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

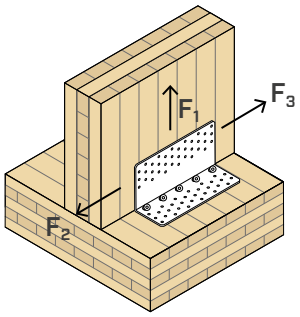
ETA-11/0496

SERVICE CLASS SC1 SC2

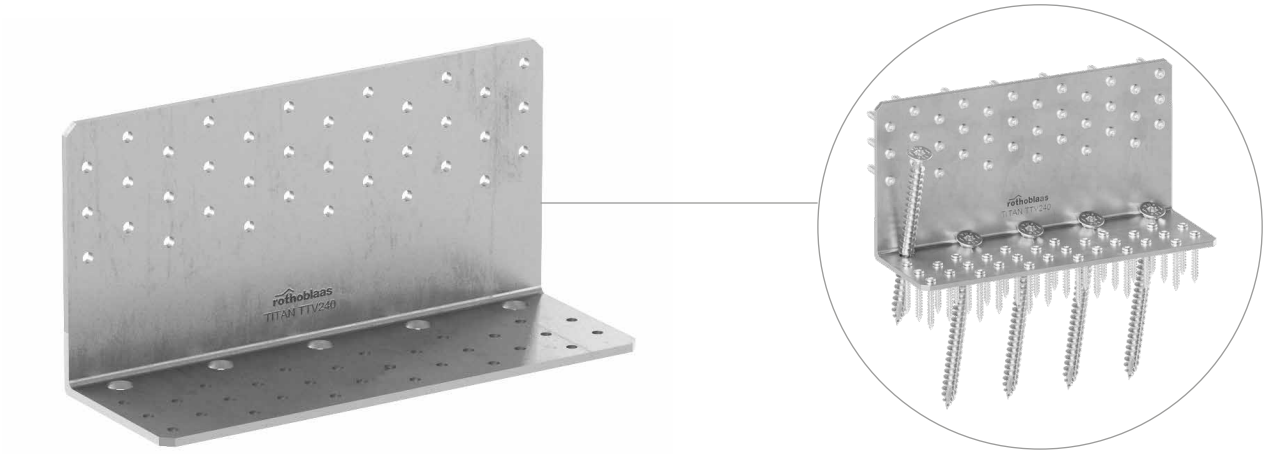
MATERIAL

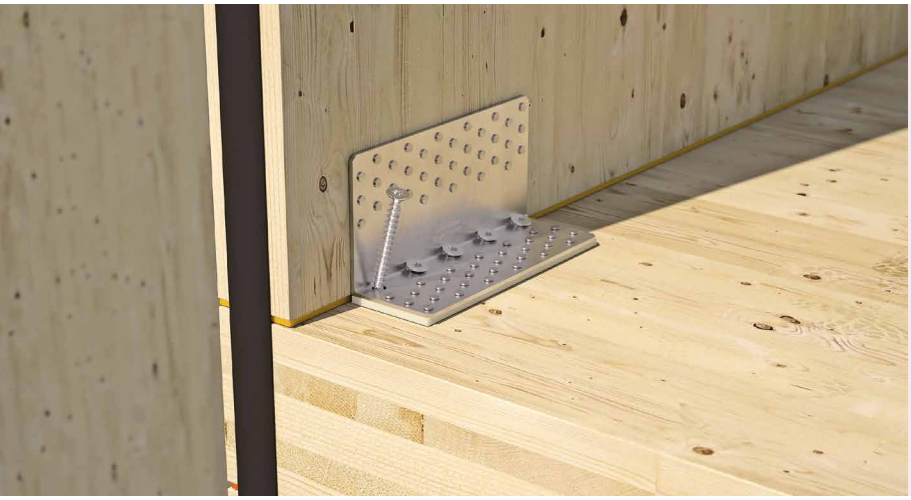
S275 Fe/Zn12c — S275 + Fe/Zn12c carbon steel

EXTERNAL LOADS



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

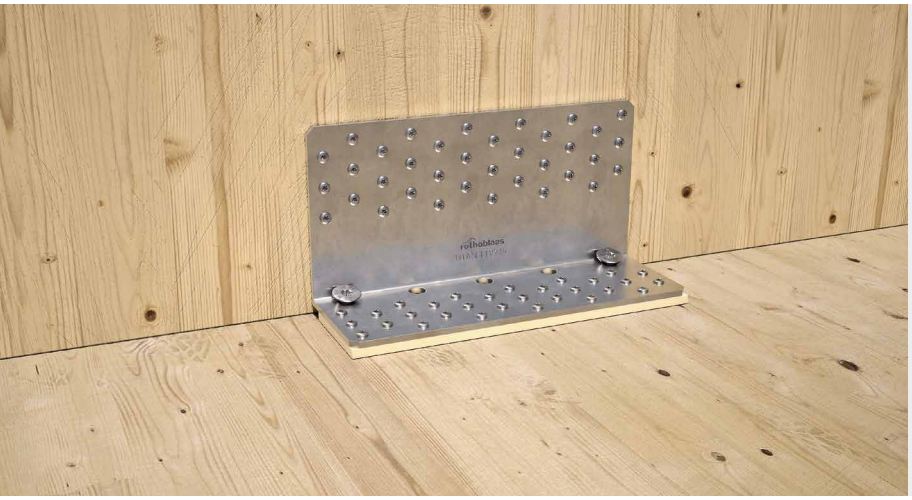




FIELDS OF USE

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.

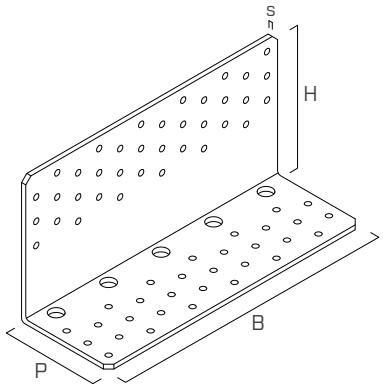
A SINGLE ANGLE BRACKET

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

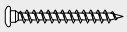
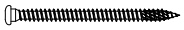
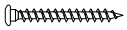
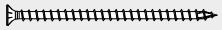
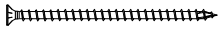
CODE	B [mm] *[in]*	P [mm] *[in]*	H [mm] *[in]*	n_V Ø5 n_V Ø0.20 [pcs]	n_H Ø5 n_H Ø0.20 [pcs]	n_H Ø12 n_H Ø0.48 [pcs]	s [mm] *[in]*	pcs
TTV240	240 *9 1/2*	83 *3 1/4*	120 *4 3/4*	36	30	5	4 *0.12*	10



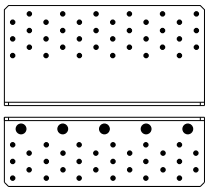
ACOUSTIC PROFILE | TIMBER-TO-TIMBER JOINTS

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

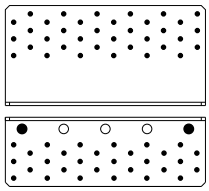
FASTENERS

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

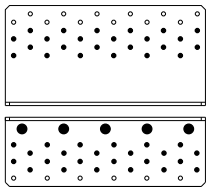
FASTENING PATTERNS



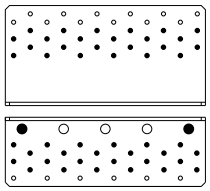
pattern 1



pattern 2

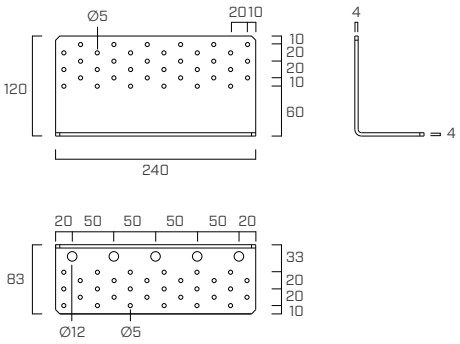


pattern 3

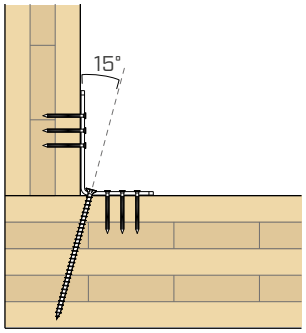


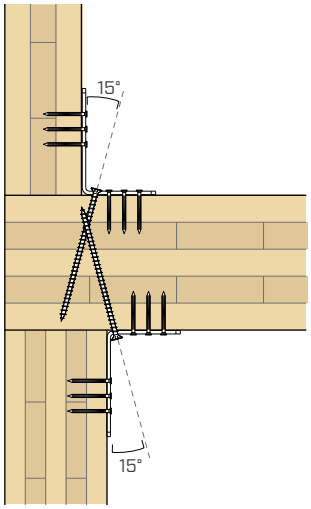
pattern 4

GEOMETRY

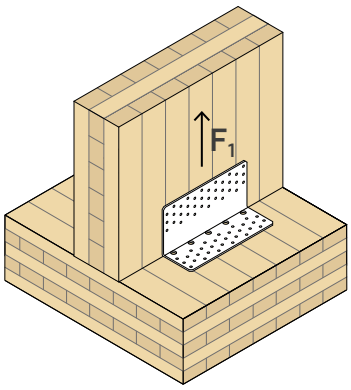


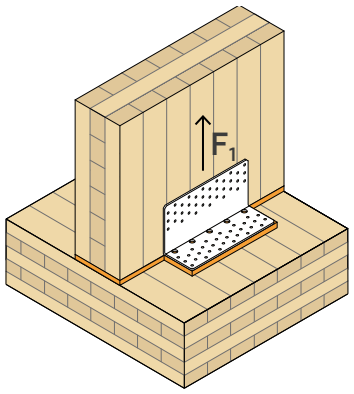
INSTALLATION





STRUCTURAL VALUES | TIMBER-TO-TIMBER | F_1





TIMBER STRENGTH

configuration on timber	fastening holes Ø5 type	Ø x L [mm]	n_V [pcs]	n_H [pcs]	fastening holes Ø12 type	$R_{1,k\ timber}$ [kN]	$K_{1,ser}$ [N/mm]
pattern 1	LBA LBS	Ø4 x 60 Ø5 x 70	36	30	5 - VGS Ø11x200	**101,0**	**12500** **-**
pattern 2	LBA LBS	Ø4 x 60 Ø5 x 70	36	30	2 - VGS Ø11x200	**51,8**	**-** **17000**
pattern 3	LBA LBS	Ø4 x 60 Ø5 x 70	24	24	5 - VGS Ø11x150	**64,5**	**10500** **-**
pattern 4	LBA LBS	Ø4 x 60 Ø5 x 70	24	24	2- VGS Ø11x150	**51,3**	**-** **17000**

TIMBER-SIDE STRENGTH WITH ACOUSTIC PROFILE

configuration on timber	fastening holes Ø5 type	Ø x L [mm]	n_V [pcs]	n_H [pcs]	fastening holes Ø12 type	$R_{1,k\ timber}$ [kN]	$K_{1,ser}$ [N/mm]
pattern 1 + XYLOFON	LBA LBS	Ø4 x 60 Ø5 x 70	36	30	5 - VGS Ø11x200	**99,0**	**-**
pattern 2 + XYLOFON	LBA LBS	Ø4 x 60 Ø5 x 70	36	30	2 - VGS Ø11x200	**50,8**	**-** **17000**

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:

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

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

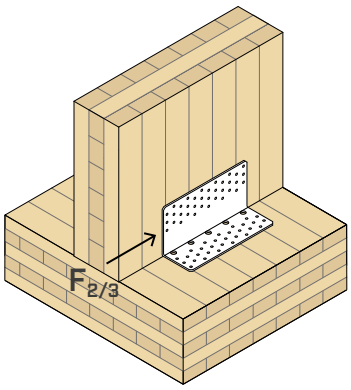
- A timber density of ρ_k = 350 kg/m^3 was considered for the calculation process. For higher ρ_k values, the strength on timber side can be converted by the k_{dens} value:

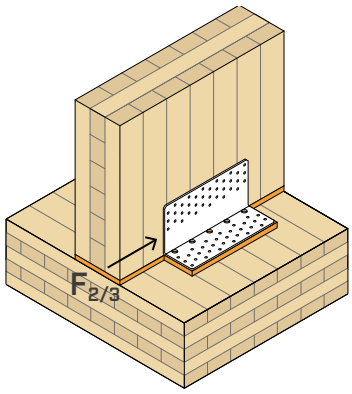
$$k_{dens} = \left(\frac{\rho_k}{350}\right)^{0,5} \quad for\ 350\ kg/m^3 \leq \rho_k \leq 420\ kg/m^3$$

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

- 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.

STRUCTURAL VALUES | TIMBER-TO-TIMBER | $F_{2/3}$





TIMBER STRENGTH

configuration on timber	fastening holes Ø5 type	Ø x L [mm]	n_V [pcs]	n_H [pcs]	fastening holes Ø12 type	$R_{2/3,k\ timber}$ [kN]	$K_{2/3,ser}$ [N/mm]
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 type	Ø x L [mm]	n_V [pcs]	n_H [pcs]	fastening holes Ø12 type	$R_{2/3,k\ timber}$ [kN]	$K_{2/3,ser}$ [N/mm]
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:

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

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

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

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

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

- 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.

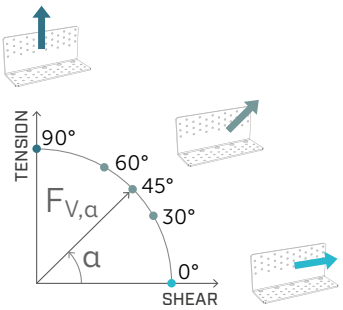
UK CONSTRUCTION PRODUCT EVALUATION

- 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).

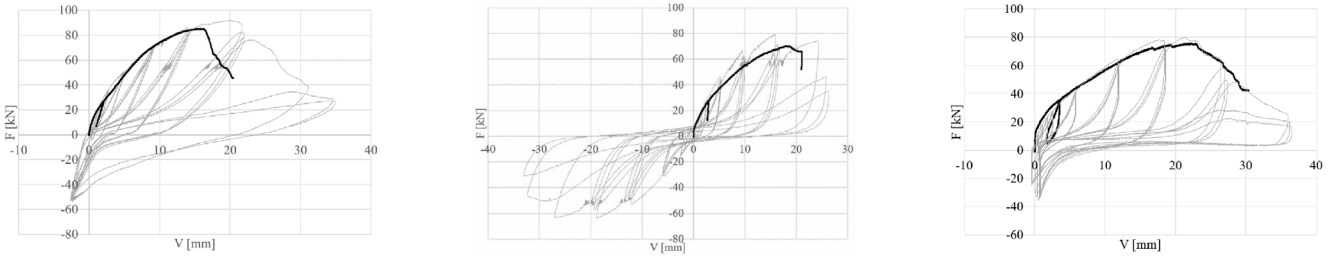


EXPERIMENTAL STRENGTH DOMAIN

In all shear (α=0°), tensile (α=90°) and load inclination (30° ≤ α ≤ 60°) 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.

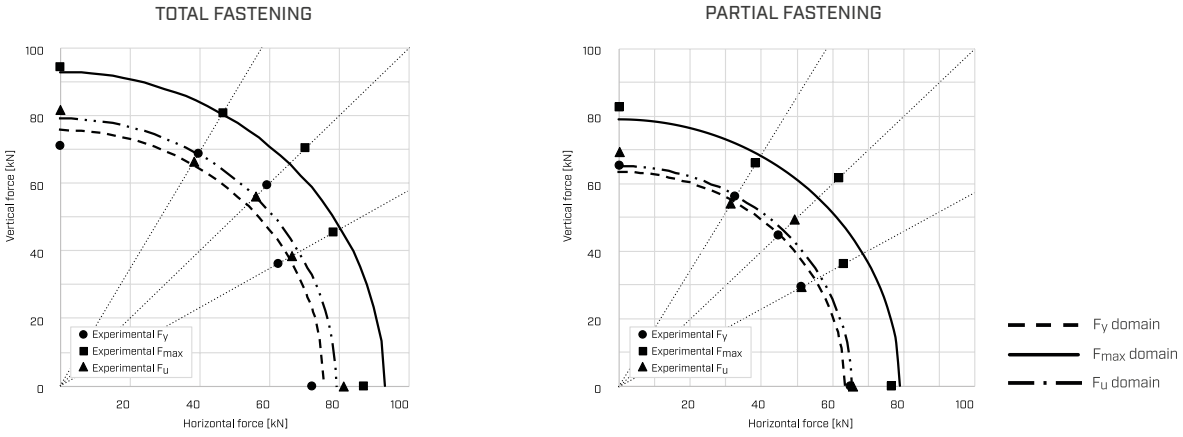
Using small diameter fasteners, it was possible to achieve comparable strengths independent of the stress load direction. The comparison of the experimental results confirmed the analytical considerations that a **circular strength domain** can be provided.

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 Ø11x150 mm e 36+30 LBA Ø4x60 mm for 90°/60°/45°/30°
- 2 VGS and 36+30 LBA Ø4x60 mm for 0°

Partial fastening - Partial nailing:
- 5 VGS Ø11x150 mm and 24+24 LBA Ø4x60 mm for 90°/60°/45°/30°
- 2 VGS and 24+24 LBA Ø4x60 mm for 0°