TITAN S

ETA 11/0496

ANGLE BRACKET FOR SHEAR AND TENSILE FORCES

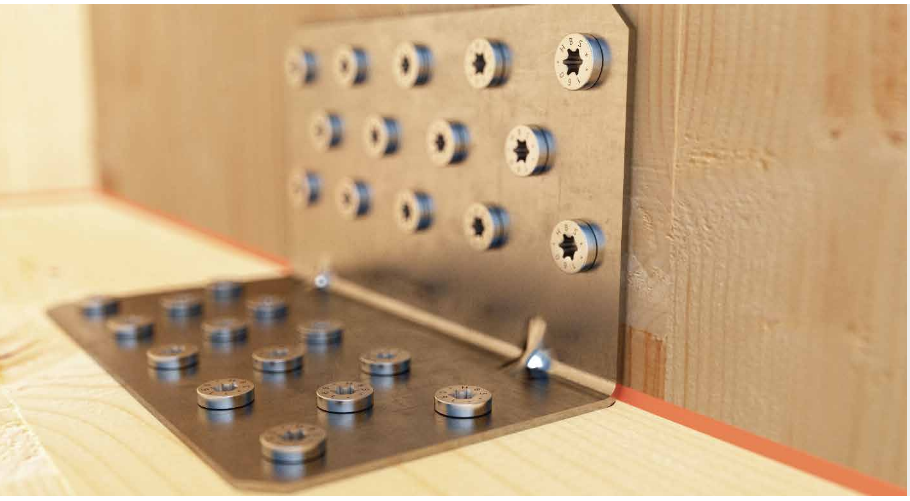
HOLES FOR HBS PLATE
Fastening with HBS PLATE Ø8 screws using a screwdriver makes installation easy and fast and allows you to work safely and comfortably.

85 kN SHEAR
Exceptional shear strengths. Up to 85,9 kN on concrete (with TCW washer). Up to 60,0 kN on timber.

75 kN TENSILE
On concrete, the TCS angle bracket with TCW washer provides excellent tensile strength. $R_{1,k}$ up to 75,9 kN characteristic values.

CHARACTERISTICS

FOCUS	shear and tensile joints
HEIGHT	130 mm
THICKNESS	3,0 mm
FASTENERS	HBS PLATE, VIN-FIX, HYB-FIX, SKR, AB1



MATERIAL
Bright zinc plated carbon steel, three dimensional perforated plate.

FIELDS OF USE
Timber-to-concrete and timber-to-timber shear tensile joints for timber panels and timber stringers
- CLT, LVL
- solid timber and glulam
- framed structures (platform frame)
- timber based panels

COMFORT

The angle brackets fastening using a reduced number of HBS PLATE Ø8 screws makes installation faster and increases operator comfort.

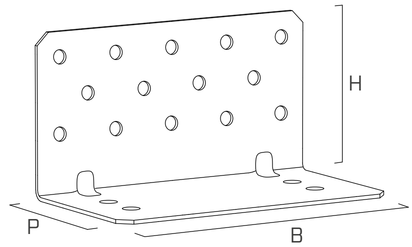
ALL DIRECTIONS

Certified shear ($F_{2,3}$), tensile (F_1) and tilting ($F_{4,5}$) strengths. Certified values also with interposed acoustic profiles.

CODES AND DIMENSIONS

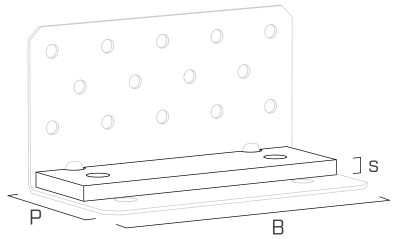
TITAN S - TCS | CONCRETE-TO-TIMBER JOINTS

CODE	B [mm]	P [mm]	H [mm]	holes [mm]	n_V Ø11 [pcs]	s [mm]		pcs
TCS240	240	123	130	4 x Ø17	14	3	●	10



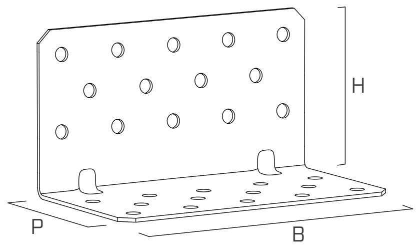
TITAN WASHER - TCW240 | CONCRETE-TO-TIMBER JOINTS

CODE	B [mm]	P [mm]	s [mm]	holes [mm]		pcs
TCW240	230	73	12	Ø18	●	1



TITAN S - TTS | TIMBER-TO-TIMBER JOINTS

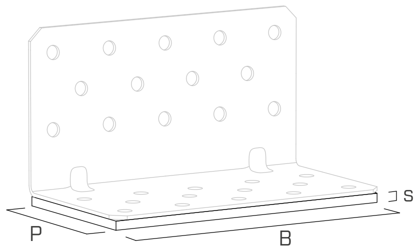
CODE	B [mm]	P [mm]	H [mm]	n_H Ø11 [pcs]	n_V Ø11 [pcs]	s [mm]		pcs
TTS240	240	130	130	14	14	3	●	10



ACOUSTIC PROFILE | TIMBER-TO-TIMBER JOINTS

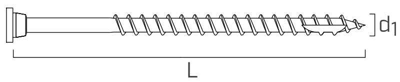
CODE	type	B	P [mm]	s [mm]		pcs
XYL35120240	xylofon plate	240 mm	120	6	●	10
ALADIN95	soft	50 m(*)	95	5	●	10
ALADIN115	extra soft	50 m(*)	115	7	●	10

(*) To be cut on site



HBS PLATE

CODE	d_1 [mm]	L [mm]	b [mm]	TX	pcs
HBSP880	8	80	55	TX40	100



MATERIAL AND DURABILITY

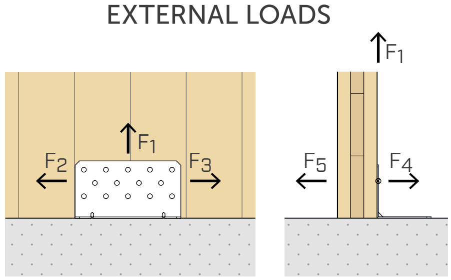
TITAN S: carbon steel DX51D+Z275.
TITAN WASHER: S235 bright zinc plated carbon steel.
To be used in service classes 1 and 2 (EN 1995-1-1).

XYLOFON PLATE: 35-shore polyurethane compound.
ALADIN STRIPE: compact EPDM.

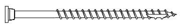
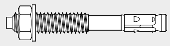
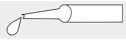
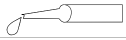
FIELD OF USE

- Timber to concrete joints
- Timber-to-timber joints
- Timber-to-steel joints

EXTERNAL LOADS

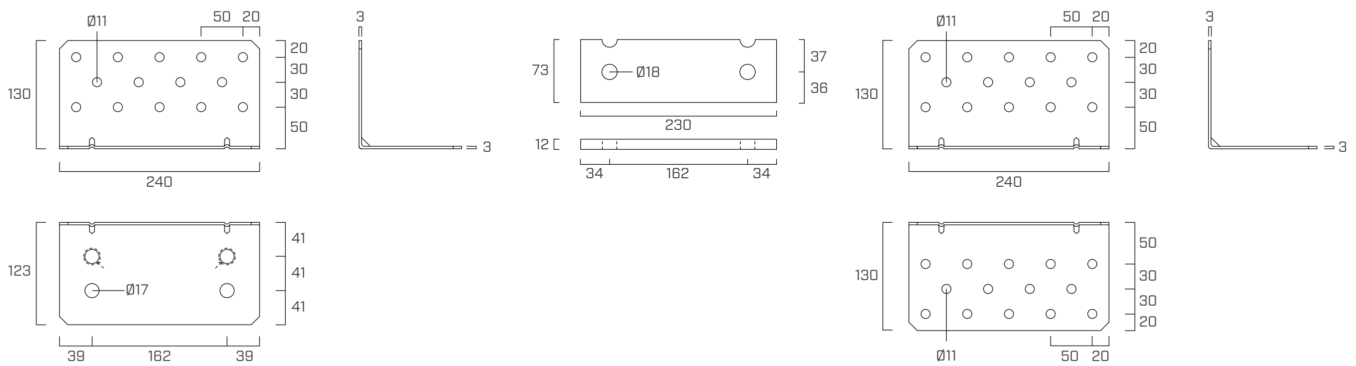


ADDITIONAL PRODUCTS - FASTENING

type	description		d [mm]	support
HBS PLATE	pan head screw		8	
AB1	mechanical anchor		16	
SKR	screw anchor		16	
VIN-FIX(*)	chemical anchor		M16	
HYB-FIX	chemical anchor		M16	

(*) For more information, see the data sheet available at www.rothoblaas.com

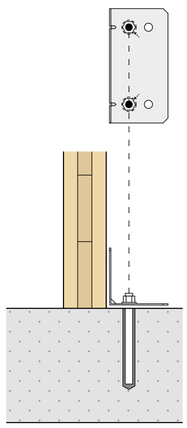
GEOMETRY



INSTALLATION ON CONCRETE

To fix **TITAN TCS** angle bracket to the concrete foundation, **2 anchors** must be used, according to one of the following installation configurations, according to the acting stress.

IDEAL INSTALLATION

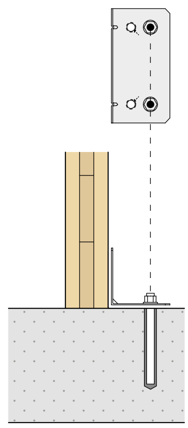


2 anchors positioned in the INTERNAL HOLES (**IN**) (identified by a mark on the product)

Reduced stress on the anchor (minimum e_y and k_t eccentricity)

Optimized connection strength

ALTERNATIVE INSTALLATION

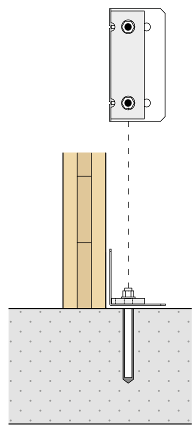


2 anchors placed in the EXTERNAL HOLES (**OUT**) (e.g. interaction between the anchor and the concrete support reinforcement)

Maximum stress on the anchor (maximum e_y and k_t eccentricity)

Reduced connection strength

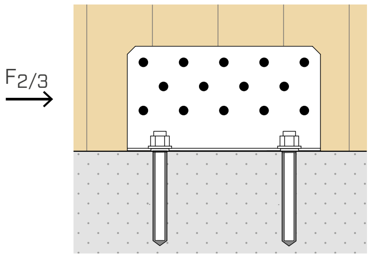
INSTALLATION WITH WASHER



The WASHER TCW must be fastened by means of 2 anchors positioned in the INTERNAL HOLES (**IN**)

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

TCS240



TIMBER STRENGTH

	TIMBER				CONCRETE			
configuration on timber	type	holes fastening Ø11 Ø x L [mm]	n_V [pcs]	$R_{2/3,k\ timber}$ [kN]	holes fastening Ø17 Ø [mm]	n_H [pcs]	IN(1) $e_{y,IN}$ [mm]	OUT(2) $e_{y,OUT}$ [mm]
TCS240	HBS PLATE	Ø8,0 x 80	14	**70,3**	M16	2	39,5	80,5

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions for anchors installed in the inner (IN) or outer (OUT) holes.

configuration on concrete	holes fastening Ø17 type	Ø x L [mm]	$R_{2/3,d\ concrete}$ IN(1) [kN]	OUT(2) [kN]
• uncracked	VIN-FIX 5.8	M16 x 160	**67,2**	**52,9**
	VIN-FIX 8.8	M16 x 160	**90,1**	**70,9**
	SKR-CE	16 x 130	**67,4**	**53,1**
	AB1	M16 x 145	**67,4**	**53,1**
• cracked	VIN-FIX 5.8 / 8.8	M16 x 160	**55,0**	**43,2**
	SKR-CE	16 x 130	**55,0**	**43,2**
	AB1	M16 x 145	**55,0**	**43,2**
• seismic	HYB-FIX 8.8	M16 x 195	**35,2**	**27,7**
		M16 x 245	**46,9**	**37,0**

installation	anchor type: type	Ø x L [mm]	t_{fix} [mm]	h_{ef} [mm]	h_{nom} [mm]	h_1 [mm]	d_0 [mm]	h_{min} [mm]
TCS240	VIN-FIX 5.8 / 8.8	M16 x 160	3	134	134	140	18	**200**
	HYB-FIX 8.8	M16 x 195	3	164	164	170	18	
		M16 x 245	3	219	219	225	18	**260**
	SKR-CE	16 x 130	3	85	127	150	14	**200**
	AB1	M16 x 145	3	85	97	105	16	

INA precut threaded rod complete with nut and washer: see INA data sheet at www.rothoblaas.com

t_{fix} fastened plate thickness
h_{nom} nominal anchoring depth
h_{ef} effective anchor depth
h_1 minimum hole depth
d_0 hole diameter in the concrete support
h_{min} concrete minimum thickness

NOTES:

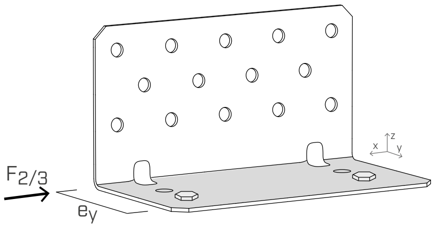
(1) Installation of the anchors in the two internal holes (IN).
(2) Installation of the anchors in external holes (OUT).

TCS240 | VERIFICATION OF CONCRETE ANCHORS FOR STRESS | $F_{2/3}$

Fastening elements to the concrete through anchors shall be verified according to the load acting on the anchor, which can be evaluated through the geometric parameters on the table (e).
E_y calculation eccentricities vary depending on the type of installation selected: 2 internal anchors (IN) or 2 external anchors (OUT).

The anchor group must be verified for:

$V_{Sd,x} = F_{2/3,d}$
$M_{Sd,z} = F_{2/3,d} \times e_{y,IN/OUT}$

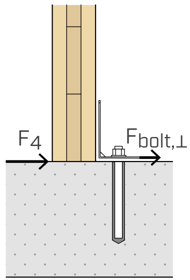


STRUCTURAL VALUES | SHEAR JOINT F_4 - F_5 - $F_{4/5}$ | TIMBER-TO-CONCRETE

TCS240

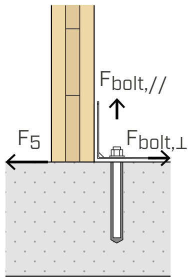
	TIMBER				STEEL		CONCRETE			
F_4	holes fastening Ø11			$R_{4,k\ timber}$	$R_{4,k\ steel}$		holes fastening		IN[1]	
	type	Ø x L [mm]	n_v [pcs]	[kN]	[kN]	γ_{steel}	Ø [mm]	n_H [pcs]	$k_{t\perp}$	$k_{t//}$
TCS240	HBS PLATE	Ø8,0 x 80	14	**21,1**	**18,1**	γ_{M0}	M16	2	0,5	-

The group of 2 anchors must be verified for: 345r$V_{Sd,y} = 2 \times k_{t\perp} \times F_{4,d}$



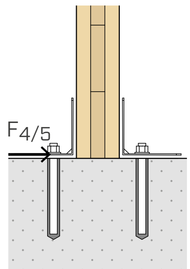
	TIMBER				STEEL		CONCRETE			
F_5	holes fastening Ø11			$R_{5,k\ timber}$	$R_{5,k\ steel}$		holes fastening		IN[1]	
	type	Ø x L [mm]	n_v [pcs]	[kN]	[kN]	γ_{steel}	Ø [mm]	n_H [pcs]	$k_{t\perp}$	$k_{t//}$
TCS240	HBS PLATE	Ø8,0 x 80	14	**17,1**	**4,3**	γ_{M0}	M16	2	0,5	0,36

The group of 2 anchors must be verified for: $V_{Sd,y} = 2 \times k_{t\perp} \times F_{5,d}$; $N_{Sd,z} = 2 \times k_{t//} \times F_{5,d}$



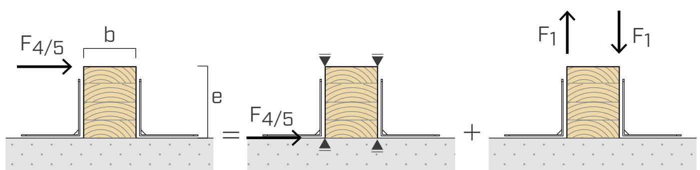
	TIMBER				STEEL		CONCRETE			
$F_{4/5}$ TWO ANGLE BRACKETS	holes fastening Ø11			$R_{4/5,k\ timber}$	$R_{4/5,k\ steel}$		holes fastening		IN[1]	
	type	Ø x L [mm]	n_v [pcs]	[kN]	[kN]	γ_{steel}	Ø [mm]	n_H [pcs]	$k_{t\perp}$	$k_{t//}$
TCS240	HBS PLATE	Ø8,0 x 80	14 + 14	**27,4**	**18,8**	γ_{M0}	M16	2 + 2	0,39	0,08

The group of 2 anchors must be verified for: $V_{Sd,y} = 2 \times k_{t\perp} \times F_{4/5,d}$; $N_{Sd,z} = 2 \times k_{t//} \times F_{4/5,d}$



The F_4, F_5, $F_{4/5}$ values in the table are valid for the acting stress calculation eccentricity e=0 (timber elements prevented from rotating). For joints with 2 angle brackets, in case the stress $F_{4/5,d}$ is applied with eccentricity e≠0, the verification for combined loads is required considering the contribution of the additional tensile component:

$$\Delta F_{1,d} = F_{4/5,d} \cdot \frac{e}{b}$$

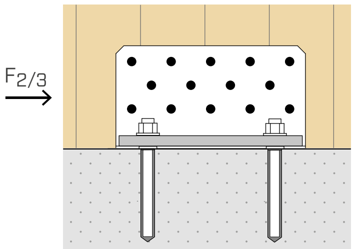


GENERAL PRINCIPLES:

For the general principles of calculation, see page 13.

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

TCS240 + TCW240



TIMBER STRENGTH

	TIMBER				CONCRETE			
configuration on timber	holes fastening Ø11			$R_{2/3,k\ timber}$	holes fastening Ø17		IN[1]	
	type	Ø x L [mm]	n_v [pcs]	[kN]	Ø [mm]	n_H [pcs]	$e_{y,IN}$ [mm]	$e_{z,IN}$ [mm]
TCS240 + TCW240	HBS PLATE	Ø8,0 x 80	14	**85,9**	M16	2	39,5	78,5

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions on concrete for anchors installed in internal holes (IN) with WASHER.

configuration on concrete	holes fastening Ø17		$R_{2/3,d\ concrete}$
	type	Ø x L [mm]	IN[1] [kN]
• uncracked	VIN-FIX 5.8	M16 x 195	**58,5**
	VIN-FIX 8.8	M16 x 195	**60,9**
	HYB-FIX 8.8	M16 x 195	**81,4**
	SKR-CE	16 x 130	**33,9**
	AB1	M16 x 145	**41,6**
• cracked	VIN-FIX 5.8 / 8.8	M16 x 195	**33,6**
	HYB-FIX 8.8	M16 x 245	**81,4**
	AB1	M16 x 145	**29,6**
• seismic	HYB-FIX 8.8	M16 x 245	**24,7**

installation	anchor type		t_{fix}	h_{ef}	h_{nom}	h_1	d_0	h_{min}
	type	Ø x L [mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
TCS240 + TCW240	VIN-FIX 5.8 / 8.8	M16 x 195	15	160	160	165	18	**200**
	HYB-FIX 8.8	M16 x 195	15	160	160	165	18	
		M16 x 245	15	210	210	215	18	**250**
	SKR-CE	16 x 130	15	85	115	145	14	**200**
	AB1	M16 x 145	15	85	97	105	16	

INA precut threaded rod complete with nut and washer: see INA data sheet at www.rothoblaas.com

t_{fix} fastened plate thickness
h_{nom} nominal anchoring depth
h_{ef} effective anchor depth
h_1 minimum hole depth
d_0 hole diameter in the concrete support
h_{min} concrete minimum thickness

NOTES:

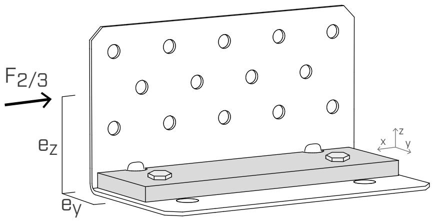
(1) Installation of the anchors in the two internal holes (IN).
(2) Installation of the anchors in external holes (OUT).

TCW240 | VERIFICATION OF CONCRETE ANCHORS FOR STRESS $F_{2/3}$

Fastening elements to the concrete through anchors shall be verified according to the load acting on the anchor, which can be evaluated through the geometric parameters on the table (e).
The calculation eccentricities e_y and e_z refer to installation with WASHER TCW of 2 internal anchors (IN).

The anchor group must be verified for:

$V_{Sd,x} = F_{2/3,d}$
$M_{Sd,z} = F_{2/3,d} \times e_{y,IN}$
$M_{Sd,y} = F_{2/3,d} \times e_{z,IN}$



TCS240 - TCW240 | CONNECTION STIFFNESS FOR STRESS | $F_{2/3}$

EVALUTATION OF SLIP MODULUS $K_{2/3,ser}$

- $K_{2/3,ser}$ experimental average value for TITAN joint on CLT (Cross Laminated Timber) according to ETA 11/0496

type	fastening type Ø x L [mm]	n_v [pcs]	$K_{2/3,ser}$ [N/mm]
TCS240	HBS PLATE Ø8,0 x 80	14	**8200**
TCS240 + TCW240	HBS PLATE Ø8,0 x 80	14	**8600**

- K_{ser} according to EN 1995-1-1 for timber-to-timber joint screws* C24/GL24h

Screws (nails without pre-drilling hole) $\frac{\rho_m^{1,5} \cdot d^{0,8}}{30}$ (EN 1995 § 7.1)

type	fastening type Ø x L [mm]	n_v [pcs]	K_{ser} [N/mm]
TCS240 (+ TCW240)	HBS PLATE Ø8,0 x 80	14	**21201**

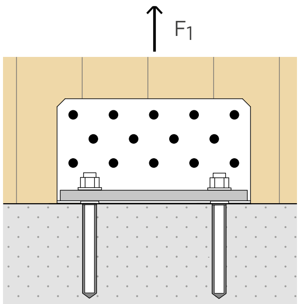
* For steel-to-timber connections the reference standard indicates the possibility of doubling the value of K_{ser} listed in the table (7.1 (3)).

GENERAL PRINCIPLES:

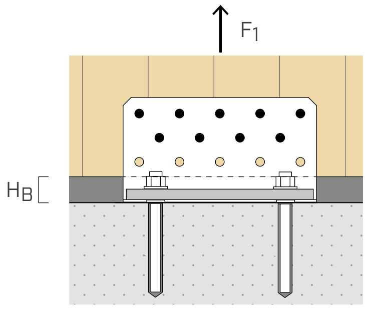
For the general principles of calculation, see page 13.

STRUCTURAL VALUES | TENSILE JOINT F_1 | TIMBER-TO-CONCRETE

TCS240 + TCW240



FULL PATTERN



PARTIAL PATTERN[1]

TIMBER STRENGTH

configuration on timber		TIMBER				STEEL		CONCRETE		
		holes fastening Ø11			$R_{1,k\ timber}$	$R_{1,k\ steel}$		holes fastening Ø17		IN[2]
		type	Ø x L	n_v				Ø	n_H	$k_{t//}$
			[mm]	[pcs]	[kN]	[kN]	γ_{steel}	[mm]	[pcs]	[mm]
TCS240 + TCW240	full pattern	HBS PLATE	Ø8,0 x 80	14	-	**75,9**	γ_{M0}	M16	2	**1,08**
	partial pattern	HBS PLATE	Ø8,0 x 80	9	**33,9**	**75,9**				

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions on concrete for anchors installed in internal holes (IN) with WASHER.

configuration on concrete	holes fastening Ø17		$R_{1,d\ concrete}$
	type	Ø x L	IN[2]
		[mm]	[kN]
• uncracked	VIN-FIX 5.8	M16 x 195	**27,4**
	HYB-FIX 8.8	M16 x 195	**45,7**
• cracked	VIN-FIX 5.8	M16 x 195	**15,3**
	HYB-FIX 5.8	M16 x 195	**31,2**
	HYB-FIX 8.8	M16 x 245	**42,2**
• seismic	HYB-FIX 8.8	M16 x 245	**14,9**
		M16 x 330	**21,1**

installation	anchor type		t_{fix}	h_{ef}	h_{nom}	h_1	d_0	h_{min}
	type	Ø x L [mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
TCS240 + TCW240	VIN-FIX 5.8	M16 x 195	15	160	160	165	18	**200**
	HYB-FIX 5.8	M16 x 195	15	160	160	165	18	
	HYB-FIX 8.8	M16 x 195	15	160	160	165	18	**200**
		M16 x 245	15	210	210	215	18	**250**
		M16 x 330	15	295	295	300	18	**350**

INA precut threaded rod complete with nut and washer: see INA data sheet at www.rothoblaas.com

t_{fix} fastened plate thickness
h_{nom} nominal anchoring depth
h_{ef} effective anchor depth
h_1 minimum hole depth
d_0 hole diameter in the concrete support
h_{min} concrete minimum thickness

NOTES:

(1) In case of design requirements such as F_1 stress of different value or presence of an H_B intermediate layer between the wall and the supporting surface, partial fastening with $H_B \leq 32$ mm can be adopted for application on CLT panel.

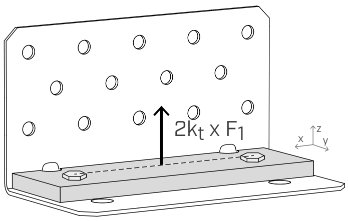
(2) Installation of the anchors in the two internal holes (IN).

TCW200 - TCW240 | ANCHORS FOR CONCRETE STRESS VERIFICATION | F_1

Fastening elements to the concrete through anchors shall be verified according to the load acting on the anchor, which can be evaluated through the geometric parameters on the table (k_t).
2 internal anchors (IN) must be provided for installation on concrete with WASHER TCW.

The anchor group must be verified for:

$N_{Sd,z} = 2 \times k_{t//} \times F_{1,d}$

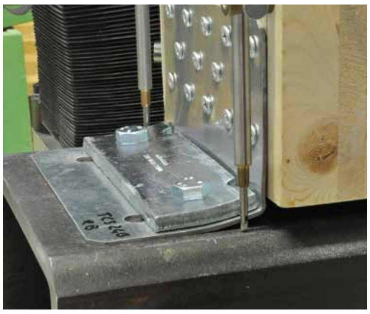


TCW240 | CONNECTION STIFFNESS FOR STRESS F_1

EVALUTATION OF SLIP MODULUS $K_{1,ser}$

- $K_{1,ser}$ experimental average for TITAN connection on CLT (Cross Laminated Timber) according to ETA 11/0496

type	fastening type Ø x L [mm]	n_v [pcs]	$K_{1,ser}$ [N/mm]
TCS240 + TCW240	HBS PLATE Ø8,0 x 80	14	**11500**



- K_{ser} according to EN 1995-1-1 for timber-to-timber joint screws* C24/GL24h

Screws (nails without pre-drilling hole) $\frac{\rho_m^{1,5} \cdot d^{0,8}}{30}$ (EN 1995 § 7.1)

type	fastening type Ø x L [mm]	n_v [pcs]	K_{ser} [N/mm]
TCS240 + TCW240	HBS PLATE Ø8,0 x 80	14	**21201**

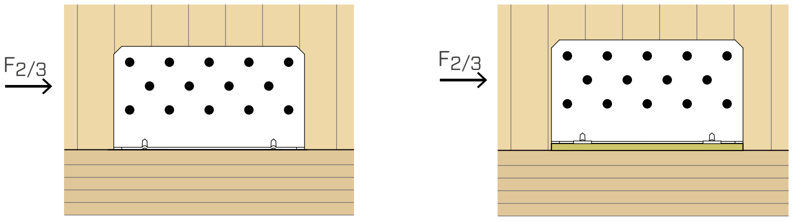
* For steel-to-timber connections the reference standard indicates the possibility of doubling the value of K_{ser} listed in the table (7.1 (3)).

GENERAL PRINCIPLES:

For the general principles of calculation, see page 13.

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

TTS240



configuration on timber[1]	TIMBER					
	holes fastening Ø11				profile[2]	$R_{2/3,k\ timber}$
	type	Ø x L [mm]	n_V [pcs]	n_H [pcs]	s [mm]	[kN]
TTS240	HBS PLATE	Ø8,0 x 80	14	14	-	**60,0**
TTS240 + XYLOFON	HBS PLATE	Ø8,0 x 80	14	14	6	**12,5**
TTS240 + ALADIN STRIPE SOFT					5	**14,7**
TTS240 + ALADIN STRIPE EXTRA SOFT					7	**13,9**

TTS240 | CONNECTION STIFFNESS FOR STRESS | $F_{2/3}$

EVALUTATION OF SLIP MODULUS $K_{2/3,ser}$

- $K_{2/3,ser}$ experimental average value for TITAN joint on CLT (Cross Laminated Timber) according to ETA 11/0496

type	fastening type Ø x L [mm]	n_V [pcs]	n_H [pcs]	$K_{2/3,ser}$ [N/mm]
TTS240	HBS PLATE Ø8,0 x 80	14	14	**5600**

- K_{ser} according to EN 1995-1-1 for timber-to-timber joint screws* C24/GL24h

Screws (nails without pre-drilling hole) $\frac{\rho_m^{1,5} \cdot d^{0,8}}{30}$ (EN 1995 § 7.1)

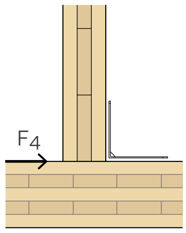
type	fastening type Ø x L [mm]	n_V [pcs]	K_{ser} [N/mm]
TTS240	HBS PLATE screws Ø8,0 x 80	14	**21201**

* For steel-to-timber connections the reference standard indicates the possibility of doubling the value of K_{ser} listed in the table (7.1 (3)).

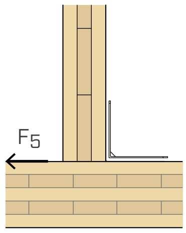
STRUCTURAL VALUES | SHEAR JOINT F_4 - F_5 - $F_{4/5}$ | TIMBER-TO-TIMBER

TTS240

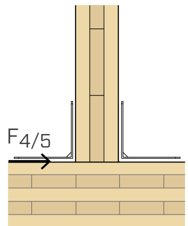
	TIMBER				STEEL	
F_4		holes fastening Ø11		$R_{4,k\ timber}$	$R_{4,k\ steel}$	
	type	Ø x L	n			
		[mm]	[pcs]	[kN]	[kN]	γ_{steel}
TTS240	HBS PLATE	Ø8,0 x 80	14 + 14	**20,7**	**20,9**	γ_{M0}



	TIMBER				STEEL	
F_5		holes fastening Ø11		$R_{5,k\ timber}$	$R_{5,k\ steel}$	
	type	Ø x L	n			
		[mm]	[pcs]	[kN]	[kN]	γ_{steel}
TTS240	HBS PLATE	Ø8,0 x 80	14 + 14	**16,8**	**4,2**	γ_{M0}



	TIMBER				STEEL	
$F_{4/5}$ TWO ANGLE BRACKETS		holes fastening Ø11		$R_{4/5,k\ timber}$	$R_{4/5,k\ steel}$	
	type	Ø x L	n_v			
		[mm]	[pcs]	[kN]	[kN]	γ_{steel}
TTS240	HBS PLATE	Ø8,0 x 80	28 + 28	**25,2**	**23,4**	γ_{M0}



The F_4, F_5, $F_{4/5}$ values in the table are valid for the acting stress calculation eccentricity e=0 (timber elements prevented from rotating).

NOTES:

(1) The TTS240 angle bracket can be installed in combination with different resilient acoustic profiles inserted below the horizontal flange. The strength values in the table are given in ETA 11/0496 and calculated according to *"Blaß, H.J. und Laskewitz, B. (2000); Load-Carrying Capacity of Joints with Dowel-Type fasteners and Interlayers."*, conservatively disregarding the stiffness of the profile.

(2) Profile thickness: in the case of ALADIN profile, the calculation took into account the reduced thickness of the profile itself, due to the corrugated section and the consequent crushing induced by the nail head during insertion.

GENERAL PRINCIPLES:

For the general principles of calculation, see page 13.

GENERAL PRINCIPLES:

- Characteristic values are consistent with EN 1995-1-1 and in accordance with ETA-11/0496. The design values of the anchors for concrete are calculated in accordance with the respective European Technical Assessments (see Chapter 6 ANCORS FOR CONCRETE). The connection design strength values are obtained from the values on the table as follows:

$$R_d = min \begin{cases} \dfrac{R_{k,\ timber} \cdot k_{mod}}{\gamma_M} \\ \dfrac{R_{k,\ steel}}{\gamma_{steel}} \\ R_{d,\ concrete} \end{cases}$$

  The coefficients k_{mod}, γ_M and γ_{steel} 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. Verify that there are no brittle fractures before reaching the connection strength.
- Structural elements in timber, to which the connection devices are fastened, must be prevented from rotating.
- For the calculation process a timber characteristic density ρ_k = 350 kg/m^3 has been considered. For higher ρ_k values, the strength on timber side can be converted by the k_{dens} value:

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

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

- In the calculation phase, a strength class of C25/30 concrete with thin reinforcement was considered, in the absence of spacing and distances from the edge and minimum thickness indicated in the tables listing the installation parameters of the anchors used. The strength values are valid for the calculation hypotheses defined in the table; for boundary conditions different from the ones in the table (e.g. minimum distances from the edge or different concrete thickness), the concrete-side anchors can be verified using MyProject calculation software according to the design requirements.
- Seismic design in performance category C2, without ductility requirements on anchors (option a2) elastic design according to EOTA TR045. For chemical anchors subjected to shear stress it is assumed that the annular space between the anchor and the plate hole is filled (α_{gap} = 1).