

4



TENSION TIES

04

TENSION TIES

TENSION TIE HT

- Absorption of high tensile loads in timber framework construction
- Reduced overall height
- Short rib (150 mm)
- Optimised hole pattern
- They are also suitable for column connections
- Optional pressure plates
- Use of pressure plates for tension loads up to 85 kN
- Without pressure plates for tension loads up to 42 kN

TENSION TIE HT2

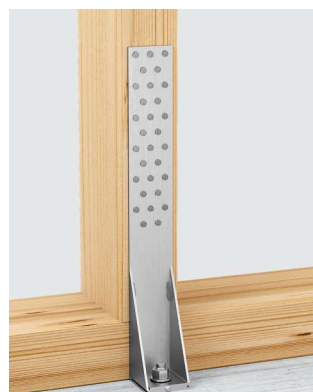
- Assembly of pull tab in wall production
- Interior walls can be fully panelled and completed
- No protruding parts during transport
- Simple and quick height compensation up to 30 mm possible on the building site
- Transfer of high tensile loads
- No improvement work on the building site

TENSION TIE TOP 240 / TOP 280 VARIO

- Approved connection over intermediate layer
- Efficient wall or column connection on concrete
- Fast and practical processing
- Time savings - no more laborious marking and dowel drilling in advance
- Safe processing due to the coordinated system
- Direct connection to OSB boards between the timber beams is possible with GH screw

CONNECTOR TOP 80 / TOP 120 VARIO

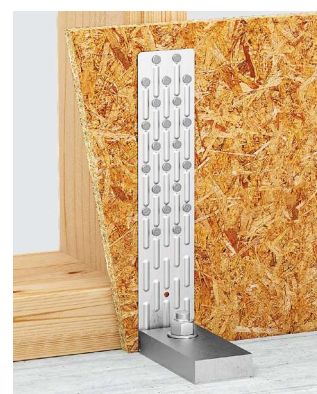
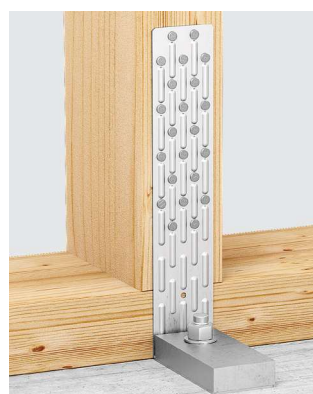
- No bothersome centre rib during processing
- Full nail fitting always possible
- High stability due to special, discreet corrugation
- Not a nail too many - optimal coordination of the bracket
- No fixing in the edge zone due to optimal hole pattern



Basics of statics **from page 163** / Products & statics **from page 172**



Basics of statics **from page 163** / Products & statics **from page 176**



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Basics of statics **from page 163** / Products & statics **from page 184**

TENSION TIES

ASSORTMENT

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TENSION TIE TOP 240 / TOP 280 VARIO							163	168
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**CE symbol****Steel with indication of the steel quality and galvanisation****Timber/timber connection****Timber/concrete-connection****Usage class 1**

Moisture content in the building materials that corresponds to a temperature of 20° C and a relative humidity of the ambient air that only exceeds a value of 65% for a few weeks per year, e.g. in the case of buildings that are closed on all sides and heated.
Comment: In UC 1, the average moisture content of most softwoods does not exceed 12 %.

**Usage class 2**

Moisture content in the building materials that corresponds to a temperature of 20° C and a relative humidity of the ambient air that only exceeds a value of 85% for a few weeks per year, e.g. in the case of open buildings covered by a roof.
Comment: In UC 2, the average moisture content of most softwoods does not exceed 20 %.

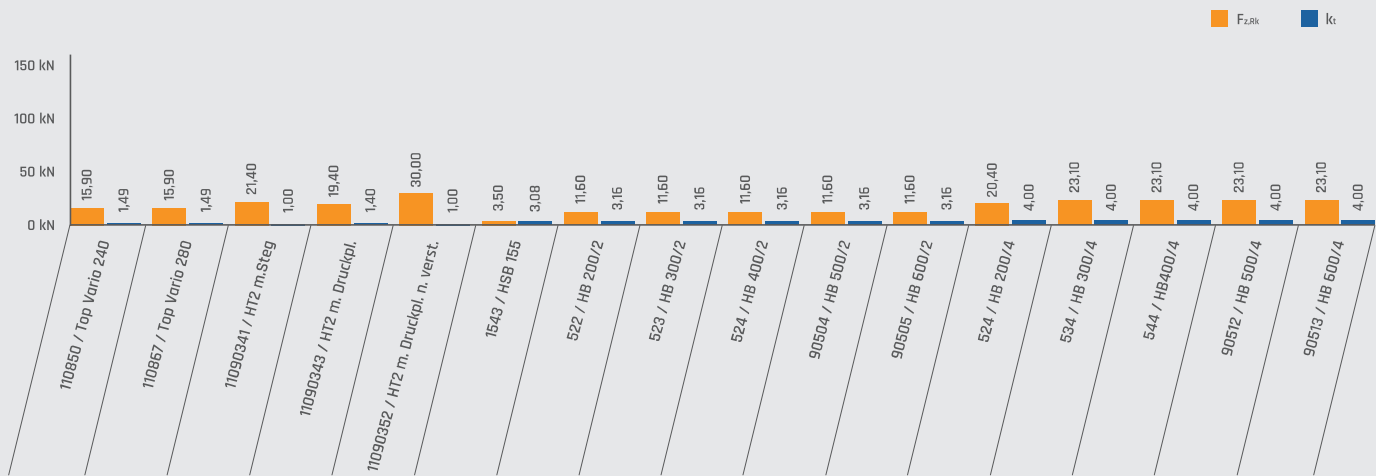
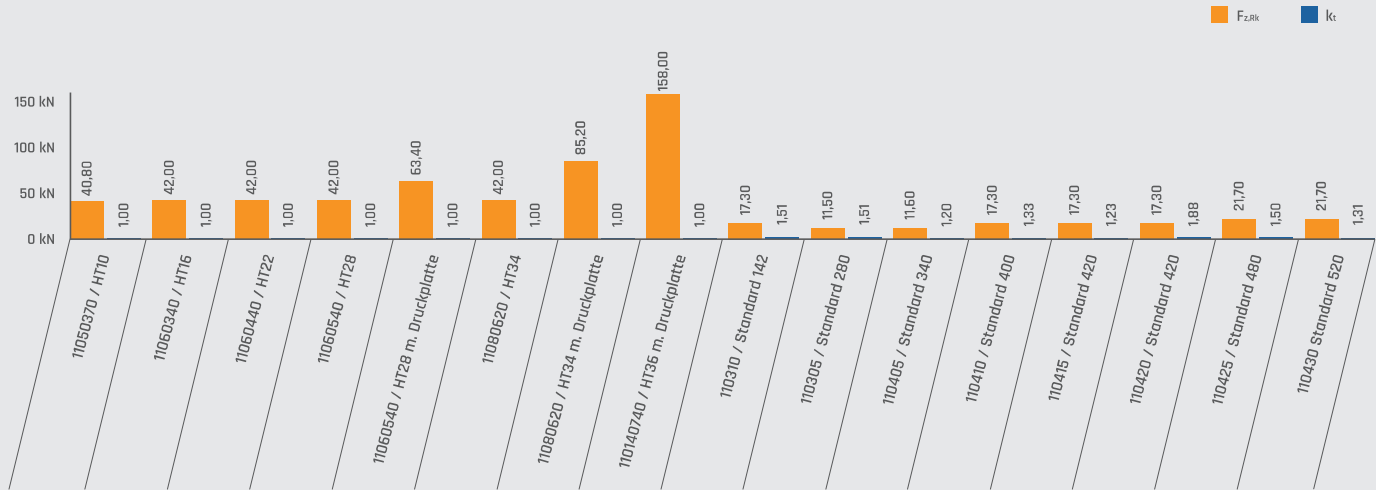
**Usage class 3**

Includes climatic conditions that lead to higher moisture contents than in UC 2, e.g. structures that are exposed to the weather without protection. Eurocode 5 / DIN EN 1995-1-1 section 2.3.1.3



TENSION TIES

STATICS DIAGRAM



TENSION TIES

TECHNICAL FEATURES

Geometry

H	Height (mm)
L	Length [mm]
W	Width (mm)
T	Material thickness (mm)

Tables

F_z	Max. load capacity in load direction [kN]
n	Number of holes Ø 5.0 mm
n_{Bo}	Number of holes for dowels/bolts with Ø [mm]
n_{eff}	Necessary number of nails/screws
$F_{Rd, Stahl}$	Design value of steel load capacity [kN]
k_t	Factor for impact on dowels/bolts
	Grain course

Timber connecting element

GH threaded nails ETA-13/0523 Ø 4.0 x L [mm]
GH wood connector screw ETA-13/0523 Ø 5.0 x L [mm]
Dowels/bolts

Load directions

$F_{1,k}$ 	Load away from baseplate
---	--------------------------



Steel with indication of the steel quality and galvanisation



Timber/timber connection



Timber/concrete-connection



Usage class 1
Moisture content in the building materials that corresponds to a temperature of 20° C and a relative humidity of the ambient air that only exceeds a value of 65% for a few weeks per year, e.g. in the case of buildings that are closed on all sides and heated.
Comment: In UC 1, the average moisture content of most softwoods does not exceed 12 %.



Usage class 2
Moisture content in the building materials that corresponds to a temperature of 20° C and a relative humidity of the ambient air that only exceeds a value of 85% for a few weeks per year, e.g. in the case of open buildings covered by a roof.
Comment: In UC 2, the average moisture content of most softwoods does not exceed 20 %.



Usage class 3
Includes climatic conditions that lead to higher moisture contents than in UC 2, e.g. structures that are exposed to the weather without protection. Eurocode 5 / DIN EN 1995-1-1 section 2.3.1.3

Design

$F_{z,Ed}$	Design value of impact in load direction F_z
$F_{z,Rk}$	Characteristic value of load capacity
$F_{z,Rd}$	Design value of load capacity
$F_{v,Rk}$	Characteristic value of load capacity of a Connecting element, nail or screw
n	Connecting element, nail or screw
k_{mod}	Chosen number of nails/screws
γ_M	Modification coefficient according to EN 1995-1-1
γ_{M0}	Partial safety factor for connections according to EN 1995-1-1
γ_{M2}	Partial safety factor according to EN 1993-1-1
$F_{Ed,Bo}$	Partial safety factor according to EN 1993-1-1 or EN 1993-1-8
$F_{Ed,Bo}$	Impact on the dowel/bolt in load direction F_z

TENSION TIES

APPLICATIONS

Application:

Absorption of tensile loads in timber construction

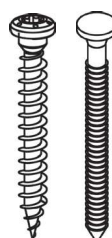
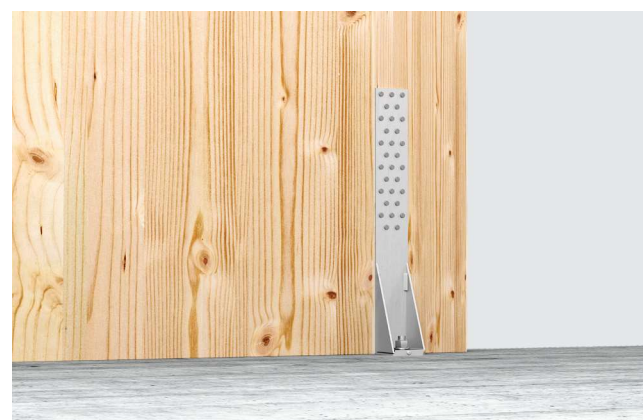
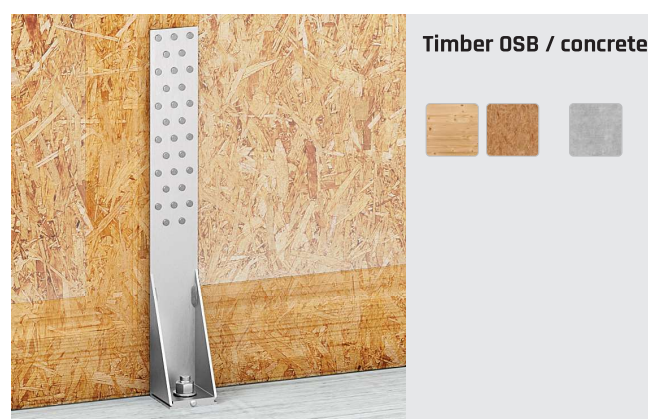
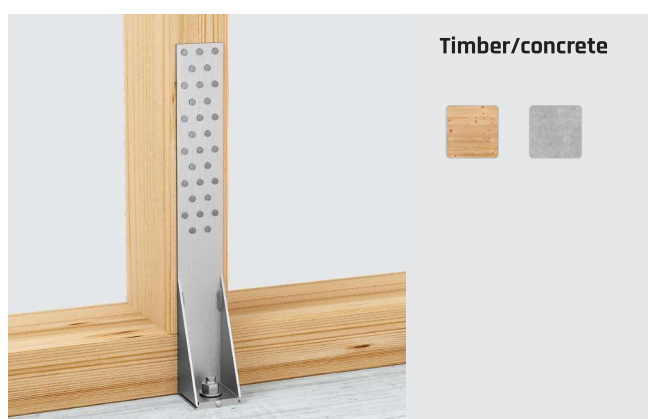
Materials:

250
GD
Z275

355
MC
galv. verzinkt

Material thicknesses:

2,0 to 4,0 mm



Connecting element:

GH threaded nails 4,0 x 35 / 40 / 50 / 60 / 75 / 100 mm

GH screws 5,0 x 25 / 35 / 40 / 50 / 60 / 70 mm

Bolt, dowel or concrete anchor M10 to M22

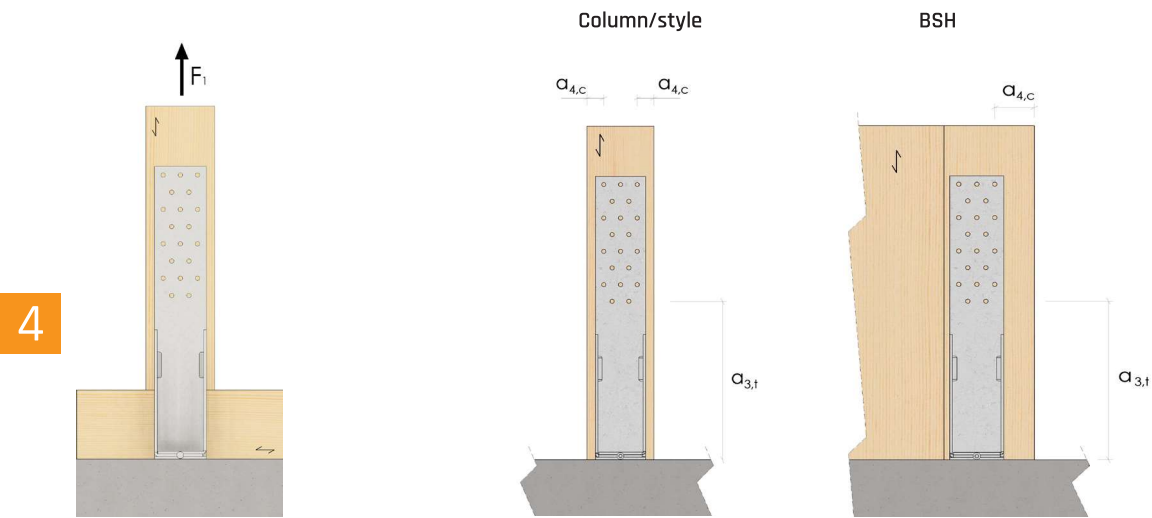
Connecting elements from page 274

For use in usage classes



Load directions

Minimum and edge spacing



Minimum and edge spacing

		Parallel to the grain	Right-angled to the grain
$a_{3,t}$	End grain with stress	15d	10d
$a_{4,c}$	Unloaded edge	5d	5d

		Parallel to the grain	Right-angled to the grain
$a_{3,t}$	End grain with stress	12d	7d
$a_{4,c}$	Unloaded edge	3d	3d

Minimum spacing according to EN 1996-1-1, without pilot drilling, $\rho_k \leq 420 \text{ kg/m}^3$

Connection to timber

Partial nail fitting or partial screw fitting
 $n_{min.}$ 2, make sure that the load does not take effect eccentrically.

Full nail fitting or full screw fitting
 $n_{max.}$ according to statics table, with compliance with minimum spacing

Connection over intermediate layers
 The specified load-bearing capacities also apply to intermediate layers if the following requirements are met:

Intermediate layer

- OSB boards type OSB/3 and OSB/4 according to EN 13986 (EN 300) or approval
- Synthetic resin-bonded chipboard in accordance with EN 13986 (EN 312) or approval
- Solid wood panels according to EN 13986 (EN 13353) or approval
- Plywood according to EN 13986 (EN 636) or approval
- Plasterboards according to approval
- Fibreboards according to EN 13986 (EN 622-2 and 622-3) minimum raw density 650 kg/m³

The value of the characteristic bearing strength of the intermediate layer must at least fulfil the value for solid softwood of strength class C24. The compressive strength of the intermediate layer when loaded at right angles to the connecting surface (for wood-based panels, compressive strength perpendicular to the board plane) must be at least equal to the value of the compressive strength perpendicular to the grain for solid softwood of strength class C24.

Connection of the intermediate layer

The intermediate layer must be force-fit to the timber component (non-moving intermediate layer).
 In other cases and generally in the case of movable intermediate layers, the load-bearing capacity of the connecting element should be determined individually for the respective connection.

Connecting element for intermediate layers

The length must be selected so that the profiled length (insert depth) behind the intermediate layer corresponds at least to the length specified in the statics tables.

Connection to concrete

Proof of the load-bearing capacity for fixing the tension tie in the concrete must be carried out separately taking into account the k_t value in accordance with the requirements of the selected dowel.

Design tables

Maximum load capacities in kN

Characteristic raw density of timber: $\rho_k = 350 \text{ kg/m}^3$ (C24)

Information in the design tables

Characteristic value $F_{v,Rk}$ max.

Design value $F_{z,Rd}$ for KLED "short" and "very short"

Design of the connecting element

The necessary number of nails or screws can be calculated from the impact $F_{z,Ed}$ and the load capacity of a connecting element $F_{v,Rk}$:

$$n_{\text{erf}} = F_{z,Ed} / (F_{v,Rk} \times k_{\text{mod}} / \gamma_M)$$

Load capacity of the connecting element according to ETA-13/0523

	4,0 x 40 5,0 x 40	4,0 x 50 5,0 x 50	4,0 x 60 5,0 x 60
$F_{v,Rk}$ [kN]	1,83	2,14	2,27

Raw density of timber at least 350 g/m^3

Design of the load capacity of the tension tie:

$$F_{z,Rd} = \min \{ n \times F_{v,Rk} \times k_{\text{mod}} / \gamma_M; F_{Rd, \text{steel}} \}$$

The load-bearing capacity can be verified using the design value of the steel load-bearing capacity specified in the design table:

$$F_{z,Ed} / F_{z,Rd} \leq 1$$

Design value of steel load capacity $F_{Rd, \text{steel}}$ is based on the partial safety factors according to EN 1993-1-1 $\gamma_{M0} = 1.0$ and $\gamma_{M2} = 1.25$. For two-piece tension ties HT2, the partial safety factor according to EN 1993-1-8 $\gamma_{M2} = 1.25$ is considered additionally.

Impact on the dowel

$$F_{Ed,Bo} = F_{z,Ed} \cdot k_t$$

Design examples

Connection of posts to C24, to concrete panel

Tension tie with pressure plate (110410), nails 4 x 40 mm.

Design value of impact: $F_{z,Ed} = 14,7 \text{ kN}$; KLED short

Maximum load capacity

KLED short: $n_{\text{erf}} = 14$; $F_{z,Ed} = 17,3 \text{ kN} \geq 14,7 \text{ kN} = F_{z,Ed}$

Alternative determination of the necessary nails 4 x 40 mm:

$$n_{\text{erf}} = F_{z,Ed} / (F_{v,Rk} \times k_{\text{mod}} / \gamma_M) = 14,7 / (1,83 \times 0,9 / 1,3) = 11,6 \rightarrow n_{\text{erf}} = 12$$

Alternative determination of the necessary nails 4 x 40 mm:

$$F_{z,Rd} = \min \{ n \times F_{v,Rk} \times k_{\text{mod}} / \gamma_M; F_{Rd, \text{steel}} \} = \min \{ 12 \times 1,83 \times 0,9 / 1,3; 17,3 \} = \min \{ 15,2; 17,3 \} = 15,2 \text{ kN}$$

According to DIN EN 1995-1-1: $k_{\text{mod}} = 0,9$ for KLED short and $\gamma_M = 1,3$

Proof of load capacity of the tension tie

$$F_{z,Ed} / F_{z,Rd} = 14,7 / 15,2 = 0,97 \leq 1$$

Impact on the dowel in concrete

$$F_{Ed,Bo} = F_{z,Ed} \times k_t = 14,7 \times 1,33 = 19,6 \text{ kN}$$

GH-HT22 tension tie (11060441) with nails 4 x 50 mm

Design value of impact: $F_{z,Ed} = 31,2 \text{ kN}$ class of load impact duration (KLED) medium

Necessary number of nails 4 x 50 mm

$$n_{\text{erf}} = F_{z,Ed} / (F_{v,Rk} \times k_{\text{mod}} / \gamma_M) = 31,2 / (2,14 \times 0,8 / 1,3) = 23,7 \rightarrow n = 24$$

Load capacity of the tension tie with 24 nails 4 x 50 mm:

$$F_{z,Rd} = \{ n \times F_{v,Rk} \times k_{\text{mod}} / \gamma_M; F_{Rd, \text{steel}} \} = \min \{ 24 \times 2,14 \times 0,8 / 1,3; 42,0 \} = \min \{ 31,6; 42,0 \} = 31,6 \text{ kN}$$

According to DIN EN 1995-1-1: $k_{\text{mod}} = 0,8$ for KLED medium and $\gamma_M = 1,3$

Proof of load capacity of the tension tie

$$F_{z,Ed} / F_{z,Rd} = 31,2 / 31,6 = 0,99 \leq 1$$

Impact on the dowel in concrete

$$F_{Ed,Bo} = F_{z,Ed} \times k_t = 31,2 \times 1,0 = 31,2 \text{ kN}$$

4

NEW
optimised
bolt holes!

See page 174



TENSION TIES



TOPLINE



KONSTRULINE

TYPE HT

1. Transfer of tensile forces, specially for timber framework construction
2. For use with new and existing timber constructions
3. Transfer of high forces into the concrete
4. Optional pressure plates for even higher tensile forces
5. For use on solid wood boards and in frame construction

**ALWAYS THE RIGHT APPLICATION WITH
VARYING PRESSURE PLATES**



4

ADVANTAGES

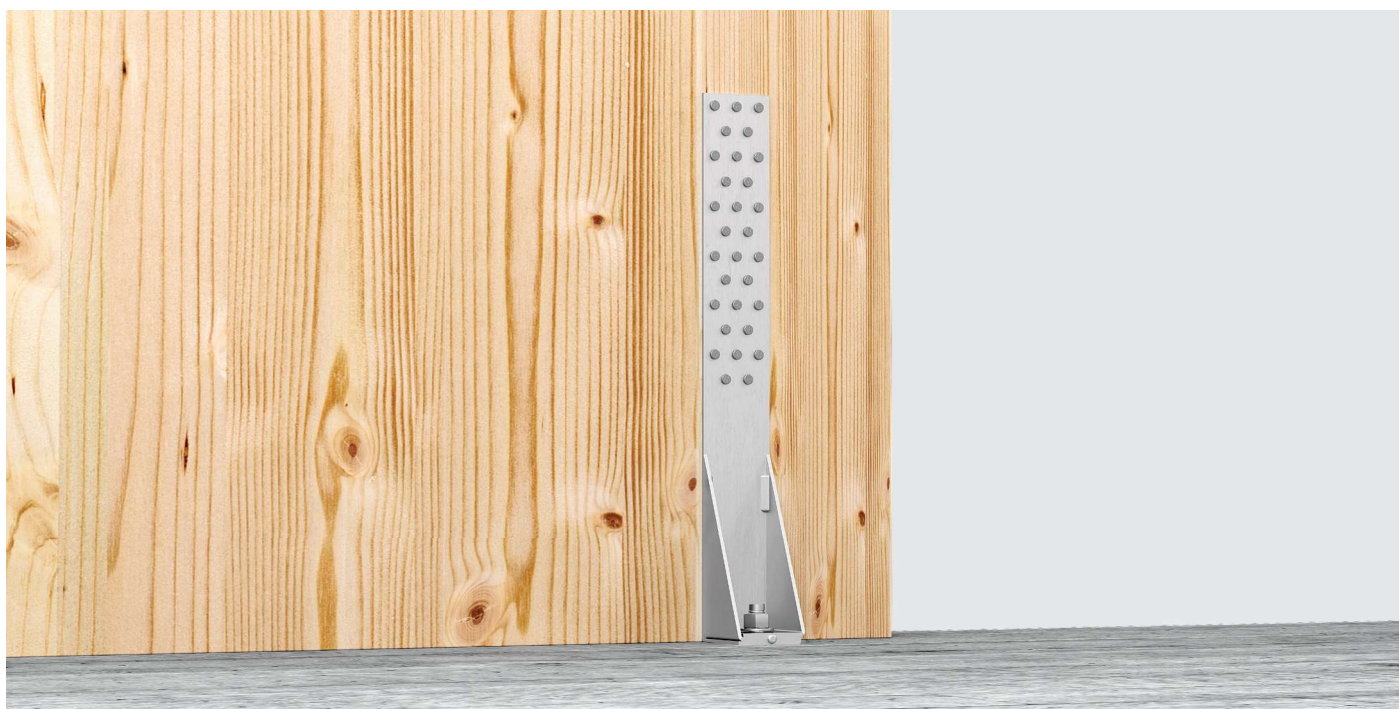
- Absorption of high tensile loads in timber framework construction
- Reduced overall height
- Short rib (150 mm)
- Optimised hole pattern
- GH HT are also suitable for column connections
- Fixing in timber, also over intermediate layers, with GH threaded nails 4.0 x 50 to 75 mm, or GH screws Ø 5.0 mm possible
- Optional pressure plates
- Use of pressure plates for tension loads up to 85 kN
- Without pressure plate for tension loads up to 42 kN
- Simple push-through assembly

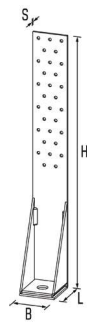
FASTENING ELEMENTS

- GH threaded nail or GH screws
- Ground fixing with bolt anchors or concrete screws

ACCESSORY ITEMS

- The optional pressure discs for HT 16 - HT 28 and pressure discs for HT 34 allow Tensile loads up to 85 kN





TOPLINE



KONSTRULINE

ETA-10
0010

TENSION TIES

HT

NEW
optimised
bolt holes!



Art. No.	Type	Dimensions [mm]							n	nBo	EAN	Weight kg	Pallet	PU		
		H	x	L	x	W(B)	x	T(S)								
11050370	HT10	370	x	63	x	50	x	3,0	18	18	479643	0.831	240	10	■	
11060341	HT16	340	x	63	x	60	x	3,0	20	18	479629	0.873	240	10	■	
11060441	HT22	440	x	63	x	60	x	3,0	30	18	479636	1.100	240	10	■	
11060541	HT28	540	x	63	x	60	x	3,0	45	22	479544	1.134	160	10	■	
11080621	HT34	620	x	83	x	80	x	3,0	55	26	479551	1.800	170	10	■	
110140740	HT36	740	x	83	x	140	x	3,0	75	29	479568	3.278	100	1	■	

OPTIMISED HT TENSION TIE!

HT16 and HT22

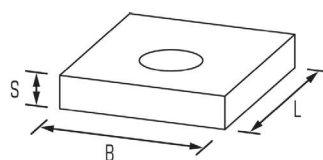
Simple push-through assembly when using bolt anchors. When installing with adhesive anchors/composite mortar, the drilled hole in the baseplate can be drilled directly through the pre-positioned HT tension tie.

HT28 and HT34

Larger bolts are possible, which means that higher loads can be transferred from the wall into the baseplate. The drilled hole in the baseplate is created directly by the pre-positioned HT tension tie.

The optimised hole diameters mean that dowels with a better load-bearing capacity can be used. This means that higher tensile loads can be transferred from the wall into the baseplate.

PRESSURE PLATES



HT



Art. No.	Dimensions [mm]					n	EAN	Weight kg	Pallet	PU		
	L	x	W(B)	x	T(S)							
1105056	50	x	56	x	10	18	479605	0.200	960	10	■	
1105057	50	x	56	x	10	22	479575	0.230	960	10	■	
1107078	70	x	77	x	20	26	479582	0.763	960	10	■	
11080130	80	x	130	x	40	29	479599	3.000	200	1	■	