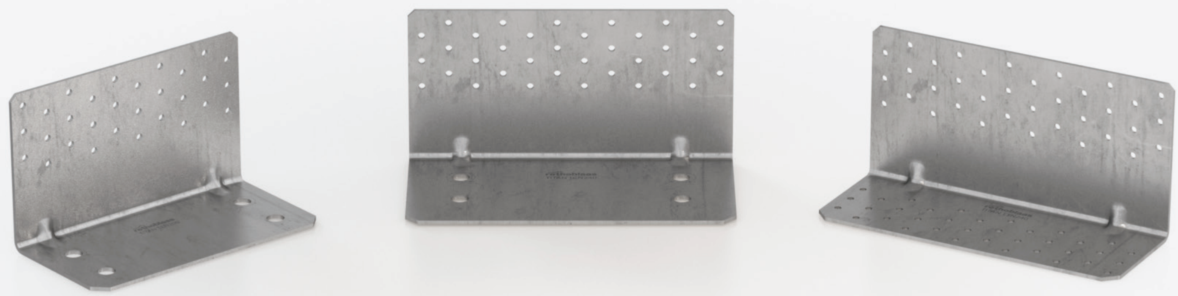
TITAN N

ETA 11/0496

software
myProject
COMING SOON

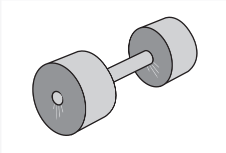
Angle bracket for shear loads in solid walls

Bright zinc plated carbon steel three-dimensional perforated plate



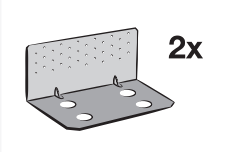
SUPERIOR STRENGTH

Geometry designed to provide high shear strength. Suitable for projects in windy and seismic areas



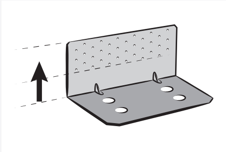
CONCRETE HOLES

The angle bracket is designed to offer two fixing possibilities, in order to avoid interference with the rebars in the concrete support



HIGHER HOLES

The hole position on the vertical flange facilitates the use of pneumatic machines in case of fastening on XLAM (Cross Laminated Timber) panels



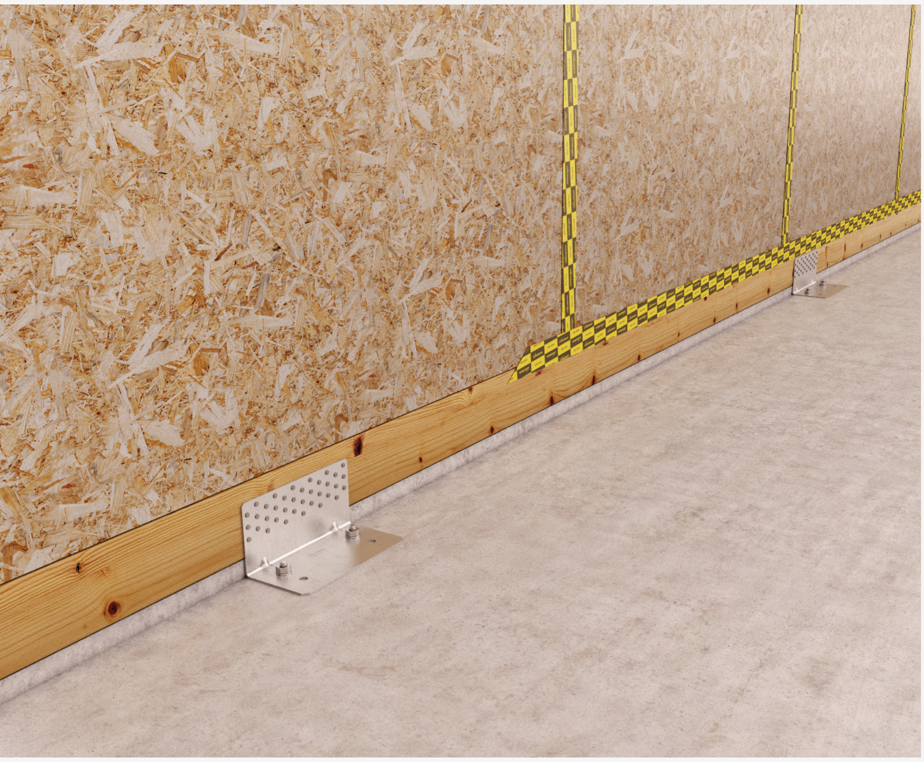
COST / PERFORMANCE

Optimization of the number of angle brackets to be installed and subsequent installation-time saving

FIELD OF USE

qTimber-to-timber and timber-to-concrete shear joints for panels and timber beams

- XLAM (Cross Laminated Timber)
- framed structures (platform frame)
- wood-based panels
- LVL (Laminated Veneer Lumber)
- solid timber
- glulam (Glued Laminated Timber)



XLAM (Cross Laminated Timber)

Ideal for being installed on XLAM (Cross Laminated Timber) panels. The higher holes allow the complete fastening of the angle bracket through pneumatic machines even if the concrete level is variable

GEOMETRY

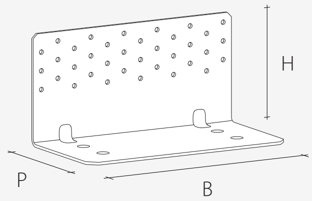
The two hole lines, placed parallel to each other, offer a second fixing option avoiding any interference with the rebars in the concrete underneath. Reinforcements provide torsional stability to the bracket

EFFICIENCY

The high strength allows the optimization of the connection, with a reduced number of angle brackets. This means a quicker onsite installation if compared to traditional constructive systems. Ideal for structures in seismic and windy areas

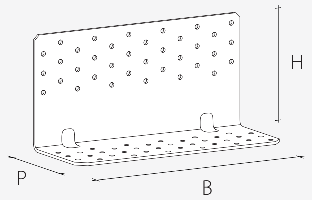
CODES AND DIMENSIONS

TITAN N - TCN



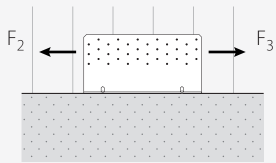
code	type	B [mm]	P [mm]	H [mm]	holes [mm]	n_V Ø5 [pcs]	s [mm]		pcs/box
TCN200	**TCN200**	200	103	120	Ø13	30	3	•	10
TCN240	**TCN240**	240	123	120	Ø17	36	3	•	10

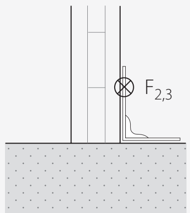
TITAN N - TTN



code	type	B [mm]	P [mm]	H [mm]	n_H Ø5 [pcs]	n_V Ø5 [pcs]	s [mm]		pcs/box
TTN240	**TTN240**	240	93	120	36	36	3	•	10

EXTERNAL LOADS





MATERIAL AND DURABILITY

TITAN N: Z275 bright zinc plated DX51D carbon steel.
To be used in Service class 1 and 2 (EN 1995:2008).

FIELD OF USE

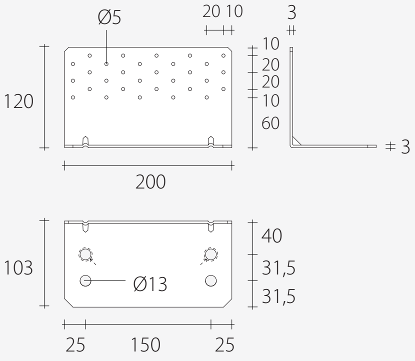
Timber to concrete joints
Timber to timber joints
Steel to timber joints

ADDITIONAL PRODUCTS - FASTENERS

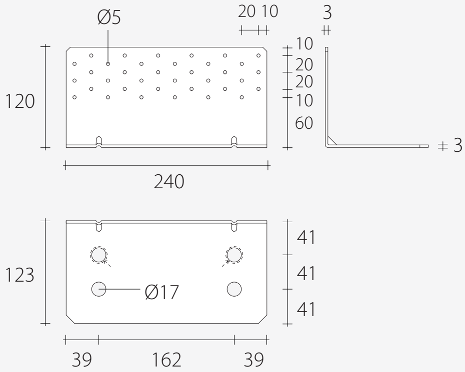
type	description	d1 [mm]	support	p.
LBA	anker nails	4		364
LBS	screw for plates	5		364
AB1	mechanical anchor	12 - 16		334
SKR	screw anchor	12 - 16		328
VINYLPRO	chemical anchor	M12 - M16		346
EPOPLUS	chemical anchor	M12 - M16		354
KOS	bolt	M12 - M16		54

GEOMETRY

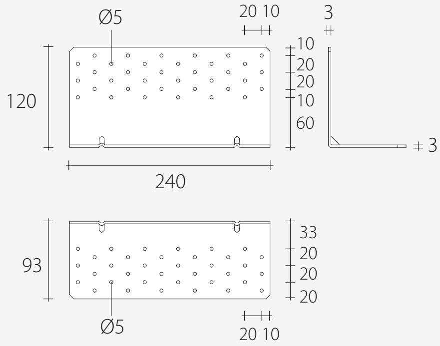
TCN200



TCN240



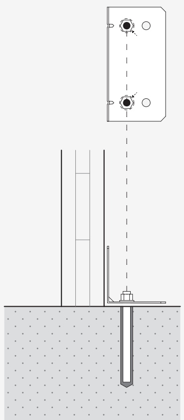
TTN240



INSTALLATION ON CONCRETE

To fix **TITAN TCN** angle bracket to the concrete foundation, **2 anchors** must be used, according to one of the following installation configurations:

IDEAL INSTALLATION

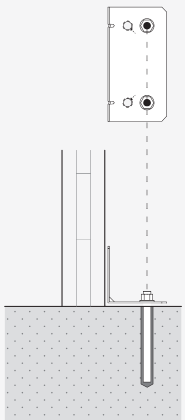


2 anchors positioned in
INTERNAL HOLES (**IN**)
(identified by a mark on the product)

Reduced load on the dowel
($k_{t\perp}$ = minimo)

Optimized
connection strength

ALTERNATIVE INSTALLATION

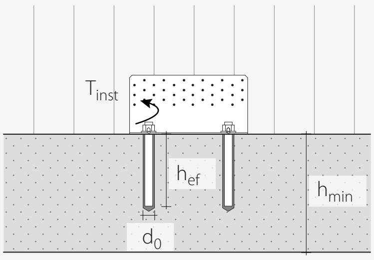


2 anchors positioned in
EXTERNAL HOLES (**OUT**)
(eg. interaction between the anchor and the rebars in the concrete support)

Maximum load on the dowel
($k_{t\perp}$ = massimo)

Reduced connection strength

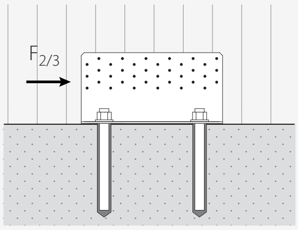
INSTALLATION PARAMETERS



			screw anchor SKR CE (SKR)		mechanical anchor AB1		chemical anchor VINYLPRO / EPOPLUS	
CONCRETE			**Ø12**	**Ø16**	**M12**	**M16**	**M12**	**M16**
Minimum support thickness	h_{min}	[mm]	130	165	140	170	h_{ef} + 30 mm ≥ 100 mm	h_{ef} + 2 d_0
Hole diameter in concrete	d_0	[mm]	10	14	12	16	14	18
Tightening torque	T_{inst}	[Nm]	80 (50)	160	50	120	40	80

h_{ef} = effective anchorage length in concrete

STATIC VALUES - SHEAR JOINT - TIMBER-TO-CONCRETE



TITAN TCN200

TIMBER STRENGTH $R_{2/3}$

configuration on timber	type	hole fixing Ø5 Ø x L [mm]	hole fixing Ø5 n_v [pcs]	CHARACTERISTIC VALUES $R_{2/3,k\ timber}$ [kN]	ADMISSIBLE VALUES $V_{2/3,\ adm,\ timber}$ [kg]
nails	LBA	Ø4,0 x 60	30	**22,1**	*960*
screws	LBS	Ø5,0 x 50	30	**26,5**	*1150*

CONCRETE STRENGTH $R_{2/3}$

configuration for type of concrete	type of anchor [(3)]	hole fixing Ø13 Ø x L [mm]	n_H [pcs]	steel class	CHARACTERISTIC VALUES $R_{2/3,k\ cls}$ IN [(1)] [kN]	OUT [(2)] [kN]	γ_{cls}	ADMISSIBLE VALUES $V_{2/3,\ adm,\ cls}$ [kg]
• uncracked concrete • screw anchor	SKR	12 x min. 100	2	-	**42,6**	**33,4**	1,5	*1140*
• uncracked concrete • mechanical anchor	AB1	M12 x 103	2	-	**30,3**	**23,7**	1,5	*1054*
• uncracked concrete • chemical anchor	VINYLPRO	M12 x 130	2	5.8	**27,6**	**21,6**	1,25	*1155*
				8.8	**44,7**	**35,1**	1,25	*1869*
• cracked concrete • chemical anchor	EPOPLUS	M12 x 130	2	5.8	**27,6**	**21,6**	1,25	-
				8.8	**44,7**	**35,1**	1,25	-

TITAN TCN240

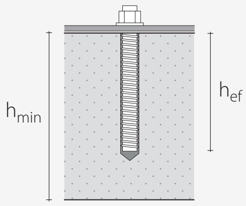
TIMBER STRENGTH $R_{2/3}$

configuration on timber	type	hole fixing Ø5 Ø x L [mm]	hole fixing Ø5 n_v [pcs]	CHARACTERISTIC VALUES $R_{2/3,k\ timber}$ [kN]	ADMISSIBLE VALUES $V_{2/3,\ adm,\ timber}$ [kg]
nails	LBA	Ø4,0 x 60	36	**30,3**	*1320*
screws	LBS	Ø5,0 x 50	36	**36,3**	*1580*

CONCRETE STRENGTH $R_{2/3}$

configuration for type of concrete	type of anchor [(3)]	hole fixing Ø13 Ø x L [mm]	n_H [pcs]	steel class	CHARACTERISTIC VALUES $R_{2/3,k\ cls}$ IN [(1)] [kN]	OUT [(2)] [kN]	γ_{cls}	ADMISSIBLE VALUES $V_{2/3,\ adm,\ cls}$ [kg]
• uncracked concrete • screw anchor	SKR	16 x 130	2	-	**76,9**	**56,9**	1,5	*2529*
• uncracked concrete • mechanical anchor	AB1	M16 x 138	2	-	**59,5**	**44,0**	1,5	*1956*
• uncracked concrete • chemical anchor	VINYLPRO	M16 x 160	2	5.8	**52,7**	**39,0**	1,25	*2080*
• cracked concrete • chemical anchor	EPOPLUS	M16 x 160	2	5.8	**52,7**	**39,0**	1,25	-

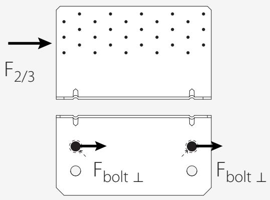
ANCHOR INSTALLATION PARAMETERS



	TYPE OF ANCHOR type	Ø x L [mm]	code	steel class	h_{ef} [mm]	h_{min} [mm]
M12	SKR	12 x min. 100	SKR12...	-	64	**200**
	AB1	M12 x 103	FE210440	-	70	**200**
	VINYLPRO / EPOPLUS	M12 x 130	FE210115 (4)	5.8	108	**200**
		M12 x 130	MGS11288 (5)	8.8	108	**200**
M16	SKR CE	M16 x 130	SKR16130CE	-	85	**200**
	AB1	M16 x 138	FE210493	-	85	**200**
	VINYLPRO / EPOPLUS	M16 x 160	FE210116 (4)	5.8	133	**200**

DIMENSIONING OF ALTERNATIVE ANCHORS

Fixing elements to the concrete ringbeam by means of anchors that are not listed in the table, shall be verified according to the load acting on the anchor, which can be evaluated through the $k_{t\perp}$. Coefficients $k_{t\perp}$ varies depending on the type of installation selected (2 internal anchors (IN) or 2 external anchors (OUT) as described at p. 157). The lateral shear load acting on the anchor can be obtained as follows:



$$F_{bolt\perp,d} = k_{t\perp} \cdot F_{2/3,d}$$

$k_{t\perp}$ = coefficient of eccentricity

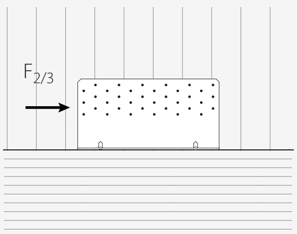
$F_{2/3}$ = shear load acting on the TITAN angle bracket

	$k_{t\perp}$ IN (1)	$k_{t\perp}$ OUT (2)
TCN200	0,76	0,97
TCN240	0,74	1,00

The anchor check is satisfied if the design tensile strength, obtained considering the boundary effects, is greater than the design external load: $R_{bolt\perp,d} \geq F_{bolt\perp,d}$.

STATIC VALUES - SHEAR JOINT - TIMBER-TO-TIMBER

TITAN TTN240



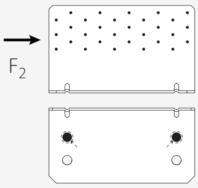
TIMBER STRENGTH $R_{2/3}$

				CHARACTERISTIC VALUES	*ADMISSIBLE VALUES*
	hole fixing Ø5			$R_{2/3,k\ timber}$	$V_{2/3,\ adm,\ timber}$
type	Ø x L [mm]	n_V [pcs]	n_H [pcs]	[kN]	*[kg]*
nails LBA	Ø4,0 x 60	36	36	**37,9**	*1650*
screw LBS	Ø5,0 x 50	36	36	**46,7**	*2030*

NOTES

(1) Installation of the anchors in internal holes (IN).
(2) Installation of the anchors in external holes (OUT).
(3) Possible alternative fixing scheme through anchor type ABS has to be verified separately.
(4) Precut INA threaded rod, with nut and washer.
(5) When employing threaded rods that are cut on size, the use of MUT DIN934 nut and ULS DIN 125 washer is recommended.

CALCULATION EXAMPLE - TIMBER-TO-CONCRETE JOINT



PROJECT DATA

- F_{2d} = 16,53 kN
- service class = 2
- load duration = instantaneous

CHOICE OF ANGLE BRACKET

- TITAN TCN200

CONFIGURATION

- uncracked concrete
- fixing on concrete: VINYLPRO M12 x 130 (steel grade 5.8) anchors installed internally (IN)
- fixing on timber: LBS Ø5 x 50 screws

CALCULATION OF SHEAR CAPACITY

$$R_d = min \begin{cases} \dfrac{R_{2/3,k\ timber} \cdot k_{mod}}{\gamma_m} \\ \dfrac{R_{2/3,k\ cls}}{\gamma_{cls}} \end{cases}$$

$R_{V\ 2/3,k\ timber}$ = 26,5 kN

$R_{V\ 2/3,k\ cls}$ = 27,6 kN (IN)

γ_{cls} = 1,25

EN 1995:2008

k_{mod} = 1,1

γ_m = 1,3

R_d = min { 22,42 ; 22,08 } = 22,08 kN

VERIFICATION

$R_d \geq F_d$: **22,08** > 16,53 kN **OK**

Italia - NTC 2008

k_{mod} = 1,0

γ_m = 1,5

R_d = min { 17,67 ; 22,08 } = 17,67 kN

VERIFICATION

$R_d \geq F_d$: **17,67** > 16,53 kN **OK**

GENERAL PRINCIPLES

- Characteristic values are consistnt with EN 1995:2008 and in accordance with ETA-11/0496.
- Design values can be obtained from characteristic values as follows:

$$R_d = min \begin{cases} \dfrac{R_{2/3,k\ timber} \cdot k_{mod}}{\gamma_m} \\ \dfrac{R_{2/3,k\ cls}}{\gamma_{cls}} \end{cases}$$

Coefficients γ_m and k_{mod} must be taken according to the current Standard adopted for the design. Coefficients γ_{cls} are listed in the table and are in accordance with the product's certificates.

- For the calculations, a timber density ρ_k = 350 kg/m^3 and a concrete grade C 25/30 have been considered.
- Dimensioning and verificaiton of timber elements must be carried out separately.
- Strength values of the connection system are valid under the calculation hypotheses listed in the table; different boundary conditions (e.g.. minimum edge distance) shall be verified.
- The use of two TITAN angle brackets, symmetrically-positioned, doubles the design strength of the joint.
- Admissible values are obtained according to DIN 1052:1988. The strength value is the minimum between the timber strength $V_{adm,timber}$ and the concrete strength $V_{adm,cls}$.