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Authorised and notified according to Article 10 of the Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products

MEMBER OF EOTA

European Technical Approval ETA-12/0171

Trade name:

GH TOP OV Connectors

Holder of approval:

GH Baubeschläge GmbH
Austrasse 34
D-73235 Weilheim / Teck
Tel.: +49 7023 7433 23-11
Telefax: +49 7023 7433 23-29
Internet: www.holzverbinder.de

Generic type and use of construction product:

Three-dimensional nailing plate (Beam hanger for timber-to-timber connections)

Valid from:
to:

2012-06-04
2017-06-04

Manufacturing plant:

GH Baubeschläge GmbH
Austrasse 34
D-73235 Weilheim / Teck

This European Technical Approval contains:

15 pages including 3 annexes which form an integral part of the document



European Organisation for Technical Approvals

Europæisk Organisation for Tekniske Godkendelser

I LEGAL BASIS AND GENERAL CONDITIONS

1 This European Technical Approval is issued by ETA-Danmark A/S in accordance with:

- Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products¹⁾, as amended by Council Directive 93/68/EEC of 22 July 1993²⁾.

- Bekendtgørelse 559 af 27-06-1994 (afløser bekendtgørelse 480 af 25-06-1991) om ikrafttræden af EF direktiv af 21. december 1988 om indbyrdes tilnærmelse af medlemsstaternes love og administrative bestemmelser om byggevarer.

- Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex to Commission Decision 94/23/EC³⁾.

- EOTA Guideline ETAG 015 *Three-dimensional nailing plates*, September 2002 edition.

2 ETA-Danmark A/S is authorized to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European Technical Approval and for their fitness for the intended use remains with the holder of the European Technical Approval.

3 This European Technical Approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European Technical Approval.

4 This European Technical Approval may be withdrawn by ETA-Danmark A/S pursuant to Article 5(1) of Council Directive 89/106/EEC.

1) Official Journal of the European Communities N° L40, 11 Feb 1989, p 12.

2) Official Journal of the European Communities N° L220, 30 Aug 1993, p 1.

3) Official Journal of the European Communities N° L 17, 20 Jan 1994, p 34.

5 Reproduction of this European Technical Approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of ETA-Danmark A/S. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.

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I SPECIAL CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

Definition 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.

Intended use

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 Essential Requirements 1 and 4 of Council Directive 89/106/EEC 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).

Assumed working life

The assumed intended working life of the angle brackets for the intended use is 50 years, provided that they are subject to appropriate use and maintenance.

The information on the working life should not be regarded as a guarantee provided by the manufacturer or ETA Danmark. An “assumed intended working life” means that it is expected that, when this working life has elapsed, the real working life may be, in normal use conditions, considerably longer without major degradation affecting the essential requirements.

2 Characteristics of product and assessment

ETAG paragraph	Characteristic	Assessment of characteristic
2.1 Mechanical resistance and stability*)		
6.1.1	Characteristic load-carrying capacity	See Annex B
6.1.2	Stiffness	No performance determined
6.1.3	Ductility in cyclic testing	No performance determined
2.2 Safety in case of fire		
6.2.1	Reaction to fire	The TOP OV Connectors are made from steel classified as Euroclass A1 in accordance with EN 1350-1 and EC decision 96/603/EC, amended by EC Decision 2000/605/EC
2.3 Hygiene, health and the environment		
6.3.1	Influence on air quality	No dangerous materials **)
2.4 Safety in use		
2.5 Protection against noise		
2.6 Energy economy and heat retention		
2.7 Related aspects of serviceability		
6.7.1	Durability	The TOP OV Connectors 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
6.7.2	Serviceability	
6.7.3	Identification	

*) See page 5 of this ETA

**) In accordance with <http://europa.eu.int/comm/enterprise/construction/internal/dangsub/dangmain.htm> In addition to the specific clauses relating to dangerous substances contained in this European Technical Approval, 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 EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

Safety principles and partial factors

2.1 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.

2.7 Related aspects of serviceability

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 Attestation of Conformity and CE marking

3.1 Attestation of Conformity system

The system of attestation of conformity is 2+ described in Council Directive 89/106/EEC (Construction Products Directive) Annex III.

- a) Tasks for the manufacturer:
 - (1) Factory production control,
 - (2) Initial type testing of the product,
- b) Tasks for the notified body:
 - (1) Initial inspection of the factory and the factory production control,
 - (2) Continuous surveillance

3.2 Responsibilities

3.2.1 Tasks of the manufacturer

3.2.1.1 Factory production control

The manufacturer has a factory production control system in the plant and exercises permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer are documented in a systematic manner in the form of written policies and procedures. This production control system ensures that the product is in conformity with the European Technical Approval.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the control plan⁴. The incoming raw materials shall be subject to controls and tests by the manufacturer before acceptance. Check of materials, such as sheet metal, shall include control of the inspection documents presented by suppliers (comparison with nominal values) by verifying dimension and determining material properties, e.g. chemical composition, mechanical properties and zinc coating thickness.

The manufactured components are checked visually and for dimensions.

The control plan, which is part of the technical documentation of this European Technical Approval, includes details of the extent, nature and frequency of

testing and controls to be performed within the factory production control and has been agreed between the approval holder and ETA Danmark.

The results of factory production control are recorded and evaluated. The records include at least the following information:

- Designation of the product, basic material and components;
- Type of control or testing;
- Date of manufacture of the product and date of testing of the product or basic material and components;
- Result of control and testing and, if appropriate, comparison with requirements;
- Signature of person responsible for factory production control.

The records shall be presented to ETA Danmark on request.

3.2.1.1 Initial type testing of the product

For initial type-testing the results of the tests performed as part of the assessment for the European Technical Approval shall be used unless there are changes in the production line or plant. In such cases the necessary initial type testing has to be agreed between ETA Danmark and the notified body.

3.2.2. Tasks of notified bodies

3.2.2.1 Initial inspection of the factory and the factory production control

The approved body should ascertain that, in accordance with the control plan, the factory, in particular the staff and equipment, and the factory production control, are suitable to ensure a continuous and orderly manufacturing of the connectors with the specifications given in part 2.

3.2.2.2 Continuous surveillance

The approved body shall visit the factory at least twice a year for routine inspections. It shall be verified that the system of factory production control and the specified manufacturing processes are maintained, taking account of the control plan.

The results of product certification and continuous surveillance shall be made available on demand by the certification body to ETA Danmark. Where the provisions of the European Technical Approval and the control plan are no longer fulfilled, the certificate of conformity shall be withdrawn by the approved body.

⁴ The control plan has been deposited at ETA-Danmark and is only made available to the approved bodies involved in the conformity attestation procedure.

3.3 CE marking

The CE marking shall be affixed on each packaging of connectors. The initials "CE" shall be followed by the identification number of the notified body and shall be accompanied by the following information:

- Name or identifying mark of the manufacturer
- The last two digits of the year in which the marking was affixed
- Number of the European Technical Approval
- Name and size of product
- Number of the ETA Guideline (ETAG no. 015)
- Number of the EC Certificate of Conformity

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

GH TOP OV Connectors are manufactured in accordance with the provisions of this European Technical Approval using the manufacturing processes as identified in the inspection of the plant by the notified inspection body and laid down in the technical documentation.

4.2

TOP OV Connector connections

A TOP OV Connector connection is deemed fit for its intended use provided:

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 $M_{ec} = R_{joist} (b_{header}/2 + 16\text{mm})$ 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

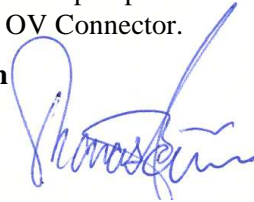
- TOP OV Connectors are fastened to wood-based headers, joists or columns by screws.
- There shall screws in all holes as prescribed in Annex B.
- The characteristic capacity of the connection with TOP OV Connectors is calculated according to the manufacturer's technical documentation, dated 2012-01-14.
- 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.

4.3 Maintenance and repair

Maintenance is not required during the assumed intended working life. Should repair prove necessary, it is normal to replace the TOP OV Connector.

Installation



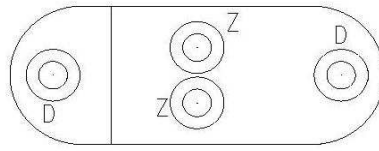
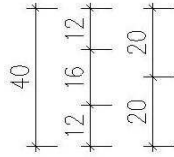
Thomas Bruun
Manager, ETA-Danmark

Annex A
Product details and definitions

TOP OV Connector

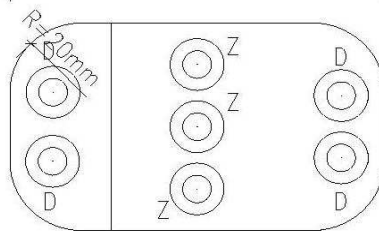
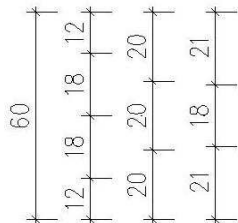
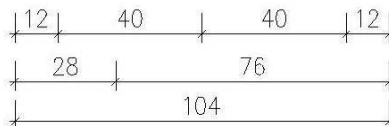
Top-mount connector.

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



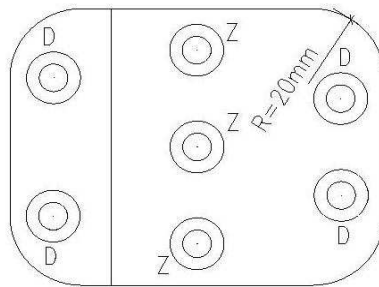
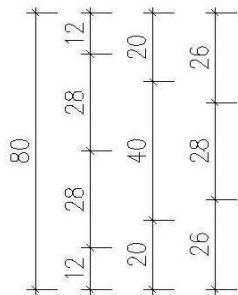
Type 40

for joist widths $B_N \geq 60\text{mm}$



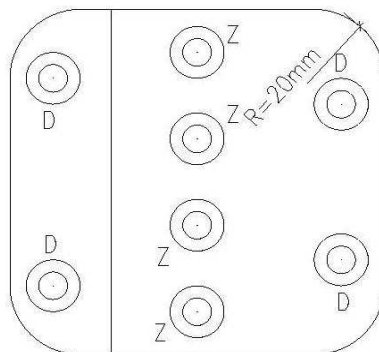
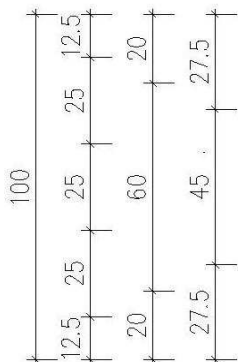
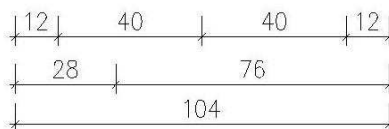
Type 60

for joist widths $B_N \geq 80\text{mm}$



Type 80

for joist widths $B_N \geq 100\text{mm}$

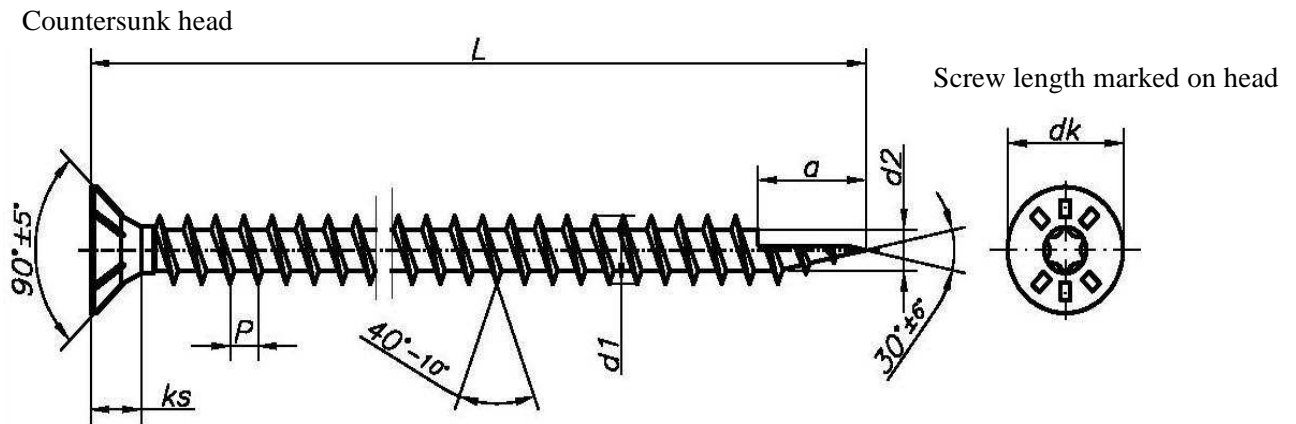


Type 80

for joist widths $B_N \geq 120\text{mm}$

Dimensions in mm

Fastener type and sizes



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

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:

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

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

Where:

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

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

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

n_H	Number of header screws;
$f_{ax,d}$	Design withdrawal parameter of the screw in the joist or header in N/mm ² ;
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/mm ² ;
A_{ef}	Effective area according to EN 1995-1-1 6.1.5 in mm ² ; 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/mm ² ;
A_c	Contact area on the column in mm ² (see Table B.1);
n_t	Number of joist tensile screws;

Force upward in the direction of the screw heads:

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

Where:

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

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

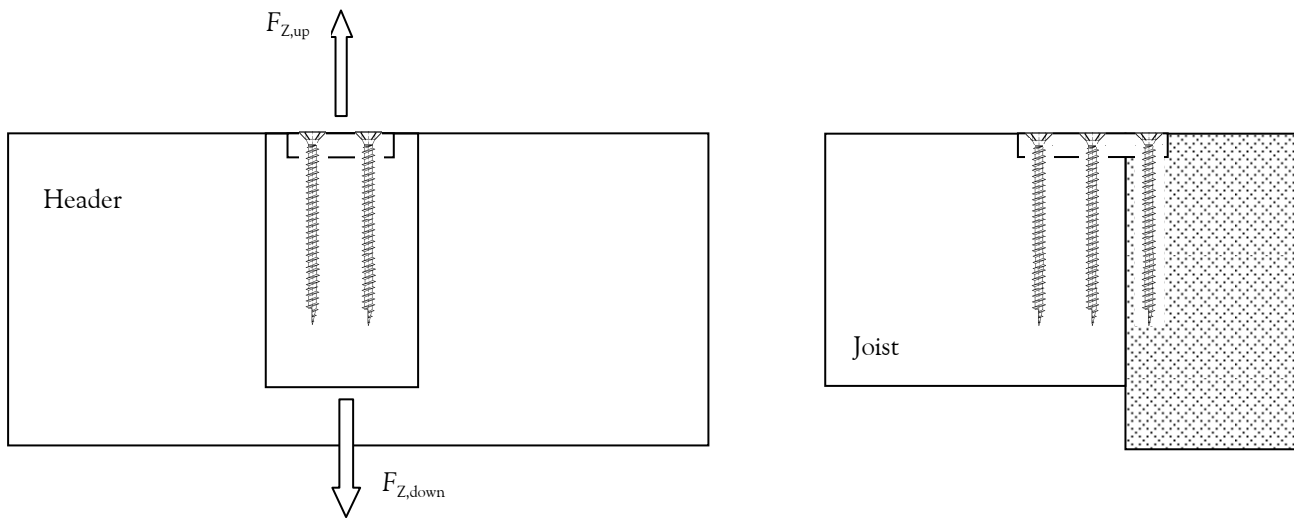
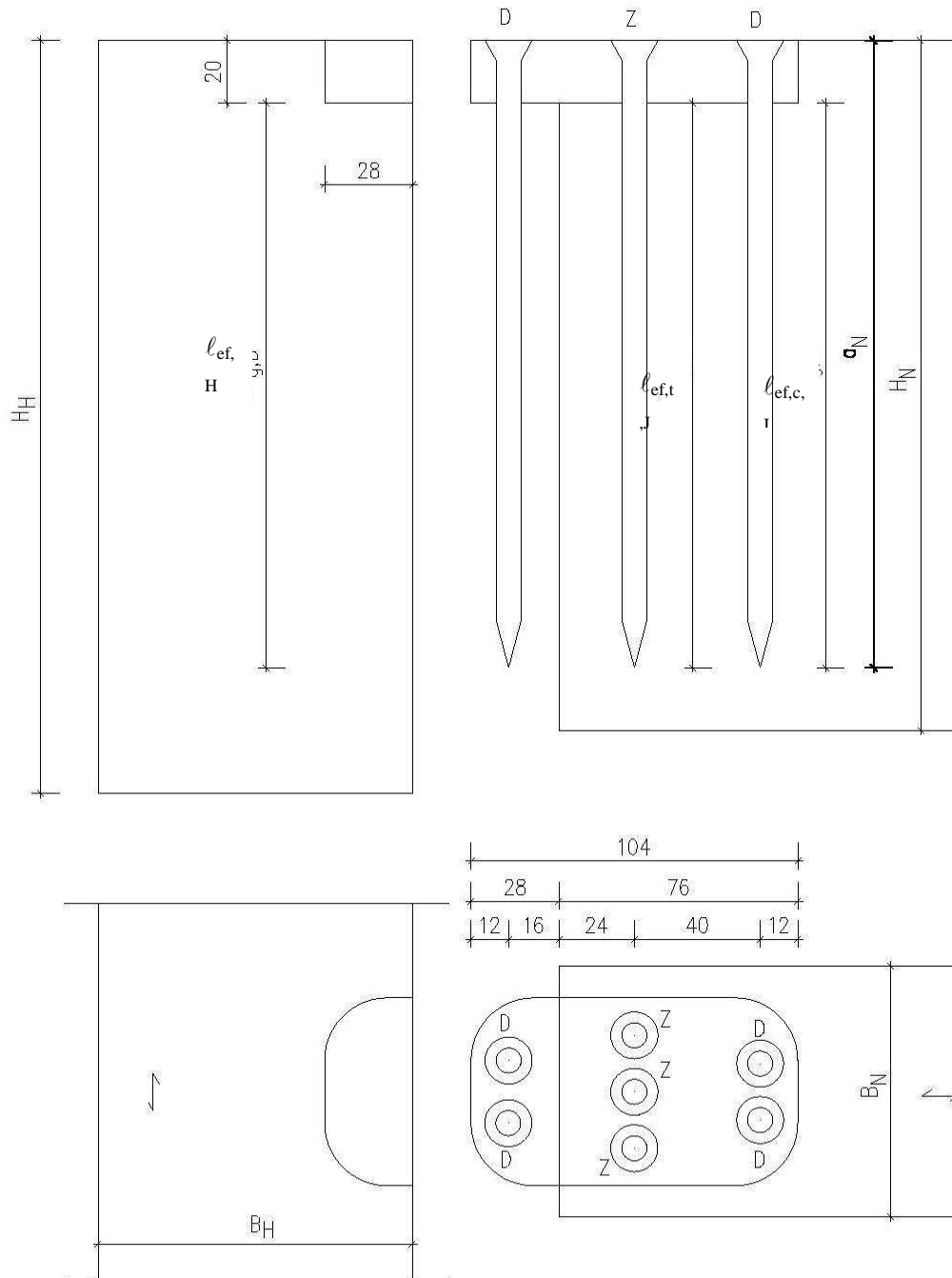


Figure B1: Definition of up and down

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

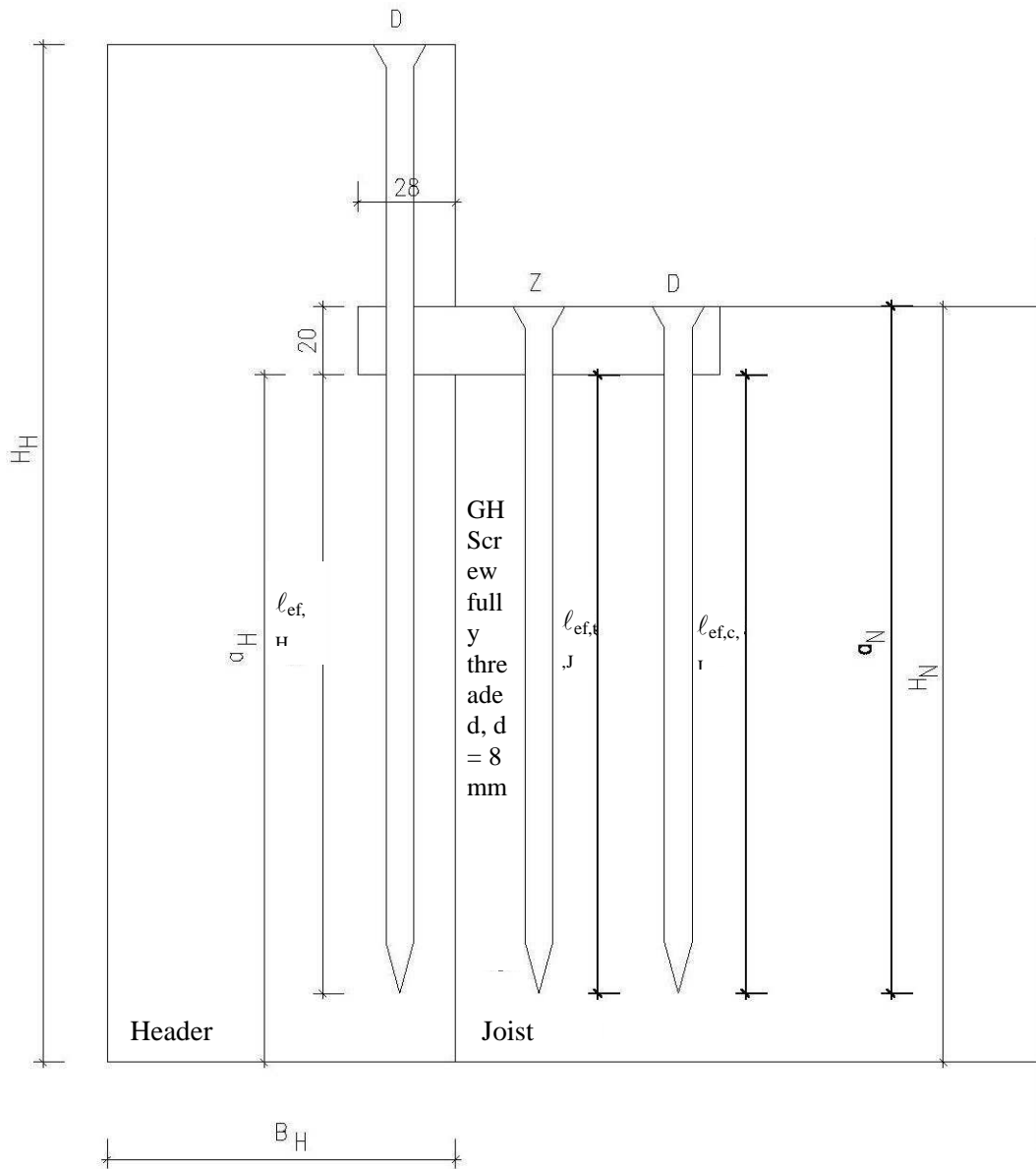
GH TOP OV connector Type		40	60	80	100
Minimum joist width	[mm]	60	80	100	120
Screws \varnothing 8 mm					
Number of header compressive screws	n_H	1	2	2	2
Number of joist tensile screws	n_t	2	3	3	4
Number of joist compressive screws	n_H	1	2	2	2
A_c	[mm ²]	948	1508	2068	2628

Annex C
Installation of GH TOP OV Connectors



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

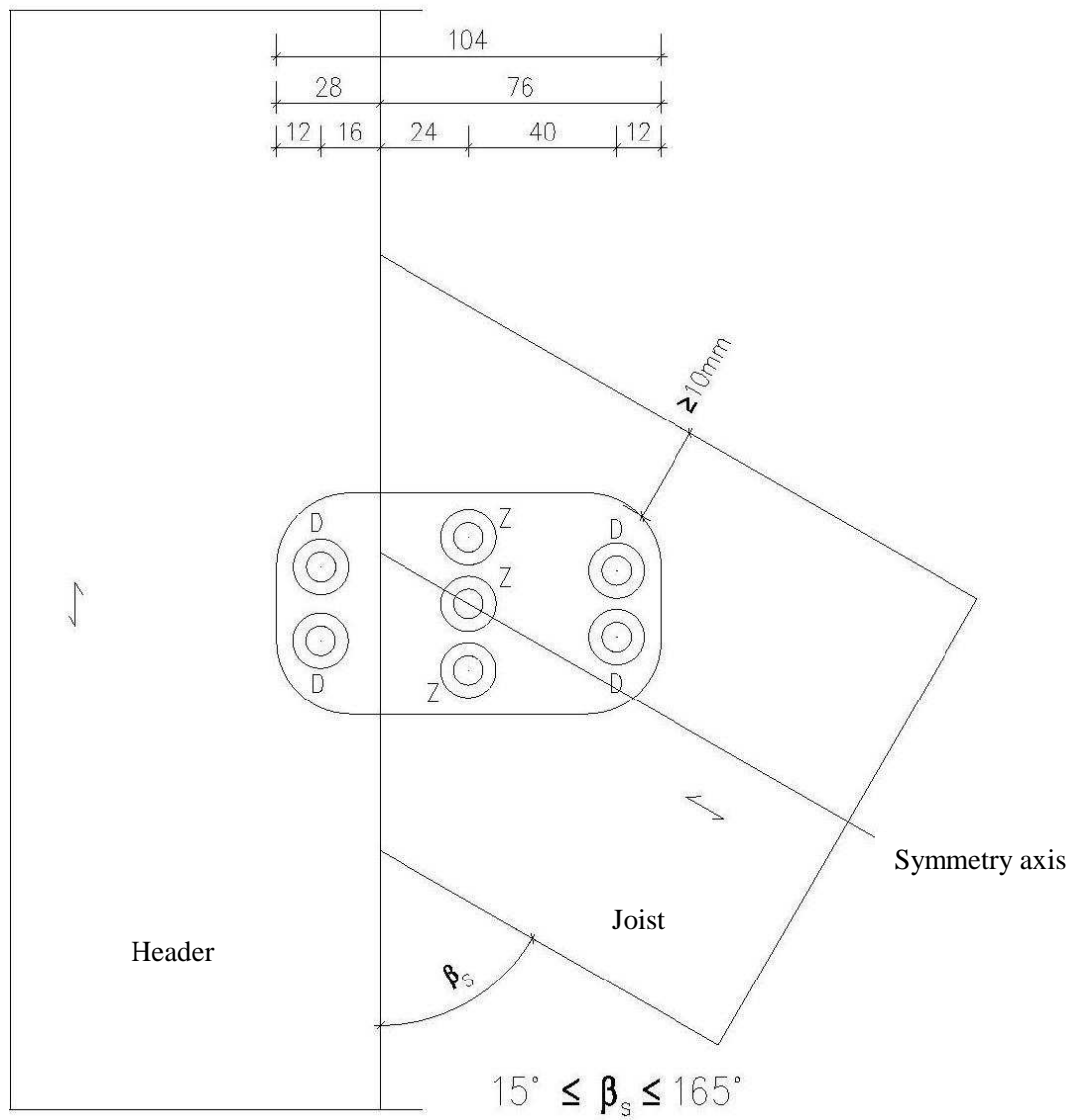
Dimensions in mm



$$l_{ef,H} \geq l_{ef,t,J} \quad l_{ef,c,J} \geq l_{ef,t,J}$$

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

Dimensions in mm



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

Dimensions in mm