**Deutsches Institut für Bautechnik**
**Zulassungsstelle für Bauprodukte und Bauarten**
**Bautechnisches Prüfamt**
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Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

Deutsches Institut für Bautechnik

DIBt

Mitglied der EOTA
*Member of EOTA*

# European Technical Approval ETA-07/0290

*English translation prepared by DIBt - Original version in German language*

| | |
|---|---|
| Handelsbezeichnung<br>*Trade name* | ATF<br>*SIMPSON STRONG-TIE-ATF-connectors* |
| Zulassungsinhaber<br>*Holder of approval* | Simpson Strong-Tie A/S<br>Hedegardsvej 11<br>8300 ODDER<br>DÄNEMARK |
| Zulassungsgegenstand und Verwendungszweck<br>*Generic type and use of construction product* | Blechformteil ATF als Holzverbindungsmittel<br>*Three-dimensional nailing plate as a connector for wood to wood connections* |
| Geltungsdauer:<br>*Validity:* vom *from* / bis *to* | 27 June 2013<br>27 June 2018 |
| Herstellwerke<br>*Manufacturing plants* | Herstellwerk 1<br>Herstellwerk 2 |



| | |
|---|---|
| Diese Zulassung umfasst<br>*This Approval contains* | 22 Seiten einschließlich 3 Anhänge<br>*22 pages including 3 annexes* |
| Diese Zulassung ersetzt<br>*This Approval replaces* | ETA-07/0290 mit Geltungsdauer vom 24.07.2008 bis 23.08.2013<br>*ETA-07/0290 with validity from 24.07.2008 to 23.08.2013* |

# I LEGAL BASES AND GENERAL CONDITIONS

1 This European technical approval is issued by Deutsches Institut für Bautechnik 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 products[1], modified by Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];
- *Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998[4], as amended by Article 2 of the law of 8 November 2011[5];*
- Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC[6];
- Guideline for European technical approval of "Three-dimensional nailing plates", ETAG 015.

2 Deutsches Institut für Bautechnik 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 Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.

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 Deutsches Institut für Bautechnik. 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 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.



1 Official Journal of the European Communities L 40, 11 February 1989, p. 12
2 Official Journal of the European Communities L 220, 30 August 1993, p. 1
3 Official Journal of the European Union L 284, 31 October 2003, p. 25
4 *Bundesgesetzblatt Teil I 1998*, p. 812
5 *Bundesgesetzblatt Teil I 2011*, p. 2178
6 Official Journal of the European Communities L 17, 20 January 1994, p. 34

# II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

## 1 Definition of product/ products and intended use

### 1.1 Definition of the construction product

SIMPSON STRONG-TIE®-ATF-connectors are two-piece non-welded, face-fixed connectors to be used in timber to timber connections.

The connector plates are made from steel grade S355MC according to EN 10149-2[7] with a minimum yield strength of 355 MPa, a minimum tensile strength of 450 MPa and a minimum ultimate strain of 25 %. The pins are made from steel with a minimum yield strength of 580 MPa, a minimum tensile strength of 610 MPa and a minimum ultimate strain of 16 %. The pins are connected with the plates by compressive strain. Dimensions, hole positions, steel grade and typical installations are shown in Annex A and Annex C.

### 1.2 Intended use

The ATF 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 wood based header or column, where requirements for mechanical resistance and stability in the sense of the Essential Requirement 1 of Council Directive 89/106/EEC shall be fulfilled.

The ATF connectors may be installed as connections between wood based members such as:

- Structural solid timber classified to C14-C40 according to EN 338[8] / EN 14081-1[9],
- Glued laminated timber of at least strength class GL24c according to EN 1194[10] / EN 14080[11],
- Laminated veneer lumber LVL according to EN 14374[12] (only header or column), connection only perpendicular to the plane of the veneers,
- Parallel strand lumber Parallam PSL (only header or column), connection only perpendicular to the plane of the veneers,
- Laminated strand lumber Intrallam LSL (only header or column), connection only perpendicular to the plane of the veneers,
- Glued laminated solid timber Duo- and Triobalken according to FprEN 14080[13] or national provisions that apply at the installation site,
- Multi layer solid wood panels according to EN 13353[14] / EN 13986[15],

| | | |
|---|---|---|
| 7 | EN 10149-2:1995 | Hot rolled flat products made of high yield strength steels for cold forming - Part 2: Delivery conditions for thermomechanically rolled steels |
| 8 | EN 338:2009 | Timber structures - Strength classes |
| 9 | EN 14081-1:2005+A1:2011 | Timber structures - Strength graded structural timber with rectangular cross section - Part 1: General requirements |
| 10 | EN 1194:1999 | Timber structures - Glued laminated timber - Strength classes and determination of characteristic values |
| 11 | EN 14080:2005 | Timber structures - Glued laminated timber - Requirements |
| 12 | EN 14374:2004 | Timber structures - Structural laminated veneer lumber - Requirements |
| 13 | prEN 14080:2013 | Timber structures – Glued laminated timber and Glued laminated solid timber - Requirements |
| 14 | EN 13353:2008+A1:2011 | Solid wood panels (SWP) - Requirements |
| 15 | EN 13986:2004 | Wood-based panels for use in construction - Characteristics, evaluation of conformity and marking |

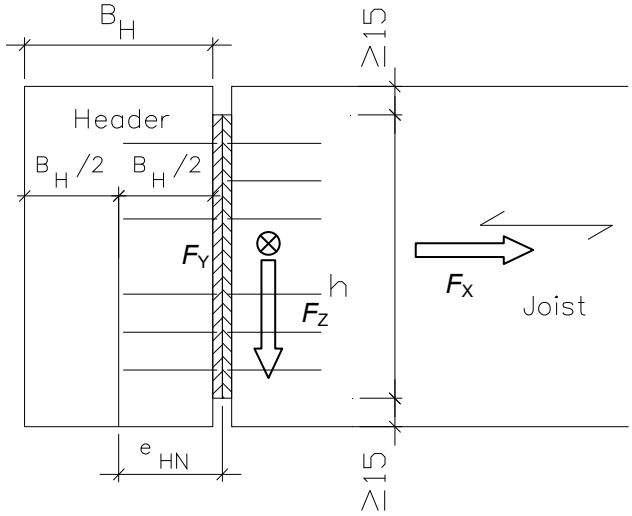
- Plywood according to EN 636[16] / EN 13986 (only header, thickness t ≥ 25 mm),
- Oriented Strand Board, OSB according to EN 300[17] / EN 13986 (only header, thickness t ≥ 25 mm)

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 formula for the characteristic load-carrying capacities of the ATF connector connections.

The design and construction of the connections shall be carried out according to the national provisions that apply at the installation site of the certified object in line with the partial safety factor format, e.g. in accordance with Eurocode 5.

It is assumed that the forces acting on the ATF connector are the following $F_X$, $F_Y$ and $F_Z$, as shown in the figure below. The forces shall act in the middle of the connector. It is assumed that the forces are acting right at the end of the joist.




The ATF connectors are intended for use for connections subject to static or quasi static loading.

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

Assumed working life

The provisions made in this European technical approval are based on an assumed working life of the ATF connectors of 50 years, provided that they are subject to appropriate use and maintenance.

The indications given on the working life cannot be interpreted as a guarantee given by the producer, 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.



16 EN 636:2012 Plywood - Specifications
17 EN 300:2006 Oriented Strand Boards (OSB) – Definitions, classification and specifications

## 2 Characteristics of product and assessment

### 2.1 Characteristics

| ETAG paragraph | Characteristic | Assessment of characteristic |
|---|---|---|
| 6.1 | **Mechanical resistance and stability*** | |
| 6.1.1 | Load-carrying capacities | See Annex B |
| 6.1.2 | Stiffness | No performance determined |
| 6.1.3 | Ductility in cyclic testing | No performance determined |
| 6.2 | **Safety in case of fire** | |
| | Reaction to fire | The ATF connectors are made from steel classified as Euroclass A1 in accordance with EC decision 96/603/EC, amended by EC Decision 2000/605/EC |
| | Resistance to fire | Performance in relation to fire resistance would be determined for the complete structural element with any associated finishes, however not for a single connector. Therefore there is no performance determined to this aspect of this Essential Requirement |
| 6.3 | **Hygiene, health and the environment** | |
| 6.3.1 | Release of dangerous substances | No dangerous substances** |
| 6.4 | **Safety in use** | Not relevant |
| 6.5 | **Protection against noise** | Not relevant |
| 6.6 | **Energy economy and heat retention** | Not relevant |
| 6.7 | **Related aspects of serviceability*** ** | |
| 6.7.1 | Durability | The ATF 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 |
| 6.7.2 | Serviceability | |
| 6.7.3 | Identification | See Annex A |

* See section 2.2 of this European technical approval

** 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.

*** See section 2.3 of this European technical approval

## 2.2 Mechanical resistance and stability

See annex B for characteristic load-carrying capacities of the ATF connectors.

The characteristic capacities of the ATF connectors are determined by calculation assisted by testing as described in the EOTA Guideline 015 clause 5.1.2. The design and construction of the connections shall be carried out according to the national provisions that apply at the installation site of the certified object in line with the partial safety factor format, e.g. in accordance with Eurocode 5.

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

Connector nails and screws in accordance to ETA-04/0013

In the formulas for ATF connectors in Annex B the capacities for connector nails and connector screws in accordance to ETA-04/0013 are applicable.

Threaded nails (ring shank nails) in accordance to EN 14592[18]

In the formulas for ATF connectors 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 bearing capacity.

No performance has been determined in relation to ductility of a joint under cyclic testing. Therefore the contribution to the performance of structures under seismic loading 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.

## 2.3 Related aspects of serviceability

### 2.3.1 Corrosion protection in service class 1.

ATF connectors have

- an electroplating zinc thickness of ≥ 8 µm, additional yellow passivated or
- an electroplating zinc thickness of ≥ 15 µm, additional yellow chromated, and a dip coating Hessetop SI 300 GM

# 3 Evaluation and attestation of conformity and CE marking

## 3.1 System of attestation of conformity

According to the Decision 97/638/EC of the European Commission[19] system 2+ of the attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 2+: Declaration of conformity of the product by the manufacturer on the basis of:

a) Tasks for the manufacturer:
   (1) initial type-testing of the product
   (2) factory production control,
   (3) testing of samples taken at the factory in accordance with a prescribed test plan.



[18] EN 14592:2008+A1:2012 Timber structures – Dowel-type fasteners – Requirements
[19] Official Journal of European Communities L 268/36 of 01.10.1997

b) Tasks for the approved body:

(4) certification of factory production control on the basis of:

- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control.

Note: Approved bodies are also referred to as "notified bodies".

## 3.2 Responsibilities

### 3.2.1 Tasks for the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use raw materials stated in the technical documentation of this European technical approval supplied with the relevant inspection documents as laid down in the "control plan"[20].

The factory production control shall be in accordance with the "control plan" which is part of the technical documentation of this European technical approval. The "control plan" is laid down in the context of the factory production control system operated by the manufacturer and deposited within Deutsches Institut für Bautechnik.

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 shall be checked visually and for dimensions and compressive strain of pins.

The control plan includes details of the extent, nature and frequency of testing and controls to be performed within the factory production control.

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the "control plan". The records shall 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 the approved body involved in the continuous surveillance and shall be presented to Deutsches Institut für Bautechnik Berlin on request.



[20] The "control plan" is a confidential part of the European Technical Approval and only handed over to the approved body or bodies involved in the procedure of attestation of conformity. See section 3.2.2.

3.2.1.2 Other tasks for the manufacturer

The manufacturer shall, on the basis of a contract, involve a body (bodies) which is (are) approved for the tasks referred to in section 3.1 in the field of ATF connectors in order to undertake the actions laid down in section 3.2.2. For this purpose, the "control plan" referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body or bodies involved.

For initial type-testing the results of the tests performed as part of the assessment for the European technical approval may 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 Deutsches Institut für Bautechnik Berlin and the notified body.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European technical approval.

**3.2.2 Tasks for the approved bodies**

The approved body (bodies) shall perform the

- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control

in accordance with the provisions laid down in the "control plan".

3.2.2.1 Initial inspection of factory and 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 joist connectors with this European technical approval.

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.

3.2.2.3 Other tasks of the approved bodies

The approved body (bodies) shall retain the essential points of its (their) actions referred to above and state the results obtained and conclusions drawn in (a) written report (reports).

The results of certification and continuous surveillance shall be made available on demand by the certification body to Deutsches Institut für Bautechnik Berlin.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the factory production control stating the conformity with the provisions of this European technical approval.

In cases where the provisions of the European technical approval and its "control plan" are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform the Deutsches Institut für Bautechnik without delay.

### 3.3 CE marking

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

- the name and address of the producer (legal entity responsible for the manufacture),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate for the factory production control,
- the number of the European technical approval,
- the name and size of product,
- the number of the guideline for European technical approval (ETAG no. 015).

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

### 4.1 Manufacturing

SIMPSON STRONG-TIE® ATF connectors shall be 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.

The European technical approval is issued for the product on the basis of agreed data/information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the European technical approval and consequently the validity of the CE marking on the basis of the European technical approval and if so whether further assessment or alterations to the European technical approval, shall be necessary.

### 4.2 Installation

#### 4.2.1 ATF connector connections

An ATF connector connection is deemed fit for its intended use provided:

- The header or column shall be free from wane under the joist plate.
- If the header carries joists only on one side the eccentricity moment from the joists $M_v = F_J (B_H/2)$ shall be considered at the strength verification of the header.

  with: $F_J$ Reaction force of joist
  $B_H$ Width of header

  The same applies when the header has connections on both sides but with forces which differ more than 20 %.
- ATF connectors shall be fastened to wood-based joists by screws and to wood-based headers or columns by nails or screws.
- There shall be specified nails or screws in all holes.
- The connection shall be designed in accordance with Eurocode 5 or an appropriate national code.
- Splitting of the header or the joist caused by tensile forces perpendicular to the grain shall be considered in calculation.
- Distortion of the header shall be considered in calculation.

- The gap between the side grain of the header and the header plate of the connector as well as the gap between the joist plate and the header plate and the gap between the end grain of the joist and the joist plate shall be limited. This means that for ATF connectors any of these gaps shall be maximum 1 mm. The joists and the connectors shall be installed strain-free, if suitable calculation is not carried out.
- For ATF connectors the width of the header or column shall be at least l+4d, where l is the length and d is the diameter of the nails or screws in the header or column. For ATF connectors the depth of the joist shall allow an edge distance of at least 10 mm between the screw tip and the adjacent joist surface.
- The width of the joist shall allow an edge distance of at least 12,5 mm between the side surfaces of the joist and the adjacent connector edges and the depth of the joist shall allow an edge distance of at least 15 mm between the top and bottom surfaces of the joist and the adjacent connector edges.
- The header or column shall have a plane surface against the whole ATF connector.
- Nails or screws to be used shall have a diameter which fits the holes of the ATF connectors.
- The requirements to the timber members being joined shall be taken into account.
- Installation is carried out by personnel under the direction of supervisors, all of whom are appropriately qualified for this work.
- Installation is in accordance with the manufacturer's technical literature.

4.2.2 Responsibility of the manufacturer

It is the responsibility of the manufacturer to ensure that the information on the specific conditions given in part II, sections 1, 2, 4 and 5, of this European technical approval, is given to those concerned. This information may be made by replicating the respective parts of this European technical approval.

## 5 Recommendations

### 5.1 Packaging, transport and storage

The ATF connectors are packed in boxes bearing the manufacturer's name, product type, dimensions, quantity, data of fabrication and batch reference details.

In relation to transportation and storage, the ATF connectors should be treated as conventional metallic building products.

### 5.2 Use, maintenance and repair

The assessment of the fitness for use is based on the assumption that maintenance is not required during the assumed intended working life.

Should repair prove necessary, it is normal for the ATF connector to be replaced.

Uwe Bender
Head of Department

b*eglaubigt:*
Baumann

Deutsches Institut für Bautechnik DIBt

# Annex A
## Product details and definitions

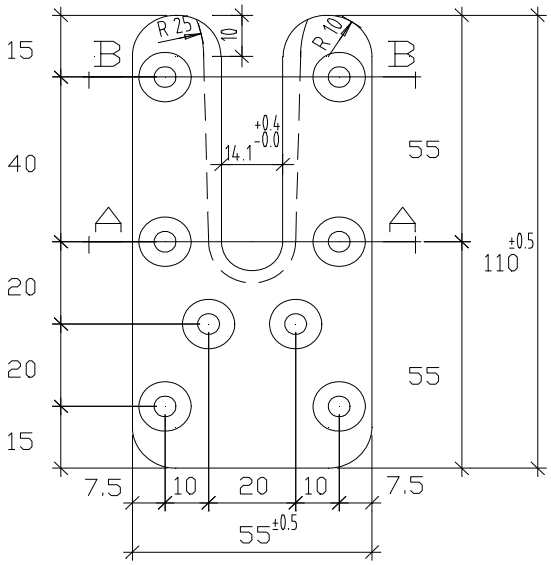
**ATF connector 55x110**

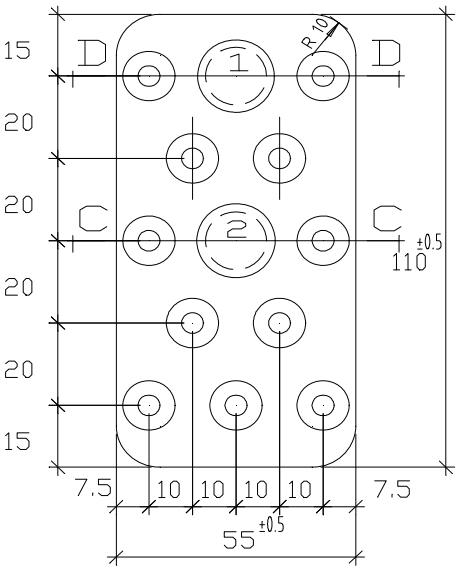
Face mounted connector consisting of 5.0 mm thick joist plate and 5.0 mm thick fitting header plate

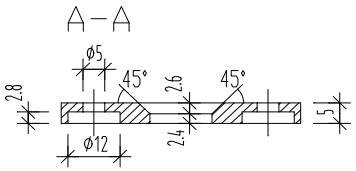
Steel S355MC according to EN 10149-2 with a thickness tolerance of ± 0.25 mm, minimum yield strength of 355 MPa, minimum tensile strength of 450 MPa and minimum ultimate strain of 25 %

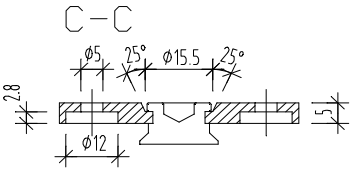
Header plate

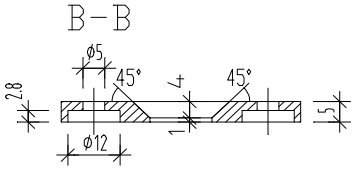
Joist plate
1 Guide pin
2 Bearing pin

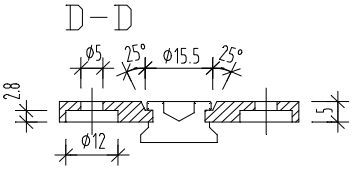



Tolerances according to ISO 2768 T1–c

Dimensions in mm

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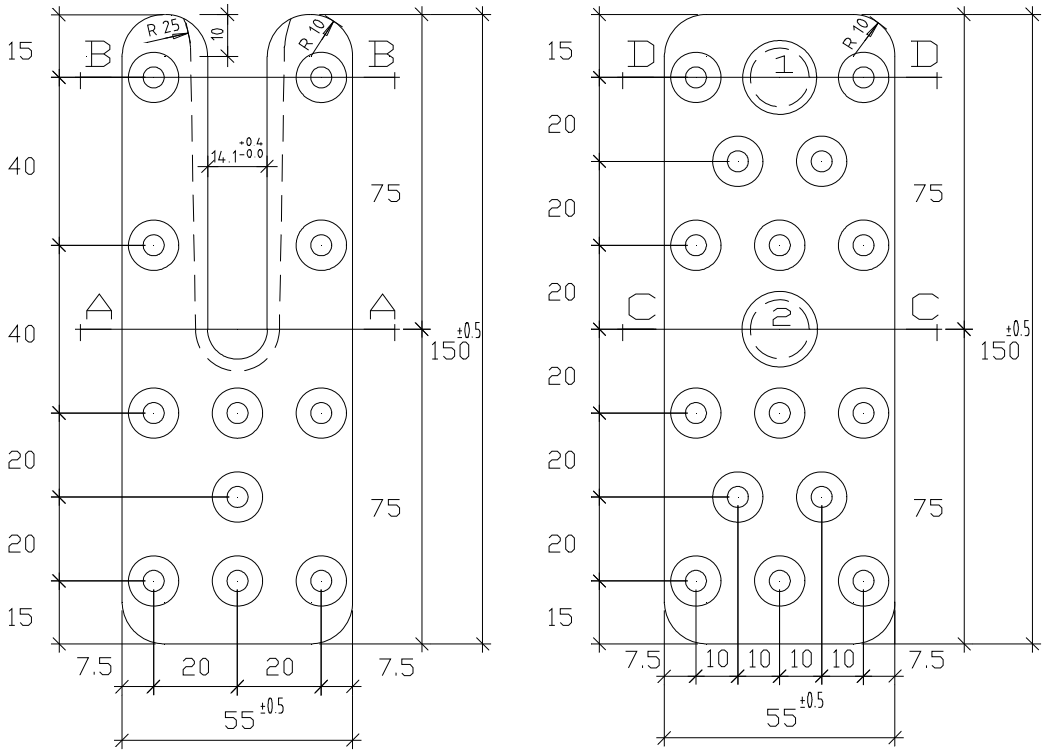
**ATF connector 55x150**

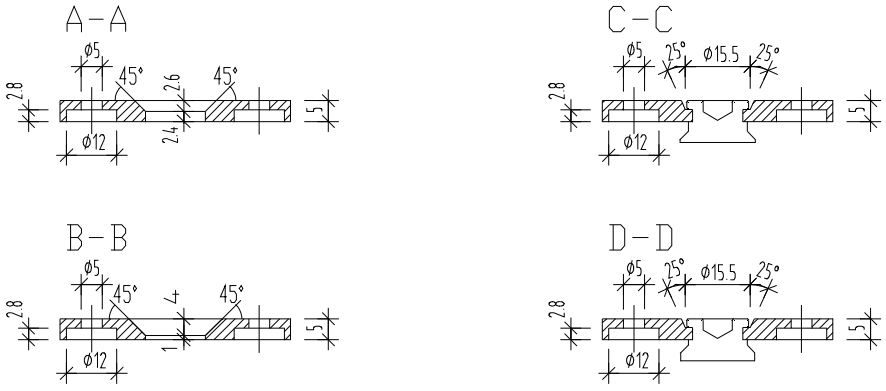
Face mounted connector consisting of 5.0 mm thick joist plate and 5.0 mm thick fitting header plate

Steel S355MC according to EN 10149-2 with a thickness tolerance of ± 0.25 mm, minimum yield strength of 355 MPa, minimum tensile strength of 450 MPa and minimum ultimate strain of 25 %

Header plate

Joist plate
1 Guide pin
2 Bearing pin




Tolerances according to ISO 2768 T1–c

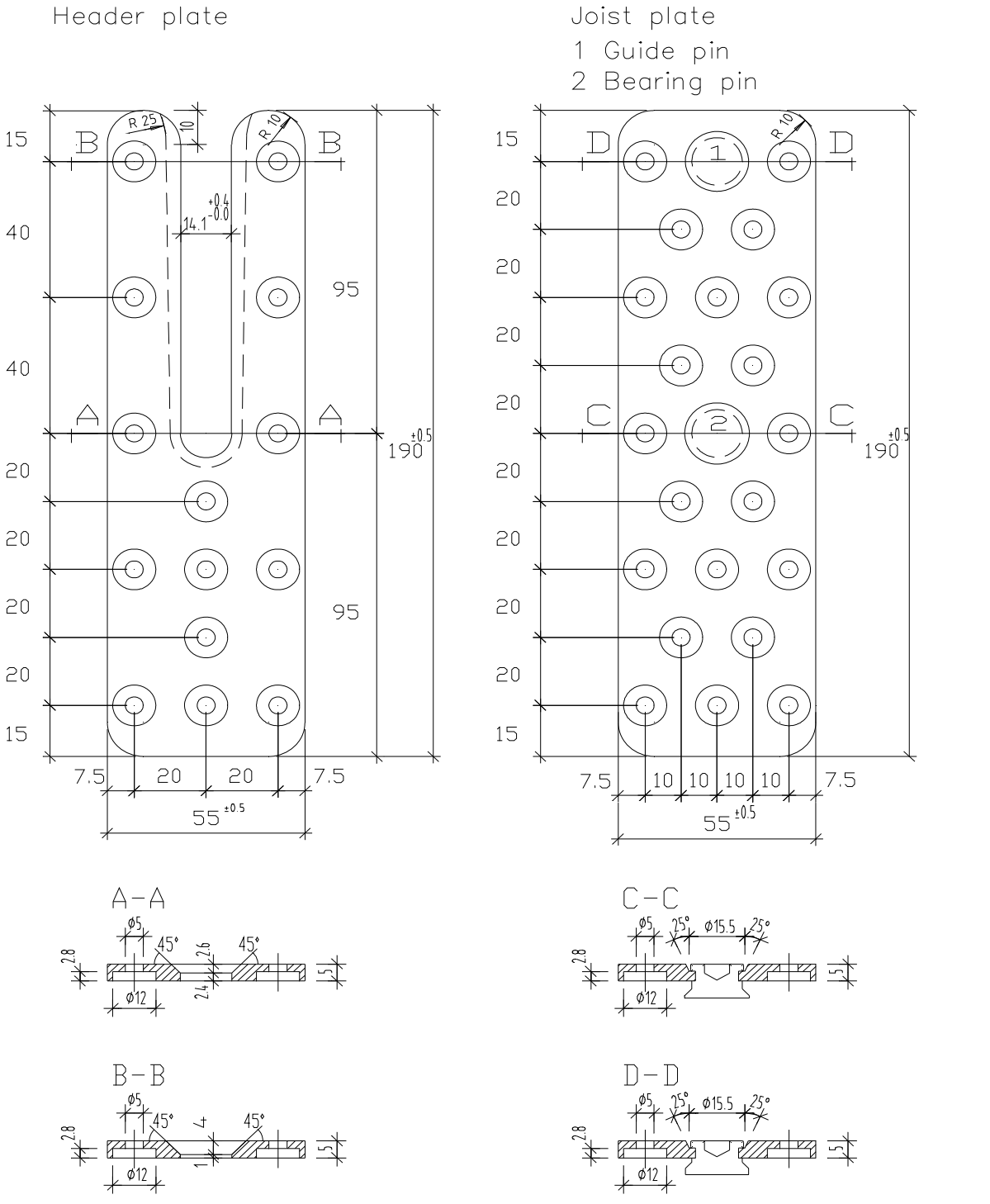
Dimensions in mm

Deutsches Institut für Bautechnik DIBt

## ATF connector 55x190

Face mounted connector consisting of 5.0 mm thick joist plate and 5.0 mm thick fitting header plate

Steel S355MC according to EN 10149-2 with a thickness tolerance of ± 0.25 mm, minimum yield strength of 355 MPa, minimum tensile strength of 450 MPa and minimum ultimate strain of 25 %




Tolerances according to ISO 2768 T1–c

Dimensions in mm

Deutsches Institut für Bautechnik DIBt

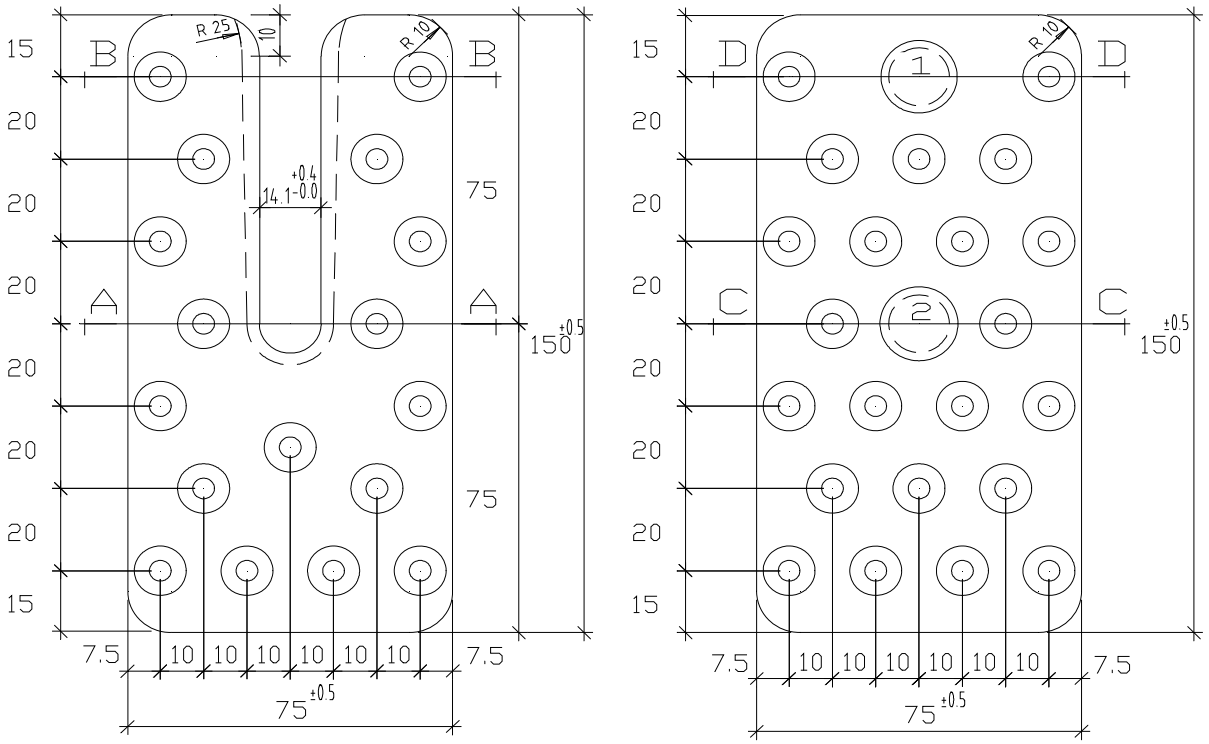
**ATF connector 75x150**

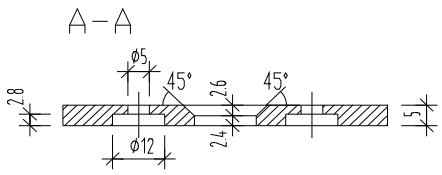
Face mounted connector consisting of 5.0 mm thick joist plate and 5.0 mm thick fitting header plate

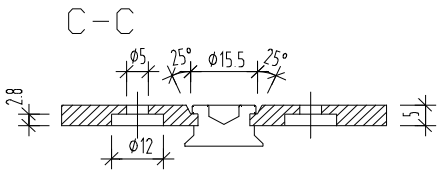
Steel S355MC according to EN 10149-2 with a thickness tolerance of ± 0.25 mm, minimum yield strength of 355 MPa, minimum tensile strength of 450 MPa and minimum ultimate strain of 25 %

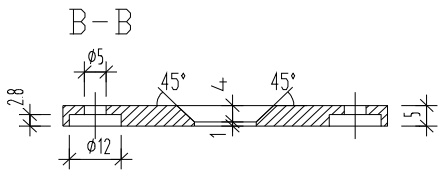
Header plate

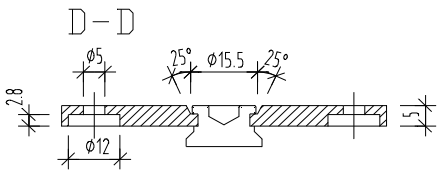
Joist plate
1 Guide pin
2 Bearing pin




Tolerances according to ISO 2768 T1–c

Dimensions in mm

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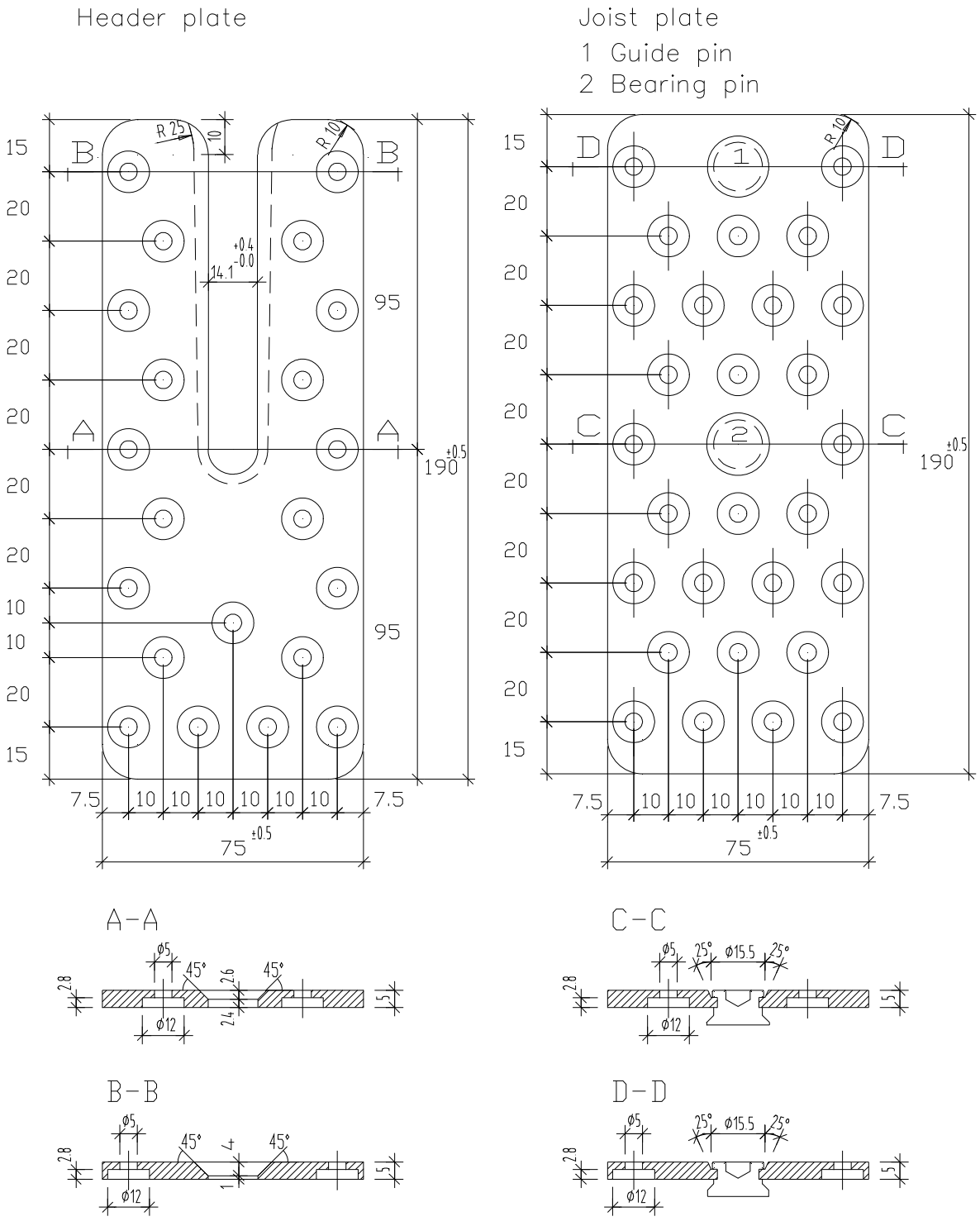
**ATF connector 75x190**

Face mounted connector consisting of 5.0 mm thick joist plate and 5.0 mm thick fitting header plate

Steel S355MC according to EN 10149-2 with a thickness tolerance of ± 0.25 mm, minimum yield strength of 355 MPa, minimum tensile strength of 450 MPa and minimum ultimate strain of 25 %




Tolerances according to ISO 2768 T1–c

Dimensions in mm

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Fastener types and sizes

| NAILS diameter | Length Min – max | Nail type |
|---|---|---|
| 4.0 | 40 - 100 | Connector nails in accordance with ETA 04/0013 |
| 4.0 | 40 - 100 | Threaded nails according to EN 14592 |

| SCREW diameter | Length Min – max | Screw type |
|---|---|---|
| 5.0 | 40 - 50 | Connector screws in accordance with ETA 04/0013 |

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# Annex B
## Load-carrying-capacities

### Characteristic capacities of the ATF connector

The forces are assumed to act in the middle of the joist.

A full pattern is specified, where there are fasteners in all the holes.

The width of the header or column shall be at least l+4d, where l is the length and d is the diameter of the nails or screws in the header.

For ATF connectors the depth of the joist shall allow an edge distance of at least 10 mm between the screw tip and the adjacent joist surface. The width of the joist shall also allow an edge distance of at least 12.5 mm between the side surfaces of the joist and the connector edges and the depth of the joist shall allow an edge distance of at least 15 mm between the top and bottom surfaces of the joist and the connector edges.

For the calculation of design values, the partial material factor and the modification factor for timber or wood-based members are used.

**Header rotation prevented:**

ATF connectors - Force downward:
$$F_{Z,Rk} = \min \begin{cases} F_{Z,J,Rk} \\ F_{Z,H,Rk} \end{cases} \quad \text{(B.1)}$$

ATF connectors - Force lateral:
$$F_{Y,Rk} = 0,5 \cdot F_{Z,Rk} \quad \text{(B.2)}$$

ATF connectors - Force perpendicular to the connector plates:
$$F_{X,Rk} = 0,25 \cdot F_{Z,Rk} \quad \text{(B.3)}$$

ATF connectors - Combined loading:
$$\left(\frac{F_{X,Ed}}{F_{X,Rd}}\right)^2 + \left(\frac{F_{Y,Ed}}{F_{Y,Rd}}\right)^2 + \left(\frac{F_{Z,Ed}}{F_{Z,Rd}}\right)^2 \le 1 \quad \text{(B.4)}$$

**Header rotation not prevented:**

ATF connectors - Force downward:
$$F^e_{Z,Rk} = \min \begin{cases} F^e_{Z,J,Rk} \\ F^e_{Z,H,Rk} \end{cases} \quad \text{(B.5)}$$

ATF connectors - Force lateral:
$$F^e_{Y,Rk} = 0,5 \cdot F^e_{Z,Rk} \quad \text{(B.6)}$$

ATF connectors - Force perpendicular to the connector plates:
$$F^e_{X,Rk} = 0,25 \cdot F^e_{Z,Rk} \quad \text{(B.7)}$$

ATF connectors - Combined loading:
$$\left(\frac{F^e_{X,Ed}}{F^e_{X,Rd}}\right)^2 + \left(\frac{F^e_{Y,Ed}}{F^e_{Y,Rd}}\right)^2 + \left(\frac{F^e_{Z,Ed}}{F^e_{Z,Rd}}\right)^2 \le 1 \quad \text{(B.8)}$$

Where:

$$F_{Z,J,Rk} = n_J \cdot \min \begin{cases} 240 \cdot f_{h,J,k} \left[ \sqrt{2 + \frac{1{,}84}{f_{h,J,k}}} - 1 \right] + 2 \cdot \rho_{k,J}^{0,8} \\ 375 \sqrt{f_{h,J,k}} + 2 \cdot \rho_{k,J}^{0,8} \\ 240 \cdot f_{h,J,k} \end{cases} \quad \text{(B.9)}$$

$$F_{Z,H,Rk} = \frac{1}{\sqrt{\left( \frac{1}{n_H \cdot F_{v,H,Rk}} \right)^2 + \left( \frac{10 \cdot z_{max,H}}{I_{p,H} \cdot F_{ax,H,Rk}} \right)^2}} \quad \text{(B.10)}$$

$$F_{Z,J,Rk}^{e} = \frac{1}{\sqrt{\left( \frac{1}{F_{Z,J,Rk}} \right)^2 + \left( \frac{e_J \cdot z_{max,J}}{I_{p,J} \cdot 7{,}5 \cdot \rho_{k,J}} \right)^2}} \quad \text{(B.11)}$$

$$F_{Z,H,Rk}^{e} = \frac{1}{\sqrt{\left( \frac{1}{n_H \cdot F_{v,H,Rk}} \right)^2 + \left( \frac{e_H \cdot z_{max,H}}{I_{p,H} \cdot F_{ax,H,Rk}} \right)^2}} \quad \text{(B.12)}$$

$n_J$ Number of screws in the joist;

$n_H$ Number of screws or nails in the header/column;

$f_{h,J,k}$ Joist embedding strength in N/mm²; $f_{h,J,k} = 0{,}0047 \cdot \rho_{k,J}^{1,24}$;

$\rho_{k,J}$ Characteristic density of joist in kg/m³; $\rho_{k,J} \leq 460$ kg/m³;

$F_{v,H,Rk}$ Characteristic value of the load-carrying-capacity of a laterally loaded header/column nail or screw in single shear in a steel-to-timber connection with a thick steel plate according to EN 1995-1-1 or ETA 04/0013 in N;

$F_{ax,H,Rk}$ Characteristic value of the withdrawal capacity of a header/column nail or screw in a steel-to-timber connection according to EN 1995-1-1 or ETA 04/0013 in N;

$e_J$ eccentricity of the joist connection in mm (distance between the force and the contact area between joist and ATF connector), generally $e_J = 0{,}5 \cdot B_H + 10$ mm;

$e_H$ eccentricity of the header connection in mm (distance between the force and the contact area between header and ATF connector), generally $e_H = 0{,}5 \cdot B_H$;

$B_H$ header width in mm

$I_{p,H} / z_{max,H}$ and $I_{p,J} / z_{max,J}$ : see Table below;

| SIMPSON STRONG-TIE® ATF connector | 55x110 | 55x150 | 55x190 | 75x150 | 75x190 |
|---|---|---|---|---|---|
| $I_{p,H} / z_{max,H}$ | 156 | 286 | 436 | 424 | 910 |
| $I_{p,J} / z_{max,J}$ | 260 | 474 | 752 | 619 | 1000 |

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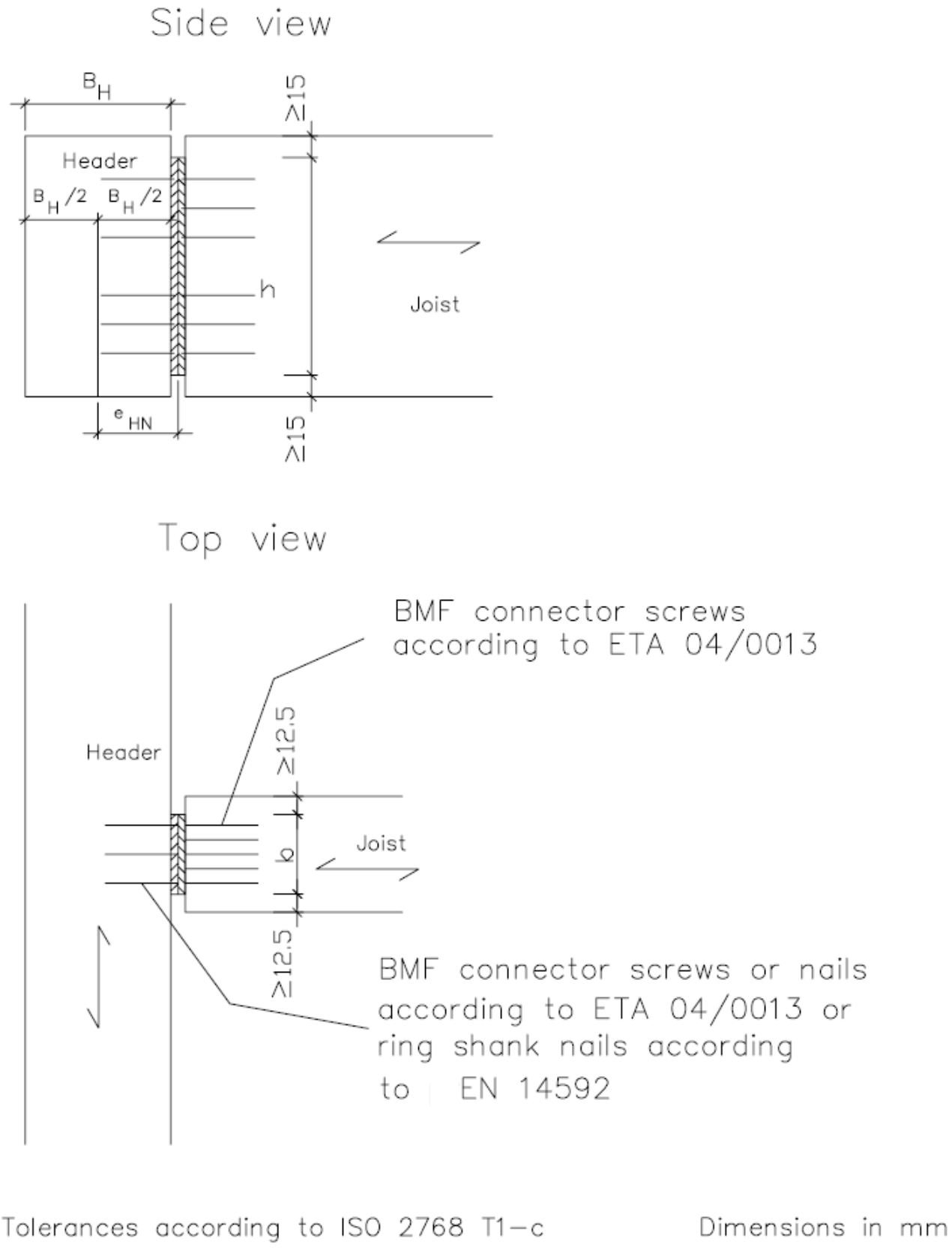
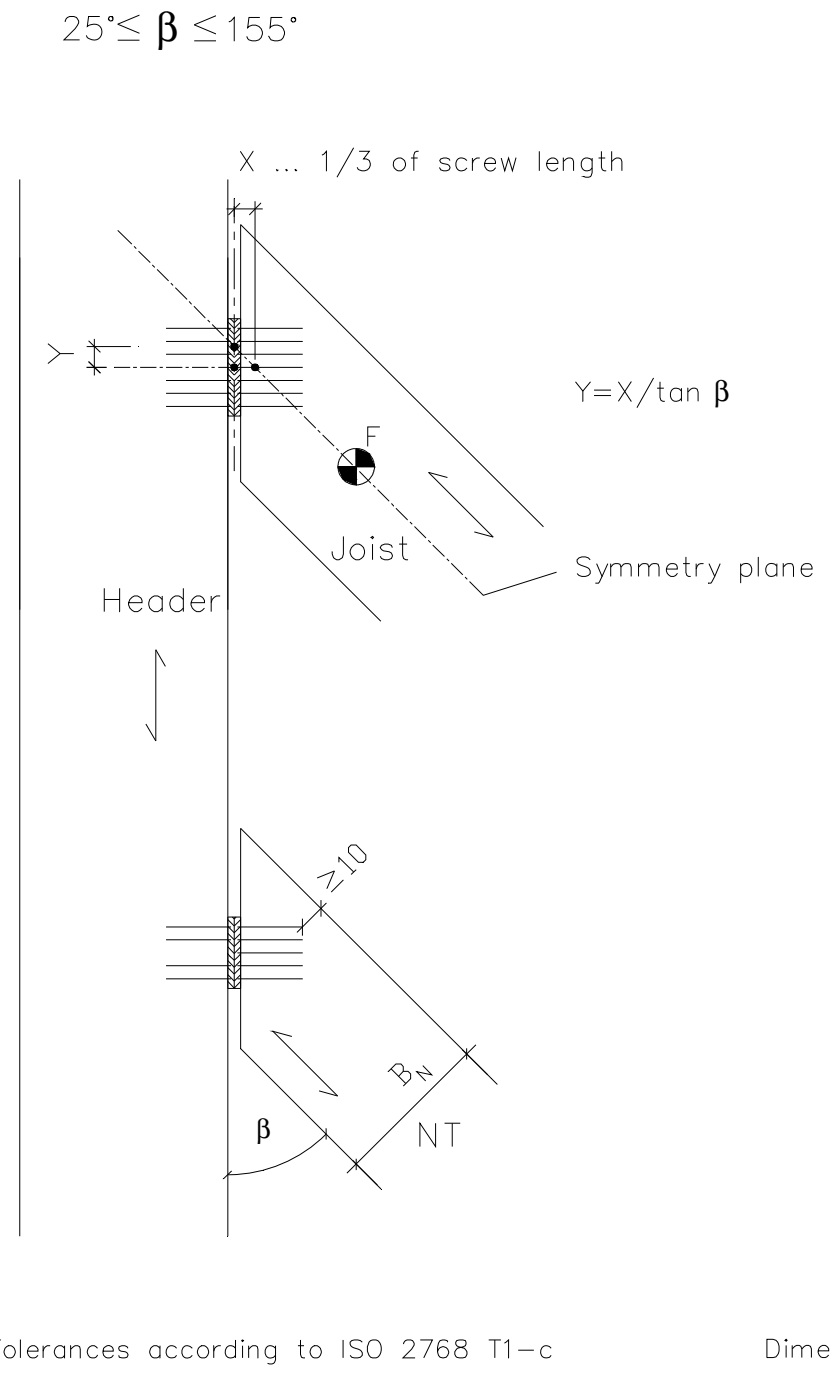
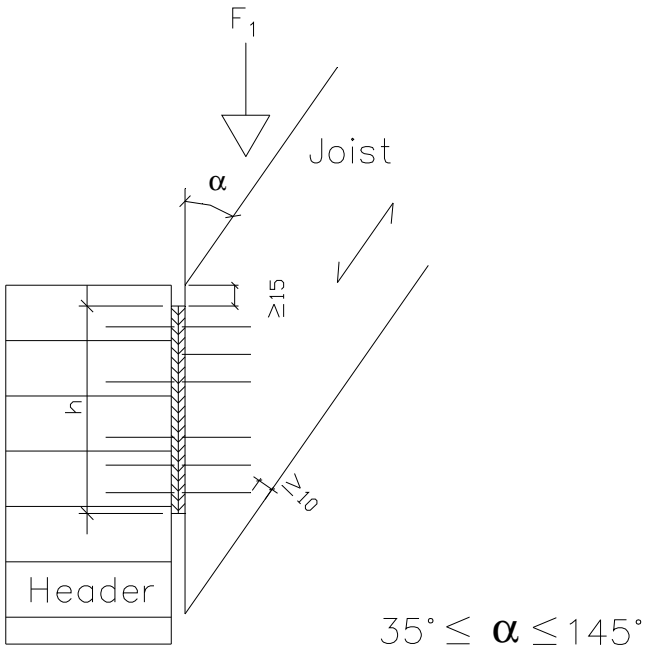
## Annex C
## Installation of ATF connectors in wood/wood connections

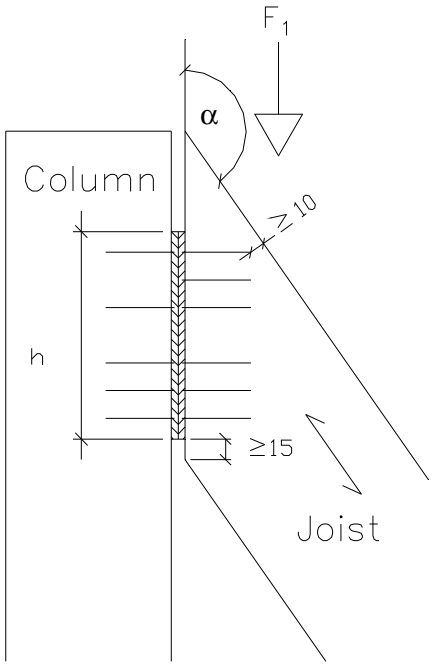



side and top view of rectangular connections; minimum connector edge distances




Top view of connections with horizontal but non rectangular arranged joists; position of ATF connectors in the joist and minimum screw edge distance




Tolerances according to ISO 2768 T1–c  Dimensions in mm

side view of connections with vertically inclined joists; definition of angle α

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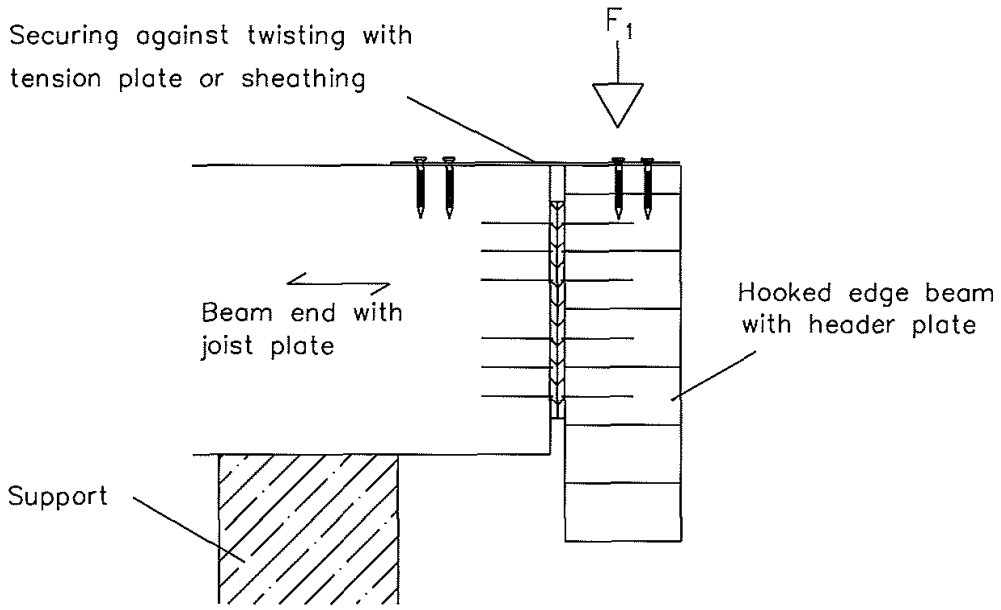
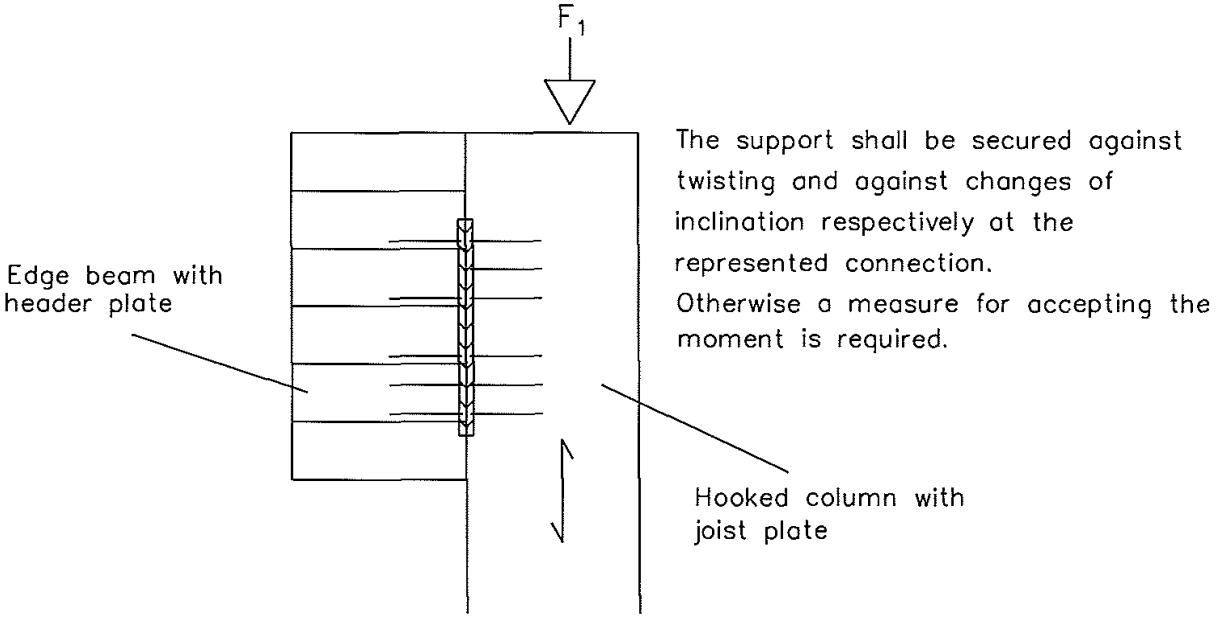
View of an edge beam connection with top-down ATF Connector (The connector is installed "turned over")




View of an edge beam – column connection with ATF connector (The connector is installed "normally")




Tolerances according to ISO 2768 T1-c

Dimensions in mm