Austrian Institute of Construction Engineering
Schenkenstrasse 4 | T +43 1 533 65 50
1010 Vienna | Austria | F +43 1 533 64 23
www.oib.or.at | mail@oib.or.at

Designated according to Article 29 of Regulation (EU) No 305/2011

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European Technical Assessment

ETA-15/0667 of 22.07.2019

General part

Technical Assessment Body issuing the European Technical Assessment	Österreichisches Institut für Bautechnik (OIB) Austrian Institute of Construction Engineering
Trade name of the construction product	Knapp Clip connector type MEGANT series 60, 100, 150
Product family to which the construction product belongs	Three-dimensional nailing plate (connector for wood to wood connections and wood to concrete or steel connections)
Manufacturer	Knapp GmbH Wassergasse 31 3324 Euratsfeld Austria
Manufacturing plant	Knapp GmbH Wassergasse 31 3324 Euratsfeld Austria
This European Technical Assessment contains	74 pages including 8 Annexes which form an integral part of this assessment.
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	Guideline for European Technical Approval ETAG 015 “Three-dimensional nailing plates”, Edition November 2012, used as European Assessment Document.
This European Technical Assessment replaces	European Technical Assessment ETA-15/0667 of 20.11.2015.

Remarks

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

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may be made with the written consent of Austrian Institute of Construction Engineering. Any partial reproduction has to be identified as such.

Specific parts

1 Technical description of the product

1.1 General

This European Technical Assessment (ETA)[1] applies to the connector MEGANT to be used in load-bearing timber to timber or timber to steel or concrete connections. MEGANT consists of two connector plates installed into the timber with self-tapping screws with diameter 8 mm and to members made of steel or concrete with suitable fasteners. Clamping jaws are placed at the bottom and at the top of the connector plates and connected by a defined number of threaded rods fixed with hexagonal nuts, see Annex 1 and Annex 2. The overall thickness of MEGANT is 40 or 50 mm.

The production series MEGANT includes 15 different types of connectors for timber to timber or timber to steel connections in the following 3 configurations with variable height

- 60 mm width with two rows of screws and 40 mm thickness
- 100 mm width with three rows of screws and 40 mm thickness
- 150 mm width with four rows of screws and 50 mm thickness

MEGANT corresponds to the specifications given in the Annexes 1, 2 and 4. The material characteristics, dimensions and tolerances of MEGANT, not indicated in these Annexes, are given in the technical file[2] of the European Technical Assessment.

1.2 Connector plates

The connector plates together with their most important dimensions are shown in Annex 2. The connector plates are produced of aluminium EN AW - 6082 according to EN 755-2[3].

The different types of connector plates can be adapted for wood to steel or concrete connections, see Annex 2.

1.3 Screws

The screws for installation of the two connector plates into the timber are described in Annex 1. They are made of carbon steel or stainless steel.

1.4 Clamping jaw

Clamping jaws are placed at the bottom and at the top of the connector plates in order to connect the two plates by threaded rods. The clamping jaw at the bottom is provided with a thread.

The clamping jaws are described in Annex 2. They are made of aluminium EN AW - 6082 according to EN 755-2.

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1 In 2015 ETA-15/0667 was firstly issued as European Technical Assessment ETA-15/0667 of 20.11.2015 and amended to ETA-15/0667 of 22.07.2019.

2 The technical file of the European Technical Assessment is deposited at Österreichisches Institut für Bautechnik and, in so far as is relevant to the tasks of the notified factory production control certification body involved in the assessment and verification of constancy of performance procedure, is handed over to the notified factory production control certification body.

3 Reference documents are listed in Annex 8.

1.5 Threaded rods

The threaded rods (M16 or M20, property class 8.8) for connection of the connector plates by clamping jaws are described in Annex 1. They are made of carbon steel or stainless steel.

1.6 Hexagonal nuts and washers

The hexagonal nuts and washers, used to fix the threaded rods at the top of the connector, are described in Annex 1. The hexagonal nuts are produced according to EN ISO 4032 (strength class 8.8), the washers are produced according to ISO 7090. They are made of carbon steel or stainless steel.

2 Specification of the intended use(s) in accordance with the applicable European Assessment Document

2.1 Intended use

The connectors are intended to be used in load bearing connections of timber structures as end grain to side grain, end grain to end grain or side grain to side grain connections, e.g. between beams as well as connections between timber and a concrete structure or a steel member.

The connectors are used for connections in load bearing timber structures between the following wood-based members:

- Solid timber of softwood/hardwood of strength class C24/D24 or better according to EN 338 and EN 14081-1,
- Glued laminated timber of strength class GL24c or better according to EN 14080
- Glued laminated timber of hardwood according to European Technical Assessments or national standards and regulations in force at the place of use,
- Laminated veneer lumber LVL according to EN 14374 or according to European Technical Assessments,
- Solid wood members similar to glued laminated timber (typically e.g. Duo- and Triobalken) according to EN 14080 or national standards and regulations in force at the place of use,
- Cross laminated timber according to European Technical Assessments or national standards and regulations in force at the place of use,
- Strand lumber (e.g. Laminated Strand Lumber – Intrallam LSL, Parallam PSL) according to European Technical Assessments or national standards and regulations in force at the place of use.

The typical installation of the connectors is shown in Annex 3.

The connectors shall be subjected to static and quasi static actions only.

The connectors are intended to be used in service classes 1 and 2 according to EN 1995-1-1.

2.2 General assumptions

MEGANT is manufactured in accordance with the provisions of the European Technical Assessment using the manufacturing process as identified in the inspection of the manufacturing plant by Österreichisches Institut für Bautechnik and laid down in the technical file.

The manufacturer shall ensure that the requirements in accordance with the Clauses 1, 2 and 3 as well as with the Annexes of the European Technical Assessment are made known to those who are concerned with design and execution of the works.

Design

The European Technical Assessment only applies to the manufacture and use of MEGANT. Verification of stability of the works including application of loads on the connector is not subject of the European Technical Assessment.

The following conditions shall be observed:

- Design of connections with MEGANT is carried out under the responsibility of an engineer experienced in timber structures.
- Design of the works shall account for the protection of the connections to maintain service class 1 or 2 according to EN 1995-1-1.
- MEGANT is installed correctly.
- It shall be checked in accordance with EN 1995-1-1 that splitting will not occur.

Design of connections with MEGANT may be according to EN 1995-1-1 and EN 1995-1-2 taking into account the Annexes of the European Technical Assessment. Standards and regulations in force at the place of use shall be considered.

Design of connections with connectors in wood to steel or concrete connections may be according to Eurocode 2, 3, 5 or 9 and Annex 5.

Packaging, transport, storage, maintenance, replacement and repair

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

Installation

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

The beam hangers shall be screwed as specified in Annex 2. In hardwood connections the screws shall be driven in predrilled holes with diameter 6 mm. The inclined screws installed into glued laminated timber of hardwood or laminated veneer lumber of hardwood may be installed without predrilling whereas the moment screws shall be predrilled.

The structural members which are connected with MEGANT shall be

- torsional fixed, or for the case that the members are not torsional fixed, the characteristic load bearing capacity shall be attenuated by f_{R2} according to Annex 5;
- wood-based members according to clause 2.1;
- free from wane under the connector;
- with plane surfaces against the connector;
- without virtually gap between the timber members;
- with minimum spacing and edge distances are in accordance with EN 1995-1-1 or European Technical Assessment.

The rules for wood to wood connections are also applicable for the connection between wood to concrete or steel.

In addition, the following conditions shall be observed:

- The connector shall be close in contact with the concrete or steel over the whole face.
- The fastener shall have a diameter not less than the hole diameter minus 2 mm.

2.3 Assumed working life

The provisions made in the European Technical Assessment (ETA) are based on an assumed intended working life of MEGANT of 50 years, when installed in the works, provided that the product is subject to appropriate installation, use and maintenance (see clause 2.2). These provisions are based upon the current state of the art and the available knowledge and experience[4].

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA nor by the Technical Assessment Body, but are regarded only as a means for choosing the appropriate products in relation to the expected economically reasonable working life of the works.

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

3.1 Essential characteristics of the product

Table 1: Essential characteristics of the product and assessment methods

№	Essential characteristic	Product performance
Basic requirement for construction works 1: Mechanical resistance and stability [1)]		
1	Characteristic load bearing capacity	3.1.1
2	Stiffness	3.1.2
3	Ductility in cyclic testing	No performance assessed.
Basic requirement for construction works 2: Safety in case of fire		
4	Reaction to fire	3.1.3
5	Resistance to fire	No performance assessed.
Basic requirement for construction works 3: Hygiene, health and the environment		
6	Content, emission and/or release of dangerous substances	3.1.4
Basic requirement for construction works 4: Safety and accessibility in use		
7	Same as basic requirement for construction works 1	
Basic requirement for construction works 5: Protection against noise		
–	Not relevant. No characteristic assessed.	
Basic requirement for construction works 6: Energy economy and heat retention		
–	Not relevant. No characteristic assessed.	
Basic requirement for construction works 7: Sustainable use of natural resources		
–	No characteristic assessed.	

[4] The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

General aspects		
8	Resistance to corrosion and deterioration	3.1.5
9	Dimensional stability	3.1.6
[1)] These characteristics also relate to basic requirement for construction works 4.		

3.1.1 Characteristic load bearing capacity

The characteristic load bearing capacities of the connectors are determined by calculation assisted by testing. The connectors are installed with a defined number of screws with respective nominal diameter as specified in Annex 1 and Annex 2. Kinematic restraints are defined in Annex 4.

The values of the characteristic load bearing capacities for the loading directions F_1, M_{tor}, F_2, M_2, F_3 and F_{45}, as defined in Annex 4, are given in Annex 5.

If the connectors are connected to structural members made of steel or concrete, suitable fasteners are used. The same load bearing capacities shall be used as for timber-to-timber connections given in Annex 5, provided the fasteners are designed to exceed the load bearing capacities of the connector to timber connections. In addition, for loading in direction of insertion, the specifications for connections between wooden members and steel and concrete members given in Annex 5 shall be considered.

3.1.2 Stiffness

The stiffness of the connectors was determined by calculation assisted by testing. The connectors are installed with a defined number of screws with respective nominal diameter as specified in Annex 1 and Annex 2. The stiffness values are given in Annex 5.

3.1.3 Reaction to fire

Connector plates and clamping jaws are made of aluminium and the screws, threaded rods, hexagonal nuts and washers are made of carbon steel or of stainless steel, all classified as Euroclass A1 in accordance with Commission Decision 96/603/EC as amended.

3.1.4 Content, emission and/or release of dangerous substances

The release of dangerous substances is determined according to Guideline for European Technical Approval ETAG 015 “Three-dimensional nailing plates”, Edition November 2012, used as European Assessment Document. No dangerous substances is the performance of MEGANT in this respect.

NOTE In addition to the specific clauses relating to dangerous substances contained in the 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.

3.1.5 Resistance to corrosion and deterioration

The product is intended to be used in service classes 1 and 2 according to EN 1995-1-1. The product and each member of the connection should at least be suitable for service classes 1 and 2, but not for service class 1 only.

In accordance with ETAG 015 and EN 1995-1-1 the connector plates and clamping jaws are made of aluminium EN AW - 6082 according to EN 755-2 with durability class B according to EN 1999-1-1. Screws, threaded rods, hexagonal nuts and washers are made of carbon steel and galvanised or of stainless steel.

3.1.7 Dimensional stability

The effects of dimensional changes on the structural timber members being jointed due to varying moisture content was considered by the determination of the characteristic load bearing capacity and stiffness of the joints. Moisture content during service shall not change to such an extent that adverse deformation will occur. The conditions of Clause 2.2 shall be observed.

3.2 Assessment methods

3.2.1 General

The assessment of the essential characteristics in Clause 3.1 of MEGANT for the intended use, and in relation to the requirements for mechanical resistance and stability, for safety in case of fire, for hygiene, health and the environment and for safety and accessibility in use in the sense of the basic requirements for construction works № 1, 2, 3 and 4 of Regulation (EU) № 305/2011 has been made in accordance with Guideline for European Technical Approval ETAG № 015 “Three-dimensional nailing plates”, edition November 2012, used as European Assessment Document.

3.2.2 Identification

The European Technical Assessment for MEGANT is issued on the basis of agreed data that identify the assessed product. Changes to materials, to composition, to characteristics of the product, or to the production process could result in these deposited data being incorrect. Österreichisches Institut für Bautechnik should be notified before the changes are implemented, as an amendment of the European Technical Assessment is possibly necessary.

4 Assessment and verification of constancy of performance (thereinafter AVCP) system applied, with reference to its legal base

4.1 System of assessment and verification of constancy of performance

According to Commission Decision 97/638/EC the system of assessment and verification of constancy of performance to be applied to MEGANT is System 2+. System 2+ is detailed in Commission Delegated Regulation (EU) № 568/2014 of 18 February 2014, Annex, 1.3, and provides for the following items

(a) The manufacturer shall carry out:

(i) an assessment of the performance of the construction product carried out on the basis of testing (including sampling), calculation, tabulated values or descriptive documentation of that product;

(ii) factory production control;

(iii) testing of samples taken at the manufacturing plant by the manufacturer in accordance with a prescribed test plan[5].

(b) The notified factory production control certification body shall decide on the issuing, restriction, suspension or withdrawal of the certificate of conformity of the factory production control on the basis of the outcome of the following assessments and verifications carried out by that body:

(iv) initial inspection of the manufacturing plant and of factory production control;

(v) continuing surveillance, assessment and evaluation of factory production control.

[5] The prescribed test plan has been deposited with Österreichisches Institut für Bautechnik and is handed over only to the notified factory production control certification body involved in the procedure for the assessment and verification of constancy of performance. The prescribed test plan is also referred to as control plan.

4.2 AVCP for construction products for which a European Technical Assessment has been issued

Manufacturers undertaking tasks under Systems 2+ shall consider the European Technical Assessment issued for the construction product in question as the assessment of the performance of that product. Manufacturers shall therefore not undertake the tasks referred to in point 4.1 (a)(i).

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

5.1 Tasks for the manufacturer

5.1.1 Factory production control

In the manufacturing plant the manufacturer shall establish and continuously maintain a factory production control. All procedures and specification adopted by the manufacturer shall be documented in a systematic manner. The factory production control shall ensure the constancy of performances of MEGANT with regard to the essential characteristics.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the control plan. The incoming raw materials shall be subject to controls by the manufacturer before acceptance. Check of incoming materials shall include control of inspection documents presented by the manufacturer of the raw materials.

The frequencies of controls and tests conducted during manufacturing and on the assembled product are defined by taking account of the manufacturing process of the product and are laid down in the control plan.

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

- Designation of the product, basic materials and components
- Type of control or test
- Date of manufacture of the product and date of testing of the product or basic materials or components
- Results of controls and tests and, if appropriate, comparison with requirements
- Name and signature of person responsible for factory production control

The records shall be presented to the notified factory production control certification body involved in continuous surveillance. On request the records shall be presented to Österreichisches Institut für Bautechnik.

5.1.2 Declaration of performance

The manufacturer is responsible for preparing the declaration of performance. When all the criteria of the assessment and verification of constancy of performance are met, including the certificate of conformity of the factory production control issued by the notified factory production control certification body, the manufacturer shall draw up a declaration of performance.

5.3 Tasks for the notified factory production control certification body

5.3.1 Initial inspection of the manufacturing plant and of factory production control

The notified factory production control certification body shall verify the ability of the manufacturer for a continuous and orderly manufacturing of MEGANT according to the European Technical Assessment. In particular the following items shall be appropriately considered.

- Personnel and equipment
- The suitability of the factory production control established by the manufacturer
- Full implementation of the control plan

5.3.2 Continuing surveillance, assessment and evaluation of factory production control

The notified factory production control certification body shall visit the factory at least once a year for routine inspection. In particular the following items shall be appropriately considered.

- The manufacturing process including personnel and equipment
- The factory production control
- The implementation of the control plan

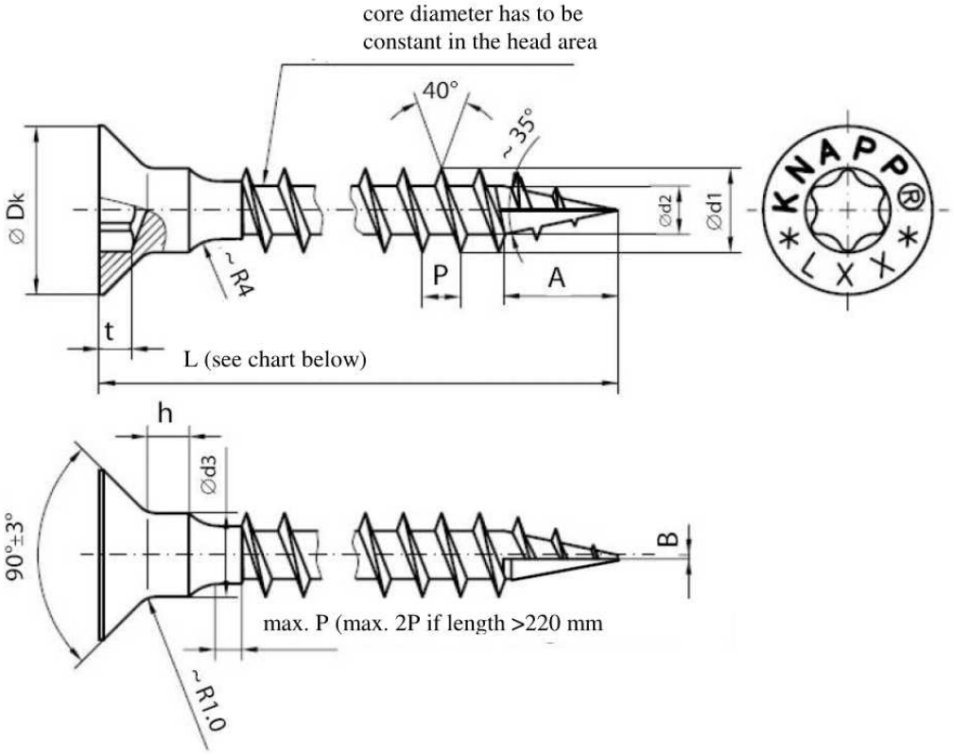
The results of continuous surveillance shall be made available on demand by the notified factory production control certification body to Österreichisches Institut für Bautechnik. When the provisions of the European Technical Assessment and the control plan are no longer fulfilled, the certificate of conformity of the factory production control shall be withdrawn.

Issued in Vienna on 22.07.2019
by Österreichisches Institut für Bautechnik

The original document is signed by:

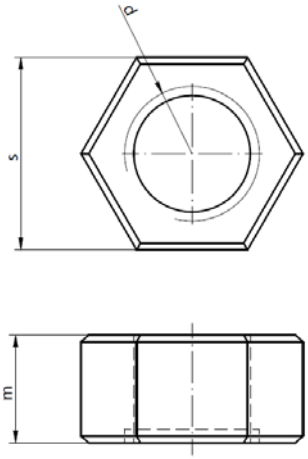
Rainer Mikulits

Managing Director

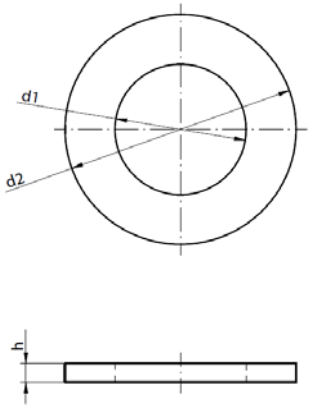


Self-tapping screw 8 x L mm	
E-Modulus	210 000 N/mm²
Min. char. tensile strength $f_{tens,k}$	20 kN
Min. char. yield moment $M_{y,k}$	20 Nm
Min. char. torsional strength $f_{tor,k}$	23 Nm
Head diameter D_k	15 mm
Outer thread diameter d_1	8 mm
Inner thread diameter d_2	5.1 mm
Length L	80 - 240 mm

MEGANT®	Annex 1
Fastener specification – self-tapping screw	of European Technical Assessment ETA-15/0667 of 22.07.2019

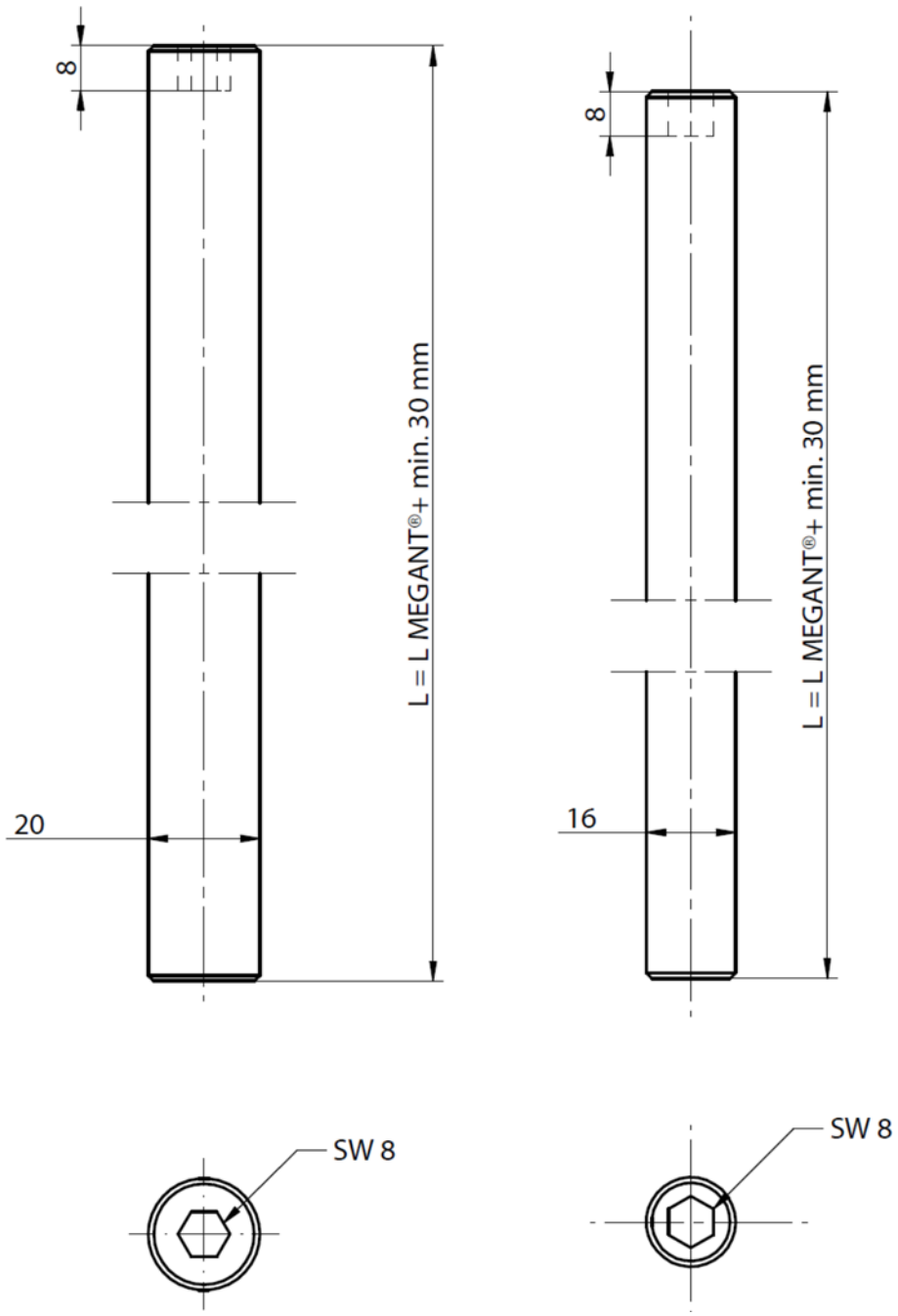


Hexagonal nut	Diameter d	Width across flat s	Thickness m
-	mm	mm	mm
M8	8	13	6.5
M10	10	17	8
M16	16	24	13
M20	20	30	16



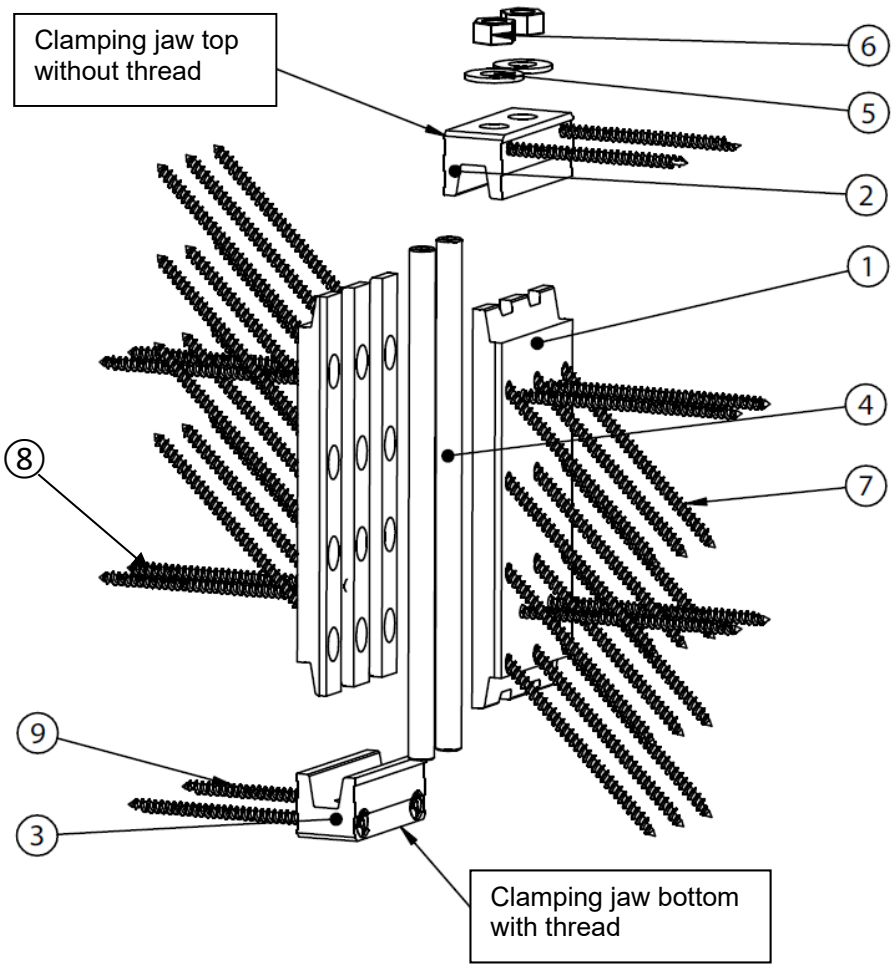
Washer	Inner diameter d_1	Outer diameter d_2	Thickness m
-	mm	mm	mm
M8	8.4	16	1.6
M10	10.5	20	2
M16	17	30	3
M20	21	37	3

MEGANT®	Annex 1
Fastener specification – hexagonal nut and washer	of European Technical Assessment ETA-15/0667 of 22.07.2019



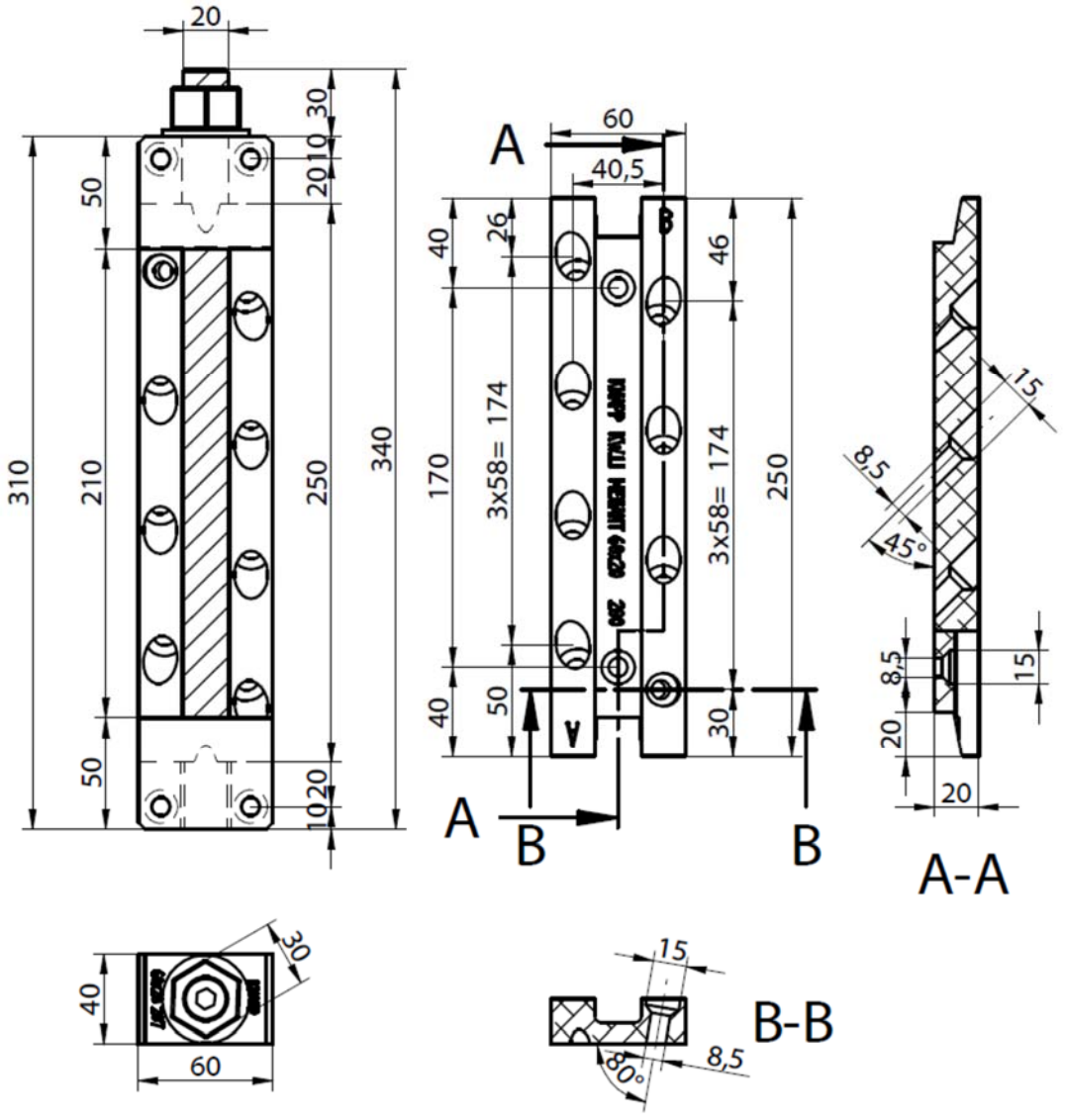
dimensions in mm

MEGANT®	Annex 1
Fastener specification – threaded rod M16 and M20	of European Technical Assessment ETA-15/0667 of 22.07.2019



Position number	Name
1	Connector plate
2	Clamping jaw top
3	Clamping jaw bottom
4	Threaded rod
5	Washer
6	Hexagonal nut
7	Inclined screws
8	Horizontal (position) screws
9	Clamping jaw screws

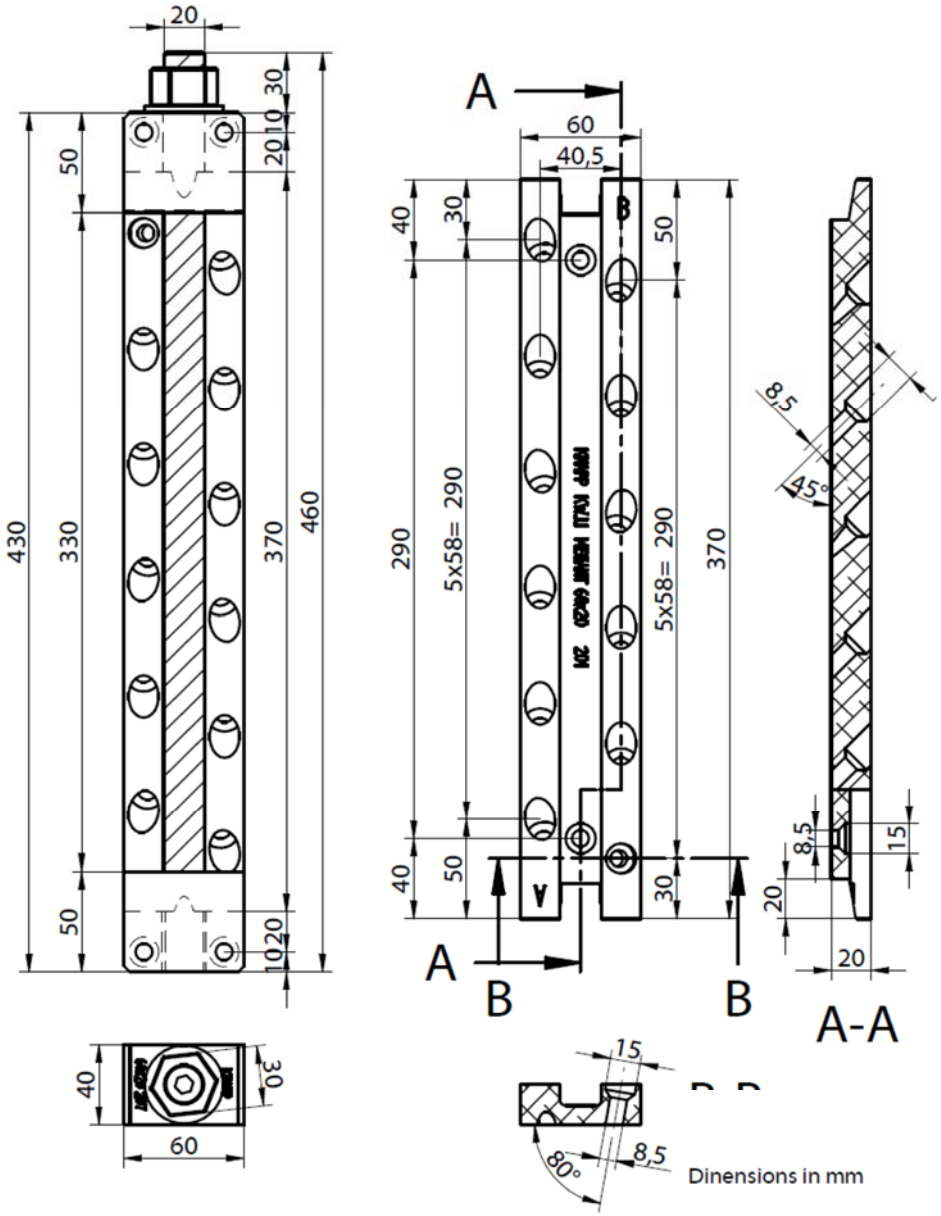
MEGANT®	Annex 2 of European Technical Assessment ETA-15/0667 of 22.07.2019
Product details definitions: assembling of the connector	



MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw	Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	mm
310x60x40	3	7	2	1x M20x340

dimensions in mm

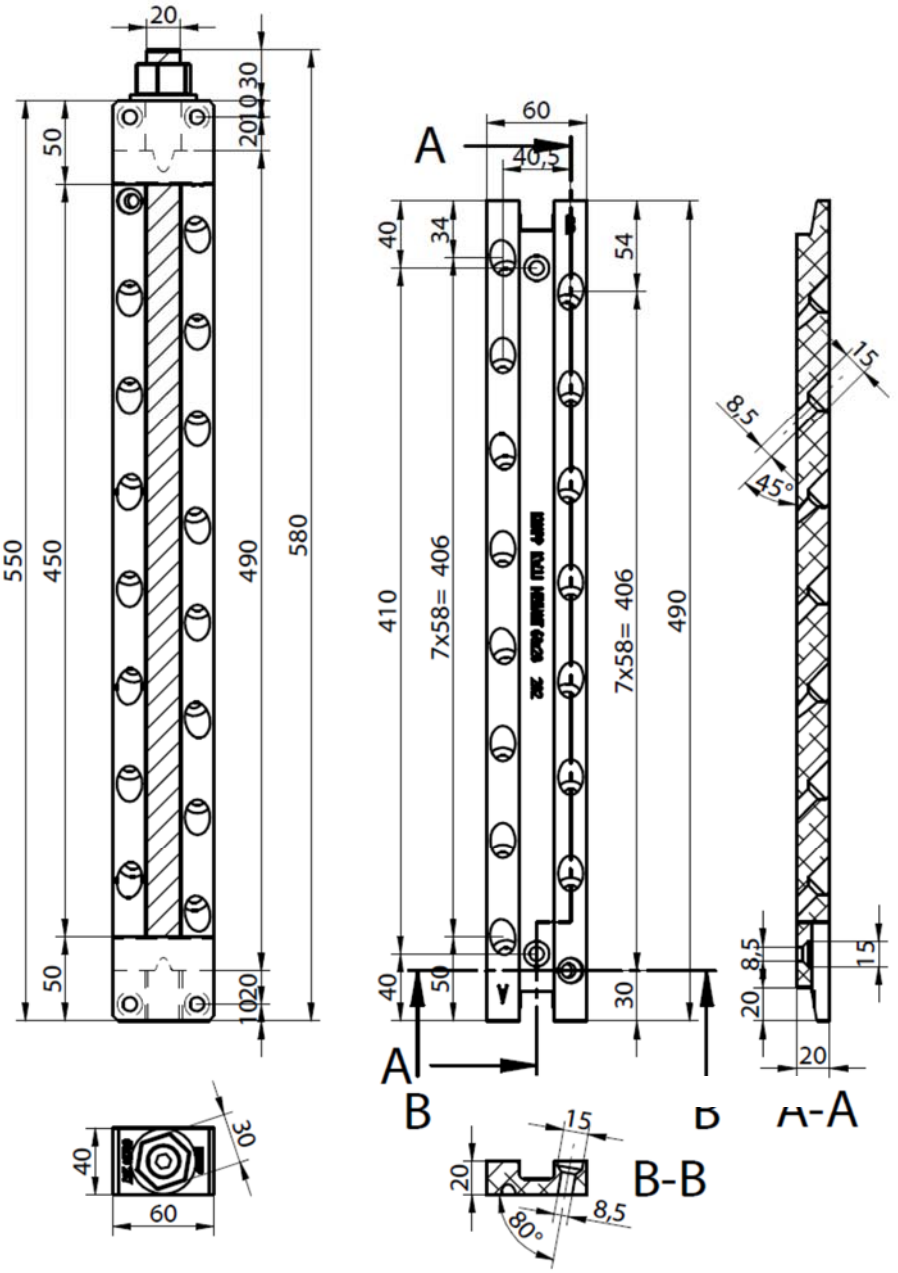
MEGANT® 60	Annex 2
Connector plate for <u>wood</u> Type: <u>310x60x40</u>	of European Technical Assessment ETA-15/0667 of 22.07.2019



MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw	Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	mm
430x60x40	3	11	2	1x M20x460

dimensions in mm

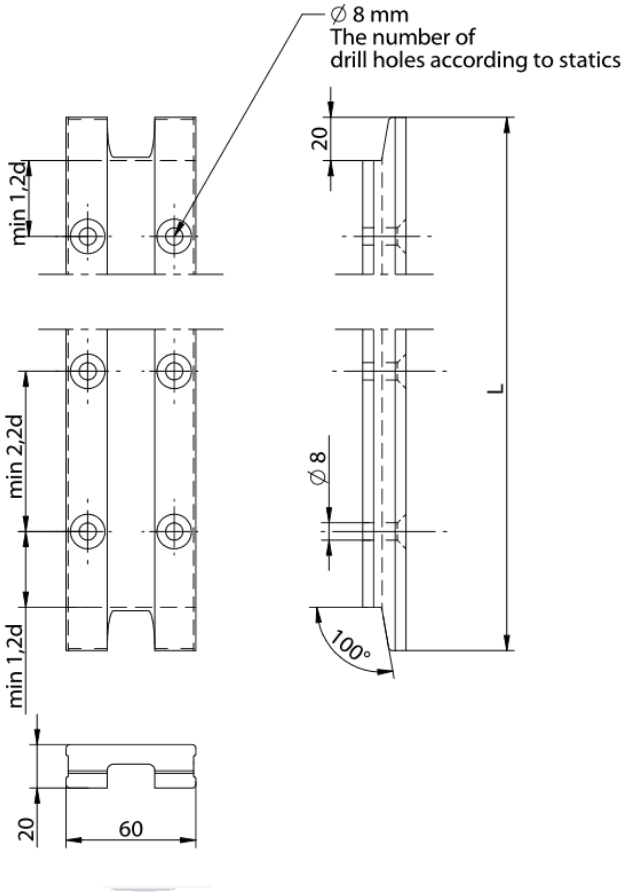
MEGANT® 60	Annex 2
Connector plate for <u>wood</u> Type: <u>430x60x40</u>	of European Technical Assessment ETA-15/0667 of 22.07.2019



MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw	Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	mm
550x60x40	3	15	2	1x M20x580

dimensions in mm

MEGANT® 60	Annex 2
Connector plate for wood Type: 550x60x40	of European Technical Assessment ETA-15/0667 of 22.07.2019

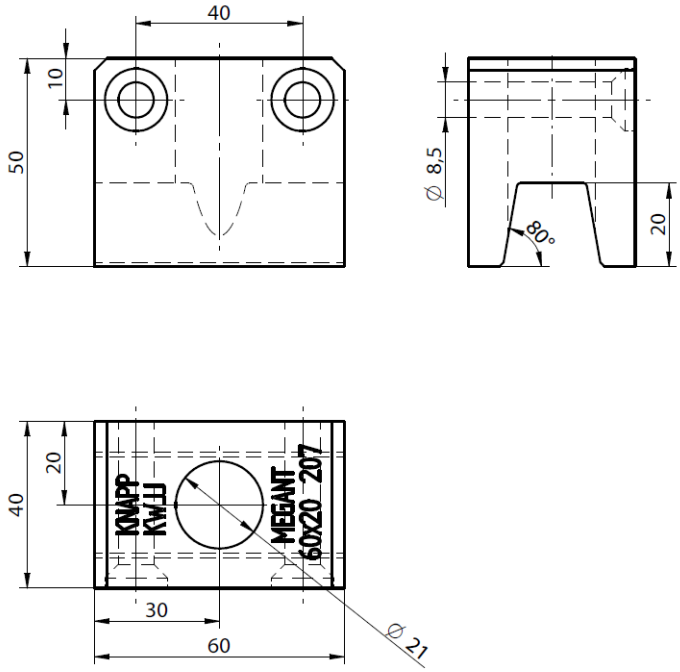


L according to the length of the connector to be mounted on the joist
Min. 2 x 3 and max. 2 x 6 countersunk holes with Ø 8 mm

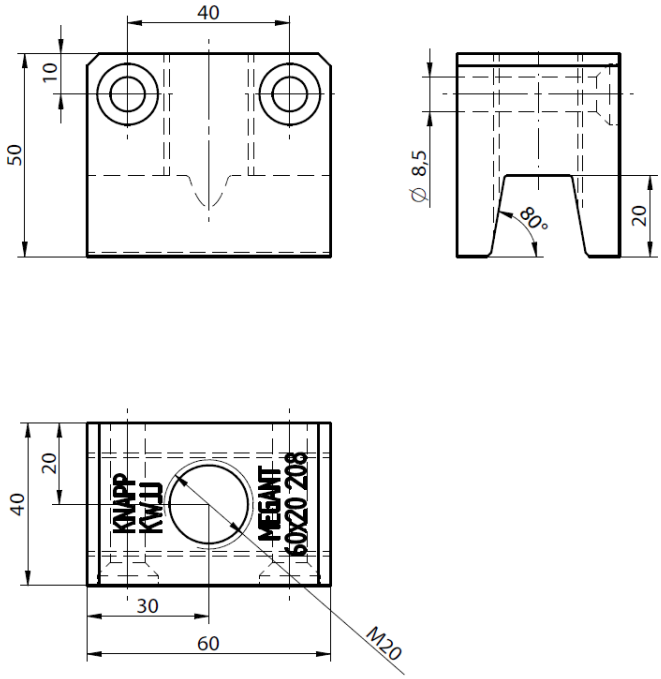
dimensions in mm

MEGANT® 60	Annex 2
Connector plate for steel Type: all	of European Technical Assessment ETA-15/0667 of 22.07.2019

Clamping jaw top

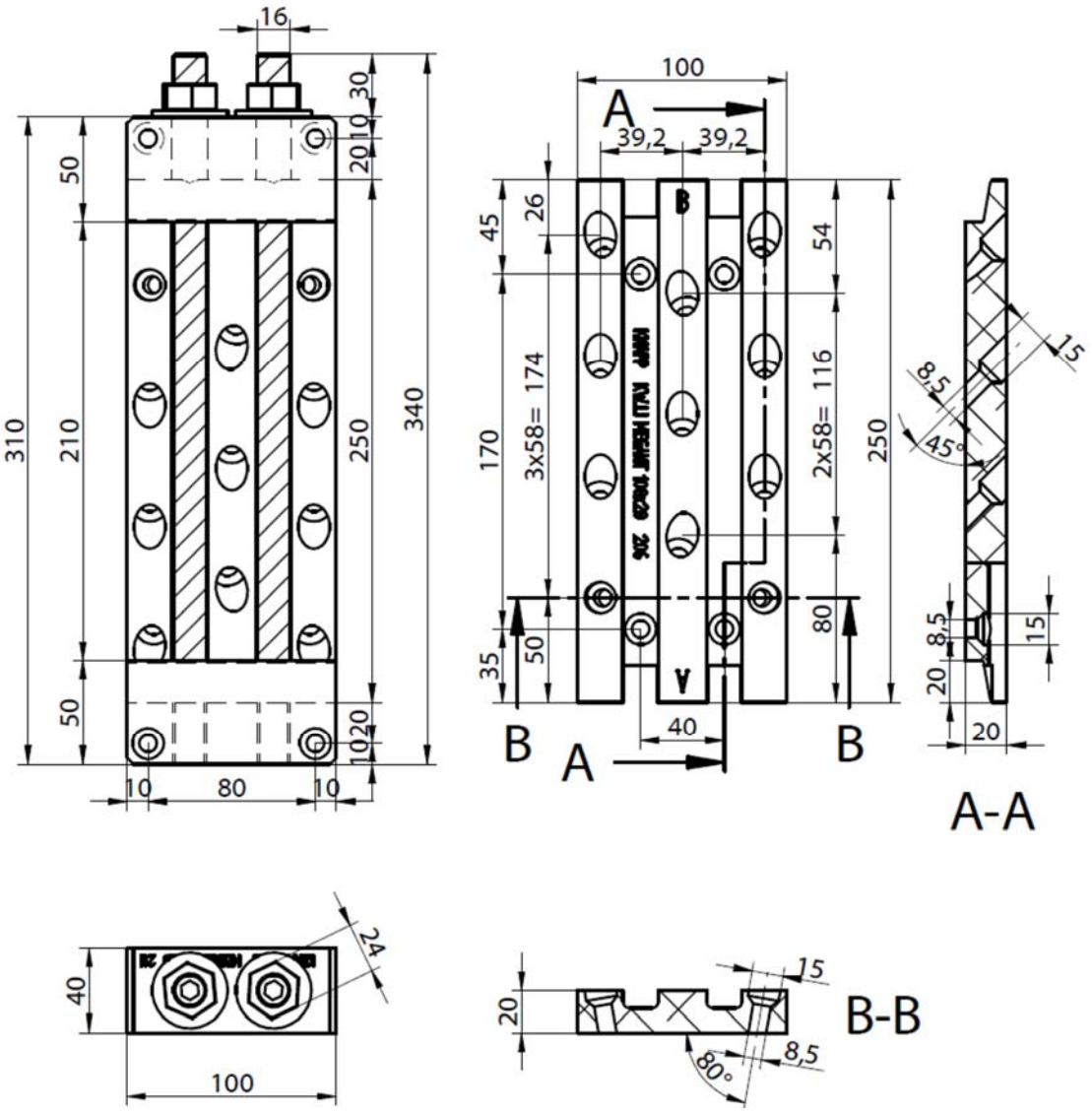


Clamping jaw bottom



dimensions in mm

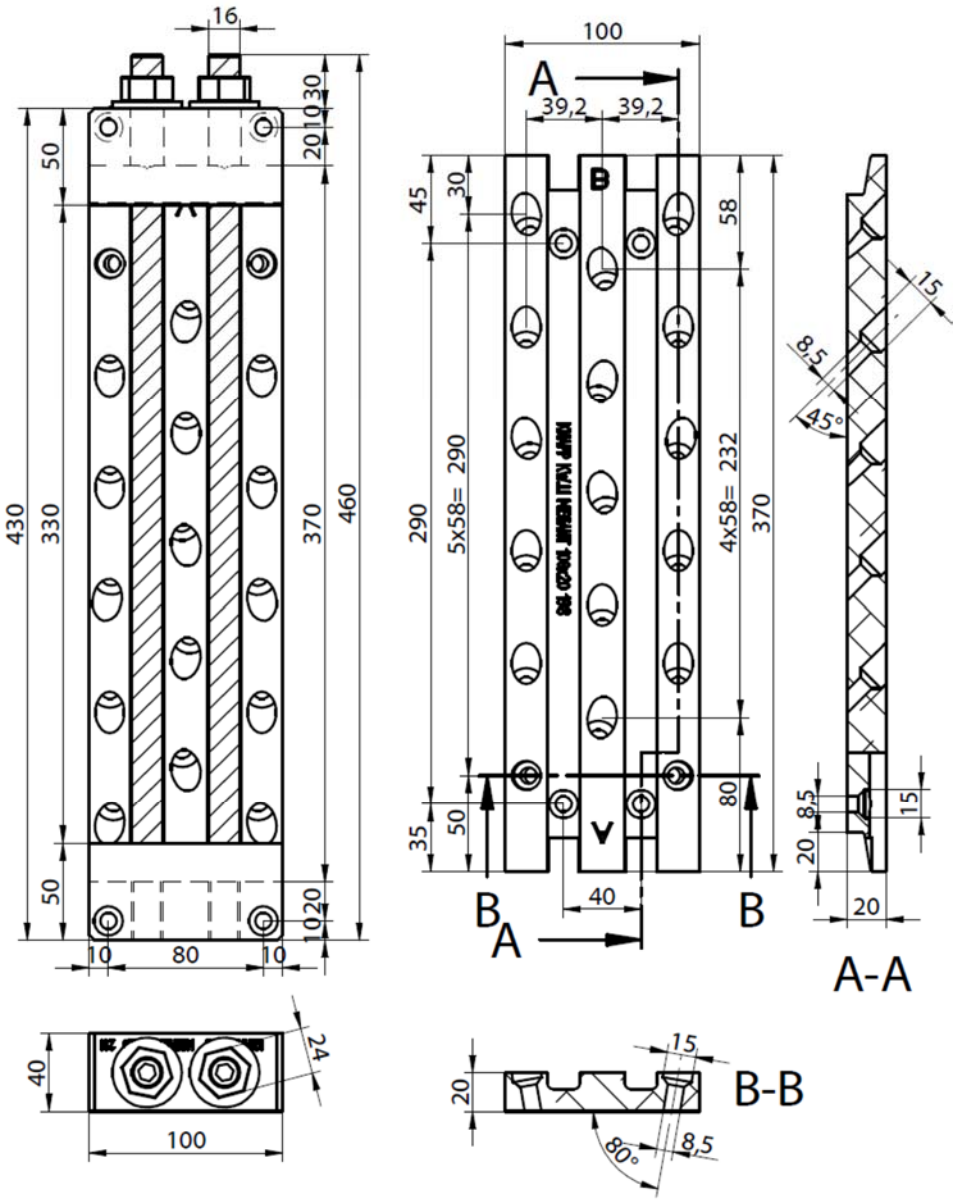
MEGANT® 60	Annex 2
Clamping jaws Type: all	of European Technical Assessment ETA-15/0667 of 22.07.2019



MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw	Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	mm
310x100x40	6	9	2	2x M16x340

dimensions in mm

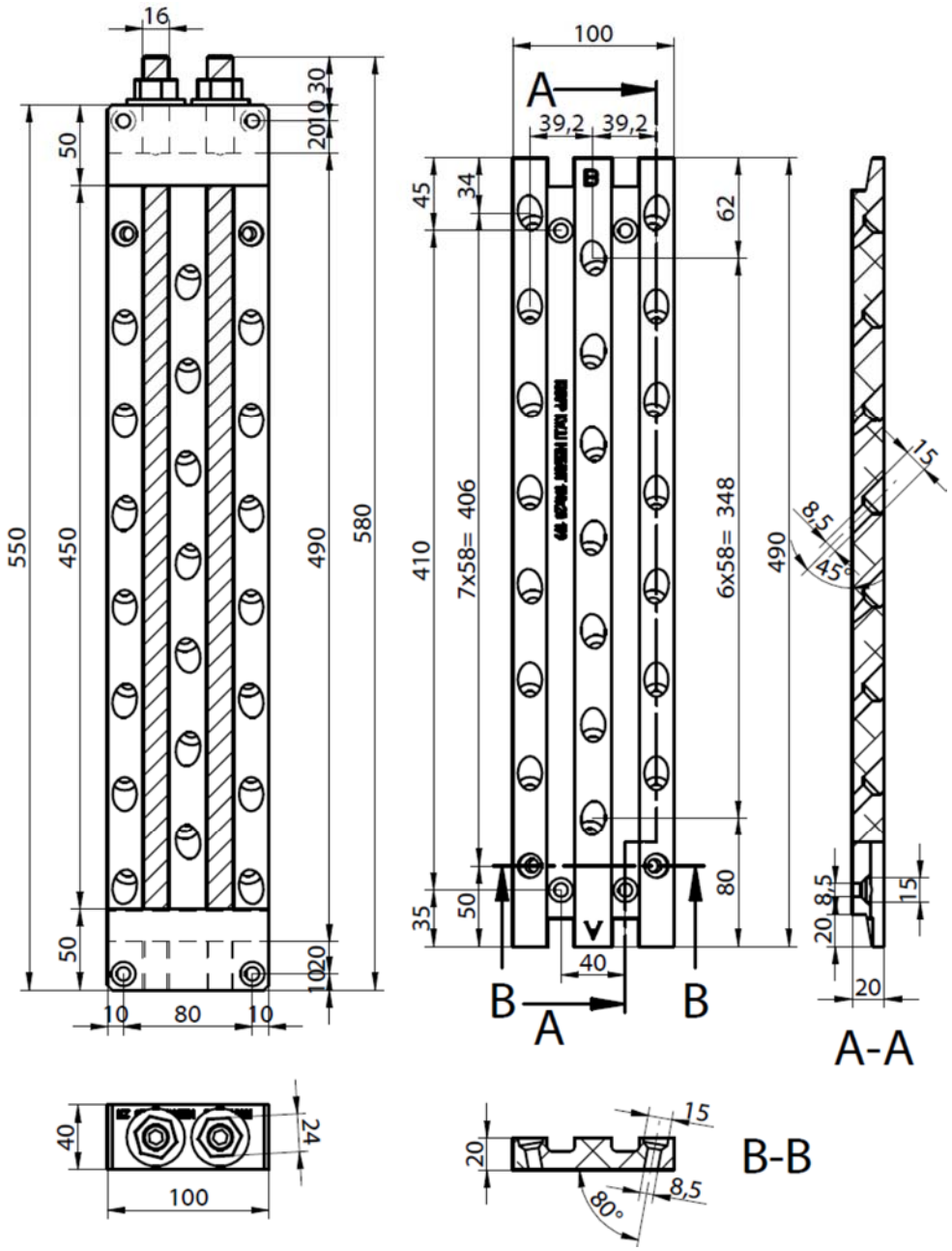
MEGANT® 100	Annex 2
Connector plate for wood Type: 310x100x40	of European Technical Assessment ETA-15/0667 of 22.07.2019



MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw	Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	mm
430x100x40	6	15	2	2x M16x460

dimensions in mm

MEGANT® 100	Annex 2
Connector plate for wood Type: 430x100x40	of European Technical Assessment ETA-15/0667 of 22.07.2019

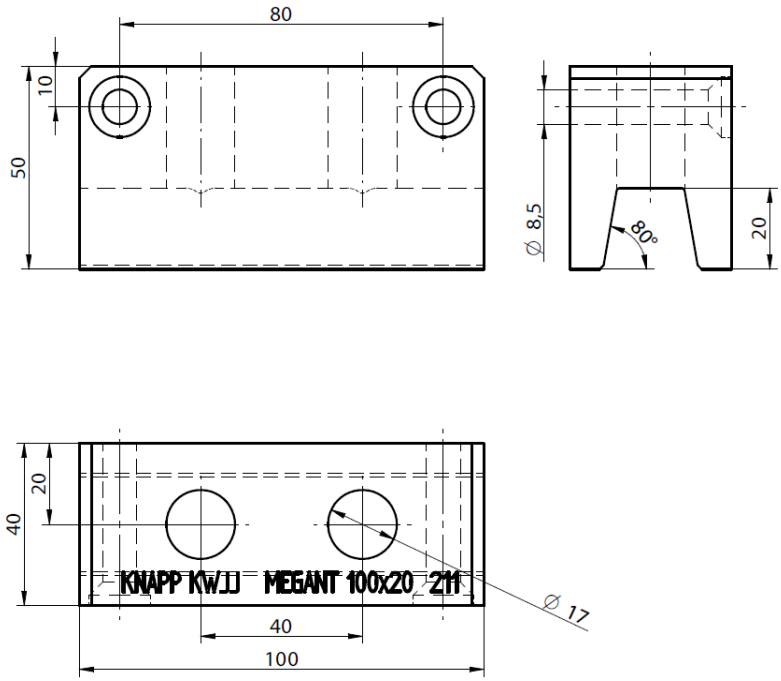


MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw	Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	mm
550x100x40	6	21	2	2x M16x580

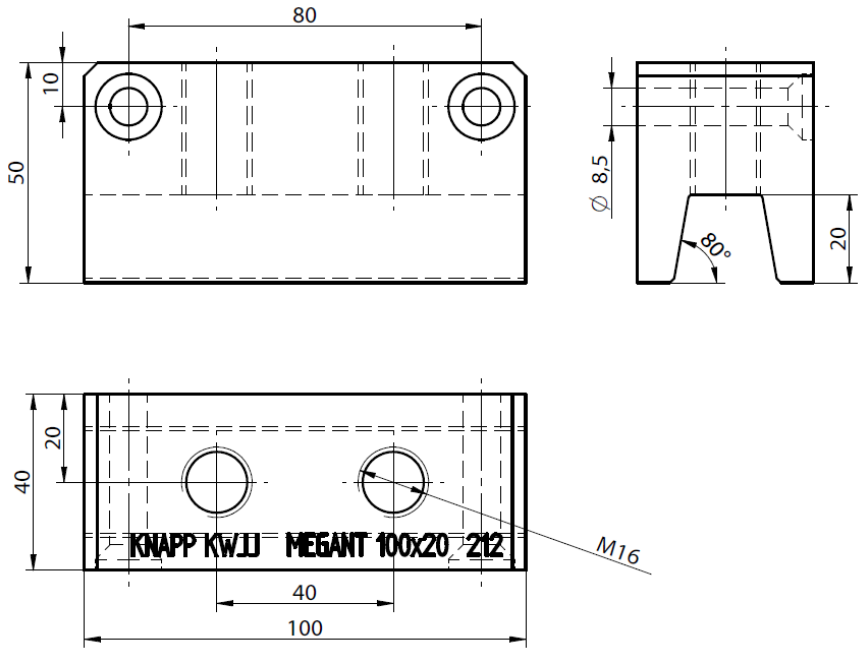
dimensions in mm

MEGANT® 100	Annex 2
Connector plate for wood Type: 550x100x40	of European Technical Assessment ETA-15/0667 of 22.07.2019

Clamping jaw top

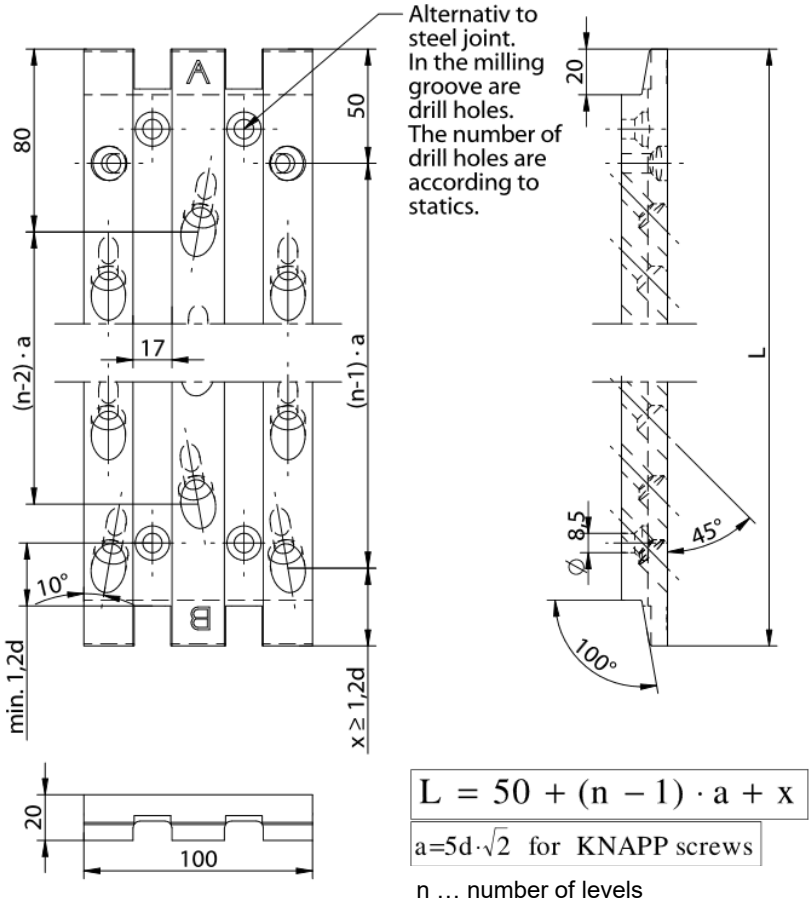


Clamping jaw bottom



dimensions in mm

MEGANT® 100	Annex 2
Clamping jaws Type: all	of European Technical Assessment ETA-15/0667 of 22.07.2019



$$L = 50 + (n - 1) \cdot a + x$$

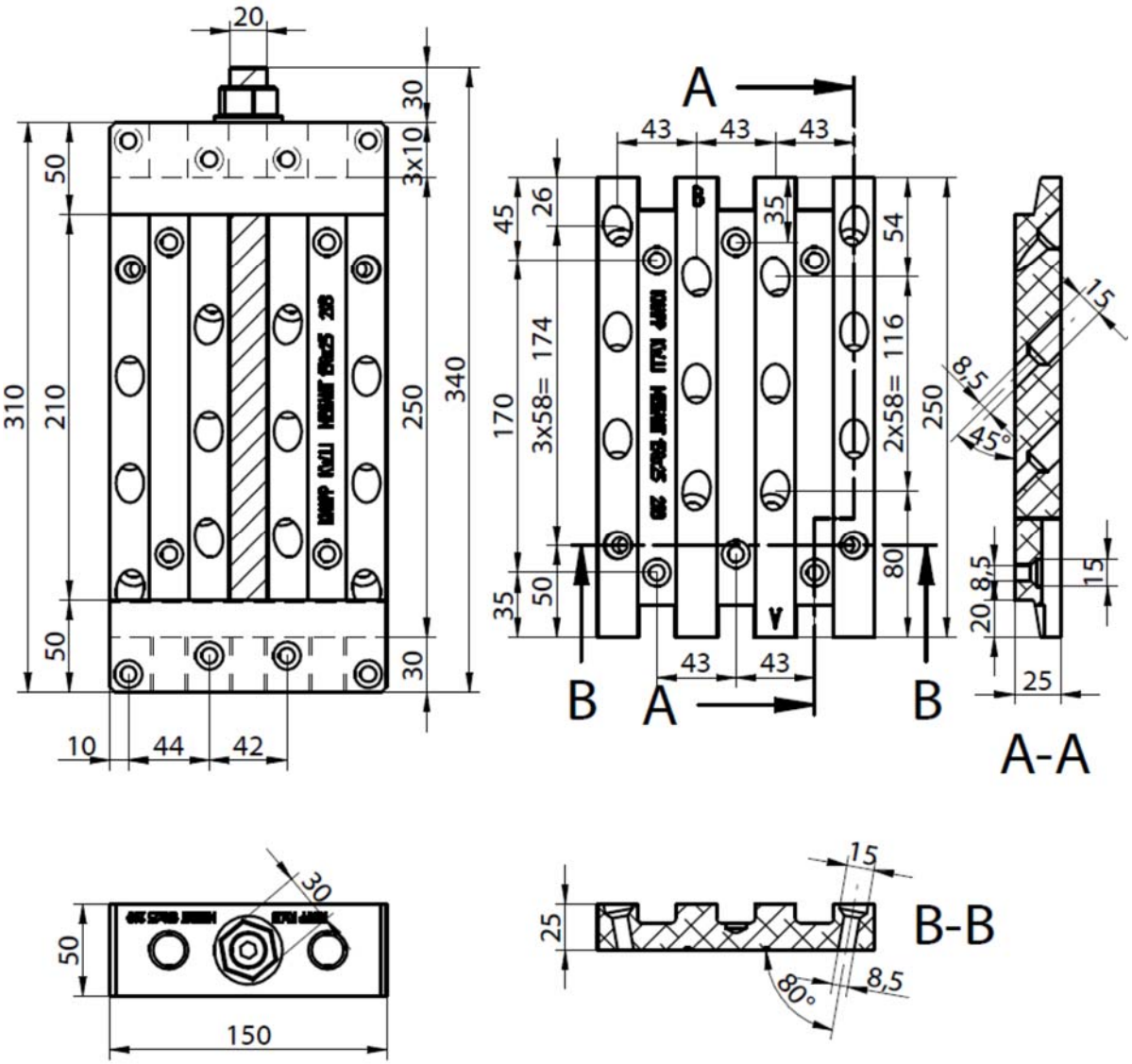
$$a = 5d \cdot \sqrt{2} \quad \text{for KNAPP screws}$$

n … number of levels
d … outer thread diameter of screw

The connector plate for use in steel connections is provided with min. 2 x 4 and max. 2 x 8 countersunk holes with Ø 8 mm instead of the holes for the n_{90} screws in the area of the threaded rods.

dimensions in mm

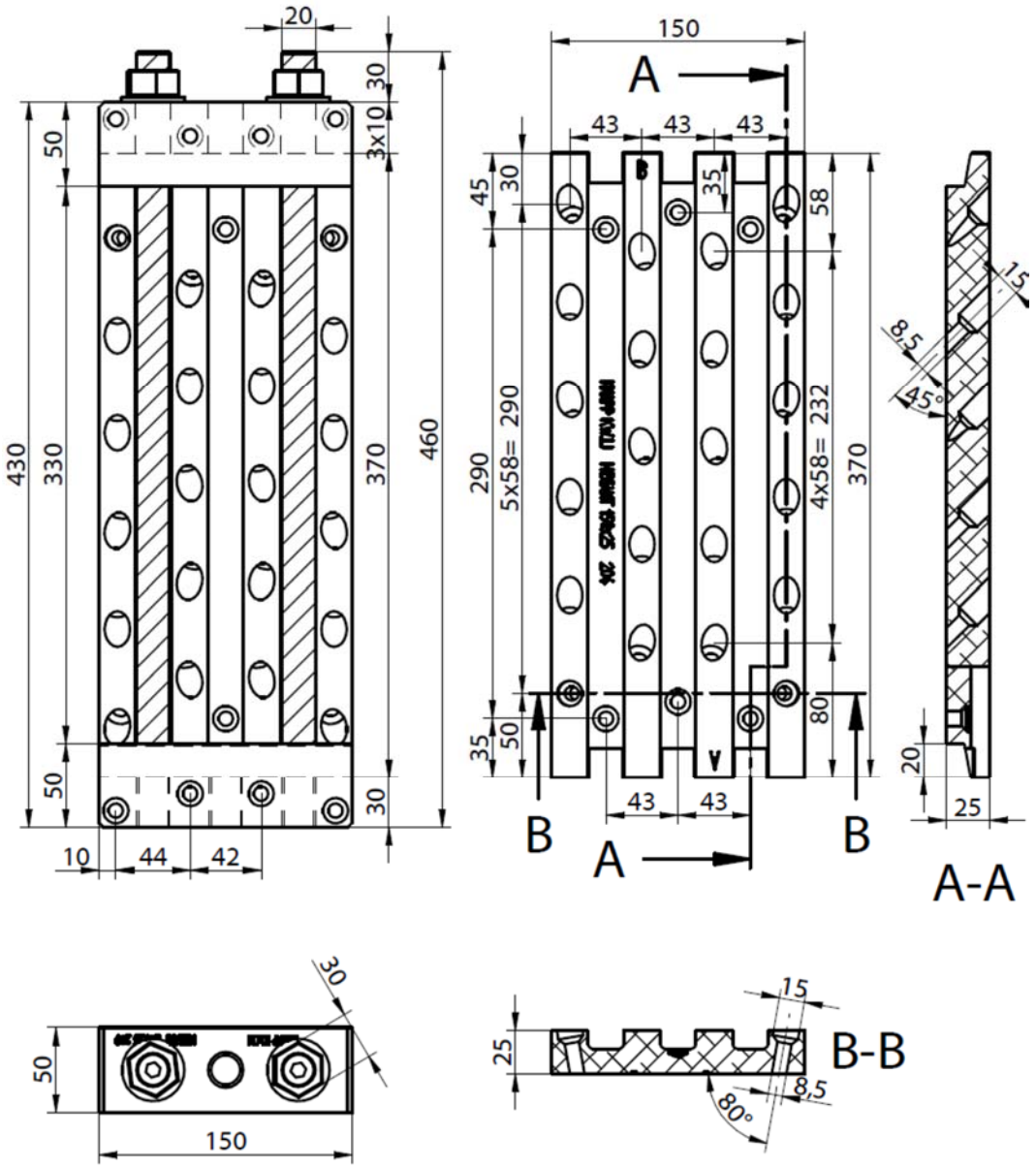
MEGANT® 100	Annex 2
Connector plate for steel Type: all	of European Technical Assessment ETA-15/0667 of 22.07.2019



MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw		Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	$n_{45,J/H}$	mm
310x150x50	8	12	4	–	1-2 x M20x340

dimensions in mm

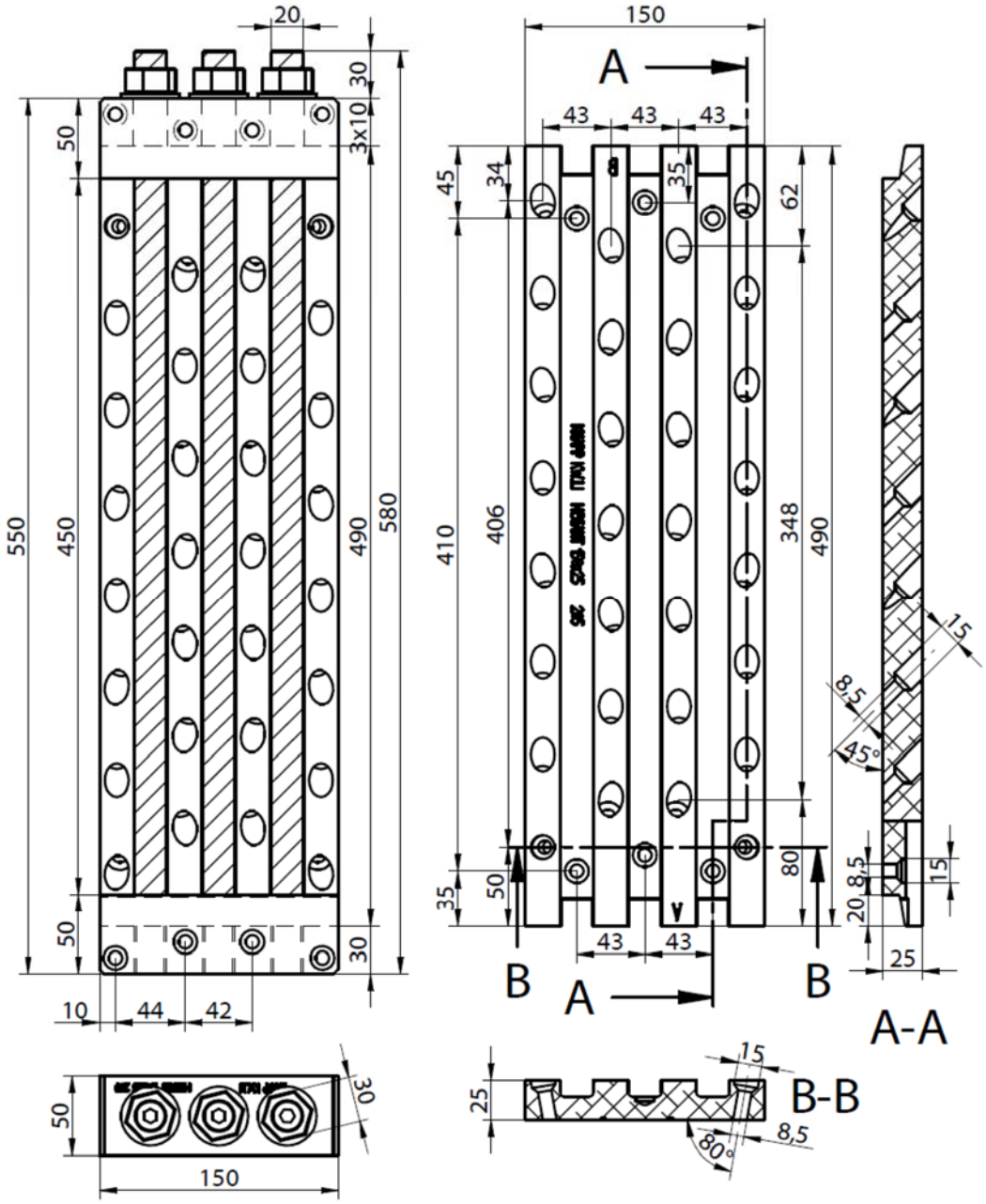
MEGANT® 150	Annex 2
Connector plate for wood Type: 310x150x50	of European Technical Assessment ETA-15/0667 of 22.07.2019



MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw		Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	$n_{45,J/H}$	mm
430x150x50	8	20	4	–	2-3 x M20x460

dimensions in mm

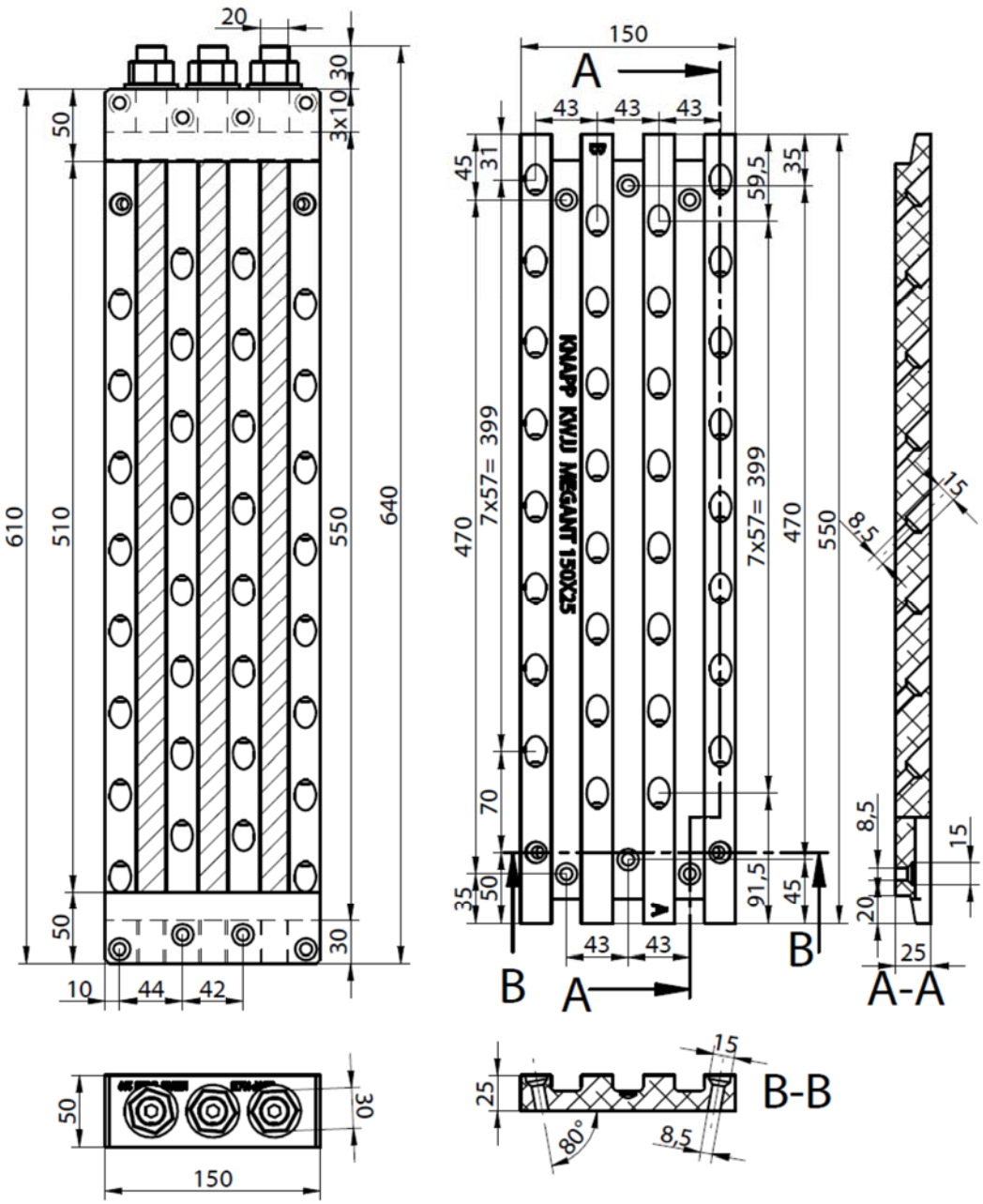
MEGANT® 150	Annex 2
Connector plate for <u>wood</u> Type: <u>430x150x50</u>	of European Technical Assessment ETA-15/0667 of 22.07.2019



MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw		Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	$n_{45,J/H}$	mm
550x150x50	8	28	4	–	3x M20x580

dimensions in mm

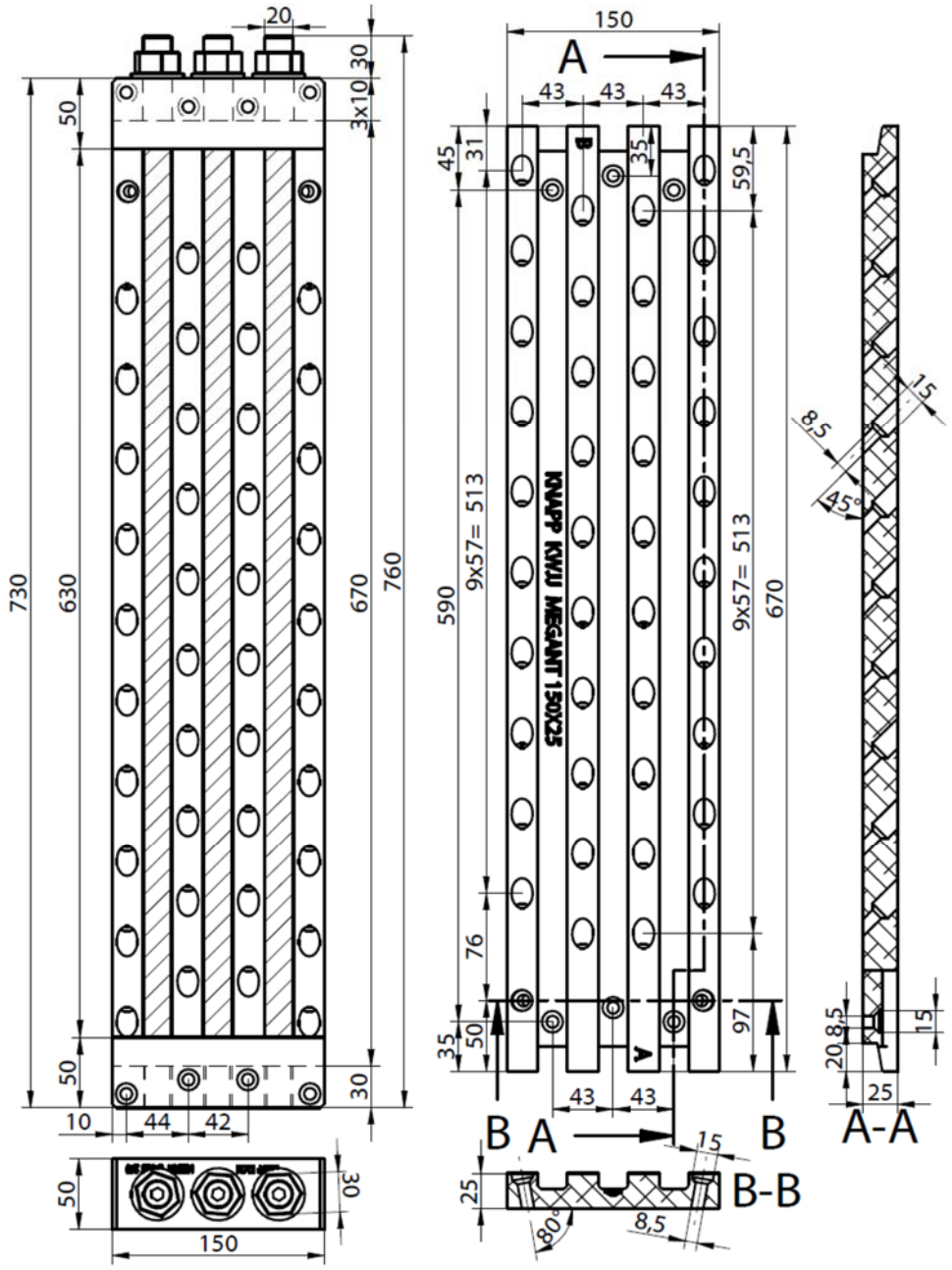
MEGANT® 150	Annex 2
Connector plate for wood Type: 550x150x50	of European Technical Assessment ETA-15/0667 of 22.07.2019



MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw		Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	$n_{45,J/H}$	mm
610x150x50	8	32	4	–	3x M20x640

dimensions in mm

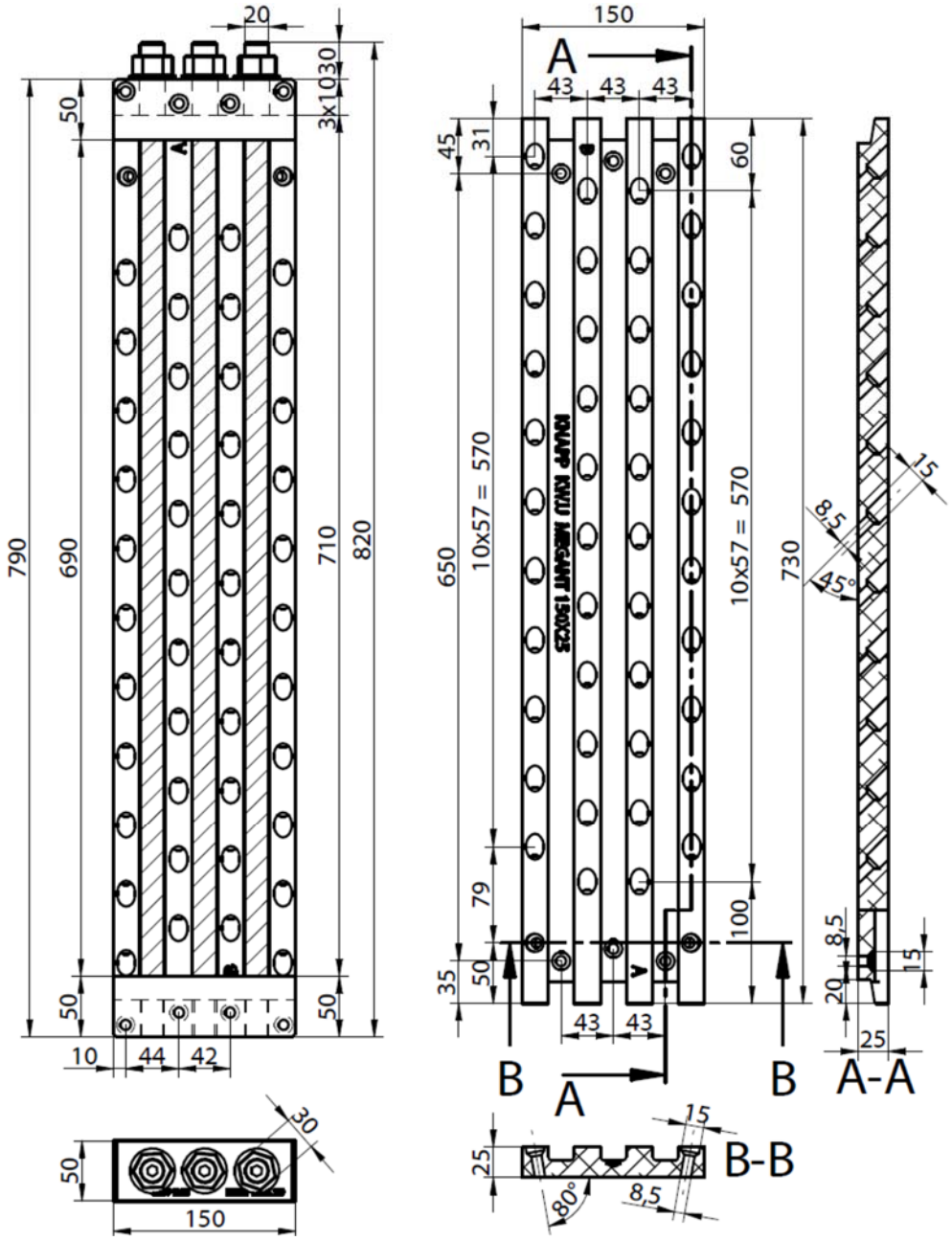
MEGANT® 150	Annex 2
Connector plate for wood Type: 610x150x50	of European Technical Assessment ETA-15/0667 of 22.07.2019



MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw		Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	$n_{45,J/H}$	mm
730x150x50	8	40	4	–	3x M20x760

dimensions in mm

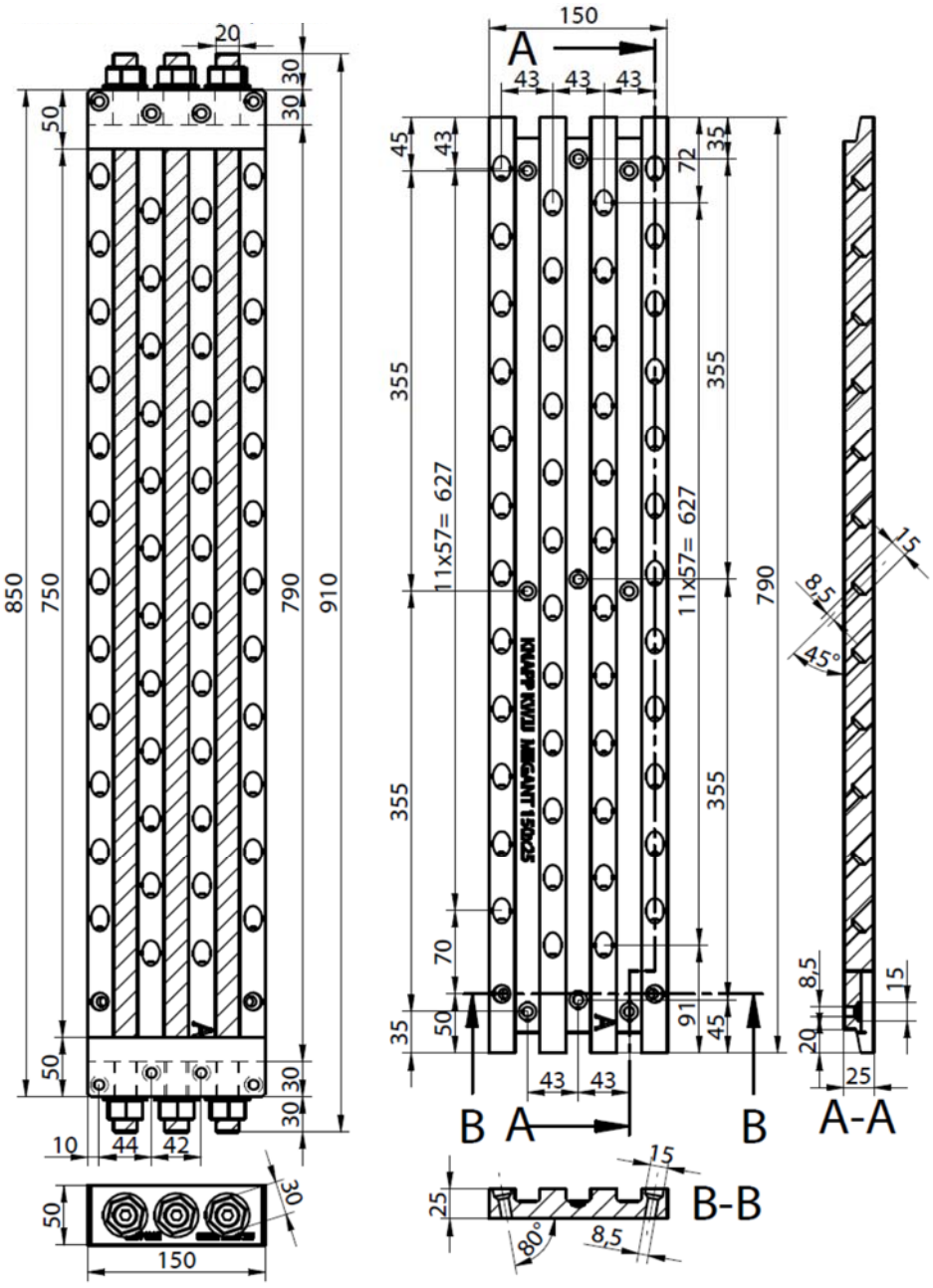
MEGANT® 150	Annex 2
Connector plate for <u>wood</u> Type: <u>730x150x50</u>	of European Technical Assessment ETA-15/0667 of 22.07.2019



MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw		Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	$n_{45,J/H}$	mm
790x150x50	8	44	4	–	3x M20x820

dimensions in mm

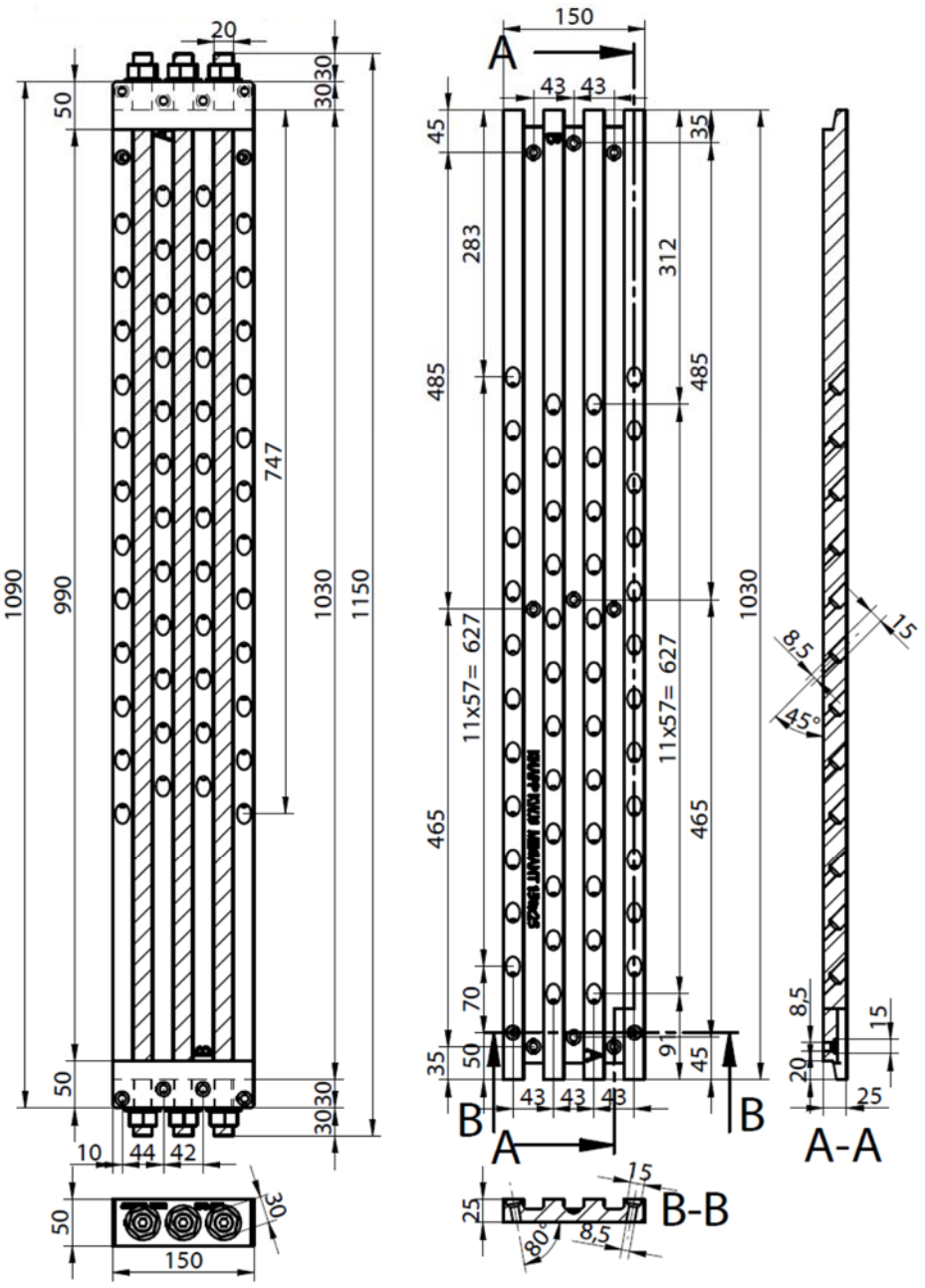
MEGANT® 150	Annex 2
Connector plate for wood Type: 790x150x50	of European Technical Assessment ETA-15/0667 of 22.07.2019



MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw		Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	$n_{45,J/H}$	mm
850x150x50	11	48	4	–	3x M20x910

dimensions in mm

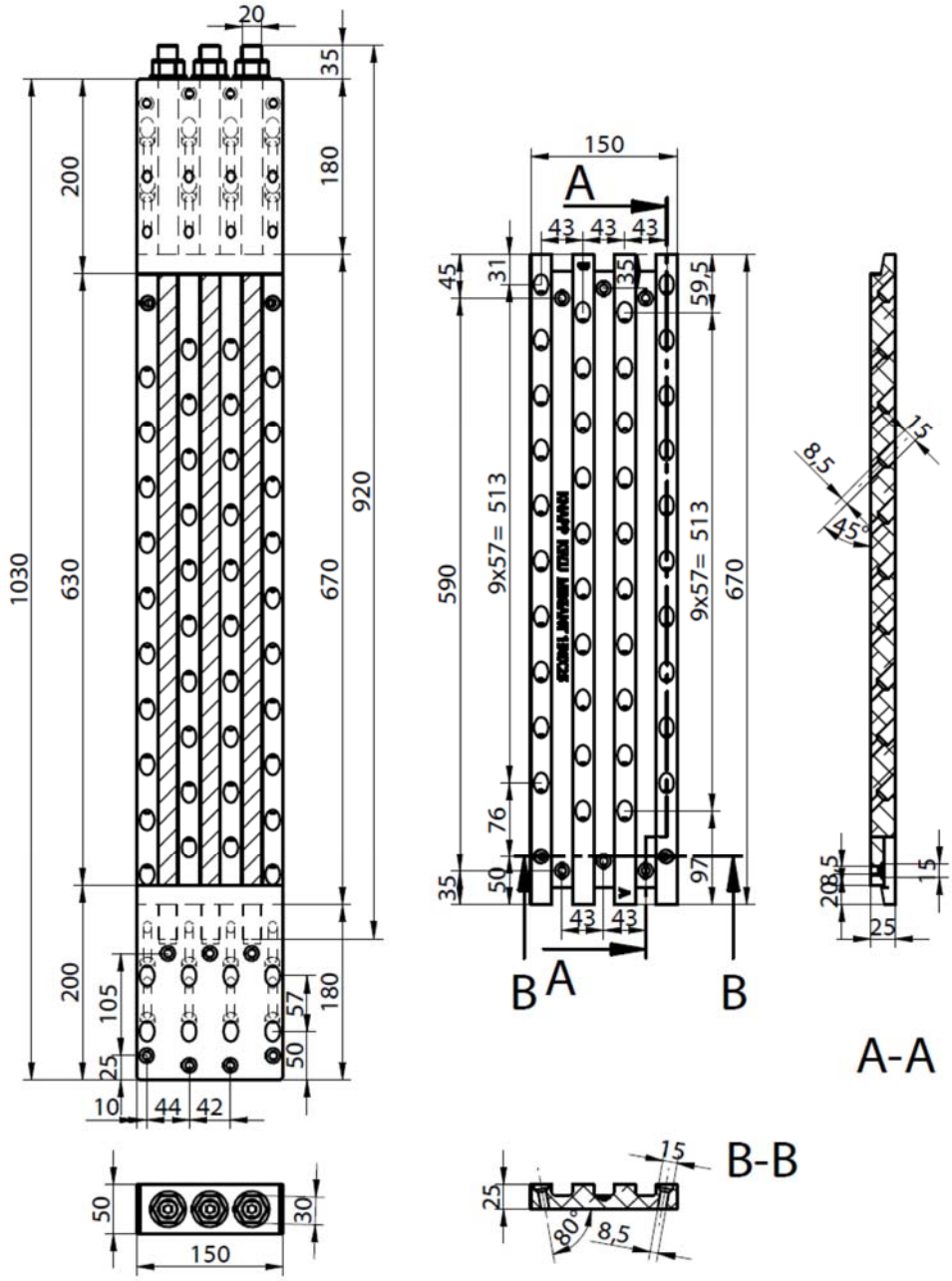
MEGANT® 150	Annex 2
Connector plate for wood Type: 850x150x50	of European Technical Assessment ETA-15/0667 of 22.07.2019



MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw		Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	$n_{45,J/H}$	mm
1090x150x50	11	48	4	–	3x M20x1150

dimensions in mm

MEGANT® 150	Annex 2
Connector plate for wood Type: 1090x150x50	of European Technical Assessment ETA-15/0667 of 22.07.2019

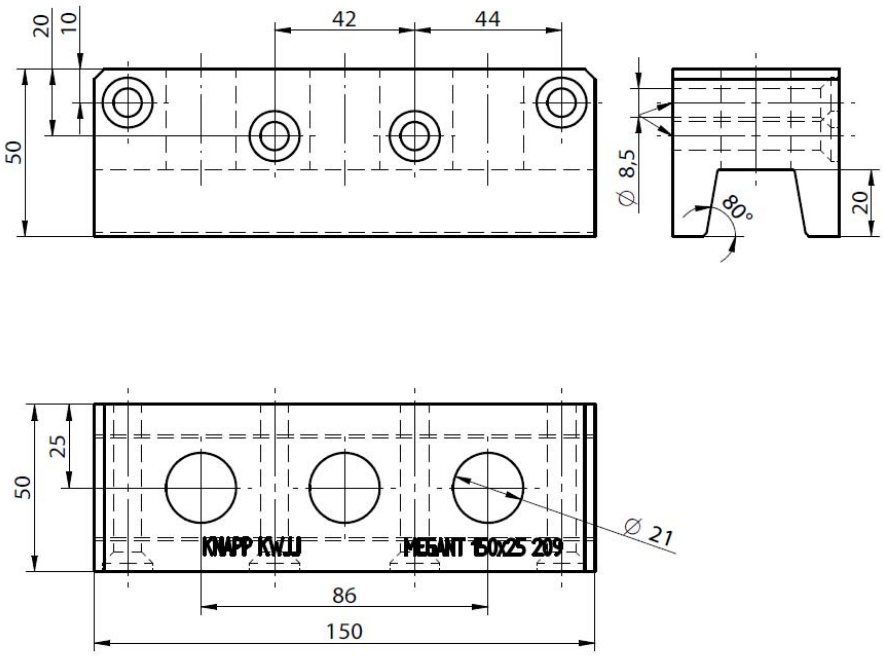


MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw		Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	$n_{45,J/H}$	mm
1030x150x50 SL	8	40	4 top 7 bottom	8	3x M20x920

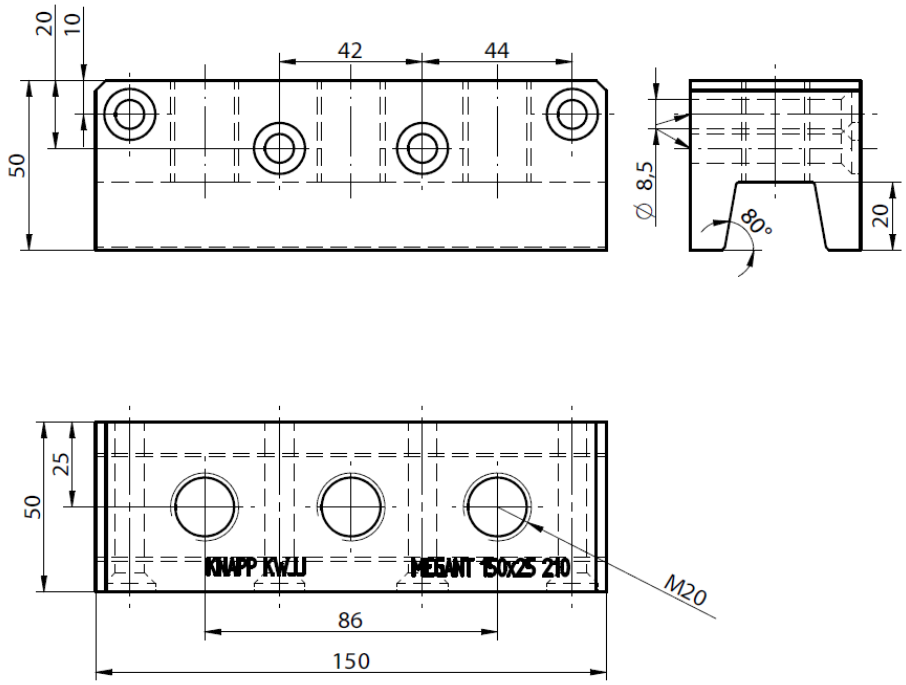
dimensions in mm

MEGANT® 150	Annex 2
Connector plate for wood Type: 1030x150x50 SL	of European Technical Assessment ETA-15/0667 of 22.07.2019

Clamping jaw top



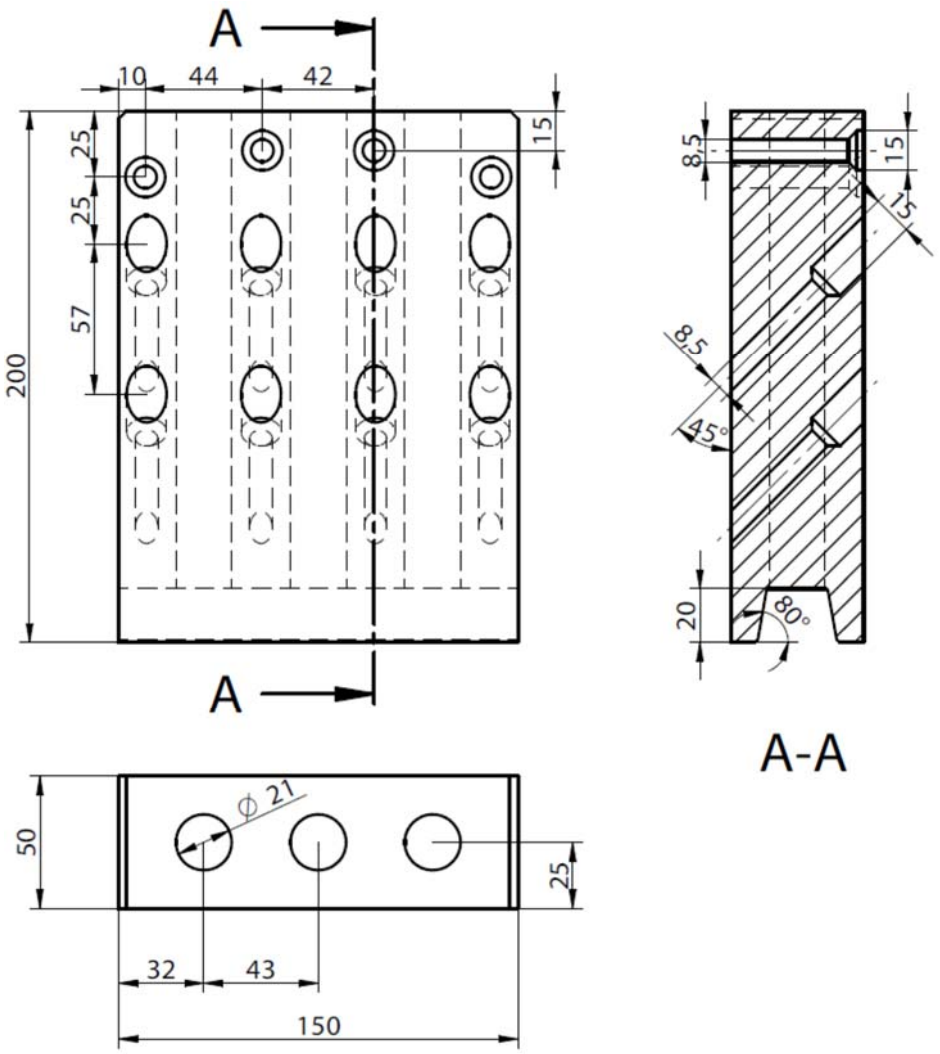
Clamping jaw bottom



dimensions in mm

MEGANT® 150	Annex 2
Clamping jaws Type: 310x150x50 to 1090x150x50	of European Technical Assessment ETA-15/0667 of 22.07.2019

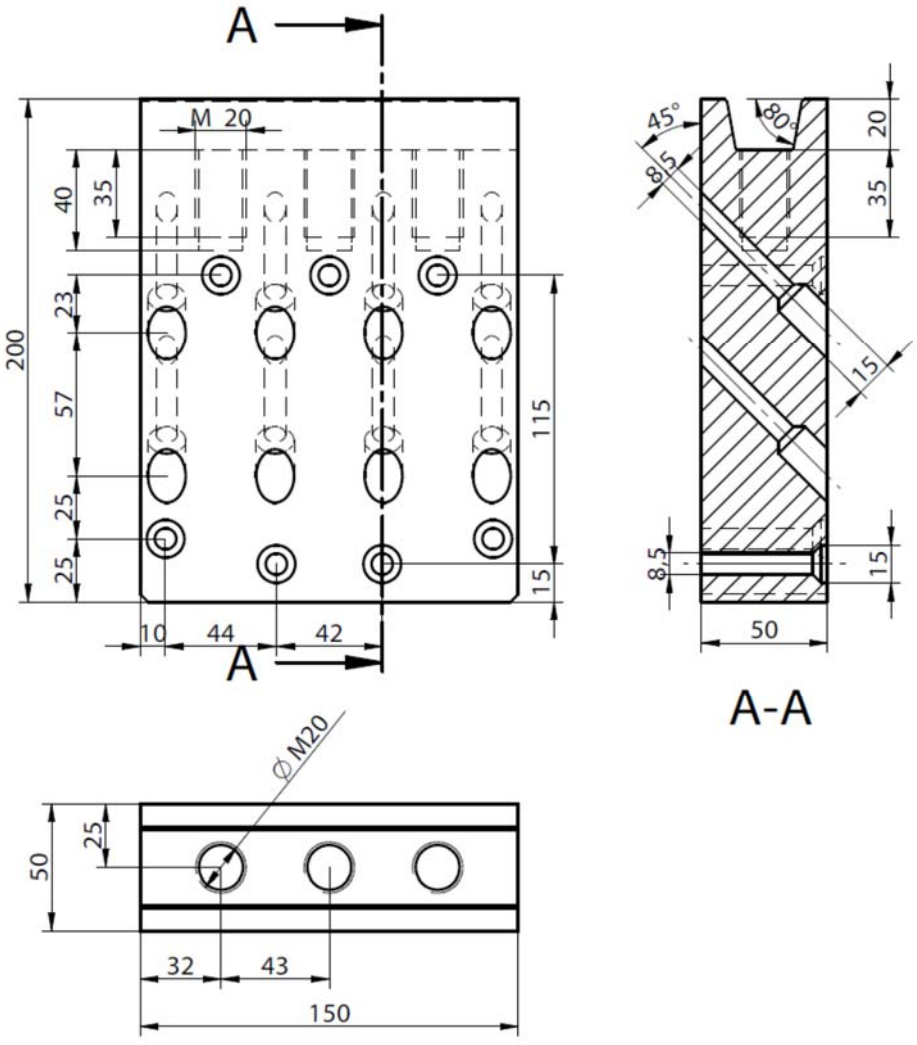
Clamping jaw top



dimensions in mm

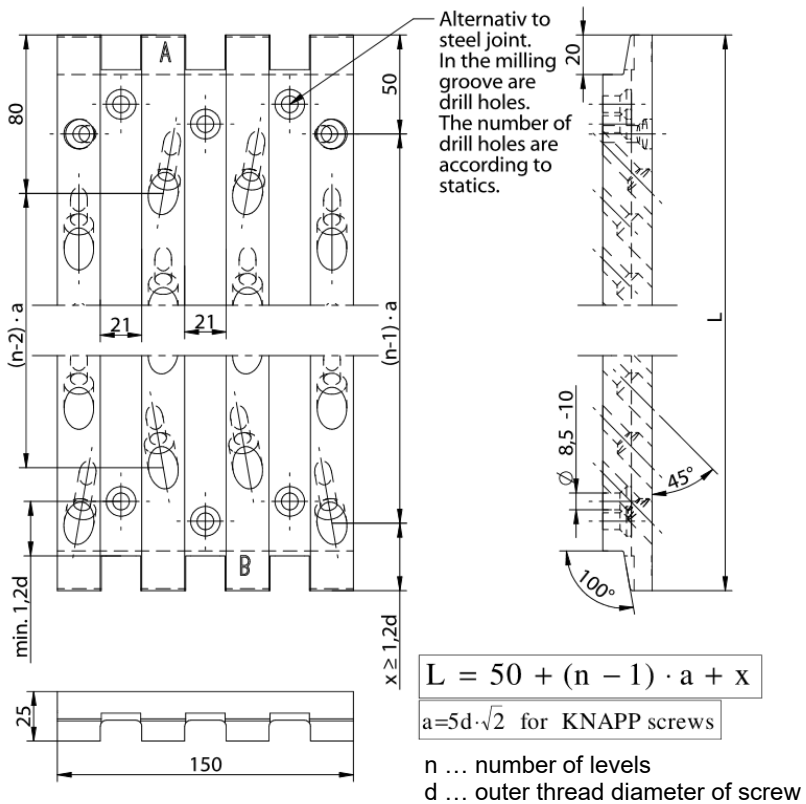
MEGANT® 150	Annex 2
Clamping jaw Type: 1030x150x50 SL	of European Technical Assessment ETA-15/0667 of 22.07.2019

Clamping jaw for MEGANT® 1030x150x50 SL bottom



dimensions in mm

MEGANT® 150	Annex 2
Clamping jaw Type: 1030x150x50 SL	of European Technical Assessment ETA-15/0667 of 22.07.2019



The connector plate for use in steel connections is provided with min. 3 x 2 and max. 3 x 6 countersunk holes with Ø 10 mm instead of the holes for the n_{90} screws in the area of the threaded rods.

dimensions in mm

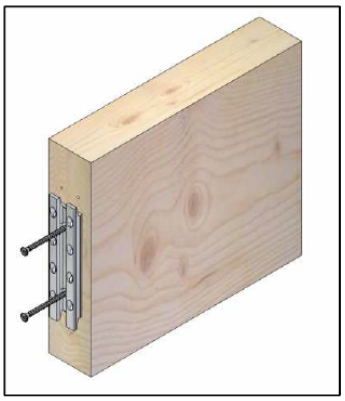
MEGANT® 150	Annex 2
Connector plate for steel Type: all	of European Technical Assessment ETA-15/0667 of 22.07.2019

Header 1: positioning screws

Header 2: 45° screws

Header 3: bottom clamoping jaw

Header 4: finished

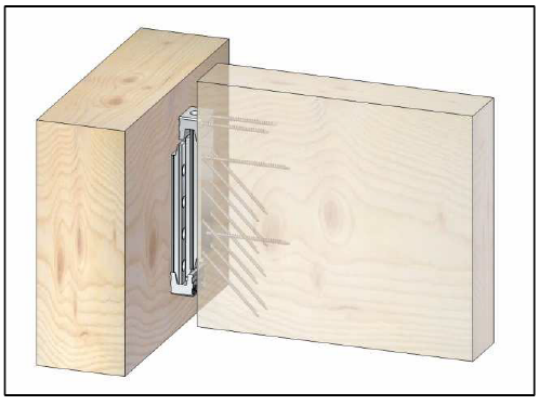


Joist 1: positioning screws

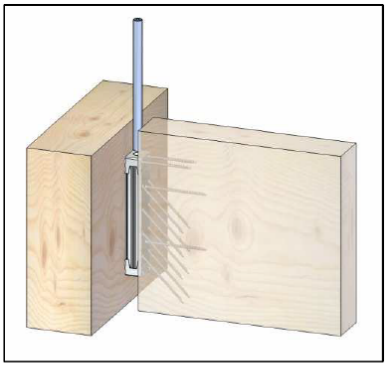
Joist 2: 45° screws

Joist 3: finished with top clamping jaw

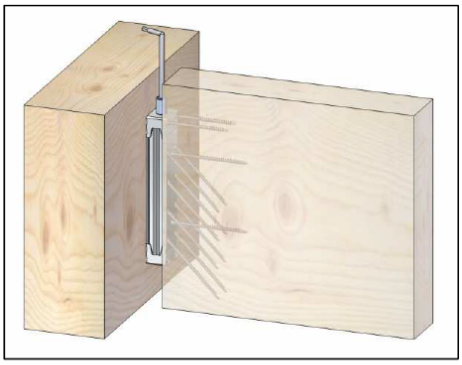
MEGANT®	Annex 3
The typical installation of the connectors Assembling from the top	of European Technical Assessment ETA-15/0667 of 22.07.2019



Header with joist 1: hang in joist

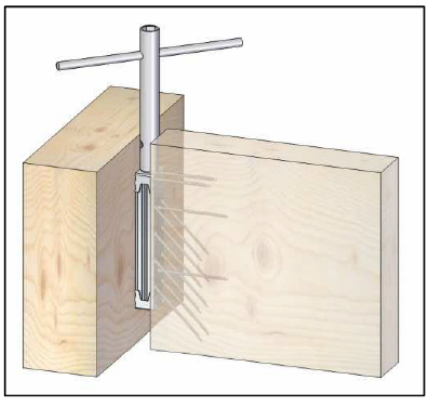


Header with joist 2: threaded rod



Header with joist 3: screw in threaded rod

Header with joist 4: washer and hex nut

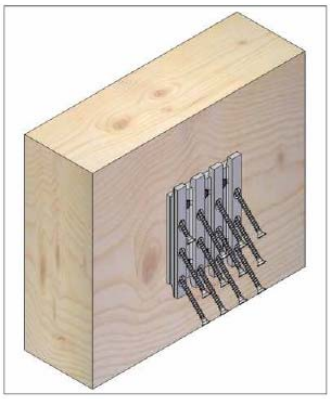


Header with joist 5: tighten hex nut

Header with joist 6: connection finished

MEGANT®	Annex 3
The typical installation of the connectors Assembling from the top	of European Technical Assessment ETA-15/0667 of 22.07.2019

Header 1: positioning screws



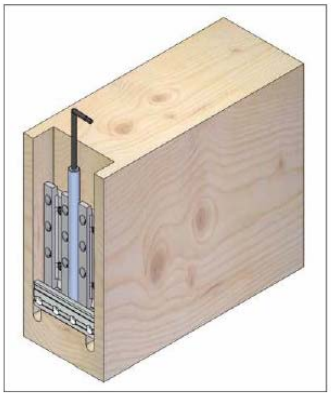
Header 2: 45° screws

Header 3: finished

Joist 1: bottom clamoping jaw in milling groove

Joist 2: positioning screws

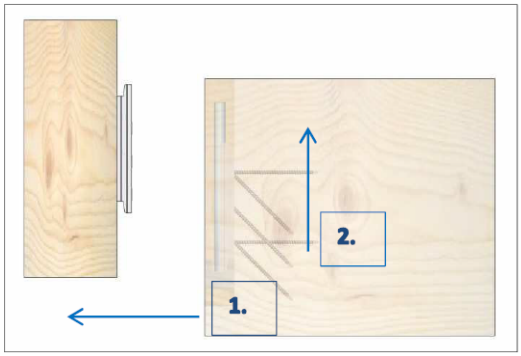
Joist 3: 45° screws



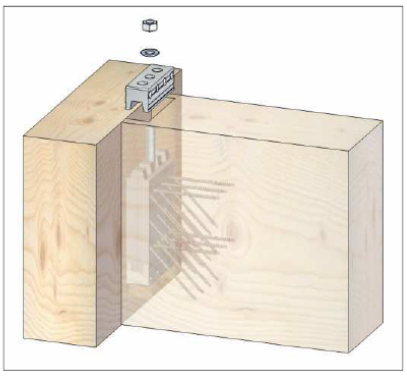
Joist 4: screw in threaded rod

MEGANT®	Annex 3
The typical installation of the connectors Assembling from the bottom	of European Technical Assessment ETA-15/0667 of 22.07.2019

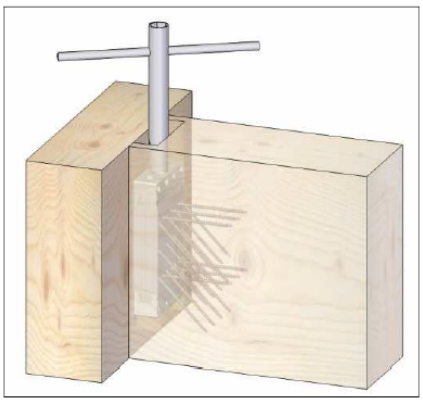
Header with joist 1: hang in joist



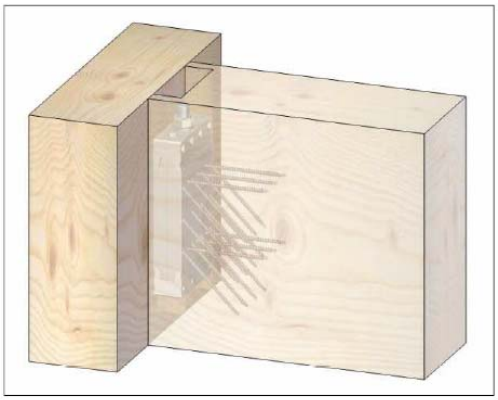
Header with joist 2: hang in joist from below



Header with joist 3: top clamping jaw, washer and hex nut

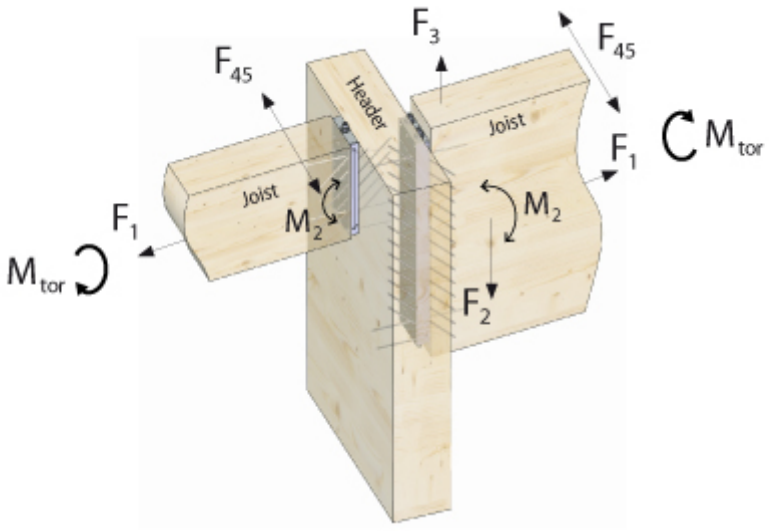


Header with joist 4: tighten hex nut



Header with joist 5: connection finished

MEGANT®	Annex 3
The typical installation of the connectors Assembling from the bottom	of European Technical Assessment ETA-15/0667 of 22.07.2019



Wooden structural components

Solid timber of softwood/hardwood of strength class C24/D24 or better according to EN 338 and EN 14081 1,

Glued laminated timber of strength class GL24c or better according to EN 14080

Glued laminated timber of hardwood according to European Technical Assessments or national standards and regulations in force at the place of use,

Laminated veneer lumber LVL according to EN 14374 or according to European Technical Assessments,

Solid wood members similar to glued laminated timber (typically e.g. Duo- and Triobalken) according to EN 14080 or national standards and regulations in force at the place of use,

Cross laminated timber according to European Technical Assessments or national standards and regulations in force at the place of use,

Strand lumber (e.g. Laminated Strand Lumber – Intrallam, Parallam) according to European Technical Assessments or national standards and regulations in force at the place of use.

The main beam (header) may also be of steel or concrete.

Forces and their directions

F_1 Force acting in direction of the secondary beam. Connection of main beam or column and secondary beam.

F_2 Force acting in direction of insertion. Connection of main beam or column and secondary beam. The member shall be prevented from rotation or eccentric loading, Annex 5, has to be considered.

F_3 Force acting against direction of insertion. Connection of main beam or column and secondary beam. The member shall be prevented from rotation or eccentric loading, Annex 5, has to be considered.

F_{45} Force acting perpendicular to direction of insertion. Connection of main beam or column and secondary beam. The member shall be prevented from rotation or eccentric loading, Annex 5, has to be considered.

M_{tor} Rotation moment. Connection of main beam or column and secondary beam.

M_2 Moment caused by an eccentric force F_2 or F_3.

MEGANT®	Annex 4
Definition of forces and their directions	of European Technical Assessment ETA-15/0667 of 22.07.2019

MEGANT series 60 – Material: EN AW - 6082										
Dimensions L/B/H	Softwood material	Characteristic load bearing capacity and stiffness in softwood with screws 8 x 160 mm and horizontal screws 8 x 240 mm in joist								
		$F_{1,KCC,Rk}$	$F_{1,Rk}$	$F_{2,KCC,Rk}$	$F_{2,Rk}$	$F_{3,Rk}$	$F_{4KCC,Rk}$	$F_{4,Rk}$	$M_{tor,Rk}$	$K_{tor,ser}$
mm	-	kN	kN	kN	kN	kN	kN	kN	kNm	kNm/rad
310x60x40	C24	36.6	18.9	150.4 [1] 130.1 · f_{R2} [2]	89.7	27.6	36.9	32.0	2.5	200
	GL24h		20.4		96.8	29.1		33.6	2.7	227
430x60x40	C24		18.9		141	36.8	40.6	50.4	5.5	639
	GL24h		20.4		152	38.7		52.8	5.8	723
550x60x40	C24		18.9		192	45.9	44.3	68.7	9.6	1 569
	GL24h		20.4		207	48.3		72.0	10.2	1 775

$F_{1,KCC,RK}$ / $F_{1,Rk}$	Characteristic load bearing capacity (aluminium failure/wood failure) in direction of secondary beam
$F_{2,KCC,RK}$ / $F_{2,Rk}$	Characteristic load bearing capacity (aluminium failure/wood failure) in direction of insertion
$F_{3,Rk}$	Characteristic load bearing capacity (wood failure) against direction of insertion
$F_{4,KCC,RK}$ / $F_{4,Rk}$	Characteristic load bearing capacity (aluminium failure/wood failure) perpendicular to direction of insertion
M_{tor}	Characteristic rotation moment

MEGANT series 100 – Material: EN AW - 6082										
Dimensions L/B/H	Softwood material	Characteristic load bearing capacity and stiffness in softwood with screws 8 x 160 mm and horizontal screws 8 x 240 mm in joist								
		$F_{1,KCC,Rk}$	$F_{1,Rk}$	$F_{2,KCC,Rk}$	$F_{2,Rk}$	$F_{3,Rk}$	$F_{4KCC,Rk}$	$F_{4,Rk}$	$M_{tor,Rk}$	$K_{tor,ser}$
mm	-	kN	kN	kN	kN	kN	kN	kN	kNm	kNm/rad
310x100x40	C24	55.3	29.4	224.2 [1] 206.6 · f_{R2} [2]	115	43.8	62.4	41.2	4.2	346
	GL24h		31.7		124	46.2		43.2	4.4	391
430x100x40	C24		29.4		192	57.5	68.6	68.7	8.6	1 066
	GL24h		31.7		207	60.6		72.0	9.2	1 206
550x100x40	C24		29.4		269	71.2	74.9	96.1	14.9	2 443
	GL24h		31.7		290	75.0		100.8	15.9	2 764

[1] $F_{2,KCC,Rk}$ for torsional fixed header
[2] $F_{2,KCC,Rk} \cdot f_{R2}$ for not torsional fixed header and f_{R2} according to page 44

MEGANT®	Annex 5
Characteristic load-bearing capacities	of European Technical Assessment ETA-15/0667 of 22.07.2019

MEGANT series 150 – Material: EN AW - 6082										
Dimensions L/B/H	Softwood material	Characteristic load bearing capacity and stiffness in softwood with screws 8 x 160 mm and horizontal screws 8 x 240 mm in joist								
		$F_{1,KCC,Rk}$	$F_{1,Rk}$	$F_{2,KCC,Rk}$	$F_{2,Rk}$	$F_{3,Rk}$	$F_{4KCC,Rk}$	$F_{4,Rk}$	$M_{tor,Rk}$	$K_{tor,ser}$
mm	-	kN	kN	kN	kN	kN	kN	kN	kNm	kNm/rad
310x150x50	C24	74.3	39.8	375.0 [1)] 366.5 · f_{R2} [2)]	145	58.4	68.0	54.9	3.9	304
	GL24h		43.0		156	61.6		57.6	4.2	344
430x150x50	C24		39.8		241	76.7	74.8	91.6	12.5	1 594
	GL24h		43.0		260	80.8		96.0	13.3	1 803
550x150x50	C24		39.8		337	95.0	81.6	128.2	20.9	3 488
	GL24h		43.0		364	100.0		134.4	22.3	3 946
610x150x50	C24		39.8		385	95.0		128.2	20.9	3 488
	GL24h		43.0		416	100.0		134.4	22.3	3 946
730x150x50	C24		39.8		482	95.0		128.2	20.9	3 488
	GL24h		43.0		520	100.0		134.4	22.3	3 946
790x150x50	C24		39.8		530	95.0		128.2	20.9	3 488
	GL24h		43.0		572	100.0		134.4	22.3	3 946
850x150x50	C24		39.8		578	95.0		128.2	20.9	3 488
	GL24h		43.0		624	100.0		134.4	22.3	3 946
1090x150x50	C24		39.8		578	95.0		128.2	20.9	3 488
	GL24h		43.0		624	100.0		134.4	22.3	3 946
1030x150x50 SL	C24		39.8	650	559	95.0		128.2	20.9	3 488
	GL24h		43.0		604	100.0		134.4	22.3	3 946

For deviating densities $K_{tor,ser}$ and $M_{tor,Rk}$ for GL24h are adapted by the factor k_{dens}

$$k_{dens} = \left(\frac{\rho_k}{385}\right)^c$$

Where

k_{dens}... Factor to consider deviating densities

ρ_k ..... Characteristic density of timber in kg/m³

c =0.8 from higher to lower density and

c =0.6 from lower to higher density

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Reduction factor f_{R2} for not fixed header			
MEGANT	Header width B_H	Eccentricity e [3)] $e = B_H/2 + H_{Megant}/2$	Reduction factor f_{R2}
series 60	$B_H \leq 140$ $140 \leq B_H \leq 320$	$e \leq 90$ $90 \leq e \leq 180$	$f_{R2} = 1.0$ $f_{R2} = (270-e)/180$
series 100	$B_H \leq 140$ $140 \leq B_H \leq 360$	$e \leq 90$ $90 \leq e \leq 200$	$f_{R2} = 1.0$ $f_{R2} = (310-e)/220$
series 150	$B_H \leq 200$ $200 \leq B_H \leq 450$	$e \leq 125$ $125 \leq e \leq 250$	$f_{R2} = 1.0$ $f_{R2} = (375-e)/250$

[3)] For greater eccentricities, additional reinforcement is necessary.

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Characteristic load-bearing capacities	of European Technical Assessment ETA-15/0667 of 22.07.2019

MEGANT series 60, 100, and 150 – Material: EN AW - 6082					
Megant series: dimension L	Softwood material	Slip modulus in softwood with screws 8 x 160 mm and horizontal screws 8 x 240 mm in joist			
		$K_{1,ser}$	$K_{2,ser}$ 3)	$K_{2,ser}$ 4)	$K_{4,ser}$
mm	-	kN/mm	kN/mm	kN/mm	kN/mm
series 60: 310, 430, 550	C24	6.7	36.9	30.3	6.1
	GL24h	7.2	39.8	32.7	6.6
series 100: 310, 430, 550	C24	12.2	53.0	45.0	8.3
	GL24h	13.2	57.2	48.6	9.0
series 150: 310, 430, 550-1090	C24	19.5	81.7	67.5	12.1
	GL24h	21.0	88.2	72.8	13.1

For deviating densities K_{ser} for GL24h is adapted by the factor k_{dens}

$$k_{dens} = \left(\frac{\rho_k}{385}\right)^c$$

Where

k_{dens}... Factor to consider deviating densities

ρ_k ..... Characteristic density of timber in kg/m³

c =0.8 from higher to lower density and

c =0.6 from lower to higher density

3) $K_{2,ser}$ for torsional fixed header
4) $K_{2,ser}$ for not torsional fixed header

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Characteristic load bearing capacities	of European Technical Assessment ETA-15/0667 of 22.07.2019

MEGANT series 60 – Material: EN AW - 6082							
Dimensions L/B/H	Bottom clamping jaw in joist	Torsion modulus and stiffness in softwood with horizontal screws 8 x 160 mm in header and horizontal screws 8 x 240 mm in joist					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ [1)]		
mm	-	kNm			kNm/rad		
		C24	GL24h	GL28h	C24	GL24h	GL28h
310x60x40	Top tension	1.7	1.8	2.0	530	555	582
	Bottom tension	2.5	2.7	2.8	366	404	466
430x60x40	Top tension	2.4	2.6	2.8	1 081	1 202	1 350
	Bottom tension	4.2	4.5	4.8	1 037	1 048	1 064
550x60x40	Top tension	3.2	3.4	3.7	1 981	2 106	2 237
	Bottom tension	5.9	6.3	6.8	2 303	2 350	2 390
Dimensions L/B/H	Bottom clamping jaw in header	Torsion modulus and stiffness in softwood with horizontal screws 8 x 160 mm in header and horizontal screws 8 x 240 mm in joist					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ [1)]		
mm	-	kNm			kNm/rad		
		C24	GL24h	GL28h	C24	GL24h	GL28h
310x60x40	Top tension	3.1	3.1	3.1	557	572	587
	Bottom tension	3.1	3.3	3.6	744	771	798
430x60x40	Top tension	6.6	6.7	6.8	1 455	1 559	1 649
	Bottom tension	4.6	4.9	5.3	1 511	1 722	1 967
550x60x40	Top tension	8.7	9.4	10.2	2 495	2 699	2 970
	Bottom tension	6.1	6.6	7.1	2 739	2 929	3 127

[1)] $K_{2,\varphi}$ for the calculation of member forces and moments in a structural system shall be calculated as:

$$K_{2,\varphi} = \frac{2 \cdot K_{2,\varphi,ser}}{3 \cdot (1+2 \cdot \psi_2 \cdot k_{def})}$$

Where

ψ_2 ..... combination factor according to EN 1990 for the quasi-permanent value of the action causing the largest stress in relation to the strength

k_{def} ... deformation factor according to EN 1995-1-1

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Characteristic load bearing capacities	of European Technical Assessment ETA-15/0667 of 22.07.2019

MEGANT series 100 – Material: EN AW - 6082							
Dimensions L/B/H	Bottom clamping jaw in joist	Torsion modulus and stiffness in softwood with horizontal screws 8 x 160 mm in header and horizontal screws 8 x 240 mm in joist					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ 1)		
mm	-	kNm			kNm/rad		
		C24	GL24h	GL28h	C24	GL24h	GL28h
310x100x40	Top tension	3.0	3.2	3.5	666	702	740
	Bottom tension	4.3	4.3	4.3	834	844	855
430x100x40	Top tension	4.2	4.5	4.9	1 576	1 663	1 755
	Bottom tension	7.9	8.3	8.8	1 577	1 693	1 883
550x100x40	Top tension	5.5	5.9	6.4	2 950	3 128	3 321
	Bottom tension	11.4	12.1	12.9	3 364	3 420	3 497
Dimensions L/B/H	Bottom clamping jaw in header	Torsion modulus and stiffness in softwood with horizontal screws 8 x 160 mm in header and horizontal screws 8 x 240 mm in joist					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ 1)		
mm	-	kNm			kNm/rad		
		C24	GL24h	GL28h	C24	GL24h	GL28h
310x100x40	Top tension	4.6	4.6	4.6	867	882	897
	Bottom tension	5.4	5.9	6.1	817	855	898
430x100x40	Top tension	8.4	9.1	9.9	2 187	2 271	2 352
	Bottom tension	8.2	8.9	9.6	1 988	2 085	2 197
550x100x40	Top tension	11.1	12.0	13.0	4 251	4 550	4 823
	Bottom tension	11.0	11.9	12.9	3 868	4 014	4 196

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MEGANT series 150 – Material: EN AW - 6082							
Dimensions L/B/H	Bottom clamping jaw in joist	Torsion modulus and stiffness in softwood with horizontal screws 8 x 160 mm in header and horizontal screws 8 x 240 mm in joist					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ 1)		
mm	-	kNm			kNm/rad		
		C24	GL24h	GL28h	C24	GL24h	GL28h
310x150x50	Top tension	4.9	5.3	5.7	1 054	1 132	1 230
	Bottom tension	5.9	6.0	6.0	966	1 022	1 073
430x150x50	Top tension	7.0	7.6	8.3	2 495	2 629	2 770
	Bottom tension	11.3	11.9	12.4	2 330	2 460	2 645
550x150x50	Top tension	9.3	10.0	10.9	4 685	4 965	5 269
	Bottom tension	16.7	17.7	18.7	4 966	5 051	5 169
610x150x50	Top tension	10.4	11.2	12.2	6 057	6 425	6 834
	Bottom tension	19.3	20.5	21.8	6 884	6 991	7 107
730x150x50	Top tension	12.7	13.7	14.8	9 431	9 964	10 589
	Bottom tension	24.6	26.2	28.0	11 878	12 147	12 387
790x150x50	Top tension	13.8	14.9	16.2	11 444	12 097	12 819
	Bottom tension	27.3	29.1	31.1	14 494	14 908	15 288
850x150x50	Top tension	19.1	20.7	22.4	15 717	16 571	17 523
	Bottom tension	32.0	33.8	35.7	17 464	18 009	18 597
1030x150x50 SL	Top tension	17.1	18.5	20.1	14 193	14 785	15 477
	Bottom tension	31.2	33.4	35.7	21 169	21 831	22 444
1090x150x50	Top tension	24.6	26.6	28.8	23 322	24 659	26 170
	Bottom tension	44.5	47.2	49.3	34 694	35 943	37 231

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Characteristic load bearing capacities	of European Technical Assessment ETA-15/0667 of 22.07.2019

MEGANT series 150 – Material: EN AW - 6082							
Dimensions L/B/H	Bottom clamping jaw in header	Torsion modulus and stiffness in softwood with horizontal screws 8 x 160 mm in header and horizontal screws 8 x 240 mm in joist					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ [1)]		
mm	-	kNm			kNm/rad		
		C24	GL24h	GL28h	C24	GL24h	GL28h
310x150x50	Top tension	6.2	6.3	6.3	1 090	1 117	1 158
	Bottom tension	7.2	7.8	8.5	1 222	1 304	1 418
430x150x50	Top tension	13.5	13.7	13.8	3 112	3 259	3 391
	Bottom tension	10.9	11.8	12.8	2 906	3 066	3 237
550x150x50	Top tension	19.2	20.8	22.5	5 777	6 284	6 793
	Bottom tension	14.6	15.8	17.1	5 507	5 790	6 128
610x150x50	Top tension	21.6	23.4	25.3	7 255	7 882	8 634
	Bottom tension	16.5	17.8	19.3	7 235	7 556	7 956
730x150x50	Top tension	26.5	28.6	31.0	11 292	11 863	12 681
	Bottom tension	20.2	21.8	23.7	11 482	12 004	12 590
790x150x50	Top tension	28.9	31.2	33.8	14 009	14 544	15 294
	Bottom tension	22.1	23.9	25.8	14 049	14 678	15 389
850x150x50	Top tension	35.0	37.9	41.0	17 865	18 395	19 099
	Bottom tension	28.1	30.4	32.9	18 195	18 945	19 802
1030x150x50 SL	Top tension	17.1	18.5	20.0	14 168	14 760	15 452
	Bottom tension	26.2	28.4	30.7	23 710	24 690	25 760
1090x150x50	Top tension	45.7	49.4	53.5	34 776	36 091	37 536
	Bottom tension	37.0	40.0	43.3	34 452	35 830	37 306

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Characteristic load bearing capacities	of European Technical Assessment ETA-15/0667 of 22.07.2019

MEGANT series 60 – Material: EN AW - 6082										
Dimensions L/B/H	Hardwood material	Characteristic load bearing capacity and stiffness in hardwood with screws 8 x 120 mm								
		$F_{1,KCC,Rk}$	$F_{1,Rk}$	$F_{2,KCC,Rk}$	$F_{2,Rk}$	$F_{3,Rk}$	$F_{4KCC,Rk}$	$F_{4,Rk}$	$M_{tor,Rk}$	$K_{tor,ser}$
mm	-	kN	kN	kN	kN	kN	kN	kN	kNm	kNm/rad
310x60x40	ρ_k = 530 kg/m³	36.6	40.1	150.4 [1] / 130.1 · f_{R2} [2]	123	46.8	36.9	49.2	3.5	374
	ρ_k = 590 kg/m³		47.6		146	50.5		54.3	3.9	439
430x60x40	ρ_k = 530 kg/m³		40.1		193	61.5	40.6	77.3	7.5	1 241
	ρ_k = 590 kg/m³		47.6		229	66.0		85.4	8.5	1 457
550x60x40	ρ_k = 530 kg/m³		40.1		263	76.3	44.3	105.3	13.2	2 924
	ρ_k = 590 kg/m³		47.6		312	81.5		116.5	14.9	3 434

$F_{1,KCC,RK}$ / $F_{1,Rk}$	Characteristic load bearing capacity (aluminium failure/wood failure) in direction of secondary beam
$F_{2,KCC,RK}$ / $F_{2,Rk}$	Characteristic load bearing capacity (aluminium failure/wood failure) in direction of insertion
$F_{3,Rk}$	Characteristic load bearing capacity (wood failure) against direction of insertion
$F_{4,KCC,RK}$ / $F_{4,Rk}$	Characteristic load bearing capacity (aluminium failure/wood failure) perpendicular to direction of insertion
M_{tor}	Characteristic rotation moment

MEGANT series 100 – Material: EN AW - 6082										
Dimensions L/B/H	Hardwood material	Characteristic load bearing capacity and stiffness in hardwood with screws 8 x 120 mm								
		$F_{1,KCC,Rk}$	$F_{1,Rk}$	$F_{2,KCC,Rk}$	$F_{2,Rk}$	$F_{3,Rk}$	$F_{4KCC,Rk}$	$F_{4,Rk}$	$M_{tor,Rk}$	$K_{tor,ser}$
mm	-	kN	kN	kN	kN	kN	kN	kN	kNm	kNm/rad
310x100x40	ρ_k = 530 kg/m³	55.3	62.5	224.2 [1] / 206.6 · f_{R2} [2]	158	75.3	62.4	63.2	5.7	644
	ρ_k = 590 kg/m³		74.2		187	81.5		69.9	6.4	757
430x100x40	ρ_k = 530 kg/m³		62.5		263	97.3	68.6	105.3	11.9	1 986
	ρ_k = 590 kg/m³		74.2		312	104.8		116.5	13.3	2 333
550x100x40	ρ_k = 530 kg/m³		62.5		368	119.4	74.9	147.5	20.5	4 553
	ρ_k = 590 kg/m³		74.2		437	128.1		163.0	23.0	5 348

[1] $F_{2,KCC,Rk}$ for torsional fixed header
[2] $F_{2,KCC,Rk} \cdot f_{R2}$ for not torsional fixed header and f_{R2} according to page 44

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MEGANT series 150 – Material: EN AW - 6082										
Dimensions L/B/H	Hardwood material	Characteristic load bearing capacity and stiffness in hardwood with screws 8 x 120 mm								
		$F_{1,KCC,Rk}$	$F_{1,Rk}$	$F_{2,KCC,Rk}$	$F_{2,Rk}$	$F_{3,Rk}$	$F_{4KCC,Rk}$	$F_{4,Rk}$	$M_{tor,Rk}$	$K_{tor,ser}$
mm	-	kN	kN	kN	kN	kN	kN	kN	kNm	kNm/rad
310x150x50	ρ_k = 530 kg/m³	74.3	84.7	375.0 [1] / 366.5 · f_{R2} [2]	191	100.3	68.0	84.3	5.4	567
	ρ_k = 590 kg/m³		100.5		227	108.7		93.2	6.1	666
430x150x50	ρ_k = 530 kg/m³		84.7		319	129.8	74.8	140.5	17.1	2 970
	ρ_k = 590 kg/m³		100.5		378	139.8		155.3	19.2	3 489
550x150x50	ρ_k = 530 kg/m³		84.7		446	159.2	81.6	196.7	28.7	6 500
	ρ_k = 590 kg/m³		100.5		530	170.8		217.4	32.3	7 634
610x150x50	ρ_k = 530 kg/m³		84.7		510	159.2		196.7	28.7	6 500
	ρ_k = 590 kg/m³		100.5		605	170.8		217.4	32.3	7 634
730x150x50	ρ_k = 530 kg/m³		84.7		637	159.2		196.7	28.7	6 500
	ρ_k = 590 kg/m³		100.5		757	170.8		217.4	32.3	7 634
790x150x50	ρ_k = 530 kg/m³		84.7		701	159.2		196.7	28.7	6 500
	ρ_k = 590 kg/m³		100.5		832	170.8		217.4	32.3	7 634
850x150x50	ρ_k = 530 kg/m³		84.7		765	159.2		196.7	28.7	6 500
	ρ_k = 590 kg/m³		100.5		908	170.8		217.4	32.3	7 634
1090x150x50	ρ_k = 530 kg/m³		84.7		765	159.2		196.7	28.7	6 500
	ρ_k = 590 kg/m³		100.5		908	170.8		217.4	32.3	7 634
1030x150x50 SL	ρ_k = 530 kg/m³		84.7	650	727	159.2		196.7	28.7	6 500
	ρ_k = 590 kg/m³		100.5		863	170.8		217.4	32.3	7 634

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MEGANT series 60, 100, and 150 – Material: EN AW - 6082					
Megant series: dimension L	Hardwoodmaterial	Slip modulus in hardwood with screws 8 x 120 mm			
		$K_{1,ser}$	$K_{2,ser}$ 3)	$K_{2,ser}$ 4)	$K_{4,ser}$
mm	-	kN/mm	kN/mm	kN/mm	kN/mm
series 60: 310, 430, 550	ρ_k = 530 kg/m³	9.4	51.9	42.7	8.6
	ρ_k = 590 kg/m³	10.2	56.6	46.5	9.4
series 100: 310, 430, 550	ρ_k = 530 kg/m³	17.2	74.6	63.4	11.7
	ρ_k = 590 kg/m³	18.8	81.3	69.1	12.8
series 150: 310, 430, 550-1090	ρ_k = 530 kg/m³	27.4	115.1	95.0	17.1
	ρ_k = 590 kg/m³	29.9	125.4	103.5	18.6

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MEGANT series 60 – Material: EN AW - 6082							
Dimensions L/B/H	Bottom clamping jaw in joist	Torsion modulus and stiffness in hardwood with horizontal screws 8 x 120 mm					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ [1]		
mm	-	kNm			kNm/rad		
		D30	D50	BauBuche [2]	D30	D50	BauBuche [2]
310x60x40	Top tension	3.5	4.2	2.8	920	1 089	798
	Bottom tension	3.8	4.5	3.9	684	801	610
430x60x40	Top tension	5.1	6.1	3.9	2 102	2 489	1 754
	Bottom tension	6.1	7.2	6.2	2 087	2 454	1 883
550x60x40	Top tension	6.8	8.1	5.1	3 818	4 519	3 164
	Bottom tension	8.4	9.9	8.6	4 302	5 073	3 929
Dimensions L/B/H	Bottom clamping jaw in header	Torsion modulus and stiffness in hardwood with horizontal screws 8 x 120 mm					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ [1]		
mm	-	kNm			kNm/rad		
		D30	D50	BauBuche [2]	D30	D50	BauBuche [2]
310x60x40	Top tension	6.1	7.2	5.8	941	1 117	904
	Bottom tension	6.3	7.5	4.9	1 160	1 371	1 086
430x60x40	Top tension	11.1	13.1	9.5	2 220	2 614	2 023
	Bottom tension	9.5	11.4	7.3	2 657	3 141	2 340
550x60x40	Top tension	16.0	18.9	12.5	4 726	5 549	4 070
	Bottom tension	12.8	15.2	9.7	5 060	5 960	4 295

[1] $K_{2,\varphi}$ for the ultimate limit state shall be calculated as:

$$K_{2,\varphi} = \frac{2 \cdot K_{2,\varphi,ser}}{3 \cdot (1 + 2 \cdot \psi_2 \cdot k_{def})}$$

Where

ψ_2 ..... combination factor according to EN 1990 for the quasi-permanent value of the action causing the largest stress in relation to the strength

k_{def} ... deformation factor according to EN 1995-1-1

[2] for Träger BauBuche according to ETA-14/0354 in service class 1

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Characteristic load bearing capacities	of European Technical Assessment ETA-15/0667 of 22.07.2019

MEGANT series 100 – Material: EN AW - 6082							
Dimensions L/B/H	Bottom clamping jaw in joist	Torsion modulus and stiffness in hardwood with horizontal screws 8 x 120 mm					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ [1]		
mm	-	kNm			kNm/rad		
		D30	D50	BauBuche [2]	D30	D50	BauBuche [2]
310x100x40	Top tension	5.3	6.3	4.2	1 192	1 406	962
	Bottom tension	7.2	8.5	6.8	1 003	1 185	1 074
430x100x40	Top tension	7.5	8.9	5.7	2 858	3 370	2 249
	Bottom tension	11.9	14.1	11.7	3 107	3 644	2 457
550x100x40	Top tension	9.8	11.7	7.4	5 429	6 409	4 208
	Bottom tension	16.7	19.8	16.6	6 847	8 052	5 502
Dimensions L/B/H	Bottom clamping jaw in header	Torsion modulus and stiffness in hardwood with horizontal screws 8 x 120 mm					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ [1]		
mm	-	kNm			kNm/rad		
		D30	D50	BauBuche [2]	D30	D50	BauBuche [2]
310x100x40	Top tension	9.1	10.7	7.5	1 449	1 709	1 211
	Bottom tension	9.8	11.5	8.0	1 502	1 765	1 213
430x100x40	Top tension	15.9	18.9	12.2	3 534	4 198	3 291
	Bottom tension	15.8	18.8	12.1	4 013	4 713	3 078
550x100x40	Top tension	21.1	25.1	16.0	6 646	7 834	5 897
	Bottom tension	21.4	25.4	16.2	7 839	9 229	6 171

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Characteristic load bearing capacities	of European Technical Assessment ETA-15/0667 of 22.07.2019

MEGANT series 150 – Material: EN AW - 6082							
Dimensions L/B/H	Bottom clamping jaw in joist	Torsion modulus and stiffness in hardwood with horizontal screws 8 x 120 mm					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ [1]		
mm	-	kNm			kNm/rad		
		D30	D50	BauBuche [2]	D30	D50	BauBuche [2]
310x150x50	Top tension	10.1	12.0	8.0	1 943	2 291	1 537
	Bottom tension	10.2	12.1	8.8	1 502	1 768	1 370
430x150x50	Top tension	14.8	17.6	11.4	4 799	5 658	3 704
	Bottom tension	17.4	20.6	16.5	4 614	5 411	3 426
550x150x50	Top tension	19.7	23.4	14.9	9 109	10 748	7 042
	Bottom tension	24.6	29.2	23.9	10 071	11 842	7 507
610x150x50	Top tension	22.2	26.3	16.7	11 882	14 021	9 174
	Bottom tension	28.2	33.4	27.6	13 650	16 070	10 380
730x150x50	Top tension	27.1	32.2	20.3	18 761	22 139	14 381
	Bottom tension	35.3	41.9	35.1	22 474	26 505	17 722
790x150x50	Top tension	29.6	35.1	22.2	22 897	27 022	17 468
	Bottom tension	38.9	46.1	38.8	27 022	31 894	21 573
850x150x50	Top tension	40.7	48.4	30.8	31 218	36 848	23 864
	Bottom tension	48.5	57.4	46.2	33 215	39 126	25 995
1030x150x50 SL	Top tension	36.5	43.4	27.6	29 555	34 875	22 084
	Bottom tension	44.9	53.1	44.3	37 146	43 895	31 296
1090x150x50	Top tension	52.6	62.5	39.5	21 609	25 598	43 118
	Bottom tension	65.7	77.8	63.8	63 939	75 447	51 329

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MEGANT series 150 – Material: EN AW - 6082							
Dimensions L/B/H	Bottom clamping jaw in header	Torsion modulus and stiffness in hardwood with horizontal screws 8 x 120 mm					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ [1]		
mm	-	kNm			kNm/rad		
		D30	D50	BauBuche [2]	D30	D50	BauBuche [2]
310x150x50	Top tension	12.4	14.5	9.5	1 964	2 322	1 618
	Bottom tension	14.6	17.4	11.5	2 177	2 561	1 728
430x150x50	Top tension	24.2	28.6	20.4	4 712	5 579	4 459
	Bottom tension	22.4	26.6	17.2	5 493	6 468	4 226
550x150x50	Top tension	35.5	42.3	27.0	9 526	11 200	8 002
	Bottom tension	30.2	35.9	22.9	10 622	12 509	8 173
610x150x50	Top tension	40.1	47.7	30.4	13 027	15 306	10 216
	Bottom tension	34.1	40.6	25.8	13 989	16 475	10 712
730x150x50	Top tension	49.3	58.6	37.2	22 153	26 052	16 475
	Bottom tension	42.0	49.9	31.6	22 457	26 457	17 040
790x150x50	Top tension	53.9	64.1	40.5	27 733	32 639	20 592
	Bottom tension	45.9	54.6	34.5	27 589	32 512	20 875
850x150x50	Top tension	66.1	78.6	50.2	33 981	40 006	26 215
	Bottom tension	58.3	69.3	44.2	35 042	41 307	27 032
1030x150x50 SL	Top tension	36.3	43.2	27.4	29 463	34 768	22 010
	Bottom tension	55.5	66.0	41.8	48 860	57 711	37 174
1090x150x50	Top tension	86.7	103.0	65.3	66 338	78 198	50 983
	Bottom tension	77.0	91.5	58.0	66 022	77 878	50 939

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1.) Calculation of characteristic load bearing capacities for connections between main beam or column and secondary beam

(a) $F_{1,Rk}$ – force acting in the direction of the secondary beam:

$$F_{1,Rk} = min \begin{cases} F_{1,J,Rk} & \dots see\ (i) \\ F_{1,H,Rk} & \dots see\ (i) \\ F_{t,Rk} & \dots see\ (ii) \\ F_{1,KCC,Rk} & \dots see\ (iii) \end{cases}$$

(i) Load bearing capacity of tension screws in softwood and hardwood for Joist/Header $F_{1,J/H,Rk}$:

Characteristic withdrawal resistance in softwood:	$F_{1,J/H,Rk} = n_{ef,J/H} \cdot f_{ax,J/H,Rk} \cdot d \cdot l_{ef,J/H} \cdot k_{ax}$
Characteristic withdrawal resistance in hardwood ($\rho_k \leq 590 kg/m^3$):	$F_{1,J/H,Rk} = n_{ef,J/H} \cdot 2 \cdot 10^{-3} \cdot l_{ef,J/H} \cdot d^{0.66} \cdot \rho_k^{1.6} \cdot k_\alpha$
Characteristic withdrawal resistance in Träger BauBuche according to ETA-14/0354:	$F_{1,J,Rk} = n_{ef,J} \cdot 11.7 \cdot d \cdot l_{ef,J}$ $F_{1,H,Rk} = n_{ef,H} \cdot 23.3 \cdot d \cdot l_{ef,H}$
with	
Characteristic withdrawal strength perpendicular to direction of grain:	$f_{ax,45,J/H,Rk} = 0.52 \cdot d^{-0.5} \cdot l_{ef,J/H}^{-0.1} \cdot \rho_k^{0.8}$
Number of screws acting in direction of force:	EN AW – 6082: series 60: $n_{ef,J/H} = 3.00$ series 100: $n_{ef,J/H} = 4.67$ series 150: $n_{ef,J/H} = 6.33$
Effective length of threaded part in the timber member:	$l_{ef,J/H} = l_{Scr,J/H} - 14\ mm$ $80\ mm \leq l_{scr} \leq 240\ mm$
Angle between screw axis and direction of grain:	$\alpha = 0°$ for Joist (end grain) $\alpha = 90°$ for Header (side grain)
Dimension coefficient	$k_{ax} = 0.3 + 0.7 \cdot \frac{\alpha}{45}$ for $0° \leq \alpha \leq 45°$ $k_{ax} = 1.0$ for for $45° \leq \alpha \leq 90°$
Coefficient	$k_\alpha = 0.7$ for Joist $k_\alpha = 1.0$ for Header
For calculation of design values	k_{mod} according to EN 1995-1-1 and $\gamma_m = 1.3$

(ii) Tensile strength of horizontal screws $F_{t,Rk}$:

Characteristic tensile resistance:	$F_{t,Rk} = n_{90} \cdot f_{tens}$
with	
Tensile strength of the screw:	$f_{tens} = 20\ kN$ according to Annex 1
For calculation of design values	$\gamma_{m,2} = 1.25$ (EN 1993-1-1)

(iii) Maximum load bearing capacity of connector MEGANT:

Maximum load bearing capacity:	$F_{1,KCC,Rk}$ according to Annex 5
For calculation of design values	$\gamma_{m,2} = 1.25$ (EN 1999-1-1)

(b) $F_{2,Rk}$ – force acting in direction of insertion:

$$F_{2,Rk} = min \begin{cases} F_{2,J,Rk} & \dots see\ (i) \\ F_{2,H,Rk} & \dots see\ (i) \\ F_{2,KCC,Rk} & \dots see\ (ii) \\ F_{t,Rk} & \dots see\ (iii) \\ F_{\tau,Rk} & \dots see\ (iv) \end{cases}$$

(i) Load bearing capacity of 45° screws in softwood and hardwood for Joist/Header $F_{2,J/H,Rk}$:

Characteristic load bearing capacity of 45° screws:	$F_{2,J/H,Rk} = \frac{1.25 \cdot n_{45,J/H} \cdot F_{ax,45,J/H,Rk}}{\sqrt{2}}$ for $e_2 < e_{2,lim}$
with	
Characteristic withdrawal strength for a single screw in softwood:	$F_{ax,45,J/H,Rk} = 0.52 \cdot d^{0.5} \cdot l_{ef,J/H}^{0.9} \cdot \rho_k^{0.8}$
Characteristic withdrawal strength for a single screw in hardwood ($\rho_k \leq 590 kg/m^3$):	$F_{ax,45,J/H,Rk} = 2 \cdot 10^{-3} \cdot l_{ef,J/H} \cdot d^{0.66} \cdot \rho_k^{1.6}$
Characteristic withdrawal strength in Träger BauBuche according to ETA-14/0354:	$F_{ax,45,J/H,Rk} = 28 \cdot d \cdot l_{ef,J/H}$
Limit value for the eccentricity	$e_{2,lim} = \frac{0.8 \cdot \sum z^2}{n_{45,J/H}} \cdot z_{max}$
Number of 45° screws in Joist/Header:	$n_{45,J/H}$ according to Annex 2
Effective length of threaded part in the timber member:	$l_{ef,J/H} = l_{Scr,J/H} - 10\ mm$ for Megant series 60/100 $l_{ef,J/H} = l_{Scr,J/H} - 20\ mm$ for Megant series 150 $l_{ef,J/H} = l_{Scr,J/H} - 50\ mm$ for the screws in the clamping jaw of MEGANT 1030x150x50 SL $80\ mm \leq l_{scr} \leq 240\ mm$
Sum of squares of the individual distances from the centre of rotation of the joint, see (1)(e), of the inclined screws in the joist or header connection	$\sum z^2$
Distance of the outermost inclined screw from the center of rotation of the joint	z_{max}
For calculation of design values	k_{mod} according to EN 1995-1-1 and $\gamma_m = 1.3$

(ii) Maximum load bearing capacity of connector MEGANT:

Maximum load bearing capacity:	$F_{2,KCC,Rk}$ according to Annex 5
For calculation of design values	$\gamma_{m,1} = 1.1$ (EN 1999-1-1)

(iii) Tensile strength of threaded rods $F_{t,Rk}$:

Tensile strength of threaded rods:	$F_{t,Rk} = n \cdot k_2 \cdot f_{u,b} \cdot A_s$
with	
Number of threaded rods:	n according to Annex 2
Characteristic tensile strength of threaded rod:	$f_{u,b}$
Cross section of core of threaded rod:	$A_s = 157\ mm^2$ for rod diameter 16 mm $A_s = 245\ mm^2$ for rod diameter 20 mm
Factor	$k_2 = 0.9$
For calculation of design values	$\gamma_{m,2} = 1.25$ (EN 1993-1-1)

(iv) Embedding strength of thread in aluminium $F_{\tau,Rk}$:

Embedding strength of thread in aluminium:	$F_{\tau,Rk} = R_{p0.2,k} \cdot A_M \cdot \beta_M$
with	
0,2 % yield strength	$R_{p0.2,k} = f_O = 240\ N/mm^2$ for EN AW – 6082
Cross section of thread:	$A_M = n \cdot d_B \cdot t \cdot \pi$

Number of threaded rods:	n according to Annex 2
Diameter of thread:	d_B according to Annex 2
Length of thread in aluminium:	t according to Annex 2
Reduction factor:	$\beta_M = 0.4$
For calculation of design values	$\gamma_{m,1} = 1.1$ (EN 1999-1-1)

(c) $F_{3,Rk}$ – force acting against direction of insertion:

$$F_{3,Rk} = min\begin{cases} F_{3,J,Rk} \\ F_{3,H,Rk} \end{cases}$$

Characteristic load bearing against direction of insertion for Joist/Header:	$F_{3,J/H,Rk} = n_{45,J/H} \cdot F_{v,45,J/H,Rk} + n_{\alpha,J/H} \cdot F_{v,\alpha,J/H,Rk}$
with	
Load bearing capacity per joint and fastener:	$F_{v,\alpha,J/H,Rk} = 2.3 \cdot \sqrt{M_{y,Rk} \cdot f_{h,J/H,k} \cdot d} + \frac{F_{ax,\alpha,J/H,Rk}}{4}$ $F_{v,45,J/H,Rk} = 2.3 \cdot \sqrt{M_{y,Rk} \cdot f_{h,J/H,k} \cdot d}$
Characteristic withdrawal strength for a single screw in softwood:	$F_{ax,\propto,J/H,Rk} = 0.52 \cdot d^{0.5} \cdot l_{ef,J/H}^{0.9} \cdot \rho_k^{0.8} \cdot k_{ax}$
Characteristic withdrawal strength for a single screw in hardwood:	$F_{ax,\alpha,J/H,Rk} = 2 \cdot 10^{-3} \cdot l_{ef,J/H} \cdot d^{0.66} \cdot \rho_k^{1.6} \cdot k_\alpha$
Characteristic withdrawal strength for a single screw in Träger BauBuche according to ETA-14/0354:	$F_{ax,\alpha,J,Rk} = 11.7 \cdot d \cdot l_{ef,J}$ $F_{ax,\alpha,H,Rk} = 23.3 \cdot d \cdot l_{ef,H}$
Dimension coefficient	$k_{ax} = 0.3 + 0.7 \cdot \frac{\alpha}{45}$ for $0° \le \alpha \le 45°$ $k_{ax} = 1.0$ for for $45° \le \alpha \le 90°$
Coefficient:	$k_\alpha = 0.7$ for Joist $k_\alpha = 1.0$ for Header
Characteristic yield moment of the screw:	$M_{y,Rk}$ according to Annex 1
Number of screws in Joist/Header:	$n_{45,J/H}$ and $n_{\alpha,J/H}$ according to Annex 2 series 150: $n_{45,J/H,max} = 28$ and $n_{\alpha,J/H,max} = 8$
Effective length of threaded part in the timber member:	$l_{ef,J/H} = l_{Scr,J/H} - 14\ mm$ $80\ mm \le l_{scr} \le 240\ mm$
Characteristic value of embedding strength in softwood:	$f_{h,J,k} = 0.033 \cdot \rho_k \cdot d^{-0.3}$ for Joist $f_{h,H,k} = 0.082 \cdot \rho_k \cdot d^{-0.3}$ for Header
Characteristic value of embedding strength in hardwood:	$f_{h,J/H,k} = \frac{0.082 \cdot \rho_k \cdot (1 - 0.01 \cdot d)}{2.5 \cdot \cos^2 \alpha + \sin^2 \alpha}$
Characteristic value of embedding strength in Träger BauBuche:	$f_{h,J/H,k}$ according to Annex 2 of ETA-14/0354
Angle between screw axis and direction of grain:	$\alpha = 0°$ for Joist (end grain) $\alpha = 90°$ for Header (side grain)
For calculation of design values	k_{mod} according to EN 1995-1-1 and $\gamma_m = 1.3$

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(d) $F_{45,Rk}$ – force acting perpendicular to direction of insertion:

$$F_{45,Rk} = min\begin{cases} F_{45,J,Rk} \\ F_{45,H,Rk} \end{cases}$$

Characteristic load bearing against direction of insertion for Joist/Header:	$F_{45,J/H,Rk} = n_{45,J/H} \cdot F_{v,J/H,Rk}$
with	
Load bearing capacity per joint and fastener:	$F_{v,J/H,Rk} = 2.3 \cdot \sqrt{M_{y,Rk} \cdot f_{h,J/H,k} \cdot d} + \frac{F_{ax,J/H,Rk}}{4}$
Characteristic withdrawal strength for a single screw in softwood:	$F_{ax,J/H,Rk} = 0.52 \cdot d^{0.5} \cdot l_{ef,J/H}^{0.9} \cdot \rho_k^{0.8} \cdot k_{ax}$
Characteristic withdrawal strength for a single screw in hardwood:	$F_{ax,J/H,Rk} = 2 \cdot 10^{-3} \cdot l_{ef,J/H} \cdot d^{0.66} \cdot \rho_k^{1.6} \cdot k_{\alpha}$
Characteristic withdrawal strength for a single screw in Träger BauBuche according to ETA-14/0354:	$F_{ax,J,Rk} = 11.7 \cdot d \cdot l_{ef,J}$ $F_{ax,H,Rk} = 23.3 \cdot d \cdot l_{ef,H}$
Dimension coefficient	$k_{ax} = 0.3 + 0.7 \cdot \frac{\alpha}{45}$ for $0° \leq \alpha \leq 45°$ $k_{ax} = 1.0$ for for $45° \leq \alpha \leq 90°$
Coefficient:	$k_{\alpha} = 0.7$ for Joist $k_{\alpha} = 1.0$ for Header
Characteristic yield moment of the screw:	$M_{y,Rk}$ according to Annex 1
Number of screws in Joist/Header:	$n_{45,J/H}$ according to Annex 2 series 150: $n_{45,J/H,max} = 28$
Effective length of threaded part in the timber member:	$l_{ef,J/H} = l_{Scr,J/H} - 14\ mm$ $80\ mm \leq l_{scr} \leq 240\ mm$
Characteristic value of embedding strength in softwood:	$f_{h,J,k} = 0.033 \cdot \rho_k \cdot d^{-0.3}$ for Joist $f_{h,H,k} = 0.082 \cdot \rho_k \cdot d^{-0.3}$ for Header
Characteristic value of embedding strength in hardwood:	$f_{h,J/H,k} = \frac{0.082 \cdot \rho_k \cdot (1 - 0.01 \cdot d)}{2.5 \cdot \cos^2 \alpha + \sin^2 \alpha}$
Characteristic value of embedding strength in Träger BauBuche:	$f_{h,J/H,k}$ according to Annex 2 of ETA-14/0354
Angle between screw axis and direction of grain:	$\alpha = 0°$ for Joist (end grain) $\alpha = 90°$ for Header (side grain)
For calculation of design values	k_{mod} according to EN 1995-1-1 and $\gamma_m = 1.3$

(e) $M_{2,Rk}$ and $K_{2\varphi}$– moment capacity and spring stiffness:

$$M_{2,Rk} = min\begin{cases} M_{2,J,Rk} \\ M_{2,H,Rk} \end{cases}$$

$$K_{2,\varphi,ser} = \frac{1}{\frac{1}{K_{2\varphi,H}} + \frac{1}{K_{2\varphi,J}}}$$ 1)

Moment capacity of the Joist/Header:	$M_{2,J,Rk} = \sum F_{ax}^{i} \cdot e_{i,J} + \frac{s_{c,0,k} \cdot x_J^2}{3}$ $M_{2,H,Rk} = \sum F_{ax}^{i} \cdot e_{i,H} + \frac{s_{c,90,k} \cdot x_H^2}{3}$ $e_{i,J/H}$ as the individual distances of the tensile screws in the Joist/Header connection from the center of rotation of the joint
Rotational spring stiffness of the Joist/Header:	$K_{2\varphi,J} = \sum K_{ser,s}^{i} \cdot a_{i,J}^2$ $K_{2\varphi,H} = \sum K_{ser,s}^{i} \cdot x_H^2 - 2 \cdot x_H \cdot \sum K_{ser,s}^{i} \cdot a_{i,H} + \sum K_{ser,s}^{i} \cdot a_{i,H}^2 + \frac{s_{c,90,k} \cdot x_H^3}{w \cdot 3}$ $a_{i,J/H}$ as the individual distances of the tensile screws in the Joist/Header connection from the upper end of the contact area
with	
Tensile force of a Joist/Header moment screw:	$F_{ax}^{i} = \frac{F_{ax,J/H,Rk}^{i} \cdot e_{i,J/H}}{e_{max,J/H}}$ For softwood glulam: $F_{ax,J,Rk} = 0.156 \cdot \sqrt{d} \cdot l_{ef,J}^{0.9} \cdot \rho_{k,J}^{0.8}$ $F_{ax,90,H,Rk} = 0.52 \cdot \sqrt{d} \cdot l_{ef,H}^{0.9} \cdot \rho_{k,H}^{0.8}$ For Träger BauBuche according to ETA-14/0354: $F_{ax,J,Rk} = 11.7 \cdot d \cdot l_{ef,J}$ $F_{ax,H,Rk} = 23.3 \cdot d \cdot l_{ef,H}$ $e_{max,J/H}$ as the distance of the outermost tensile screw in the Joist/Header from the center of rotation of the joint
Maximum value of contribution of compression:	$s_{c,90,k} = \left(k_a \cdot \left(1 - e^{-k_b \cdot w}\right) \cdot b + l_{dis}\right) \cdot f_{c,90,k}$ for Header $s_{c,0,k} = b \cdot f_{c,0,k}$ for Joist with $k_a = 1.7$ and $k_b = 0.6$ for softwood glulam $k_a = 1.6$ and $k_b = 0.15$ for Träger Baubuche according to ETA-14/0354 $w = 1$ mm as the compressive deformation at the top of the contact area b as the width of the contact area $l_{dis} = min\{8 \cdot w; 40\ mm\}$ for softwood glulam $f_{c,0,k}$ as the char. compression strength of the Joist parallel to the grain $f_{c,90,k}$ as the char. compression strength of the Header perpendicular to the grain

Distance of the centre of rotation of the joint to the end of the contact area (to be determined iteratively):	$x_J = \frac{a_{max,J}}{2} + \frac{n_J \cdot F^i_{ax,max}}{s_{c,0,k}} - \sqrt{\frac{\left(-a_{max,J} - \frac{2 \cdot n_J \cdot F^i_{ax,max}}{s_{c,0,k}}\right)^2}{4} - \frac{2 \cdot F^i_{ax,max}}{s_{c,0,k}} \cdot \sum_{i=1}^{n} a_{i,J}}$ $x_H = \frac{a_{max,H}}{2} + \frac{n_H \cdot F^i_{ax,max}}{s_{c,90,k}} - \sqrt{\frac{\left(-a_{max,H} - \frac{2 \cdot n_H \cdot F^i_{ax,max}}{s_{c,90,k}}\right)^2}{4} - \frac{2 \cdot F^i_{ax,max}}{s_{c,90,k}} \cdot \sum_{i=1}^{n} a_{i,H}}$ $a_{max,J/H}$ as the maximum distance of the tensile screws in the Joist/Header connection from the upper end of the contact area $n_{J/H}$ as the number of tensile screws in Joist/Header
Spring stiffness of the screws:	$K^i_{ser,s} = \frac{F^i_{ax,J/H,Rk}}{0.5}$ N/mm

[1] $K_{2,\varphi}$ for the ultimate limit state shall be calculated as:

$$K_{2,\varphi} = \frac{2 \cdot K_{2,\varphi,ser}}{3 \cdot (1 + 2 \cdot \psi_2 \cdot k_{def})}$$

Where

ψ_2 ..... combination factor according to EN 1990 for the quasi-permanent value of the action causing the largest stress in relation to the strength

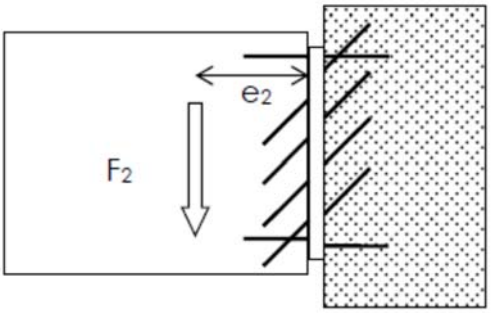
k_{def} ... deformation factor according to EN 1995-1-1

(f) Combined loading:

For combined loading, the following needs to be valid

$$\left(\frac{F_{1,Ed}}{F_{1,Rd}}+\frac{M_{2,Ed}}{M_{2,Rd}}\right)^2+\left(\frac{F_{2,Ed}}{F_{2,Rd}}\right)^2+\left(\frac{F_{3,Ed}}{F_{3,Rd}}\right)^2+\left(\frac{F_{45,Ed}}{F_{45,Rd}}\right)^2+\left(\frac{M_{tor,Ed}}{M_{tor,Rd}}\right)\leq 1$$

Moments $M_{2,Ed}$ only need to be considered, if the force $F_{2,Ed}$ acts outside the MEGANT connector.



Where $e_2=\frac{M_{2,Ed}}{F_{2,Ed}}$

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2.) Tension reinforcement

(a) Tension perpendicular to the grain in main- and secondary beam loaded in direction of insertion F_2

(i) No further calculation is needed if:

$$\frac{a_J}{H_J} > 0.7 \text{ and } \frac{a_H}{H_H} > 0.7$$

with	
Distance of screw row to the loaded edged of the wooden member:	$a_{J/H}$ according to Annex 7
Height of secondary and main beam:	$H_{J/H}$ according to Annex 7

(ii) Tension perpendicular to the grain for timber members with $0.2 \leq \frac{a_{J/H}}{H_{J/H}} \leq 0.7$:

The following expressions shall be satisfied for timber members **without** reinforcement:	
For joist and header:	$\left(\frac{F_{90,d}}{F_{90,J/H,Rd}}\right) \leq 1.0$
with	
	$F_{90,J/H,Rd} = k_{J/H} \cdot k_{s,J/H} \cdot k_{r,J/H} \cdot \left[6.5 + 18 \cdot \left(\frac{a_{J/H}}{H_{J/H}}\right)^2\right] \cdot \left(t_{ef} \cdot H_{J/H}\right)^{0.8} \cdot f_{t,90,d}$
Factor	$k_J = 0.5$ in joist and $k_H = 1.0$ in header
Factor	$k_{s,J/H} = max\left\{0.7 + \frac{1}{1.4 \cdot a_{r,J/H}}{H_{J/H}}\right.$
	MEGANT series 60: $a_{r,J/H} = 40\ mm$ MEGANT series 100: $a_{r,J/H} = 80\ mm$ MEGANT series 150: $a_{r,J/H} = 130\ mm$
Factor	$k_{r,J/H} = \frac{n_{J/H}}{\sum_{i=1}^{n_{J/H}} \left(\frac{h_{1,J/H}}{h_{i,J/H}}\right)^2}$
Distance of screw row to the unloaded edged of the wooden member:	h_i according to Annex 7
Effective depth	$t_{ef} = min\left\{\frac{B_{J/H}}{\frac{l_{ef,J/H}}{\sqrt{2}}}\right.$ see Annex 7

The following expressions shall be used to **reinforce** timber members:	
For joist and header:	$\left(\frac{F_{t,90,J/H,d}}{n \cdot F_{ax,Rd}}\right) \leq 1$
with	
	$F_{t,90,J/H,d} = \left[1 - 3 \cdot \left(\frac{a_{J/H}}{H_{J/H}}\right)^2 + 2 \cdot \left(\frac{a_{J/H}}{H_{J/H}}\right)^3\right] \cdot F_{90,d}$
Number of fully threaded self-tapping screws for reinforcement	n
Characteristic withdrawal strength:	$F_{ax,Rd}$ according to EN 1995-1-1 or ETA

(b) Tension perpendicular to the grain in main- and secondary beam loaded perpendicular to direction of insertion F_{45}

(iii) No further calculation is needed if:

$$\frac{a_J}{B_J} > 0.7 \text{ and } \frac{a_H}{B_H} > 0.7$$

with	
Distance of screw row to the loaded edged of the wooden member:	$a_{J/H}$ according to Annex 7
Width of main and secondary beam:	$B_{J/H}$ according to Annex 7

(iv) Tension perpendicular to the grain for timber members with $0.2 \leq \frac{a_{J/H}}{B_{J/H}} \leq 0.7$:

The following expressions shall be satisfied for timber members **without** reinforcement:	
For joist and header:	$\left(\frac{F_{90,d}}{F_{90,J/H,Rd}}\right) \leq 1.0$
with	
	$F_{90,J/H,Rd} = k_{J/H} \cdot k_{s,J/H} \cdot k_{r,J/H} \cdot \left[6.5 + 18 \cdot \left(\frac{a_{J/H}}{B_{J/H}}\right)^2\right] \cdot \left(t_{ef} \cdot B_{J/H}\right)^{0.8} \cdot f_{t,90,d}$
Factor	$k_J = 0.5$ in joist and $k_H = 1.0$ in header

Factor	$k_{s,J/H} = max\left\{0.7 + \frac{1}{1.4 \cdot a_{r,J/H}}{B_{J/H}}\right.$
	MEGANT height $h = 310\ mm$: $a_{r,J/H} = 171\ mm$ MEGANT height $h = 430\ mm$: $a_{r,J/H} = 285\ mm$ MEGANT height $h = 550\ mm$: $a_{r,J/H} = 399\ mm$
Factor	$k_{r,J/H} = \frac{n_{J/H}}{\sum_{i=1}^{n_{J/H}} \left(\frac{b_{1,J/H}}{b_{i,J/H}}\right)^2}$
Distance of screw row to the unloaded edged of the wooden member:	b_i according to Annex 7
Effective depth	$t_{ef} = 48\ mm$

The following expressions shall be used to **reinforce** timber members:	
For joist and header:	$\left(\frac{F_{t,90,J/H,d}}{n \cdot F_{ax,Rd}}\right) \leq 1.0$
with	
	$F_{t,90,J/H,d} = \left[1 - 3 \cdot \left(\frac{a_{J/H}}{B_{J/H}}\right)^2 + 2 \cdot \left(\frac{a_{J/H}}{B_{J/H}}\right)^3\right] \cdot F_{90,d}$
Number of fully threaded self-tapping screws for reinforcement	n
Characteristic withdrawal strength:	$F_{ax,Rd}$ according to EN 1995-1-1 or ETA

MEGANT®	Annex 5
Characteristic load bearing capacities	of European Technical Assessment ETA-15/0667 of 22.07.2019

3.) MEGANT - timber to steel connections:

Main beam from steel and secondary beam as timber construction for load direction F_2:

$$F_{2,Rd} = min\begin{cases} F_{2,J,Rd} \\ F_{2,steel,Rd} \end{cases}$$

Structural analysis of timber connection:

$$F_{2,J,Rd} = min\begin{cases} F_{2,KCC,Rk}/\gamma_{M1} \\ F_{2,Rk} \cdot k_{mod}/\gamma_{M,timber} \end{cases}$$

with
$\gamma_{M1} = 1.1$ and $\gamma_{M,timber} = 1.3$

Structural analysis of steel connection:

$$F_{2,Steel,Rd} = min\begin{cases} n \cdot F_{v,Rd} \\ n \cdot F_{b,Megant,Rd} \\ n \cdot F_{b,Steelplate,Rd} \end{cases}$$

$F_{v,Rd} = \frac{n \cdot \alpha_v \cdot f_{ub,k} \cdot A_s}{\gamma_{M2}}$ according to EN 1993-1-8/3.6.1

$F_{b,Megant,Rd} = \frac{k_1 \cdot \alpha_b \cdot f_u \cdot d_1 \cdot t}{\gamma_{M2}}$ according to EN 1999

$F_{b,Steelplate,Rd} = \frac{n \cdot k_1 \cdot \alpha_b \cdot f_u \cdot d_1 \cdot t}{\gamma_{M2}}$ according to EN 1993-1-8/3.6.1

with
$\gamma_{M2} = 1.25$

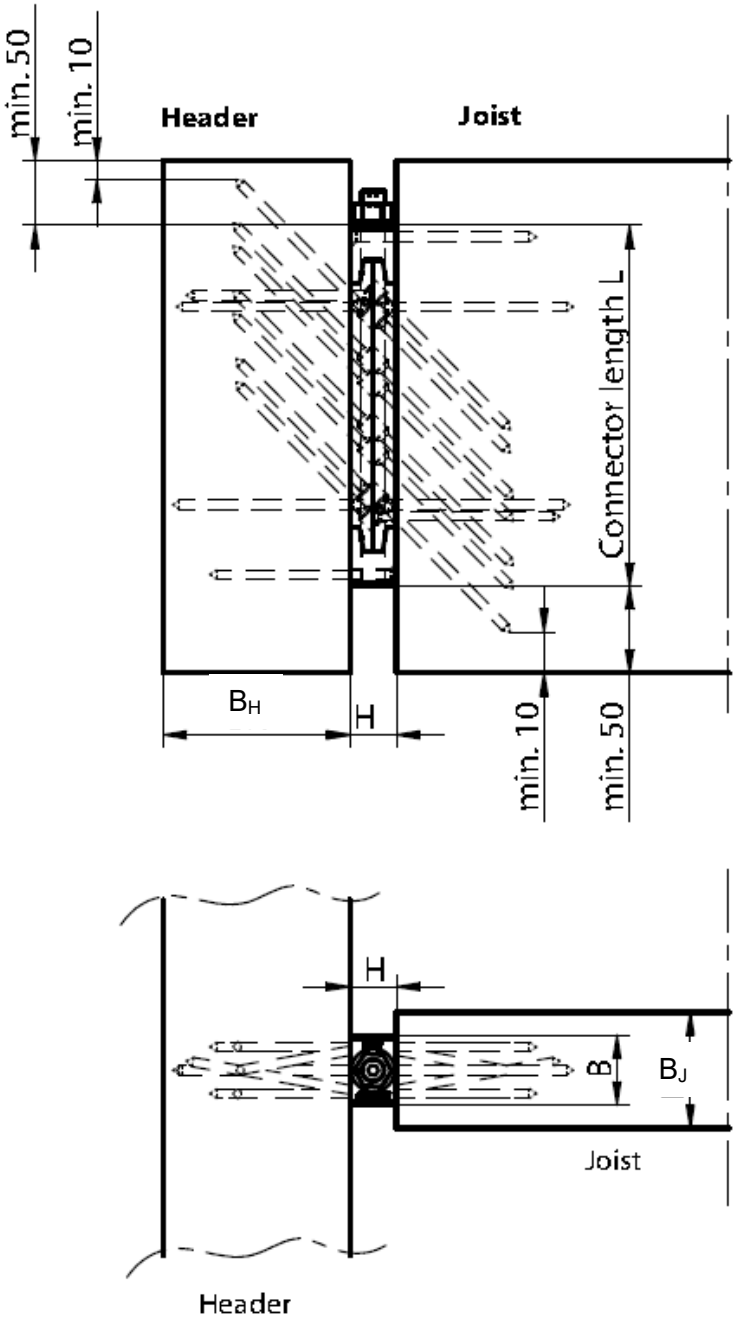
Additional loading directions have to be calculated similar, following the rules of EC3 and EC9.

4.) MEGANT - timber to concrete connections:

The connector MEGANT may be installed to members made of concrete with suitable fasteners. Design of connections with connectors in wood to concrete connections shall follow the respective Eurocode.

MEGANT®	Annex 5
Characteristic load bearing capacities	of European Technical Assessment ETA-15/0667 of 22.07.2019

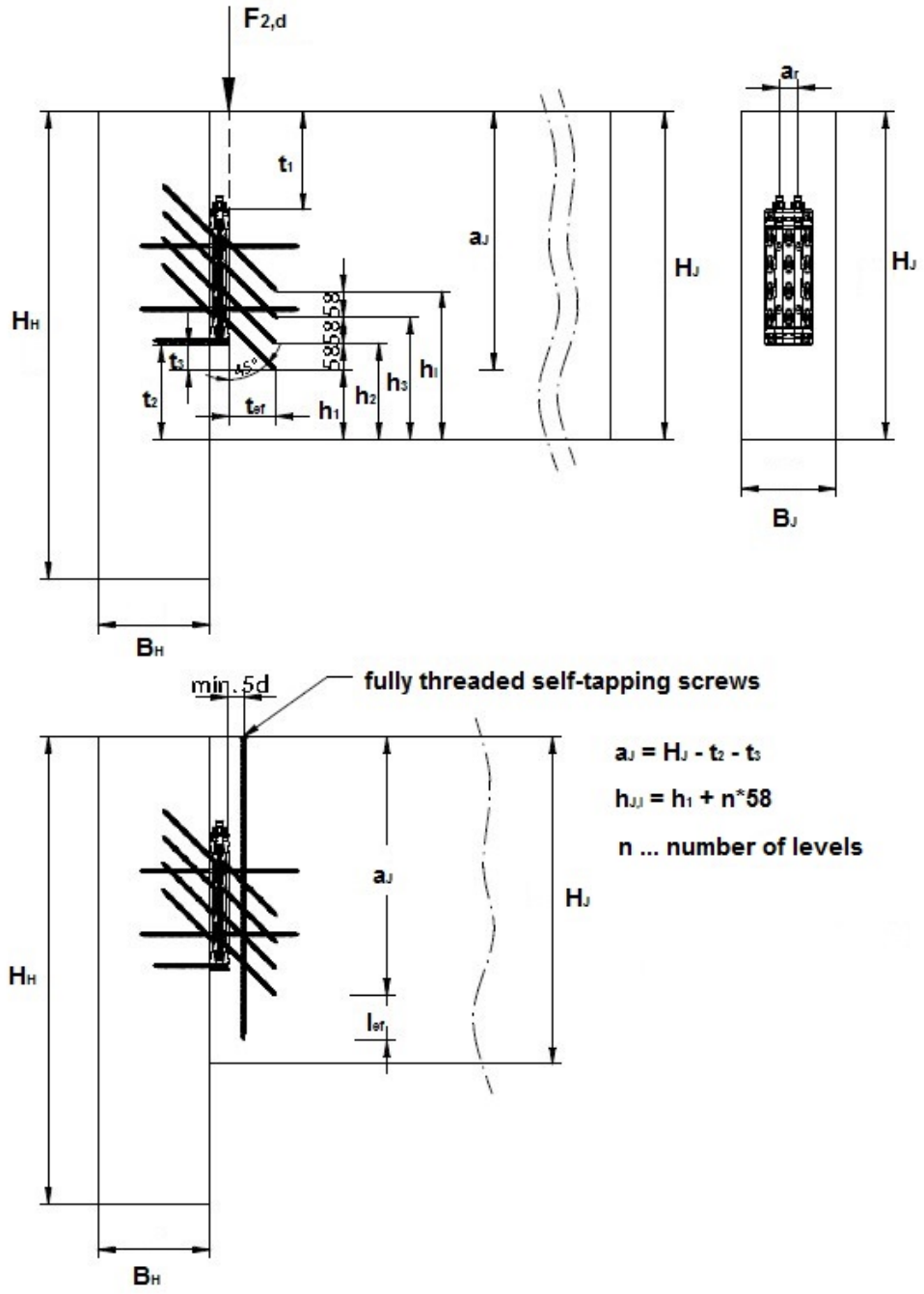
MEGANT (AW 6082) header / joist connection



dimensions in mm

MEGANT®	Annex 6
Dimensions and minimum spacings	of European Technical Assessment ETA-15/0667 of 22.07.2019

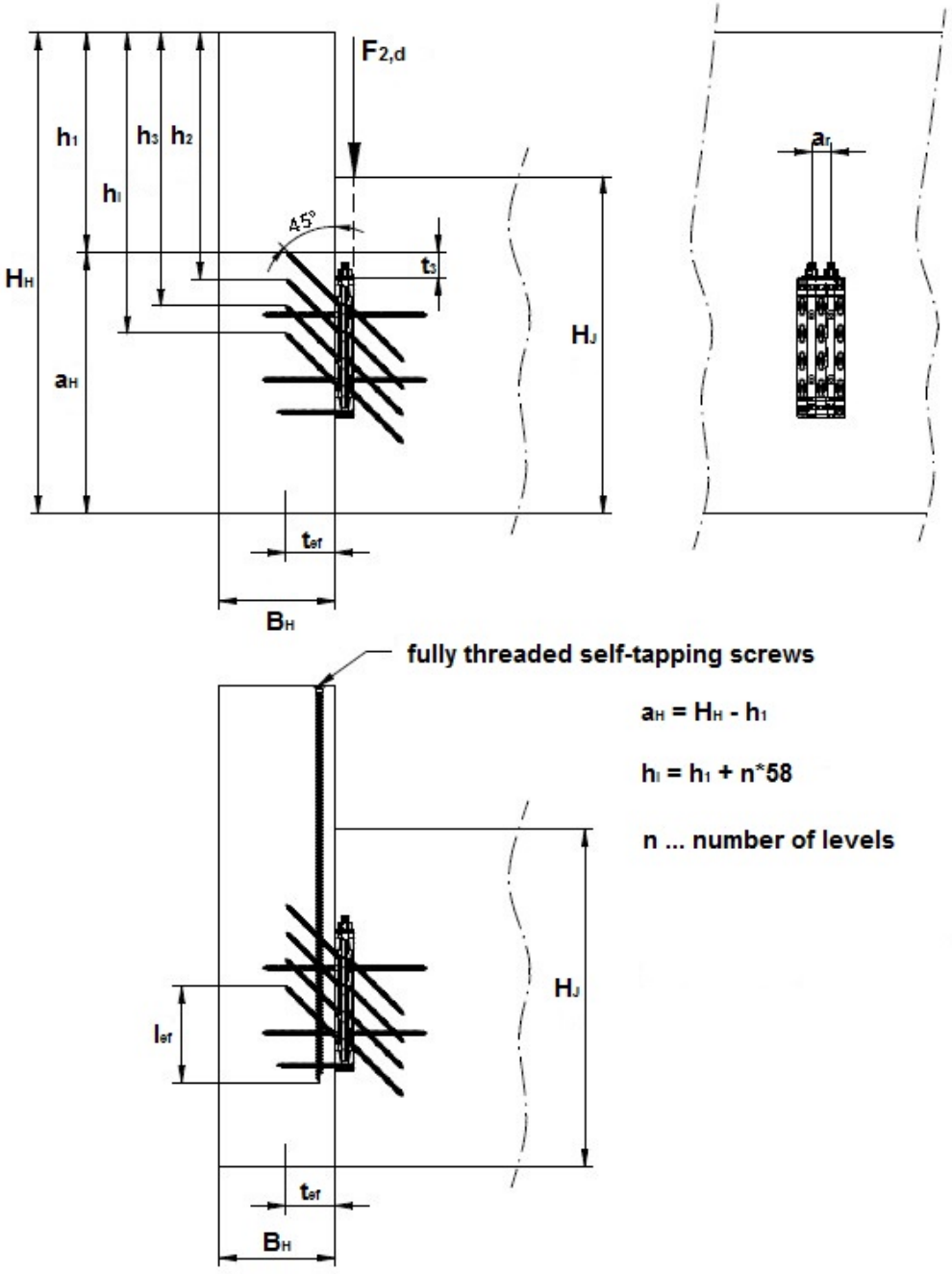
Tension reinforcement in joist - F_2



dimensions in mm

MEGANT®	Annex 7
Tension reinforcement	of European Technical Assessment ETA-15/0667 of 22.07.2019

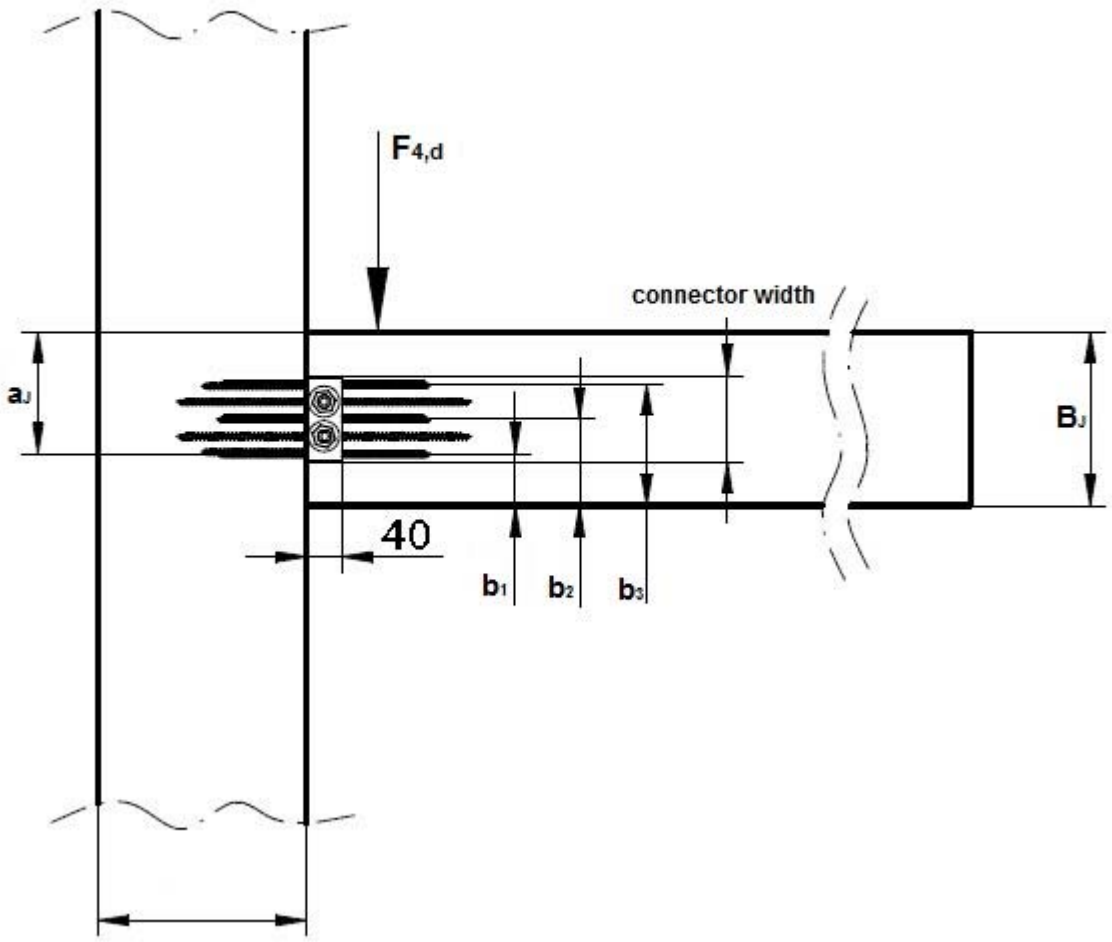
Tension reinforcement in header - F_2



dimensions in mm

MEGANT®	Annex 7
Tension reinforcement	of European Technical Assessment ETA-15/0667 of 22.07.2019

Tension reinforcement – F_4



dimensions in mm

MEGANT®	Annex 7
Tension reinforcement	of European Technical Assessment ETA-15/0667 of 22.07.2019

Guideline for European Technical Approval ETAG 015 “Three-dimensional nailing plates”, Edition November 2012, used as European Assessment Document

European Technical Assessment ETA-14/0354 of 11.07.2018 for “Träger BauBuche GL75, Beam BauBuche GL75, Poutre BauBuche GL75, Trave BauBuche GL75, Viga BauBuche GL75, Belka BauBuche GL75, Draagbalk BauBuche GL75” of Pollmeier Furnierwerkstoffe GmbH, Pferdsdorfer Weg 6, 99831 Creuzburg, Germany

EN 338 (04.2016), Structural timber – Strength classes

EN 755-2 (03.2016), Aluminium and aluminium alloys – Extruded rod/bar, tube and profiles – Part 2: Mechanical properties

EN 1993-1-8 (05.2005) +AC (12.2015) +AC (07.2009), Design of steel structures – Part 1-8: Design of joints

EN 1995-1-1 (11.2004) +AC (06.2006) +A1 (06.2008) +A2 (05.2014), Eurocode 5 – Design of timber structures – Part 1-1: General – Common rules and rules for buildings

EN 1995-1-2 (11.2004) +AC (06.2006) +AC (03.2009), Eurocode 5 – Design of timber structures – Part 1-2: General – Structural fire design

EN 1999-1-1 (05.2007) +A1 (07.2009) +A2 (12.2013), Design of aluminium structures – Part 1-1: General structural rules

EN 14080 (06.2013), Timber structures – Glued laminated timber and glued solid timber – Requirements

EN 14081-1 (02.2016), Timber structures – Strength graded structural timber with rectangular cross section – Part 1: General requirements

EN 14374 (11.2004), Timber structures – Structural laminated veneer lumber – Requirements

EN ISO 4032 (12.2012), Hexagon regular nuts (style 1) – Product grades A and B

ISO 7090 (06.2000), Plain washers, chamfered – Normal series – Product grade A

MEGANT®	Annex 8
Reference documents	of European Technical Assessment ETA-15/0667 of 22.07.2019