ETA-Danmark A/S
Göteborg Plads 1
DK-2150 Nordhavn
Tel. +45 72 24 59 00
Fax +45 72 24 59 04
Internet www.etadanmark.dk

Authorised and notified according to Article 29 of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011

European Technical Assessment ETA-19/0706 of 2025/10/17

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S	
Trade name of the construction product:	Rotho Blaas Disc Flat Connectors
Product family to which the above construction product belongs:	Three-dimensional nailing plate (end grain to side grain connector for timber members)
Manufacturer:	ROTHO BLAAS SRL Via dell'Adige 2/1 IT-39040 Cortaccia (BZ) Tel. + 39 0471 818400 Fax + 39 0471 818484 Internet www.rothoblaas.com
Manufacturing plant:	Held on file by ETA-Danmark A/S
This European Technical Assessment contains:	13 pages including 2 annexes which form an integral part of the document
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:	EAD 130186-00-0603, Three Dimensional Nailing Plates
This version replaces:	The ETA with the same number issued on 2019-11-28

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

Disc Flat connectors are one-piece, face-fixed connectors to be used in timber-to-timber, in steel-to-timber and concrete-to-timber connections.

The Disc Flat connectors are made from steel grade S235 JR according to EN 10025-2 or equivalent or better carbon steel or an equivalent or better stainless steel. Dimensions, hole positions and typical installations are shown in Annexes A and B.

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

Disc Flat connectors are intended for use in making end grain to side grain connections in load bearing timber structures, as a connection between a main and secondary solid timber or wood based member, as well as steel-to timber or concrete-to-timber connections, where requirements for mechanical resistance and stability and safety in use in the sense of the Basic Work Requirements 1 and 4 of the Regulation 305/2011 (EU) shall be fulfilled.

The Disc Flat connectors can be installed as connections between members such as:

- Structural solid timber according to EN 14081,
- Glued laminated or glued solid timber according to EN 14080,
- LVL according to EN 14374 or ETA,
- Cross laminated timber according to ETA,
- Steel plates.

However, the calculation methods are only allowed for a characteristic wood density of up to 500 kg/m^3. Even though the wood-based material may have a larger density, this must not be used in the formulas for the load-carrying capacities of the fasteners.

Annex B states the formulas for the characteristic load-carrying capacities and slip moduli of the connections with Disc Flat connectors. The design of the connections shall be in accordance with Eurocode 5 or a similar national Timber Code.

It is assumed that the forces acting on the connection are the axial force F_1 perpendicular to the connector plane or the shear force F_{23} and F_{45} parallel to the connector plane.

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

The Disc Flat connectors made of carbon steel are for use in timber structures subject to the dry, internal conditions defined by the service classes 1 and 2 of EN 1995-1-1 (Eurocode 5).

The Disc Flat connectors made of stainless steel are for use in timber structures subject to the conditions defined by the service classes 1, 2 and 3 of EN 1995-1-1 (Eurocode 5).

The scope of the connectors regarding resistance to corrosion shall be defined according to national provisions that apply at the installation site considering environmental conditions and in conjunction with the admissible service conditions according to EN 1995-1-1 and the admissible corrosivity category as described and defined in EN ISO 12944-2.

The provisions made in this European Technical Assessment are based on an assumed intended working life of the connectors and fasteners of 50 years.

The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

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

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability*) (BWR1)	
Joint Strength - Characteristic load-carrying capacity	See Annex B
Joint Stiffness	See annex B
Joint ductility	No performance assessed
Resistance to seismic actions	No performance assessed
Resistance to corrosion and deterioration	See section 3.6
3.2 Safety in case of fire (BWR2)	
Reaction to fire	The conenctors are made from steel classified as **Euroclass A1** in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364
Resistance to fire	No performance assessed
3.3 General aspects related to the performance of the product	The conenctors have been assessed as having satisfactory durability and serviceability when used in timber structures using the timber species described in Eurocode 5 and subject to the conditions defined by service class 1, 2 and 3

*) See additional information in section 3.4 – 3.7.

3.4 Methods of verification

Safety principles and partial factors

The characteristic load-carrying capacities are based on the characteristic values of the connections with metal fasteners, the steel plates and the timber members.

In the case of timber failure or failure of the metal fasteners, the design values shall be calculated according to EN 1995-1-1 by dividing the characteristic values of the load-carrying capacities by different partial factors for the strength properties, and in addition multiplied with the coefficient k_{mod}.

In the case of steel failure, the design value shall be calculated according to EN 1993-1-1 by reducing the characteristic values of the load-carrying capacity with different partial factors.

The design value of the load-carrying capacity is the smaller value of all load-carrying capacities:

$$F_{Rd} = \min\left\{\frac{k_{mod} \cdot F_{Rk,T}}{\gamma_{M,T}}; \frac{F_{Rk,S}}{\gamma_{Mi,S}}\right\}$$

Therefore, for timber failure or failure of the metal fasteners the load duration class and the service class are included. The different partial factors γ_M for steel or timber failure, respectively, are also correctly taken into account.

3.5 Mechanical resistance and stability

See Annex B for characteristic load-carrying capacities of the Disc Flat connections.

The characteristic capacities of the connectors are determined by calculation assisted by testing as described in the EAD 130186-00-0603 clause 2.2.1. They should be used for designs in accordance with Eurocode 5 or a similar national Timber Code.

The design models allow the use of fasteners described in the table on page 8 in Annex A:

- *Screws in accordance with EN 14592 or ETA-11/0030*
- *Bolts in accordance with EN ISO 898, EN ISO 4014, EN ISO 4016, EN ISO 4017, EN ISO 4018, EN 15048 or ETA*

No performance has been determined in relation to ductility of a joint under cyclic testing. The contribution to the performance of structures in seismic zones, therefore, has not been assessed.

3.6 Aspects related to the performance of the product

3.6.1 Corrosion protection in service class 1, 2 and 3
In accordance with EAD 130186-00-0603 the Disc Flat connectors are produced from steel grade S235 JR according to EN 10025-2 or equivalent or better carbon steel or an equivalent or better stainless steel..

3.7 General aspects related to the use of the product

Disc Flat connectors are manufactured in accordance with the provisions of this European Technical Assessment using the manufacturing processes as identified in the inspection of the plant by the notified inspection body and laid down in the technical documentation.
The following provisions concerning product performance apply:

Disc Flat connector joints

A Disc Flat connector joint is deemed fit for its intended use provided:

- The timber member shall be free from wane under the Disc Flat connector.
- Disc Flat connectors are fastened to wood-based members by self-tapping screws.
- There shall be screws of equal length in all holes.
- The characteristic capacity of the Disc Flat connector joint is calculated according to the manufacturer's technical documentation dated 2019-09-16.
- The Disc Flat connector joint is designed in accordance with Eurocode 5 or an appropriate national code.
- The gap between the timber member and the surface, where contact stresses can occur during loading shall be limited. This means that for Disc Flat connectors the gap between the timber members shall be maximum 1 mm.
- The depth of the timber member shall be so large that the edge of the timber member is outside the screw tips in the secondary member.
- The spacing between adjacent Disc Flat connectors in connections containing more than one connector shall be large enough to avoid contact between screw tips.
- Screws to be used shall have a diameter of 5 mm to 7 mm and head shape which fits the holes of the Disc Flat connectors.
- Disc Flat connectors is used as part of post bases type R30 according to ETA-10/0422.

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

4.1 AVCP system

According to the decision 97/638/EC of the European Commission1, as amended, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 2+.

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking.

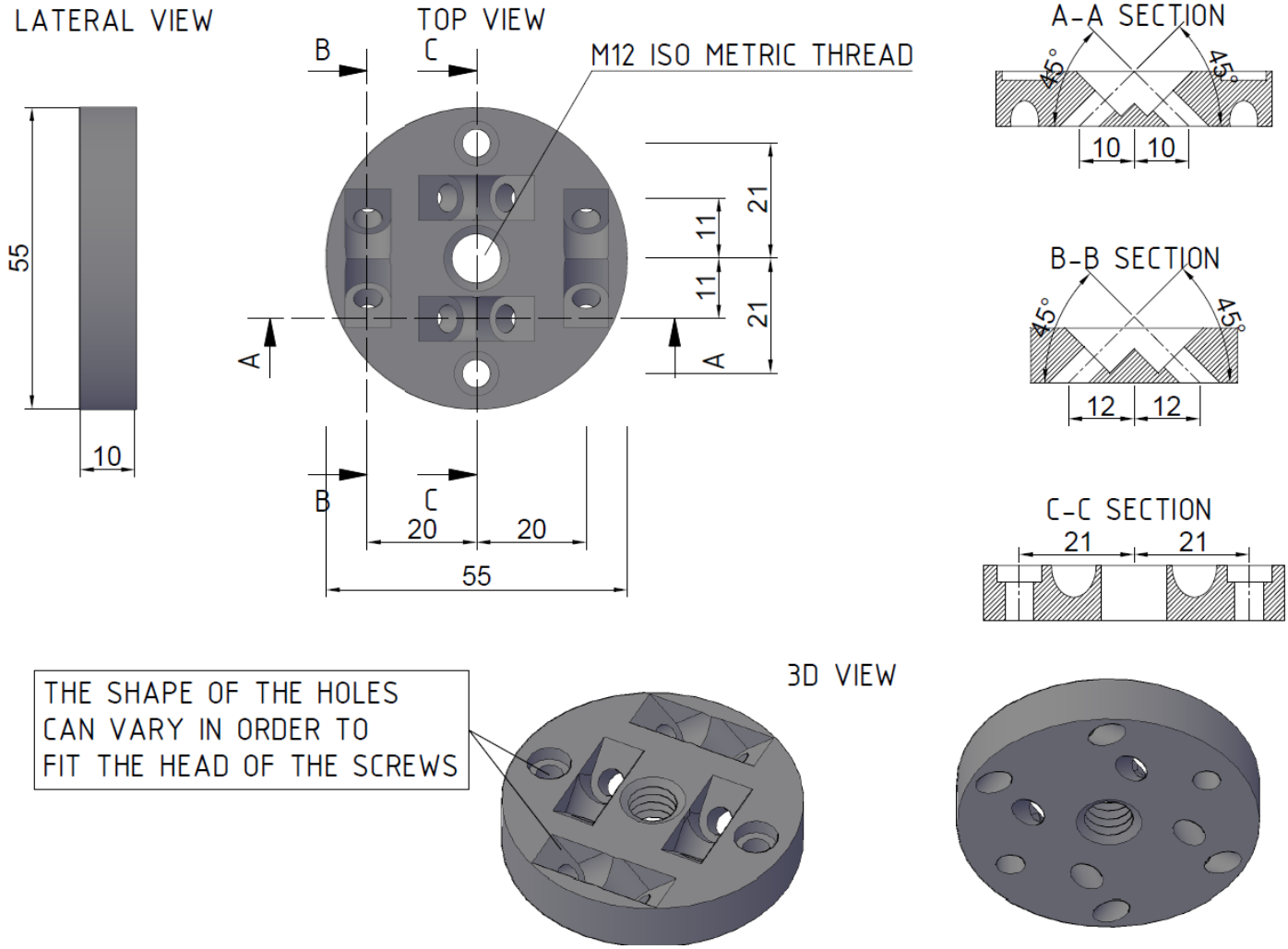
Issued in Copenhagen on 2025-10-17 by

Thomas Bruun
Managing Director, ETA-Danmark

Annex A
Product details and definitions

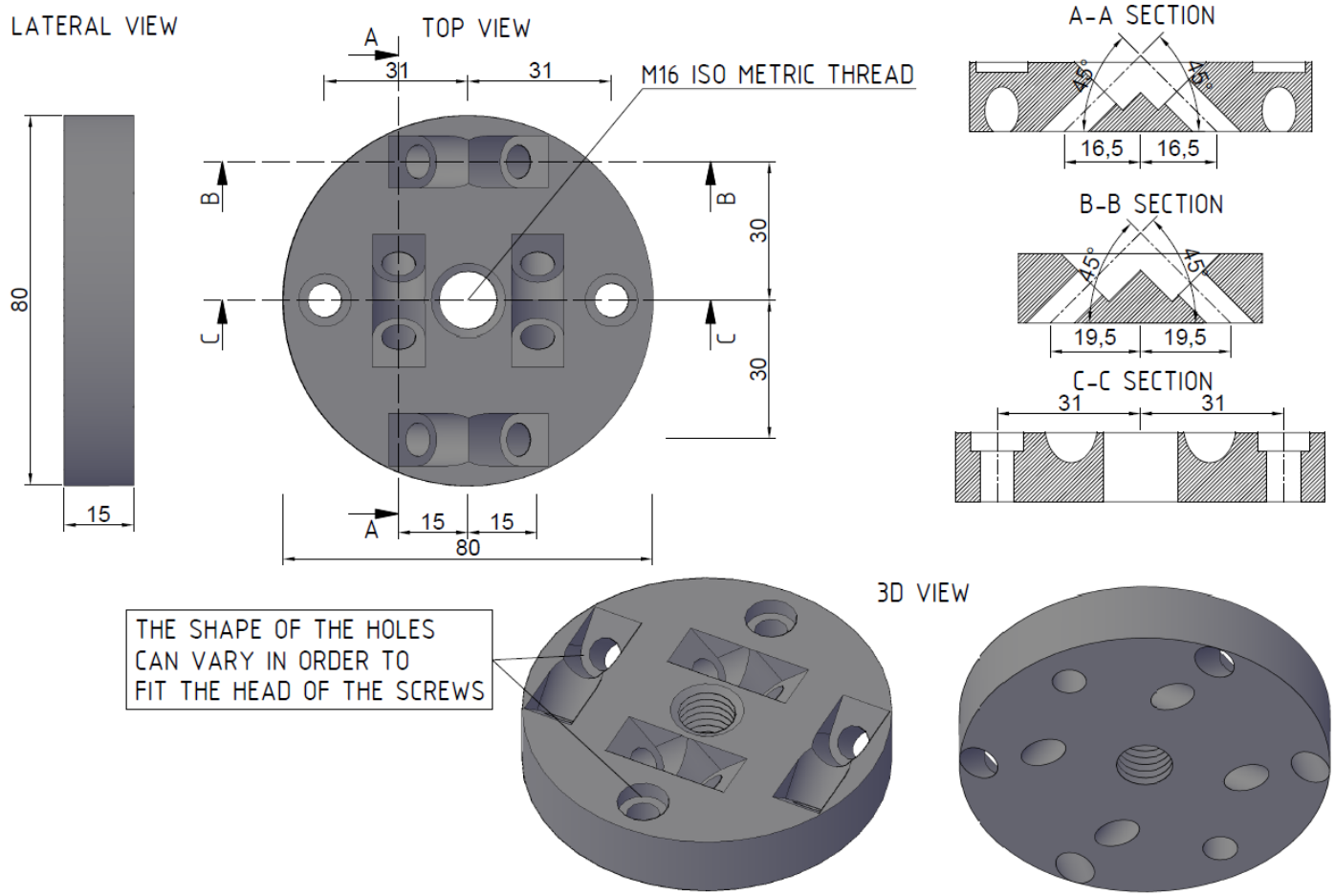
Disc 55 Flat connector

Face mount one-piece connector. Steel grade S235 JR according to EN 10025-2 or equivalent or better carbon steel or an equivalent or better stainless steel. Timber-to-timber or steel-to-timber connections with 5 mm screws and metric bolts M12.



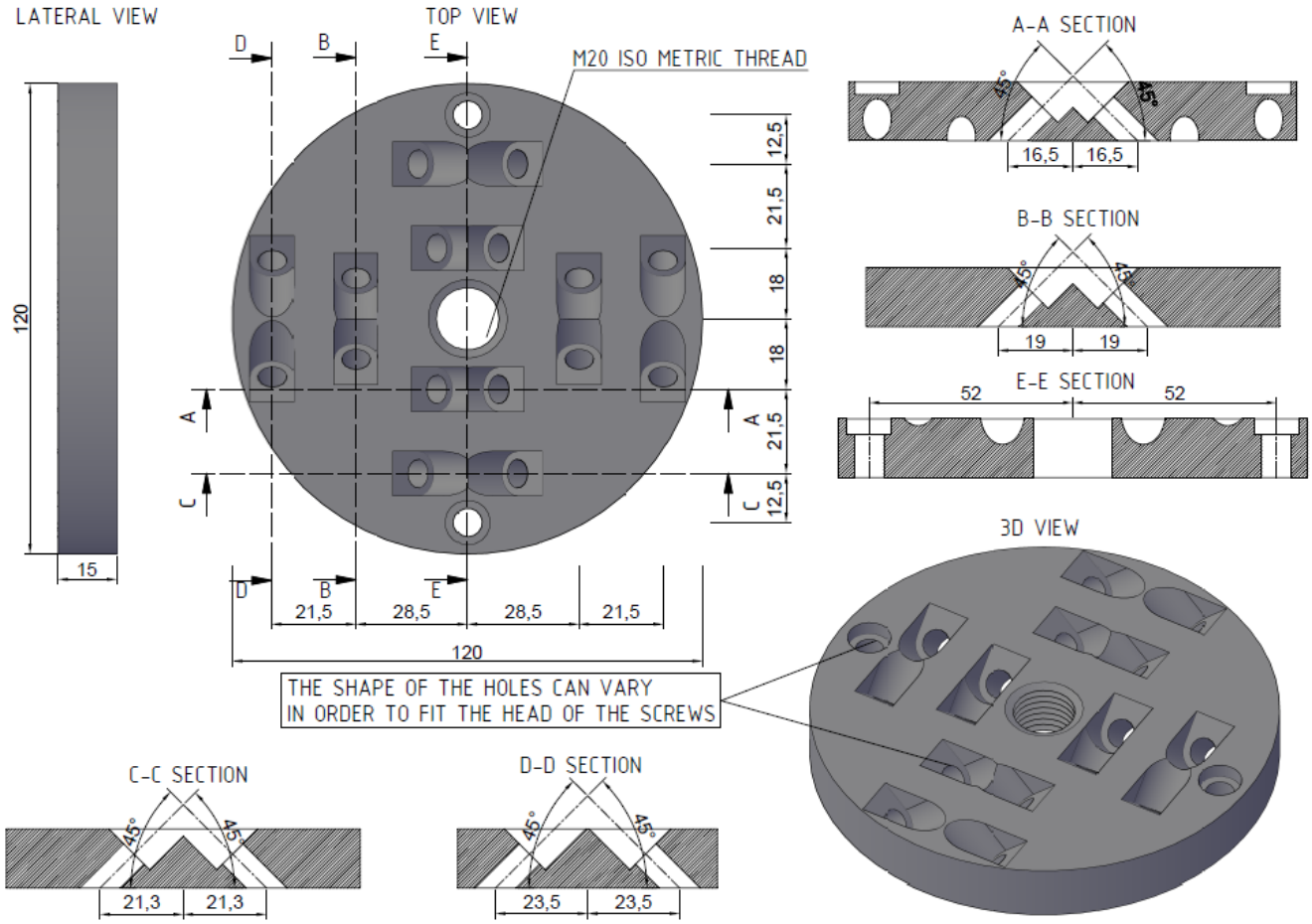
Disc 80 Flat connector

Face mount one-piece connector. Steel grade S235 JR according to EN 10025-2 or equivalent or better carbon steel or an equivalent or better stainless steel.Timber-to-timber or steel-to-timber connections with 6 mm or 7 mm screws and metric bolts M16.



Disc 120 Flat connector

Face mount one-piece connector. Steel grade S235 JR according to EN 10025-2 or equivalent or better carbon steel or an equivalent or better stainless steel.Timber-to-timber or steel-to-timber connections with 6 mm or 7 mm screws and metric bolts M20.

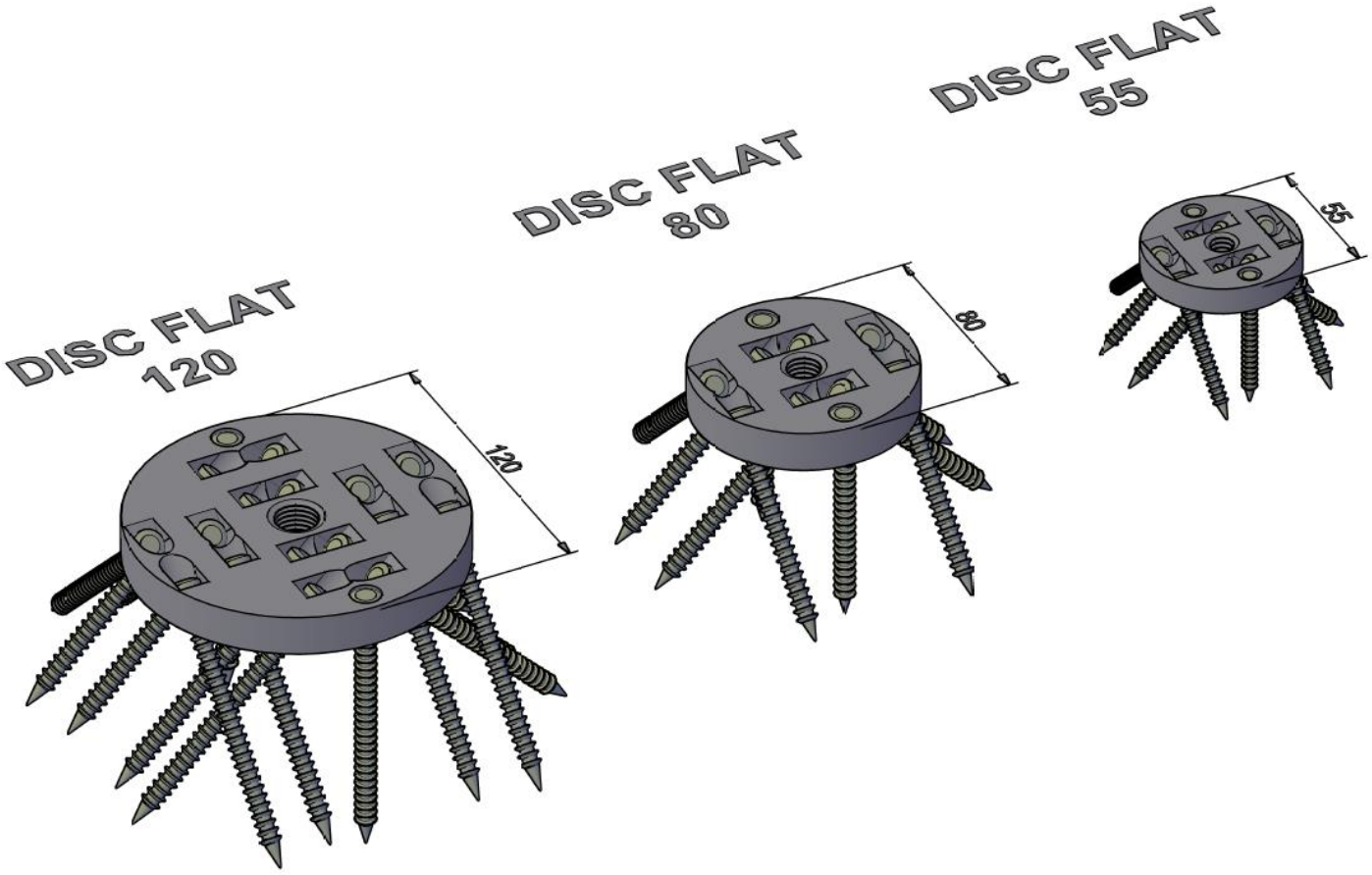


Fastener types and sizes

SCREW diameter [mm]	Length [mm]	Screw type
5.0	50 - 70	Self-tapping full thread screws according to ETA-11/0030 or EN 14592
6.0 or 7.0	60 - 120	Self-tapping full thread screws according to ETA-11/0030 or EN 14592

BOLTS diameter [mm]	Length [mm]	Bolt type
12.0 – 20.0	80 - 500	Bolts or threaded rods with metric thread min. 4.6 according to EN ISO 898, EN ISO 4014, EN ISO 4016, EN ISO 4017, EN ISO 4018, EN 15048 or ETA

Metal anchors diameter [mm]	Length [mm]	Anchor type
12.0 – 20.0	80 - 500	Adhesive anchors according to ETA

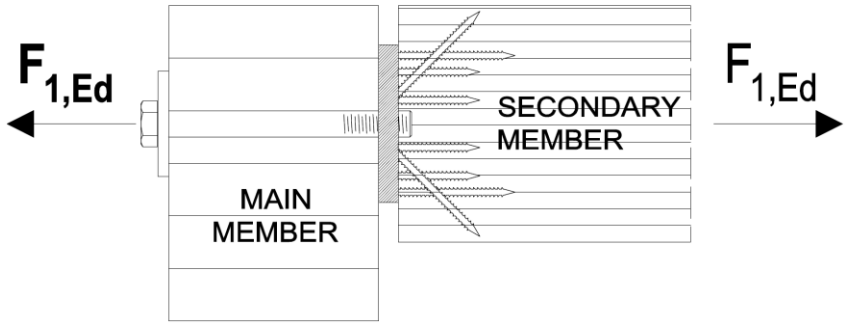


Annex B
Characteristic values of load-carrying-capacities and slip moduli

The forces are assumed to act parallel or perpendicular to the plane of the connector.

Timber-to-timber or steel-to-timber connections with screws and bolt loaded in tension

The screws of equal length are arranged in all the screw holes of the connector. The angle between connector plane and grain direction of the secondary member may be between 0° and 90°.

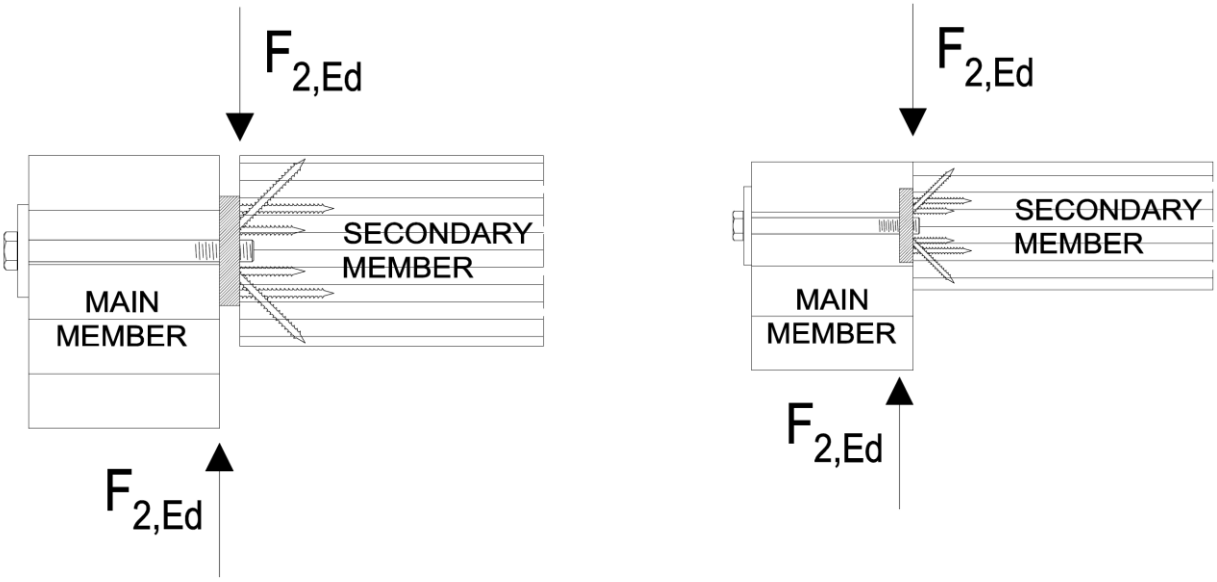


Example shown: Disc 120 Flat with screws 7x100 in end grain of secondary beam

$$F_{l,Rk} = \min\left\{F_{ax,bolt,Rk}\,;\, n_{45}\cdot\frac{F_{ax,45,Rk}}{\sqrt{2}} + 2\cdot F_{ax,0,Rk}\right\} \qquad \text{(B.1)}$$

Timber-to-timber connections with screws and bolt loaded in shear

Only a full fastener pattern is specified, where there are screws of equal length in all the holes of the connector. The angle between connector plane and grain direction of the secondary member may be between 0° and 90°.



Examples shown: Disc 80 Flat not inserted into main member loaded by force $F_{2,Ed}$ (left), Disc 50 Flat inserted into main member loaded by force $F_{2,Ed}$ (right)

$$F_{23,Rk} = F_{45,Rk} = \min\begin{cases}\dfrac{1{,}25\cdot F_{ax,45,Rk}\cdot n_{45}}{2\cdot\sqrt{2}}\\[2ex] F_{v,bolt,Rk} + \dfrac{k_{DF}\cdot 0{,}1\cdot d_{DF}^{1,5}\cdot\rho_k}{1{,}4\cdot\sin^2\alpha+\cos^2\alpha}\end{cases} \qquad \text{(B.2)}$$

Steel-to-timber connections with screws and bolt loaded in shear

Only a full fastener pattern is specified, where there are screws of equal length in all the holes of the connector.

$$F_{23,Rk} = F_{45,Rk} = \frac{1,25 \cdot F_{ax,45,Rk} \cdot n_{45}}{2 \cdot \sqrt{2}} \quad \text{(B.3)}$$

Where:

$F_{ax,bolt,Rk}$ Characteristic axial bolt capacity according to Eurocode 5 in N,

$F_{v,bolt,Rk}$ Characteristic lateral bolt capacity according to Eurocode 5 for thick steel plates in single shear,

$F_{ax,0,Rk}$ Characteristic withdrawal capacity of a screw at an angle $\alpha = 0°$ to the grain according to ETA-11/0030 or EN 14592 in N,

$F_{ax,45,Rk}$ Characteristic withdrawal capacity of a screw at an angle $\alpha = 45°$ to the grain according to ETA-11/0030 or EN 14592 in N,

n_{45} Number of screws per Disc Flat connector arranged under 45° to the connector plane,

k_{DF} Factor taking into account the insertion of the Disc Flat connector in the timber main member,
$k_{DF} = 1$ for inserted Disc Flat connectors,
$k_{DF} = 0$ for not inserted Disc Flat connectors,

d_{DF} Diameter of the Disc Flat connector, d_{DF} = 55 mm or 80 mm or 120 mm,

ρ_k Characteristic density of the main member in kg/m³,

α Angle between load and grain direction of the main member

Combined loading by $F_{1,Ed}$, $F_{23,Ed}$ and $F_{45,Ed}$

For simultaneous loads $F_{1,Ed}$, $F_{23,Ed}$ and $F_{45,Ed}$ the following condition should be fulfilled:

$$\left(\frac{F_{1,Ed}}{F_{1,Rd}}\right)^2 + \frac{F_{23,Ed}}{F_{23,Rd}} + \frac{F_{45,Ed}}{F_{45,Rd}} \leq 1$$

Where:

$F_{1,Ed}$ Design value of the load perpendicular to the connector plane,

$F_{23,Ed}$ Design value of the load parallel to the connector plane in load direction F_2 or F_3,

$F_{45,Ed}$ Design value of the load parallel to the connector plane in load direction F_4 or F_5,

$F_{1,Rd}$ Design value of the load-carrying capacity perpendicular to the connector plane,

$F_{23,Rd}$ Design value of the load-carrying capacity parallel to the connector plane for load direction F_2 or F_3.

$F_{45,Rd}$ Design value of the load-carrying capacity parallel to the connector plane for load direction F_4 or F_5.

The slip modulus per Disc Flat connector may be assumed as:

$K_{1,ser} = 150\ \text{kN/mm}$ for Disc Flat connectors loaded perpendicular to the connector plane in tension

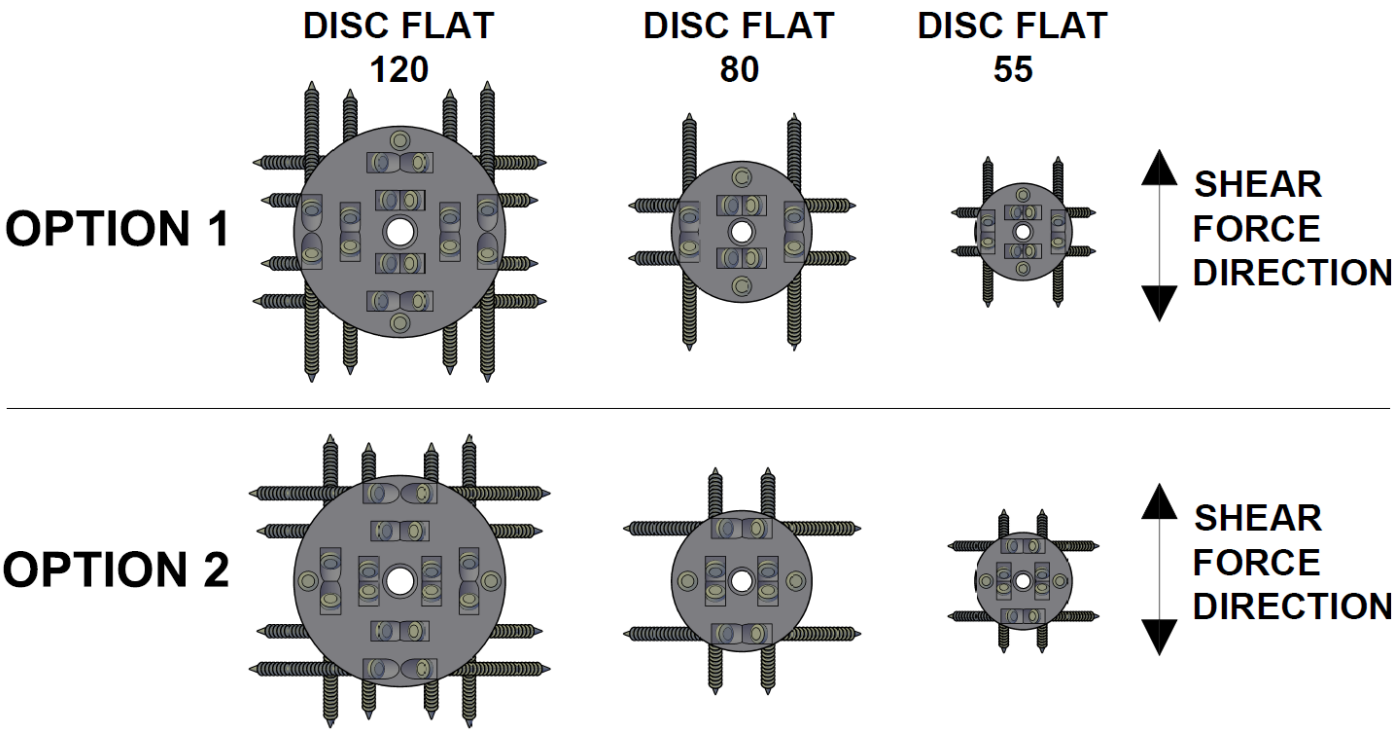
$K_{23,ser} = K_{45,ser} = \frac{\rho_m^{1,5} \cdot d}{23}$ kN/mm for Disc Flat connectors with laterally loaded bolt in timber-to-timber connections

$K_{23,ser} = K_{45,ser} = 70 \cdot d^2$ N/mm for Disc Flat connectors with laterally loaded bolt in steel-to-timber connections

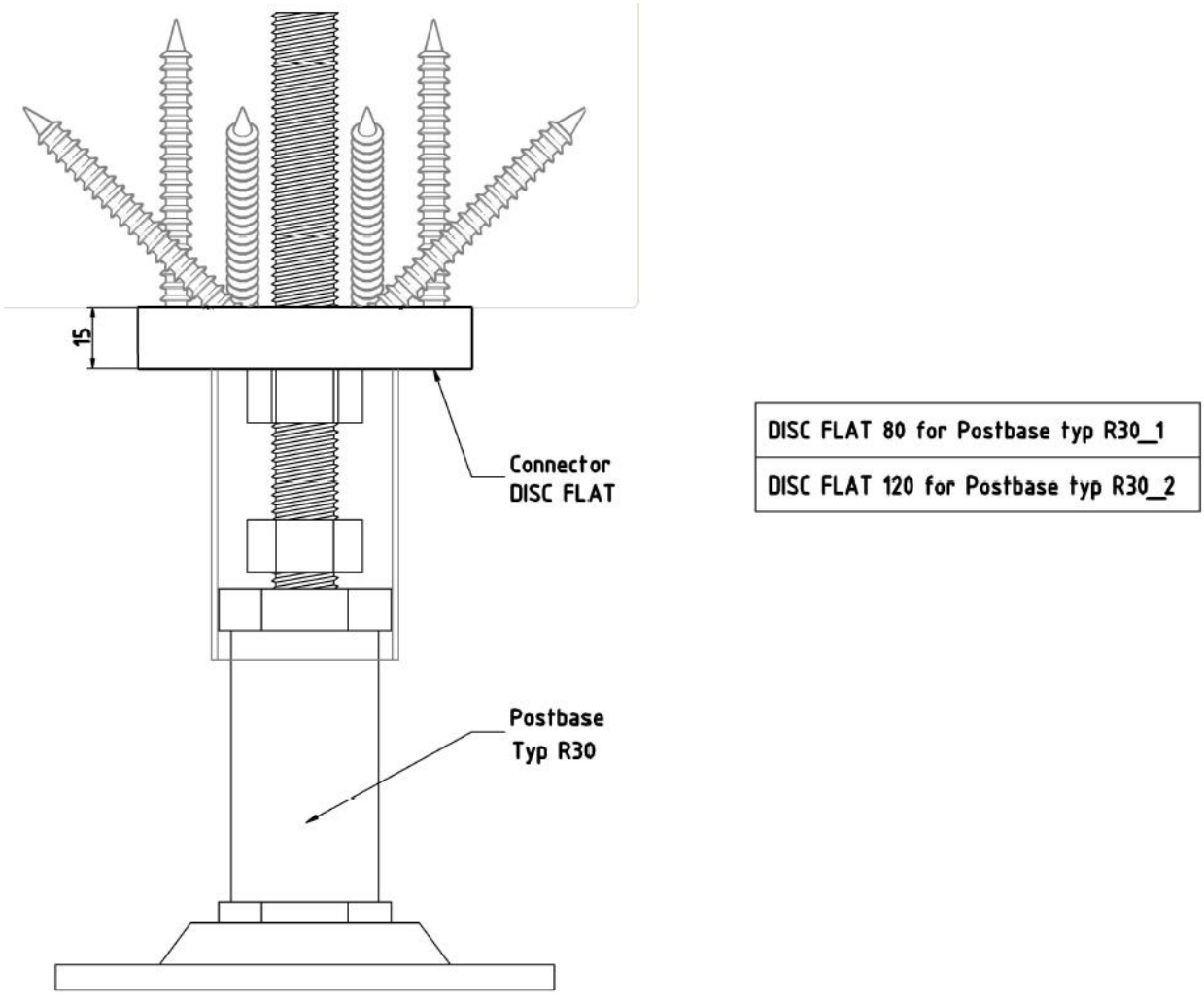
Where:

d Bolt diameter in mm,

ρ_m Mean density of the main timber member in kg/m³,



Orientation of Disc Flat connectors for shear force loading: F23 (top), F45 (bottom)



Disc Flat connector used as part of type R30 post bases according to ETA-10/0422