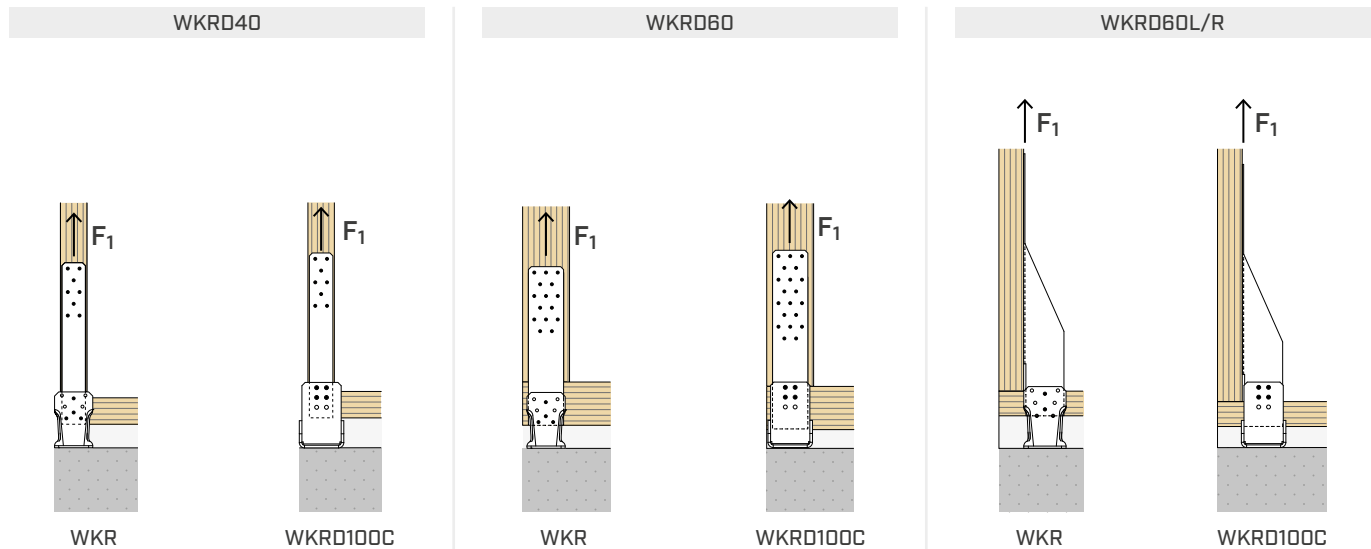
Example: post-installed M16 anchor for prefabricated wall with single OSB panel.



Example: post-installed M20 anchor for prefabricated wall with internal counter wall.

STRUCTURAL VALUES | TIMBER-TO-CONCRETE | F₁

WALL-ANGLE BRACKET BASE PLATE COUPLING



TIMBER STRENGTH

wall plate	basic angle bracket	fasteners			R _{1,k,timber}		R _{1,k,steel}	
		steel-to-timber LBA Ø4 LBS Ø5 [pcs]	steel-to-steel WKRDSCREW Ø6,3 [pcs]	concrete [Ø]	LBA460 [kN]	LBS570 [kN]	[kN]	Y _{steel}
WKRD40 ⁽¹⁾	WKR9530	8	4	M12	22,6	21,7	22,7	YM2
	WKR13535	8	4	M12	22,6	21,7	22,7	
	WKR21535	8	4	M12	22,6	21,7	22,7	
	WKR28535	8	4	M12	22,6	21,7	22,7	
	WKRD100C	8	4	M16	22,6	21,7	17,6	
	WKRD100C + WHTW6020	8	4	M20	22,6	21,7	18,8	
WKRD60 ⁽²⁾	WKR9530	20	4	M12	36,1	34,6	24,8	YM2
	WKR13535	20	4	M12	36,1	34,6	24,8	
	WKR21535	20	4	M12	36,1	34,6	24,8	
	WKR28535	20	4	M12	36,1	34,6	24,8	
	WKRD100C + WHTW6016	20	4	M16	36,1	34,6	24,8	
	WKRD100C + WKRWD6020	20	6	M16	36,1	34,6	37,2	
	WKRD100C + WKRWD6020	20	6	M20	36,1	34,6	27,2	

⁽¹⁾For WKRD40 on LVL studs with width B_{st} < 60mm, R_{1,k,timber} for LBA nails shall be reduced by applying the coefficient $0,8 \cdot \sqrt{350 / \rho_k}$

⁽²⁾For WKRD60 on LVL studs with width B_{st} < 80mm, R_{1,k,timber} for LBA nails shall be reduced by applying the coefficient $0,8 \cdot \sqrt{350 / \rho_k}$

wall plate	basic angle bracket	fasteners			R _{1,k,timber}		R _{1,k,steel}	
		steel-to-timber LBA Ø4 LBS Ø5 [pcs]	steel-to-steel WKRDSCREW Ø6,3 [pcs]	concrete [Ø]	LBA440 [kN]	LBS540 [kN]	[kN]	Y _{steel}
WKRD60L WKRD60R	WKR9530	20	4	M12	16,6	17,2	24,8	YM2
	WKR13535	20	4	M12	16,6	17,2	24,8	
	WKR21535	20	4	M12	16,6	17,2	24,8	
	WKR28535	20	4	M12	16,6	17,2	24,8	
	WKRD100C + WHTW6016	20	4	M16	16,6	17,2	24,8	
	WKRD100C + WKRWD6020	20	4	M20	16,6	17,2	24,8	

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.

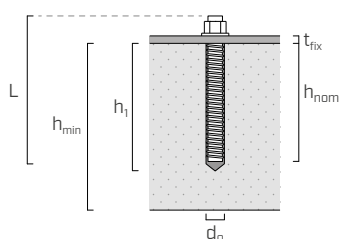
	configuration on concrete	fasteners		R _{1,d concrete} [kN]
		type	Ø x L [pcs]	
WKR9530 WKR13535	uncracked	VIN-FIX 5.8	M12 X 195	26,6
	cracked	VIN-FIX 5.8	M12 X 195	19,5
		HYB-FIX 5.8	M12 X 195	26,7
	seismic	HYB-FIX 8.8	M12 X 245	18,1
		EPO-FIX 8.8	M12 X 195	23,6
WKR21535 WKR28535	uncracked	VIN-FIX 5.8	M12 X 195	25,4
	cracked	VIN-FIX 5.8	M12 X 195	18,6
		HYB-FIX 5.8	M12 X 195	25,5
	seismic	HYB-FIX 8.8	M12 X 245	17,3
		EPO-FIX 8.8	M12 X 195	22,5
WKR100C	uncracked	VIN-FIX 5.8	M16 X 195	30,0
	cracked	HYB-FIX 5.8	M16 X 195	39,7
	seismic	EPO-FIX 8.8	M16 X 195	20,8
WKR100C + WHTW6016	uncracked	VIN-FIX 5.8	M16 X 195	26,7
	cracked	HYB-FIX 5.8	M16 X 195	35,3
		EPO-FIX 8.8	M16 X 195	18,4
	seismic	HYB-FIX 8.8	M16 X 245	23,8
WKR100C + WHTW6020	uncracked	VIN-FIX 5.8	M20 X 245	34,1
	cracked	HYB-FIX 5.8	M20 X 245	42,3
	seismic	EPO-FIX 8.8	M20 X 245	24,6
WKR100C + WKR100C (M16)	uncracked	VIN-FIX 5.8	M16 X 195	26,7
		HYB-FIX 5.8	M16 X 195	38,4
	cracked	HYB-FIX 5.8	M16 X 195	35,2
			M16 X 245	38,4
	seismic	EPO-FIX 8.8	M16 X 245	23,2
			M16 X 330	33,2
WKR100C + WKR100C (M20)	uncracked	VIN-FIX 5.8	M20 X 245	28,3
	cracked	HYB-FIX 5.8	M20 X 245	36,7
	seismic	EPO-FIX 8.8	M20 X 245	21,5
			M20 X 330	30,8

ANCHORS INSTALLATION PARAMETERS

type	type of washer	type of rod Ø x L [mm]		t _{fix} [mm]	h _{nom} = h _{ef} [mm]	h ₁ [mm]	d ₀ [mm]	h _{min} [mm]
WKR	-	M12	195	3	155	160	14	200
			245	3	210	215	14	250
WKR100D	no washer	M16	195	4	155	160	18	200
	WHTW6016	M16	195	10	155	160	18	200
			245	10	200	205	18	250
	WHTW6020	M20	245	10	200	205	22	250
	WKR100D	M16	195	24	155	160	18	200
			245	24	195	200	18	250
		M20	245	24	195	200	22	250
			330	24	280	285	22	250

Precut INA threaded rod, with nut and washer

MGS threaded rod 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}
h_{nom}
h_{ef}
h₁
d₀
h_{min}

fastened plate thickness
nominal anchoring depth
effective anchoring depth
minimum hole depth
hole diameter in the concrete support
concrete minimum thickness

ANCHORS VERIFICATION FOR STRESS LOADING F₁

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:

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

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} ≥ F_{bolt//,d}.

The resistances shown in the table on the previous page have been determined taking into account the contribution of the coefficient k_{t//}.

configuration	rod	k _{t//}
WKR9530 - WKR13535	M12	1,05
WKR21535 - WKR28535	M12	1,10
WKR100C	M16	1,20
WKR100C + WHTW6016	M16	1,35
WKR100C + WHTW6020	M20	1,70
WKR100C + WKR100D	M16	1,35 ^(*)
WKR100C + WKR100D	M20	1,90

^(*) Value calculated considering the anchor installed in the most unfavourable position within the slotted hole.

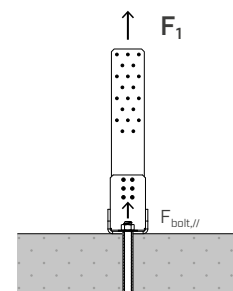
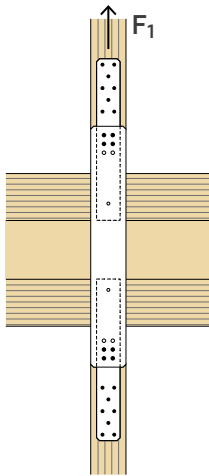
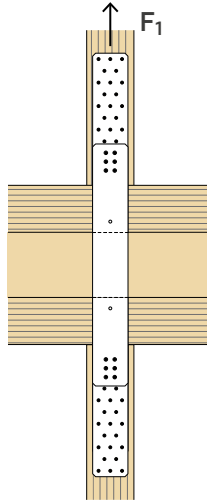


PLATE COUPLING FOR INTER-STOREY WALL-PLATE

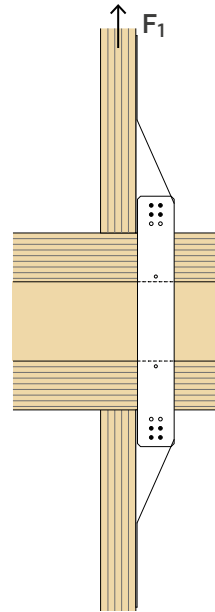
WKRD40 - WKRD60T



WKRD60 - WKRD60T



WKRD60L/R - WKRD60T



wall plate	inter-storey plate	fasteners		R _{1,k,timber}		R _{1,k,steel}	
		LBA Ø4-LBS Ø5 [pcs]	WKRDSCREW Ø6,3 [pcs]	LBA460 [kN]	LBS570 [kN]	[kN]	Y _{steel}
WKRD40 ⁽¹⁾	WKRD60T	8 + 8	4 + 4	22,6	21,7	22,7	YM2
WKRD60 ⁽²⁾		20 + 20	6 + 6	36,1	34,6	37,2	

⁽¹⁾For WKRD40 on LVL studs with width B_{st} < 60mm, R_{1,k,timber} for LBA nails shall be reduced by applying the coefficient $0,8 \cdot \sqrt{350 / \rho_k}$

⁽²⁾For WKRD60 on LVL studs with width B_{st} < 80mm, R_{1,k,timber} for LBA nails shall be reduced by applying the coefficient $0,8 \cdot \sqrt{350 / \rho_k}$

wall plate	inter-storey plate	fasteners		R _{1,k,timber}		R _{1,k,steel}	
		LBA Ø4-LBS Ø5 [pcs]	WKRDSCREW Ø6,3 [pcs]	LBA440 [kN]	LBS540 [kN]	[kN]	Y _{steel}
WKRD60L/R	WKRD60T	20 + 20	4 + 4	16,6	17,2	24,8	YM2

GENERAL PRINCIPLES

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

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

The coefficients k_{mod} , γ_M and γ_{steel} should be taken according to the current regulations used for the calculation.

- It is possible to use nails or screws different to those proposed. Refer to ETA-22/0089 for the calculation of resistance with different connector lengths.
- 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.
- 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 $\alpha_{\text{sus}} = 0,6$. For chemical anchors it is assumed that the annular space between the anchor and the plate hole is filled ($\alpha_{\text{gap}} = 1$).
- 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;