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European Technical Assessment

ETA-15/0667 of 16.08.2023

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	70 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	European Assessment Document (EAD) 130186-00-0603 “Three-dimensional nailing plates”.
This European Technical Assessment replaces	European Technical Assessment ETA-15/0667 of 22.07.2019.

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 12 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 or are in accordance with an ETA. 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, amended in 2019 to ETA 15/0667 of 22.07.2019 and amended in 2023 to ETA-15/0667 of 16.08.2023.

[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	Joint strength	3.1.1
2	Joint stiffness	3.1.2
3	Joint ductility	No performance assessed.
4	Resistance to seismic actions	No performance assessed.
5	Resistance to corrosion and deterioration	3.1.3
Basic requirement for construction works 2: Safety in case of fire		
6	Reaction to fire	3.1.4
7	Resistance to fire	No performance assessed.

3.1.1 Joint strength

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.

[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.

3.1.2 Joint 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 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.

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.

3.1.4 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.

3.2 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 and for safety in case of fire in the sense of the basic requirements for construction works № 1 and 2 of Regulation (EU) № 305/2011 has been made in accordance with the European Assessment Document EAD 130186-00-0603 “Three-dimensional nailing plates”.

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:

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

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

4.2 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] 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.

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.

5.2 Tasks for the notified factory production control certification body

5.2.1 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

5.2.2 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

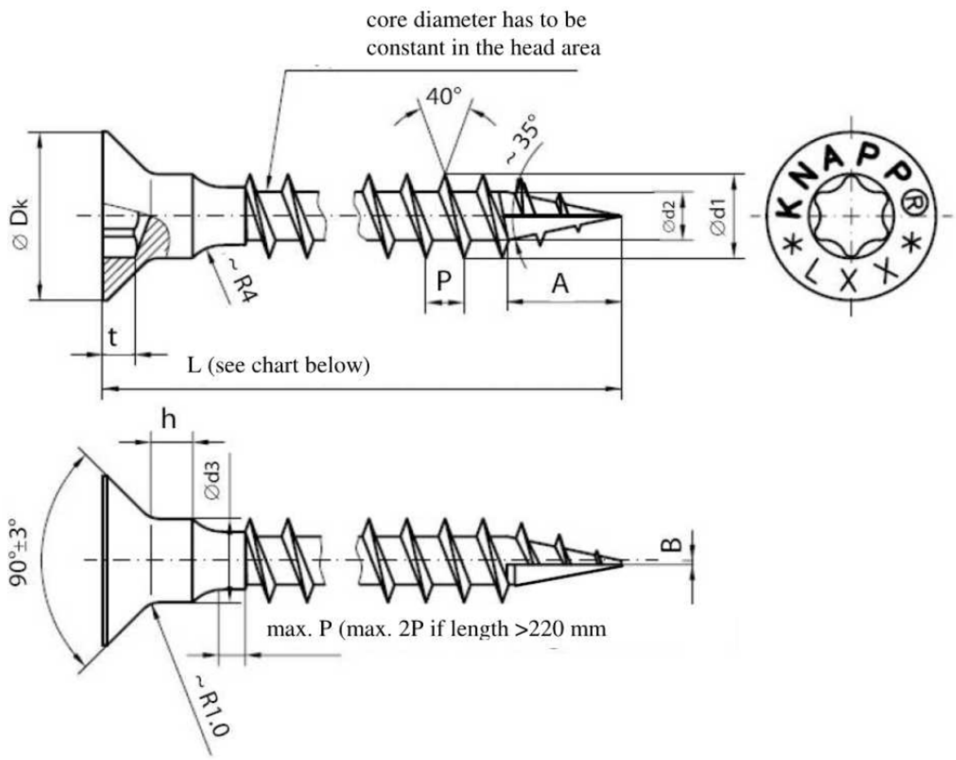
The results of continuous surveillance shall be made available on demand by the notified factory production control certification body to Österreichisches Institut für Bautechnik. When the provisions of the European Technical Assessment and the control plan are no longer fulfilled, the certificate of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

Issued in Vienna on 16.08.2023
by Österreichisches Institut für Bautechnik

The original document is signed by:

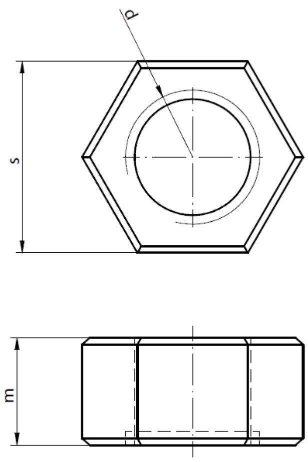
Georg Kohlmaier

Deputy Managing Director

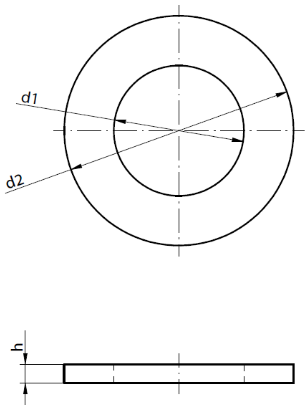


Self-tapping screw 8 x L mm	
E-Modulus	210 000 N/mm²
Min. char. tensile strength $f_{tens,k}$	20 kN
Min. char. yield moment $M_{y,k}$	20 Nm
Min. char. torsional strength $f_{tor,k}$	23 Nm
Head diameter D_k	15 mm
Outer thread diameter d_1	8 mm
Inner thread diameter d_2	5.1 mm
Length L	80 - 240 mm

MEGANT®	Annex 1
Fastener specification – self-tapping screw	of European Technical Assessment ETA-15/0667 of 16.08.2023

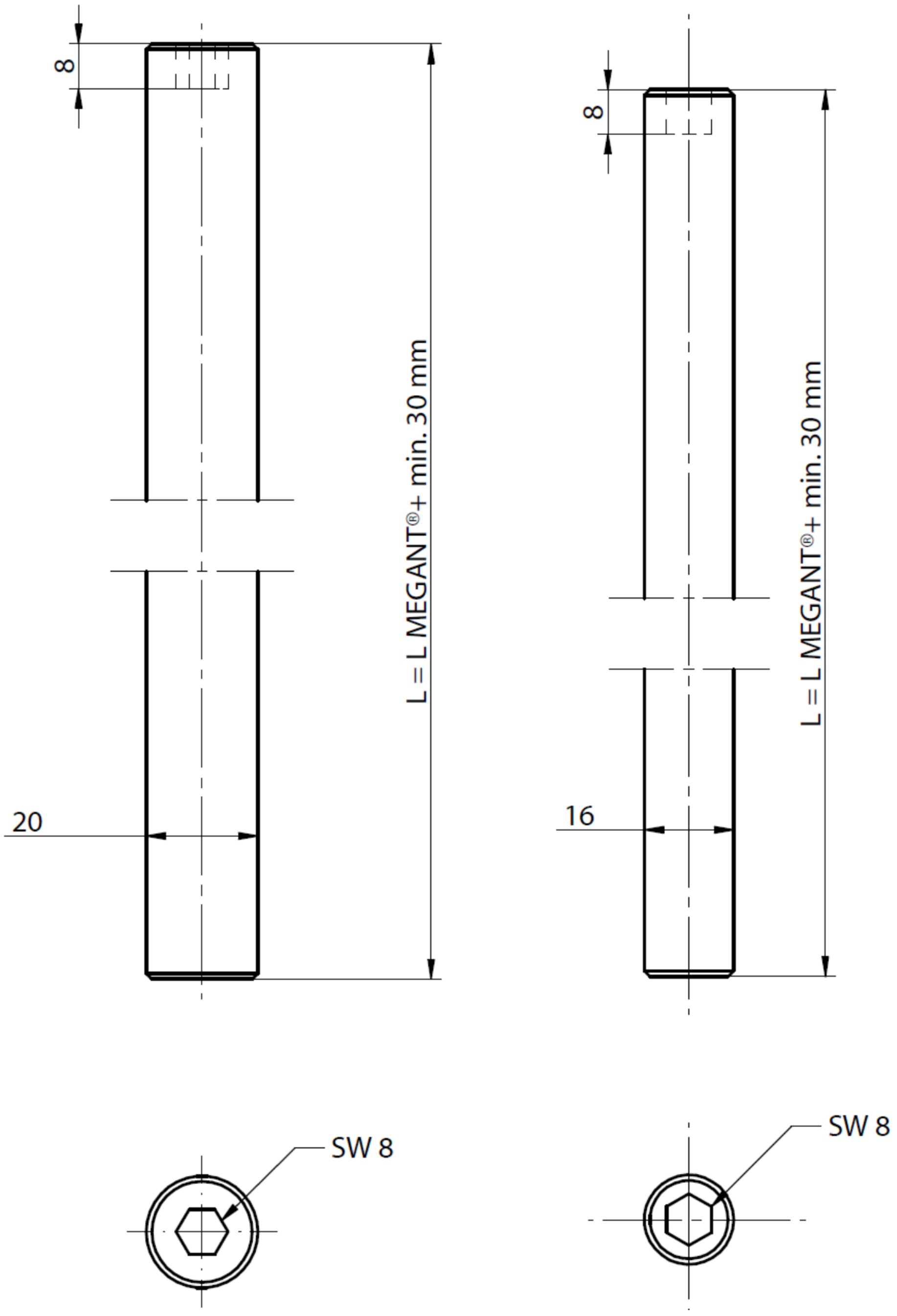


Hexagonal nut	Diameter d	Width across flat s	Thickness m
-	mm	mm	mm
M8	8	13	6.5
M10	10	17	8
M16	16	24	13
M20	20	30	16



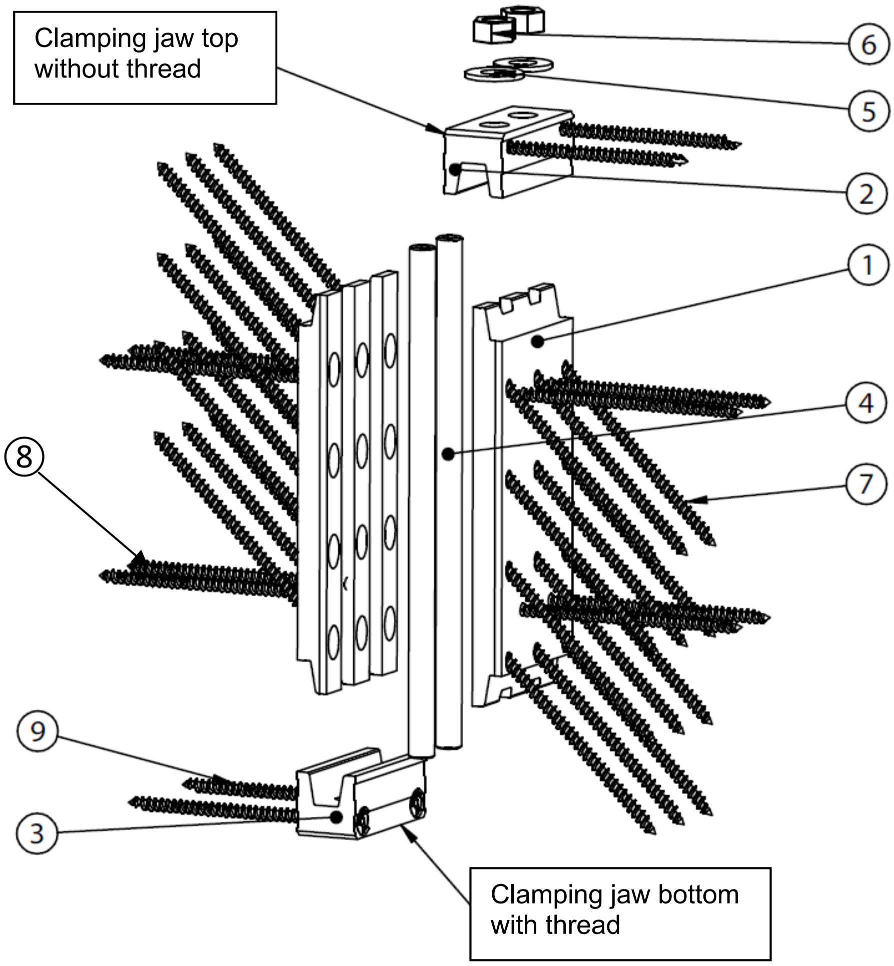
Washer	Inner diameter d_1	Outer diameter d_2	Thickness m
-	mm	mm	mm
M8	8.4	16	1.6
M10	10.5	20	2
M16	17	30	3
M20	21	37	3

MEGANT®	Annex 1
Fastener specification – hexagonal nut and washer	of European Technical Assessment ETA-15/0667 of 16.08.2023



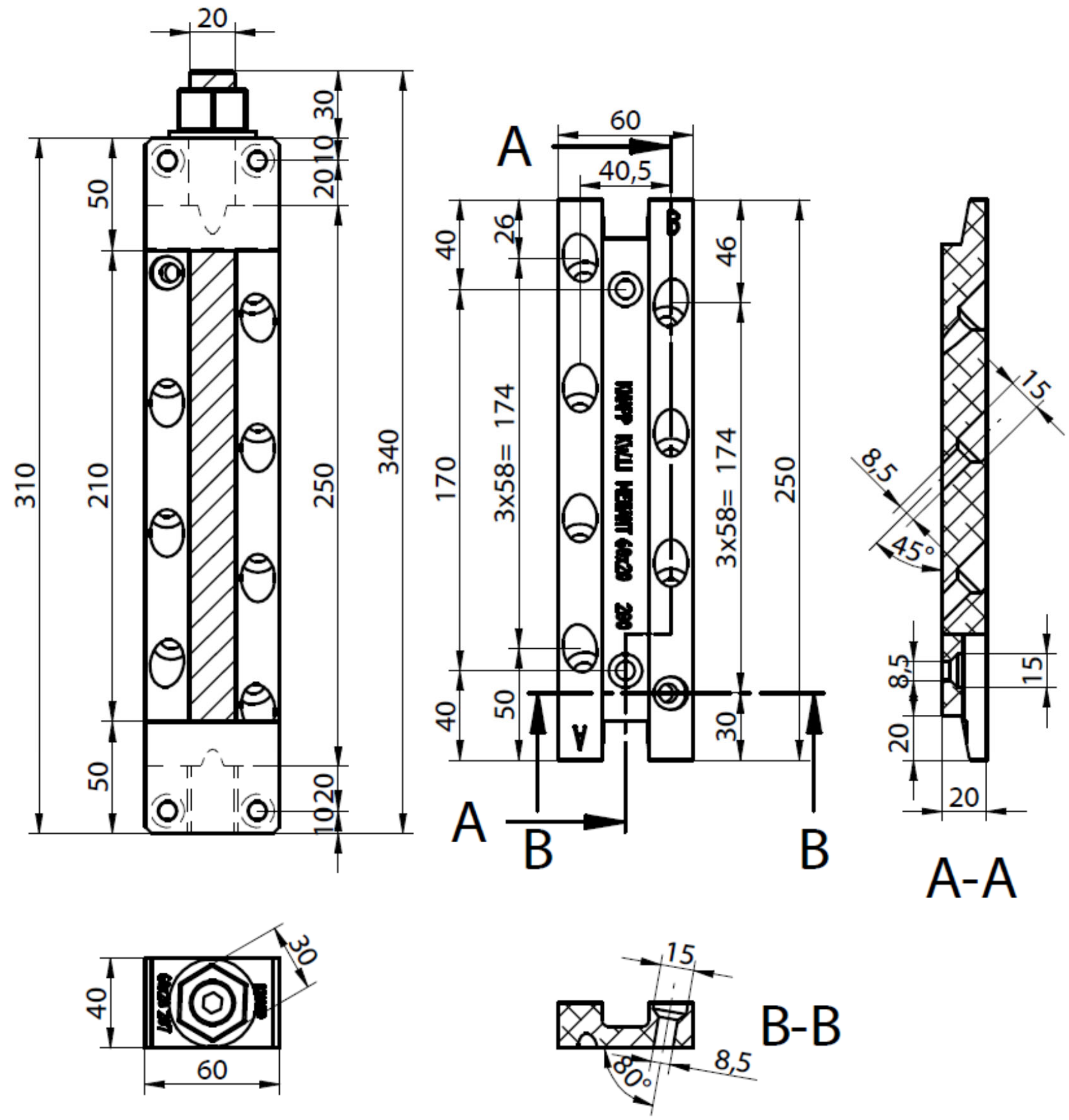
dimensions in mm

MEGANT®	Annex 1
Fastener specification – threaded rod M16 and M20	of European Technical Assessment ETA-15/0667 of 16.08.2023



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

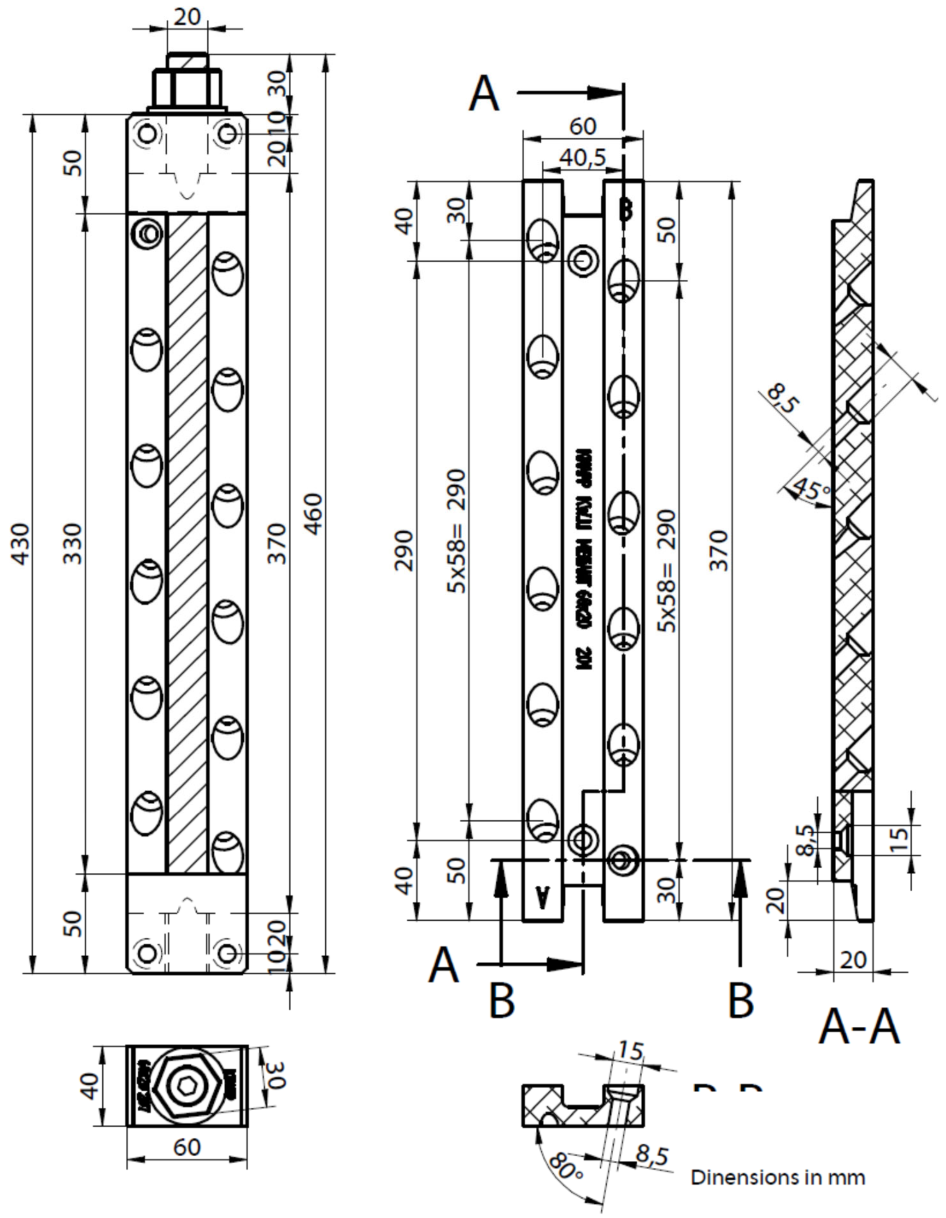
MEGANT®	Annex 2
Product details definitions: assembling of the connector	of European Technical Assessment ETA-15/0667 of 16.08.2023



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

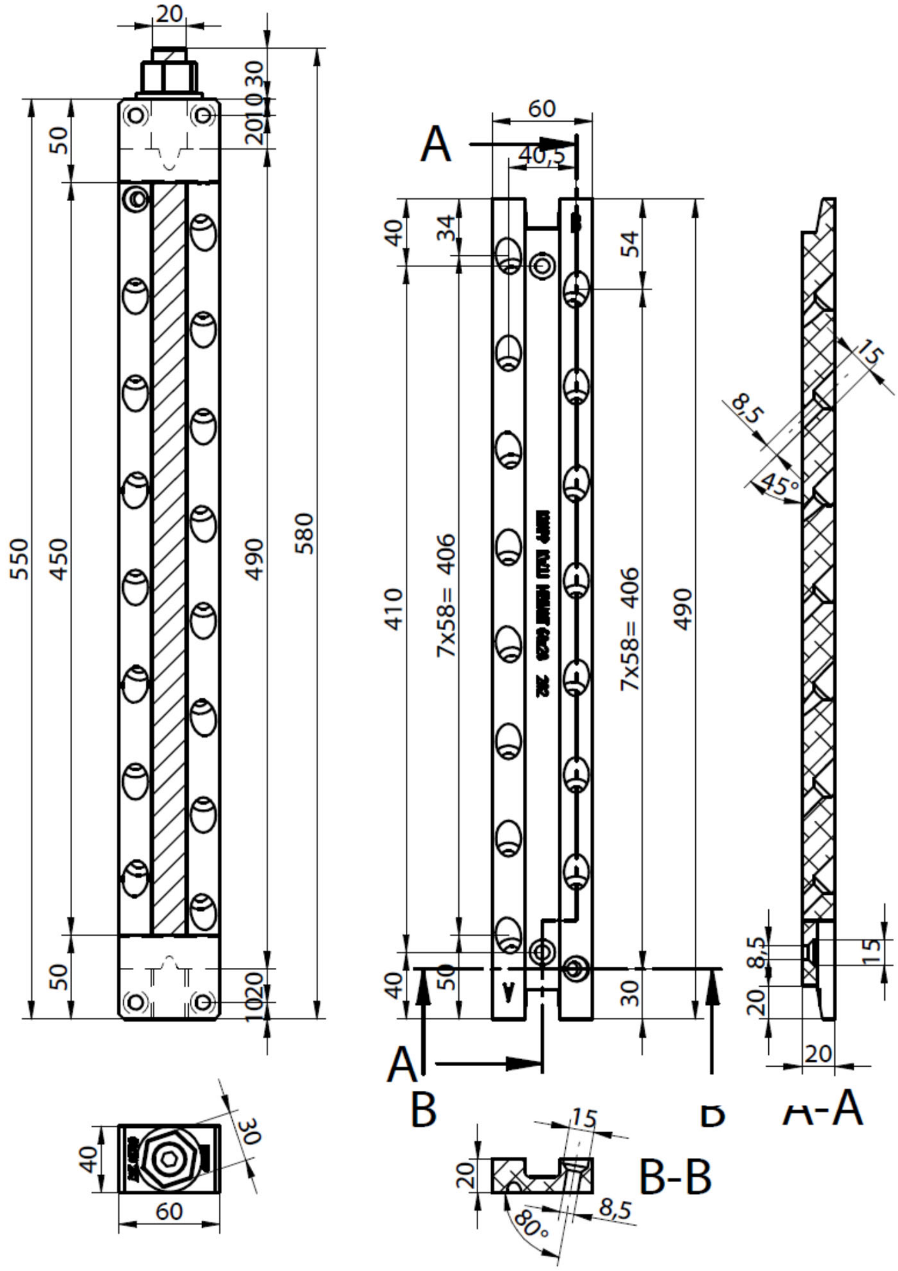
MEGANT® 60	Annex 2
Connector plate for wood Type: 310x60x40	of European Technical Assessment ETA-15/0667 of 16.08.2023



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

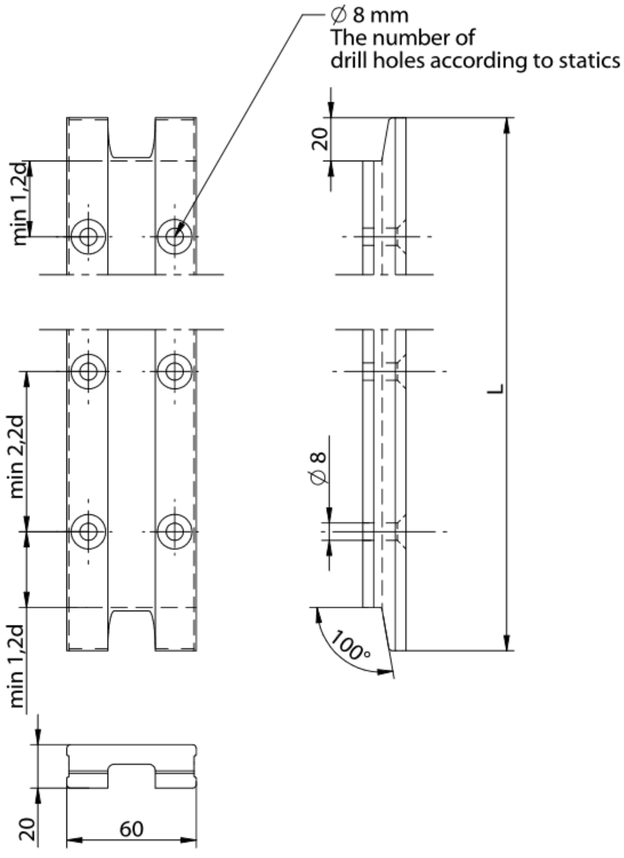
MEGANT® 60	Annex 2
Connector plate for wood Type: 430x60x40	of European Technical Assessment ETA-15/0667 of 16.08.2023



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 16.08.2023

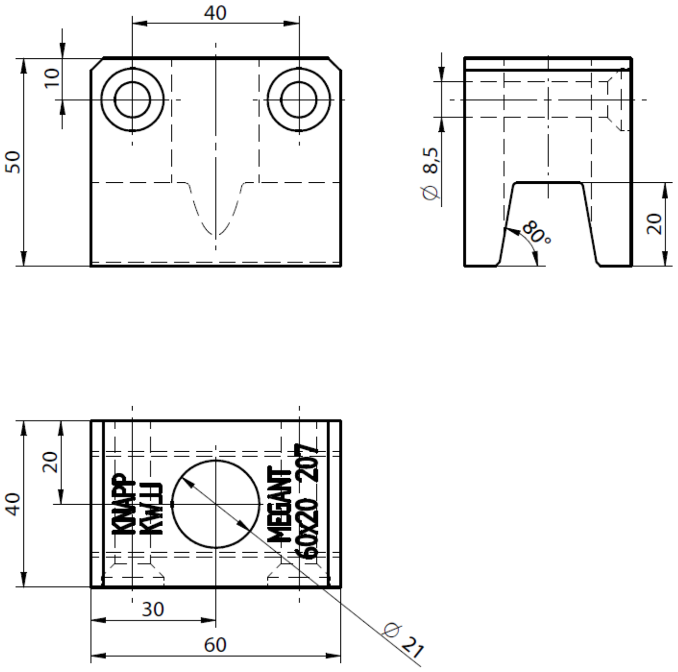


L according to the length of the connector to be mounted on the joist
Min. 2 x 3 and max. 2 x 6 countersunk holes with Ø 8 mm

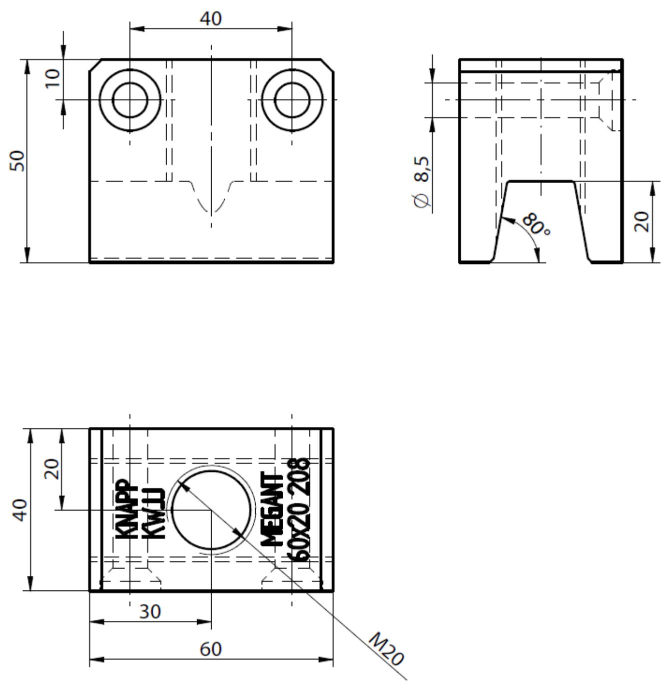
dimensions in mm

MEGANT® 60	Annex 2
Connector plate for steel Type: all	of European Technical Assessment ETA-15/0667 of 16.08.2023

Clamping jaw top

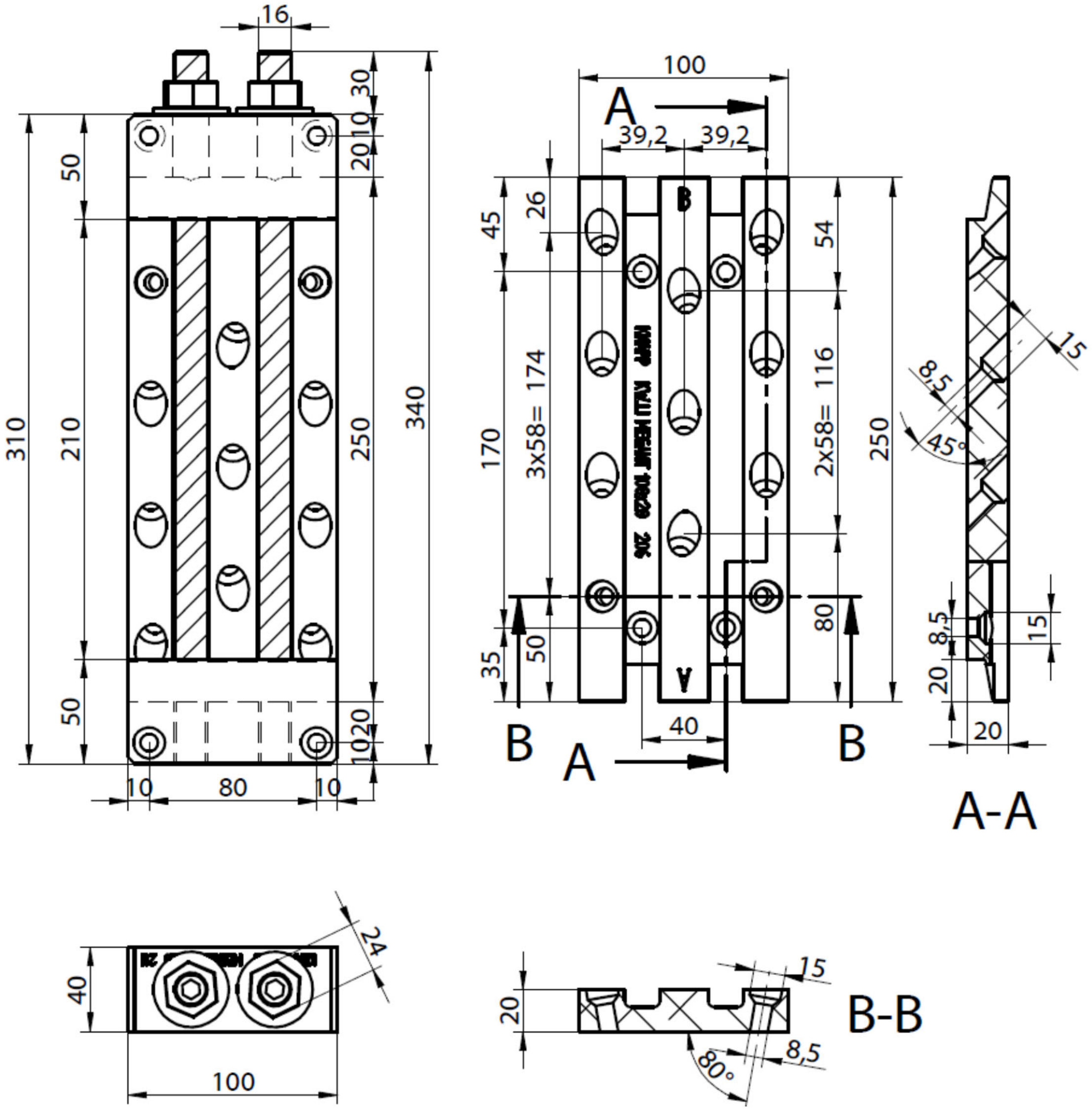


Clamping jaw bottom



dimensions in mm

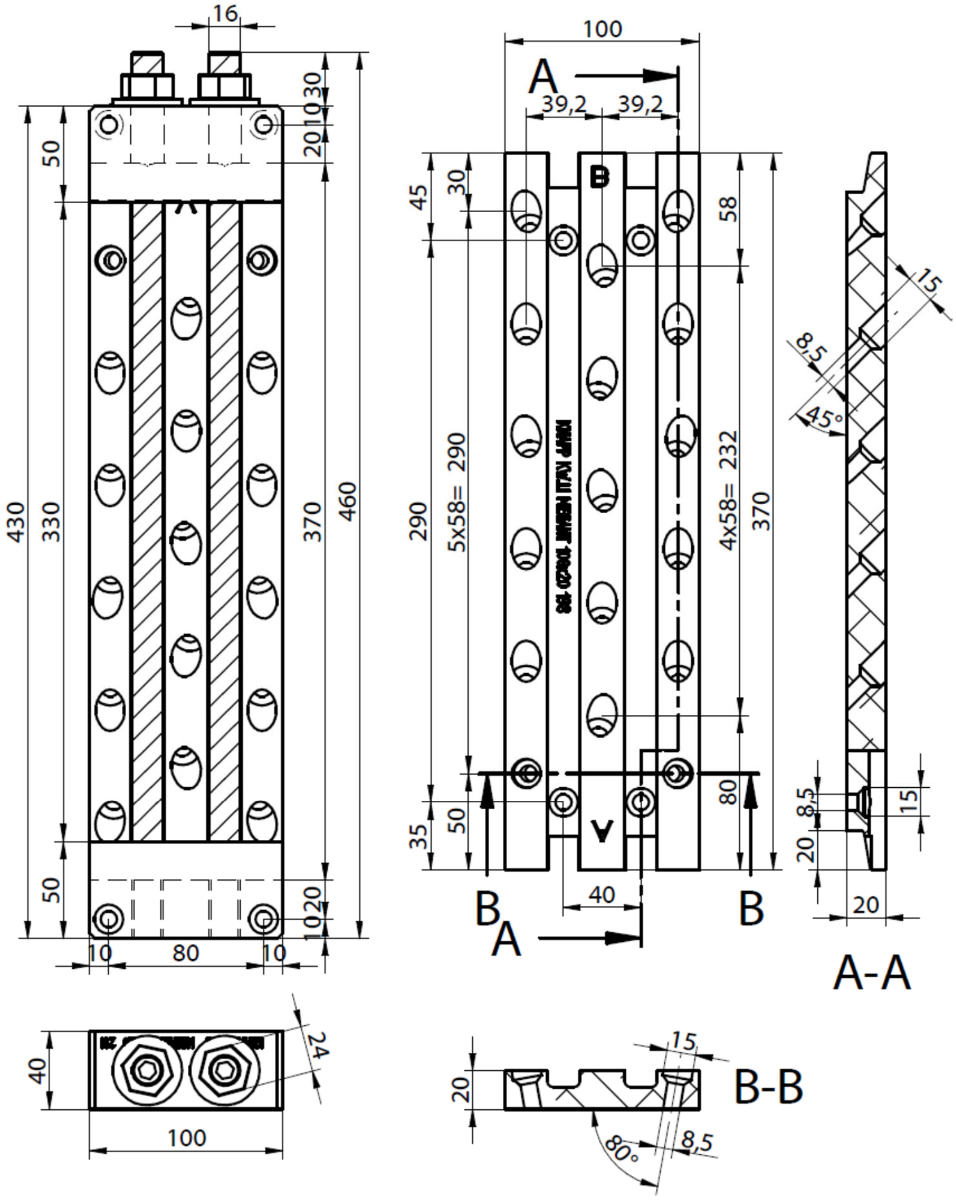
MEGANT® 60	Annex 2
Clamping jaws Type: <u>all</u>	of European Technical Assessment ETA-15/0667 of 16.08.2023



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

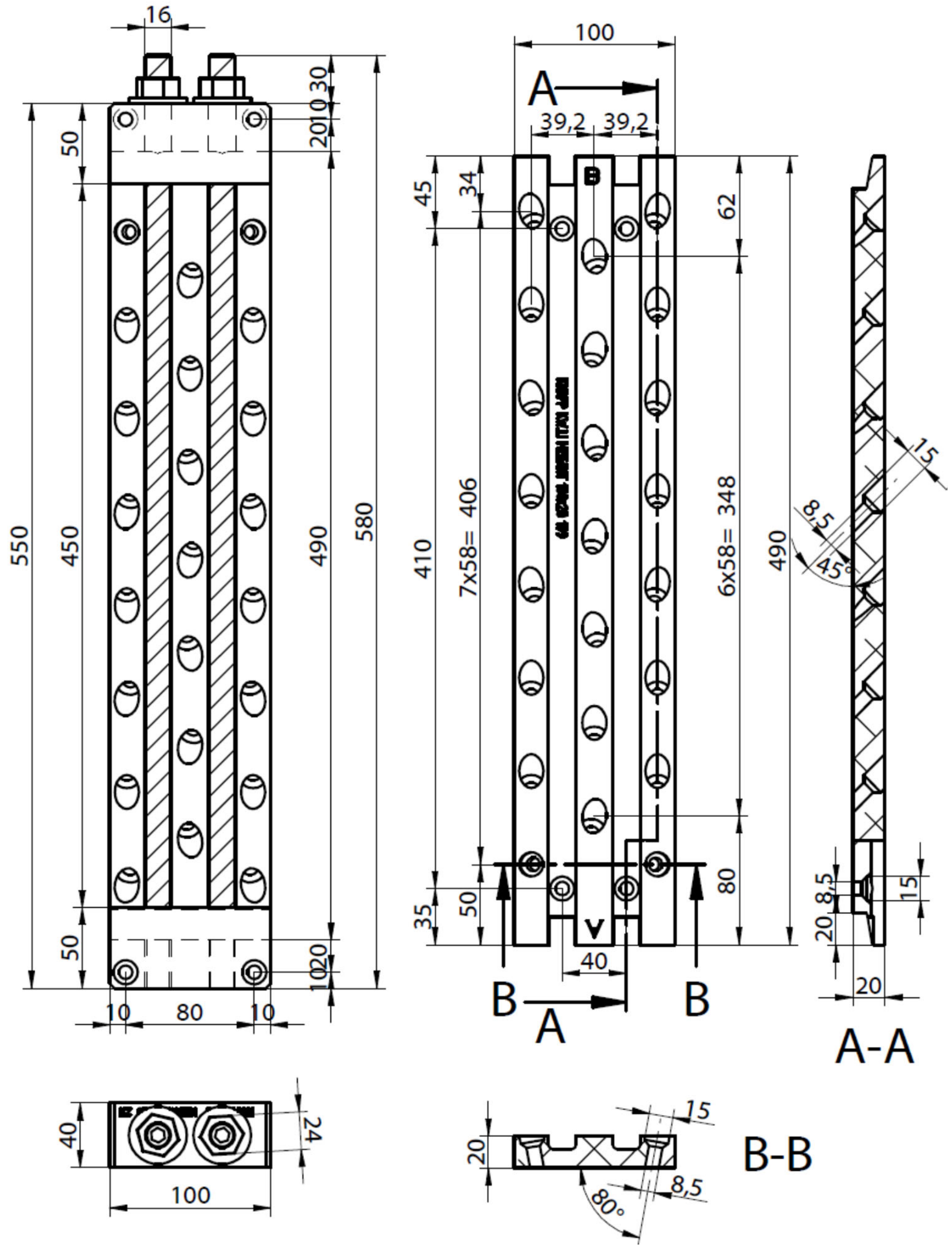
MEGANT® 100	Annex 2
Connector plate for wood Type: 310x100x40	of European Technical Assessment ETA-15/0667 of 16.08.2023



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 16.08.2023

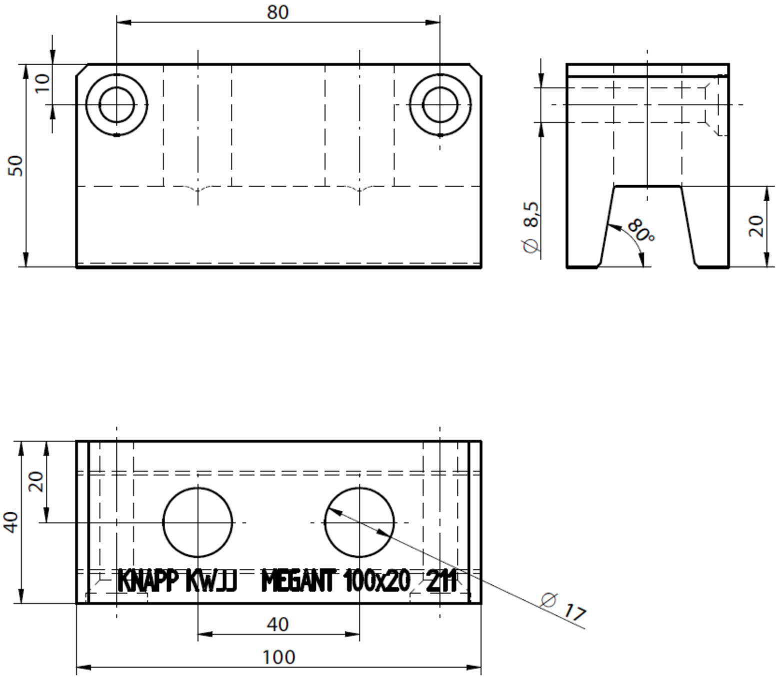


MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw	Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	mm
550x100x40	6	21	2	2x M16x580

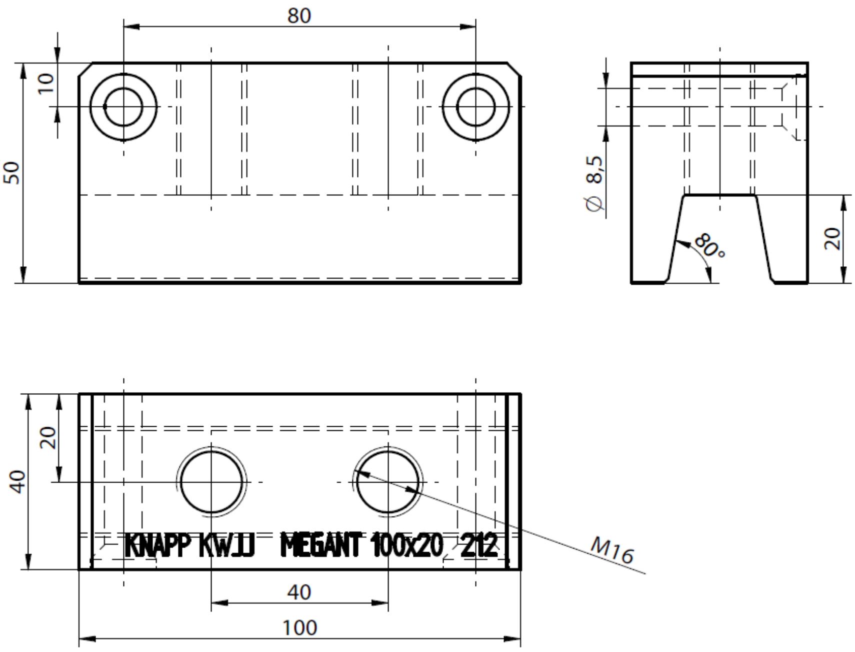
dimensions in mm

MEGANT® 100	Annex 2
Connector plate for wood Type: 550x100x40	of European Technical Assessment ETA-15/0667 of 16.08.2023

Clamping jaw top

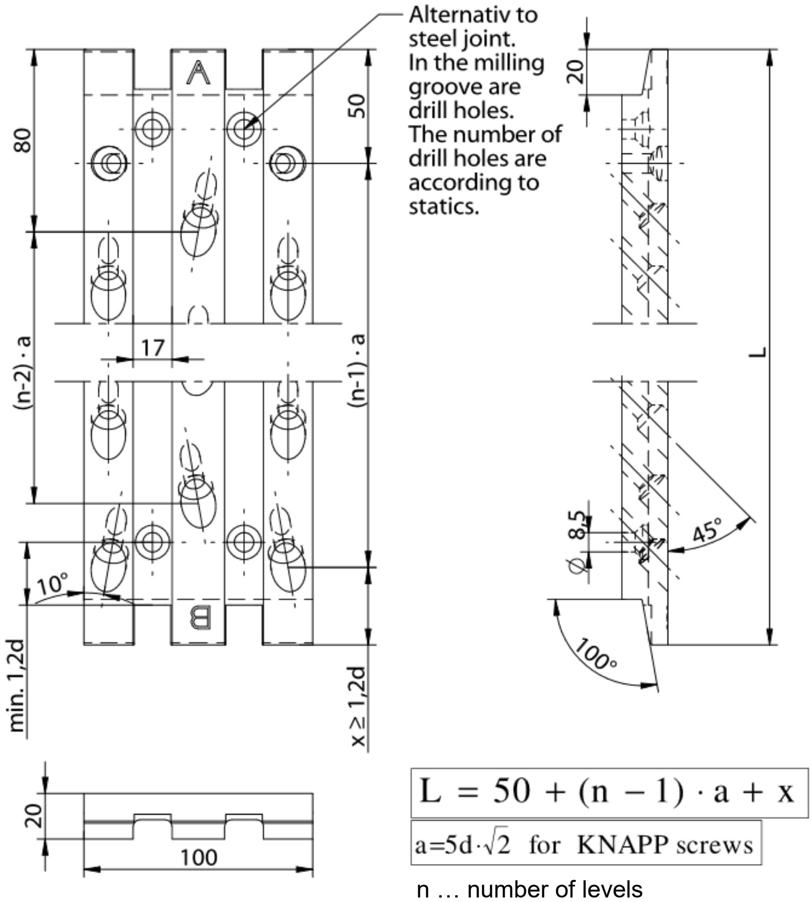


Clamping jaw bottom



dimensions in mm

MEGANT® 100	Annex 2
Clamping jaws Type: <u>all</u>	of European Technical Assessment ETA-15/0667 of 16.08.2023



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

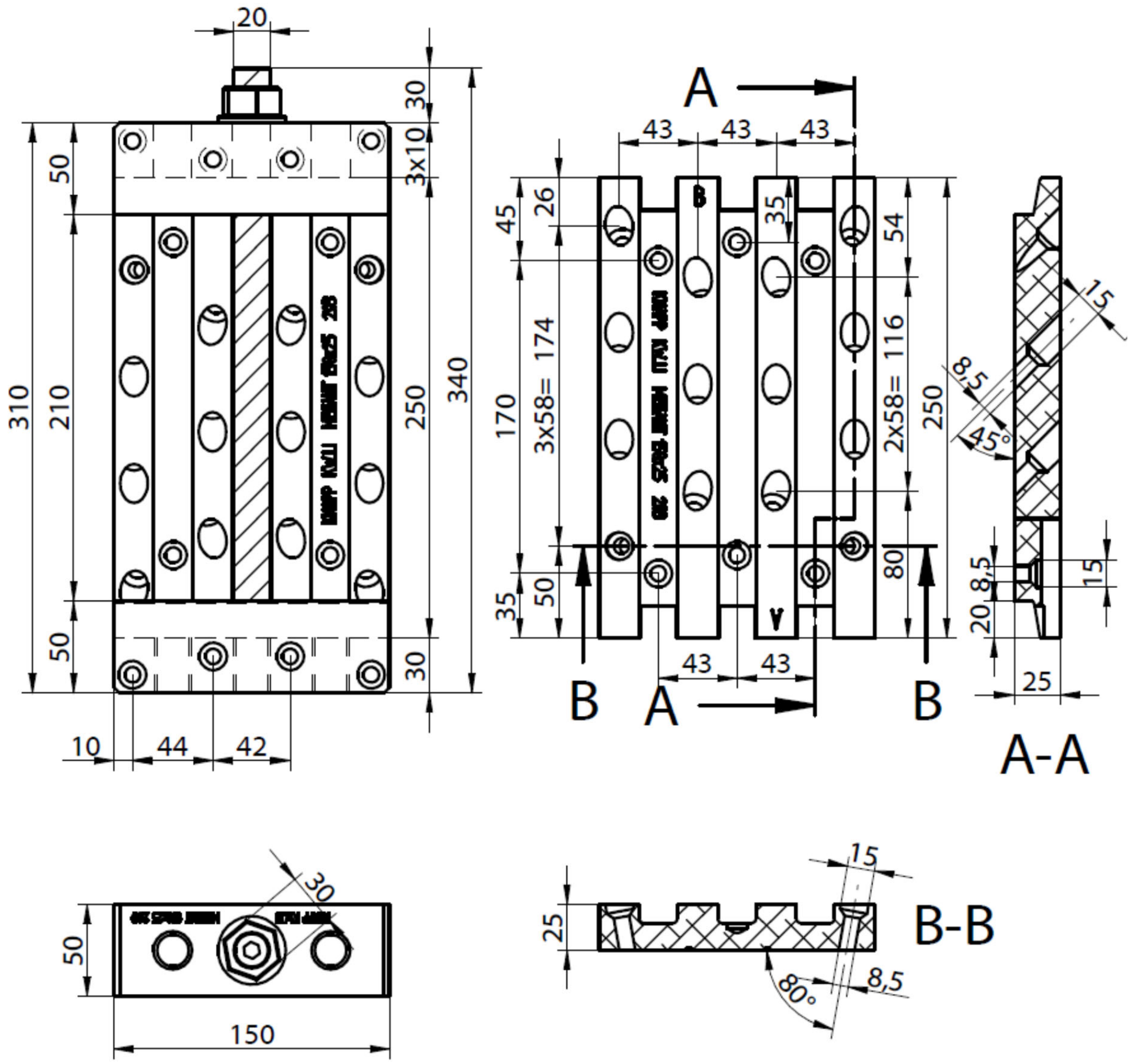
$$a = 5d \cdot \sqrt{2} \quad \text{for KNAPP screws}$$

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

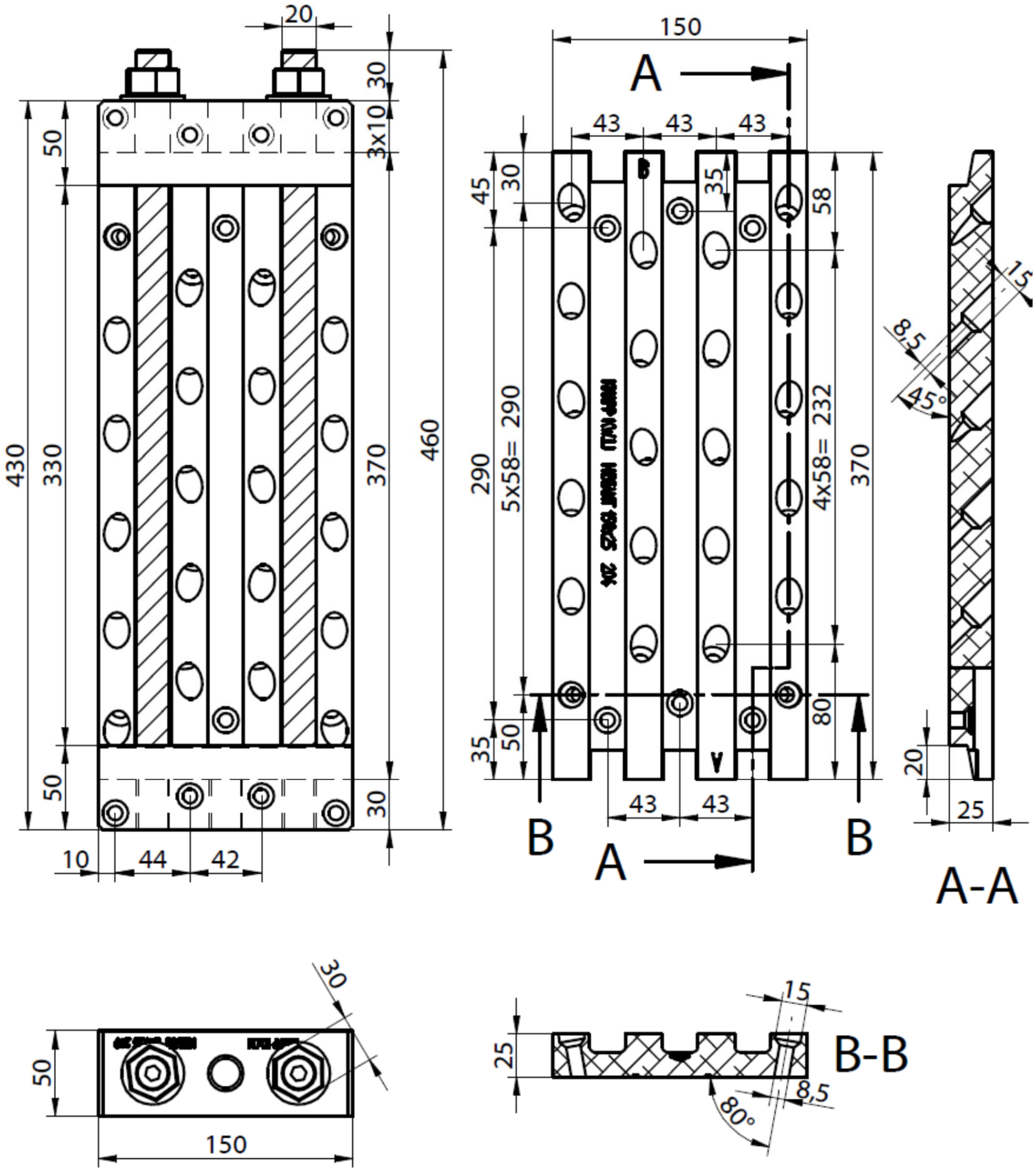
MEGANT® 100	Annex 2
Connector plate for <u>steel</u> Type: <u>all</u>	of European Technical Assessment ETA-15/0667 of 16.08.2023



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

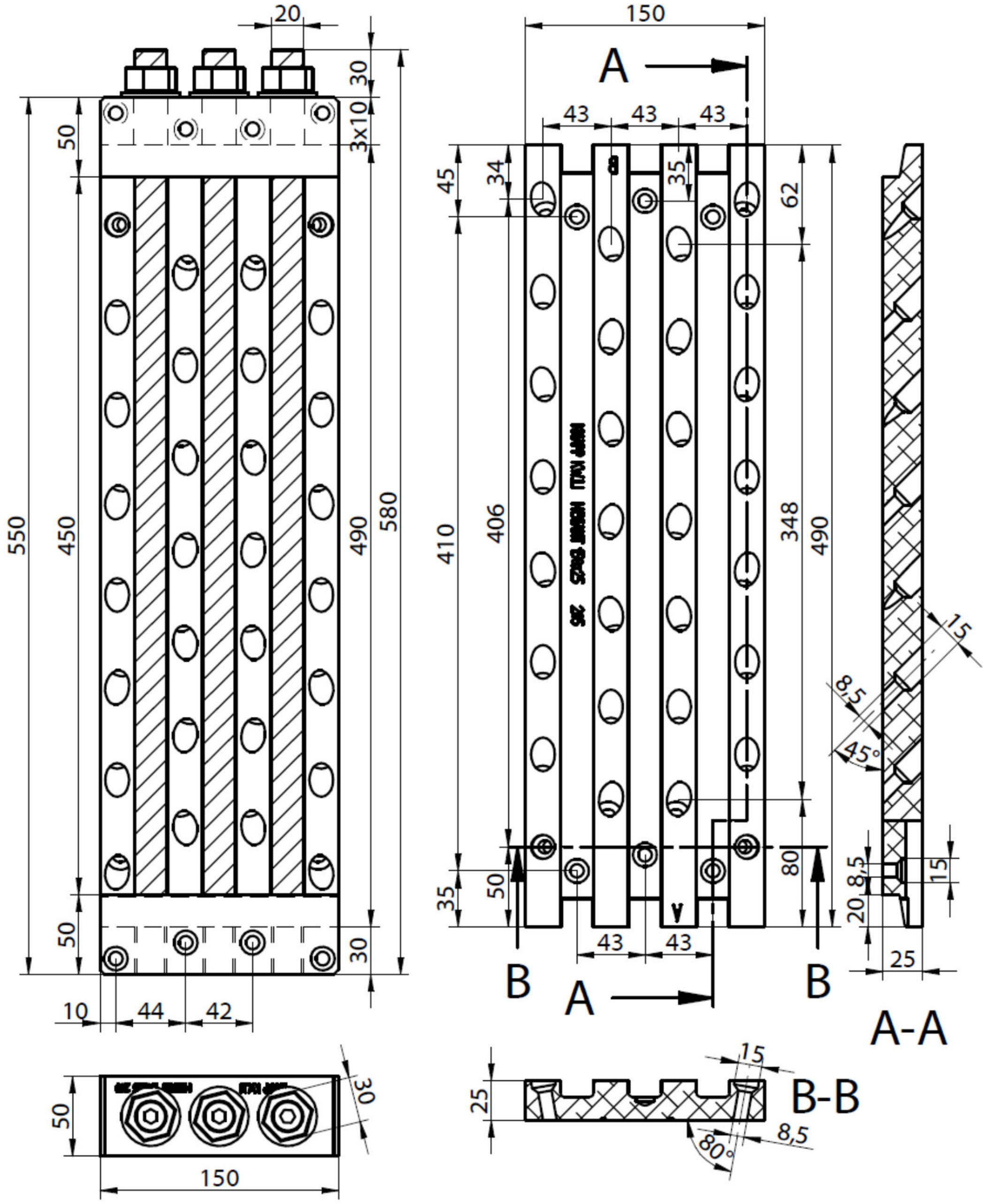
MEGANT® 150	Annex 2
Connector plate for wood Type: 310x150x50	of European Technical Assessment ETA-15/0667 of 16.08.2023



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

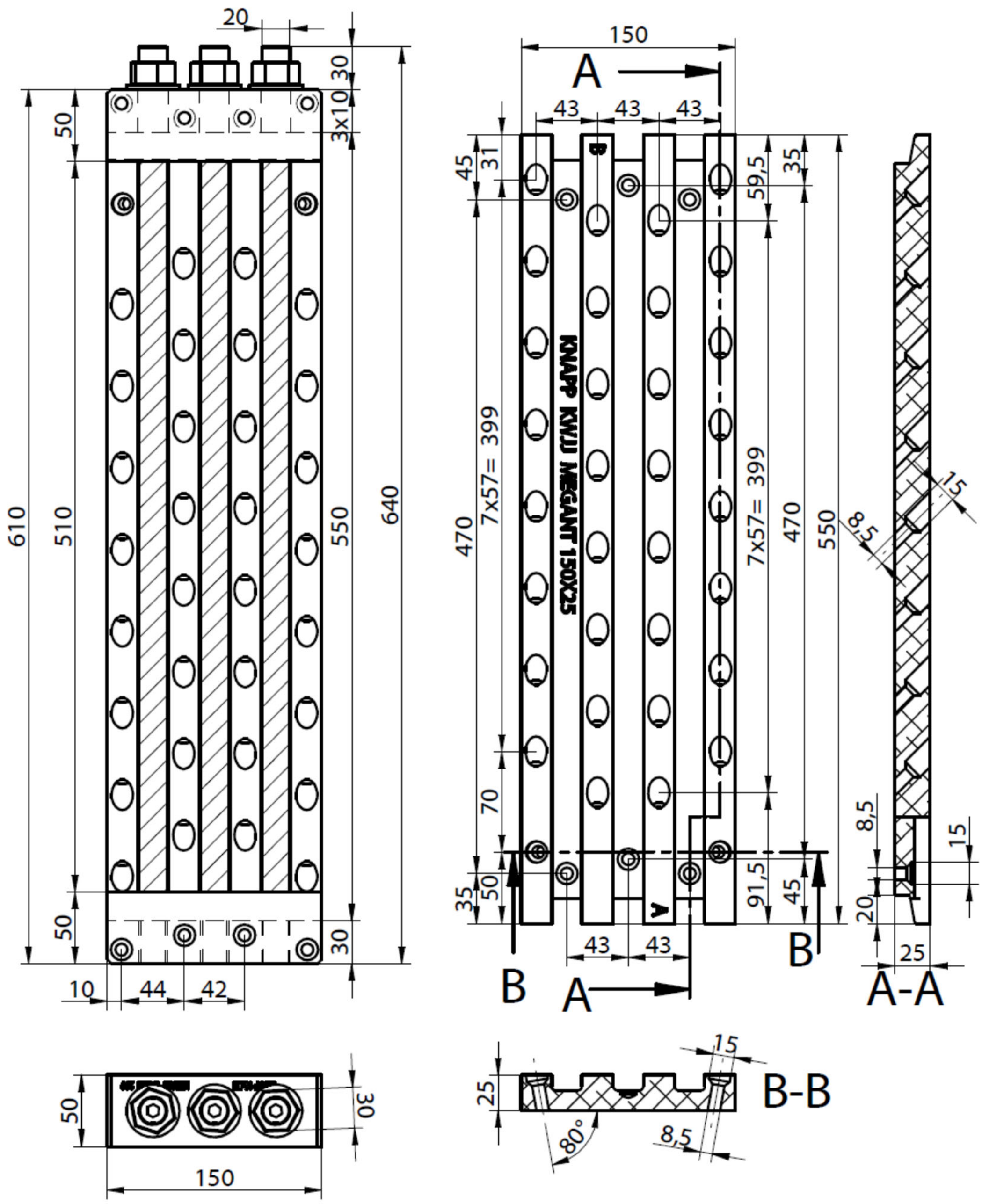
MEGANT® 150	Annex 2
Connector plate for wood Type: 430x150x50	of European Technical Assessment ETA-15/0667 of 16.08.2023



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

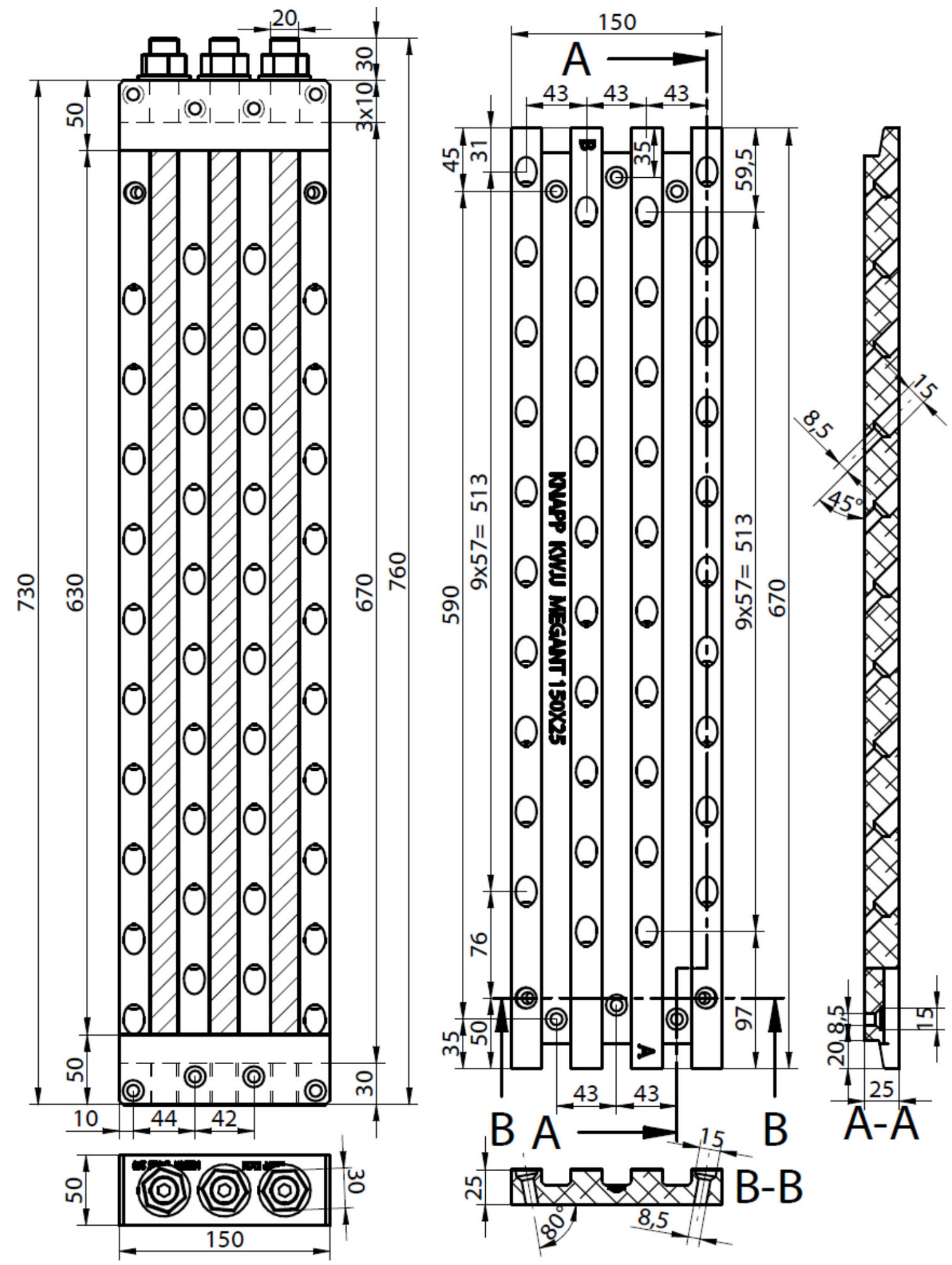
MEGANT® 150	Annex 2
Connector plate for wood Type: 550x150x50	of European Technical Assessment ETA-15/0667 of 16.08.2023



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

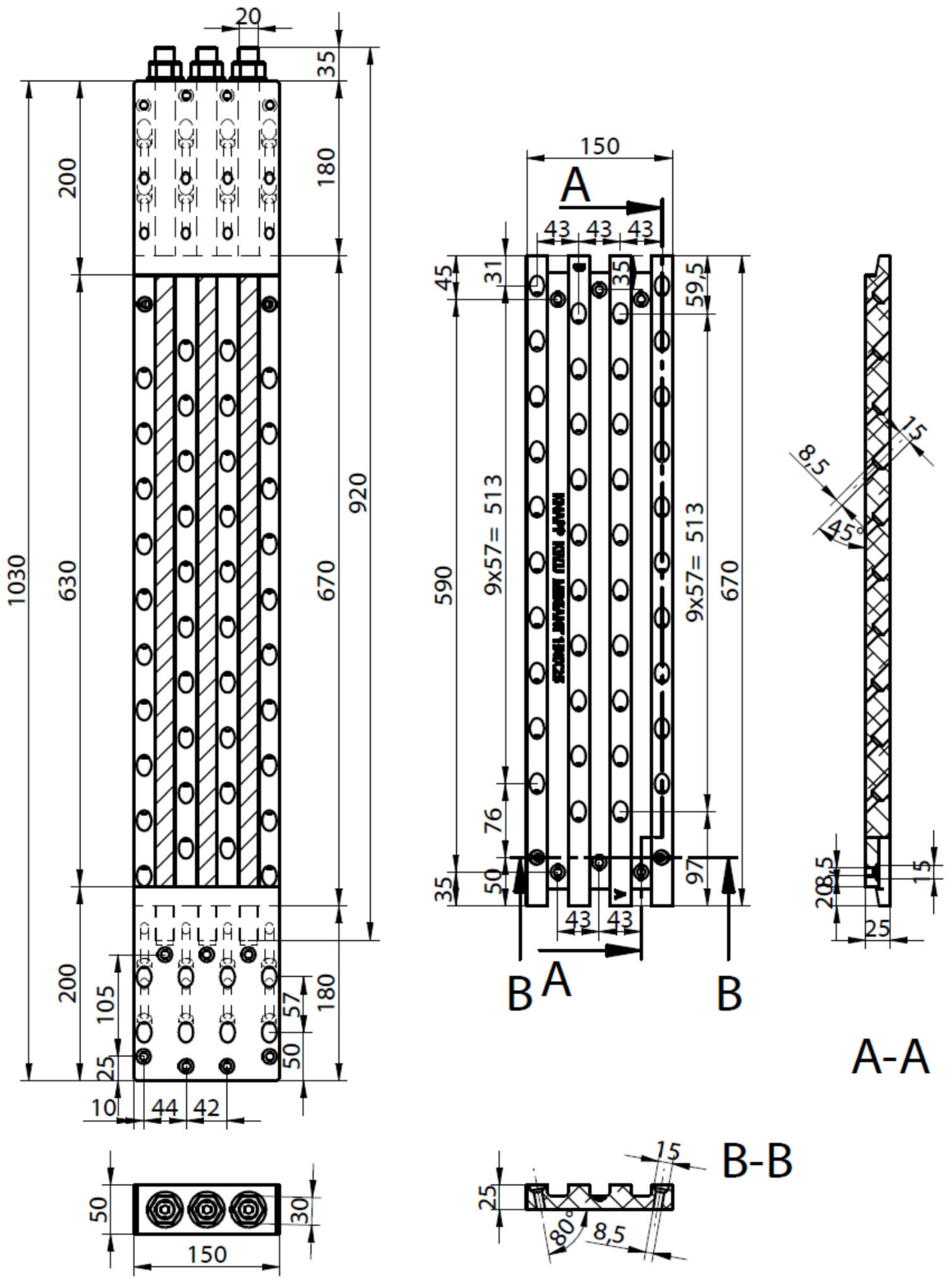
MEGANT® 150	Annex 2
Connector plate for wood Type: 610x150x50	of European Technical Assessment ETA-15/0667 of 16.08.2023



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 wood Type: 730x150x50	of European Technical Assessment ETA-15/0667 of 16.08.2023

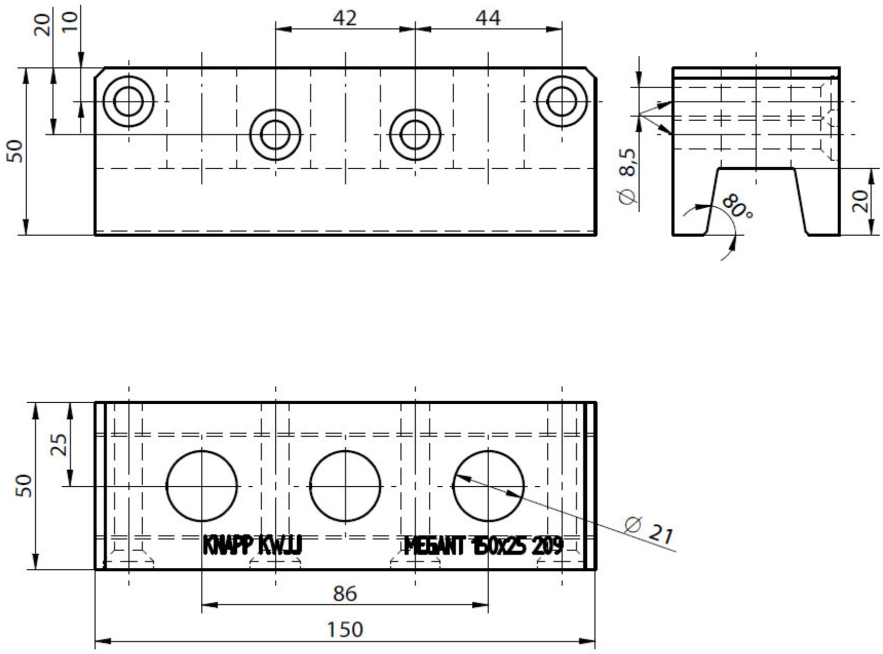


MEGANT® Dimension L/B/H	Number of screws in connector plate (joist and header)		Number of screws in clamping jaw		Number and dimension of threaded rod
mm	$n_{90,J/H}$	$n_{45,J/H}$	$n_{90,J/H}$	$n_{45,J/H}$	mm
1030x150x50 SL	8	40	4 top 7 bottom	8	3x M20x920

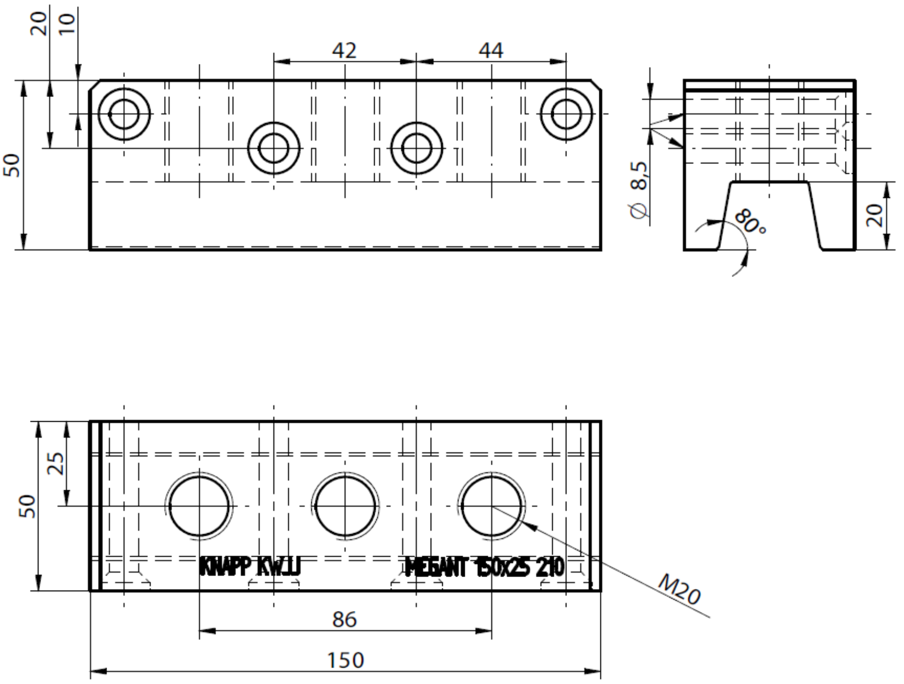
dimensions in mm

MEGANT® 150	Annex 2 of European Technical Assessment ETA-15/0667 of 16.08.2023
Connector plate for wood Type: 1030x150x50 SL	

Clamping jaw top



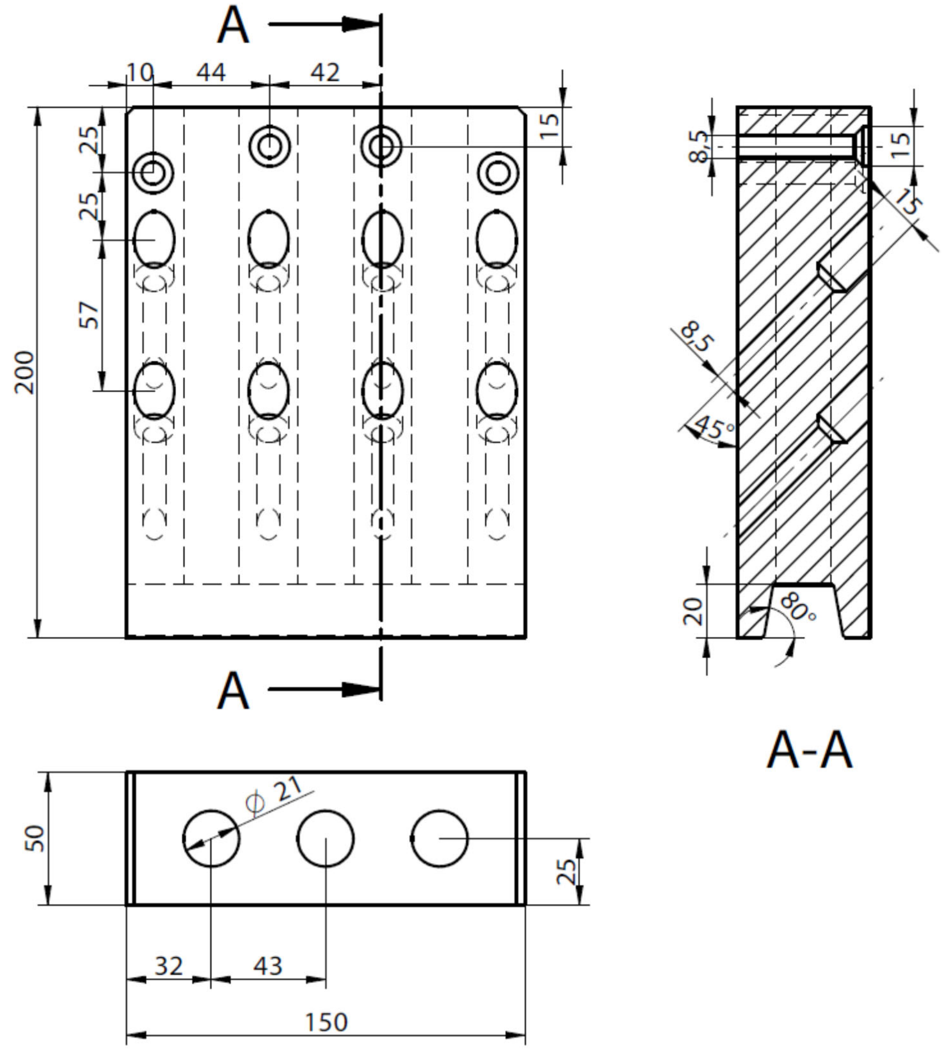
Clamping jaw bottom



dimensions in mm

MEGANT® 150	Annex 2
Clamping jaws Type: 310x150x50 to 1030x150x50	of European Technical Assessment ETA-15/0667 of 16.08.2023

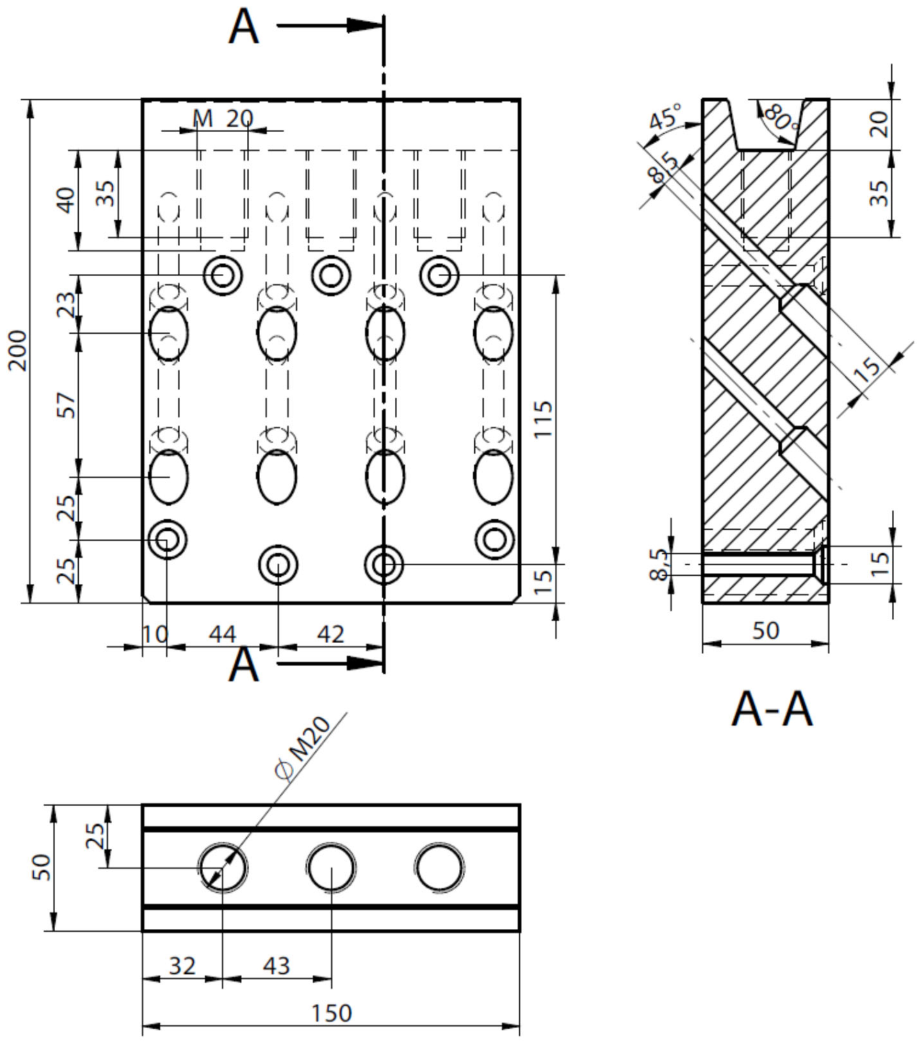
Clamping jaw top



dimensions in mm

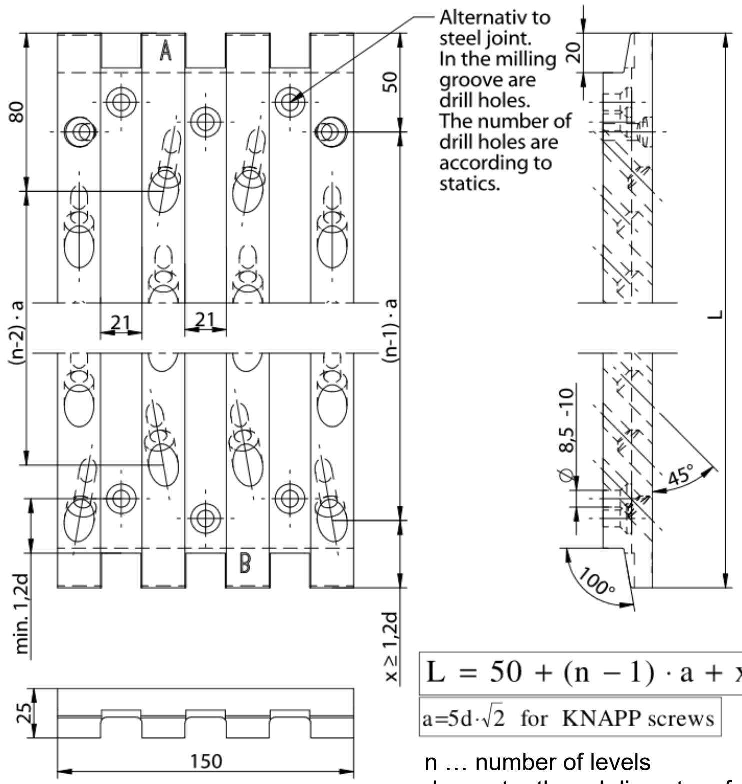
MEGANT® 150	Annex 2
Clamping jaw Type: 1030x150x50 SL	of European Technical Assessment ETA-15/0667 of 16.08.2023

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 16.08.2023



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

$a = 5d \cdot \sqrt{2}$ 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. 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

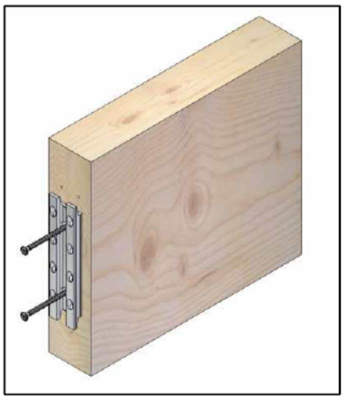
MEGANT® 150	Annex 2
Connector plate for steel Type: all	of European Technical Assessment ETA-15/0667 of 16.08.2023

Header 1: positioning screws

Header 2: 45° screws

Header 3: bottom clamoping jaw

Header 4: finished



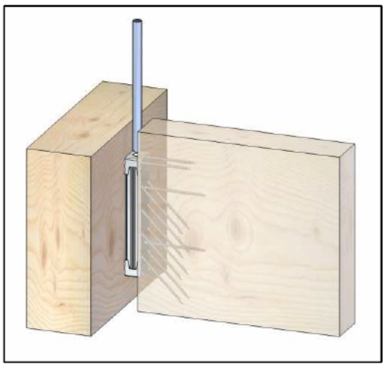
Joist 1: positioning screws

Joist 2: 45° screws

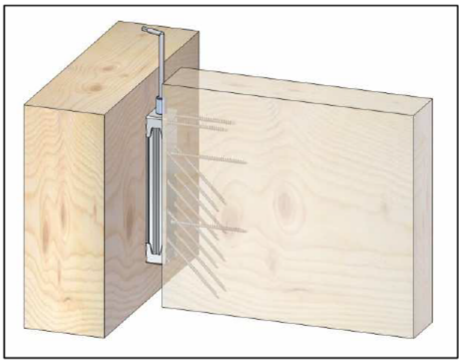
Joist 3: finished with top clamping jaw

MEGANT®	Annex 3
The typical installation of the connectors Assembling from the top	of European Technical Assessment ETA-15/0667 of 16.08.2023

Header with joist 1: hang in joist

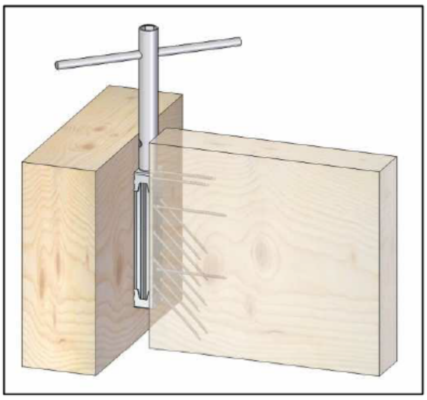


Header with joist 2: threaded rod

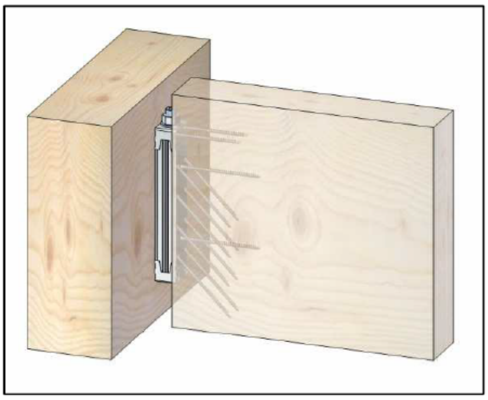


Header with joist 3: screw in threaded rod

Header with joist 4: washer and hex nut



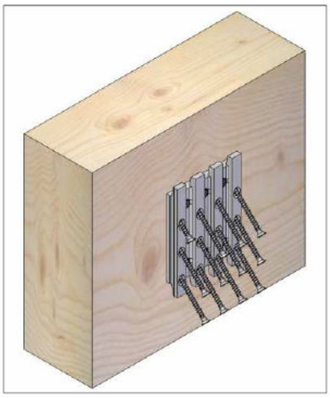
Header with joist 5: tighten hex nut



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 16.08.2023

Header 1: positioning screws



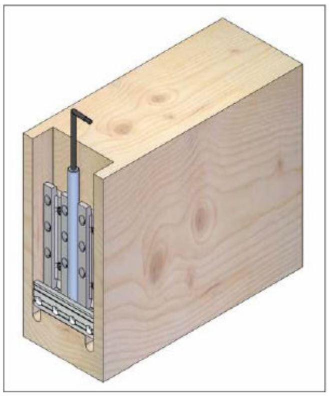
Header 2: 45° screws

Header 3: finished

Joist 1: bottom clamoping jaw in milling groove

Joist 2: positioning screws

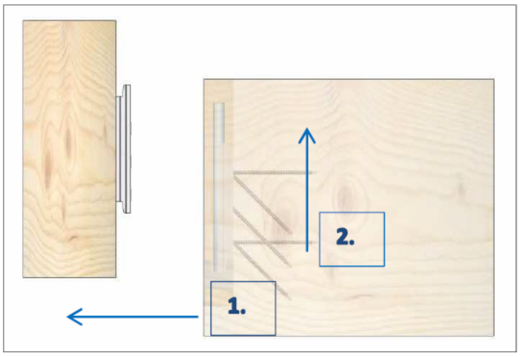
Joist 3: 45° screws



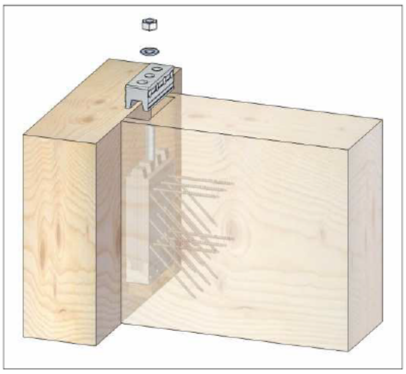
Joist 4: screw in threaded rod

MEGANT®	Annex 3
The typical installation of the connectors Assembling from the bottom	of European Technical Assessment ETA-15/0667 of 16.08.2023

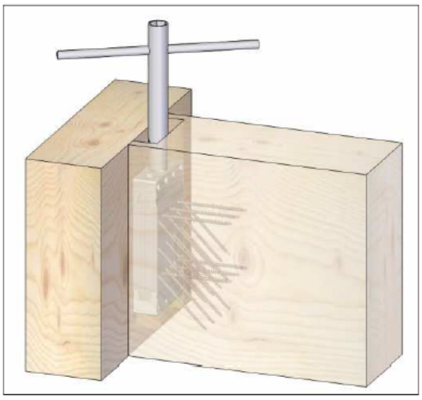
Header with joist 1: hang in joist



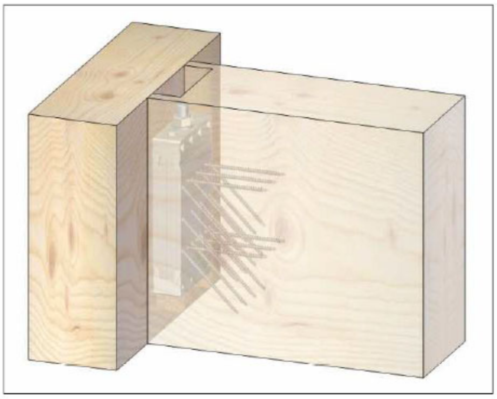
Header with joist 2: hang in joist from below



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

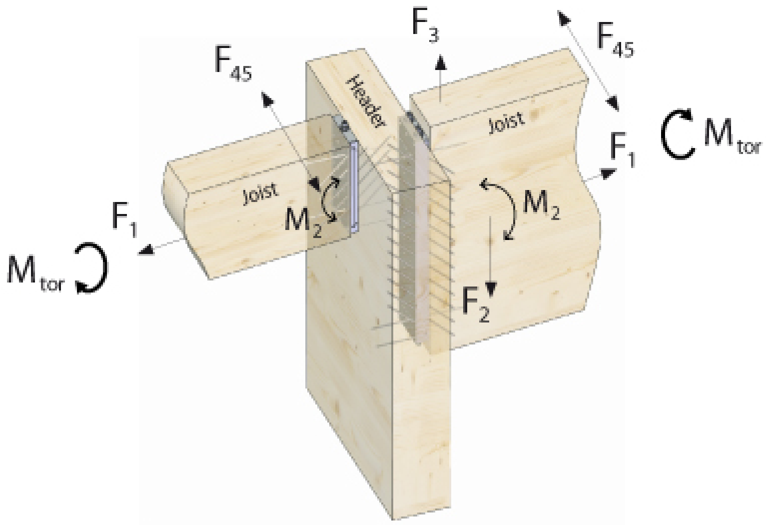


Header with joist 4: tighten hex nut



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 16.08.2023



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 16.08.2023

MEGANT series 60 – Material: EN AW - 6082										
Dimensions L/B/H	Softwood material	Characteristic load bearing capacity and stiffness in softwood with KNAPP screws 8 x 160 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	C24	36.6	18.9	150.4 [1)] 130.1 · f_{R2} [2)]	89.7	28.0	36.9	32.0	2.5	200
	GL24h		20.4		96.8	29.1		33.6	2.7	227
430x60x40	C24		18.9		141.0	37.1	40.6	50.4	5.5	639
	GL24h		20.4		152.1	38.7		52.8	5.8	723
550x60x40	C24		18.9		192.2	46.3	44.3	68.7	9.6	1 569
	GL24h		20.4		207.4	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 KNAPP screws 8 x 160 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	C24	55.3	29.4	224.2 [1)] 206.6 · f_{R2} [2)]	115.3	44.5	62.4	41.2	4.2	346
	GL24h		31.7		124.5	46.2		43.2	4.4	391
430x100x40	C24		29.4		192.2	58.2	68.6	68.7	8.6	1 066
	GL24h		31.7		207.4	60.6		72.0	9.2	1 206
550x100x40	C24		29.4		269.1	72.0	74.9	96.1	14.9	2 443
	GL24h		31.7		290.4	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 16.08.2023

Member of EOTA

MEGANT series 150 – Material: EN AW - 6082										
Dimensions L/B/H	Softwood material	Characteristic load bearing capacity and stiffness in softwood with KNAPP screws 8 x 160 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	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
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/m^3

c =0.8 from higher to lower density and

c =0.6 from lower to higher density

MEGANT®	Annex 5
Characteristic load-bearing capacities	of European Technical Assessment ETA-15/0667 of 16.08.2023

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	$B_H \leq 140$ $140 \leq B_H \leq 320$	$e \leq 90$ $90 \leq e \leq 180$	$f_{R2} = 1.0$ $f_{R2} = (270\text{-}e)/180$
series 100	$B_H \leq 140$ $140 \leq B_H \leq 360$	$e \leq 90$ $90 \leq e \leq 200$	$f_{R2} = 1.0$ $f_{R2} = (310\text{-}e)/220$
series 150	$B_H \leq 200$ $200 \leq B_H \leq 450$	$e \leq 125$ $125 \leq e \leq 250$	$f_{R2} = 1.0$ $f_{R2} = (375\text{-}e)/250$

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

MEGANT series 60, 100, and 150 – Material: EN AW - 6082					
Megant series: dimension L	Softwood material	Slip modulus in softwood with KNAPP screws 8 x 160 mm and horizontal KNAPP 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, 550-1030	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

MEGANT®	Annex 5
Characteristic load bearing capacities	of European Technical Assessment ETA-15/0667 of 16.08.2023

MEGANT series 60 – Material: EN AW - 6082							
Dimensions L/B/H	Bottom clamping jaw in joist	Torsion modulus and stiffness in softwood with horizontal KNAPP screws 8 x 160 mm in header and horizontal KNAPP 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	1.69	1.83	1.99	530	555	582
	Bottom tension	2.52	2.65	2.78	364	400	459
430x60x40	Top tension	2.42	2.61	2.83	1079	1193	1350
	Bottom tension	4.21	4.47	4.75	1037	1048	1063
550x60x40	Top tension	3.17	3.42	3.70	1979	2103	2235
	Bottom tension	5.89	6.28	6.71	2301	2348	2389
Dimensions L/B/H	Bottom clamping jaw in header	Torsion modulus and stiffness in softwood with horizontal KNAPP screws 8 x 160 mm in header and horizontal KNAPP 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	3.10	3.12	3.14	556	572	586
	Bottom tension	3.05	3.30	3.58	744	770	798
430x60x40	Top tension	6.55	6.66	6.74	1447	1553	1644
	Bottom tension	4.55	4.92	5.34	1498	1705	1966
550x60x40	Top tension	8.66	9.36	10.15	2483	2683	2949
	Bottom tension	6.07	6.56	7.11	2730	2920	3119

[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

MEGANT®	Annex 5
Characteristic load bearing capacities	of European Technical Assessment ETA-15/0667 of 16.08.2023

MEGANT series 100 – Material: EN AW - 6082							
Dimensions L/B/H	Bottom clamping jaw in joist	Torsion modulus and stiffness in softwood with horizontal KNAPP screws 8 x 160 mm in header and horizontal KNAPP 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	2.99	3.24	3.52	666	702	741
	Bottom tension	4.27	4.27	4.27	834	845	855
430x100x40	Top tension	4.21	4.55	4.93	1578	1665	1757
	Bottom tension	7.91	8.32	8.76	1575	1689	1876
550x100x40	Top tension	5.49	5.93	6.43	2954	3132	3325
	Bottom tension	11.41	12.10	12.84	3366	3421	3498
Dimensions L/B/H	Bottom clamping jaw in header	Torsion modulus and stiffness in softwood with horizontal KNAPP screws 8 x 160 mm in header and horizontal KNAPP 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	4.64	4.64	867	883	898
	Bottom tension	5.44	5.87	6.04	817	855	897
430x100x40	Top tension	8.44	9.12	9.89	2187	2272	2353
	Bottom tension	8.25	8.91	9.67	1988	2086	2197
550x100x40	Top tension	11.17	12.07	13.08	4248	4550	4824
	Bottom tension	11.08	11.97	12.98	3872	4016	4198

MEGANT series 150 – Material: EN AW - 6082							
Dimensions L/B/H	Bottom clamping jaw in joist	Torsion modulus and stiffness in softwood with horizontal KNAPP screws 8 x 160 mm in header and horizontal KNAPP 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	4.89	5.29	5.75	1055	1134	1232
	Bottom tension	5.87	5.96	6.03	967	1024	1074
430x150x50	Top tension	7.05	7.62	8.26	2498	2632	2773
	Bottom tension	11.35	11.87	12.36	2333	2464	2651
550x150x50	Top tension	9.28	10.03	10.87	4692	4972	5276
	Bottom tension	16.71	17.68	18.70	4968	5053	5173
610x150x50	Top tension	10.41	11.25	12.18	6065	6434	6843
	Bottom tension	19.37	20.55	21.82	6886	6993	7109
730x150x50	Top tension	12.69	13.70	14.84	9442	9977	10604
	Bottom tension	24.67	26.28	28.02	11884	12152	12391
1030x150x50 SL	Top tension	17.15	18.52	20.07	14193	14783	15470
	Bottom tension	31.22	33.35	35.68	21170	21832	22445

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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 softwood with horizontal KNAPP screws 8 x 160 mm in header and horizontal KNAPP 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	6.23	6.27	6.34	1091	1117	1159
	Bottom tension	7.24	7.83	8.51	1224	1307	1422
430x150x50	Top tension	13.51	13.65	13.77	3117	3262	3394
	Bottom tension	10.91	11.79	12.79	2910	3069	3241
550x150x50	Top tension	19.25	20.80	22.56	5791	6299	6806
	Bottom tension	14.63	15.81	17.13	5513	5796	6136
610x150x50	Top tension	21.66	23.40	25.37	7271	7901	8655
	Bottom tension	16.50	17.82	19.31	7242	7563	7967
730x150x50	Top tension	26.49	28.61	31.00	11305	11881	12706
	Bottom tension	20.24	21.86	23.67	11494	12017	12604
1030x150x50 SL	Top tension	17.10	18.47	20.01	14168	14760	15452
	Bottom tension	26.25	28.35	30.71	23711	24693	25768

MEGANT series 60 – Material: EN AW - 6082

Dimensions L/B/H	Hardwood material	Characteristic load bearing capacity and stiffness in hardwood with screws ASSY PLUS VG 8 x 160 mm acc. to ETA-11/0190								
		$F_{1,KCC,Rk}$	$F_{1,Rk}$	$F_{2,KCC,Rk}$	$F_{2,Rk}$	$F_{3,Rk}$	$F_{4KCC,Rk}$	$F_{4,Rk}$	$M_{tor,Rk}$	$K_{tor,ser}$
mm	-	kN	kN	kN	kN	kN	kN	kN	kNm	kNm/rad
310x60x40	ρ_k = 530 kg/m³	36.6	15.6	150.4 [1)] 130.1 · f_{R2} [2)]	96.3	43.3	36.9	33.0	3.5	374
	ρ_k = 590 kg/m³		17.0		104.9	45.9		35.1	3.9	439
430x60x40	ρ_k = 530 kg/m³		15.6		151.3	59.1	40.6	51.9	7.5	1 241
	ρ_k = 590 kg/m³		17.0		164.9	62.5		55.2	8.5	1 457
550x60x40	ρ_k = 530 kg/m³		15.6		206.3	74.9	44.3	70.8	13.2	2 924
	ρ_k = 590 kg/m³		17.0		224.8	79.2		75.3	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 ASSY PLUS VG 8 x 160 mm acc. to ETA-11/0190								
		$F_{1,KCC,Rk}$	$F_{1,Rk}$	$F_{2,KCC,Rk}$	$F_{2,Rk}$	$F_{3,Rk}$	$F_{4KCC,Rk}$	$F_{4,Rk}$	$M_{tor,Rk}$	$K_{tor,ser}$
mm	-	kN	kN	kN	kN	kN	kN	kN	kNm	kNm/rad
310x100x40	ρ_k = 530 kg/m³	55.3	24.2	224.2 [1)] 206.6 · f_{R2} [2)]	123.8	67.0	62.4	42.5	5.7	644
	ρ_k = 590 kg/m³		26.4		134.9	70.9		45.2	6.4	757
430x100x40	ρ_k = 530 kg/m³		24.2		206.3	90.6	68.6	70.8	11.9	1 986
	ρ_k = 590 kg/m³		26.4		224.8	95.9		75.3	13.3	2 333
550x100x40	ρ_k = 530 kg/m³		24.2		288.9	114.3	74.9	99.1	20.5	4 553
	ρ_k = 590 kg/m³		26.4		314.8	120.9		105.4	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 ASSY PLUS VG 8 x 160 mm acc. to ETA-11/0190								
		$F_{1,KCC,Rk}$	$F_{1,Rk}$	$F_{2,KCC,Rk}$	$F_{2,Rk}$	$F_{3,Rk}$	$F_{4KCC,Rk}$	$F_{4,Rk}$	$M_{tor,Rk}$	$K_{tor,ser}$
mm	-	kN	kN	kN	kN	kN	kN	kN	kNm	kNm/rad
310x150x50	ρ_k = 530 kg/m³	74.3	32.8	375.0 [1)] 366.5 · f_{R2} [2)]	165.1	89.3	68.0	56.6	5.4	567
	ρ_k = 590 kg/m³		35.8		179.9	94.6		60.2	6.1	666
430x150x50	ρ_k = 530 kg/m³		32.8		275.1	120.9	74.8	94.4	17.1	2 970
	ρ_k = 590 kg/m³		35.8		299.8	127.9		100.4	19.2	3 489
550x150x50	ρ_k = 530 kg/m³		32.8		385.2	152.4	81.6	132.1	28.7	6 500
	ρ_k = 590 kg/m³		35.8		419.7	161.2		140.5	32.3	7 634
610x150x50	ρ_k = 530 kg/m³		32.8		440.2	152.4		132.1	28.7	6 500
	ρ_k = 590 kg/m³		35.8		479.6	161.2		140.5	32.3	7 634
730x150x50	ρ_k = 530 kg/m³		32.8		550.3	152.4		132.1	28.7	6 500
	ρ_k = 590 kg/m³		35.8		599.6	161.2		140.5	32.3	7 634
1030x150x50 SL	ρ_k = 530 kg/m³		32.8	650	645.7	152.4		132.1	28.7	6 500
	ρ_k = 590 kg/m³		35.8		703.5	161.2		140.5	32.3	7 634

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MEGANT series 60, 100, and 150 – Material: EN AW - 6082					
Megant series: dimension L	Hardwood material	Slip modulus in hardwood with screws ASSY PLUS VG 8 x 160 mm acc. to ETA-11/0190			
		$K_{1,ser}$	$K_{2,ser}$ 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	8.7	48.2	39.6	8.0
	ρ_k = 590 kg/m³	9.3	51.4	42.2	8.5
series 100: 310, 430, 550	ρ_k = 530 kg/m³	16.0	69.3	58.9	10.9
	ρ_k = 590 kg/m³	17.1	73.9	62.8	11.6
series 150: 310, 430, 550-1030	ρ_k = 530 kg/m³	25.4	106.8	88.2	15.9
	ρ_k = 590 kg/m³	27.1	113.9	94.1	16.9

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 ASSY PLUS VG 8 x 160 mm acc. to ETA-11/0190					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ [1)]		
mm	-	kNm			kNm/rad		
		D30	D50	BauBuche [2)]	D30	D50	BauBuche [2)]
310x60x40	Top tension	1.48	1.62	3.74	519	573	1033
	Bottom tension	3.63	4.00	4.19	602	692	1107
430x60x40	Top tension	2.09	2.29	5.31	1141	1254	2364
	Bottom tension	5.76	6.32	6.59	1717	1935	3176
550x60x40	Top tension	2.74	2.99	6.94	2032	2239	4446
	Bottom tension	7.89	8.65	8.99	3395	3786	6282
Dimensions L/B/H	Bottom clamping jaw in header	Torsion modulus and stiffness in hardwood with horizontal screws ASSY PLUS VG 8 x 160 mm acc. to ETA-11/0190					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ [1)]		
mm	-	kNm			kNm/rad		
		D30	D50	BauBuche [2)]	D30	D50	BauBuche [2)]
310x60x40	Top tension	3.71	4.06	7.03	721	781	1093
	Bottom tension	2.64	2.89	6.68	755	833	1367
430x60x40	Top tension	5.39	5.89	11.90	1724	1966	3383
	Bottom tension	3.92	4.28	9.94	1706	1897	3388
550x60x40	Top tension	7.10	7.75	16.71	3501	3979	7202
	Bottom tension	5.22	5.69	13.23	3184	3560	6746

[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

MEGANT®	Annex 5
Characteristic load bearing capacities	of European Technical Assessment ETA-15/0667 of 16.08.2023

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 ASSY PLUS VG 8 x 160 mm acc. to ETA-11/0190					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ 1)		
mm	-	kNm			kNm/rad		
		D30	D50	BauBuche 2)	D30	D50	BauBuche 2)
310x100x40	Top tension	2.42	2.65	6.12	759	842	1409
	Bottom tension	6.50	7.12	7.52	857	977	1323
430x100x40	Top tension	3.36	3.67	8.51	1709	1898	3315
	Bottom tension	9.93	10.85	12.32	2560	2921	4486
550x100x40	Top tension	4.35	4.75	11.04	3141	3486	6279
	Bottom tension	13.40	14.64	17.12	5327	5995	9657
Dimensions L/B/H	Bottom clamping jaw in header	Torsion modulus and stiffness in hardwood with horizontal screws ASSY PLUS VG 8 x 160 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	4.76	5.21	10.22	1103	1220	1573
	Bottom tension	4.50	4.93	11.41	1081	1219	1780
430x100x40	Top tension	6.91	7.55	17.51	2527	2779	3989
	Bottom tension	6.80	7.42	17.23	2710	3055	4608
550x100x40	Top tension	9.10	9.94	23.08	4768	5372	8639
	Bottom tension	9.11	9.95	23.11	5271	5889	9432

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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 hardwood with horizontal screws ASSY PLUS VG 8 x 160 mm acc. to ETA-11/0190					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ 1)		
mm	-	kNm			kNm/rad		
		D30	D50	BauBuche 2)	D30	D50	BauBuche 2)
310x150x50	Top tension	4.24	4.65	10.75	1270	1412	2211
	Bottom tension	9.48	10.40	10.46	1295	1483	1852
430x150x50	Top tension	6.08	6.64	15.42	2929	3263	5287
	Bottom tension	14.45	15.81	17.74	3801	4338	6179
550x150x50	Top tension	7.99	8.72	20.27	5424	6024	9960
	Bottom tension	19.50	21.31	24.97	7852	8844	13517
610x150x50	Top tension	8.96	9.78	22.72	6967	7734	12985
	Bottom tension	22.04	24.07	28.57	10422	11685	18260
730x150x50	Top tension	10.91	11.90	27.67	10710	11872	20687
	Bottom tension	27.12	29.61	35.78	16628	18519	29842
1030x150x50 SL	Top tension	14.78	16.13	37.49	17068	18885	35369
	Bottom tension	34.28	37.42	45.51	27751	30773	49357

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 ASSY PLUS VG 8 x 160 mm acc. to ETA-11/0190					
		$M_{2,\varphi,Rk}$			$K_{2,\varphi,ser}$ [1)]		
mm	-	kNm			kNm/rad		
		D30	D50	BauBuche [2)]	D30	D50	BauBuche [2)]
310x150x50	Top tension	7.93	8.69	12.97	1545	1695	2070
	Bottom tension	6.21	6.80	15.73	1545	1730	2520
430x150x50	Top tension	11.71	12.81	25.32	3622	4053	5422
	Bottom tension	9.30	10.16	23.58	3787	4268	6088
550x150x50	Top tension	15.57	17.00	37.53	7242	8212	12090
	Bottom tension	12.44	13.58	31.54	7153	8005	11938
610x150x50	Top tension	17.50	19.11	43.58	9700	10972	16828
	Bottom tension	14.01	15.29	35.54	9285	10376	15961
730x150x50	Top tension	21.40	23.35	54.26	15789	17732	28866
	Bottom tension	17.17	18.73	43.55	14499	16158	26374
1030x150x50 SL	Top tension	14.72	16.06	37.32	17005	18814	35262
	Bottom tension	22.52	24.57	57.11	27702	30614	52760

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:

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

(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 ($\rho_k \leq 590 kg/m^3$):	according to ETA for screws in hardwood e.g. ETA-11/0190
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)

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(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 resistance 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 resistance for a single screw in hardwood ($\rho_k \leq 590 kg/m^3$):	according to ETA for screws in hardwood e.g. ETA-11/0190
Characteristic withdrawal resistance 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 resistance 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 resistance for a single screw in hardwood:	according to ETA for screws in hardwood e.g. ETA-11/0190
Characteristic withdrawal resistance 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 $0° \leq \alpha \leq 45°$ $k_{ax} = 1.0$ 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:	$n_{45,J/H}$ 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:	$l_{ef,J/H} = l_{Scr,J/H} - 14\ mm$ $80\ mm \leq l_{scr} \leq 240\ mm$
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 $\gamma_m = 1.3$

(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 resistance 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 resistance for a single screw in hardwood:	according to ETA for screws in hardwood e.g. ETA-11/0190
Characteristic withdrawal resistance 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

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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

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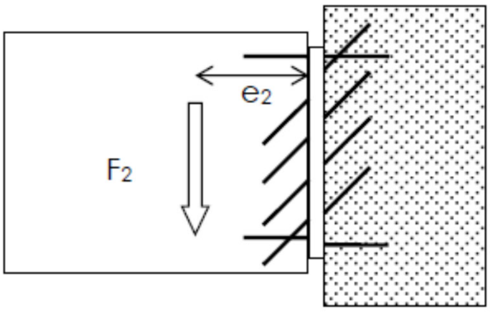
(f) Combined loading:

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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Characteristic load bearing capacities	of European Technical Assessment ETA-15/0667 of 16.08.2023

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:

$\frac{a_J}{H_J} > 0.7$ 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	$k_{s,J/H} = max\begin{cases} 1 \\ 0.7 + \frac{1.4 \cdot a_{r,J/H}}{H_{J/H}} \end{cases}$
	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	$t_{ef} = min\begin{cases} B_{J/H} \\ \frac{l_{ef,J/H}}{\sqrt{2}} \end{cases}$ see Annex 7

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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
Design withdrawal resistance:	$F_{ax,Rd}$ 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:

$\frac{a_J}{B_J} > 0.7$ 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

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Factor	$k_{s,J/H} = max \begin{cases} 1 \\ 0.7 + \dfrac{1.4 \cdot a_{r,J/H}}{B_{J/H}} \end{cases}$
	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	$k_{r,J/H} = \dfrac{n_{J/H}}{\sum_{i=1}^{n_{J/H}} \left(\dfrac{b_{1,J/H}}{b_{i,J/H}}\right)^2}$
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:	$\left(\dfrac{F_{t,90,J/H,d}}{n \cdot F_{ax,Rd}}\right) \le 1.0$
with	
	$F_{t,90,J/H,d} = \left[1 - 3 \cdot \left(\dfrac{a_{J/H}}{B_{J/H}}\right)^2 + 2 \cdot \left(\dfrac{a_{J/H}}{B_{J/H}}\right)^3\right] \cdot F_{90,d}$
Number of fully threaded self-tapping screws for reinforcement	n
Design withdrawal resistance:	$F_{ax,Rd}$ according to EN 1995-1-1 or ETA

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.

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Characteristic load bearing capacities	of European Technical Assessment ETA-15/0667 of 16.08.2023

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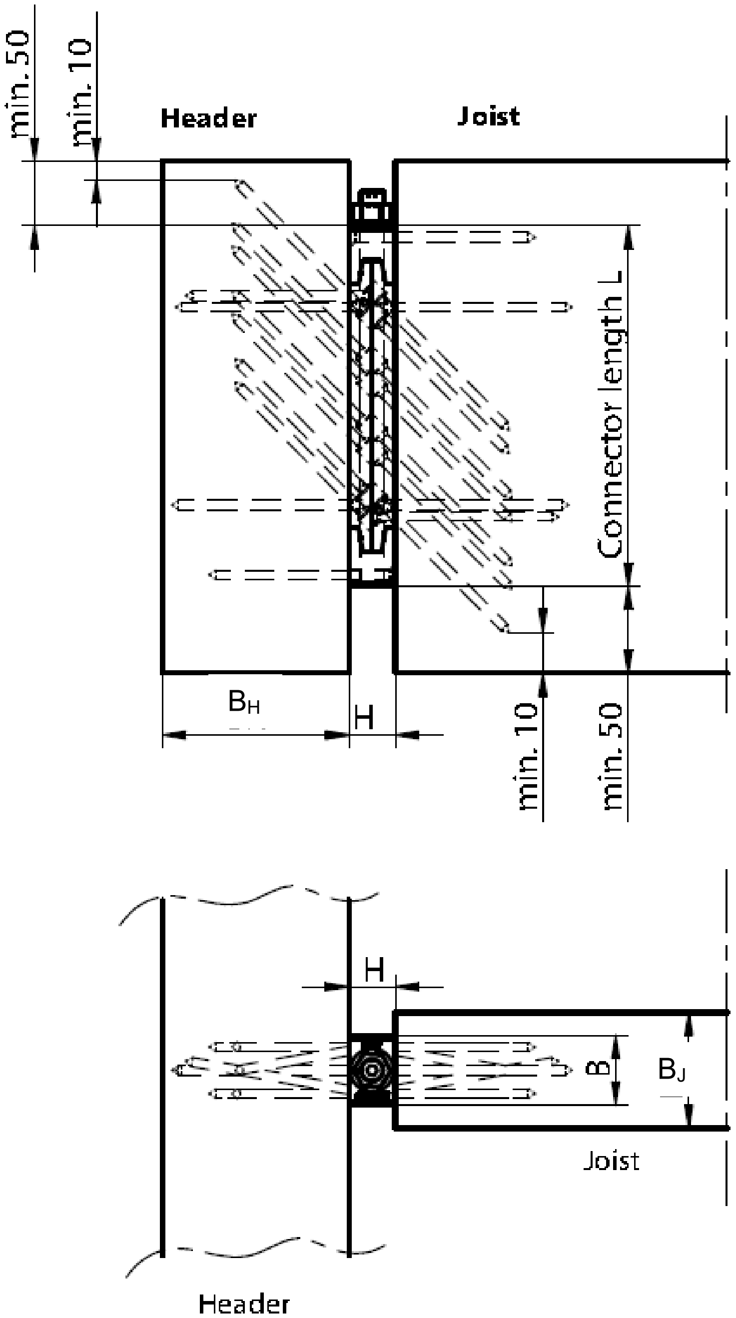
MEGANT (AW 6082) header / joist connection



dimensions in mm

MEGANT®	Annex 6
Dimensions and minimum spacings	of European Technical Assessment ETA-15/0667 of 16.08.2023

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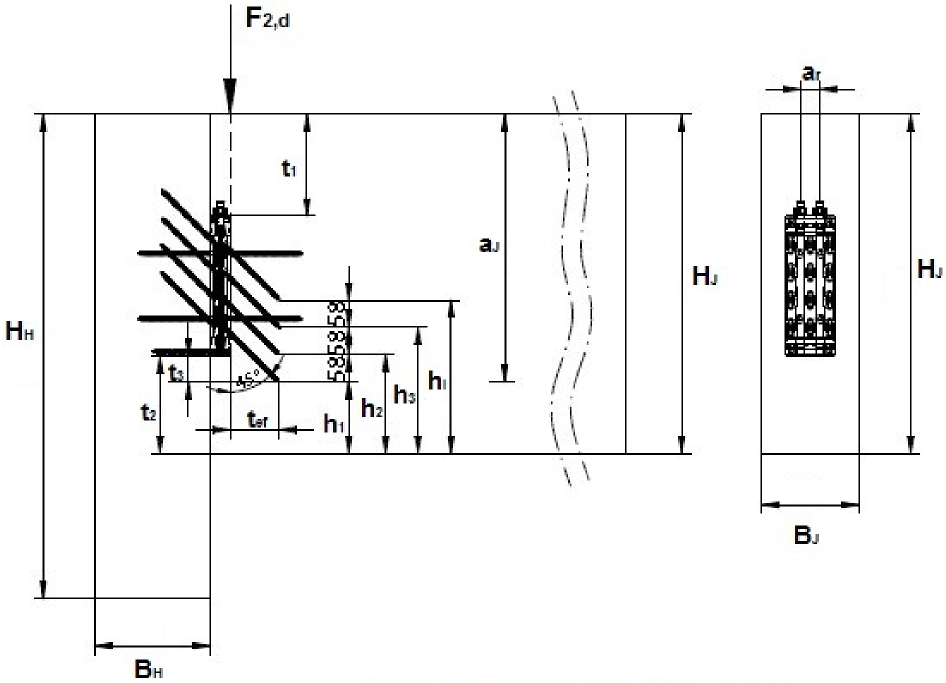
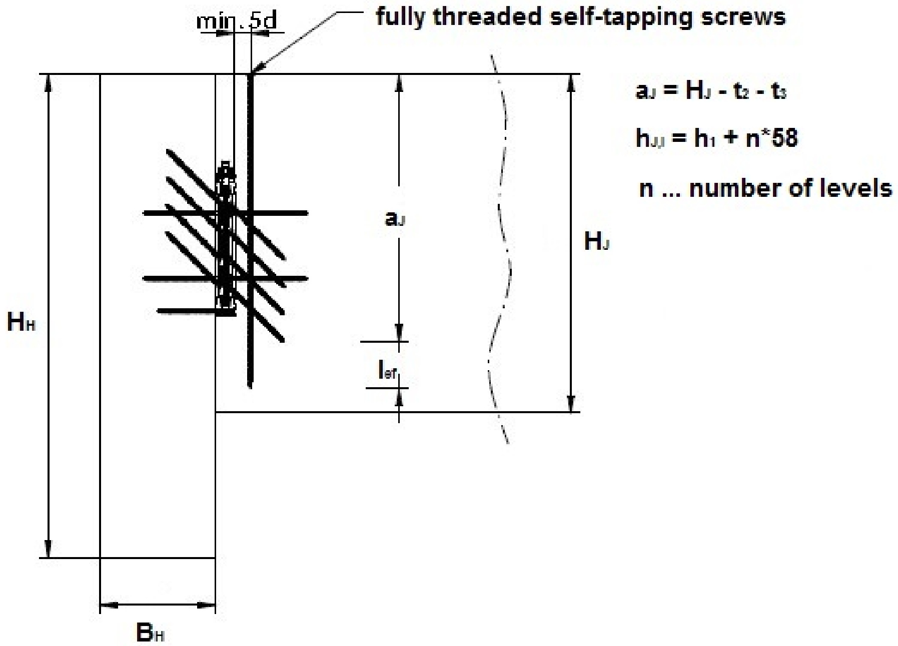
Tension reinforcement in joist - F_2





dimensions in mm

MEGANT®	Annex 7
Tension reinforcement	of European Technical Assessment ETA-15/0667 of 16.08.2023

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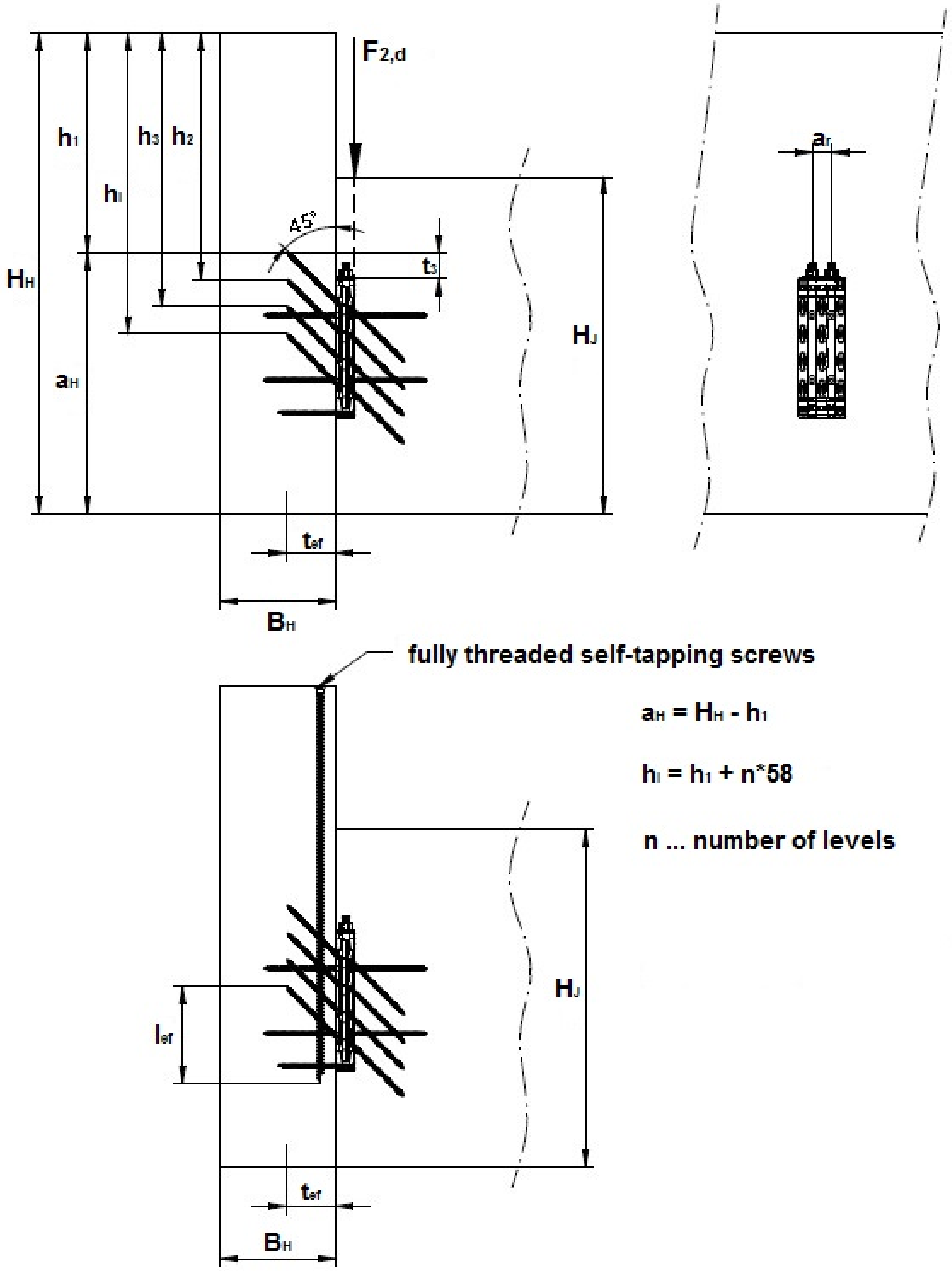
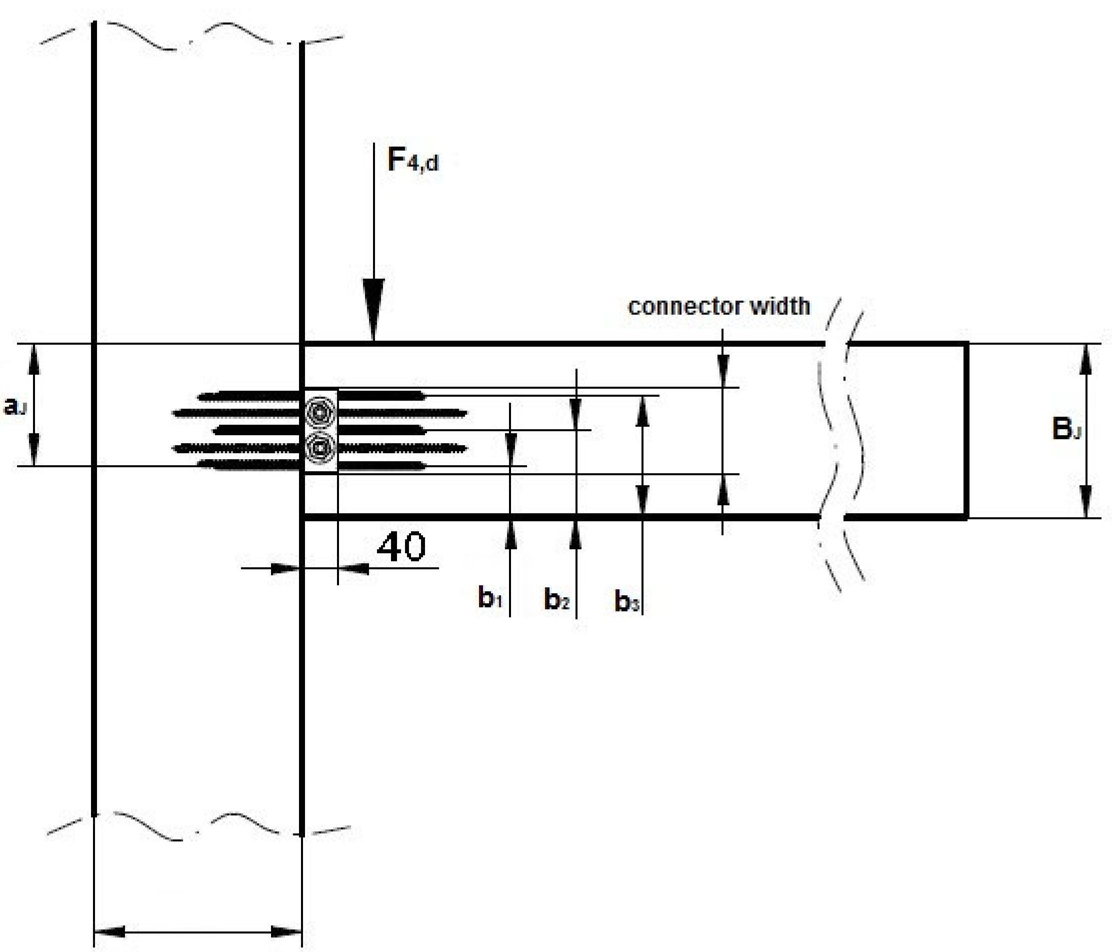
Tension reinforcement in header - F_2



dimensions in mm

MEGANT®	Annex 7
Tension reinforcement	of European Technical Assessment ETA-15/0667 of 16.08.2023

Tension reinforcement – F_4



dimensions in mm

MEGANT®	Annex 7
Tension reinforcement	of European Technical Assessment ETA-15/0667 of 16.08.2023

European Assessment Document EAD 130186-00-0603 “Three-dimensional nailing plates”

European Technical Assessment ETA-14/0354 of 20.09.2021 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

European Technical Assessment ETA-11/0190 of 23.07.2018 for “Würth self-tapping screws” of Adolf Würth GmbH & Co. KG, Reinhold-Würth-Straße 12-17, 74653 Künzelsau, 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 (12.2005) +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 14081-1:2005+A1 (02.2011), 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