ETA-Danmark A/S
Göteborg Plads 1
DK-2150 Nordhavn
Tel. +45 72 24 59 00
Fax +45 72 24 59 04
Internet ww.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-09/0104 of 2022/10/21

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:	Purlin Ties 170, 210, 250, 290 right/left Purlin Ties 170, 210, 250 uni
Product family to which the above construction product belongs:	Three-dimensional nailing plate (Purlin tie for timber-to-timber connections)
Manufacturer:	Gutzeit Verbindungssysteme GmbH & Co. Rudolf-Diesel-Strasse 1 D-58730 Fröndenberg, Industriegebiet Tel. +49 2373 - 979261 Fax +49 2373 - 979266 Internet www.gutzeit-holzverbinder.de
Manufacturing plant:	Gutzeit Verbindungssysteme GmbH & Co. Rudolf-Diesel-Strasse 1 D-58730 Fröndenberg, Industriegebiet
This European Technical Assessment contains:	14 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 for Three-dimensional nailing plates
This version replaces:	The previous ETA with the same number issued on 2020-01-11

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

Technical description of the product
Gutzeit purlin ties right/left 170, 210, 250 and 290 and Gutzeit purlin ties uni 170, 210 and 250 are one-piece non-welded, face-fixed purlin ties to be used in timber to timber connections. They are connected to the timber elements by ringed shank nails.

The purlin ties are made from pre-galvanized steel DX51D+ Z275 according to EN 10346 with $R_e \geq 295$ N/mm², $R_m \leq 360$ N/mm² and $A_{80} \geq 22\%$. Dimensions, hole positions and typical installations are shown in Annex A. Purlin ties are made from steel with tolerances according to EN 10143.

The purlin ties can also be produced from hardened stainless steel number 1.4301, 1.4401, 1.4541 and 1.4571 in strength class CP350 according to EN 10088-4 or a stainless steel with a strength class CP350 according to EN 10088-4. Tolerances are according to EN ISO 9445

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

The purlin ties are intended for use in making connections in load bearing timber structures, as a connection between a beam and a purlin, where requirements for mechanical resistance and stability and safety in use in the sense of the Basic Works Requirements 1 and 4 of Regulation (EU) 305/2011 shall be fulfilled.

The connection always contains two purlin ties (see Annex A).

The static and kinematic behaviour of the timber members or the supports shall be as described in Annex B.

The wood members may be of solid timber, glued laminated timber and similar glued members, or wood-based structural members with a characteristic density from 290 kg/m^3 to 420 kg/m^3. This requirement to the material of the wood members may be fulfilled by using the following materials:

- Structural solid timber according to EN 14081,
- Glulam classified according to EN 14080,
- Glued solid timber according to EN 14080,
- LVL according to EN 14374,
- Cross laminated timber according to ETA,
- Plywood according to EN 636.

Annex B states the load-carrying capacities of the purlin tie connections for a characteristic density of 350 kg/m^3. For timber or wood based material with a lower characteristic density than 350 kg/m^3 the load-carrying capacities of the nailed connection shall be modified by the k_{dens} factor:

$$k_{dens} = \sqrt{\frac{\rho_k}{350}}$$

where ρ_k is the characteristic density of the timber in kg/m^3.

The design of the connections shall be in accordance with Eurocode 5 or a similar national Timber Code. The wood members shall have a thickness which is larger than the penetration depth of the nails into the members.

The purlin ties are primarily for use in timber structures subject to the dry, internal conditions defined by service class 1 and 2 of Eurocode 5 and for connections subject to static or quasi-static loading.

The purlin ties can also be used in outdoor timber structures, service class 3, when a corrosion protection in accordance with Eurocode 5 is applied, or when stainless steel with similar or better characteristic yield and ultimate strength is employed.

The scope of the brackets regarding resistance to corrosion shall be defined according to national provisions that apply at the installation site considering environmental conditions.

The provisions made in this European Technical Assessment are based on an assumed intended working life of the purlin ties 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 purlin ties are made from steel classified as Euroclass A1 in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364
3.3 General aspects related to the performance of the product	The purlin ties have been assessed as having satisfactory durability and serviceability when used in timber structures using the timber species described in Eurocode 5 and subject to the conditions defined by service class 1 and 2
Identification	See Annex A

*) See additional information in section 3.4 – 3.7.

3.4 Methods of verification

The characteristic load-carrying capacities are based on the characteristic values of the nail connections, the timber components and the steel plates. To obtain design values the capacities have to be divided by different partial factors for the material properties, the nail connection and the timber components in addition multiplied with the coefficient k_{mod}.

According to EN 1990 (Eurocode – Basis of design) paragraph 6.3.5 the design value of load-carrying capacity can be determined by reducing the characteristic values of the load-carrying capacity with different partial factors.

Thus, the characteristic values of the load–carrying capacity are determined also for timber failure $F_{Rk,N}$ (reaching the embedment strength of nails subjected to shear), $F_{90,Rk}$ (reaching the transverse tensile strength of the timber components) as well as for steel plate failure $F_{Rk,S}$. The design value of the load–carrying capacity is the smaller value of both load–carrying capacities.

$$F_{Rd} = \min\left\{\frac{k_{mod} \cdot F_{Rk,N}}{\gamma_{M,T}}; \frac{F_{Rk,S}}{\gamma_{M,S}}; \frac{k_{mod} \cdot F_{90,Rk}}{\gamma_{M,T}}\right\}$$

In the case of timber failure, the design value shall be calculated according to EN 1995-1-1 by dividing the characteristic value of the load-carrying capacity by the partial factor for the material property and by multiplying with the coefficient k_{mod}, taking the load duration class and the service class into account.

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 partial factor $\gamma_{M,S} = \gamma_{M0}$.

3.5 Mechanical resistance and stability

See annex B for the characteristic load-carrying capacity in the direction F_1.

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

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

No performance has been determined in relation to the joint's stiffness properties - to be used for the analysis of the serviceability limit state.

3.6 Aspects related to the performance of the product

3.6.1 Corrosion protection in service class 1 and 2.
The purlin ties are made from pre-galvanized steel DX51D+Z275 according to EN 10346 with $R_e \geq 295$ N/mm², $R_m \leq 360$ N/mm² and $A_{80} \geq 22\%$

3.6.2 Corrosion protection in service class 3.
In accordance with Eurocode 5 connectors with a thickness up to 3 mm shall be made from stainless steel.

3.7 General aspects related to the fitness for use of the product

Gutzeit purlin ties 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 execution of the connection shall be in accordance with the following:

A purlin tie connection is deemed fit for its intended use provided:

- The structural members to which the purlin ties are fixed shall be:
  - Restrained against rotation.
  - Strength class C14 or better, see section 1 of this ETA
  - Free from wane under the purlin tie.

- The tensile perpendicular to the grain capacity of the timber member to be used in conjunction with the purlin tie is to be checked by the designer of the structure to ensure it is not less than the purlin tie capacity and, if necessary, the purlin tie capacity reduced accordingly.

- The gap between the timber members does not exceed 3 mm.

- There are no specific requirements relating to preparation of the timber members

4 Attestation and verification of constancy of performance (AVCP)

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 foreseen 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 2022-10-21 by

Thomas Bruun
Managing Director, ETA-Danmark

Annex A
Product details and definitions

Table A.1 Materials specification

Purlin Ties Type	Thickness (mm)	Steel specification	Coating specification
right/left (170-290)	2,0	DX51D[1)] or stainless steel	Z275
uni (170-250)	2,0	DX51D[1)] or stainless steel	Z275
[1)] $R_e \geq 295$ N/mm², $R_m \leq 360$ N/mm² and $A_{80} \geq 22\%$			

Table A.2 Dimensions

Purlin Ties Type	Length (mm)		Width (mm)	
	min	**max**	**min**	**max**
right/left	169	172	33,5	35,0
right/left	209	212	33,5	35,0
right/left	249	252	33,5	35,0
right/left	289	292	33,5	35,0
uni	168	172	34,5	35,5
uni	208	212	34,5	35,5
uni	248	252	34,5	35,5

Table A.3 Fastener specification

	Diameter [mm]	Length [mm]	Profiled length [mm]	Withdrawal resistance	Nail type
Nails	4,0	40	31	$f_{ax,k} \geq 6{,}13$ N/mm²	Ringed shank nails according to EN 14592
	The shape of the nail directly under the head shall be in the form of a truncated cone with a diameter under the nail head which exceeds the hole diameter.				

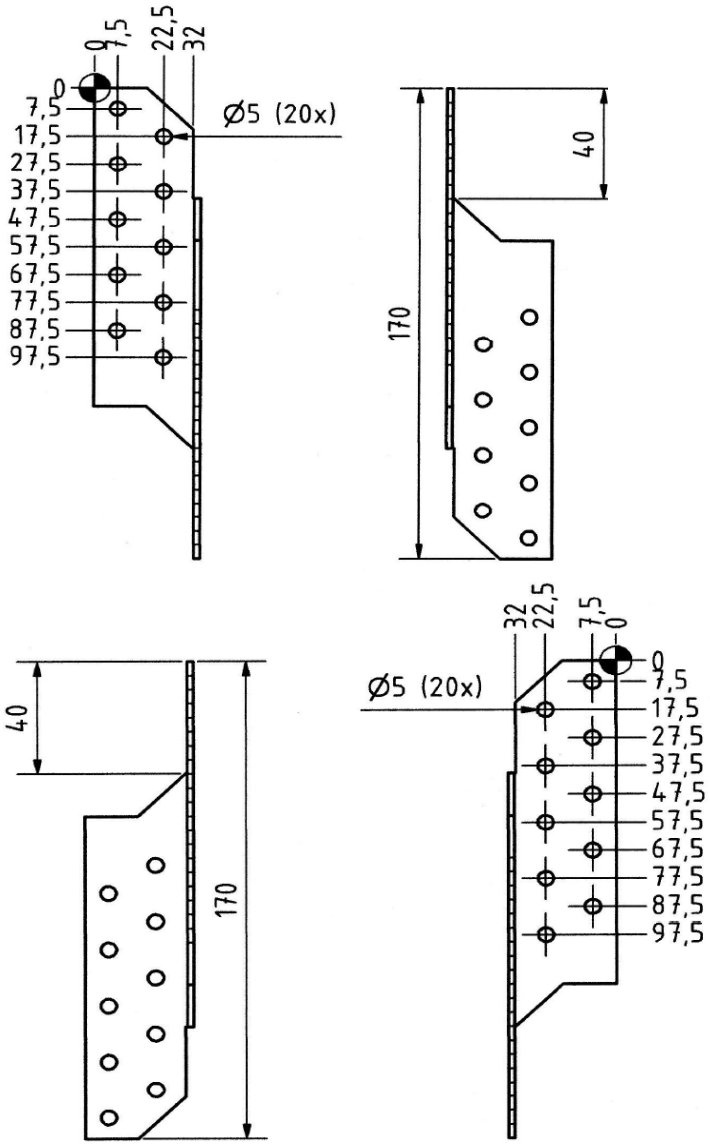

Figure A. 1 Dimensions of Purlin Ties 170 right/left

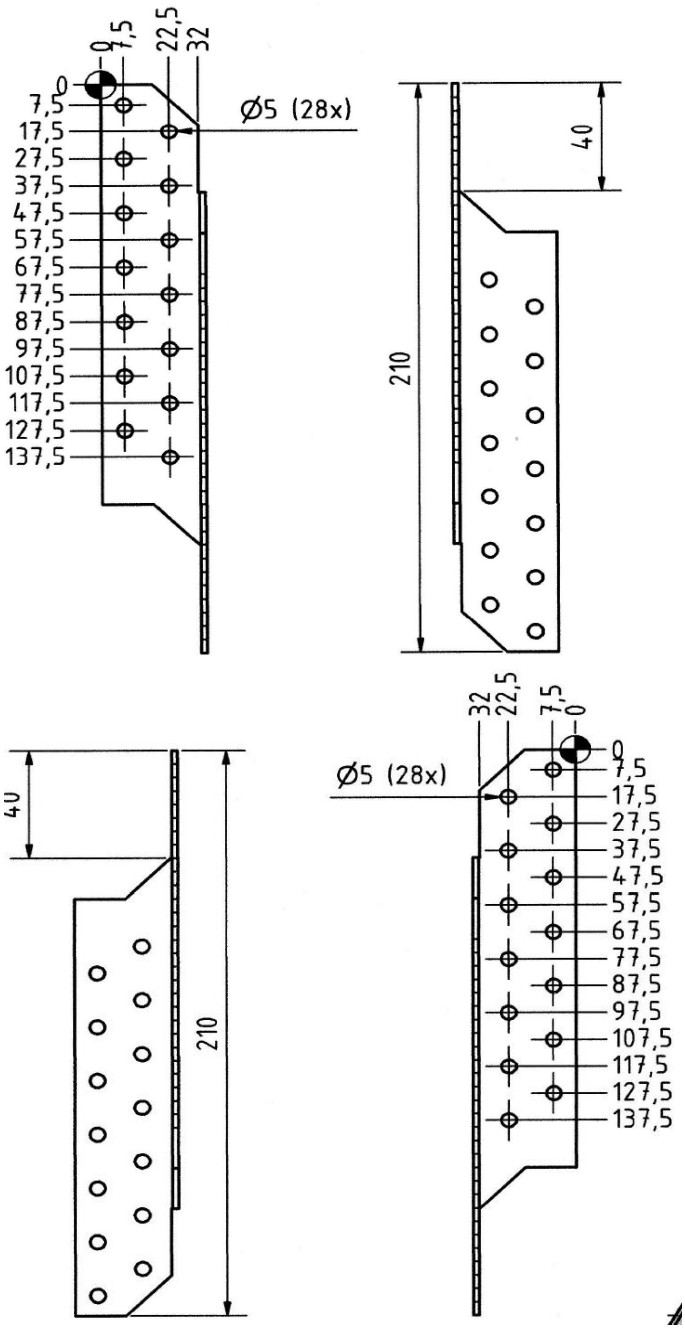

Figure A. 2 Dimensions of Purlin Ties 210 right/left

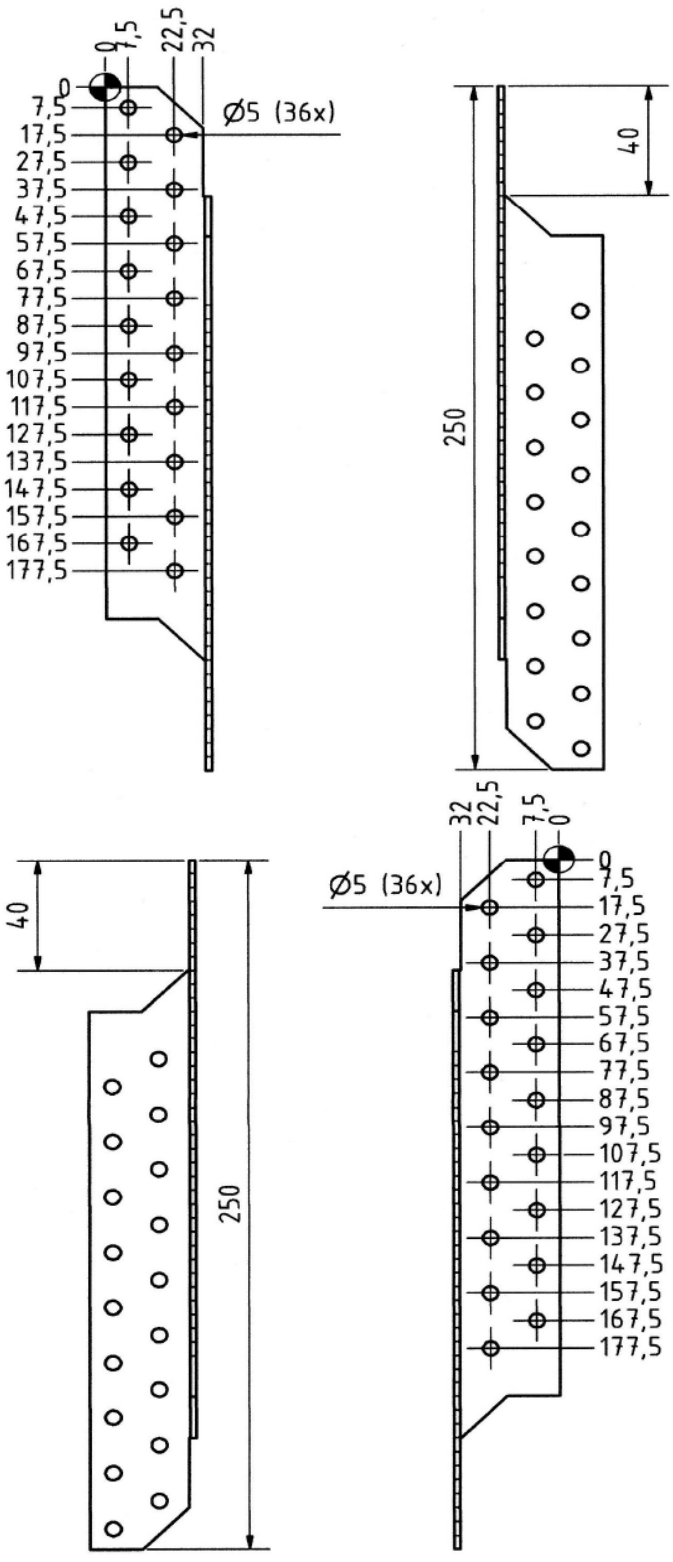

Figure A. 3 Dimensions of Purlin Ties 250 right/left

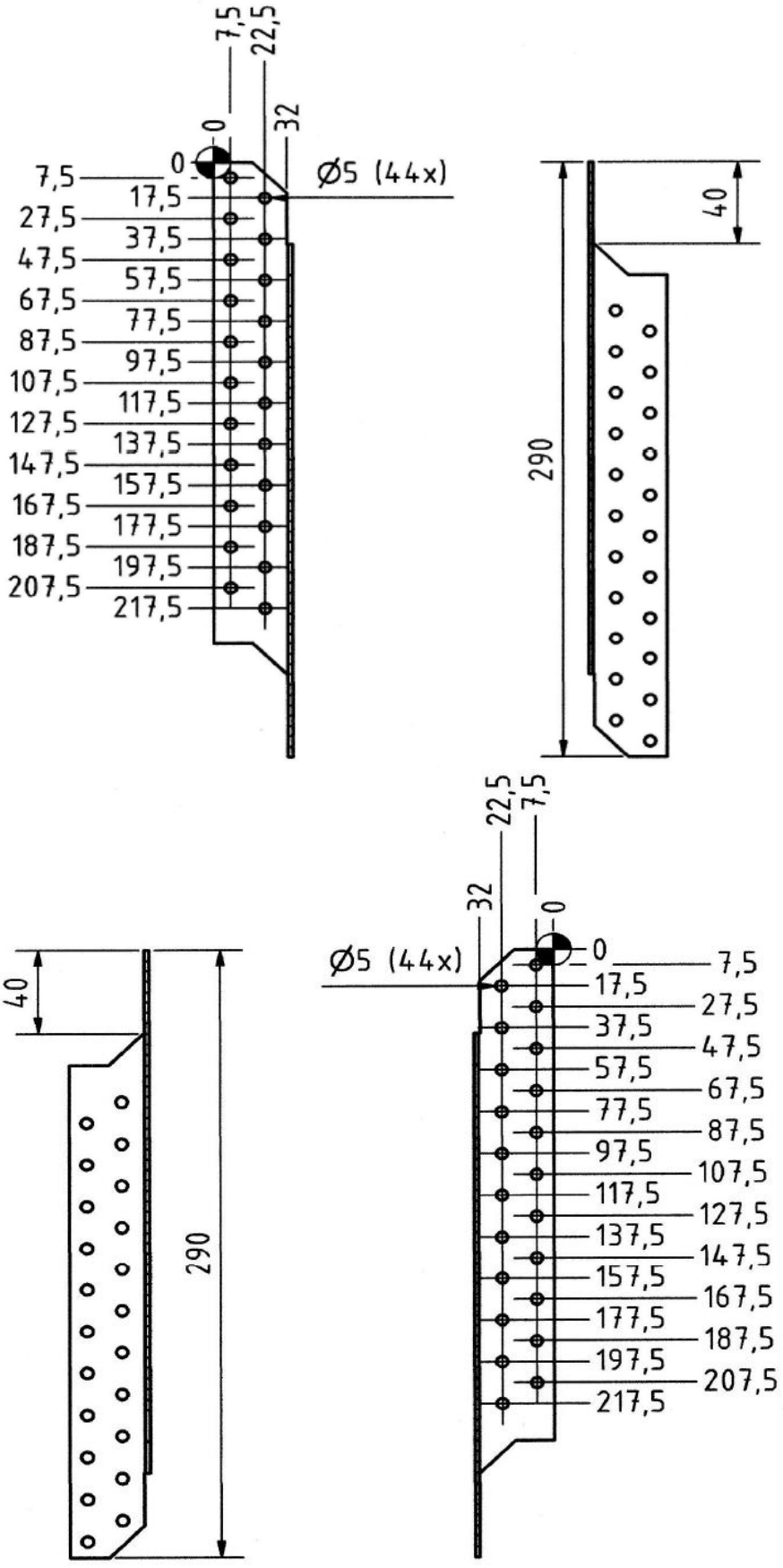

Figure A. 4 Dimensions of Purlin Ties 290 right/left

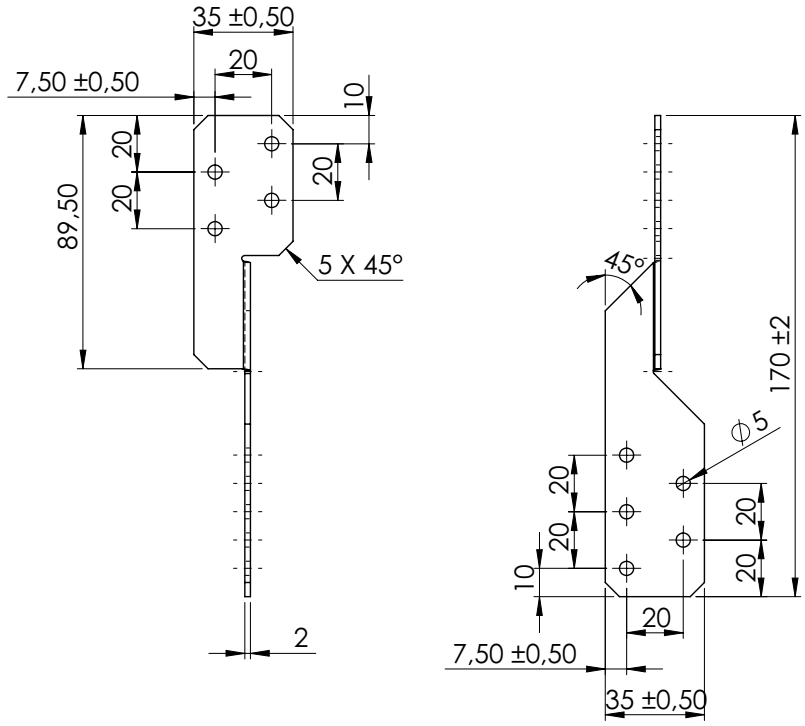

Figure A. 5 Dimensions of Purlin Tie 170 uni

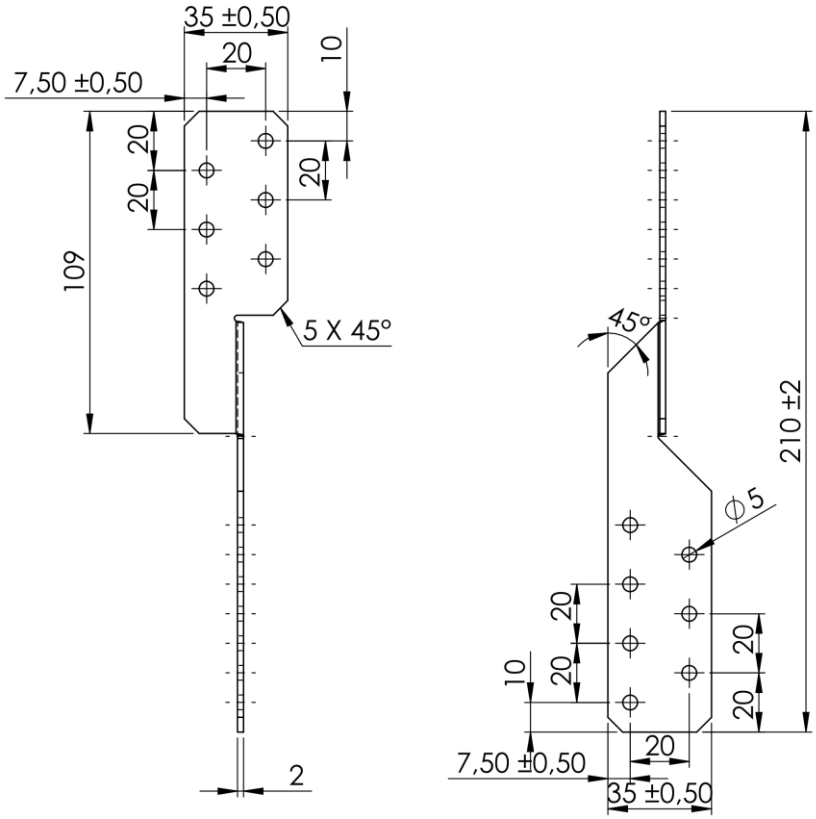

Figure A. 6 Dimensions of Purlin Tie 210 uni

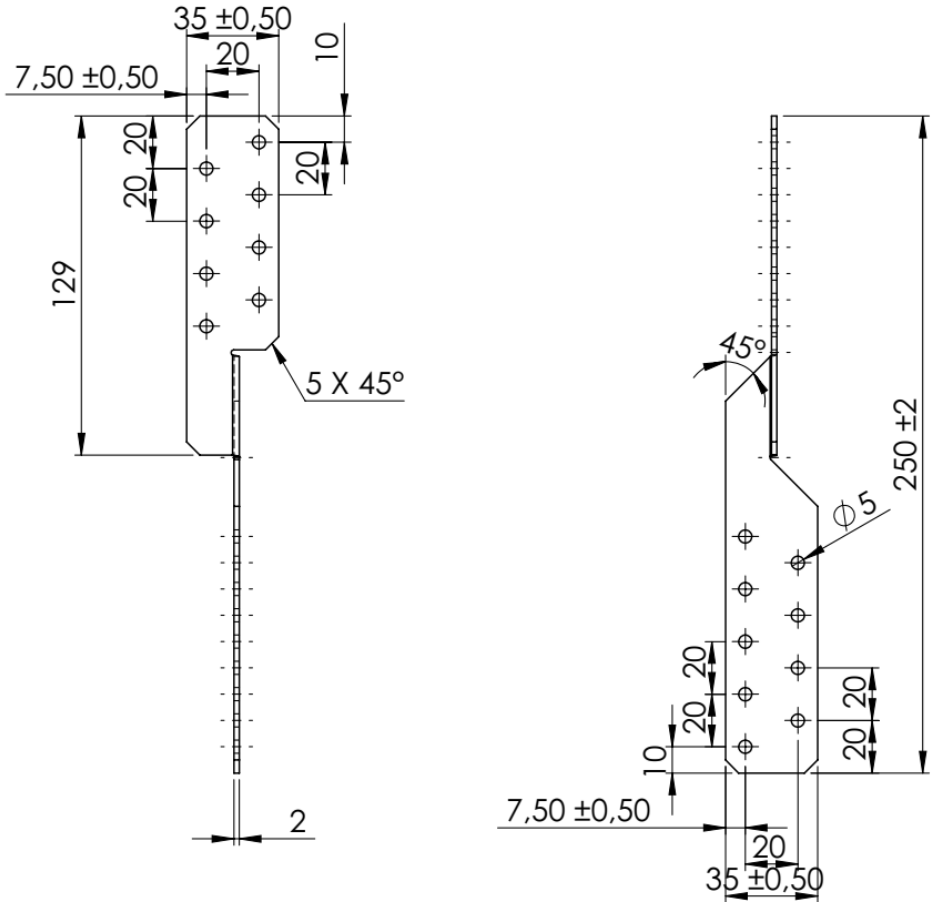

Figure A. 7 Dimensions of Purlin Tie 250 uni

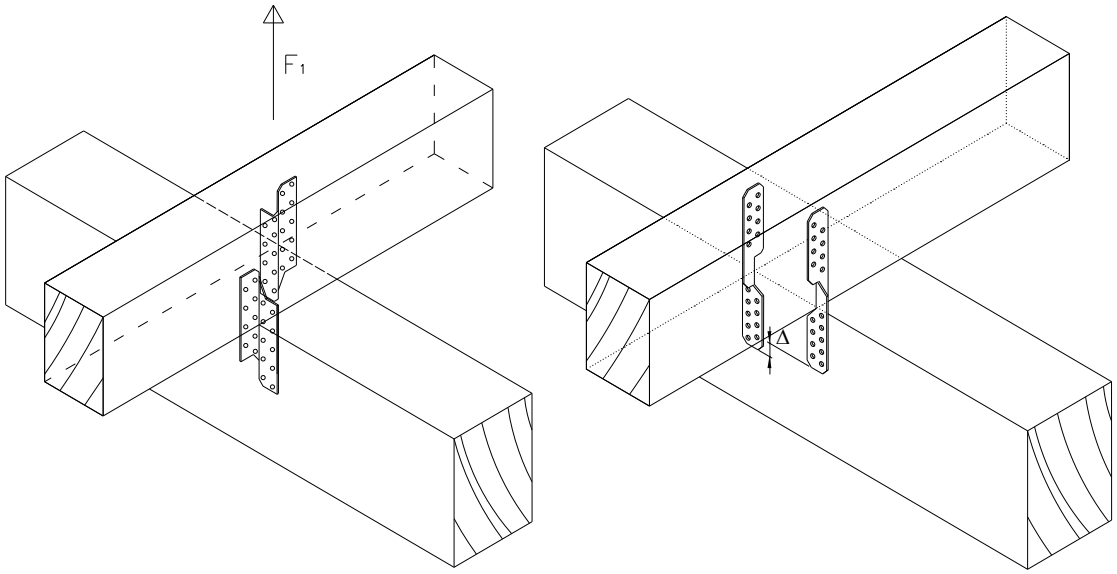

Figure A. 8 Typical installation

Annex B
Characteristic load-carrying capacities

Support conditions
The distance between the timber elements in the area of the connection must not exceed 3 mm. The timber members are prevented from rotation.

Fastener specification
The holes are to be nailed beginning at the end of the purlin tie.

Wane
Wane is not allowed, the timber has to be sharp-edged in the area of the purlin ties.

Characteristic load-carrying capacities 2 purlin ties

Table B.1: Characteristic load-carrying capacities Load F_1 – 2 Purlin Ties / connection

Purlin Ties	Number of nails	Nail failure $F_{Rk,N}$ [kN]	Steel failure $F_{Rk,S}$ [kN]	Transverse tensile failure
right/left 170, 210, 250, 290	2 x 2	2,2	11,9	Design according to equation (B.1)
	2 x 3	3,4	11,9	
	2 x 4	5,5	11,9	
	2 x 5	8,5	11,9	
	2 x 6	9,9	11,9	
	2 x 7	13.9	11,9	
	2 x 8	15,3	11,9	
	2 x 9	19,7	11,9	
	2 x 10	21,4	11,9	
	2 x 11	26,0	11,9	
	2 x 12	27,9	11,9	
uni 170, 210, 250	4 + 5	12,4	8,21	Design according to equation (B.1)
	6 + 7	18,9	8,21	
	8 + 9	25,5	8,21	

Splitting
For a lifting force F_1 splitting has to be proved, when necessary, for both timber elements. The capacity of a connection with two purlin ties on both sides of the timber element is calculated according to the general splitting design for connections with mechanical fasteners in EN 1995-1-1.

$$F_{90,Rk} = 14 \cdot b \sqrt{\frac{h_e}{\left(1 - \frac{h_e}{h}\right)}} \qquad \text{(B.1)}$$

Where:

$F_{90,Rk}$	the characteristic splitting capacity in N
b	the member thickness, in mm
h_e	is the loaded edge distance to the centre of the most distant fastener in mm
h	the timber member height in mm

The design value of the force component perpendicular to the structural member's axis has to be lower than the design capacity $F_{90,Rd}$.