

TITAN V

ANGLE BRACKET FOR SHEAR AND TENSILE FORCES

HOLES FOR VGS

Ideal for CLT. The full thread VGS Ø11 inclined screws offer exceptional strength and allow to fasten inter-storey walls of different thickness.

CONCEALED

The reduced height of the vertical flange allows hidden installation of the bracket within the floor panels. Steel thickness: 4 mm.

100 kN TENSILE

On timber, the TTV angle bracket guarantees exceptional tensile strength ($R_{1,k}$ up to 101,0 kN) and shear strength ($R_{2/3,k}$ up to 73,1 kN). Partial fastening possibilities.



USA, Canada and more design values available online.



VIDEO



PATENTED



ETA-11/0496

SERVICE CLASS

SC1

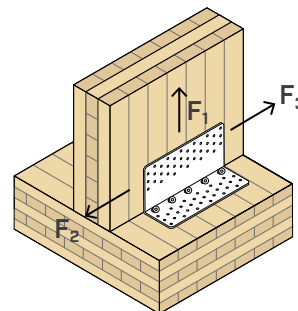
SC2

MATERIAL

S275
Fe/Zn12c

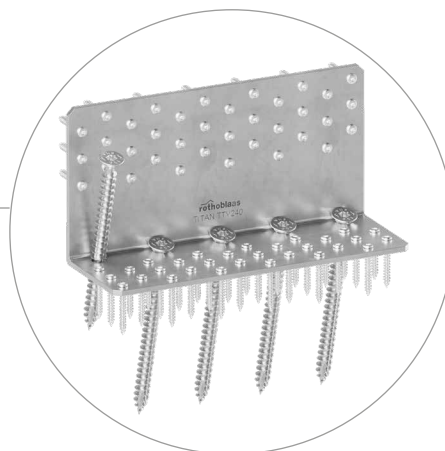
S275 + Fe/Zn12c carbon steel

EXTERNAL LOADS



VIDEO

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



FIELDS OF USE

Shear and tension joints for timber walls. Suitable for walls subject to very high stress. Timber-to-timber configuration.

Can be applied to:

- solid timber and glulam
- CLT and LVL panels



CONCEALED HOLD DOWN

Ideal on timber-to-timber both as a hold down at the ends of the walls and as shear angle bracket along the walls. It can be integrated into the floor panels.

A SINGLE ANGLE BRACKET

Use of a single type of angle bracket for both shear and tensile wall fastening. Optimisation and consistency of fastenings. Possibility of partial fastening with interposed acoustic profiles.

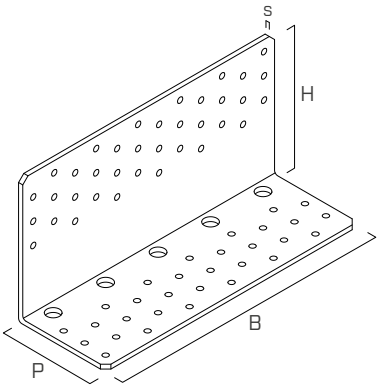
CODES AND DIMENSIONS

TITAN V - TTV | TIMBER-TO-TIMBER JOINTS

CODE	B [mm] [in]	P [mm] [in]	H [mm] [in]	n _V Ø5 n _V Ø0.20 [pcs]	n _H Ø5 n _H Ø0.20 [pcs]	n _H Ø12 n _H Ø0.48 [pcs]	s [mm] [in]	pcs
TTV240	240 9 1/2	83 3 1/4	120 4 3/4	36	30	5	4 0.12	10

ACOUSTIC PROFILE | TIMBER-TO-TIMBER JOINTS

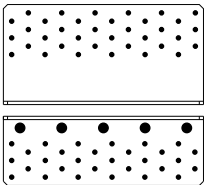
CODE	type	B [mm] [in]	P [mm] [in]	s [mm] [in]	pcs
XYL3590240	XYLOFON PLATE	240 9 1/2	90 3 1/2	6 0.24	10



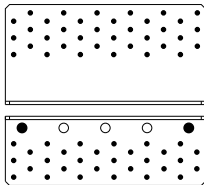
FASTENERS

type	description		d [mm]	support	page
LBA	high bond nail		4		570
LBS	round head screw		5		571
LBS HARDWOOD	round head screw on hardwoods		5		572
LBS HARDWOOD EVO	C4 EVO round head screw on hardwoods		5		572
LBS EVO	C4 EVO round head screw		5		571
VGS	full thread connector with countersunk head		11		575
VGS EVO	C4 EVO full thread connector with countersunk head		11		576

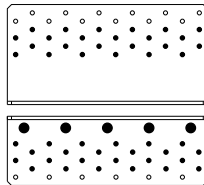
FASTENING PATTERNS



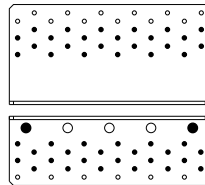
pattern 1



pattern 2

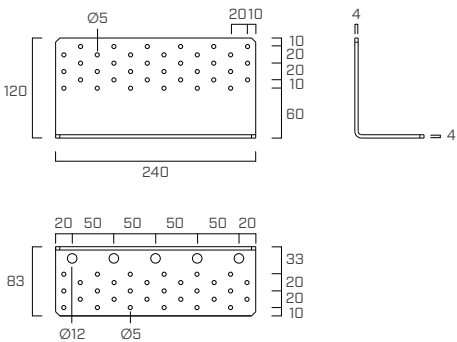


pattern 3

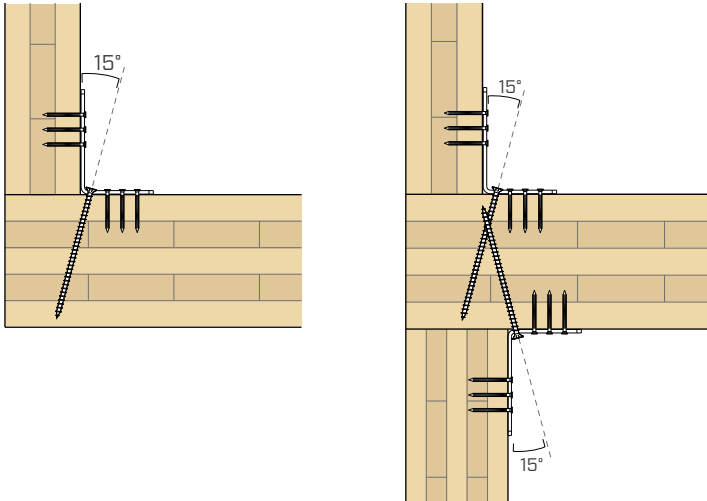


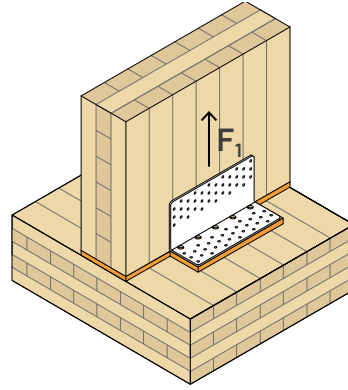
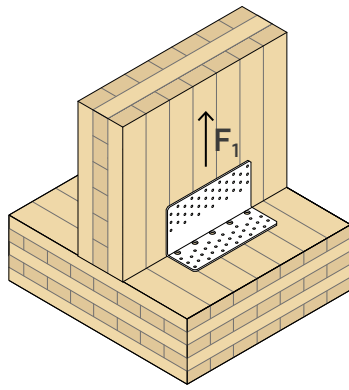
pattern 4

GEOMETRY



INSTALLATION





TIMBER STRENGTH

configuration on timber	fastening holes Ø5				fastening holes Ø12 type	R _{1,k} timber [kN]	K _{1,ser} [N/mm]
	type	Ø x L [mm]	n _V [pcs]	n _H [pcs]			
pattern 1	LBA	Ø4 x 60	36	30	5 - VGS Ø11x200	101,0	12500
	LBS	Ø5 x 70					
pattern 2	LBA	Ø4 x 60	36	30	2 - VGS Ø11x200	51,8	- 17000
	LBS	Ø5 x 70					
pattern 3	LBA	Ø4 x 60	24	24	5 - VGS Ø11x150	64,5	10500
	LBS	Ø5 x 70					
pattern 4	LBA	Ø4 x 60	24	24	2 - VGS Ø11x150	51,3	- 17000
	LBS	Ø5 x 70					

TIMBER-SIDE STRENGTH WITH ACOUSTIC PROFILE

configuration on timber	fastening holes Ø5				fastening holes Ø12 type	R _{1,k} timber [kN]	K _{1,ser} [N/mm]
	type	Ø x L [mm]	n _V [pcs]	n _H [pcs]			
pattern 1 + XYLOFON	LBA	Ø4 x 60	36	30	5 - VGS Ø11x200	99,0	-
	LBS	Ø5 x 70					
pattern 2 + XYLOFON	LBA	Ø4 x 60	36	30	2 - VGS Ø11x200	50,8	- 17000
	LBS	Ø5 x 70					

GENERAL PRINCIPLES

- Characteristic values comply with the EN 1995:2014 standard in accordance with ETA-11/0496.
- Design values can be obtained from characteristic values as follows:

$$R_{i,d} = R_{i,k \text{ timber}} \cdot \frac{k_{mod}}{\gamma_M}$$

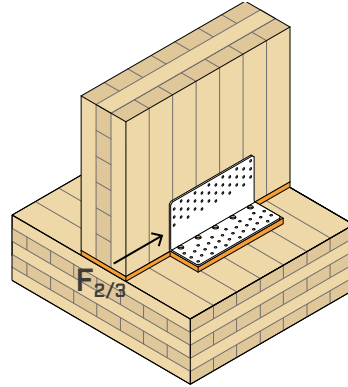
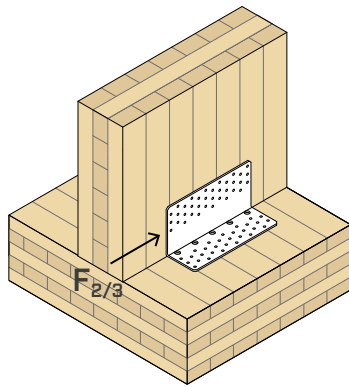
The coefficients k_{mod} and γ_M should be taken according to the current regulations used for the calculation.

- 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:

$$k_{dens} = \left(\frac{\rho_k}{350} \right)^{0.5} \text{ for } 350 \text{ kg/m}^3 \leq \rho_k \leq 420 \text{ kg/m}^3$$

$$k_{dens} = \left(\frac{\rho_k}{350} \right)^{0.5} \text{ for LVL with } \rho_k \leq 500 \text{ kg/m}^3$$

- Dimensioning and verification of the timber 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.



TIMBER STRENGTH

configuration on timber	fastening holes Ø5				fastening holes Ø12 type	R _{2/3,k} timber [kN]	K _{2/3,ser} [N/mm]
	type	Ø x L [mm]	n _V [pcs]	n _H [pcs]			
pattern 1	LBA	Ø4 x 60	36	30	5 - VGS Ø11x200	68,8	-
	LBS	Ø5 x 70				73,1	16000
pattern 2	LBA	Ø4 x 60	36	30	2 - VGS Ø11x200	59,7	6600
	LBS	Ø5 x 70					-
pattern 3	LBA	Ø4 x 60	24	24	5 - VGS Ø11x150	61,8	-
	LBS	Ø5 x 70				65,8	13000
pattern 4	LBA	Ø4 x 60	24	24	2- VGS Ø11x150	51,5	4800
	LBS	Ø5 x 70					-

TIMBER-SIDE STRENGTH WITH ACOUSTIC PROFILE

configuration on timber	fastening holes Ø5				fastening holes Ø12 type	R _{2/3,k} timber [kN]	K _{2/3,ser} [N/mm]
	type	Ø x L [mm]	n _V [pcs]	n _H [pcs]			
pattern 1 + XYLOFON	LBA	Ø4 x 60	36	30	5 - VGS Ø11x200	61,0	-
	LBS	Ø5 x 70					10000
pattern 2 + XYLOFON	LBA	Ø4 x 60	36	30	2 - VGS Ø11x200	49,4	6200
	LBS	Ø5 x 70					-

GENERAL PRINCIPLES

- Characteristic values comply with the EN 1995:2014 standard in accordance with ETA-11/0496.
- Design values can be obtained from characteristic values as follows:

$$R_{i,d} = R_{i,k \text{ timber}} \cdot \frac{k_{mod}}{\gamma_M}$$

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

- 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:

$$k_{dens} = \left(\frac{\rho_k}{350} \right)^{0.5} \text{ for } 350 \text{ kg/m}^3 \leq \rho_k \leq 420 \text{ kg/m}^3$$

$$k_{dens} = \left(\frac{\rho_k}{350} \right)^{0.5} \text{ for LVL with } \rho_k \leq 500 \text{ kg/m}^3$$

- Dimensioning and verification of the timber 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.

INTELLECTUAL PROPERTY

- TITAN V angle brackets are protected by the following patents:
 - EP3.568.535;
 - US10.655.320;
 - CA3.049.483.

UK CONSTRUCTION PRODUCT EVALUATION

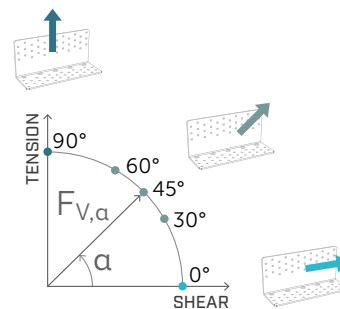
- UKTA-0836-22/6373.

EXPERIMENTAL INVESTIGATIONS | TTV240

The TTV240 angle bracket is an innovative connection system that can withstand both tensile and shear loads with high performance.

Thanks to the increased thickness and the use of full threaded screws for the fastening of the floor panel, it has an excellent behaviour in case of **biaxial stress** with different directions.

The experimental campaigns were carried out within an international collaboration with the University of Kassel (Germany), the "Kore" University of Enna (Italy) and CNR-IBE Institute for BioEconomy (Italy).



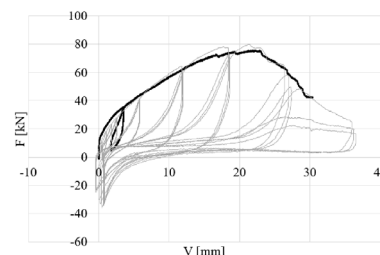
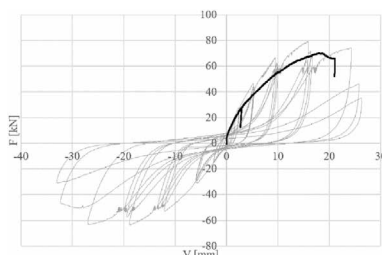
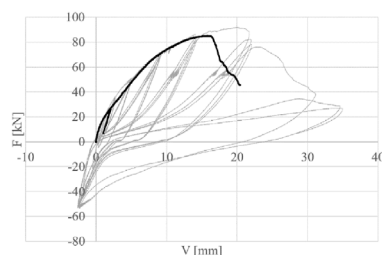
EXPERIMENTAL STRENGTH DOMAIN

In all shear ($\alpha=0^\circ$), tensile ($\alpha=90^\circ$) and load inclination ($30^\circ \leq \alpha \leq 60^\circ$) tests, similar collapse modes were achieved, which, due to the lower flange overstrength, are attributable to nail failure in the vertical flange. Also the mechanical parameters for cyclic load behaviour showed a good match ensuring ductile failures in the upper nails.

Using small diameter fasteners, it was possible to achieve comparable strengths independent of the stress load direction. The comparison of the experimental results confirmed the analytical considerations that a **circular strength domain** can be provided.

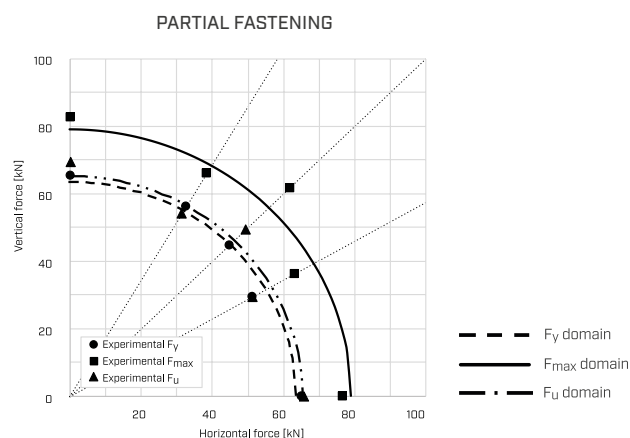
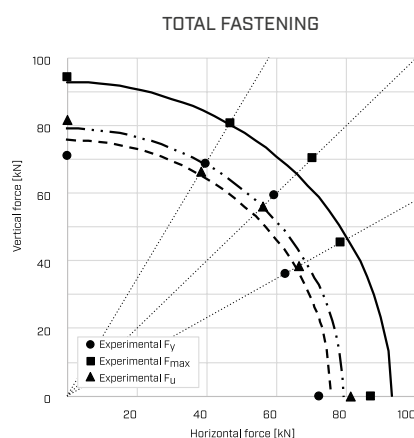


Samples at the end of cyclic tests: tension (a), shear (b) and 45° (c) (partial fastening).



Monotonic and cyclic load-displacement curves for tension (a), shear (b) and 45° (c) (partial fastening).

EXPERIMENTAL STRENGTH DOMAIN



NOTES

⁽¹⁾ Full fastening - Full nailing:

- 5 VGS $\varnothing 11 \times 150$ mm e 36+30 LBA $\varnothing 4 \times 60$ mm for $90^\circ/60^\circ/45^\circ/30^\circ$
- 2 VGS and 36+30 LBA $\varnothing 4 \times 60$ mm for 0°

Partial fastening - Partial nailing:

- 5 VGS $\varnothing 11 \times 150$ mm and 24+24 LBA $\varnothing 4 \times 60$ mm for $90^\circ/60^\circ/45^\circ/30^\circ$
- 2 VGS and 24+24 LBA $\varnothing 4 \times 60$ mm for 0°