TITAN N

ANGLE BRACKET FOR SHEAR AND TENSILE FORCES

HIGH HOLES
Ideal for CLT, it is easy to install thanks to the raised holes. Values also certified with partial fastening for presence of bedding grout or base plate.

80 kN SHEAR
Exceptional shear strengths. Up to 82,6 kN on concrete (with TCW washer). Up to 58,0 kN on timber.

70 kN TENSILE
On concrete, TCN angle brackets with TCW washers provide excellent tensile strength. $R_{1,k}$ up to 69,8 kN characteristic values.

USA, Canada and more design values available online.

CE
ETA-11/0496

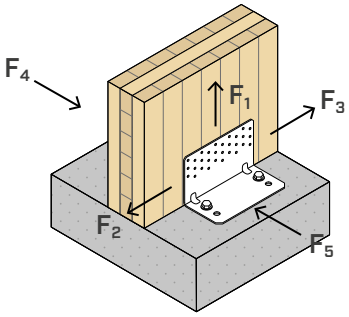
SERVICE CLASS SC1 SC2

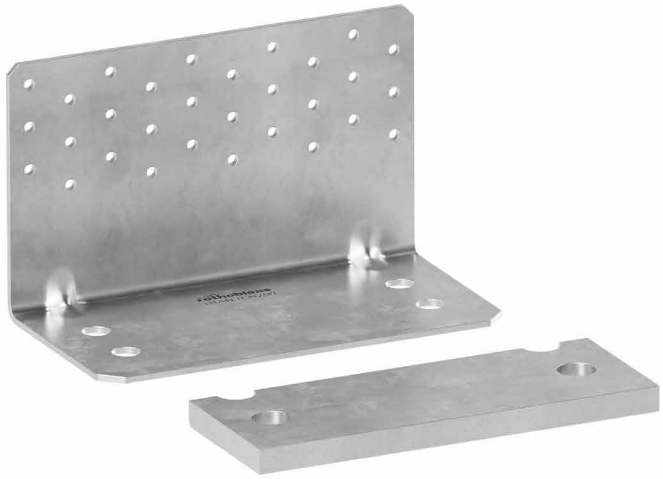
MATERIAL

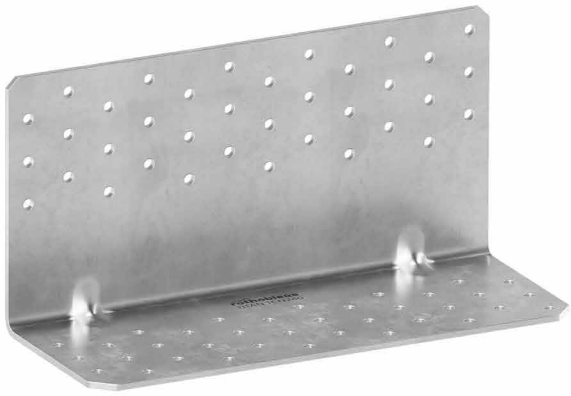
DX51D Z275 **TITAN N:** DX51D + Z275 carbon steel.

S235 Fe/Zn12c **TITAN WASHER:** S235 + Fe/Zn12c carbon steel

EXTERNAL LOADS



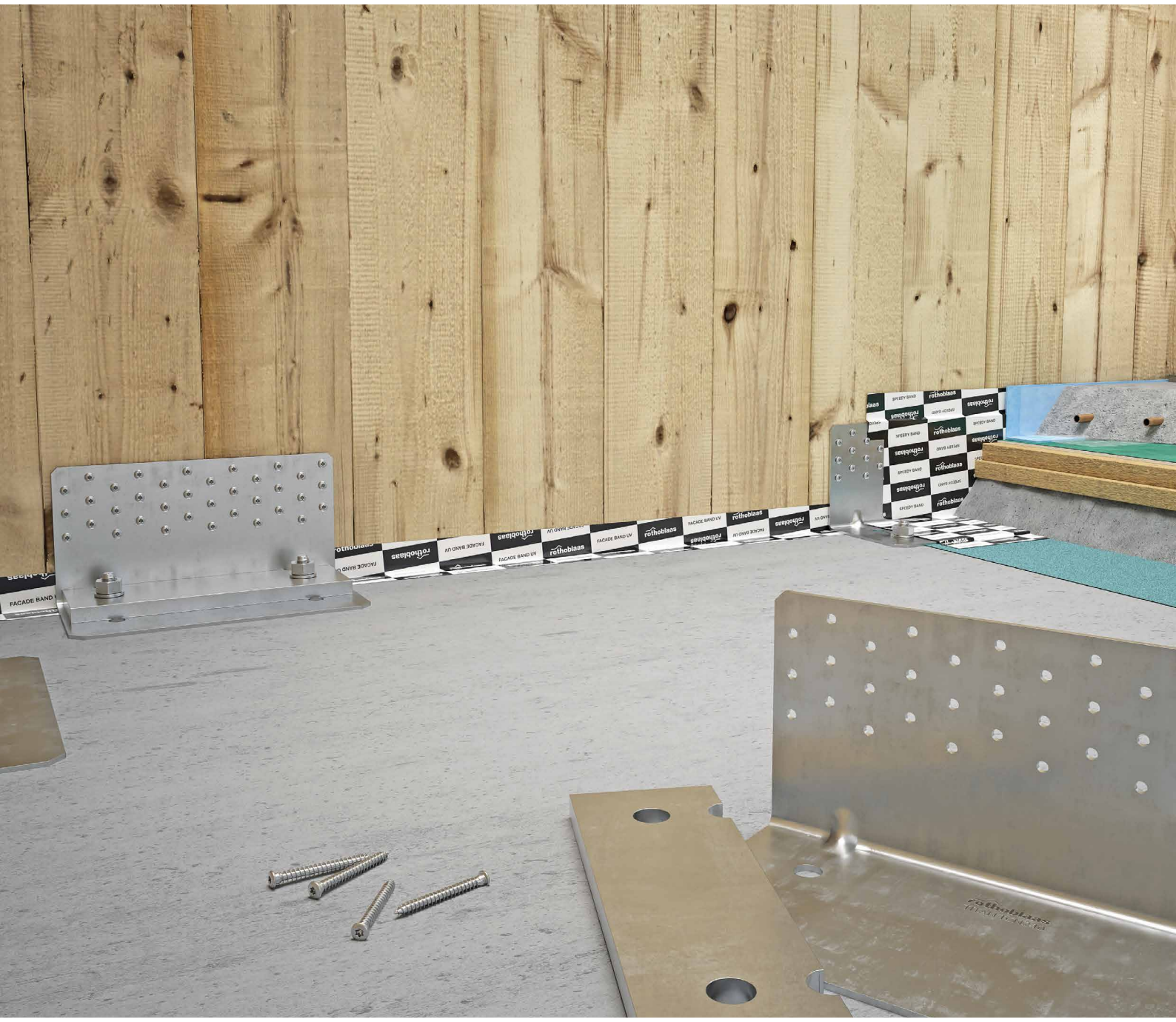




FIELDS OF USE

Shear and tension joints for timber walls. Suitable for walls subject to high stress. Timber-to-timber, timber-to-concrete and timber-to-steel configurations.

Can be applied to:
- solid timber and glulam
- CLT and LVL panels



CONCEALED HOLD DOWN

Ideal on timber-to-concrete 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 package due to its height of 120 mm.

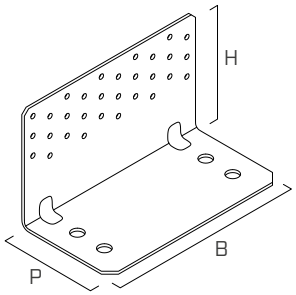
TIMBER-TO-TIMBER

It can also be used in connections between CLT panels.

CODES AND DIMENSIONS

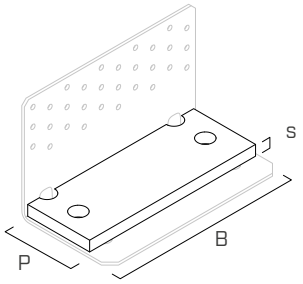
TITAN N - TCN | CONCRETE-TO-TIMBER JOINTS

CODE	B [mm] *[in]*	P [mm] *[in]*	H [mm] *[in]*	holes [mm] *[in]*	n_V Ø5 *n_V Ø.20* [pcs]	s [mm] *[in]*		pcs
TCN200	200 *8*	103 *4 1/16*	120 *4 3/4*	Ø13 *Ø0.52*	30	3 *0.12*	●	10
TCN240	240 *9 1/2*	123 *4 13/16*	120 *4 3/4*	Ø17 *Ø0.67*	36	3 *0.12*	●	10



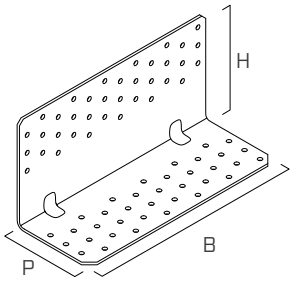
TITAN WASHER - TCW | CONCRETE-TO-TIMBER JOINTS

CODE	TCN200	TCN240	B [mm] *[in]*	P [mm] *[in]*	s [mm] *[in]*	holes [mm] *[in]*		pcs
TCW200	●	-	190 *7 1/2*	72 *2 13/16*	12 *0.47*	Ø14 *Ø0.56*	●	1
TCW240	-	●	230 *9 1/16*	73 *2 7/8*	12 *0.47*	Ø18 *Ø0.71*	●	1



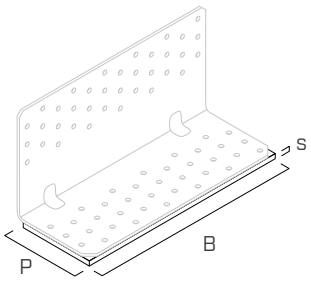
TITAN N - TTN | TIMBER-TO-TIMBER JOINTS

CODE	B [mm] *[in]*	P [mm] *[in]*	H [mm] *[in]*	n_H Ø5 *n_H Ø.20* [pcs]	n_V Ø5 *n_V Ø.20* [pcs]	s [mm] *[in]*		pcs
TTN240	240 *9 1/2*	93 *3 11/16*	120 *4 3/4*	36	36	3 *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*	120 *4 3/4*	6 *0.24*	●	10

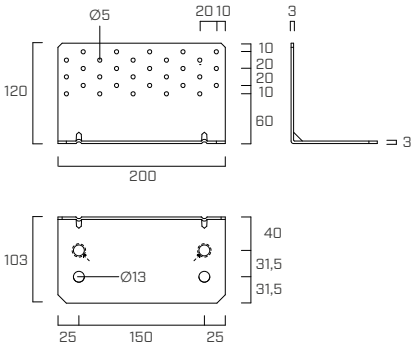


FASTENERS

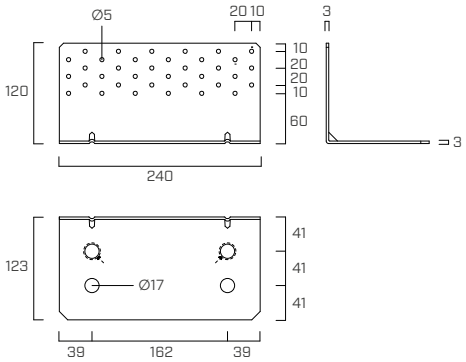
type	description		d [mm]	support	page
LBA	high bond nail		4		570
LBS	round head screw		5		571
LBS EVO	C4 EVO round head screw		5		571
AB1	CE1 expansion anchor		12 - 16		536
SKR	screw-in anchor		12 - 16		528
VIN-FIX	vinyl ester chemical anchor		M12 - M16		545
HYB-FIX	hybrid chemical anchor		M12 - M16		552
EPO-FIX	epoxy chemical anchor		M12 - M16		557

GEOMETRY

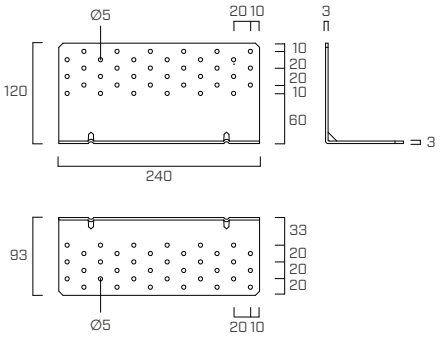
TCN200



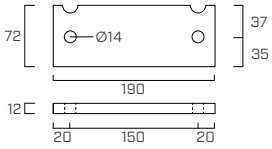
TCN240



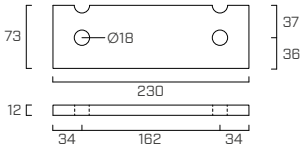
TTN240



TCW200



TCW240

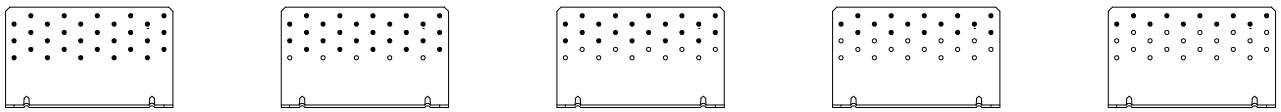


FASTENING PATTERNS

FASTENINGS FOR $F_{2/3}$ STRESS

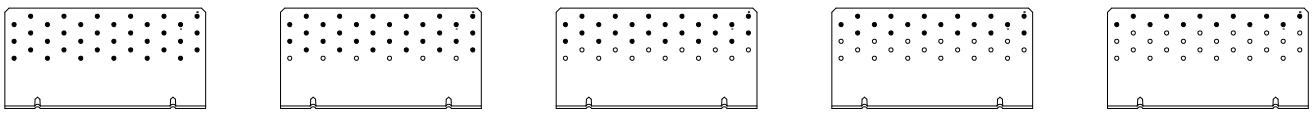
In the presence of design requirements such as $F_{2/3}$ stresses of different value or the presence of an intermediate H_B layer (levelling grout, sill or ground) between the wall and the supporting surface, partial fastening patterns can be adopted:

TCN200



full pattern | **pattern 4** | **pattern 3** | **pattern 2** | **pattern 1**

TCN240



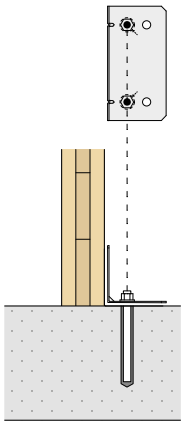
full pattern | **pattern 4** | **pattern 3** | **pattern 2** | **pattern 1**

Pattern 2 also applies in case of F_4, F_5 and $F_{4/5}$ stresses.

INSTALLATION

To fix **TITAN TCN** 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



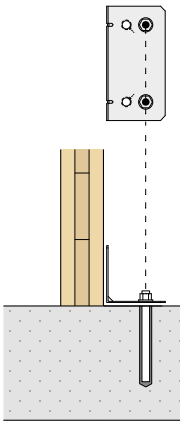
2 anchors positioned in the INTERNAL HOLES (**IN**) (identified by a mark on the product)

$e=e_{y,IN}$

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

Optimized connection strength

alternative installation



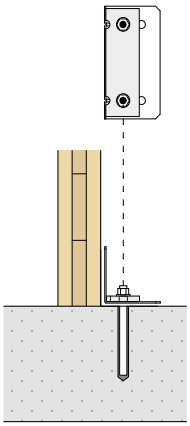
2 anchors placed in the EXTERNAL HOLES (**OUT**) (e.g. in case of clash between the anchor and the concrete support reinforcement)

$e=e_{y,OUT}$

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

Reduced connection strength

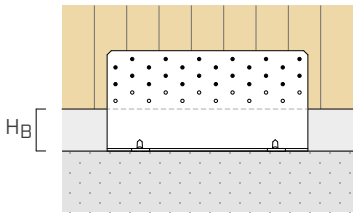
installation with washer

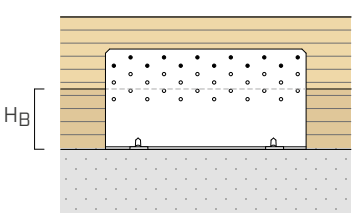


The WASHER TCW must be fastened by means of 2 anchors positioned in the INTERNAL HOLES (**IN**)

$e=e_{y,IN}$

MAXIMUM HEIGHT OF THE INTERMEDIATE H_B LAYER



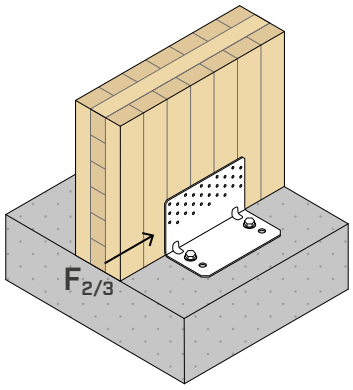


configuration on timber	n_V holes Ø5 [pcs]		CLT $H_{B\,max}$ [mm]		C/GL $H_{B\,max}$ [mm]	
	TCN200	TCN240	nails LBA Ø4	screws LBS Ø5	nails LBA Ø4	screws LBS Ø5
full pattern	30	36	20	30	32	10
pattern 4	25	30	30	40	42	20
pattern 3	20	24	40	50	52	30
pattern 2	15	18	50	60	62	40
pattern 1	10	12	60	70	72	50

The height of the H_B intermediate layer (levelling grout, sill or timber platform beam) is determined by taking into account the following regulatory requirements for fastenings on timber:

- CLT: minimum distances according to ÖNORM EN 1995:2014 (Annex K) for nails and ETA-11/0030 for screws.
- C/GL: minimum distances for solid timber or glulam with horizontal fibres consistent with EN 1995:2014 according to ETA considering a timber density of $\rho_k \leq 420$ kg/m^3.

STRUCTURAL VALUES | **TCN200** | TIMBER-TO-CONCRETE | $F_{2/3}$



TIMBER STRENGTH

configuration on timber (1)	fastening holes Ø5 type	Ø x L [mm]	n_V [pcs]	$R_{2/3,k\ timber}$ [kN]	$K_{2/3,ser}$ [N/mm]
full pattern	LBA LBS	Ø4 x 60 Ø5 x 70	30	**30,5** **42,1**	**9000**
pattern 4	LBA LBS	Ø4 x 60 Ø5 x 70	25	**24,0** **37,9**	**7000**
pattern 3	LBA LBS	Ø4 x 60 Ø5 x 70	20	**18,8** **18,0**	-
pattern 2	LBA LBS	Ø4 x 60 Ø5 x 70	15	**13,2** **12,7**	-
pattern 1	LBA LBS	Ø4 x 60 Ø5 x 70	10	**8,8** **8,4**	-

CONCRETE STRENGTH

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

configuration on concrete	fastening holes Ø13 type	Ø x L [mm]	n_H [pcs]	$R_{2/3,d\ concrete}$ IN(2) [kN]	OUT(3) [kN]	$e_{y,IN}$ [mm]	$e_{y,OUT}$ [mm]
uncracked	VIN-FIX 5.8	M12 x 140	2	**35,5**	**29,1**	**38,5**	**70**
	VIN-FIX 8.8	M12 x 140		**48,1**	**39,1**		
	SKR	12 x 90		**34,5**	**28,5**		
	AB1	M12 x 100		**35,4**	**28,9**		
cracked	VIN-FIX 5.8	M12 x 140		**35,5**	**29,1**		
	HYB-FIX 8.8	M12 x 140		**48,1**	**39,1**		
	SKR	12 x 90		**24,3**	**20,0**		
	AB1	M12 x 100		**35,4**	**28,9**		
seismic	HYB-FIX 8.8	M12 x 195		**29,0**	**23,8**		
	SKR	12 x 90		**9,0**	**7,3**		
	AB1	M12 x 100		**10,6**	**8,7**		

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]
TCN200	VIN-FIX 5.8/8.8	M12 x 140	3	121	121	130	14	200
	HYB-FIX 8.8	M12 x 140	3	121	121	130	14	210
		M12 x 195	3	176	176	185	14	210
	SKR	12 x 90	3	64	87	110	10	200
	AB1	M12 x 100	3	70	80	85	12	200

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

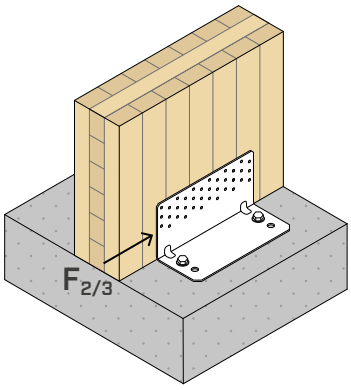
Precut INA threaded rod, with nut and washer: see page 562.
MGS threaded rod class 8.8 to be cut to size: see page 174.

NOTES

(1) Partial fastening pattern on page 219.
(2) Installation of the anchors in the two internal holes (IN).
(3) Installation of the anchors in external holes (OUT).

For the GENERAL PRINCIPLES of calculation, see page 230.
For the anchors verification refer to page 230.

STRUCTURAL VALUES | **TCN240** | TIMBER-TO-CONCRETE | $F_{2/3}$



TIMBER STRENGTH

configuration on timber (1)	fastening holes Ø5			$R_{2/3,k\ timber}$	$K_{2/3,ser}$
	type	Ø x L [mm]	n_V [pcs]	[kN]	[N/mm]
full pattern	LBA LBS	Ø4 x 60 Ø5 x 70	36	**41,7** **55,2**	**12000**
pattern 4	LBA LBS	Ø4 x 60 Ø5 x 70	30	**33,1** **51,3**	**11000**
pattern 3	LBA LBS	Ø4 x 60 Ø5 x 70	24	**25,9** **24,9**	-
pattern 2	LBA LBS	Ø4 x 60 Ø5 x 70	18	**18,4** **17,6**	-
pattern 1	LBA LBS	Ø4 x 60 Ø5 x 70	12	**12,2** **11,7**	-

CONCRETE STRENGTH

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

configuration on concrete	fastening holes Ø17			$R_{2/3,d\ concrete}$			
	type	Ø x L [mm]	n_H [pcs]	IN(2) [kN]	OUT(3) [kN]	$e_{y,IN}$ [mm]	$e_{y,OUT}$ [mm]
uncracked	VIN-FIX 5.8	M16 x 160	2	**67,2**	**52,9**	**39,5**	**80,5**
	VIN-FIX 8.8	M16 x 160		**90.1**	**70,9**		
	SKR	16 x 130		**65,0**	**51,2**		
	AB1	M16 x 145		**79,0**	**62,4**		
cracked	VIN-FIX 5.8/8.8	M16 x 160		**55,0**	**43.2**		
	SKR	16 x 130		**45,3**	**35,7**		
	AB1	M16 x 145		**67,0**	**53,1**		
seismic	HYB-FIX 8.8	M16 x 195		**35,2**	**27,7**		
	EPO-FIX 8.8	M16 x 195		**47,1**	**37,2**		
	SKR	16 x 130		**14,8**	**11,6**		
	AB1	M16 x 145		**21,8**	**17,2**		

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]
TCN240	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	
	EPO-FIX 8.8	M16 x 195	3	164	164	170	18	
	SKR	16 x 130	3	85	127	150	14	
	AB1	M16 x 145	3	85	97	105	16	

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

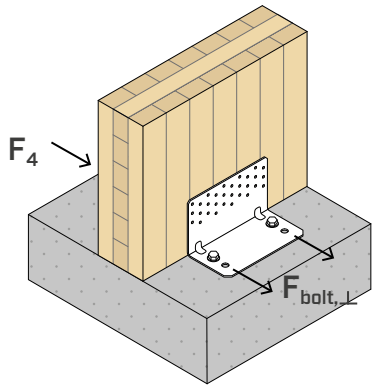
Precut INA threaded rod, with nut and washer: see page 562.
MGS threaded rod class 8.8 to be cut to size: see page 174.

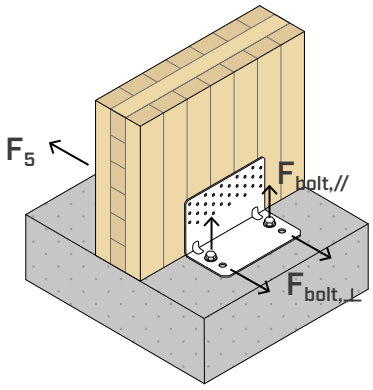
NOTES

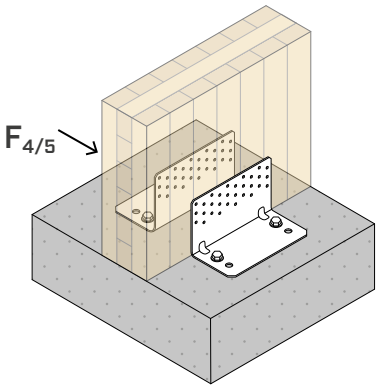
(1) Partial fastening pattern on page 219.
(2) Installation of the anchors in the two internal holes (IN).
(3) Installation of the anchors in external holes (OUT).

For the GENERAL PRINCIPLES of calculation, see page 230.
For the anchors verification refer to page 230.

STRUCTURAL VALUES | **TCN200 - TCN240** | TIMBER-TO-CONCRETE | F_4 | F_5 | $F_{4/5}$







		TIMBER				STEEL		CONCRETE			
F_4		fastening holes Ø5 type	Ø x L [mm]	n_V [pcs]	$R_{4,k\ timber}$ [kN]	$R_{4,k\ steel}$ [kN]	γ_{steel}	fastening holes Ø [mm]	n_H [pcs]	IN(1) $k_{t\perp}$	IN(1) $k_{t//}$
TCN200	full pattern	LBA LBS	Ø4 x 60 Ø5 x 70	30	**20,9**	**22,4**	γ_{M0}	M12	2	0,5	-
	pattern 2	LBA LBS	Ø4 x 60 Ø5 x 70	15	**20,7**	**24,3**	γ_{M0}				
TCN240	full pattern	LBA LBS	Ø4 x 60 Ø5 x 70	36	**24,1**	**26,9**	γ_{M0}	M16	2	0,5	-
	pattern 2	LBA LBS	Ø4 x 60 Ø5 x 70	18	**23,9**	**29,1**	γ_{M0}				

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

		TIMBER				STEEL		CONCRETE			
F_5		fastening holes Ø5 type	Ø x L [mm]	n_V [pcs]	$R_{5,k\ timber}$ [kN]	$R_{5,k\ steel}$ [kN]	γ_{steel}	fastening holes Ø [mm]	n_H [pcs]	IN(1) $k_{t\perp}$	IN(1) $k_{t//}$
TCN200	full pattern	LBA LBS	Ø4 x 60 Ø5 x 70	30	**6,6**	**2,7**	γ_{M0}	M12	2	0,5	0,47
	pattern 2	LBA LBS	Ø4 x 60 Ø5 x 70	15	**3,6**	**1,6**	γ_{M0}			0,5	0,83
TCN240	full pattern	LBA LBS	Ø4 x 60 Ø5 x 70	36	**8,0**	**3,3**	γ_{M0}	M16	2	0,5	0,48
	pattern 2	LBA LBS	Ø4 x 60 Ø5 x 70	18	**4,3**	**1,9**	γ_{M0}			0,5	0,83

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		fastening holes Ø5 type	Ø x L [mm]	n_V [pcs]	$R_{4/5,k\ timber}$ [kN]	$R_{4/5,k\ steel}$ [kN]	γ_{steel}	fastening holes Ø [mm]	n_H [pcs]	IN(1) $k_{t\perp}$	IN(1) $k_{t//}$
TCN200	full pattern	LBA LBS	Ø4 x 60 Ø5 x 70	30 + 30	**25,6**	**14,9**	γ_{M0}	M12	2 + 2	0,41	0,09
	pattern 2	LBA LBS	Ø4 x 60 Ø5 x 70	15 + 15	**22,4**	**20,9**	γ_{M0}			0,46	0,06
TCN240	full pattern	LBA LBS	Ø4 x 60 Ø5 x 70	36 + 36	**27,8**	**24,7**	γ_{M0}	M16	2 + 2	0,43	0,06
	pattern 2	LBA LBS	Ø4 x 60 Ø5 x 70	18 + 18	**25,2**	**30,6**	γ_{M0}			0,48	0,04

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

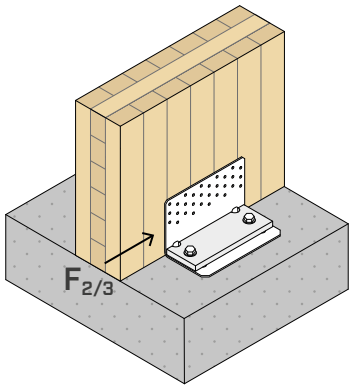
NOTES

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

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

For the GENERAL PRINCIPLES of calculation, see page 230.

STRUCTURAL VALUES | **TCN200 + TCW200** | TIMBER-TO-CONCRETE | $F_{2/3}$



TIMBER STRENGTH

configuration on timber	fastening holes Ø5			$R_{2/3,k\ timber}$	$K_{2/3,ser}$
	type	Ø x L [mm]	n_V [pcs]	[kN]	[N/mm]
TCN200 + TCW200	LBA	Ø4 x 60	30	**56,7**	**9000**
	LBS	Ø5 x 50		**66,4**	

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	fastening holes Ø13			$R_{2/3,d\ concrete}$		
	type	Ø x L [mm]	n_H [pcs]	IN[(1)] [kN]	$e_{y,IN}$ [mm]	$e_{z,IN}$ [mm]
uncracked	VIN-FIX 5.8	M12 x 140	2	**27,4**	**38,5**	**83.5**
	HYB-FIX 8.8	M12 x 195		**41,5**		
	SKR	12 x 110		**15,4**		
	AB1	M12 x 120		**26,1**		
cracked	VIN-FIX 5.8	M12 x 140		**21,1**		
	HYB-FIX 8.8	M12 x 195		**41,8**		
	AB1	M12 x 120		**17,3**		
seismic	HYB-FIX 8.8	M12 x 195		**14,0**		
	EPO-FIX 8.8	M12 x 195		**17,2**		

ANCHORS INSTALLATION PARAMETERS

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]
TCN200 + TCW200	VIN-FIX 5.8	M12 x 140	15	111	111	120	14	200
	HYB-FIX 8.8	M12 x 195	15	166	166	175	14	
	EPO-FIX 8.8	M12 x 195	15	166	166	175	14	
	SKR	12 x 110	15	64	95	115	10	
	AB1	M12 x 120	15	70	80	85	12	

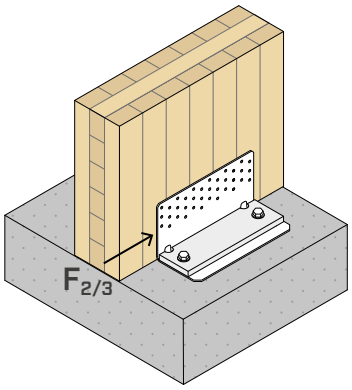
t_{fix} fastened plate thickness
h_{nom} nominal anchoring depth
h_{ef} effective anchoring depth
h_1 minimum hole depth
d_0 hole diameter in the concrete support
h_{min} concrete minimum thickness

Precut INA threaded rod, with nut and washer: see page 562.
MGS threaded rod class 8.8 to be cut to size: see page 174.

NOTES

(1) Installation of the anchors in the two internal holes (IN).
For the GENERAL PRINCIPLES of calculation, see page 230.
For the anchors verification refer to page 230.

STRUCTURAL VALUES | **TCN240 + TCW240** | TIMBER-TO-CONCRETE | $F_{2/3}$



TIMBER STRENGTH

configuration on timber	fastening holes Ø5			$R_{2/3,k\ timber}$	$K_{2/3,ser}$
	type	Ø x L [mm]	n_V [pcs]	[kN]	[N/mm]
TCN240 + TCW240	LBA	Ø4 x 60	36	**70,5**	**9000**
	LBS	Ø5 x 50		**82.6**	

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	fastening holes Ø17			$R_{2/3,d\ concrete}$		
	type	Ø x L [mm]	n_H [pcs]	IN[1] [kN]	$e_{y,IN}$ [mm]	$e_{z,IN}$ [mm]
uncracked	VIN-FIX 5.8	M16 x 195	2	**57,5**	**39,5**	**83.5**
	HYB-FIX 8.8	M16 x 195		**80,4**		
	SKR	16 x 130		**31,4**		
	AB1	M16 x 145		**42,4**		
cracked	VIN-FIX 5.8	M16 x 195		**32,2**		
	HYB-FIX 8.8	M16 x 245		**80,4**		
	AB1	M16 x 145		**30,3**		
seismic	HYB-FIX 8.8	M16 x 245		**23,9**		
	EPO-FIX 8.8	M16 x 245		**30,4**		

ANCHORS INSTALLATION PARAMETERS

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]
TCN240 + TCW240	VIN-FIX 5.8	M16 x 195	15	160	160	165	18	200
	HYB-FIX 8.8	M16 x 195	15	160	160	165	18	200
		M16 x 245	15	210	210	215	18	250
	EPO-FIX 8.8	M16 x 245	15	210	210	215	18	250
	SKR	16 x 130	15	85	115	145	14	200
	AB1	M16 x 145	15	85	97	105	16	200

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

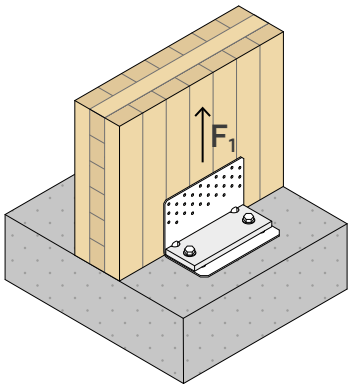
Precut INA threaded rod, with nut and washer: see page 562.
MGS threaded rod class 8.8 to be cut to size: see page 174.

NOTES

[1] Installation of the anchors in the two internal holes (IN).
For the GENERAL PRINCIPLES of calculation, see page 230.

For the anchors verification refer to page 230.

STRUCTURAL VALUES | **TCN200 + TCW200** | TIMBER-TO-CONCRETE | F_1



TIMBER STRENGTH

configuration on timber	TIMBER				STEEL	
	fastening holes Ø5			$R_{1,k\ timber}$	$R_{1,k\ steel}$	
	type	Ø x L [mm]	n_V [pcs]	[kN]	[kN]	γ_{steel}
TCN200 + TCW200	LBA	Ø4 x 60	30	**79,8**	**45,7**	γ_{M0}
	LBS	Ø5 x 50		**68,1**		

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	fastening holes Ø13			$R_{1,d\ concrete}$	
	type	Ø x L [mm]	n_H [pcs]	IN[(1)] [kN]	$k_{t//}$
uncracked	VIN-FIX 5.8/8.8	M12 x 195	2	**21,8**	**1,09**
	HYB-FIX 8.8	M12 x 195		**40,8**	
cracked	HYB-FIX 5.8/8.8	M12 x 195		**23,0**	
	HYB-FIX 8.8	M12 x 245		**30,6**	
seismic	EPO-FIX 8.8	M12 x 195		**14,0**	
	EPO-FIX 8.8	M12 x 245		**18,5**	

ANCHORS INSTALLATION PARAMETERS

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]
TCN200 + TCW200	VIN-FIX 5.8/8.8 HYB-FIX 5.8/8.8 EPO-FIX 8.8	M12 x 195	15	160	160	165	14	200
	HYB-FIX 8.8 EPO-FIX 8.8	M12 x 245	15	210	210	215	14	250

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

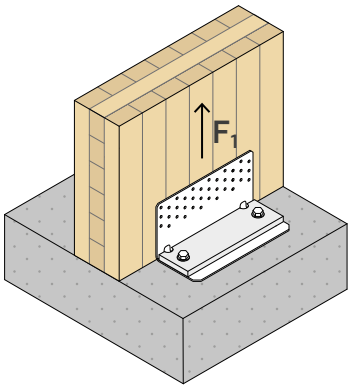
Precut INA threaded rod, with nut and washer: see page 562.
MGS threaded rod class 8.8 to be cut to size: see page 174.

NOTES

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

For the GENERAL PRINCIPLES of calculation, see page 230.
For the anchors verification refer to page 230.

STRUCTURAL VALUES | **TCN240 + TCW240** | TIMBER-TO-CONCRETE | F_1



TIMBER STRENGTH

configuration on timber	TIMBER				STEEL	
	fastening holes Ø5			$R_{1,k\ timber}$	$R_{1,k\ steel}$	
	type	Ø x L [mm]	n_V [pcs]	[kN]	[kN]	γ_{steel}
TCN240+TCW240	LBA	Ø4 x 60	36	**95,8**	**69,8**	γ_{M0}
	LBS	Ø5 x 50		**81,7**		

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	fastening holes Ø17			$R_{1,d\ concrete}$	
	type	Ø x L [mm]	n_H [pcs]	IN(1) [kN]	$k_{t//}$
uncracked	VIN-FIX 5.8/8.8	M16 x 195	2	**27,4**	**1,08**
	HYB-FIX 5.8/8.8	M16 x 195		**45,7**	
cracked	HYB-FIX 5.8/8.8	M16 x 195		**31,2**	
	HYB-FIX 5.8/8.8	M16 x 245		**42,2**	
seismic	HYB-FIX 8.8	M16 x 330		**21,1**	
	EPO-FIX 8.8	M16 x 245		**19,8**	
	EPO-FIX 8.8	M16 x 330		**28,1**	

ANCHORS INSTALLATION PARAMETERS

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]
TCN240 + TCW240	VIN-FIX 5.8/8.8	M16 x 195	15	160	160	165	18	200
	HYB-FIX 5.8/8.8	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
	EPO-FIX 8.8	M16 x 245	15	210	210	215	18	250
		M16 x 330	15	295	295	300	18	350

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

Precut INA threaded rod, with nut and washer: see page 562.
MGS threaded rod class 8.8 to be cut to size: see page 174.

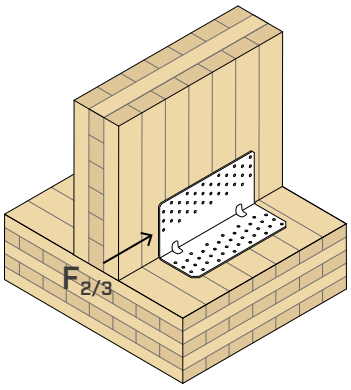
NOTES

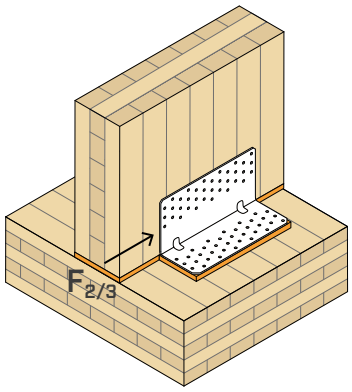
(1) Installation of the anchors in the two internal holes (IN).

For the GENERAL PRINCIPLES of calculation, see page 230.

For the anchors verification refer to page 230.

STRUCTURAL VALUES | **TTN240** | TIMBER-TO-TIMBER | $F_{2/3}$

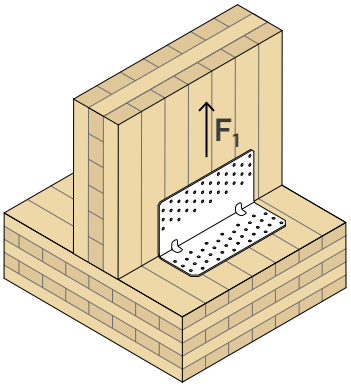




TIMBER STRENGTH

configuration on timber	fastening holes Ø5 type	Ø x L [mm]	n_V [pcs]	n_H [pcs]	profile s [mm]	$R_{2/3,k\ timber}$ [kN]	$K_{2/3,ser}$ [N/mm]
TTN240	LBA	Ø4 x 60	36	36	-	**51,3**	**11000**
	LBS	Ø5 x 70				**58,0**	
TTN240 + XYLOFON	LBA	Ø4 x 60	36	36	6	**41,7**	**9000**
	LBS	Ø5 x 70				**43,8**	

STRUCTURAL VALUES | **TTN240** | TIMBER-TO-TIMBER | F_1



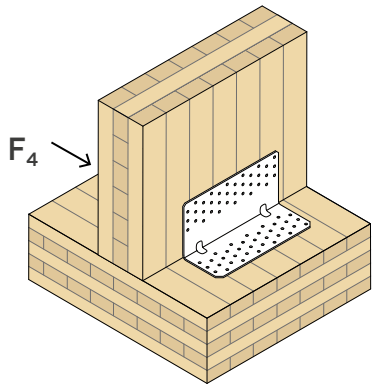
TIMBER STRENGTH

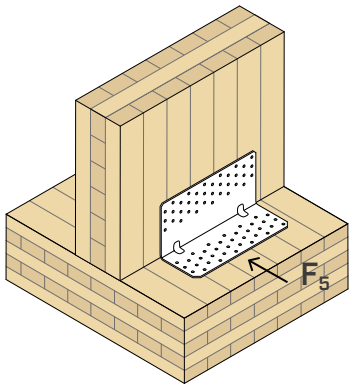
configuration on timber	fastening holes Ø5 type	Ø x L [mm]	n_V [pcs]	n_H [pcs]	$R_{1,k\ timber}$ [kN]
TTN240	LBA	Ø4 x 60	36	36	**7,4**
	LBS	Ø5 x 70			**16,2**

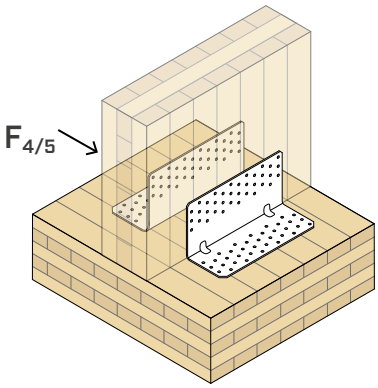
NOTES

For the GENERAL PRINCIPLES of calculation, see page 230.

STRUCTURAL VALUES | **TTN240** | TIMBER-TO-CONCRETE | F_4 | F_5 | $F_{4/5}$







F_4		TIMBER				STEEL	
		fastening holes Ø5			$R_{4,k\ timber}$	$R_{4,k\ steel}$	
		type	Ø x L [mm]	n_V [pcs]	[kN]	[kN]	γ_{steel}
TTN240	full pattern	LBA LBS	Ø4 x 60 Ø5 x 70	36 + 36	**23,8**	**31,1**	γ_{M0}

F_5		TIMBER				STEEL	
		fastening holes Ø5			$R_{5,k\ timber}$	$R_{5,k\ steel}$	
		type	Ø x L [mm]	n_V [pcs]	[kN]	[kN]	γ_{steel}
TTN240	full pattern	LBA LBS	Ø4 x 60 Ø5 x 70	36 + 36	**7,3**	**3,4**	γ_{M0}

$F_{4/5}$ TWO ANGLE BRACKETS		TIMBER				STEEL	
		fastening holes Ø5			$R_{4/5,k\ timber}$	$R_{4/5,k\ steel}$	
		type	Ø x L [mm]	n_V [pcs]	[kN]	[kN]	γ_{steel}
TTN240	full pattern	LBA LBS	Ø4 x 60 Ø5 x 70	72 + 72	**26,7**	**31,6**	γ_{M0}

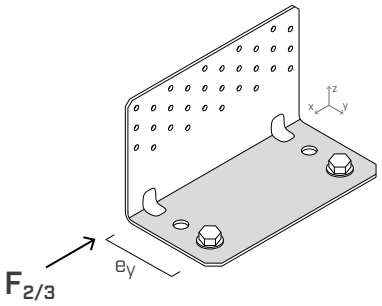
NOTES

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

For the GENERAL PRINCIPLES of calculation, see page 230.

ANCHORS VERIFICATION FOR STRESS LOADING $F_{2/3}$

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

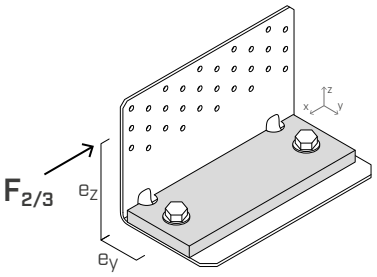


The anchor group must be verified for:

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

ANCHORS VERIFICATION FOR STRESS LOADING $F_{2/3}$ WITH WASHER

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

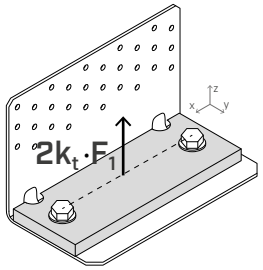


The anchor group must be verified for:

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

ANCHORS VERIFICATION FOR STRESS LOADING F_1 WITH WASHER

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



The anchor group must be verified for:

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

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:

$$R_d = min \begin{cases} \frac{R_{k,\,timber} \cdot k_{mod}}{\gamma_M} \\ \frac{R_{k,\,steel}}{\gamma_{M0}} \\ R_{d,\,concrete} \end{cases}$$

  The coefficients k_{mod}, γ_M and γ_{M0} 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 failures before reaching the connection strength.
- Structural elements in timber, to which the connection devices are fastened, must be prevented from rotating.
- 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:

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

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

- 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 hypothesis 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) and elastic design according to EN 1992:2018. 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).
- The product ETAs for the anchors used in the concrete-side strength calculation are indicated below:
  - VIN-FIX chemical anchor according to ETA-20/0363;
  - HYB-FIX chemical anchor according to ETA-20/1285;
  - EPO-FIX chemical anchor according to ETA-23/0419;
  - SKR screw-in anchor according to ETA-24/0024;
  - AB1 mechanical anchor according to ETA-17/0481 (M12);
  - AB1 mechanical anchor according to ETA-99/0010 (M16).

UK CONSTRUCTION PRODUCT EVALUATION

- UKTA-0836-22/6373.