

ETA-Danmark A/S
Kollegievej 6
DK-2920 Charlottenlund
Tel. +45 72 24 59 00
Fax +45 72 24 59 04
Internet www.etadanmark.dk



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-11/0036

Trade name:

GH TOP UV 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:

2011-02-25
2016-02-25

Manufacturing plant:

GH Baubeschläge GmbH
Austrasse 34
D-73235 Weilheim / Teck

This European Technical Approval contains:

20 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.

6 This European Technical Approval is issued by ETA-Danmark A/S in English. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

I SPECIAL CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

Definition of the product

GH TOP UV Connectors are two-piece, face-fixed connectors to be used in timber to timber connections.

The TOP UV Connectors are made from steel grade S235 according to EN 10025-2:2004 or aluminium grade EN AW-2007 according to EN 755-2:2008-06. Dimensions, hole positions, steel grade or aluminium alloy and typical installations are shown in Annexes A and C.

Intended use

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

- Structural solid timber classified to C14-C40 according to EN 338 / EN 14081,
- Glulam classified to GL24-GL36 according to EN 1194 / EN 14080,
- LVL according to EN 14374,
- Parallam PSL,
- Intrallam LSL,
- Duo- and Triobalken,
- Cross laminated timber,

However, the calculation methods are only allowed for a characteristic wood density of up to 460 kg/m³. 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 characteristic load-carrying capacities of the connections with TOP UV 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. The lateral force $F_{Y,Ed}$ is assumed to act at a distance e from the centre of the GH TOP UV Connector. The force $F_{X,Ed}$ perpendicular to the connector plate is assumed to act in the centre of the GH TOP UV Connector.

It is assumed that the header beam is prevented from rotating. If the header beam only has installed a TOP UV

Connector on one side the eccentricity moment $M_v = F_d \cdot (B_H / 2 + 14\text{mm})$ shall be considered. The same applies when the header has TOP UV Connector connections on both sides, but with vertical forces which differ more than 20%.

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

The steel or 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 concealed beam hangers 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 UV hangers are made from steel or aluminium 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 UV 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
6.7.2	Serviceability	
6.7.3	Identification	See Annex A

*) 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 characteristic load-carrying capacities of the TOP UV Connectors.

The characteristic capacities of the TOP UV 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:

Threaded nails (ringed shank nails) and screws in accordance with EN 14592

In the formulas in Annex B the capacities for threaded nails and screws calculated from the formulas of Eurocode 5 are used assuming a thick steel plate when calculating the lateral fastener load-carrying-capacity.

The load bearing capacities of the brackets has been determined based on the use of connector nails 4,0 x 40 mm in accordance with the German national approval for the nails.

The characteristic withdrawal capacity of the nails has to be determined by calculation in accordance with EN 1995-1-1: 2004, paragraph 8.3.2 (head pull-through is not relevant):

$$F_{ax,Rk} = f_{ax,k} \times d \times t_{pen}$$

Where:

$f_{ax,k}$ Characteristic value of the withdrawal parameter in N/mm^2

d Nail diameter in mm

t_{pen} Penetration depth of the profiles in mm

Based on tests by Versuchsanstalt für Stahl, Holz und Steine, University of Karlsruhe, the characteristic value of the withdrawal resistance for the threaded nails used can be calculated as:

$$f_{ax,k} = 50 \times 10^{-6} \times \sigma_k^2$$

Where:

σ_k Characteristic density of the timber in kg/m^3

The shape of the nail directly under the head shall be in the form of a truncated cone with a diameter under the nail head which exceeds the hole diameter.

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

2.7.1 Corrosion protection in service class 1 and 2.

In accordance with ETAG 015 the TOP UV Connectors are produced from steel grade S235 according to EN 10025-2:2004 or aluminium grade EN AW-2007 according to EN 755-2:2008.

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,

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.

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 brackets 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.

3.3 CE marking

The CE marking shall be affixed on each packaging of hangers. 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 UV 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 Installation

TOP UV Connector connections

A TOP UV 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 UV Connector.

If the header carries joists only on one side the eccentricity moment from the joists $M_{ec} = R_{joist} (b_{header}/2 + 14\text{mm})$ 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 UV Connectors are fastened to wood-based headers or columns by nails or screws and to wood-based joists by screws.
- There shall either be nails or screws in all holes for connections to headers or a partial nailing pattern for connections to headers or columns as prescribed in Annex B can be used.
- The characteristic capacity of the connection with TOP UV Connectors is calculated according to the manufacturer's technical documentation, dated 2010-11-02.
- The connection with TOP UV Connectors is designed in accordance with Eurocode 5 or an appropriate national code.
- The gap between the end of the joist and the surface, where contact stresses can occur during loading shall be limited. This means that for TOP UV Connectors the gap between the surface of the header or column

and the header plate or the joist plate 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 against the whole TOP UV Connector.
- The depth of the joist shall be so large that the top (bottom) of the joist is at least 10 mm above (below) the upper (lower) screw tip in the joist.
- Nails or screws to be used shall have a diameter and head shape, which fits the holes of the TOP UV 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 hanger.

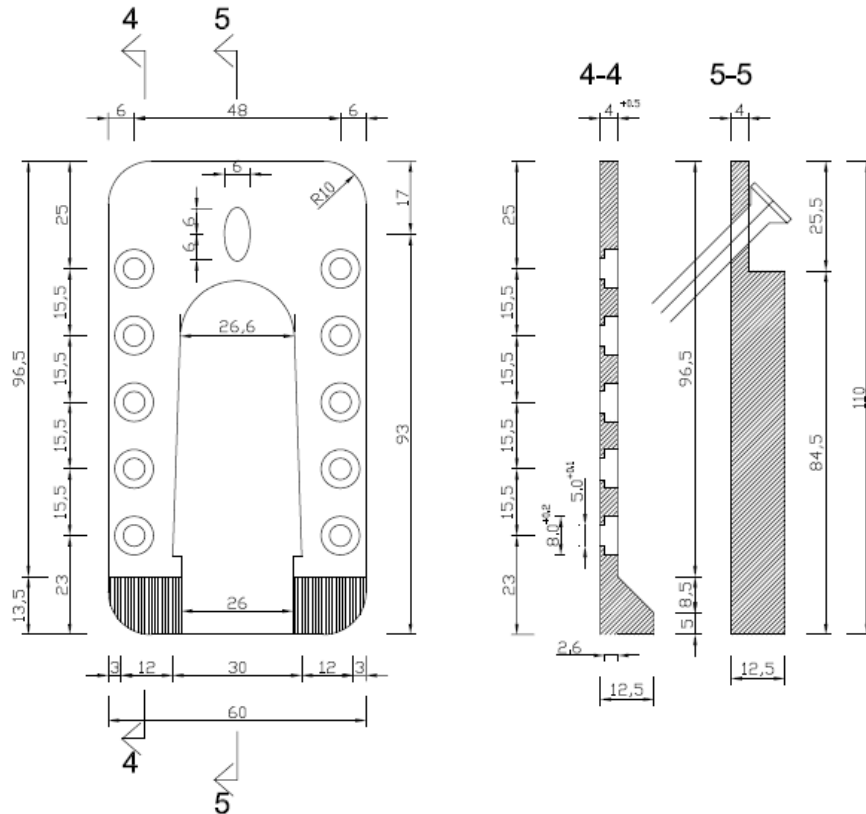
Thomas Bruun
Manager, ETA-Danmark

Annex A
Product details and definitions

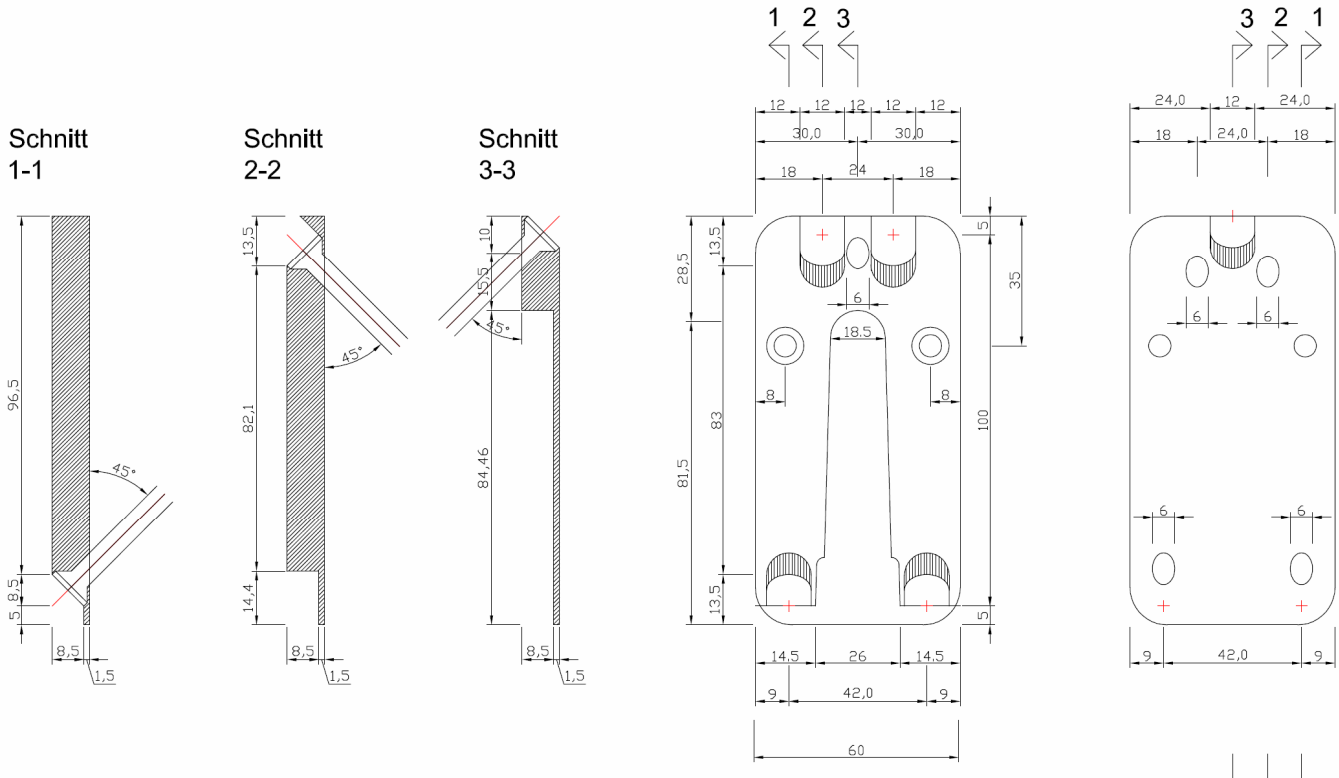
TOP UV Connector TC

Face mount connector.

Steel grade S235 according to EN 10025-2:2004 or aluminium grade EN AW-2007 according to EN 755-2:2008.



Header plate of GH TOP UV Connector TC



Joist plate of GH TOP UV Connector

Fastener types and sizes

NAIL diameter	Length	Nail type
4.0	40 - 100	Ringed shank nails according to EN 14592
<p>In the formulas in Annex B the capacities for threaded nails calculated from the formulas of Eurocode 5 are used assuming a thick steel plate when calculating the lateral nail load-carrying-capacity. The load bearing capacities of the TOP UV Connectors have been determined based on the use of connector 4,0 x L mm in accordance with the German national approval for the nails. The characteristic withdrawal capacity of the nails has to be determined by calculation in accordance with EN 1995-1-1: 2004, paragraph 8.3.2 (head pull-through is not relevant):</p> $F_{ax,Rk} = f_{1,k} \times d \times t_{pen}$ <p>Where:</p> <p>$f_{1,k}$ Characteristic value of the withdrawal parameter in N/mm² d Nail diameter in mm t_{pen} Penetration depth of the profiled shank in mm</p> <p>Based on tests by Versuchsanstalt für Stahl, Holz und Steine, University of Karlsruhe, the characteristic value of the withdrawal resistance for the threaded nails used can be calculated as:</p> $f_{1,k} = 50 \times 10^{-6} \times \rho_k^2$ <p>Where:</p> <p>ρ_k Characteristic density of the timber in kg/m³</p> <p>The shape of the nail directly under the head shall be in the form of a truncated cone with a diameter under the nail head which exceeds the hole diameter.</p>		

Screw diameter	Length	Nail type
5.0	30 - 70	Self-tapping screw according to EN 14592 or to an ETA
6.0	120 - 200	Self-tapping screw according to EN 14592 or to an ETA
<p>In the formulas in Annex B the capacities for self-tapping screws calculated from the formulas of Eurocode 5 are used assuming a thick steel plate when calculating the lateral load-carrying-capacity.</p>		

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. The lateral force $F_{Y,Ed}$ is assumed to act at a distance e above or below the centre of the GH TOP UV Connector. The force $F_{X,Ed}$ perpendicular to the connector plate is assumed to act in the centre of the GH TOP UV Connector.

Three nail or screw patterns for the header plate are specified. A full pattern for connections to headers, where there are nails or screws in all the holes of the header plate and two partial patterns for connections to headers or columns, where the number of nails or screws in the header or column are either 4 or 6.

The joist plates of GH TOP UV Connectors may contain two tensile screws and optionally two additional compressive screws. For loading up, an additional tensile screw is required.

**Force downward in the direction of insertion or upward against the direction of insertion:
(downward: at least two screws \varnothing 6 mm required in the joist, upward: at least two screws \varnothing 6 mm required in the joist and one screw \varnothing 6 mm required in the header)**

$$F_{Z,Rd} = \min \left\{ \frac{n_{J,ef} \cdot F_{ax,J,Rd}}{\sqrt{\left(\frac{1}{n_H \cdot F_{v,H,Rd}}\right)^2 + \left(\frac{1}{k_{H,Z} \cdot F_{ax,H,Rd}}\right)^2}} \right. \quad (B.1.1)$$

Lateral force (four screws \varnothing 6 mm required in the joist):

$$F_{Y,Rd} = \min \left\{ \frac{F_{v,J,Rd}}{\sqrt{\left(\frac{1}{4} + \frac{e}{189}\right)^2 + \left(\frac{e}{360}\right)^2}} \right. \quad (B.1.2)$$

$$\left. \frac{F_{v,H,Rd}}{\sqrt{\left(\frac{1}{n_H} + \frac{e}{e_1}\right)^2 + \left(\frac{e}{e_2}\right)^2 + \left(\frac{F_{v,H,Rd}}{k_{H,Y} \cdot F_{ax,H,Rd}}\right)^2}} \right.$$

Force perpendicular to the connector plate (four screws \varnothing 6 mm required in the joist):

$$F_{X,Rd} = \min(4 \text{ kN}; n_H \cdot F_{ax,H,Rd}; 2,8 \cdot F_{ax,J,Rd}) \quad (B.1.3)$$

Combined forces

In case of combined forces shall the following inequality be fulfilled:

$$\left(\frac{F_{X,Ed}}{F_{X,Rd}} + \frac{F_{Z,Ed}}{F_{Z,Rd}}\right)^2 + \left(\frac{F_{Y,Ed}}{F_{Y,Rd}}\right)^2 \leq 1 \quad (B.1.4)$$

Where:

- $n_{J,ef}$ Effective number of screws in the joist connection; for loading DOWN: $n_{J,ef} = 1,77$; for loading UP: $n_{J,ef} = 0,88$;
- n_H Number of nails or screws in the header connection with full or partial nailing;
- $F_{ax,J,Rd}$ Design value of the axial load-carrying-capacity per screw \varnothing 6 mm in the joist;
- $F_{ax,H,Rd}$ Design value of the axial load-carrying-capacity per nail or screw in the header;
- $F_{v,J,Rd}$ Design value of the lateral load-carrying-capacity per screw \varnothing 6 mm in the joist with an outer thick steel or aluminium plate, and loading perpendicular to the grain;

- $F_{v,H,Rd}$ Design value of the lateral load-carrying-capacity per nail or screw in the header connection with an outer thick steel or aluminium plate;
- $k_{H,Y}$ Factor according to Table B.1;
- $k_{H,Z}$ Factor according to Table B.1;
- e distance of the lateral force above or below the centre of the GH TOP UV Connector;
- e_1 GH TOP UV Connector dimension according to Table B.1;
- e_2 GH TOP UV Connector dimension according to Table B.1;

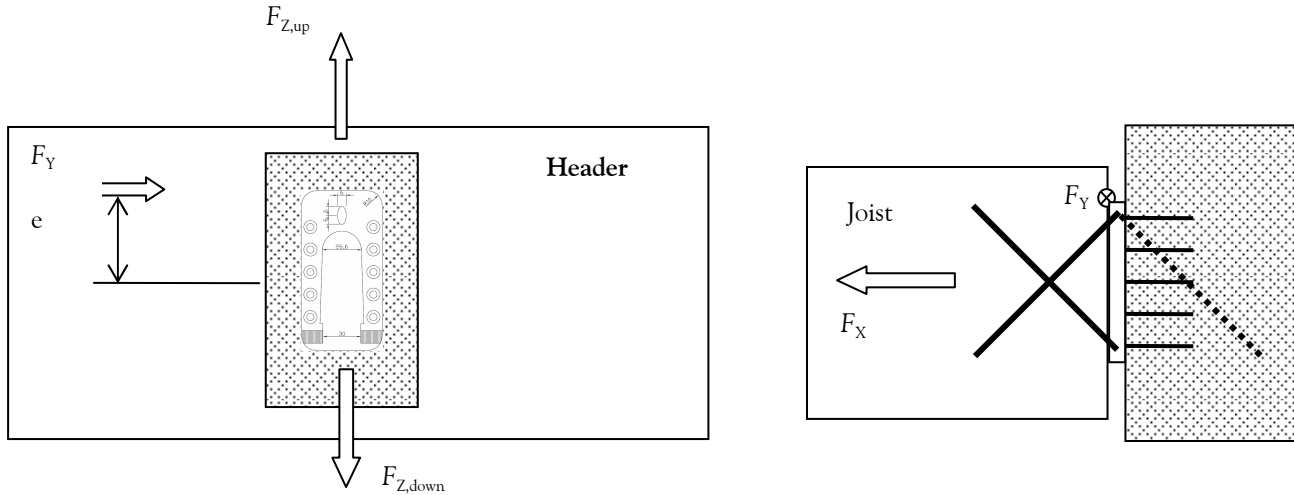
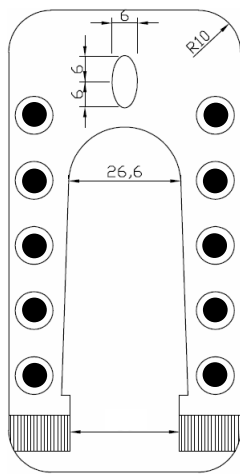


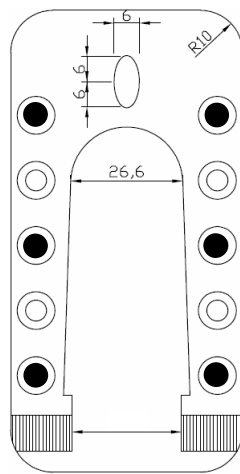
Figure B1: Definition of e

Table B.1: GH TOP UV Connectors: Form factors k_H and dimensions e_1 and e_2

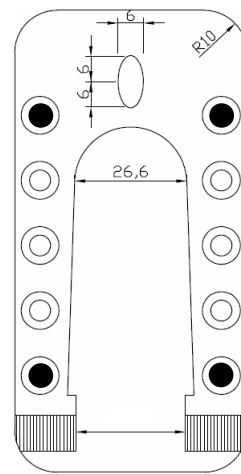
Nail or screw pattern	n_H	$k_{H,Y}$	$k_{H,Z}$	e_1 [mm]	e_2 [mm]
Full (connection to header)	10	15,7	23,0	341	440
Partial – 6 (connection to header or column)	6	9,4	14,7	235	304
Partial – 4 (connection to header or column)	4	6,3	11,0	198	256



Full:
Connection to header



Partial – 6:
Connection to header or column



Partial – 4:
Connection to header or column

Figure B2: Nail or screw patterns

Annex C
Installation of GH TOP UV Connectors

