ALUMEGA

PINNED CONNECTION FOR POST AND BEAM

POST AND BEAM CONSTRUCTIONS
It standardizes the beam-to-beam and beam-to-column connections for post-and-beam systems, even with large spans. Modular components and various fastening possibilities solve all types of connections on timber, concrete or steel.

TOLERANCE AND ASSEMBLY
Axial tolerance up to 8 mm (±4 mm) to accommodate installation inaccuracies. The upper notch allows using a bolt as a positioning aid. The connection can be pre-assembled in the factory and completed on site with bolts.

ROTATIONAL COMPATIBILITY
Slotted holes allow rotation of the connector and ensure hinged structural behaviour. The rotation of the connector is compatible with the inter-story drift caused by earthquake and wind actions, reducing momentum transfer and structural damage.

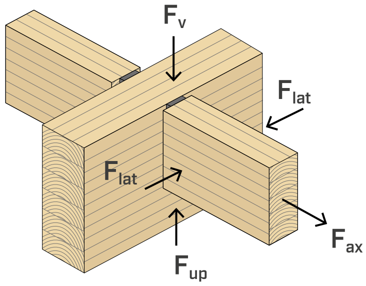
VIDEO | CALCULATION TOOL | DESIGN REGISTERED | CE ETA-23/0824

SERVICE CLASS SC1 SC2

MATERIAL

alu 6082 EN AW-6082 aluminium alloy

EXTERNAL LOADS



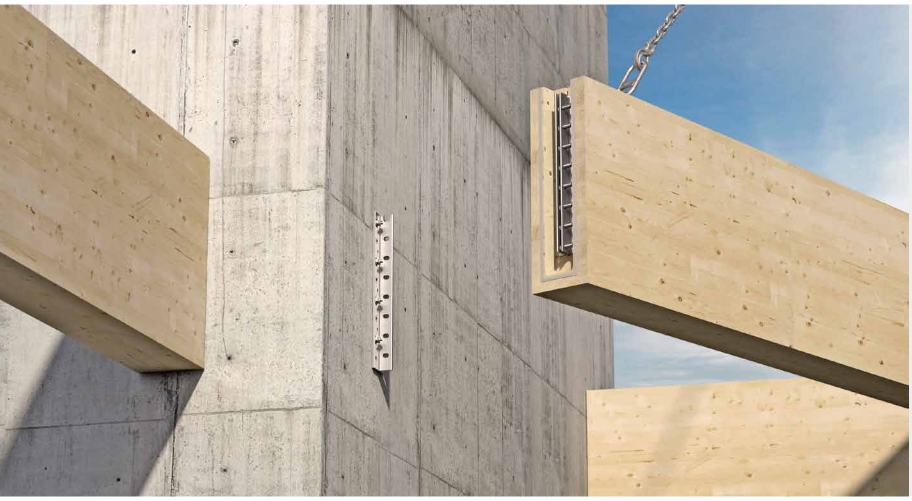
VIDEO
Scan the QR Code and watch the video on our YouTube channel


HP


HVG


JVG


JS



FIELDS OF USE
Concealed joint for beam in timber-to-timber, timber-to-concrete or timber-to-steel configuration, suitable for floors and post and beam constructions, even with large spans.

Can be applied to:
- glulam, softwood and hardwood
- LVL

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FIRE

The multiple installation methods allow for concealed installation and fire protection at all times, possibly by inserting FIRE STRIPE GRAPHITE to seal the joist-header interface.

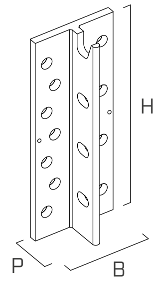
HYBRID STRUCTURES

The HP version can be fixed on timber, concrete or steel. Ideal for hybrid timber-to-concrete or timber-to-steel structures.

CODES AND DIMENSIONS

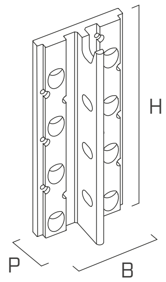
HP - main element connector (**H**EADER) for timber (HBS **P**LATE screws), concrete and steel

CODE	B x H x P [mm]	pcs
ALUMEGA240HP	95 x 240 x 50	1
ALUMEGA360HP	95 x 360 x 50	1
ALUMEGA480HP	95 x 480 x 50	1
ALUMEGA600HP	95 x 600 x 50	1
ALUMEGA720HP	95 x 720 x 50	1
ALUMEGA840HP	95 x 840 x 50	1



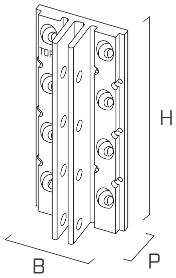
HVG - main element connector (**H**EADER) for timber with inclined **VG**S screws

CODE	B x H x P [mm]	pcs
ALUMEGA240HVG	95 x 240 x 50	1
ALUMEGA360HVG	95 x 360 x 50	1
ALUMEGA480HVG	95 x 480 x 50	1
ALUMEGA600HVG	95 x 600 x 50	1
ALUMEGA720HVG	95 x 720 x 50	1
ALUMEGA840HVG	95 x 840 x 50	1



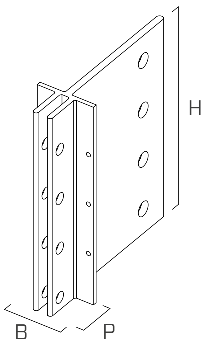
JVG - beam connector (**J**OIST) with inclined **VG**S screws

CODE	B x H x P [mm]	pcs
ALUMEGA240JVG	95 x 240 x 49	1
ALUMEGA360JVG	95 x 360 x 49	1
ALUMEGA480JVG	95 x 480 x 49	1
ALUMEGA600JVG	95 x 600 x 49	1
ALUMEGA720JVG	95 x 720 x 49	1
ALUMEGA840JVG	95 x 840 x 49	1



JS - beam connector (**J**OIST) with **S**TA/**S**BD dowels

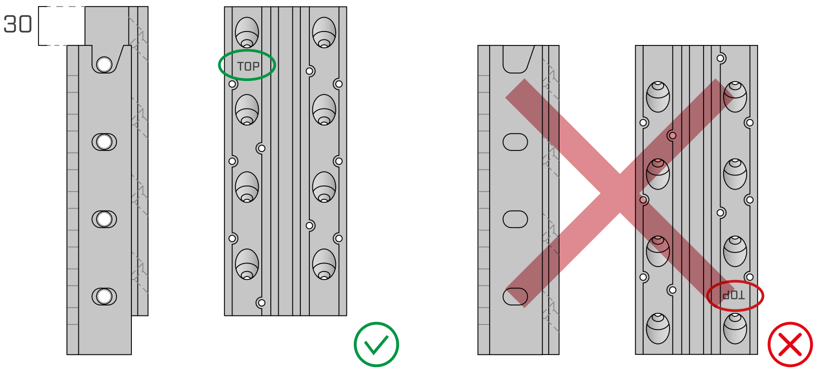
CODE	B x H x P [mm]	pcs
ALUMEGA240JS	68 x 240 x 49	1
ALUMEGA360JS	68 x 360 x 49	1
ALUMEGA480JS	68 x 480 x 49	1
ALUMEGA600JS	68 x 600 x 49	1
ALUMEGA720JS	68 x 720 x 49	1
ALUMEGA840JS	68 x 840 x 49	1



The connectors can be cut in multiples of 60 mm, respecting the minimum height of 240 mm.
For example, it is possible to obtain two ALUMEGA JVG connectors with H = 300 mm from the ALUMEGA600JVG connector.

CONNECTION BETWEEN CONNECTORS

Make sure that the **JVG** and **JS** connectors are correctly installed to the secondary beam, referring to the "**TOP**" marking on the product.



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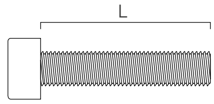
ADDITIONAL PRODUCTS - FASTENING

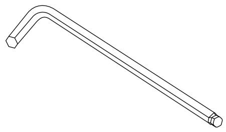
MEGABOLT - cylindrical head bolt with hexagon socket

CODE	material	d_1 [mm]	L [mm]	pcs
MEGABOLT12030	steel class 8.8 zinc plated ISO 4762	M12	30	100
MEGABOLT12150		M12	150	50
MEGABOLT12270		M12	270	25



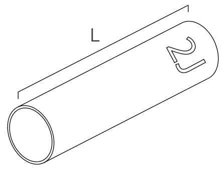
HEX WRENCH 10 mm

CODE	d_1 [mm]	L [mm]	pcs
HEX10L234	10	234	1



JIG ALUMEGA - set of jigs for installing ALUMEGA connectors side by side

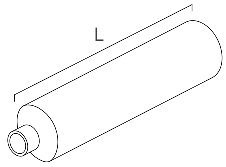
CODE	installation combination	distance between side-by-side connectors [mm]	L [mm]	pcs
JIGALUMEGA10	ALUMEGA HVG + JVG ALUMEGA HVG + JS	HVG = 10 | JVG = 10 HVG = 10 | JS = 37	82 (1J) - 97 (1H)	6 + 6
JIGALUMEGA22	ALUMEGA HP + JVG ALUMEGA HP + JS	HP = 22 | JVG = 22 HP = 22 | JS = 49	94 (2J) - 109 (2H)	6 + 6



JIGVGS – Drilling Template for ALUMEGA HVG and JVG

CODE	fields of use	L [mm]	d_h [mm]	d_v [mm]	pcs
JIGVGS9	softwood	80	5,3	5	1
JIGVGSH9	hardwood and LVL	80	6,3	6	1

d_h = template hole diameter
d_v = pre-drilling hole diameter



product	description		d [mm]	support	reference connector
HBS PLATE **HBS PLATE EVO**	pan head screw		10		ALUMEGA HP
KOS	hexagonal head bolt		12		ALUMEGA HP
LBS HARDWOOD EVO **LBS**	round head screw		5		ALUMEGA HP ALUMEGA HVG ALUMEGA JVG ALUMEGA JS
VGS **VGS EVO**	fully threaded countersunk screw		9		ALUMEGA HVG ALUMEGA JVG
STA **STA A2 | AISI304**	smooth dowel		16		ALUMEGA JS
SBD	self-drilling dowel		7,5		ALUMEGA JS
INA	the threaded rod for chemical anchors		12		ALUMEGA HP
VIN-FIX	vinyl ester chemical anchor		-		ALUMEGA HP
ULS 440	washer		12		ALUMEGA HP

RELATED PRODUCTS

LEWIS

BIT

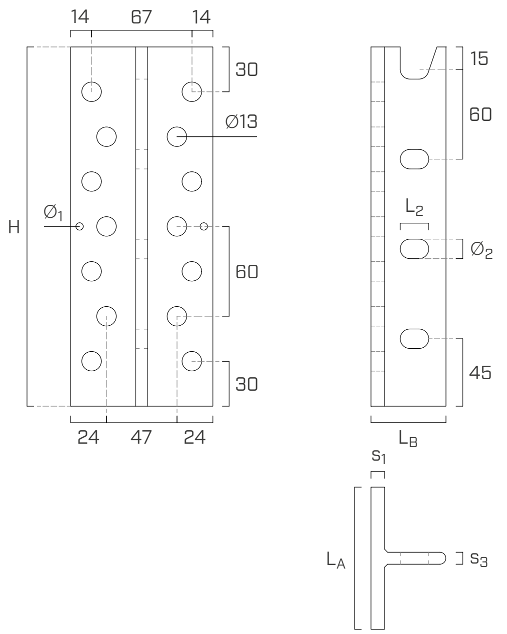
TORQUE LIMITER

BEAR

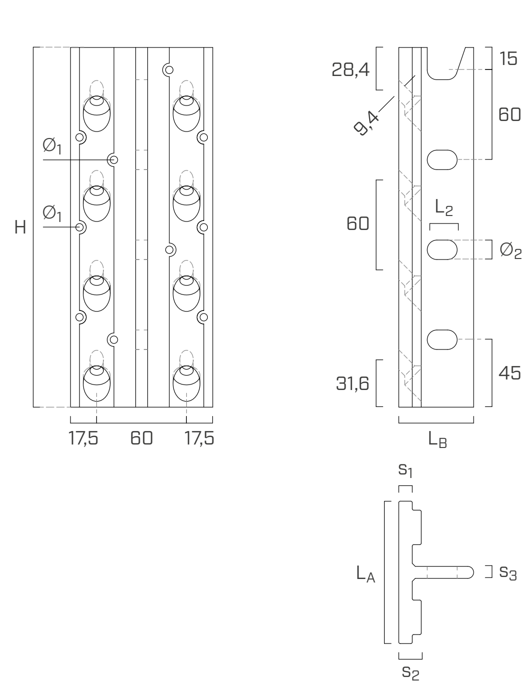
FIRE STRIPE GRAPHITE

GEOMETRY

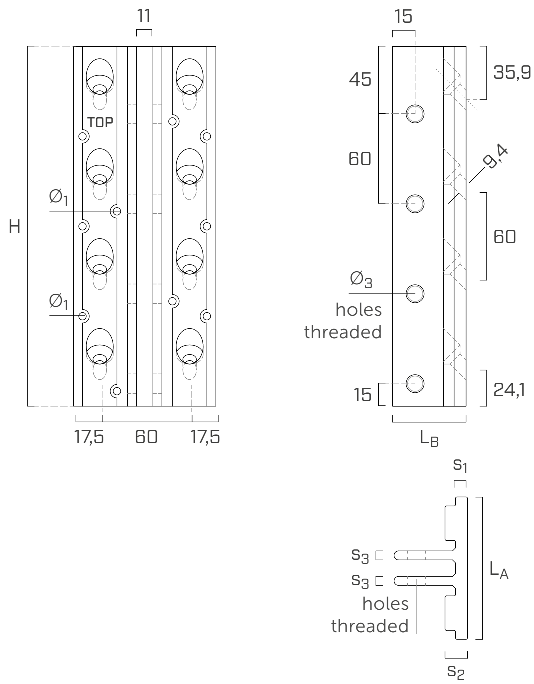
HP - main element connector (**H**EADER) for timber (HBS **P**LATE screws), concrete and steel



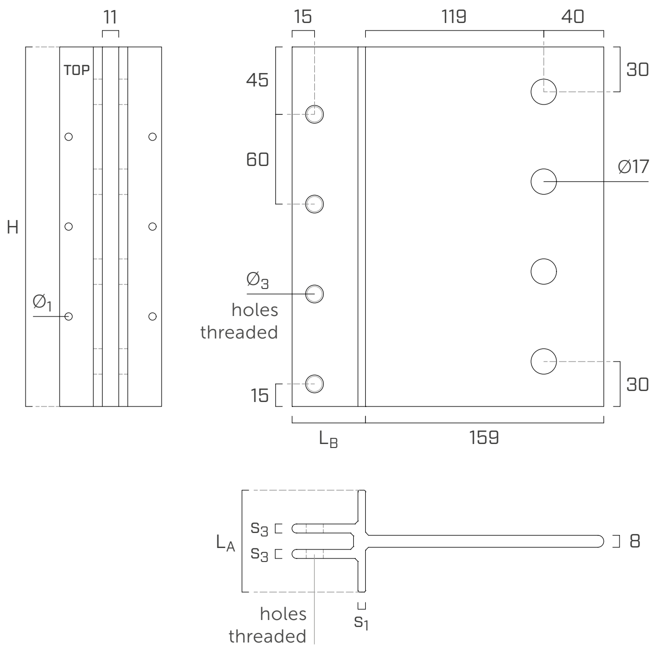
HVG - main element connector (**H**EADER) for timber with inclined **VG**S screws



JVG - beam connector (**J**OIST) with inclined **VG**S screws



JS - beam connector (**J**OIST) with **S**TA/**S**BD dowels



			HP	HVG	JVG	JS
flange thickness	s_1	[mm]	9	9	8	5
flange thickness	s_2	[mm]	-	15	15	-
web thickness	s_3	[mm]	8	8	6	6
flange length	L_A	[mm]	95	95	95	68
web length	L_B	[mm]	50	50	49	49
flange holes	$Ø_1$	[mm]	5	5	5	5
web slotted holes	$Ø_2$ x L_2	[mm]	Ø13x20	Ø13x20	-	-
web threaded holes	$Ø_3$	[mm]	-	-	M12	M12

FASTENING OPTIONS

Two main beam connector types (HP and HVG) and two secondary beam connector types (JVG and JS) are available. Fastening options offer design freedom in terms of structural element cross-sections and strengths.

HP - main element connector (**H**EADER) for timber (HBS **P**LATE screws), concrete and steel

CODE	HBS PLATE Ø10 [pcs]	KOS Ø12[1] [pcs]	VIN-FIX anchor Ø12 x 245 [pcs]	bolt Ø12 [pcs]
ALUMEGA240HP	14	8	6	6
ALUMEGA360HP	22	12	8	8
ALUMEGA480HP	30	16	12	10
ALUMEGA600HP	38	20	16	12
ALUMEGA720HP	46	24	18	14
ALUMEGA840HP	54	28	20	16

[1]Use the two outer rows of holes.

HVG - main element connector (**H**EADER) for timber with inclined **VG**S screws

CODE	total fastening VGS Ø9 [pcs]	partial fastening[2] VGS Ø9 [pcs]	LBS HARDWOOD EVO[3] Ø5 x 80 [pcs]
ALUMEGA240HVG	8	6	6
ALUMEGA360HVG	12	10	10
ALUMEGA480HVG	16	14	14
ALUMEGA600HVG	20	18	18
ALUMEGA720HVG	24	22	22
ALUMEGA840HVG	28	26	26

[2]Do not use the first row of holes.
[3]The use of LBS HARDWOOD EVO screws is mandatory. It is recommended to use the two outer rows of holes.

JVG - beam connector (**J**OIST) with inclined **VG**S screws

CODE	total fastening VGS Ø9 [pcs]	partial fastening[4] VGS Ø9 [pcs]	LBS HARDWOOD EVO[5] Ø5 x 80 [pcs]
ALUMEGA240JVG	8	6	6
ALUMEGA360JVG	12	10	10
ALUMEGA480JVG	16	14	14
ALUMEGA600JVG	20	18	18
ALUMEGA720JVG	24	22	22
ALUMEGA840JVG	28	26	26

[4]Do not use the last row of holes.
[5]The use of LBS HARDWOOD EVO screws is mandatory. It is recommended to use the two outer rows of holes.

JS - beam connector (**J**OIST) with **S**TA/**S**BD dowels

CODE	STA Ø16 [pcs]	total fastening[6] SBD Ø7,5 [pcs]	partial fastening[6] SBD Ø7,5 [pcs]
ALUMEGA240JS	4	14	8
ALUMEGA360JS	6	22	12
ALUMEGA480JS	8	30	16
ALUMEGA600JS	10	38	20
ALUMEGA720JS	12	46	24
ALUMEGA840JS	14	54	28

[6]The positioning of the SBD dowels for total and partial fastening is shown on page 10.

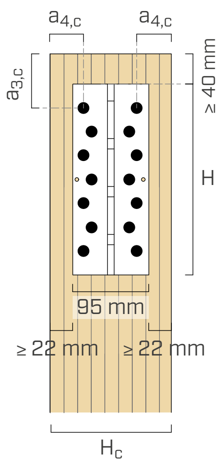
MEGABOLT

H [mm]	total fastening MEGABOLT Ø12 [pcs]
240	4
360	6
480	8
600	10
720	12
840	14

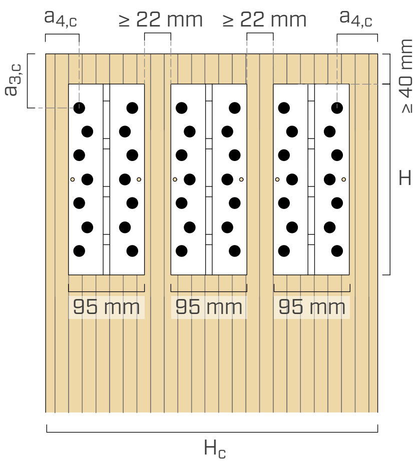
INSTALLATION | **ALUMEGA HP**

MINIMUM DISTANCES AND DIMENSIONS

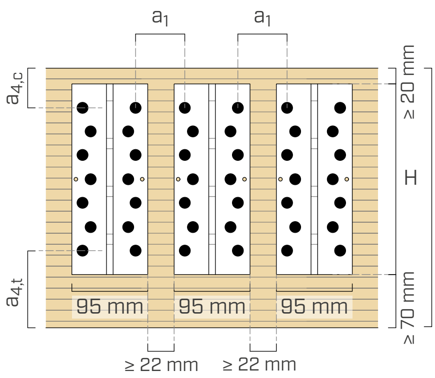
column-timber
single connector



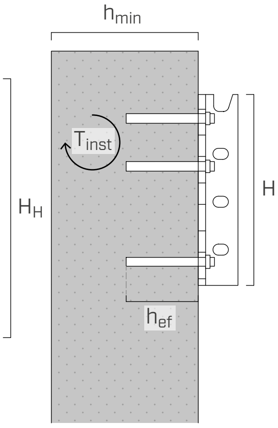
column-timber
side-by-side connectors



beam-timber
side-by-side connectors



concrete



Primary beam height $H_H \geq H + 90$mm, where H is the connector height.
The spacing between connectors refers to timber elements with density $\rho_k \leq 420$ kg/m^3, screws inserted without pre-drilling hole and for stresses F_v. For other configurations refer to ETA-23/0824.

ALUMEGA HP - minimum distances

main element-timber			HBS PLATE Ø10			
			column load-to-grain angle α = 0°		beam load-to-grain angle α = 90°	
screw-screw	a_1	[mm]	-	-	≥ 5·d	≥ 50
screw-unloaded end	$a_{3,c}$	[mm]	≥ 7·d	≥ 70	-	-
screw-stressed edge	$a_{4,t}$	[mm]	-	-	≥ 10·d	≥ 100
screw-unloaded edge	$a_{4,c}$	[mm]	≥ 3,6·d	≥ 36	≥ 5·d	≥ 50

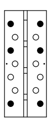
ALUMEGA HP - side-by-side connectors

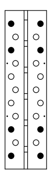
			single connector	double connector	triple connector
column width	H_c	[mm]	139	256	373

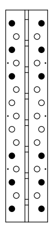
concrete			chemical anchor VIN-FIX Ø12
minimum support thickness	h_{min}	[mm]	h_{ef} + 30 ≥ 100
concrete hole diameter	d_0	[mm]	14
tightening torque	T_{inst}	[Nm]	40

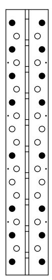
h_{ef} = effective anchoring depth in concrete

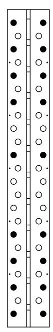
TIMBER-TO-CONCRETE FASTENING PATTERNS

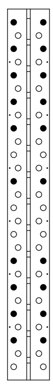

ALUMEGA240HP


ALUMEGA360HP


ALUMEGA480HP


ALUMEGA600HP


ALUMEGA720HP

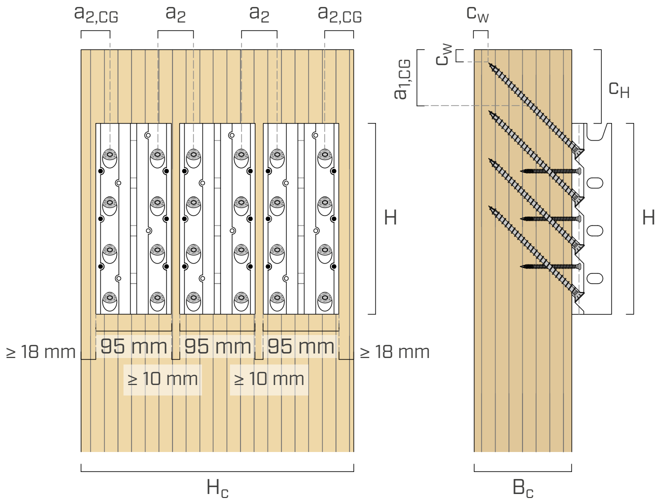

ALUMEGA840HP

Depending on stress, minimum concrete thickness and edge distances, different fastening patterns can be used; we recommend using the free Concrete Anchors software (www.rothoblaas.com).

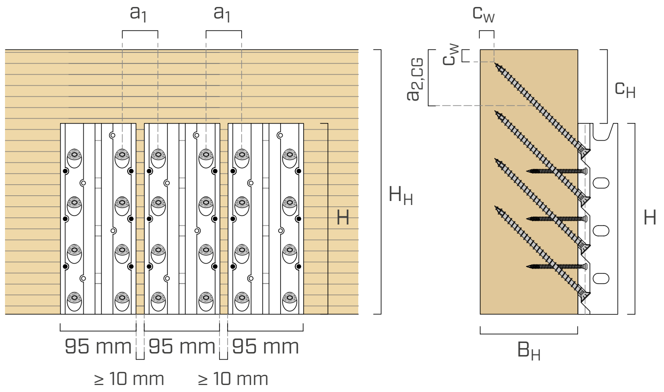
INSTALLATION | **ALUMEGA HVG**

MINIMUM DISTANCES AND DIMENSIONS

total fastening with VGS screws on column
side-by-side connectors



total fastening with VGS screws on main beam
side-by-side connectors



ALUMEGA HVG - single connector

H	VGS Ø9 x 160				VGS Ø9 x 200				VGS Ø9 x 240			
	column		main beam		column		main beam		column		main beam	
	B_c x H_c	c_H	B_H x H_H	c_H	B_c x H_c	c_H	B_H x H_H	c_H	B_c x H_c	c_H	B_H x H_H	c_H
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
240	113 x 132	99	113 x 325	85	141 x 132	113	141 x 353	113	170 x 132	141	170 x 381	141
360	113 x 132		113 x 445		141 x 132		141 x 473		170 x 132		170 x 501	
480	113 x 132		113 x 565		141 x 132		141 x 593		170 x 132		170 x 621	
600	113 x 132		113 x 685		141 x 132		141 x 713		170 x 132		170 x 741	
720	113 x 132		113 x 805		141 x 132		141 x 833		170 x 132		170 x 861	
840	113 x 132		113 x 925		141 x 132		141 x 953		170 x 132		170 x 981	

ALUMEGA HVG - minimum distances

main element-timber			VGS Ø9	
screw-screw	a_1	[mm]	≥ 5·d	≥ 45
screw-screw	a_2	[mm]	≥ 5·d	≥ 45
screw-column end	$a_{1,CG}$	[mm]	≥ 8,4·d	≥ 76
beam/column screw-edge	$a_{2,CG}$	[mm]	≥ 4·d	≥ 36

ALUMEGA HVG - side-by-side connectors

			single connector	double connector	triple connector
column width	H_c	[mm]	132	237	342

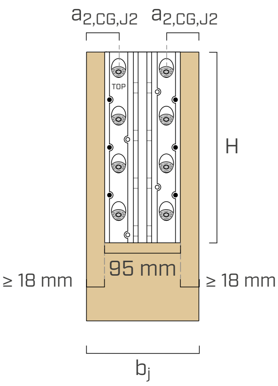
NOTES

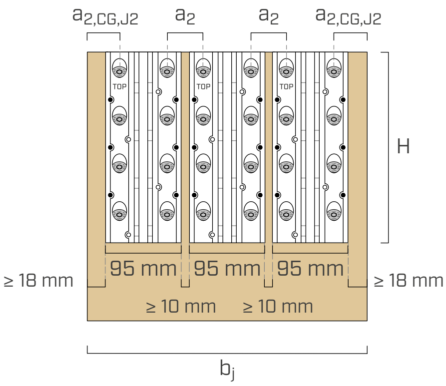
- The distances $a_{1,CG}$ and $a_{2,CG}$ refer to the centre of gravity of the threaded part of the screw in the timber element.
- In addition to the stated minimum distances $a_{1,CG}$ and $a_{2,CG}$, it is recommended to use a c_W ≥ 10 mm timber cover.
- The minimum length of VGS screws is 160 mm.
- The minimum distances and spacing for single connectors refers to timber elements with density $\rho_k \leq 420$ kg/m^3 and for stresses F_v, F_{ax} and F_{up}.
- Spacings for side-by-side connectors do not consider the contribution of LBS HARDWOOD EVO screws in terms of strength and refer to F_v, F_{ax} and F_{up} loads.
- For other configurations refer to ETA-23/0824.

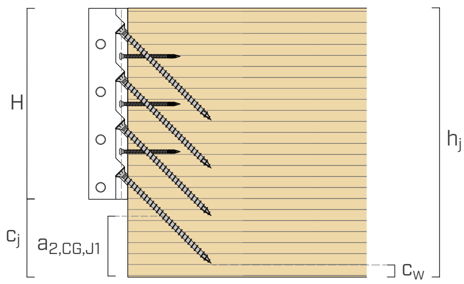
MINIMUM DISTANCES AND DIMENSIONS

total fastening with VGS screws on secondary beam single connector

total fastening with VGS screws on secondary beam side-by-side connectors







ALUMEGA JVG - single connector

H	VGS Ø9 x 160		VGS Ø9 x 200		VGS Ø9 x 240	
	b_j x h_j	c_j	b_j x h_j	c_j	b_j x h_j	c_j
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
240	132 x 343	103	132 x 358	118	132 x 386	146
360	132 x 463		132 x 478		132 x 506	
480	132 x 583		132 x 598		132 x 626	
600	132 x 703		132 x 718		132 x 746	
720	132 x 823		132 x 838		132 x 866	
840	132 x 943		132 x 958		132 x 986	

ALUMEGA JVG - minimum distances

secondary beam-timber			VGS Ø9	
screw-screw	a_2	[mm]	≥ 5·d	≥ 45
screw-beam edge	$a_{2,CG,J1}$	[mm]	≥ 8,4·d	≥ 76
screw-beam edge	$a_{2,CG,J2}$	[mm]	≥ 4·d	≥ 36

ALUMEGA JVG - side-by-side connectors

			single connector	double connector	triple connector
secondary beam width	b_j	[mm]	132	237	342

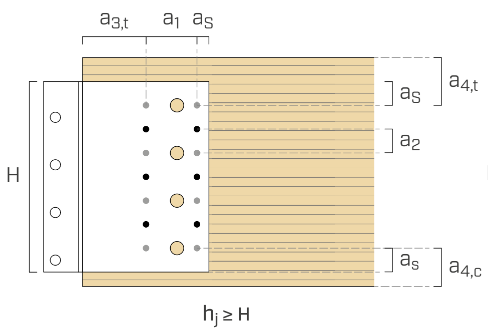
NOTES

- The distances $a_{1,CG,J1}$ and $a_{2,CG,J2}$ refer to the centre of gravity of the threaded part of the screw in the timber element.
- In addition to the stated minimum distances $a_{1,CG,J1}$ and $a_{2,CG,J2}$, it is recommended to use a $c_W \geq 10$ mm timber cover.
- The minimum length of VGS screws is 160 mm.
- The minimum distances and spacing for single connectors refers to timber elements with density $\rho_k \leq 420$ kg/m^3 and for stresses F_v, F_{ax} and F_{up}.
- Spacings for side-by-side connectors do not consider the contribution of LBS HARDWOOD EVO screws in terms of strength and refer to F_v, F_{ax} and F_{up} loads.
- For other configurations refer to ETA-23/0824.

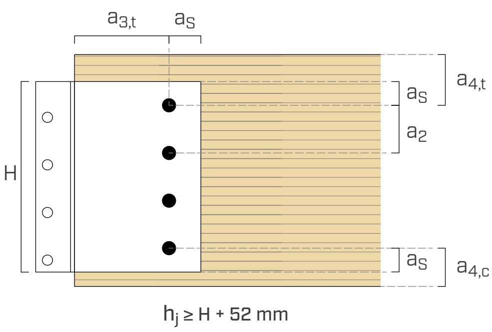
INSTALLATION | **ALUMEGA JS**

MINIMUM DISTANCES AND DIMENSIONS

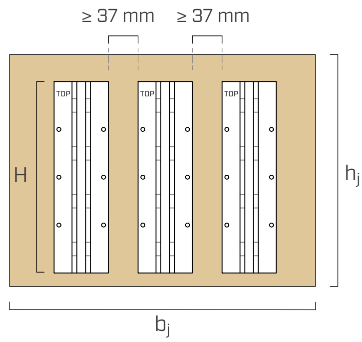
self-drilling dowel SBD Ø7,5



STA smooth dowel Ø16



side-by-side connectors



● partial fastening with SBD Ø7,5

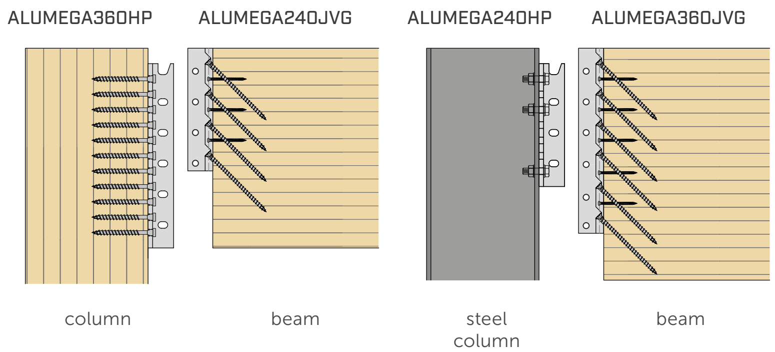
● + ● total fastening with SBD Ø7,5

Spacing between ALUMEGA JS side-by-side ≥ 37 mm meets the minimum spacing requirement of 10 mm between HVG connectors on beam and column. If the JS connector is attached to an HP connector on beam and column under shear load F_v, the minimum spacing between connectors is 49 mm.

secondary beam-timber				SBD Ø7,5	STA Ø16
dowel-dowel	a_1(1)	[mm]	≥ 3·d | ≥ 5·d	≥ 23 | ≥ 38	-
dowel-dowel	a_2	[mm]	≥ 3·d	≥ 23	≥ 48
dowel-beam end	$a_{3,t}$	[mm]	max (7 d; 80 mm)	≥ 80	≥ 112
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(2)	[mm]	≥ 1,2·d_0(3)	≥ 10	≥ 21

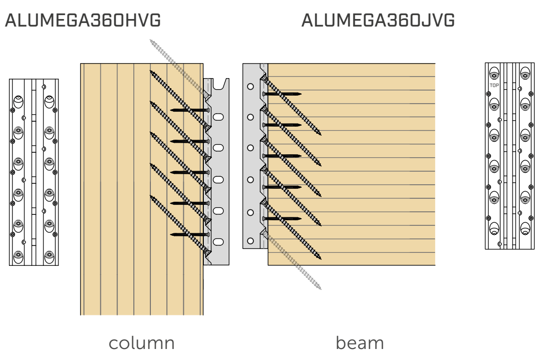
(1)Spacing between SBD dowels parallel to the fibre for load-to-grain angle α = 90° (F_v or F_{up} stress) and α = 0° (F_{ax} stress) respectively.
(2)It is advisable to pay special attention to the positioning of the SBD dowels with respect to the distance from the bracket edge, using a guide hole if necessary.
(3)Hole diameter.

ASSEMBLY OF CONNECTORS OF DIFFERENT HEIGHTS



A secondary beam connector (JVG and JS) may be attached to a main element connector (HVG and HP) of a different height. The configurations shown allow for balancing the strengths between the HP and JVG connectors, and limit the extension of the inclined screws beyond the outline of the connectors (example on the left).
The final strength is the minimum between the strength of the connectors and the bolts.

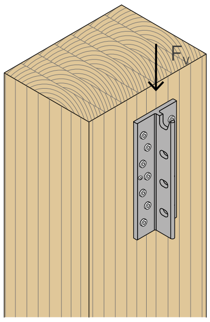
PARTIAL FASTENING FOR **HVG** AND **JVG** CONNECTORS



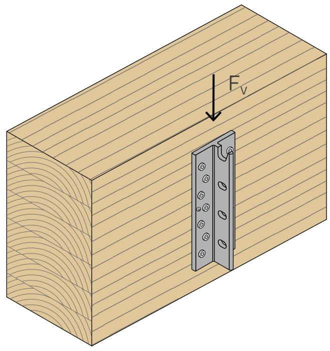
Partial fastening is permitted for the HVG and JVG connectors by omitting the first and last row of screws, respectively. This configuration is particularly favourable for beam-to-column connections, with the column extrados aligned with the beam extrados.

STATIC VALUES | **ALUMEGA HP** | F_v

column



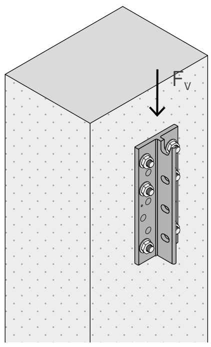
main beam



H	fasteners			$R_{v,k\ timber}$			$R_{v,k\ timber}$			$R_{v,k\ alu}$
	screws	screws	bolts	column			main beam			
	LBSHEVO(1) Ø5 x 80	HBS PL Ø10	MEGABOLT Ø12	HBS PL Ø10 x 100	HBS PL Ø10 x 140	HBS PL Ø10 x 180	HBS PL Ø10 x 100	HBS PL Ø10 x 140	HBS PL Ø10 x 180	MEGABOLT Ø12
[mm]	[pcs]	[pcs]	[pcs]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
240	2	14	4	**94**	**108**	**123**	**111**	**129**	**148**	**188**
360	4	22	6	**145**	**165**	**187**	**182**	**208**	**236**	**286**
480	6	30	8	**193**	**219**	**248**	**251**	**285**	**324**	**384**
600	8	38	10	**239**	**271**	**307**	**320**	**363**	**411**	**483**
720	10	46	12	**285**	**322**	**365**	**388**	**440**	**499**	**581**
840	12	54	14	**329**	**373**	**422**	**457**	**517**	**586**	**679**

(1) It is recommended to use LBS HARDWOOD EVO screws to fasten the plate to the timber element and prior to inserting the HBS PLATE screws.
For the calculation of F_{up}, F_{ax}, and F_{lat} strengths and for additional configurations, refer to the ALUMEGA calculation sheet available on the website www.rothoblaas.com.
For the GENERAL PRINCIPLES of calculation, see page 13.

STATIC VALUES | **ALUMEGA HP** | F_v



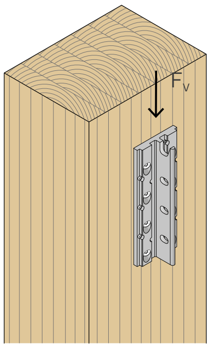
CONNECTOR		$R_{v,d\ concrete}$					
		H=240	H=360	H=480	H=600	H=720	H=840
	fastening	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
ALUMEGA HP	VIN-FIX anchor Ø12 x 245	**157**	**213**	**322**	**429**	**486**	**541**

NOTES

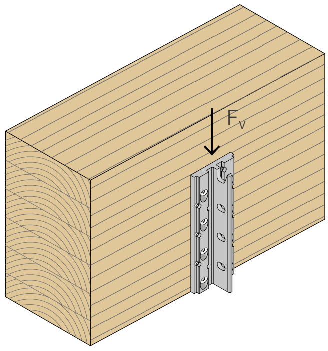
- In the calculation, C25/30 concrete with thin reinforcement was considered in the absence of distances from the edge.
- Chemical anchor VIN-FIX according to ETA-20/0363 with threaded rods (type INA) of minimum steel class 8.8 with h_{ef} = 225 mm.
- The design values are according to EN 1992:2018 with α_{sus} = 0,6.
- The values in the table are design values referring to the dowelling patterns on page 7.
- Aluminium-side strength must be verified in accordance with ETA-23/0824.
- Refer to ETA-23/0824 for the calculation of $F_{ax,d}$, $F_{up,d}$ and $F_{lat,d}$.

STATIC VALUES | **ALUMEGA HVG** | F_v

column



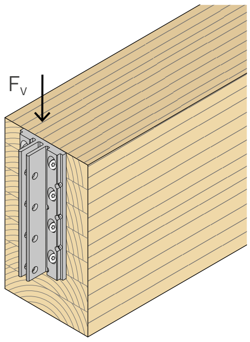
main beam



				$R_{v,k\ screw}$ [1][2]					$R_{v,k\ alu}$
	fasteners			$R_{v,k\ timber}$				$R_{tens,45,k}$	
	screws	screws	bolts	main beam/column					
H	LBSHEVO Ø5 x 80	VGS Ø9	MEGABOLT Ø12	VGS Ø9 x 160	VGS Ø9 x 200	VGS Ø9 x 240	VGS Ø9 x 280	VGS Ø9	MEGABOLT Ø12
[mm]	[pcs]	[pcs]	[pcs]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
240	6	8	4	**116**	-	-	-	**179**	**188**
360	10	12	6	**158**	-	-	-	**244**	**286**
480	14	16	8	**211**	**269**	-	-	**325**	**384**
600	18	20	10	**264**	**336**	-	-	**406**	**483**
720	22	24	12	**316**	**404**	**491**	-	**488**	**581**
840	26	28	14	**369**	**471**	**573**	**675**	**569**	**679**

STATIC VALUES | **ALUMEGA JVG** | F_v

secondary beam



				$R_{v,k\ screw}$ [1][2]					$R_{v,k\ alu}$
	fasteners			$R_{v,k\ timber}$				$R_{tens,45,k}$	
	screws	screws	bolts	secondary beam					
H	LBSHEVO Ø5 x 80	VGS Ø9	MEGABOLT Ø12	VGS Ø9 x 160	VGS Ø9 x 200	VGS Ø9 x 240	VGS Ø9 x 280	VGS Ø9	MEGABOLT Ø12
[mm]	[pcs]	[pcs]	[pcs]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
240	6	8	4	**116**	-	-	-	**179**	**188**
360	10	12	6	**158**	-	-	-	**244**	**286**
480	14	16	8	**211**	**269**	-	-	**325**	**384**
600	18	20	10	**264**	**336**	-	-	**406**	**483**
720	22	24	12	**316**	**404**	**491**	-	**488**	**581**
840	26	28	14	**369**	**471**	**573**	**675**	**569**	**679**

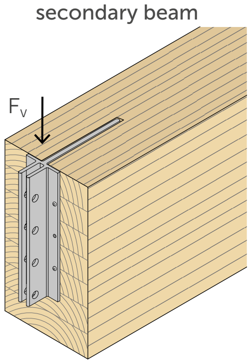
NOTES

(1) The $R_{v,k\ screw}$ strengths for partial fastening can be determined by multiplying by the following ratio: (number of screws for partial fastening)/(number of screws for total fastening).

(2) The test campaign for ETA-23/0824 resulted in the certification of ALUMEGA HVG and JVG models with VGS screws lengths up to 300 mm. To increase safety in the event of the incorrect installation, the use of connectors with short screws is preferred. A pilot hole Ø5 x 50 mm is always recommended, using the JIGVGS drilling jig, and inserting VGS screws with controlled torque ≤ 20 Nm using a TORQUE LIMITER or BEAR torque wrench.

For the calculation of F_{up}, F_{ax}, and F_{lat} strengths and for additional configurations, refer to the ALUMEGA calculation sheet available on the website www.rothoblaas.com.

For the GENERAL PRINCIPLES of calculation, see page 13.



H	fasteners		total fastening smooth dowels		partial fastening self-drilling dowels		total fastening self-drilling dowels		$R_{v,k\ alu}$
	screws	bolts							
	LBSHEVO[1] Ø5 x 80	MEGABOLT Ø12	STA[3] Ø16 x 240	$R_{v,k\ timber}$[2]	SBD[4] Ø7,5 x 195	$R_{v,k\ timber}$[2]	SBD[4] Ø7,5 x 195	$R_{v,k\ timber}$[2]	MEGABOLT Ø12
[mm]	[pcs]	[pcs]	[pcs]	[kN]	[pcs]		[pcs]	[kN]	[kN]
240	4	4	4	**77**	8	**63**	14	**106**	**188**
360	4	6	6	**142**	12	**114**	22	**205**	**286**
480	6	8	8	**206**	16	**170**	30	**312**	**384**
600	6	10	10	**269**	20	**224**	38	**422**	**483**
720	8	12	12	**331**	24	**279**	46	**530**	**581**
840	8	14	14	**394**	28	**332**	54	**638**	**679**

NOTES

(1) It is recommended to use LBS HARDWOOD EVO screws to fasten the plate to the timber element before inserting the dowels.

(2) The values provided are calculated with a 12 mm thick routing in the timber and according to the installation diagrams on page 10.

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

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

GENERAL PRINCIPLES

- The distances indicated in the installation section are minimum dimensions of structural elements, for screws inserted without pre-drilling hole, and do not take fire resistance requirements into account.
- 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}, γ_M and γ_{M2} 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.
- Characteristic values are consistent with EN 1995-1-1, EN 1999-1-1 and in accordance with ETA-23/0824.
- Refer to ETA-23/0824 for the sliding modulus.
- ETA-23/0824 does not cover eccentricity in F_v loads, which means the application of torque on the connection. Designers should evaluate whether to use an additional fastening system or ALUMEGA connectors placed side by side Refer to the detailed explanation on page 17.
- Regarding the installation of the connector, especially the VGS and HBS PLATE screws, it is strongly recommended to strictly follow the installation instructions provided on pages 19 and 20, as well as the technical documentation available at www.rothoblaas.com, in order to ensure the required structural performance.

SIDE-BY-SIDE CONNECTORS

- Particular attention must be paid to alignment during installation, in order to avoid different stresses between connectors. The use of the JIGALUMEGA assembly template is recommended.
- The total strength of a connection consisting of up to three side-by-side connectors is the sum of the strength of the individual connectors.

ALUMEGA HP

- Design values can be obtained from characteristic values as follows:

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

ALUMEGA HVG-ALUMEGA JVG

- Design values can be obtained from characteristic values as follows:

$$R_{v,Rd} = min \begin{cases} \dfrac{R_{v,k\ timber} \cdot k_{mod}}{\gamma_M} \\ \dfrac{R_{tens,45,k}}{\gamma_{M2,s}} \\ \dfrac{R_{v,k\ alu}}{\gamma_{M2,a}} \end{cases}$$

with $\gamma_{M2,s}$ as the partial factor for steel material and $\gamma_{M2,a}$ as partial factor for aluminium material.

ALUMEGA JS

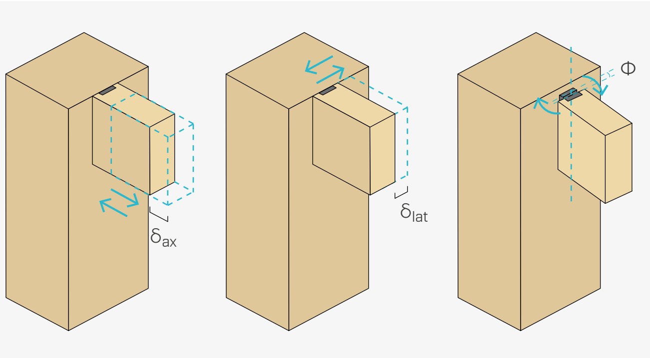
- Design values can be obtained from characteristic values as follows:

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

- The secondary beam must be in contact with the JS connector flange.
- In some cases the connection strength $R_{v,k\ timber}$ is notably large and may be higher than the secondary beam strength. Particular attention should be paid to the shear strength of the reduced section of the secondary beam at the bracket.

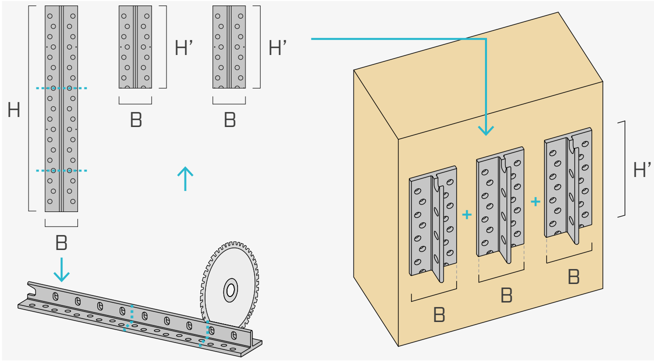
MAIN CHARACTERISTICS

ASSEMBLY TOLERANCE



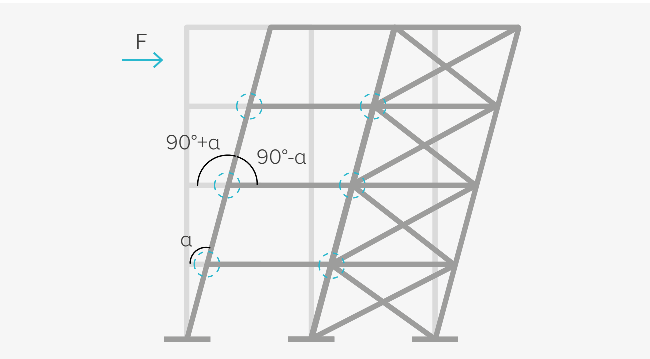
It offers the greatest assembly tolerance of any high-strength connector on the market:
δ_{ax} = 8 mm (± 4 mm), δ_{lat} = 3 mm (± 1,5 mm) and Φ = ± 6°.

MODULARITY



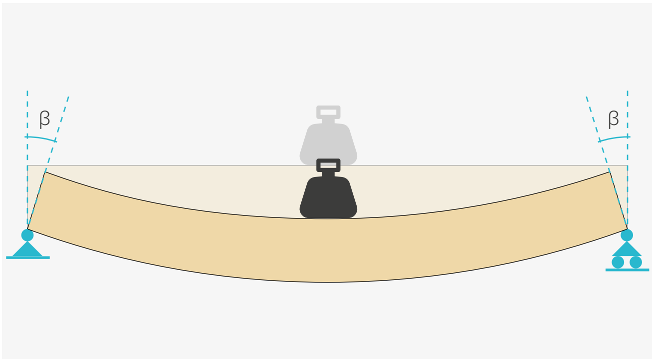
Available in 6 standard sizes (heights); the height H can be changed due to the modular connector geometry. In addition, connectors can be placed side-by-side to meet geometric or strength requirements.

INTER-STOREY DRIFT FOR HORIZONTAL ACTIONS



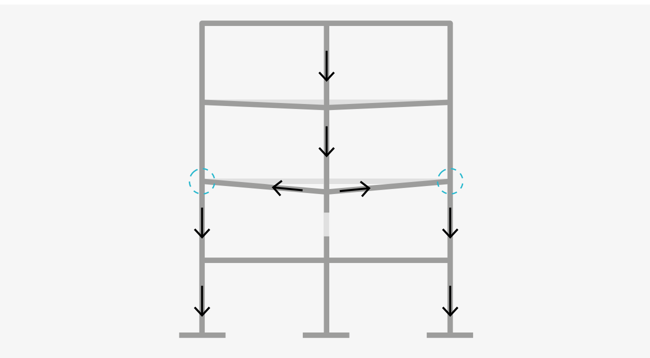
The connector's rotation capacity is compatible, depending on the installation setup, with inter-storey drift caused by seismic or wind actions.

ROTATION FOR GRAVITATIONAL LOADS



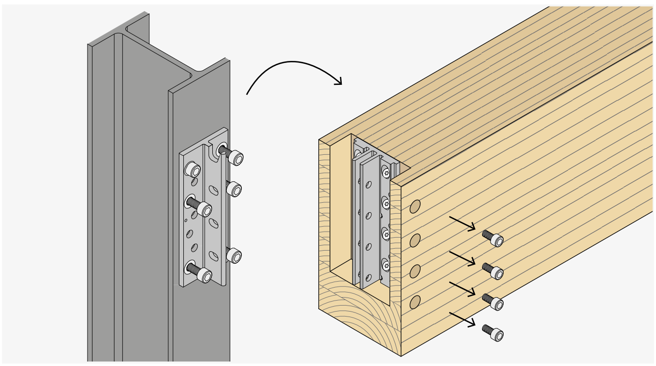
For gravitational loads, the connector has a hinged structural behaviour and ensures free rotation at the ends of the beam, provided that the connection detail actually enables such rotation.

STRUCTURAL STRENGTH



The high rotational capacity of the connector allows the development of the catenary effect under exceptional load conditions. For high tensile forces, additional connections and a global structural analysis are recommended.

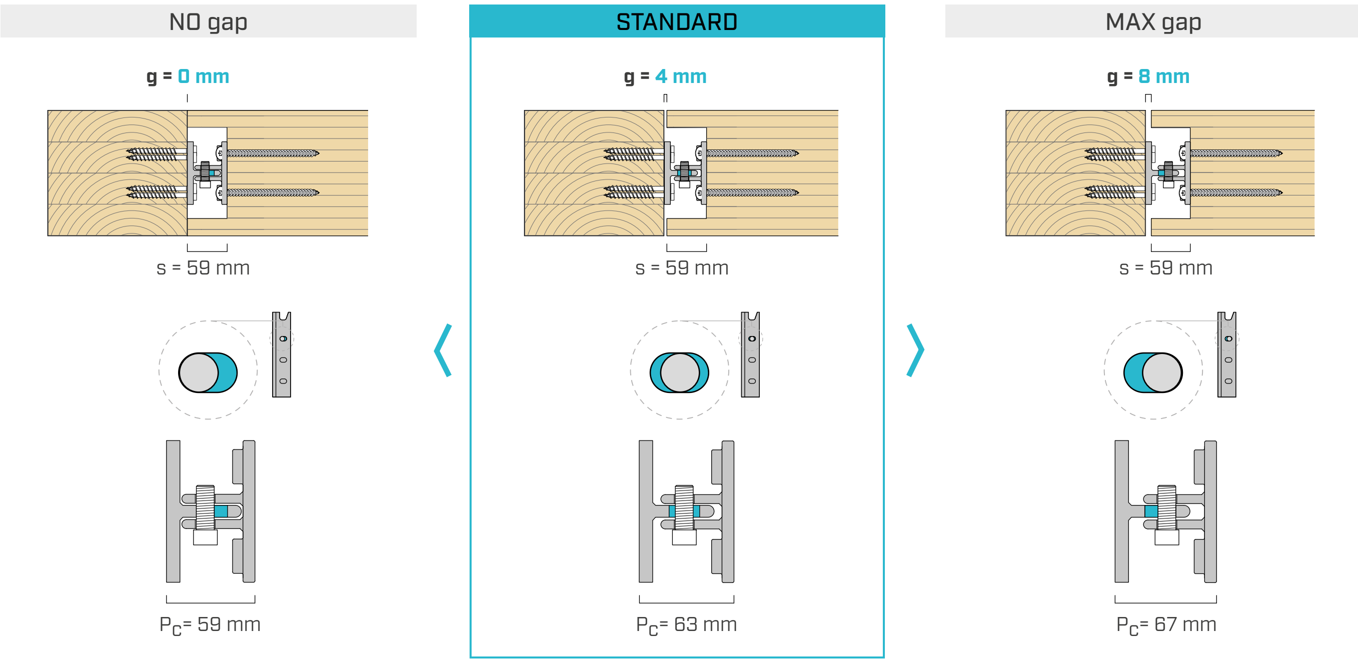
DISASSEMBLY



Particularly suitable for facilitating the dismantling of temporary structures or structures that have reached the end of their useful life. The connection with ALUMEGA can be easily disassembled by removing the MEGABOLT bolts, thus simplifying the separation of components (Design for Disassembly).

INSTALLATION CONFIGURATIONS

The standard configuration for the manufacture of timber elements consists in a nominal 4 mm gap.
On site, a variety of configurations can occur between the two limiting cases: zero gap and maximum 8 mm gap.



If it is required to limit the gap in the construction, for example due to fire resistance requirements of the connection, the depth of the routing in the secondary beam can be modified. As the depth of the routing increases, the gap between the secondary beam and the primary element is reduced and, at the same time, the axial installation tolerance is reduced. The limit case, for which particular precision during assembly is required, is achieved with a routing depth of 67 mm and zero axial installation gap/tolerance.

routing depth s [mm]	assembled connectors size P_C [mm]								
	59	60	61	62	63	64	65	66	67
59	g = 0 mm	g = 1 mm	g = 2 mm	g = 3 mm	g = 4 mm	g = 5 mm	g = 6 mm	g = 7 mm	g = 8 mm
61	-	-	g = 0 mm	g = 1 mm	g = 2 mm	g = 3 mm	g = 4 mm	g = 5 mm	g = 6 mm
63	-	-	-	-	g = 0 mm	g = 1 mm	g = 2 mm	g = 3 mm	g = 4 mm
65	-	-	-	-	-	-	g = 0 mm	g = 1 mm	g = 2 mm
67	-	-	-	-	-	-	-	-	g = 0 mm

Fire resistance requirements can be met by limiting the gap or by using dedicated products for fire protection of metal elements, such as FIRE STRIPE GRAPHITE, FIRE SEALING SILICONE, MS SEAL and FIRE SEALING ACRYLIC.

From a static point of view, the hinge behaviour and thus the free rotation at the ends of the beam is favoured by an installation configuration with a maximum gap between the secondary beam and the primary element.

INTELLECTUAL PROPERTY

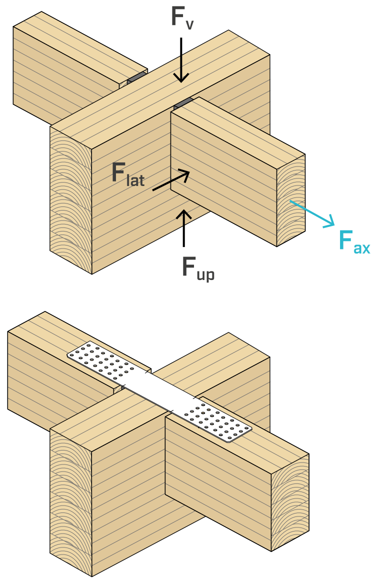
- Some ALUMEGA models are protected by the following Registered Community Designs: RCD 015032190-0002 | RCD 015032190-0003 | RCD 015032190-0004 | RCD 015032190-0005 | RCD 015032190-0006 | RCD 015032190-0007 | RCD 015032190-0008 | RCD 015032190-0009.

TENSILE STRENGTH

The axial strength values F_{ax} of the connection is to be considered valid after the initial sliding generated by the slotted holes in the ALUMEGA HP and HVG connectors. If there are design requirements according to which the connection must be able to withstand tensile stress without initial sliding or limited initial sliding, one of the following options is recommended:

- In the case of a concealed connection, it is possible to modify the depth of the routing in the secondary beam (or in the column) in such a way that the axial sliding is entirely or partially reduced. Refer to the INSTALLATION CONFIGURATIONS section.
- Use an additional fastening system positioned at the top of the beam. Standard (e.g. WHT PLATE T) or customised metal plates as well as screw systems can be used, depending on the geometrical and strength requirements.

The proposed solutions can change the rotational stiffness of the connection and its hinge behaviour.

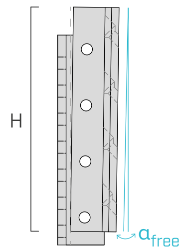


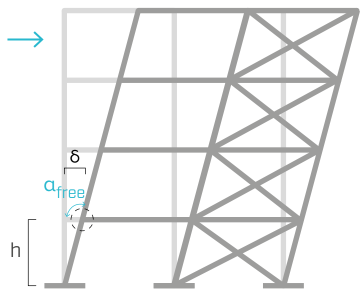
ROTATIONAL COMPATIBILITY

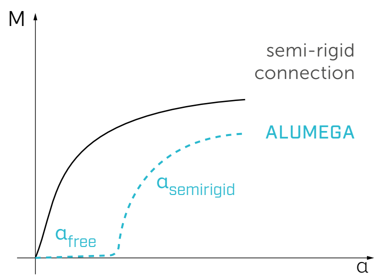
The ALUMEGA HVG and HP connectors have horizontally slotted holes, which not only offer installation tolerance, but also allow free rotation of the connection. The table shows the maximum free rotation α_{free} of the connection and the respective storey-drift, as a function of the height H of the connector. The connector, once it has reached α_{free} rotation has a further $\alpha_{semi-rigid}$ rotation before failure. Rotation $\alpha_{semi-rigid}$ occurs due to the deformation of the aluminium connector and its fastening.
The moment-rotation graph shows a comparison between the theoretical behaviour of a connection with ALUMEGA and that of a common semi-rigid connection.
For a connection with ALUMEGA, it is possible to assume a first phase, the extension of which is a function of H, in which the behaviour is hinge-like; in a second phase, semi-rigid behaviour can be assumed.
It should be noted that the free rotation α_{free}, and consequently the storey-drift capability, occur without deformation or damage to the aluminium or fasteners, and depend on several factors, including:

- the positioning of the connector relative to the secondary beam;
- the actual gap between the secondary beam and the primary element;
- the vertical load applied to the secondary beam;
- for concealed connections, the depth of the routing in the secondary beam or primary element, and the potential insertion of fire-resistant products (e.g. FIRE STRIPE GRAPHITE).

All the above considerations must be verified through testing. See www.rothoblaas.com for updates.







H [mm]	maximum free rotation α_{free} [°]	STOREY-DRIFT δ/h [%]
240	2,5	4,4
360	1,5	2,7
480	1,1	1,9
600	0,8	1,5
720	0,7	1,2
840	0,6	1,0

SHEAR DESIGN

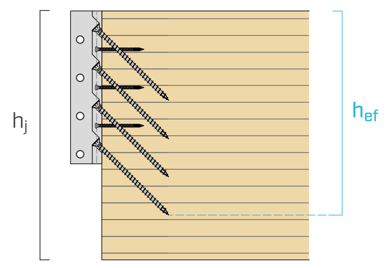
The use of concealed plates, such as ALUMEGA connectors, for beam-to-beam connections requires special design considerations:

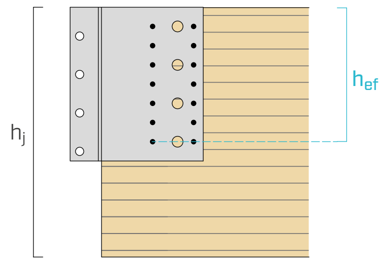
- reduction in the shear resistance of the secondary beam when the connection engages only a limited portion of the beam height;
- potential stability issues of the beam at the supports during installation or in service.

According to various technical standards and design guidelines, it is recommended to use connectors with a height $h_{ef} \geq 70\%$ of the secondary beam height h_j. This ensures adequate lateral stability and helps to prevent tension perpendicular to the timber grain.

Alternatively, specific design solutions can be adopted, such as:

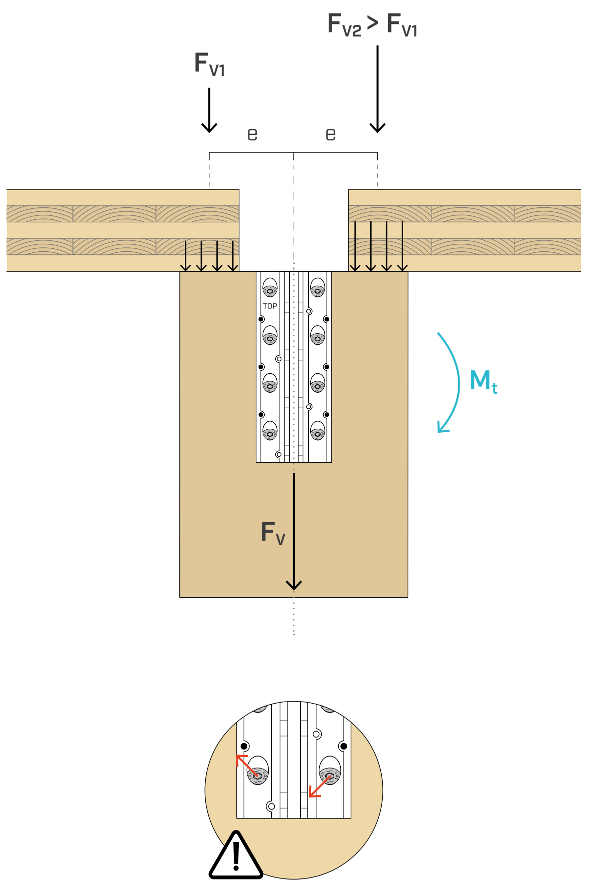
- insertion of screws perpendicular to the beam grain to increase the shear resistance capacity;
- stabilisation of the beam through connection to the floor slab or other structural elements.

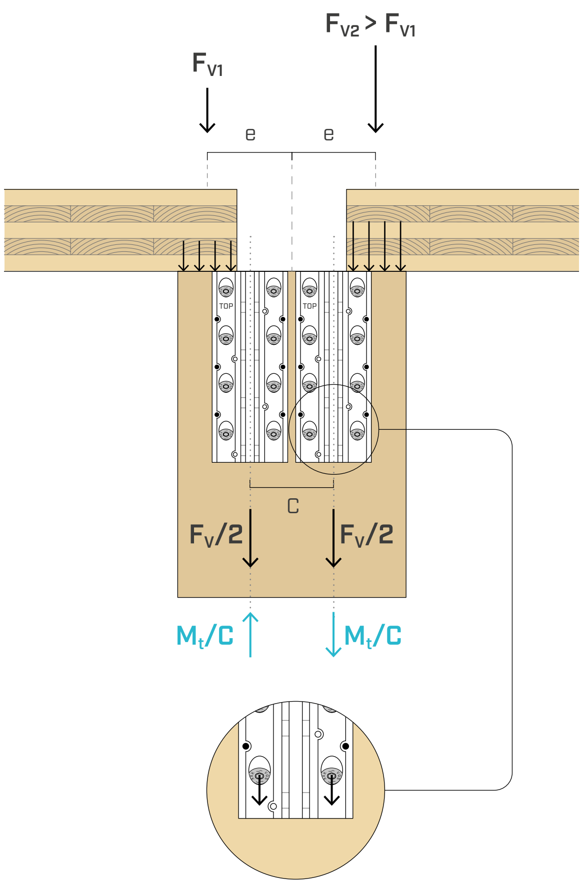




TORSIONAL DESIGN

Particular attention should be paid to possible torsional moments caused by eccentricities between the vertical loads and the connector's centre of gravity. This phenomenon typically occurs in edge beams and interior beams subjected to asymmetric loading, including during the installation phase, inducing undesired stresses in the screws.
In the presence of significant eccentricities, for example in wide beams or under highly unbalanced loads, it is recommended to adopt a side-by-side connector configuration, in order to improve load distribution.





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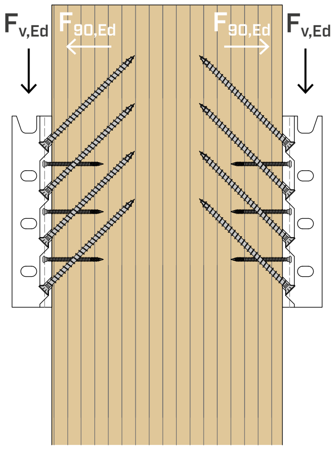
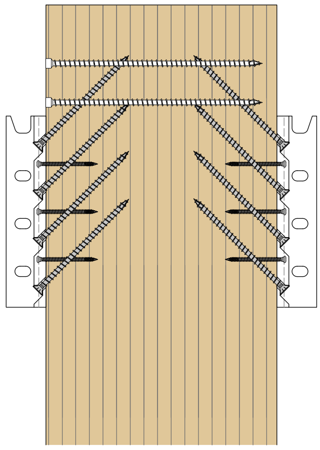
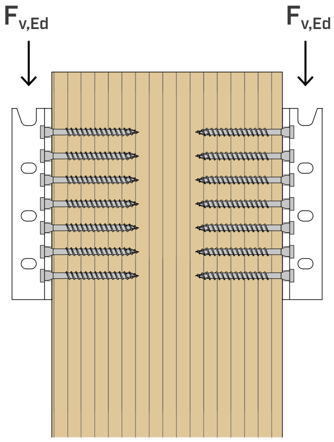
PERPENDICULAR TENSION TO THE GRAIN IN THE PRIMARY ELEMENT

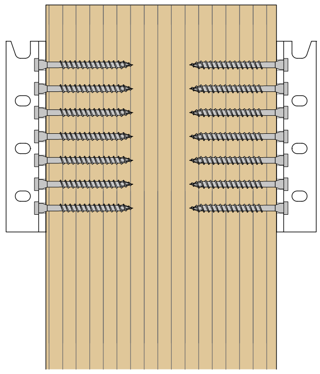
The ALUMEGA HVG connector, when subjected to vertical loads, induces tensile stress perpendicular to the grain in the portion of the primary element above the connector. When using connectors on both sides of the beam, as shown below, it is recommended to insert reinforcement screws (VGS/VGZ) that fully penetrate the depth of the primary element.





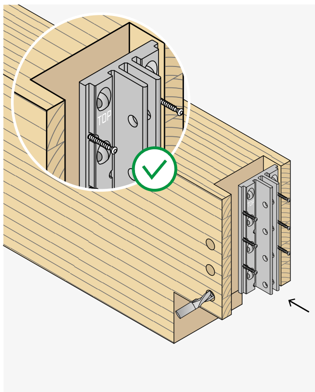
For applications with ALUMEGA HP connectors under gravity loads, reinforcement screws are not required, since no significant perpendicular tension is generated in the grain direction.





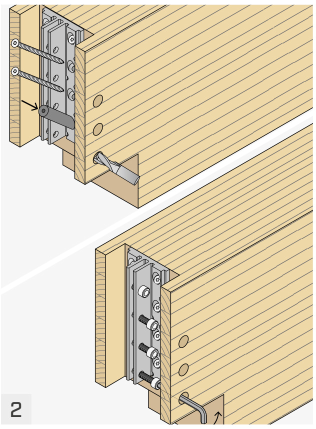
For further updates and technical documentation, **please refer to:** www.rothoblaas.com

"TOP-DOWN" INSTALLATION WITH ROUTING IN THE SECONDARY BEAM



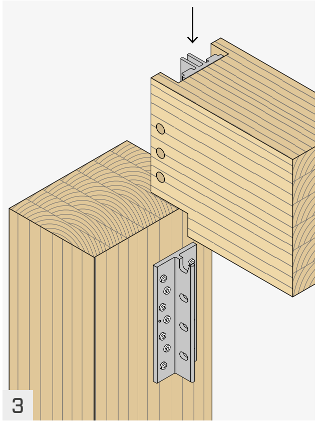
1

Make the routing in the secondary beam and drill the holes (min. Ø25) for the MEGABOLT bolts. Position the ALUMEGA JVG connector on the secondary beam paying particular attention to the correct orientation with reference to the "TOP" marking on the connector. Fasten the LBSHEVO Ø5 x 80 mm screws.



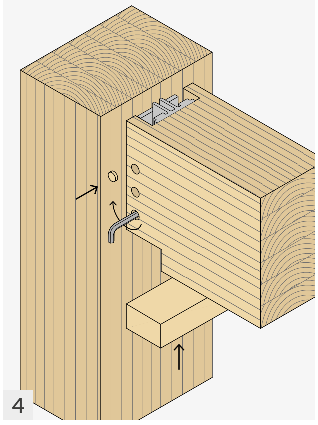
2

Drill pilot holes Ø5 mm with a minimum depth of 50 mm using the JIGVGS drilling jig. Insert the VGS screws at a 45° angle with controlled torque, using a TORQUE LIMITER or BEAR torque wrench. Do not exceed ≤ 20 Nm. Insert the MEGABOLT bolts in the following way: the first bolt must pass completely through both cores of the connector, while the other bolts must only pass through the first core.



3

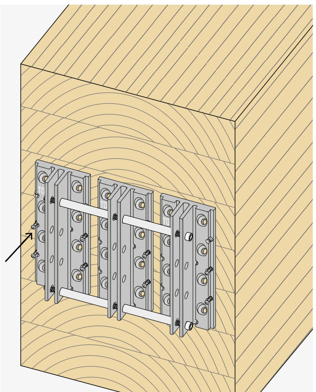
Position the ALUMEGA HP connector on the column and fasten the LBSHEVO Ø5 positioning screws (recommended), followed by the HBS PLATE screws with an insertion torque ≤ 35 Nm. It is reccomended to use a TORQUE LIMITER or BEAR torque wrench. Hook the secondary beam from top to bottom using the upper positioning notch in the ALUMEGA HP connector.



4

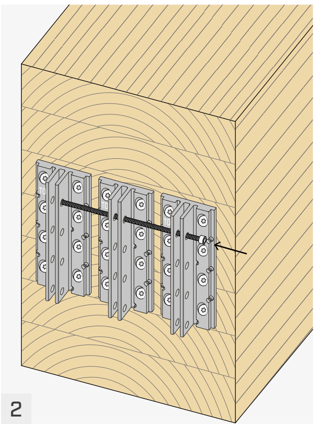
Fully tighten the MEGABOLT bolts with a 10 mm hexagonal wrench (recommended insertion torque ≤ 30 Nm). Place the TAPS timber plugs in the circular holes and insert the closing board, hiding the connection for fire resistance requirements.

"TOP-DOWN" INSTALLATION WITH ROUTING IN THE COLUMN



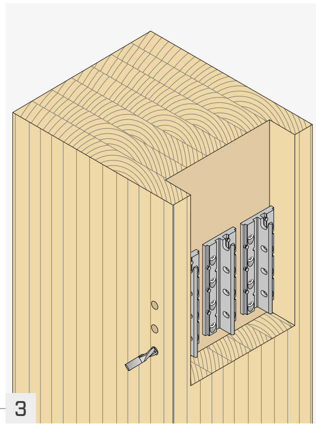
1

Place the three JVG connectors assembled with template and bolts on the secondary beam. Once the LBSHEVO Ø5 x 80 mm screws have been fastened, remove the jigs and bolts.



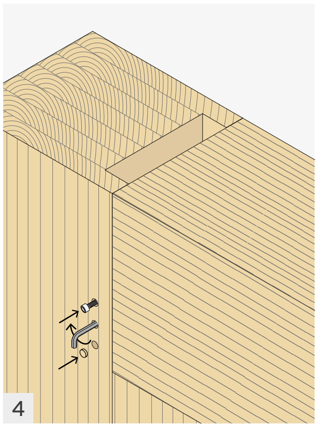
2

Drill pilot holes Ø5 mm with a minimum depth of 50 mm using the JIGVGS drilling jig. Insert the VGS screws at a 45° angle with controlled torque, using a TORQUE LIMITER or BEAR torque wrench. Do not exceed ≤ 20 Nm. Insert the upper MEGABOLT bolt through the three JVG connectors.



3

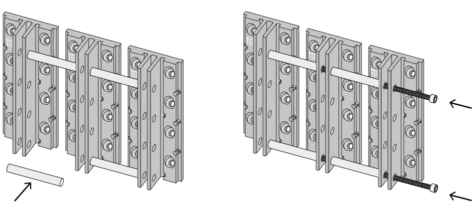
Make the routing in the column and drill the holes (min. Ø25) for the MEGABOLT bolts. Use the jig for positioning the ALUMEGA HVG connectors. Fasten the LBSHEVO Ø5 x 80 mm screws. Drill pilot holes Ø5 mm with a minimum depth of 50 mm using the JIGVGS drilling jig. Install the VGS screws at a 45° angle with controlled torque, using a TORQUE LIMITER or BEAR torque wrench. Do not exceed ≤ 20 Nm.



4

Hook the secondary beam from top to bottom using the upper positioning notch in the ALUMEGA HVG connectors. Insert the remaining MEGABOLT bolts and screw them in completely with a 10 mm hexagonal wrench.

0

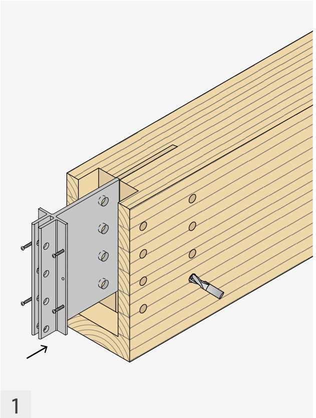


MANUALS

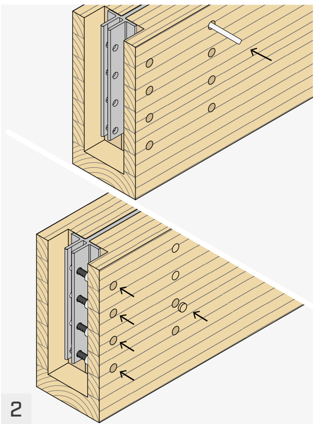
JIG INSTALLATION

Place the JVG connectors side by side and position the jigs at two rows of M12 holes in the connectors. Insert the MEGABOLT bolts through the M12 threaded holes, taking care to maintain the alignment between connectors. The use of the jig for HP and HVG connectors is similar, it is recommended to use M12 nuts to avoid MEGABOLT bolts slipping out during installation.

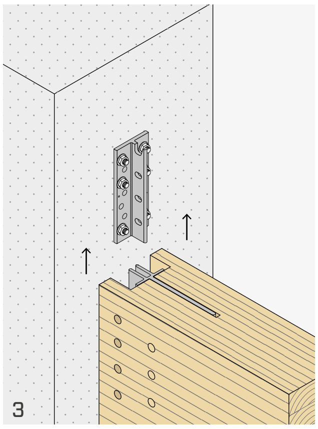
"BOTTOM-UP" INSTALLATION WITH ROUTING IN THE SECONDARY BEAM



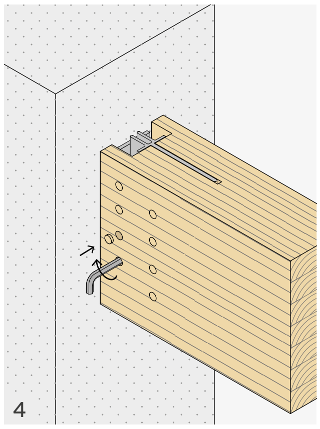
Carry out the routing at partial height in the secondary beam and drill the holes for the MEGABOLT bolts (min. Ø25) and the STA dowels Ø16. Position the ALUMEGA JS connector on the secondary beam paying particular attention to the correct orientation with reference to the "TOP" marking on the connector. Fasten the Ø5 LBSH EVO positioning screws (recommended).



Insert STA dowels Ø16 and then close with TAPS timber plugs. Insert the MEGABOLT bolts through the first core of the connector.

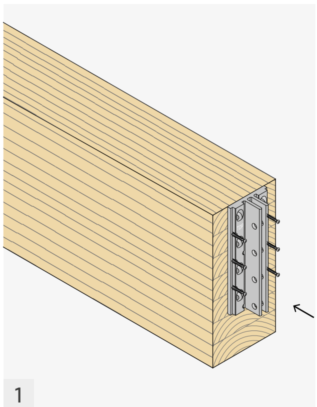


Place the ALUMEGA HP connector on concrete with INA threaded rods Ø12 and VIN-FIX resin, according to the installation instructions. Lift the secondary beam from the bottom upwards, and only screw the upper MEGABOLT bolt fully in when the ALUMEGA JS connector is positioned above the ALUMEGA HP connector.

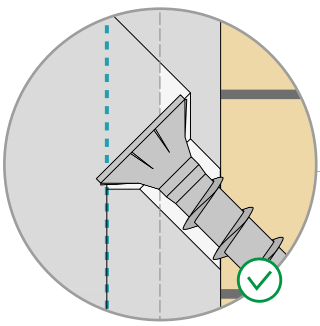


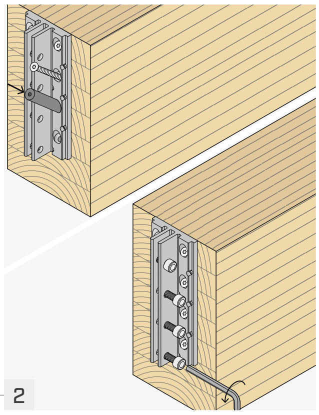
Hook the secondary beam from top to bottom using the upper positioning notch in the ALUMEGA HP connector. Fully screw in the remaining MEGABOLT bolts with a 10 mm hexagonal wrench (recommended insertion torque ≤ 30 Nm), and insert the TAPS timber plugs into the round holes.

VISIBLE "TOP-DOWN" INSTALLATION

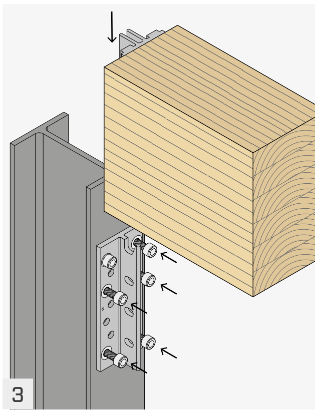


Position the ALUMEGA JVG connector on the secondary beam paying particular attention to the correct orientation with reference to the "TOP" marking on the connector. Subsequently, install the LBSHEVO Ø5 x 80 mm screws.

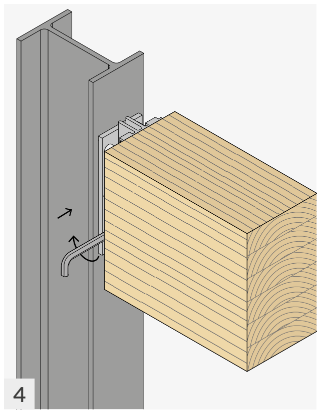




Drill pilot holes Ø5 mm with a minimum depth of 50 mm using the JIGVGS drilling jig. Insert the VGS screws at a 45° angle with controlled torque, using a TORQUE LIMITER or BEAR torque wrench. Do not exceed ≤ 20 Nm. Insert the MEGABOLT bolts in the following way: the first bolt must pass completely through both cores of the connector, while the other bolts must only pass through the first core.



Fasten the ALUMEGA HP connector to steel using M12 bolts and washer, MEGABOLT bolts can be used. Hook the secondary beam from top to bottom using the upper positioning notch in the ALUMEGA HP connector.



Fully tighten the MEGABOLT bolts with a 10 mm hexagonal wrench (recommended insertion torque ≤ 30 Nm).