

2

02

CONCEALED CONNECTORS



CONCEALED CONNECTORS

(Invisible connectors)

TOP UV CONCEALED CONNECTORS

- Invisible dovetail connection
 - Safety catch
 - Optimised hole pattern
 - For loading in 4 load directions
 - Quick assembly of secondary beams
 - Conical dovetail guide pulls together
 - Milling radii
- up to 72 kN**



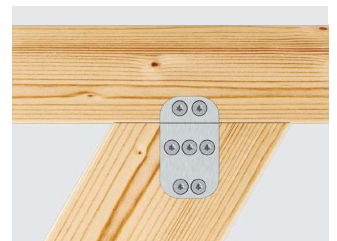
Basics of statics **from page 68** / Products & statics **from page 66**

CONCEALED CONNECTORS TOP OV

„Simple and ingenious“

More flexibility in connection technology

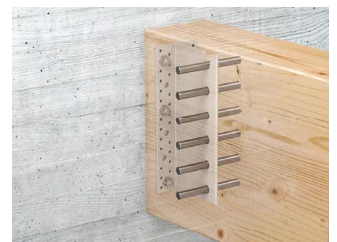
- **In the factory:** Simply mill out the connection form or attach and mount on the secondary beam with a maximum of 4 tensile and 2 pressure screws.
 - **On the building site:** Insert the secondary beam in the recess of the main beam or only place it down. Turn 2 pressure screws into the main beam/support.
- up to 27 kN**



Basics of statics **from page 84** / Products & statics **from page 82**

BEAM HANGER

- Connection to timber, concrete and masonry
 - Type alu combi without holes for rod dowels. By drilling through the secondary beam and connector, you receive a connection with a perfect fit.
 - Type alu SD 12 and SD 16 with assembly fix tab.
- up to 258 kN**



Basics of statics **from page 90** / Products & statics **from page 88**

INTEGRAL CONNECTORS

- GH integral connectors type M, 2- and 4-row with assembly fix tab for concealed connections with connections between the main/secondary beam and connections to the columns. For both versions, the secondary beam with pre-fitted rod dowel is suspended in the assembly fix tab.
 - 2-row integral connectors with embossed reinforcement studs. This gives you the necessary accuracy of fit and the same slot width as with a 4-row integral connector.
 - 4-row integral connections with even higher load-bearing capacities!
- up to 58 kN**



Basics of statics **from page 90** / Products & statics **from page 88**

CONCEALED CONNECTORS

2 ASSORTMENT

					Basics Statics & Diagrams from page	Products & Statics from page
TOP UV CONNECTORS TIMBER/TIMBER						65 66
TOP UVB CONNECTORS TIMBER/CONCRETE						65 / 68 78
TOP OV CONNECTORS						65 / 84 82
BEAM HANGER TYPE ALU COMBI					 	65 / 90 88
BEAM HANGER TYPE ALU COMBI SD 12					 	65 / 90 88
BEAM HANGER TYPE ALU COMBI SD 16					 	65 / 90 88
INTEGRAL CONNECTOR 2-ROW TYPE M						65 / 90 88
INTEGRAL CONNECTOR 4-ROW TYPE M						65 / 90 88
INTEGRAL CONNECTOR ANGLED CONNECTION						102



CE symbol



Steel with indication of the steel quality and galvanisation



Aluminium



Timber/timber connection



Timber/concrete-connection

**Usage class 1**

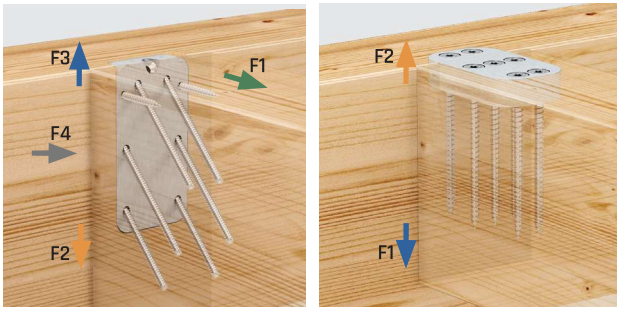
Moisture content in the building materials that corresponds to a temperature of 20° C and a relative humidity of the ambient air that only exceeds a value of 65% for a few weeks per year, e.g. in the case of buildings that are closed on all sides and heated. Comment: In UC 1, the average moisture content 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 %.

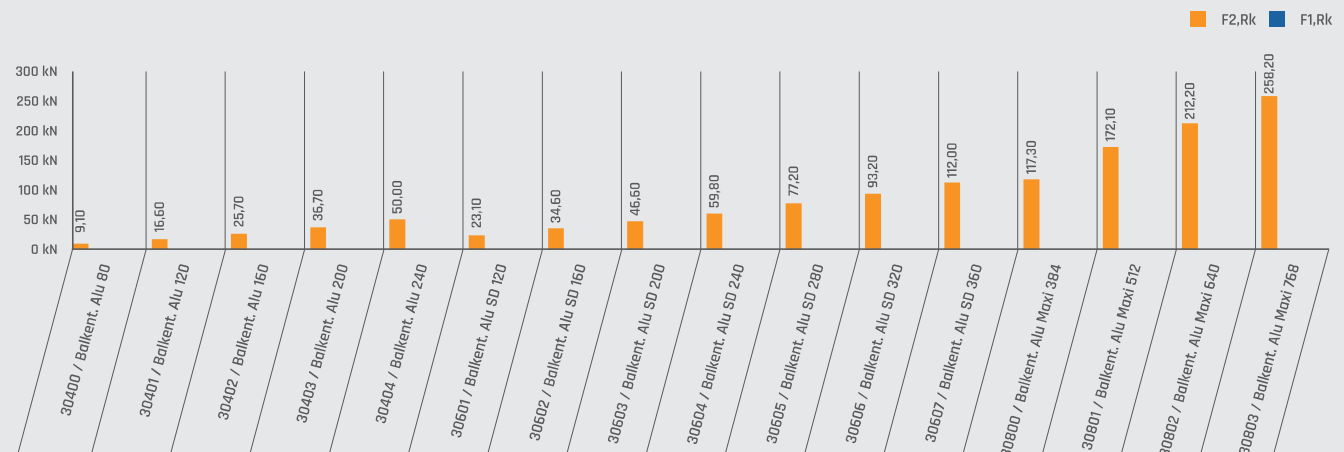
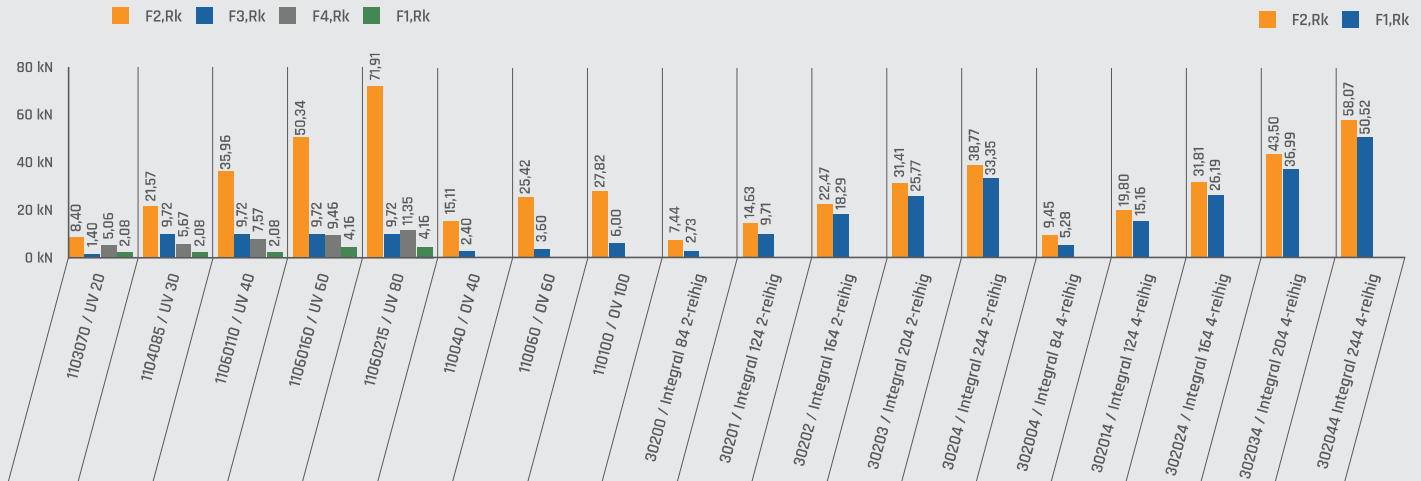
**Usage class 3**

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



CONCEALED CONNECTORS

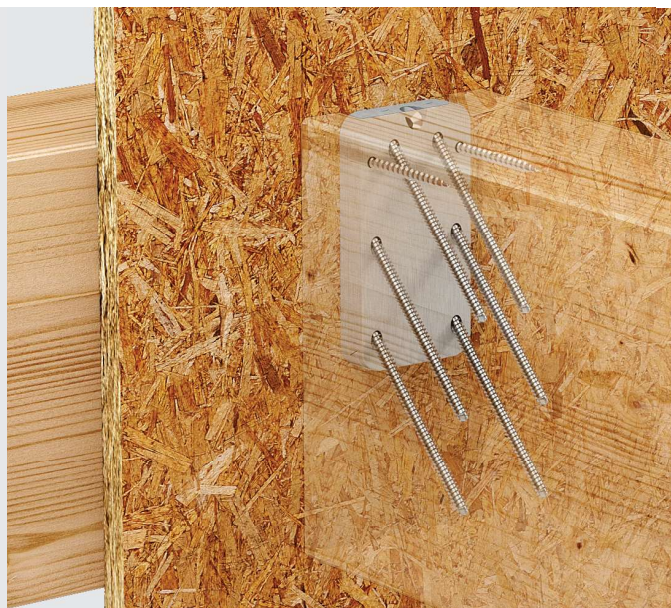
STATICS DIAGRAM 2



TOP UV CONNECTORS

2

1. For invisible connections in timber/timber and timber/concrete
2. Optimised hole pattern in 5 different sizes
3. Dovetail guide with conical guide
4. From timber cross-sections 45 mm x 100 mm
5. Time-saving quick assembly



ADVANTAGES

- Invisible dovetail connection
- Connection of secondary beams made of timber to timber, concrete
- For loading in up to 4 load directions
- With safety catch in all connection variants
- Quick assembly of secondary beams
- Connectors pull together with the large conical gliding surfaces
- The connection can be removed again as required
- The load capacity is determined by the number of screws on the main beam and the screw length on the secondary beam



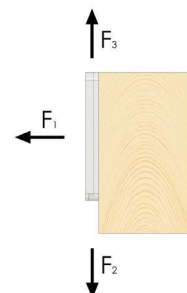
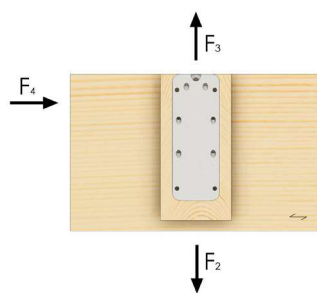
APPLICATIONS

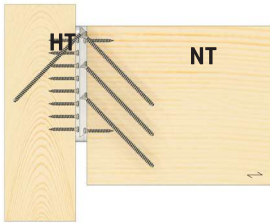
- Right-angled
- Titled at right angles - upwards +90° / downwards -30°
- Angled connections - to the left +45° / to the right -45°
- Bar connections
- Column connections, with and without shadow joint
- Connections over the intermediate layer
- Connections possible directly to the timber board materials such as OSB



LOAD DIRECTIONS

- F_2 for pressure (in push-in direction, Z-axis)
- F_3 for lifting (opposite to push-in direction, Z-axis)
- F_4 2-axis (angled installation, Y-axis)
- F_1 for pull-out (X-axis)





TOP UV CONNETORS



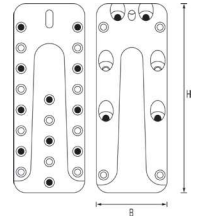
TOP UV

Art. No.	Type	Dimensions [mm]					nH	nN	EAN	Weight	Pallet	PU
		W(B)	x	H	x	T(S)						
							Ø 5	Ø 6.2	4019346	kg		
1103070	UV 20	30	x	70	x	16,0	6(8)	6(7)x Ø4,0	018910	0.071	2400	25
1104085	UV 30	40	x	85	x	16,0	9(11)	4(5)	018927	0.123	2400	25
11060110	UV 40	60	x	115	x	16,0	15(17)	6(7)	018903	0.260	2400	25
11060160	UV 60	60	x	160	x	16,0	21(25)	6(7)	018941	0.384	960	10
11060215	UV 80	60	x	215	x	16,0	30(34)	8(9)	018965	0.515	960	10

Number of screws required:

nH = maximum number of connecting elements in the main beam

nN = maximum number of connecting elements in the secondary beam



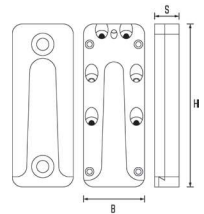
TOP UVB

Art. No.	Type	Dimensions [mm]					nH	nN	nN	EAN	Weight	Pallet	PU
		W(B)	x	H	x	T(S)							
							Ø 12	Ø 6	Ø 5	4019346	kg		
12060115	UVB 40	60	x	115	x	24,0	2	6	2	018934	0.400	2400	10
12060160	UVB 60	60	x	160	x	24,0	2	6	4	018958	0.574	960	10
12060215	UVB 80	60	x	215	x	24,0	3	8	4	018972	0.774	960	10

Number of screws required:

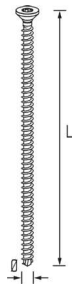
nH = maximum number of connecting elements in the main beam

nN maximum number of connecting elements in the secondary beam



TOP UV full thread screw for UV connectors type 30 - type 80

Art. No.	Dimensions [mm]			TX	EAN	Weight	Pallet	PU
	Ø	x	L					
					4019346	kg		
116100	6,0	x	100	TX30	019009	1.178	39000	100
116120	6,0	x	120	TX30	019016	1.387	39000	100
116140	6,0	x	140	TX30	019023	1.629	39000	100
116160	6,0	x	160	TX30	019030	1.851	26800	100
116200	6,0	x	200	TX30	019047	2.313	26800	100



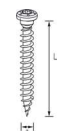
GH S Drive screw for UV connector type 20

Art. No.	Dimensions [mm]			TX	EAN	Weight	Pallet	PU
	Ø	x	L					
					4019346	kg		
90140050	4,0	x	50/30	TX20	521533	0.255	145000	500
90140060	4,0	x	60/35	TX20	521540	0.302	110000	500
90140070	4,0	x	70/35	TX20	521557	0.349	72000	200



GH screw

Art. No.	Dimensions [mm]			TX	EAN	Weight	Pallet	PU
	Ø	x	L					
					4019346	kg		
505050	5,0	x	50	TX20	400029	0.427	72000	200
505060	5,0	x	60	TX20	400036	0.480	58000	200
505070	5,0	x	70	TX20	400043	0.554	58000	200



TOP UV CONNECTORS

2 TECHNICAL FEATURES

Geometry

W	Width (mm)
H	Height (mm)
T	Material thickness (mm)

Tables

n_{HT}	Number of holes in main beam
n_{NT}	Number of holes in secondary beam
n_v	Number of connecting elements for full screw fitting
n_T	Number of connecting elements for partial screw fitting
HT	Main beam
NT	Secondary beam
H_{HT}	Minimum height of main beam
B_{HT}	Minimum width of main beam
H_{NT}	Minimum height of secondary beam
B_{NT}	Minimum width of secondary beam

Verbindungsmittel Beton/Stahl

Bo	Dowels/bolts
----	--------------

Timber connecting element

$\emptyset$ [mm]	Diameter of connecting element
L [mm]	Length of connecting element
	Grain direction of component

Force directions

F_1 	Force at a right angle to the connector level
F_2 	Force in insertion direction (main load)
F_3 	Force against insertion direction (lifting load)
F_4 	Force at right-angle to insertion direction in Connector level (horizontal load)

Design

$F_{i,Ed}$	Design value of impact
$F_{i,Rd}$	Design value of load capacity
$F_{i,Rk}$	Characteristic value of load capacity
i	Index of force direction
k_{mod}	Modification factor
γ_M	Partial safety factor

Dowel measurement

$F_{Bo,lat}$	Force at right angles to the bolt axis (shearing)
$F_{Bo,ax}$	Force in bolt axis
H	Spacing of the two outer bolts/dowels
$f_{2/3}$	Spacing of the two outer bolts/dowels
f_4	Spacing of the two outer bolts/dowels
n_{Bo}	Spacing of the two outer bolts/dowels



Aluminium

User video
for our TOP UV connectors



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

TOP UV CONNECTORS

APPLICATIONS 2

Application:

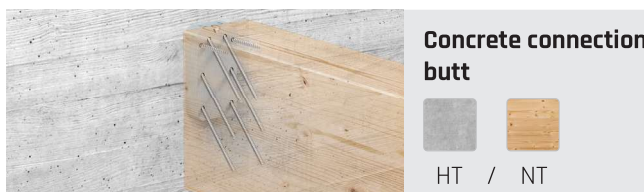
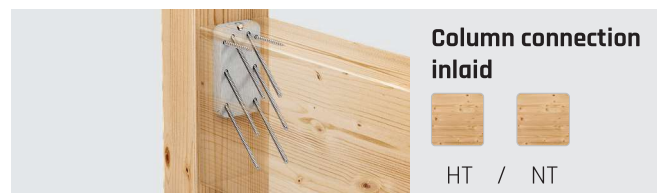
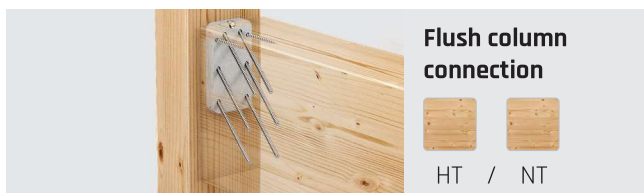
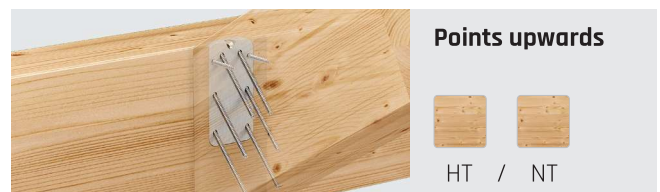
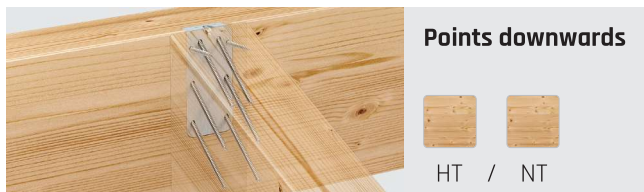
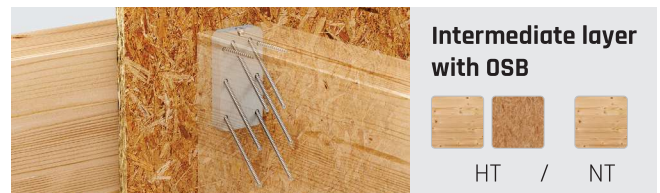
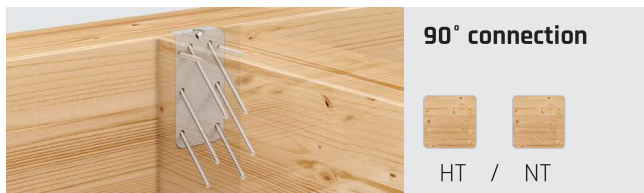
Timber-timber/steel/concrete connection
Construction beech and other materials according to the approval

Materials:



Material thicknesses:

16 / 24 mm



For use in usage classes



Connecting element

Timber - timber

Main beam: GH screws Ø 5.0 x 50 / 60 / 70 mm

Secondary beam: UV VG Ø 6.0 x 100 / 120 / 140 / 160 / 200 mm

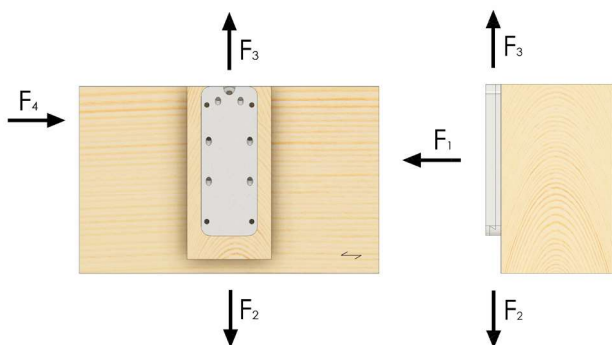
UV 20: GHS Drive Ø 4.0 mm

Timber - concrete/ steel

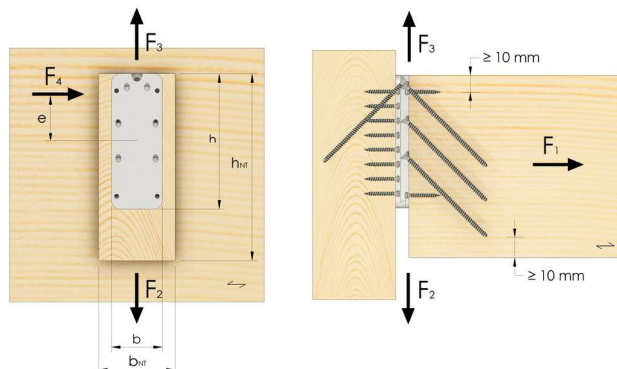
Main beam: Dowel or bolt M10 or Ø 10 with countersunk head

Secondary beam: UV VG Ø 6.0 x 100 / 120 / 140 / 160 / 200 mm

Load directions



Load attack points



F_1 takes effect in the centre of the TOP UV connector.

F_2 and F_3 take effect in the centre of the TOP UV connector.

F_4 takes effect at spacing e from the centre of the TOP UV connector. In the design tables, the values for $e = 0 \text{ mm}$ and $e = h/2$ are indicated. Load capacities for other spacing e can be calculated according to ETA-11/0036.

Timber/timber connection

Load case F_3

When connecting timber to timber, an additional UV fully threaded screw is always required after hanging the connector.

When connecting wood - concrete/steel, always use 2 M6 x 20 locking screws with washers.

One-sided connection

With one-sided connection to a main beam, the moment $M_{ec} = F_{2/3,E} \times (B_{HT} / 2 + e)$ must be considered for the load capacity proof of the main beam. With $F_{2/3}$ support force of the secondary beam, B_{HT} - width of the main beam and e - spacing of support force from the component edge, $e = 9 \text{ mm}$ for connection timber/timber with screws, $e = 17 \text{ mm}$ for connection timber/concrete or timber/steel with dowels/bolts

Two-sided connection

In the case of connections on both sides with different loads on the secondary beam connections (difference in forces $> 20 \%$), the moment from the differential forces of the secondary beam connections should be applied when designing the main beam.

Connection over intermediate layers

If there is an intermediate layer between the joist hangers and the main beam, the length of the connecting centre must be selected so that the fastener is anchored to the main beam at the lengths given above.

Proof of load capacity

$$\left(\frac{F_{1,Ed}}{F_{1,Rd}} + \frac{F_{2/3,Ed}}{F_{2/3,Rd}} \right)^2 + \left(\frac{F_{4,Ed}}{F_{4,Rd}} \right)^2 \leq 1$$

Connection timber/concrete, steel

Dowel design

Stress on the dowel/bolt for connection timber - concrete/ steel

Forces in most stressed dowel/bolt

Load case	F_1	F_2 and F_3	F_4
$F_{B,lat}$	0	$F_{2/3} / n_B$	$F_4 \times (1/n_B + e/H) = f_4 \times F_4$
$F_{B,ax}$	F_1 / n_B	$f_{2/3} \times F_{2/3}$	$1,2 \times F_4 / n_B$

Design value of load capacity

Full and partial screw fitting

$$F_{i,Rd} = F_{i,Rk} \times k_{mod} / \gamma_{M,Holz} \text{ mit } \gamma_{M,Holz} = 1,3$$

Load case F_3 timber-concrete/steel: $F_{3,Rd} = 6 / 1,25 = 4,8 \text{ kN}$

Factors for connection timber-concrete/steel

Type	UV-B 40	UV-B 60	UV-B 80	
n_B	2	2	3	2
$f_{2/3}$	0,299	0,192	0,106	0,133
f_4	$e = 0 \text{ mm}$	0,500	0,333	0,500
	$e = h/2$	1,267	1,167	0,948

Proof of load capacity

$$\left(\frac{F_{1,Ed}}{F_{1,Rd}} + \frac{F_{2/3,Ed}}{F_{2/3,Rd}} \right)^2 + \left(\frac{F_{4,Ed}}{F_{4,Rd}} \right)^2 \leq 1$$

General information

The load capacities in the table apply to timbers with a characteristic raw density of $\rho_s 350 \text{ kg/m}^3$.

For timber with a high raw density, the values in the table can be used to be on the safe side.

The height of the secondary beam must be selected so that the top screw $\varnothing 5 \text{ mm}$ in the secondary beam is at least 10 mm below the top of the secondary beam and the lowest screw tip in the secondary beam is at least 10 mm above the underside of the secondary beam.

The spacing between a TOP UV connector and a component surface may be max. 1 mm.

Design example timber/timber connection UV 80

Main beam: BSH GL24h 14/40; secondary beam: NH C24 10/28

Connection forces:

$F_{2,Ed} = 32.0$ kN; $F_{4,Ed} = 1.20$ kN; NKL 1, KLED mittel bzw. $k_{mod} = 0.8$; Last $F_{4,Ed}$

Attacks the secondary beam top edge.

Determination of spacing "e" between the connector's centre of gravity and the attack point of load F_4
 $e = h / 2 = 215 / 2 = 108$ mm, with connector top edge flush with the top edge of the secondary beam

Necessary characteristic load capacities of a connector

$$F_{2,Rk,erf} = F_{2,Ed} / k_{mod} \times \gamma_M = 32.0 / 0.8 \times 1.3 = 52.0 \text{ kN}$$

$$F_{4,Rk,erf} = F_{4,Ed} / k_{mod} \times \gamma_M = 1.20 / 0.8 \times 1.3 = 1.95 \text{ kN}$$

A higher load-bearing capacity is selected due to the biaxial load.

TOP UV 80 fully screw fitted with screws 5.0 x 60 mm and 6.0 x 160 mm

Design value of load capacities from the table values

$$F_{2,Rd} = F_{2,Rk} \times k_{mod} / \gamma_M = 68.0 \times 0.8 / 1.3 = 41.8 \text{ kN}$$

$$F_{4,Rd} = F_{4,Rk} \times k_{mod} / \gamma_M = 3.53 \times 0.8 / 1.3 = 2.17 \text{ kN}$$

Proof of load capacity

$$\left(\frac{F_{1,Ed}}{F_{1,Rd}} + \frac{F_{2/3,Ed}}{F_{2/3,Rd}} \right)^2 + \left(\frac{F_{4,Ed}}{F_{4,Rd}} \right)^2 \leq 1 \quad \left(\frac{32,0}{41,8} \right)^2 + \left(\frac{1,20}{2,17} \right)^2 = 0.89$$

Connecting element:

Main beam:	GH screws 5.0 x 60	30 units
	VG screws 6.0 x 160	1 units
Secondary beam:	GH screws 5.0 x 60	4 units
	VG screws 6.0 x 160	8 units

Design example timber/concrete connection UV-B 80

Main beam: Reinforced concrete wall; secondary beam: NH C24 10/28

Proof of load capacity same as timber-timber connection

Determination of forces for the concrete with the maximum stress

Anchor forces from load $F_{2,Ed}$: $F_{B,2,lat,Ed} = F_{2/3,Ed} / n_B = 32.0 / 3 = 10.7$ kN

$$F_{B,2,ox,Ed} = f_{2/3} \times F_{2/3,Ed} = 0.106 \times 32.0 = 3.39 \text{ kN}$$

Anchor forces from load $F_{4,Ed}$: $F_{B,4,lat,Ed} = f_4 \times F_{4,Ed} = 0.948 \times 1.20 = 1.14$ kN

$$F_{B,4,ox,Ed} = 1.2 \times F_{4,Ed} / n_B = 1.2 \times 1.20 / 3 = 0.48 \text{ kN}$$

Addition of anchor forces: $F_{B,lat,Ed} = 10.7 + 1.14 = 11.8$ kN

$$F_{B,ox,Ed} = 3.39 + 0.48 = 3.87 \text{ kN}$$

The load capacity of the concrete anchor must be verified for the impacts $F_{B,lat,Ed} = 11.8$ kN and $F_{B,ox,Ed} = 3.87$ kN.

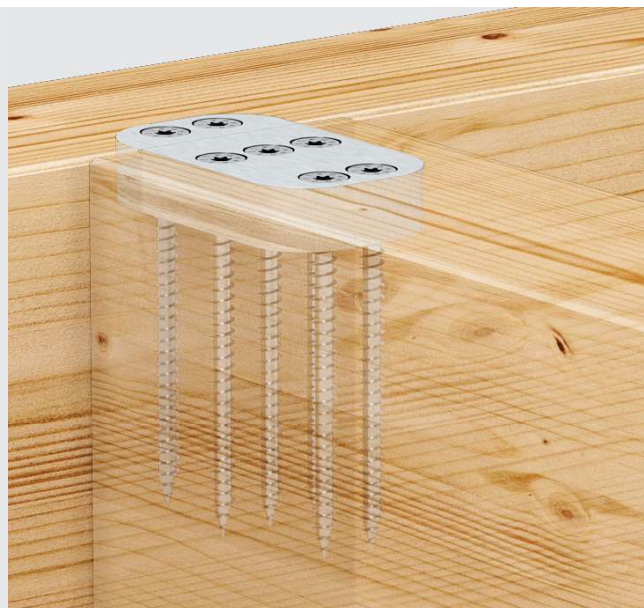
Connecting element:

Concrete:	Concrete anchor M10	3 units
Secondary beam:	GH screws 5.0 x 60	4 units
	VG screws 6.0 x 160	8 units



TOP OV CONNECTORS

2 “SIMPLE AND INGENIOUS”



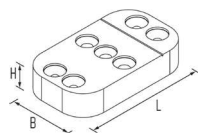
ADVANTAGES

- Cost savings due to reduction of working time
- No templates required
- Does not weaken the timber cross-section
- For narrow cross-sections (from 60 mm)
- No one-sided load on the main beam
- Connections on both sides possible due to the low contact surface
- For complete ceiling elements in timber framework construction

TWO STEPS TO SUCCESS

- In the factory:
Mill in TOP OV connectors or only position. Mount the TOP OV connectors with maximum 4 tensile and 2 pressure screws on the secondary beam
- On the building site:
Place the secondary beam in or on the main beam and turn in 2 pressure screws



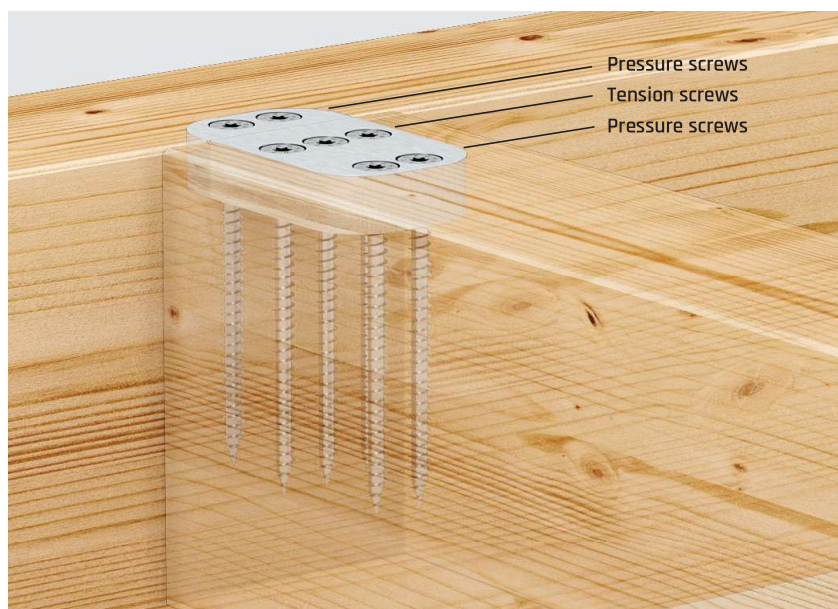


TOP OV CONNECTORS

TIMBER/TIMBER 2

Art. No.	Type	Dimensions [mm]					nH	nN	EAN	Weight kg	Pallet	PU
		W(B)	x	L	x	H						
110040	OV 40	40	x	104	x	20	1	3	017692	0.200	480	10
110060	OV 60	60	x	104	x	20	2	5	017708	0.304	480	10
110100	OV 100	100	x	104	x	20	2	6	017722	0.537	480	10

Number of screws required: nH = maximum number of connecting elements in the main beam
nN = maximum number of connecting elements in the secondary beam



TOP-OV

FULL THREAD SCREWS

Art. No.	Dimensions [mm]				TX	EAN	Weight kg	Pallet	PU
	Ø	x	L						
110120	8,0	x	120		TX40	017739	3.000	14500	50
110160	8,0	x	160		TX40	017753	3.520	11000	50
110200	8,0	x	200		TX40	017777	4.370	11000	50

TOP OV CONNECTORS

2 TECHNICAL FEATURES

Geometry

W(B)	Width (mm)
H	Height (mm)
T(S)	Material thickness (mm)

Tables

n_{HT}	Number of holes in main beam
n_{NT}	Number of holes in secondary beam
n_v	Number of connecting elements for full screw fitting
HT	Main beam
NT	Secondary beam
H_{HT}	Minimum height of main beam
B_{HT}	Minimum width of main beam
H_{NT}	Minimum height of secondary beam
B_{NT}	Minimum width of secondary beam

Timber connecting element

$\emptyset$ [mm]	Diameter of connecting element
L [mm]	Length of connecting element
	Grain direction of component

Force directions

$F_{Z,G,Rk}$ ↓	Pressure load directly downward (main load)
$F_{Z,t,Rk}$ ↑	Upwards directed, lifting load



User video
for our TOP OV connectors



Aluminium



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

TOP OV CONNECTORS

APPLICATIONS 2

Application:

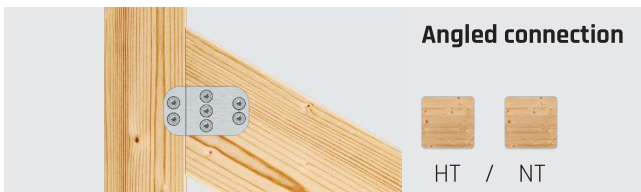
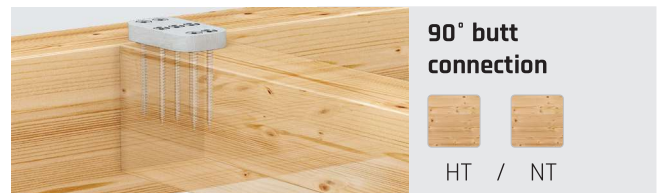
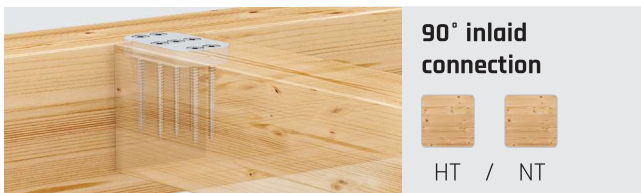
Timber-timber/steel connection

Materials:



Material thickness:

20 mm



For use in usage classes



Connecting element:

GH OV full thread screws Ø 8.0 x 120 / 140 / 160 / 200 / 220 mm



TOP OV CONNECTORS

2 “SIMPLE AND INGENUOUS”

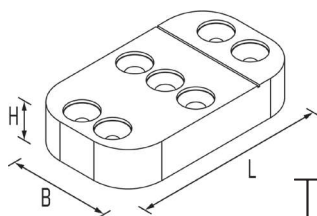


Function of pressure screws

When turning in the OV full thread screws, a thread cuts into the OV connector. This creates a flush-fitting connection between the OV connector and the OV screw.

Effect of pressure screws

Due to the flush-fit connection, load $F_{z,down}$ is transferred from the secondary beam via the OV screws into the main beam.



TOP OV CONNECTORS

TIMBER/TIMBER

2

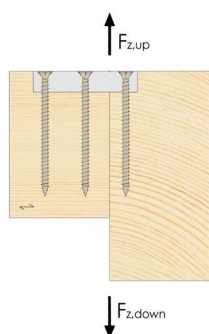
Timber / Timber													
Art. No.	Type	Dimensions [mm]					nH	nN	B _{NT}	EAN	Weight kg	Pallet	PU
		W(B)	x	L	x	H							
110040	OV 40	40	x	104	x	20	1	3	60	017692	0.200	480	10
110060	OV 60	60	x	104	x	20	2	5	80	017708	0.304	480	10
110100	OV 100	100	x	104	x	20	2	6	120	017722	0.537	480	10
Art. No.	Dimensions [mm]			Minimum height of secondary beam									
	Ø	x	L	OV applied H _{min} [mm]					OV inlaid H _{min} [mm]				
110120	8,0	x	120	130					150				
110160	8,0	x	160	170					190				
110200	8,0	x	200	210					230				

nH = number of connectors in the main beam

nN = maximum number of connecting elements in the secondary beam

B_{NT} = minimum width of secondary beam

Load directions



Proof of load capacity

See statics table. For more detailed information on design, see ETA-12/0171

Proof of load capacity

The pressure load-bearing capacity of the screws (OV pressure screws) is limited depending on the diameter. This limit is lower than the tensile load capacity (OV tension screws).

The load-bearing capacity for buckling is a pure steel component and is therefore not dependent on the KLED. In the design situation, the thread load-bearing capacity is always lower than the buckling load-bearing capacity (k_{mod}). With the characteristic load-bearing capacity, buckling is already decisive with shorter screws.

General information

One-sided connection

The main beam must be secured against twisting.

The load capacities in the table apply to timbers with a characteristic raw density of ρ_k at least 350 kg/m³. For timber with a high raw density, the values in the table can be used to be on the safe side.

Timber / Timber										
Art. No.	Type	W(B)	L	H	n _{HT}	n _{NT}	GH VG screw 8.0 x L [mm]			
							120	160	200	
110040	OV 40	40	104	20	1	3	F _{Z,C,Rk}	10,06	13,62	15,11
							F _{Z,T,Rk}	2,40	2,40	2,40
110060	OV 60	60	104	20	2	5	F _{Z,C,Rk}	15,10	20,44	25,42
							F _{Z,T,Rk}	3,60	3,60	3,60
110100	OV 100	100	104	20	2	6	F _{Z,C,Rk}	20,13	27,25	27,82
							F _{Z,T,Rk}	6,00	6,00	6,00