ALUMAXI

VIDEO | MY PROJECT SOFTWARE | DESIGN REGISTERED | ETA-09/0361

CONCEALED BRACKET WITH AND WITHOUT HOLES

POST AND BEAM CONSTRUCTIONS

Standard connection designed for optimum strength for post and beam systems. By using SBD self-drilling dowels, a tolerance of up to 46 mm (± 23 mm) along the beam axis can be accommodated to fit installation tolerances.

NEW GEOMETRY

Optimised shape thanks to the new high-strength aluminium alloy EN AW-6082. Reduced weight and easier insertion of SBD self-drilling dowels.

FAST FASTENING

Certified strengths calculated in all directions: vertical, horizontal and axial. Certified fastening with LBS screws and SBD self-drilling dowels.

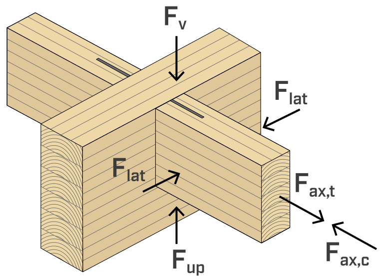
USA, Canada and more design values available online.

SERVICE CLASS SC1 SC2 SC3

MATERIAL

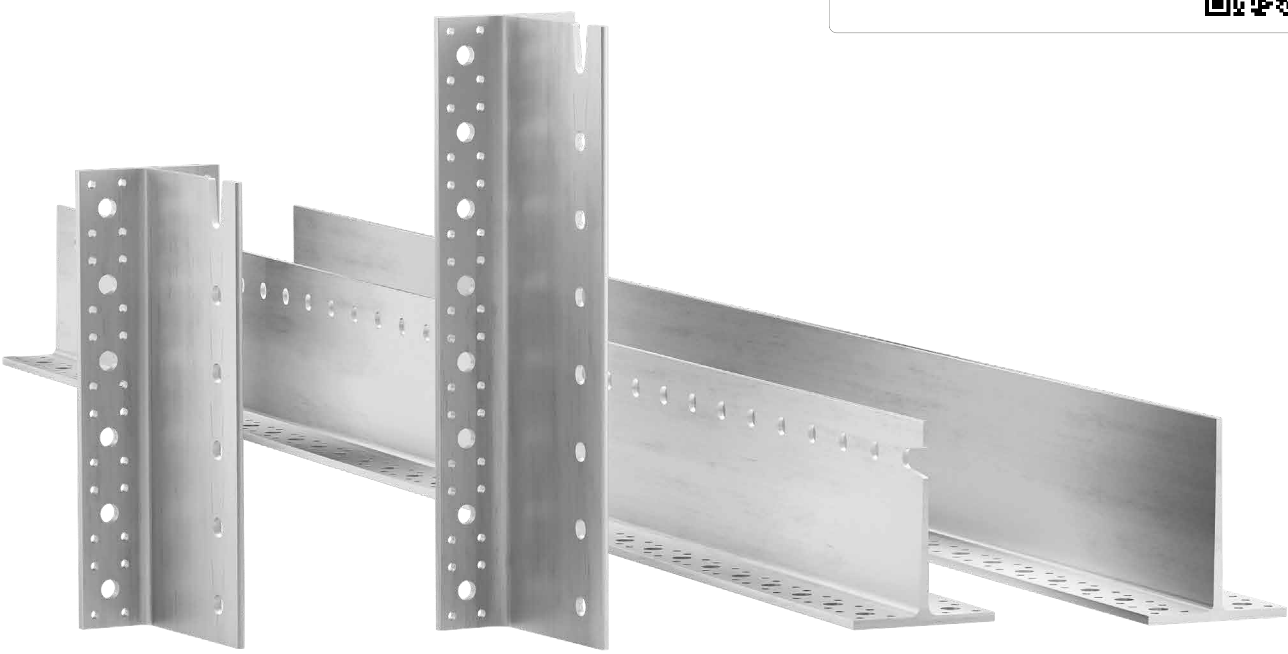
alu 6082 — EN AW-6082 aluminium alloy

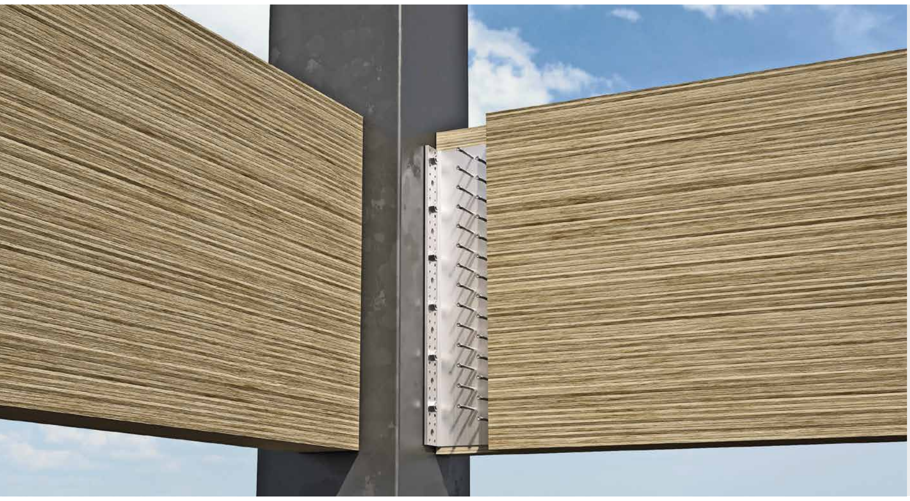
EXTERNAL LOADS



VIDEO

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





FIELDS OF USE

Concealed beam joints in timber-to-timber, timber-to-concrete or timber-to-steel configurations, suitable for large roofs, floors and post-and-beam constructions. Use also outdoors in non aggressive environments.

Can be applied to:

- glulam, softwood and hardwood
- LVL

FIRE RESISTANCE

The low weight of the steel - aluminium alloy facilitates easy transportation and on-site movements, while guaranteeing a very high strength. Being a concealed joint, it satisfies the fire safety requirements.

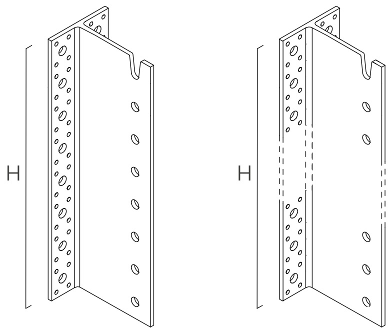
SIDE-BY-SIDE INSTALLATION

For high stresses or in the case of wide beams, two brackets can be placed side by side and fastened with long SBD dowels.

CODES AND DIMENSIONS

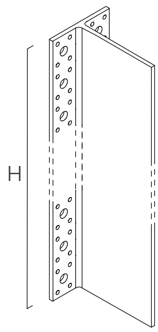
ALUMAXI WITH HOLES

CODE	type	H [mm]	*H* *[in]*	pcs
ALUMAXI384L	with holes	384	*15 1/8*	1
ALUMAXI512L	with holes	512	*20 3/16*	1
ALUMAXI640L	with holes	640	*25 3/16*	1
ALUMAXI768L	with holes	768	*30 1/4*	1
ALUMAXI2176L	with holes	2176	*85 11/16*	1



ALUMAXI WITHOUT HOLES

CODE	type	H [mm]	*H* *[in]*	pcs
ALUMAXI2176	without holes	2176	*85 11/16*	1

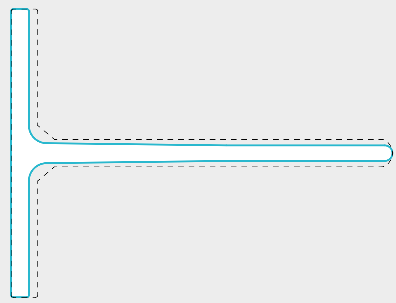


ENGINEERING OPTIMISATION

The new ALUMAXI bracket has been designed using a higher-performance aluminium alloy. This choice made it possible to reduce the thickness of the wing and core, and to optimise the shape of the wing by using a tapered profile. The mechanical characteristics are unchanged despite a 17% weight reduction.

——— new geometry

- - - - - previous geometry

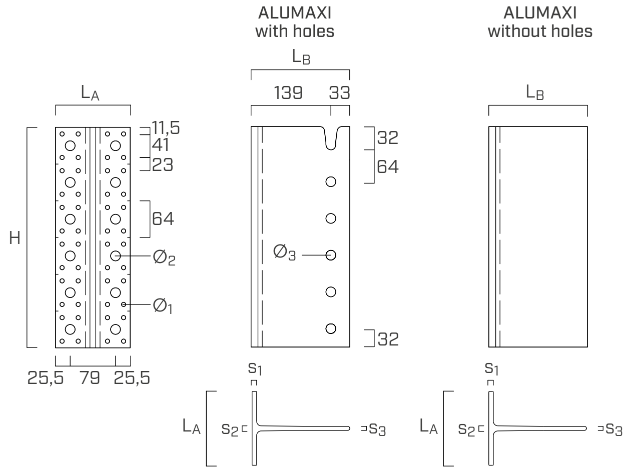


ADDITIONAL PRODUCTS - FASTENING

type	description		d [mm]	support	page
LBA	high bond nail		6		570
LBS	round head screw		7		571
LBS EVO	C4 EVO round head screw		7		571
LBS HARDWOOD EVO	C4 EVO round head screw on hardwoods		7		572
SBD	self-drilling dowel		7,5		154
STA	smooth dowel		16		162
STA A2 | AISI 304	smooth dowel		16		162
KOS	hexagonal head bolt		M16		168
VIN-FIX	vinyl ester chemical anchor		M16		545
EPO-FIX	epoxy chemical anchor		M16		557
INA	5.8 or 8.8 steel class threaded rod		M16		562
JIG ALU STA	drilling template for ALUMIDI and ALUMAXI	-	-		-

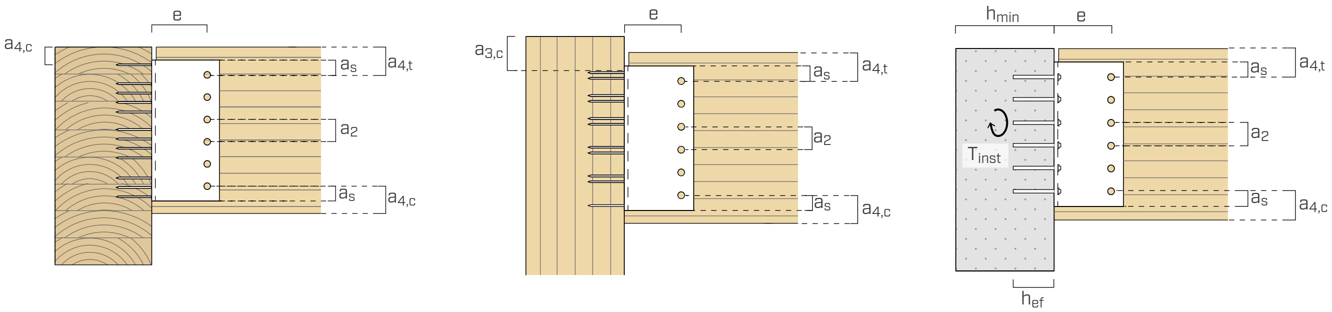
GEOMETRY

ALUMAXI			
flange thickness	s_1	[mm]	8
web thickness (base)	s_2	[mm]	9
web thickness (end)	s_3	[mm]	7
flange width	L_A	[mm]	130
web length	L_B	[mm]	172
small flange-holes	$Ø_1$	[mm]	7,5
large flange-holes	$Ø_2$	[mm]	17,0
blade holes (dowels)	$Ø_3$	[mm]	17,0



INSTALLATION

MINIMUM DISTANCES



secondary beam-timber				self-drilling dowel SBD Ø7,5	smooth dowel STA Ø16
dowel-dowel	a_2	[mm]	≥ 3·d	≥ 23	≥ 48
dowel-top of beam	$a_{4,t}$	[mm]	≥ 4·d	≥ 30	≥ 64
dowel-bottom of beam	$a_{4,c}$	[mm]	≥ 3·d	≥ 23	≥ 48
dowel-bracket edge	a_s	[mm]	≥ 1,2·d_0(1)	≥ 10	≥ 21
dowel-dowel	a_1(2)	[mm]	≥ 3·d	≥ 23 | ≥ 38	-
dowel-main beam	e	[mm]	-	88 ÷ 139	139

(1) Hole diameter.
(2) Spacing between dowels parallel to the grain for load-to-grain angle α = 90° (F_v stress) and α = 0° (F_{ax} stress).

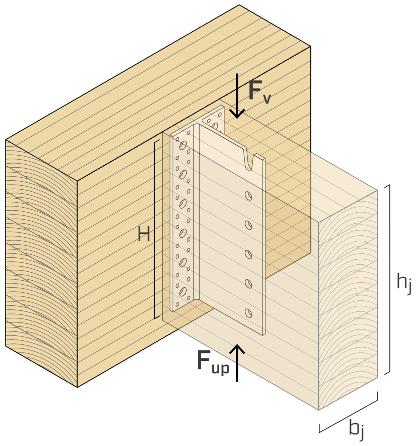
main element-timber				nail LBA Ø6	screw LBS Ø7
first connector-top of beam	$a_{4,c}$	[mm]	≥ 5·d	≥ 30	≥ 35
first connector-column end	$a_{3,c}$	[mm]	≥ 10·d	≥ 60	≥ 70

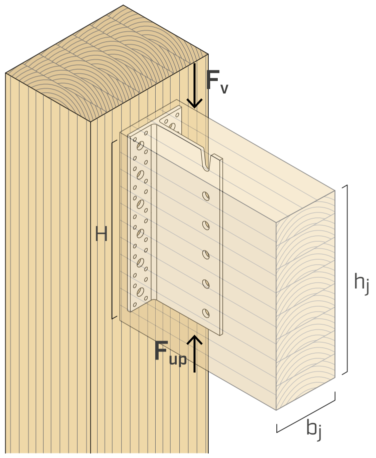
Minimum spacing and diameters refers to timber elements with density ρ_k ≤ 420 kg/m^3 and screws inserted without pre-drilling hole.

main element-concrete			chemical anchor VIN-FIX Ø16
minimum support thickness	h_{min}	[mm]	h_{ef} + 30 ≥ 100
concrete hole diameter	d_0	[mm]	18
tightening torque	T_{inst}	[Nm]	80

h_{ef} = effective anchoring depth in concrete.

STRUCTURAL VALUES | TIMBER-TO-TIMBER | F_v | F_{up}





ALUMAXI with SBD self-drilling dowels

	SECONDARY BEAM		MAIN ELEMENT	
ALUMAXI H[1] [mm]	b_j x h_j [mm]	dowels SBD Ø7,5[2] [pcs Ø x L]	LBA nails / LBS screws LBA Ø6 x 80 / LBS Ø7 x 80 [pcs]	$R_{v,k}$ - $R_{up,k}$[3] [kN]
384	160 x 432	12 - Ø7,5 x 155	48	**134,5**
448	160 x 496	14 - Ø7,5 x 155	56	**156,9**
512	160 x 560	16 - Ø7,5 x 155	64	**179,4**
576	160 x 624	18 - Ø7,5 x 155	72	**201,8**
640	200 x 688	20 - Ø7,5 x 195	80	**259,8**
704	200 x 752	22 - Ø7,5 x 195	88	**285,8**
768	200 x 816	24 - Ø7,5 x 195	96	**311,8**
832	200 x 880	26 - Ø7,5 x 195	104	**337,7**
896	200 x 944	28 - Ø7,5 x 195	112	**363,7**
960	200 x 1008	30 - Ø7,5 x 195	120	**389,7**

ALUMAXI with STA dowels

	SECONDARY BEAM		MAIN ELEMENT	
ALUMAXI H[1] [mm]	b_j x h_j [mm]	dowels STA Ø16[4] [pcs Ø x L]	LBA nails / LBS screws LBA Ø6 x 80 / LBS Ø7 x 80 [pcs]	$R_{v,k}$ - $R_{up,k}$[3] [kN]
384	160 x 432	6 - STA Ø16 x 160	48	**131,1**
448	160 x 496	7 - STA Ø16 x 160	56	**153,0**
512	160 x 560	8 - STA Ø16 x 160	64	**174,8**
576	160 x 624	9 - STA Ø16 x 160	72	**196,7**
640	200 x 688	10 - STA Ø16 x 200	80	**247,6**
704	200 x 752	11 - STA Ø16 x 200	88	**272,4**
768	200 x 816	12 - STA Ø16 x 200	96	**297,1**
832	200 x 880	13 - STA Ø16 x 200	104	**321,9**
896	200 x 944	14 - STA Ø16 x 200	112	**346,6**
960	200 x 1008	15 - STA Ø16 x 200	120	**371,4**

NOTES

(1) The bracket with height H is available pre-cut in the ALUMAXI versions with holes (codes on page 90) or can be obtained from the rod ALUMAXI2176 or ALUMAXI2176L rod.

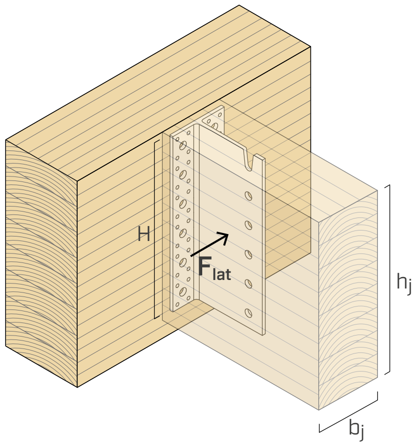
(2) SBD self-drilling dowels Ø7,5: $M_{y,k}$ = 75000 Nmm.

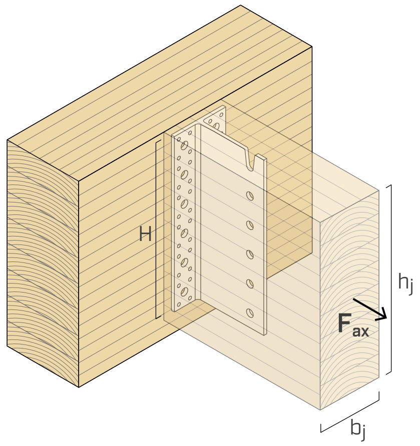
(3) The structural values in the table are valid for fastening on the main beam and column. The screws can be installed in the column without pre-drilled holes.

(4) STA smooth dowel Ø16: $M_{y,k}$ = 191000 Nmm.

For the GENERAL PRINCIPLES of calculation, see page 95.

STRUCTURAL VALUES | TIMBER-TO-TIMBER | F_{lat} | F_{ax}





TIMBER-TO-TIMBER | F_{lat}

ALUMAXI with SBD self drilling dowels and STA dowels

	SECONDARY BEAM[1]	MAIN BEAM [2]		
ALUMAXI H [mm]	b_j x h_j [mm]	LBA nails / LBS screws LBA Ø6 x 80 / LBS Ø7 x 80 [pcs]	$R_{lat,k\ timber}$ GL24h [kN]	$R_{lat,k\ alu}$ [kN]
384	160 x 432	≥ 24	**34,3**	**31,2**
448	160 x 496	≥ 28	**39,4**	**36,4**
512	160 x 560	≥ 32	**44,4**	**41,6**
576	160 x 624	≥ 36	**49,5**	**46,8**
640	200 x 688	≥ 40	**69,1**	**52,0**
704	200 x 752	≥ 44	**75,6**	**57,2**
768	200 x 816	≥ 48	**82,0**	**62,4**
832	200 x 880	≥ 52	**88,4**	**67,6**
896	200 x 944	≥ 56	**94,9**	**72,8**
960	200 x 1008	≥ 60	**101,3**	**78,0**

TIMBER-TO-TIMBER | F_{ax}

ALUMAXI with STA dowels

	SECONDARY BEAM		MAIN BEAM				
ALUMAXI			fastening through nails		fastening through screws		
H [mm]	b_j x h_j [mm]	STA Ø16 [pcs Ø x L]	LBA Ø6 x 80 [pcs]	$R_{ax,k\ timber}$ GL24h [kN]	LBS LBS Ø7 x 80 [pcs]	$R_{ax,k\ timber}$ GL24h [kN]	$R_{ax,k\ alu}$ [kN]
384	160 x 432	6 - Ø16 x 160	48	**78,3**	48	**131,3**	**101,6**
448	160 x 496	7 - Ø16 x 160	56	**91,4**	56	**153,1**	**118,5**
512	160 x 560	8 - Ø16 x 160	64	**104,4**	64	**175,0**	**135,4**
576	160 x 624	9 - Ø16 x 160	72	**117,5**	72	**196,9**	**152,4**
640	200 x 688	10 - Ø16 x 200	80	**130,5**	80	**218,8**	**169,3**
704	200 x 752	11 - Ø16 x 200	88	**143,6**	88	**240,7**	**186,2**
768	200 x 816	12 - Ø16 x 200	96	**156,6**	96	**262,5**	**203,2**
832	200 x 880	13 - Ø16 x 200	104	**169,7**	104	**284,4**	**220,1**
896	200 x 944	14 - Ø16 x 200	112	**182,7**	112	**306,3**	**237,0**
960	200 x 1008	15 - Ø16 x 200	120	**195,8**	120	**328,2**	**254,0**

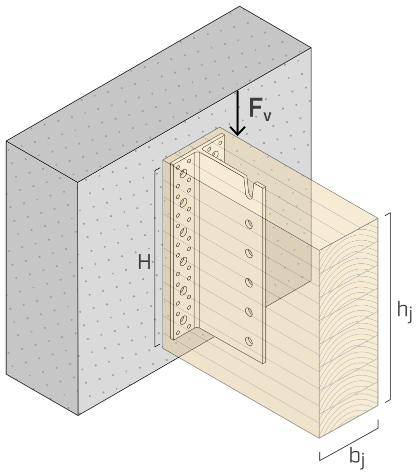
NOTES

(1) The strength values are valid for both STA Ø16 dowels and for SBD Ø7,5 self-drilling dowels.

(2) The strength values are valid for both LBA Ø6 nails and for LBS Ø7 screws.

For the GENERAL PRINCIPLES of calculation, see page 95.

STRUCTURAL VALUES | TIMBER-TO-CONCRETE | F_v



CHEMICAL ANCHOR

ALUMAXI with SBD self drilling dowels and STA dowels

	SECONDARY BEAM TIMBER					MAIN BEAM UNCRACKED CONCRETE	
ALUMAXI		SBD dowels(2)		STA dowels(3)		VIN-FIX anchor(4)	
H(1) [mm]	b_j x h_j [mm]	Ø7,5 [pcs Ø x L]	$R_{v,k}$ [kN]	Ø16 [pcs Ø x L]	$R_{v,k}$ [kN]	Ø16 x 160 [pcs]	$R_{v,d\ concrete}$ [kN]
384	160 x 432	12 - Ø7,5 x 155	**134,5**	6 - Ø16 x 160	**131,1**	6	**86,2**
448	160 x 496	14 - Ø7,5 x 155	**156,9**	7 - Ø16 x 160	**153,0**	8	**110,0**
512	160 x 560	16 - Ø7,5 x 155	**179,4**	8 - Ø16 x 160	**174,8**	8	**124,3**
576	160 x 624	18 - Ø7,5 x 155	**201,8**	9 - Ø16 x 160	**196,7**	10	**147,3**
640	200 x 688	20 - Ø7,5 x 195	**259,8**	10 - Ø16 x 200	**247,6**	10	**161,8**
704	200 x 752	22 - Ø7,5 x 195	**285,8**	11 - Ø16 x 200	**272,4**	12	**189,1**
768	200 x 816	24 - Ø7,5 x 195	**311,8**	12 - Ø16 x 200	**297,1**	12	**197,9**
832	200 x 880	26 - Ø7,5 x 195	**337,7**	13 - Ø16 x 200	**321,9**	14	**226,2**
896	200 x 944	28 - Ø7,5 x 195	**363,7**	14 - Ø16 x 200	**346,6**	14	**240,1**
960	200 x 1008	30 - Ø7,5 x 195	**389,7**	15 - Ø16 x 200	**371,4**	16	**259,8**

NOTES

(1) The bracket with height H is available pre-cut in the ALUMAXI versions with holes (codes on page 90) or can be obtained from the rod ALUMAXI2176 or ALUMAXI2176L rod.

(2) SBD self-drilling dowels Ø7,5: $M_{y,k}$ = 75000 Nmm.

(3) STA smooth dowel Ø16: $M_{y,k}$ = 191000 Nmm.

(4) Chemical anchor VIN-FIX according to ETA-20/0363 with threaded rods (type INA) of minimum steel class 5.8 with h_{ef} = 128 mm. Install the anchors two at a time, starting from the top, dowelling alternate rows.

For the GENERAL PRINCIPLES of calculation, see page 95.

GENERAL PRINCIPLES

- Resistance values for the fastening system are valid for the calculation examples shown in the table. For different calculation methods, the MyProject software is available free of charge (www.rothoblaas.com).
- The calculation process used a timber characteristic density of ρ_k = 385 kg/m^3 and C25/30 concrete with a thin reinforcing layer, where edge-distance is not a limiting factor.
- The coefficients k_{mod} and γ_M should be taken according to the current regulations used for the calculation.
- Dimensioning and verification of timber and concrete elements must be carried out separately.
- The following verification shall be satisfied for combined loading:

$$\left(\frac{F_{v,d}}{R_{v,d}}\right)^2 + \left(\frac{F_{lat,d}}{R_{lat,d}}\right)^2 + \left(\frac{F_{ax,d}}{R_{ax,d}}\right)^2 + \left(\frac{F_{up,d}}{R_{up,d}}\right)^2 \leq 1$$

$F_{v,d}$ and $F_{up,d}$ are forces acting in opposite directions. Therefore only one of the forces $F_{v,d}$ and $F_{up,d}$ can act in combination with the forces $F_{ax,d}$ or $F_{lat,d}$.

- The values provided are calculated with a routing in the 10 mm thick timber.
- For configurations for which only the timber-side strength is reported, the aluminium-side overstrength can be assumed.

STRUCTURAL VALUES | F_v | F_{up}

TIMBER-TO-TIMBER

- Characteristic values comply with the EN 1995-1-1:2014 standard in accordance with ETA-09/0361.
- Design values can be obtained from characteristic values as follows:

$$R_{v,d} = \frac{R_{v,k} \cdot k_{mod}}{\gamma_M}$$

$$R_{up,d} = \frac{R_{up,k} \cdot k_{mod}}{\gamma_M}$$

- Shear strengths on columns are calculated considering the effective number of connectors according to ETA-09/0361.
- In some cases the connection shear strength $R_{V,k}$-$R_{up,k}$ is notably large and may be higher than the secondary beam strength. Particular attention should be paid to the shear check of the reduced timber cross-section at the bracket location.

STRUCTURAL VALUES | F_{lat} | F_{ax}

TIMBER-TO-TIMBER

- Characteristic values comply with the EN 1995-1-1:2014 standard in accordance with ETA-09/0361.
- Design values can be obtained from characteristic values as follows:

$$R_{lat,d} = min \begin{cases} \dfrac{R_{lat,k\ alu}}{\gamma_{M2}} \\ \dfrac{R_{lat,k\ timber} \cdot k_{mod}}{\gamma_M} \end{cases}$$

$$R_{ax,d} = min \begin{cases} \dfrac{R_{ax,k\ alu}}{\gamma_{M2}} \\ \dfrac{R_{ax,k\ timber} \cdot k_{mod}}{\gamma_M} \end{cases}$$

with γ_{M2} partial coefficient of the aluminium.

STRUCTURAL VALUES | F_v

TIMBER-TO-CONCRETE

- Characteristic values are consistent with EN 1995-1-1:2014 and in accordance with ETA-09/0361 and ETA-20/0363..
- Design resistance values can be obtained from the tabulated values as follows:

$$R_{v,d} = min \begin{cases} \dfrac{R_{v,k} \cdot k_{mod}}{\gamma_M} \\ R_{v,d\ concrete} \end{cases}$$

- The design values $R_{v,d\ concrete}$ are according to EN 1992:2018 with α_{sus} = 0,6.

INTELLECTUAL PROPERTY

- An ALUMAXI model is protected by the Registered Community Design RCD 015032190-0001.