ETA-Danmark A/S
Göteborg Plads 1
DK-2150 Nordhavn
Tel. +45 72 24 59 00
Fax +45 72 24 59 04
Internet www.etadanmark.dk

Authorised and notified according to Article 29 of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011

European Technical Assessment ETA-12/0171 of 2017-06-04

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S

Trade name of the construction product:	GH TOP OV Connectors
Product family to which the above construction product belongs:	Three-dimensional nailing plate (Beam hanger for timber-to-timber connections)
Manufacturer:	GH-Baubeschläge GmbH Austraße 34 D-73235 Weilheim/Teck Tel. +49 7023 743323 0 Fax +49 7023 743323 90 Internet www.holzverbinder.de
Manufacturing plant:	Werk 1, Werk 2
This European Technical Assessment contains:	13 pages including 3 annexes which form an integral part of the document
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:	Guideline for European Technical Approval (ETAG) No. 015 Three Dimensional Nailing Plates, April 2013, used as European Assessment Document (EAD).
This version replaces:	The previous ETA with the same number issued on 2012-06-04 and expiry on 2017-06-04

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product and intended use

Technical description of the product
GH TOP OV Connectors are one-piece, top-fixed connectors to be used in timber to timber connections.

The TOP OV Connectors are made from aluminium grade EN AW-7020 T6 or EN AW-2007 T4 according to EN 573-3. Dimensions, hole positions, aluminium alloy and typical installations are shown in Annexes A and C.

2 Specification of the intended use in accordance with the applicable EAD

The TOP OV Connectors are intended for use in making end-grain to side-grain connections in load bearing timber structures, as a connection between a wood based joist and a solid timber or wood based header or column, where requirements for mechanical resistance and stability and safety in use in the sense of the Basic Works Requirements 1 and 4 of Regulation (EU) 305/2011 shall be fulfilled.

The TOP OV Connectors can be installed as connections between wood based members such as:

- Structural solid timber classified to C14-C40 according to EN 14081,
- Glulam classified to GL24-GL36 according to EN 14080,
- Duo- and Triobalken,
- Cross laminated timber.

However, the calculation methods are only allowed for a characteristic wood density of up to 460 kg/m^3. Even though the wood based material may have a larger density, this must not be used in the formulas for the load-carrying capacities of the fasteners.

Annex B states the formulas for the design load-carrying capacities of the connections with TOP OV Connectors. The design of the connections shall be in accordance with Eurocode 5 or a similar national Timber Code.

The downward and the upward directed forces $F_{Z,Ed}$ are assumed to act in the middle of the joist.

It is assumed that the header beam is prevented from rotating. If the header beam only has installed a TOP OV Connector on one side the eccentricity moment $M_v = F_d \cdot (B_H / 2 + 16\text{mm})$ shall be considered. The same applies when the header has TOP OV Connector connections on both sides, but with vertical forces which differ more than 20%.

The TOP OV Connectors are intended for use for connections subject to static or quasi static loading.

The aluminium connectors are for use in timber structures subject to the dry, internal conditions defined by the service classes 1 and 2 of EN 1995-1-1:2008, (Eurocode 5).

The scope of the hangers regarding resistance to corrosion shall be defined according to national provisions that apply at the installation site considering environmental conditions.

The provisions made in this European Technical Assessment are based on an assumed intended working life of the connectors of 50 years.

The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability*) (BWR1)	
Characteristic load-carrying capacity	See Annex B
Stiffness	No performance determined
Ductility in cyclic testing	No performance determined
3.2 Safety in case of fire (BWR2)	
Reaction to fire	The TOP OV hangers are made from steel or aluminium classified as **Euroclass A1** in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364
3.3 Hygiene, health and the environment (BWR3)	
Influence on air quality	The product does not contain/release dangerous substances specified in TR 034, dated March 2012 0**)
3.7 Sustainable use of natural resources (BWR7)	No Performance Determined
3.8 General aspects related to the performance of the product	The TOP OV hangers have been assessed as having satisfactory durability and serviceability when used in timber structures using the timber species described in Eurocode 5 and subject to the conditions defined by service class 1 and 2
Identification	See Annex A

*) See additional information in section 3.9 – 3.11.

**) In addition to the specific clauses relating to dangerous substances contained in this European technical Assessment, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

3.9 Mechanical resistance and stability

See annex B for design load-carrying capacities of the TOP OV Connectors.

The characteristic capacities of the TOP OV Connectors are determined by calculation assisted by testing as described in the EOTA Guideline 015 clause 5.1.1. They should be used for designs in accordance with Eurocode 5 or a similar national Timber Code.

The design models allow the use of fasteners described in the table on page 7 in Annex A:

- *Screws in accordance with EN 14592 and Annex A*

No performance has been determined in relation to ductility of a joint under cyclic testing. The contribution to the performance of structures in seismic zones, therefore, has not been assessed.

No performance has been determined in relation to the joint's stiffness properties - to be used for the analysis of the serviceability limit state.

3.10 Aspects related to the performance of the product

2.7.1 Corrosion protection in service class 1 and 2.
In accordance with ETAG 015 the TOP OV Connectors are produced from aluminium grade EN AW-7020 T6 or EN AW-2007 T4 according to EN 573-3.

3.11 General aspects related to the fitness for use of the product

TOP UV Connector connections

The performances given in this ETA are based on the following:

Header – support conditions

- The header beam shall be restrained against rotation and be free from wane under the TOP OV Connector

  If the header carries joists only on one side the eccentricity moment from the joists $M_{ec} = R_{joist}$ (b_{header}/2+16mm) shall be considered at the strength verification of the header.

  R_{joist} Reaction force from the joists
  b_{header} Width of header

- For a header with joists from both sides but with different reaction forces a similar consideration applies.

Wood to wood connections

- TOP OV Connectors are fastened to wood-based headers, joists or columns by screws.
- There shall screws in all holes as prescribed in Annex B.
- The characteristic capacity of the connection with TOP OV Connectors is calculated according to the manufacturer's technical documentation, dated 2012-01-14.
- The connection with TOP OV Connectors is designed in accordance with Eurocode 5 or an appropriate national code.
- The gap between the end of the joist and the surface of the header shall be limited. This means that for TOP OV Connectors the gap between the surfaces of the header or column and the end of the joist shall be maximum 1 mm.
- The joist end grain surface and the surface of the header shall have a plane surface.
- The depth of the joist or header shall be so large that the bottom of the joist or header is at least 10 mm below the lower screw tip in the joist or header.
- Screws to be used shall have a diameter of 8 mm and a head shape, which fits the indentations in the TOP OV Connectors.

4 Attestation and verification of constancy of performance (AVCP)

4.1 AVCP system

According to the decision 97/638/EC of the European Commission1, as amended, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 2+.

5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking

Issued in Copenhagen on 2017-06-04 by

Thomas Bruun
Managing Director, ETA-Danmark

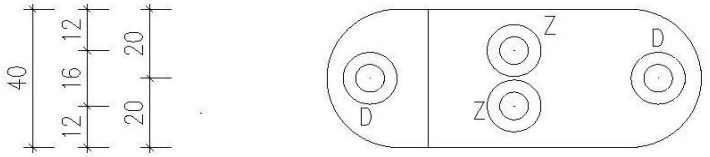
Annex A

Product details and definitions

TOP OV Connector

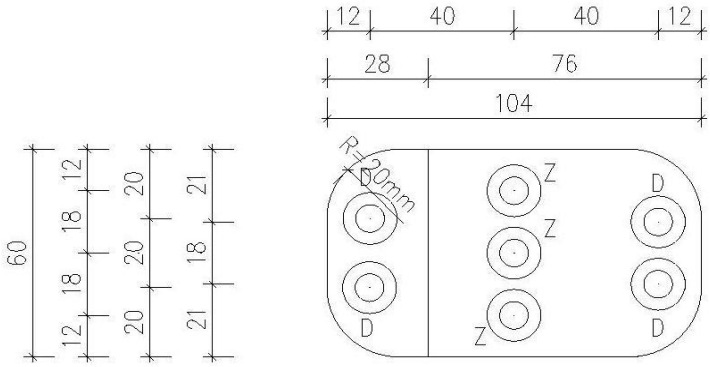
Top-mount connector.

Aluminium grade EN AW-7020 T6 or EN AW-2007 T4 according to EN 573-3.



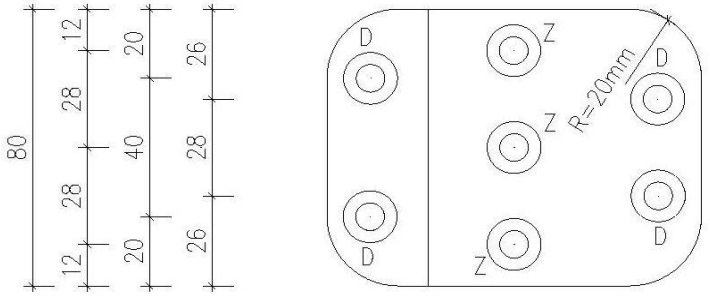
Type 40

for joist widths $B_N \geq 60$mm



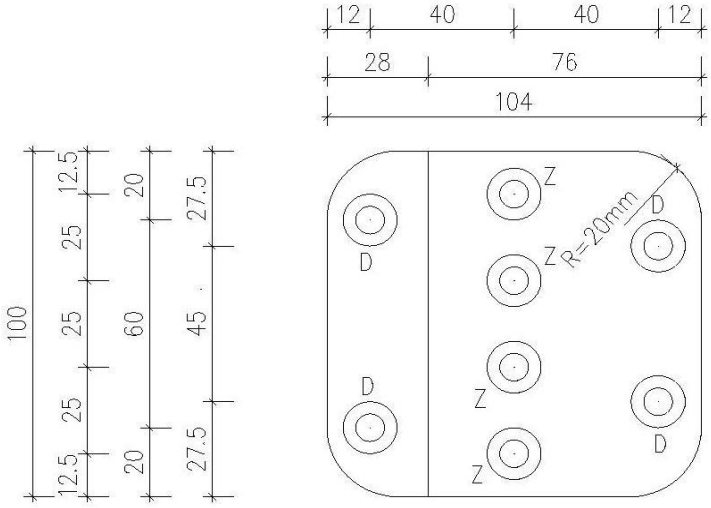
Type 60

for joist widths $B_N \geq 80$mm



Type 80

for joist widths $B_N \geq 100$mm



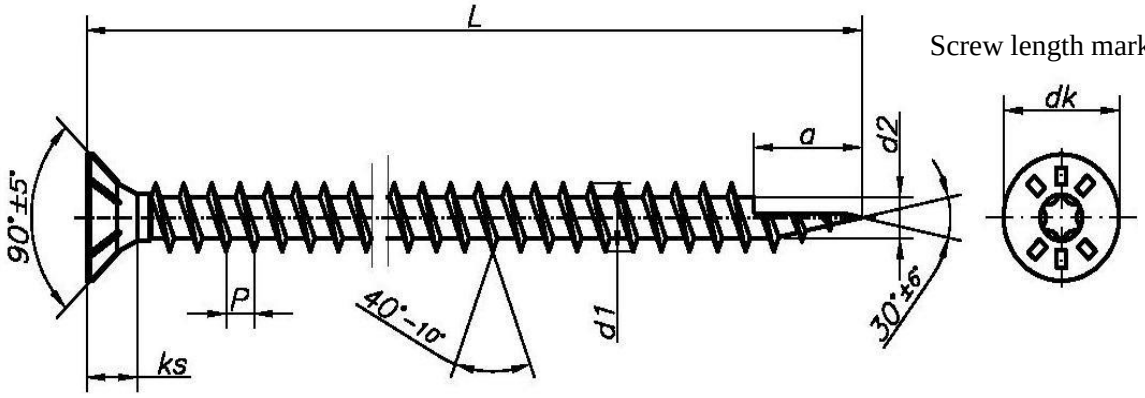
Type 100

for joist widths $B_N \geq 120$mm

Dimensions in mm

Fastener type and sizes

Countersunk head



Screw length marked on head

Outer thread diameter d1	Lead P	Inner thread diameter d2	Head diameter dk	ks	a	Drive	t
8,0 +0,3/-0,5	3,6 ±0,3	5,3 -0,4	15,0 -1	7,0	11,0 ±3	T 40	3,4 ±0,7

$f_{tens,k}$	$f_{ax,k}$	$f_{y,k}$
23 kN	$0{,}52 \cdot d_1^{-0{,}5} \cdot \ell_{ef}^{-0{,}1} \cdot \rho_k^{0{,}8} N/mm^2$	800 N/mm²

d_1 Outer thread diameter in mm
ℓ_{ef} Penetration length of the thread in mm
ρ_k Characteristic density in kg/m³

Lengths			
Nominal length		tolerance	steps
from	to		
120	180	-4,0	10
180	250	-4,6	10
250	315	-5,2	10
315	400	-5,7	10

Dimensions in mm

Annex B
Design values of load-carrying-capacities

The downward and the upward directed forces $F_{Z,Ed}$ are assumed to act in the middle of the joist. There is only one fastener pattern, where there are screws in all the holes of the connector plate.

Force downward in the direction of the screw tips:

$$F_{Z,Rd} = \min\left\{F_{H,Rd}\,;\,F_{J,Rd}\right\} \text{ for joist-to-header connections} \quad \text{(B.1.1)}$$

$$F_{Z,Rd} = \min\left\{F_{C,Rd}\,;\,F_{J,Rd}\right\} \text{ for joist-to-column connections} \quad \text{(B.1.2)}$$

Where:

$$F_{H,Rd} = n_H \cdot \min\left\{f_{ax,d} \cdot d \cdot \ell_{ef}\,;\,\kappa_c \cdot N_{pl,d}\,;\,\frac{14700}{\gamma_{M,Alu}}\right\} + f_{c,90,d} \cdot A_{ef} \cdot k_{c,90} \quad \text{(B.1.3)}$$

$$F_{C,Rd} = f_{c,0,d} \cdot A_c \quad \text{(B.1.4)}$$

$$F_{J,Rd} = \frac{n_t}{2} \cdot \min\left\{f_{ax,d} \cdot d \cdot \ell_{ef}\,;\,f_{tens,d}\right\} \quad \text{(B.1.5)}$$

n_H	Number of header screws;
$f_{ax,d}$	Design withdrawal parameter of the screw in the joist or header in N/mm²;
ℓ_{ef}	Threaded length in the joist or header in mm;
d	Screw diameter, d = 8 mm;
$\kappa_c \cdot N_{pl,d}$	Design buckling capacity of the screw in N;
$f_{c,90,d}$	Design compression strength perpendicular to the grain of the header in N/mm²;
A_{ef}	Effective area according to EN 1995-1-1 6.1.5 in mm²; the width of A_{ef} is 16 mm, the length is between b_{verb} and b_{verb} + 60 mm;
b_{verb}	Width of the GH TOP OV connector in mm;
$k_{c,90}$	Factor according to EN 1995-1-1 6.1.5;
$f_{c,0,d}$	Design compression strength parallel to the grain of the column in N/mm²;
A_c	Contact area on the column in mm² (see Table B.1);
n_t	Number of joist tensile screws;

Force upward in the direction of the screw heads:

$$F_{Z,Rd} = \min\left\{F_{H,Rd}\,;\,F_{J,Rd}\right\} \text{ for joist-to-header connections} \quad \text{(B.1.6)}$$

Where:

$$F_{H,Rd} = n_H \cdot \min\left\{f_{ax,d} \cdot d \cdot \ell_{ef}\,;\,f_{tens,d}\right\} \quad \text{(B.1.7)}$$

$$F_{J,Rd} = f_{c,90,d} \cdot b_{verb} \cdot 24 \quad \text{(B.1.8)}$$

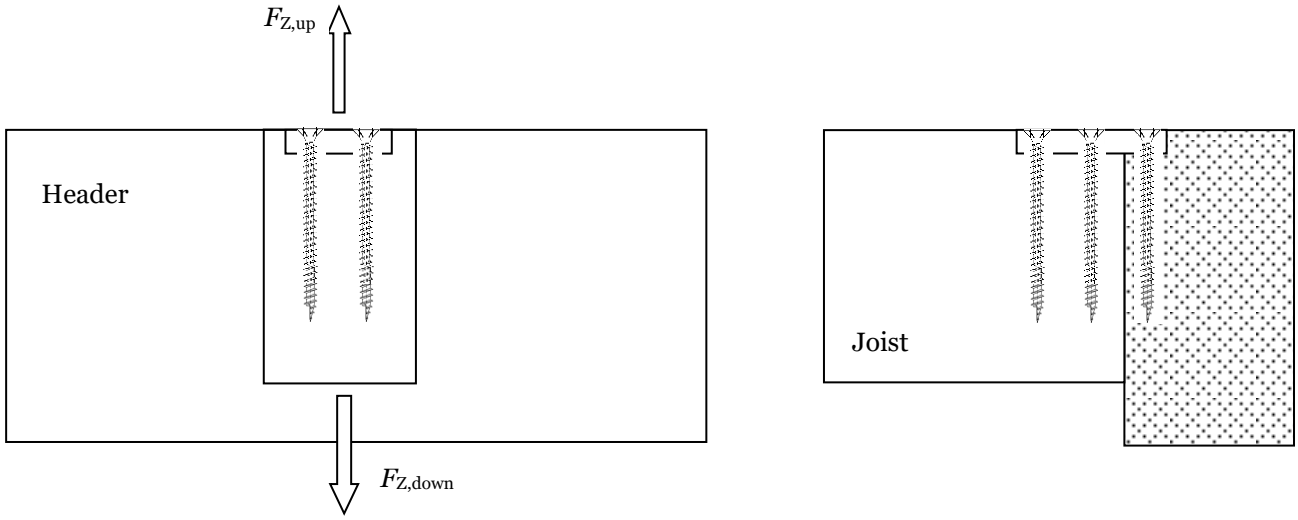
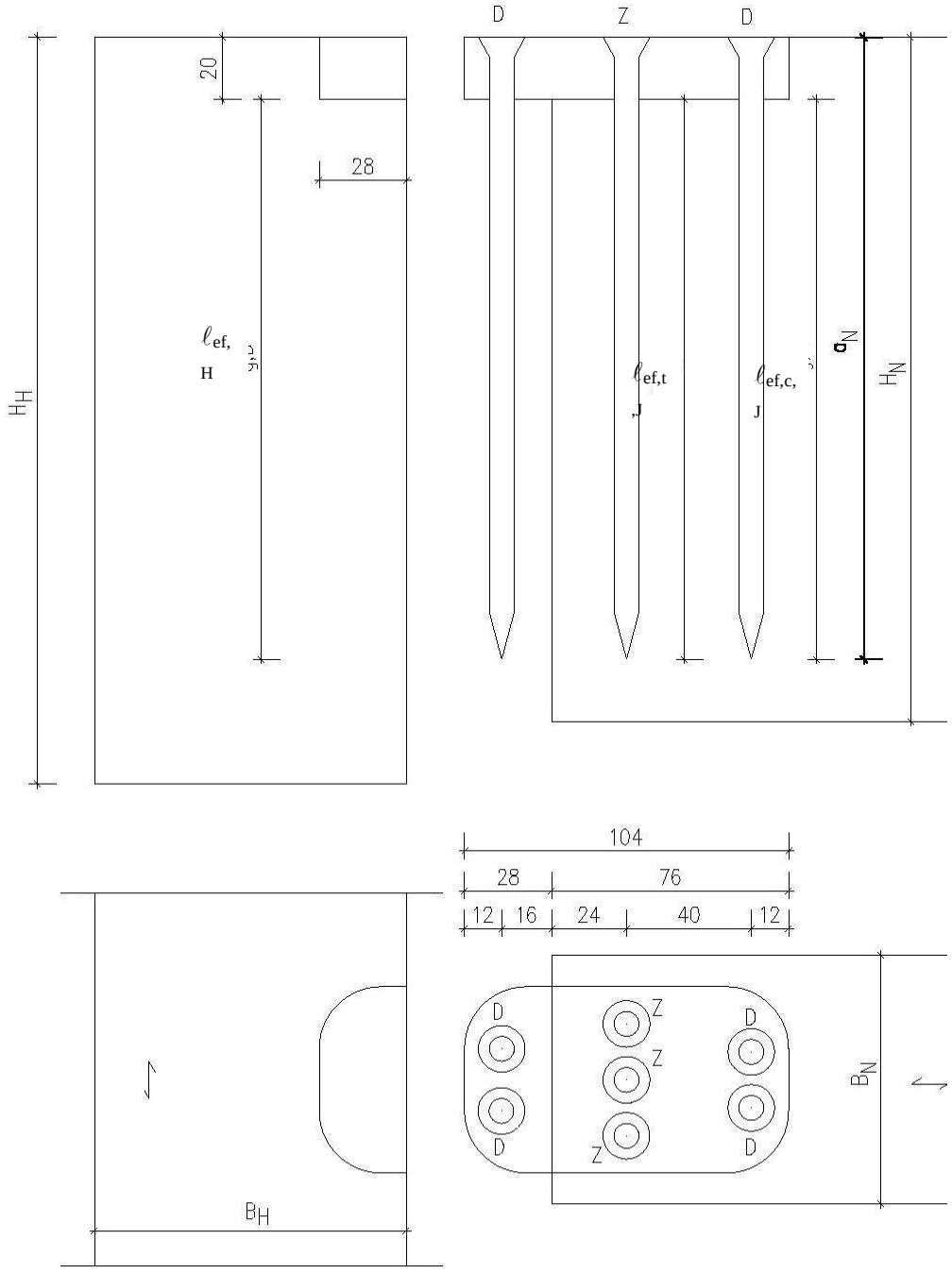


Figure B1: Definition of up and down

Table B.1: GH TOP OV Connectors: Dimensions, number of screws and contact area A_c

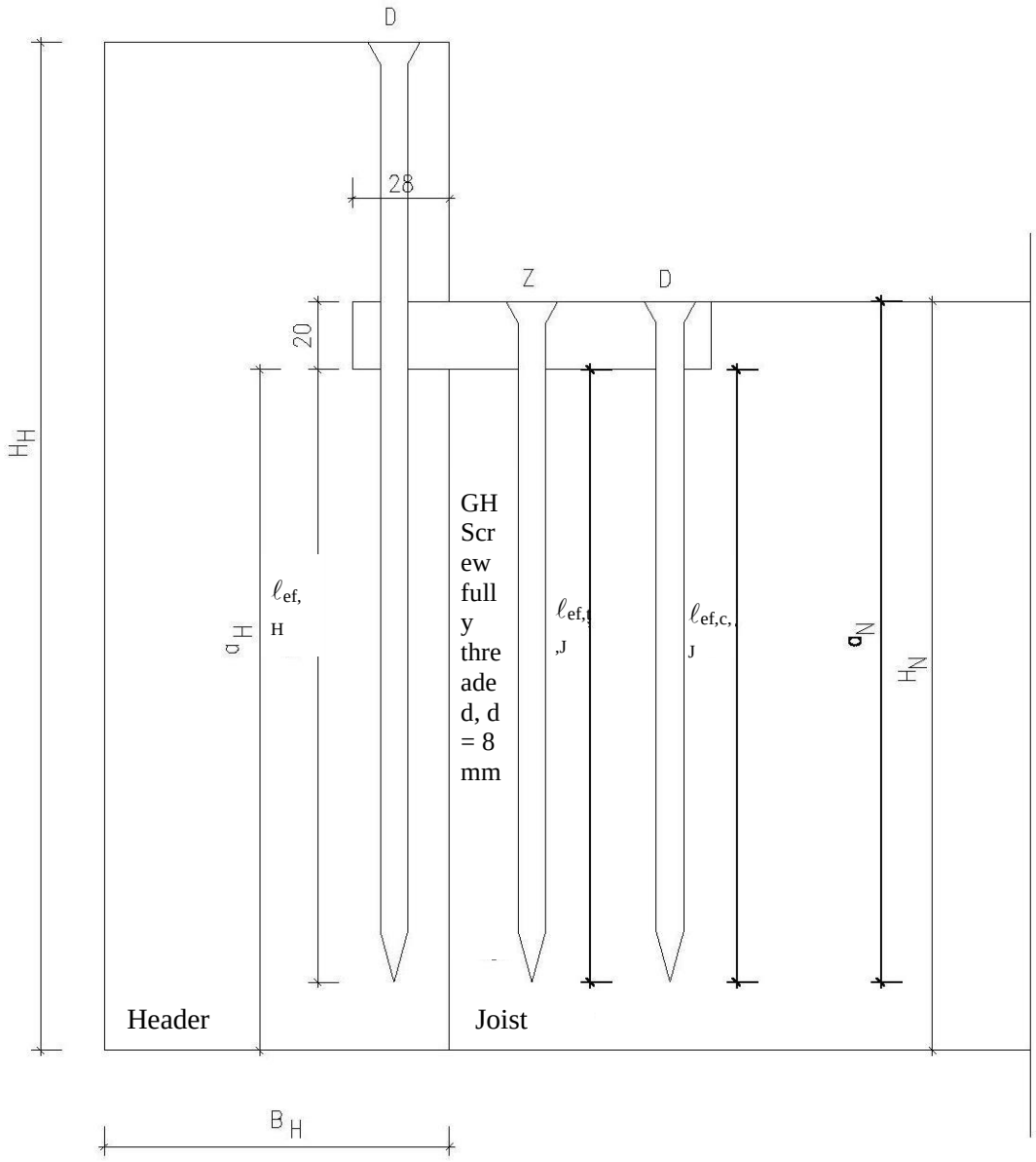
GH TOP OV connector Type		40	60	80	100
Minimum joist width	[mm]	60	80	100	120
Screws ∅ 8 mm					
Number of header compressive screws	n_H	1	2	2	2
Number of joist tensile screws	n_t	2	3	3	4
Number of joist compressive screws	n_H	1	2	2	2
A_c	[mm²]	948	1508	2068	2628

Annex C
Installation of GH TOP OV Connectors



The connector maybe arranged on top of joist and header or put into fitting indentations

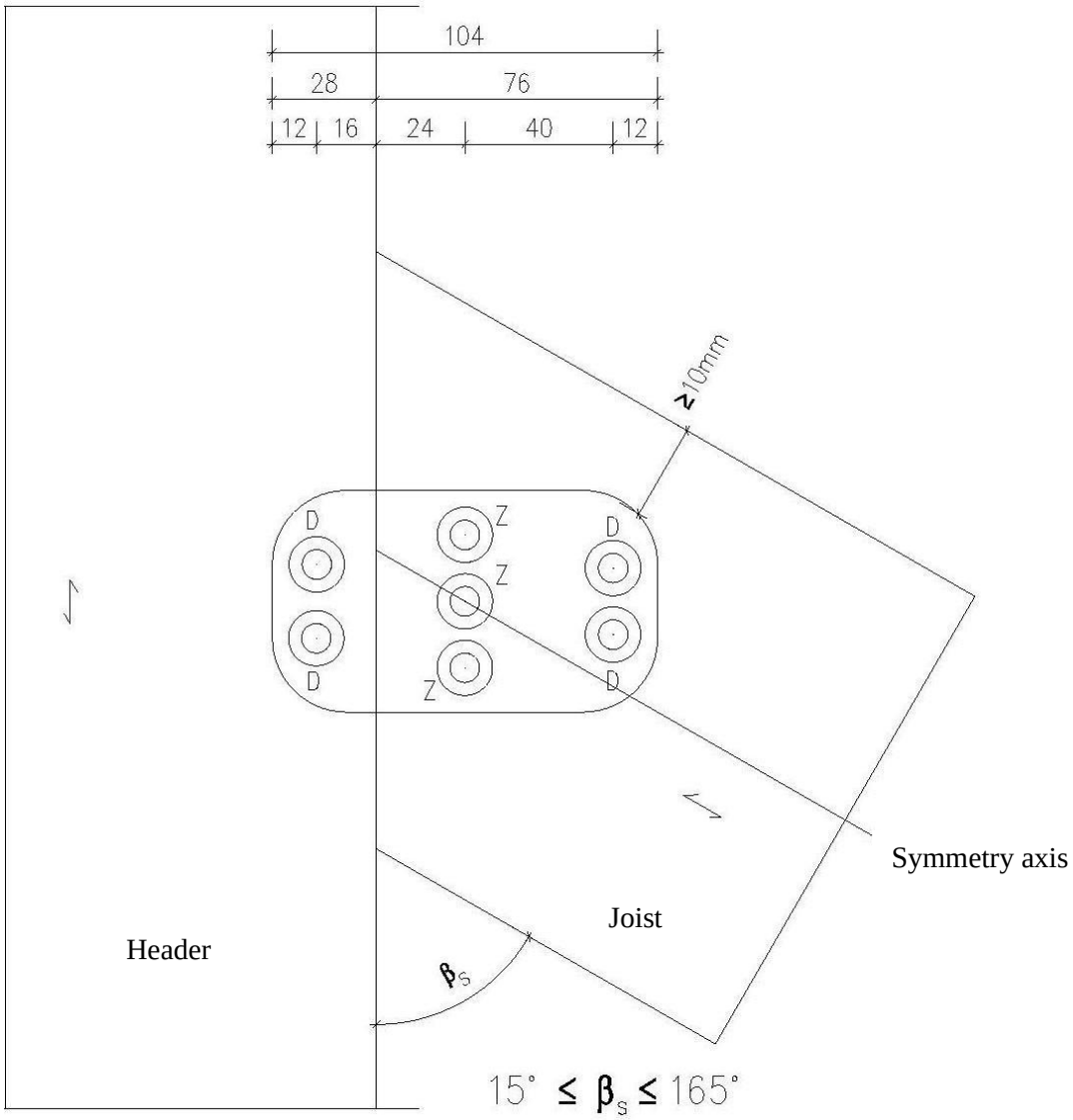
Dimensions in mm



$\ell_{ef,H} \geq \ell_{ef,t,J}$ $\ell_{ef,c,J} \geq \ell_{ef,t,J}$

The connector maybe arranged on top of the joist or put into fitting indentations

Dimensions in mm



The connector maybe arranged on top of joist and header or put into fitting indentations

Dimensions in mm