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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

MEMBER OF EOTA



## European Technical Assessment ETA-21/0750 of 2023/10/09

### I General Part

**Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Denmark A/S**

**Trade name of the construction product:**

GEPI Angle bracket

**Product family to which the above construction product belongs:**

Three-dimensional nailing plate (Angle Bracket for timber-to-timber or timber-to-concrete connections)

**Manufacturer:**

Pitzl Metallbau GmbH & Co. KG  
Siemensstraße 26  
D-84051 Essenbach  
Germany  
Internet [www.pitzl-connectors.com](http://www.pitzl-connectors.com)

**Manufacturing plant:**

Pitzl Metallbau GmbH & Co. KG  
Manufacturing Plants: T1

**This European Technical Assessment contains:**

20 pages including 3 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 ETA with the same number issued on 2021-08-21

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## II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

### 1 Technical description of product

The GEPI angle brackets are one-piece non-welded, face-fixed angle brackets with/without intermediate elastic layers and additional supporting plates to be used in timber to timber or in timber to concrete connections. They are connected to construction members made of timber or wood-based products with self-tapping screws according to EN 14592 or European Technical Assessment and to concrete members with metal anchors or concrete screws according to EN 1992-4 or European Technical Assessment or national provisions that apply at the installation site.

#### Geometry and Material

Dimensions, hole positions are shown in Annex A and typical installations are shown in Annex B. Pitzl "GEPI angle brackets" are made from steel with tolerances in accordance with EN 10143.

The angle brackets with a steel plate thickness of up to 4 mm are made from the following materials:

- Steel with a strength class S250GD+Z275 according to EN 10143

The screw supporting plates with a thickness up to 15 mm are made from:

- Aluminium EN AW-6082 T6 according to EN 755-2 or
- Steel S235 or better according to EN 10143

Soundproofing interlayer up to a thickness of 8 mm:

- Sylodyn NC, Getzner

Optional tension/shear plates for flexible adjustment to timber parts:

- Steel S235 or better according to EN 10143

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

The angle brackets are intended for use in making connections in load-bearing timber structures, as a connection between wall and slab elements or as wall-to-wall connection and on concrete/steel elements or as a connection between 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 may be with a single angle bracket or with an angle bracket on each side of the fastened timber member (see Annex B).

The static behavior of the timber members or the supports shall be as described in Annex A and 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<sup>3</sup> to 420 kg/m<sup>3</sup>. The wood members may be of Laminated Veneer Lumber (LVL) with a characteristic density up to 500 kg/m<sup>3</sup> with screws in the wide face of the LVL component. This requirement to the material of the wood members can be fulfilled by using the following materials:

- Structural solid timber according to EN 14081
- Glulam, glued solid timber according to EN 14080
- LVL according to EN 14374 or European Technical Assessment or national provisions that apply at the installation site
- Parallel PSL according to an European Technical Assessment or national provisions that apply at the installation site
- Intrallam LSL according to an European Technical Assessment or national provisions that apply at the installation site
- Cross laminated timber (CLT) according to European Technical Assessment or national provisions that apply at the installation site
- Plywood according to EN 636 or European Technical Assessment or national provisions that apply at the installation site
- Solid wood panels according to EN 13353 or European Technical Assessment or national provisions that apply at the installation site
- Wood-based panels for use in constructions according to EN 13986
- Cross laminated timber according to European Technical Assessment
- Laminated Veneer Lumber according to EN 14374 or European Technical Assessment

Annex B states the load-carrying capacities of the angle bracket connections for a characteristic density of 385 kg/m<sup>3</sup>. For connections timber or wood-based material with a lower or higher characteristic density than 385 kg/m<sup>3</sup> the load-carrying capacities for GEPI

brackets without intermediate elastic layers can be converted by the factor  $k_{dens}$ :

Load case  $F_{1}$ :

$$k_{dens} = \left( \frac{\rho_k}{385} \right)^{0,5} \quad \text{for } \rho_k \quad 320 \text{ kg/m}^3 \leq 440 \text{ kg/m}^3$$

$$k_{dens} = \left( \frac{\rho_k}{385} \right)^{0,5} \quad \text{for LVL } \rho_k \leq 500 \text{ kg/m}^3$$

Load case  $F_{2/3}$  and  $F_{4/5}$ :

$$k_{dens} = \left( \frac{\rho_k}{385} \right)^{0,8} \quad \text{for } \rho_k \quad 320 \text{ kg/m}^3 \leq 440 \text{ kg/m}^3$$

$$k_{dens} = \left( \frac{\rho_k}{385} \right)^{0,5} \quad \text{for LVL } \rho_k \leq 500 \text{ kg/m}^3$$

Where

$\rho_k$  Characteristic density of the timber in [kg/m<sup>3</sup>]

If a wood-based panel interlayer with a thickness of not more than 26 mm is placed between the connector plate and the timber member, the lateral load-carrying capacity of the screw, respectively, has to take into account the effect of the interlayer.

The design of the connections shall be in accordance with the Eurocode 5 or a similar national timber standards. The wood members must have a thickness which is larger than the penetration depth of the screws into the structural parts.

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

The angle brackets 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 strength and ultimate strength is employed.

The angle brackets may also be used for connections between a timber member and a member of concrete or steel. For connections wood to concrete the

connection has to fulfill the rules of Eurocode 2 or other European Technical Assessments or national standards.

The scope of the angle brackets 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 angle brackets 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<sup>1)</sup> (BWR1)

Joint Strength - Characteristic load-carrying capacity

Tensile strength  $F_{1,Rk}$

	Characteristic values $F_{1,Rk}$	
GEPI 80 with/without intermediate elastic layer	8	kN
GEPI 100 with/without intermediate elastic layer	16	kN
GEPI 240 with/without intermediate elastic layer	54	kN

Shear strength, direction  $F_{2/3,Rk}$

	Characteristic values $F_{2/3,Rk}$	
GEPI 80 with intermediate elastic layer	5	kN
GEPI 100 with intermediate elastic layer	12	kN
GEPI 240 with intermediate elastic layer	62	kN
GEPI PLANE with intermediate elastic layer	35	kN
GEPI 80 without intermediate elastic layer	8	kN
GEPI 100 without intermediate elastic layer	55	kN
GEPI 240 without intermediate elastic layer	67	kN

Shear strength, direction  $F_{4/5,Rk}$

	Characteristic values $F_{4/5,Rk}$	
GEPI 80 with/without intermediate elastic layer	5	kN
GEPI 100 with/without intermediate elastic layer	20	kN
GEPI 240 with/without intermediate elastic layer	55	kN
GEPI PLANE with intermediate elastic layer	35	kN

Joint Stiffness

Slip modules for static and quasi static loads

In direction  $K_{ser,1/2}$

	Mean values $K_{ser}$	
GEPI 80 with/without intermediate elastic layer	2,30	kN/mm
GEPI 100 with/without intermediate elastic layer	4,68	kN/mm
GEPI 240 with/without intermediate elastic layer	13,93	kN/mm
	5,3	kN/mm

In direction  $K_{ser,2/3}$

GEPI 80 with intermediate elastic layer	1,65	kN/mm
GEPI 100 with intermediate elastic layer	3,26	kN/mm
GEPI 240 with intermediate elastic layer	11,64	kN/mm
GEPI PLANE with intermediate elastic layer	5,3	kN/mm

GEPI 80 without intermediate elastic layer	3,50	kN/mm
GEPI 100 without intermediate elastic layer	11,13	kN/mm
GEPI 240 without intermediate elastic layer	18,00	kN/mm

In direction  $K_{ser,4/5}$

GEPI 80 with/without intermediate elastic layer	2,50	kN/mm
GEPI 100 with/without intermediate elastic layer	5,19	kN/mm
GEPI 240 with/without intermediate elastic layer	16,88	kN/mm
GEPI PLANE with intermediate elastic layer	5,3	kN/mm

<b>Characteristic</b>	<b>Assessment of characteristic</b>
Joint ductility	No performance assessed
Resistance to seismic actions	No performance assessed
Resistance to corrosion and deterioration	See section 3.6
<b>3.2 Safety in case of fire (BWR2)</b>	
Reaction to fire	The angle brackets are made from steel classified as performance class A1 of the characteristic reaction to fire, in accordance with EN 13501-1 and the provisions of Commission Delegated Regulation 2016/364 and EC decision 96/603/EC, amended by EC Decision 2000/605/EC.
<b>Characteristic</b>	<b>Assessment of characteristic</b>
<b>3.3 General aspects related to the performance of the product<sup>*)</sup></b>	The angle brackets have been assessed as having satisfactory durability and serviceability when used in timber structures using the timber species described in EN 1995-1-1 and subject to the conditions defined by service classes 1, 2 and 3
Identification	See Annex B
1) 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 screw connections and the steel plates and were determined by experimental tests. To obtain design values the capacities have to be divided by different partial factors for the material properties  $\gamma_M$ , in case of timber failure in addition multiplied with the modification factor  $k_{mod}$  to consider different service classes and load-duration classes (EN 1995-1-1).

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

Thus, the characteristic values of the load-carrying capacities are determined also for timber failure  $F_{t,Rk}$  or  $F_{c,Rk}$  (obtaining the withdrawal and embedment strength of fasteners subjected to shear or the withdrawal capacity of the most loaded fastener) as well as for steel plate failure  $F_{s,Rk}$ . The design value of the load-carrying capacity has to be considered according to equation (1).

$$F_{Rd} = \min \left\{ k_{mod} \cdot \frac{F_{t,Rk}}{\gamma_M}, \frac{F_{c,Rk}}{\gamma_{Mc/Ms}}, \frac{F_{s,Rk}}{\gamma_{M0}} \right\} \quad (1)$$

With

$k_{mod}$	Modification factor EN 1995-1-1
$F_{Rd}$	Design value of the strength property
$F_{t,Rk}$	Characteristic strength of the screws in timber
$F_{c,Rk}$	Characteristic strength of the anchors/screws in concrete
$F_{s,Rk}$	Characteristic strength of the steel plates
$\gamma_M$	Partial factor for timber connections
$\gamma_{M0}$	Partial factor for the steel parts
$\gamma_{Mc/Ms}$	Partial factor for anchors/screws in concrete

Therefore, for timber failure the load duration class and the service class are included. The different partial factors  $\gamma_M$  for steel or timber, respectively, are also correctly taken into account.

### 3.5 Mechanical resistance and stability

The characteristic capacities of the angle brackets are determined by calculation assisted by testing and testing as described in the EAD 130186-00-0603 for Three-dimensional nailing plates. They should be

used for designs in accordance with Eurocode 5 or a similar national timber code.

Annex B includes the characteristic load-carrying capacities (identifications) in the different directions  $F_1$ ,  $F_{2/3}$ , and  $F_{4/5}$ .

To ensure to transfer the loads from the GEPI brackets to the structural adjoining elements self-tapping screws according to table A.1 must be used.

For the intermediate elastic layer a closed-cell PU elastomer (polyurethane) with highly elastic properties must be used according to Table A.2.

Reductions in the cross-sectional area caused by the screws shall be taken into account in accordance to the Eurocode 5.

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

The angle brackets have been assessed as having satisfactory durability and serviceability when used in timber structures using timber species described in EN 1995-1-1 and subject to the conditions defined by service classes 1, 2 and service class 3, when a corrosion protection in accordance with Eurocode 5 is applied, or when stainless steel with similar or better characteristic yield strength and ultimate strength is employed.

In accordance with EAD 130186-00-0603 the angle brackets are produced with:

- Steel with a strength class S250GD / Z275 or better according to EN 10143, with  $Re = 355$  N/mm<sup>2</sup>,  $Rm \leq 630$  N/mm<sup>2</sup> and  $A80 = 22\%$

The screw supporting plates are made of:

- Aluminium EN AW-6082 T6 according to EN 755-2 or
- Steel with a strength class steel S235 with Z275 or FeZn12c treated according to EN 10025 with  $Re = 235$  N/mm<sup>2</sup>,  $Rm \leq 510$  N/mm<sup>2</sup> and  $A80 = 26\%$

The tension plates are made of:

- Steel with a strength class steel S235 with Z275 or FeZn12c treated according to EN 10025 with  $Re = 235$  N/mm<sup>2</sup>,  $Rm \leq 510$  N/mm<sup>2</sup> and  $A80 = 26\%$

### **3.7 General aspects related to the intended use of the product**

The angle brackets are manufactured in accordance with the provisions of the European Technical Assessment using the manufacturing process as identified during the inspection of the plant by the assessment body issuing the ETA and the notified body and laid down in the technical documentation.

The installation shall be carried out in accordance with Eurocode 5 or an appropriate national code unless, otherwise is defined in the following.

The following provisions apply:

The structural members to which the brackets are fixed shall be:

- Strength class C20 or better
- Free from wane under the bracket
- The actual end bearing capacity of the timber member to be used in conjunction with the bracket is checked by the designer of the structure to ensure it is not less than the bracket capacity and, if necessary, the bracket capacity reduced accordingly.
- The minimum nail's end and edge distances according to EN 1995-1-1 have to be ensured.
- The connected construction parts must be in contact to ensure that the compression forces in direction F1 transferred directly over the contact area.
- The soundproofing interlayer of the Pitzl GEPI 80/100/240 angle brackets shall be arranged between the horizontal flange and the timber member and between the horizontal flange of the bracket and the screw plate. The length of the intermediate layer under permanent compression has to be at least 500 mm.
- There are no specific requirements relating to preparation of the timber members.

The execution of the connection shall be in accordance with the assessment holder's technical literature.



## **4 Attestation and verification of constancy of performance (AVCP)**

### **4.1 AVCP system**

According to the decision 97/176/EC of the European Commission<sup>1</sup>, 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 2023-10-09 by



Thomas Bruun  
Managing Director, ETA-Danmark

**Annex A**  
**Product details and definitions**

Table A.1 Specifications of „GEPI 100 / 240“

Angle bracket type	Dimension [b/h/l]	Thickness [mm]	Material	Coating
GEPI 80	80/80/80	3	S250GD	Z 275
GEPI 100	100/100/100	3	S250GD	Z 275
GEPI 240	100/100/240	3	S250GD	Z 275
GEPI PLANE	240/280	3	S250GD	Z 275
Screw plate 80	75/80	3	EN AW-6082 T6/S235	-/ FeZn12c
Screw plate 100	94/120	8	EN AW-6082 T6/S235	-/ FeZn12c
Screw plate 240	90/260	15	EN AW-6082 T6/ S235	-/ FeZn12c
Tension plates	70/1	≥ 3	S235	FeZn12c

Table A.2 Specification of the soundproofing Interlayer SYLODYN NC, Getzner

Interlayer type	Position	Thickness [mm]
Getzner <sup>1)</sup> Sylodyn NC	between angle and screw plate	4,00
Getzner Sylodyn NC	between slab and angle	8,00

<sup>1)</sup> Material properties	Type Sylodyn NC
Color	yellow
Static range of use in N/mm <sup>2</sup>	0,15
Load peaks in N/mm <sup>2</sup>	3
Mechanical loss factor	0,07
Rebound resilience in %	70
Compression set in %	<5
Static modulus of elasticity in N/mm <sup>2</sup>	1,1
Dynamic modulus of elasticity in N/mm <sup>2</sup>	1,45
Static shear modulus in N/mm <sup>2</sup>	0,21
Dynamic shear modulus in N/mm <sup>2</sup>	0,29
Min. tensile stress at rupture in %	1,5
Min. tensile elongation at rupture in %	500
Abrasion in mm <sup>3</sup>	≤550
Coefficient in friction (steel)	0,7
Coefficient in friction (concrete)	0,7
Specific volume resistance in o-cm	>10
Thermal conductivity in W/mK	0,075
Temperature range in °C	-30 to 70
Temperature peak in °C	short term 4 120
Flammability	class E/EN 13501-1

Table A.3: Fastener specification for timber parts

Fastener	Type GEPI	Side	Diameter [mm]	Minimum length [mm]	Minimum threaded length [mm]	Amount
Self-tapping screws according to ETA-19/0553 <sup>1)</sup>	80	1	8	80	60	3
		2	8	160	140	2
	100	1	8	80	60	5
		2	8	160	140	4
	240	1	8	80	60	16
		2	8	160	140	11
	Plane	1	8	120	100	32

<sup>1)</sup> If other screws are used it must be ensured that the properties are equal or better according to EN 14592 or an European Technical Assessment or national provisions that apply at the installation site

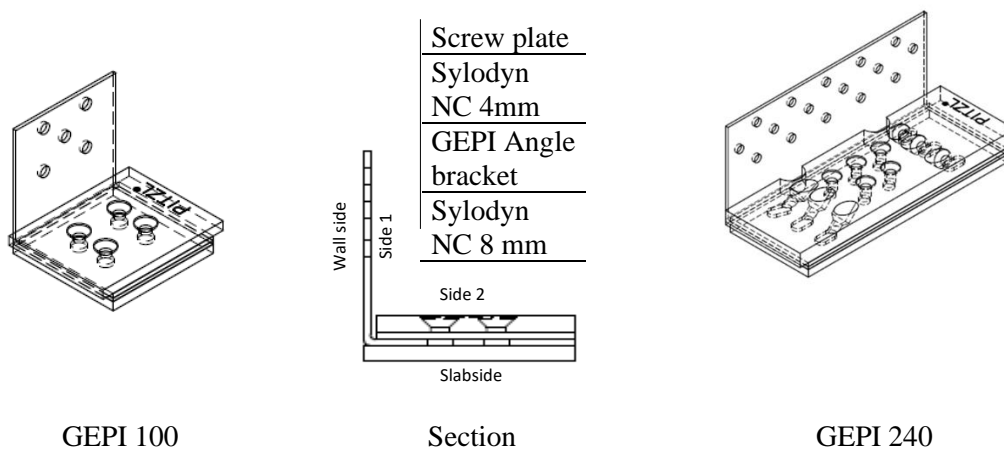
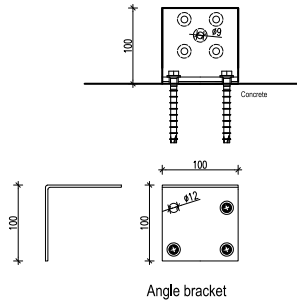


Figure A.1: Notation GEPI angle brackets (exemplary)

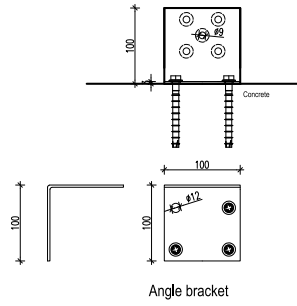
Table A.4: Fastener specification for concrete/steel parts

Metal Anchors diameter	Correspondent hole diameter	Anchors type
8	Max. 2mm larger than the anchor diameter	See specification of the manufacturer

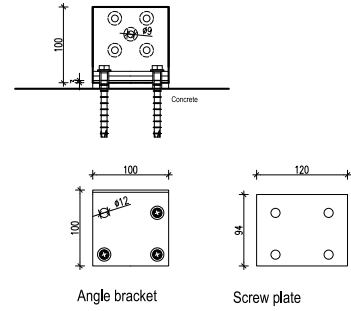
GEPI 100 with concrete screws  
and steel plate example HUS3



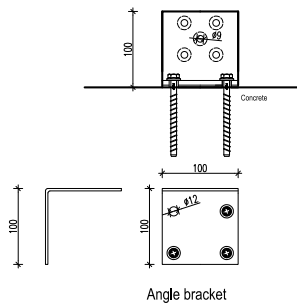
GEPI 100 with concrete screws  
example HUS3-H 8x85



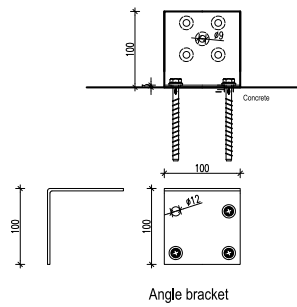
GEPI 100 with concrete screws and  
Sylodyn example HUS3-H 8x85



GEPI 100 with concrete screws  
and steel plate example ULTRACUT



GEPI 100 with concrete screws  
example ULTRACUT



GEPI 100 with concrete screws and  
Sylodyn example ULTRACUT

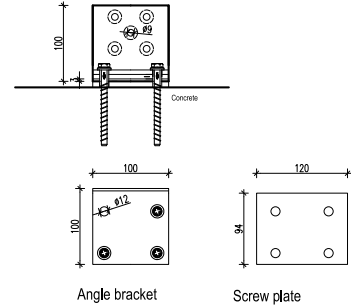


Figure A.1: GEPI 100 angle brackets concrete applications, example with HUS3 and ULTRACUT

## Annex B

### Characteristic load-carrying capacities and slip modules

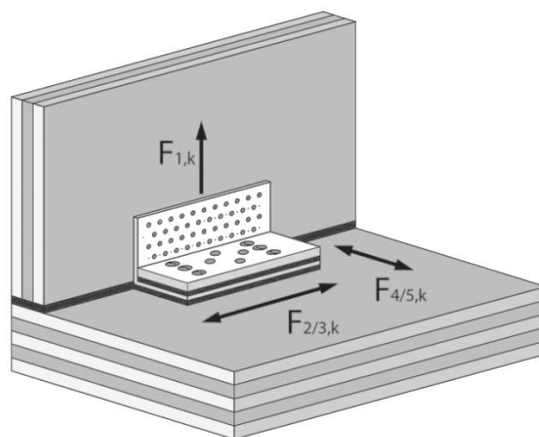


Figure B.1: Definition of forces and their directions

Table B.1: Characteristic loads and slip modules timber to timber connections

GEPI	Sylodyn	Support plate	Characteristic values according to EN 14358					
			$F_{1,Rk}$ [kN]	$K_{1,ser}$ [kN/mm]	$F_{2/3,Rk}$ [kN]	$K_{2/3,ser}$ [kN/mm]	$F_{4/5,Rk}$ [kN]	$K_{4/5,ser}$ [kN/mm]
80	NC	steel	8	2,30	5	1,65	5	2,50
100	NC	steel	16	4,68	12	3,26	20	5,19
240	NC	aluminum	54	13,24	62	11,64	55	16,88
80	-	steel	8	2,30	8	3,50	5	2,50
100	-	steel	16	4,68	55	11,13	20	5,19
240	-	steel	54	13,24	67	18,00	55	16,88
plane	NC	steel	-	-	20	5,3	35	5,3

#### Combined forces

If the forces  $F_1$  and  $F_2/F_3$  or  $F_4/F_5$  act at the same time, the following linear inequality has to be considered with the help of equation (2)

$$\left(\frac{F_{1,Ed}}{F_{1,Rd}}\right)^2 + \left(\frac{F_{2/3,Ed}}{F_{2/3,Rd}}\right)^2 + \left(\frac{F_{4/5,Ed}}{F_{4/5,Rd}}\right)^2 \leq 1 \quad (2)$$

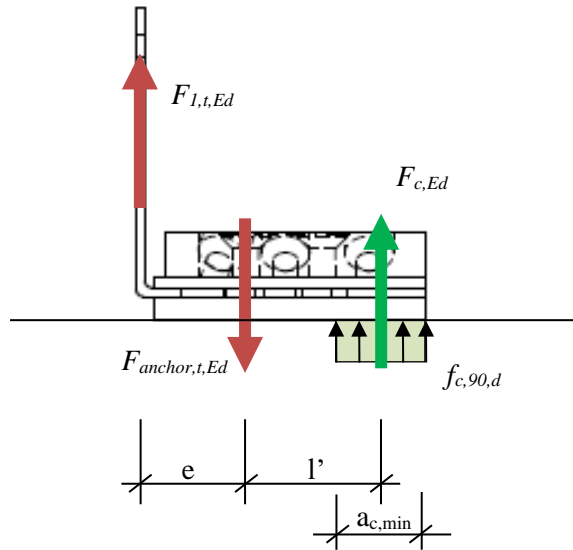
The forces  $F_2$  and  $F_3$  or  $F_4$  and  $F_5$  are forces with opposite direction. Therefore only one force  $F_2$  or  $F_3$ , and  $F_4$  or  $F_5$ , respectively, is able to act simultaneously with  $F_1$ , while the other shall be set to zero.

For the ultimate limit state the slip modules in Table B.1 should be calculated according to equation (3)

$$K_u = \frac{2}{3} \cdot K_{ser} \quad (3)$$

### Anchor forces

To calculate the anchor forces due to  $F_{1,t,Ed}$  the following equation to design the concrete/steel anchors should be used like following

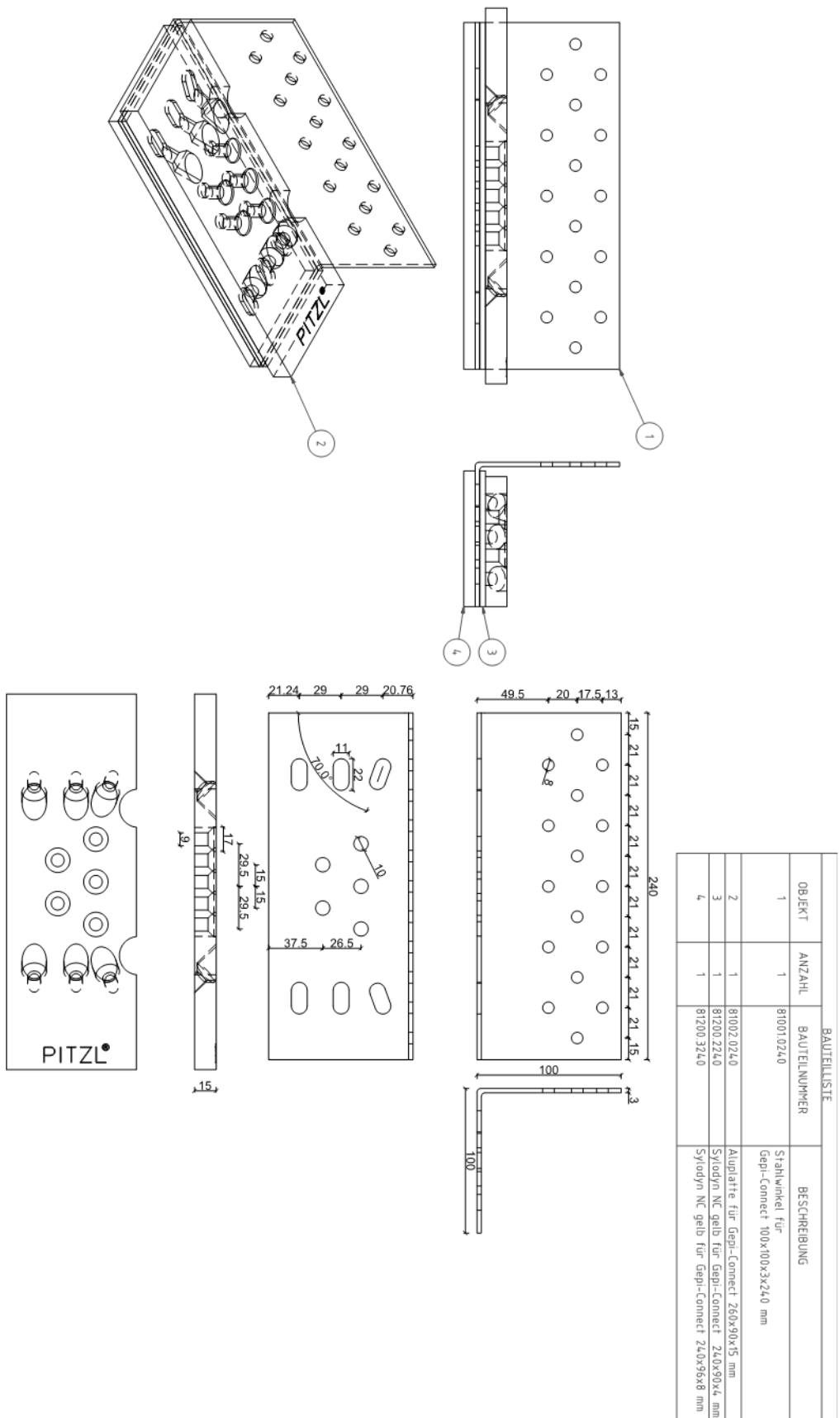


$$F_{anchor,t,Ed} = F_{1,t,Ed} \cdot k_{t,1} \quad (4)$$

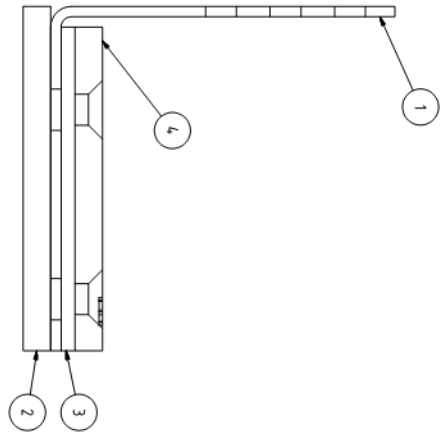
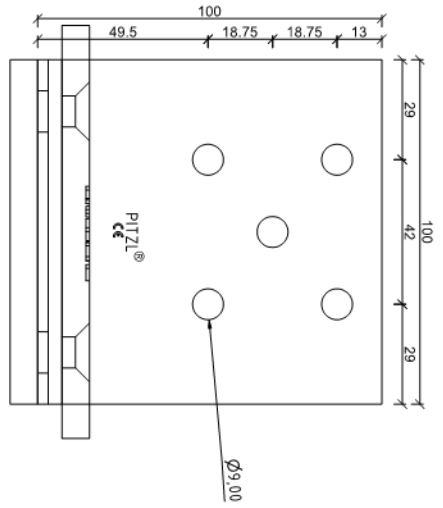
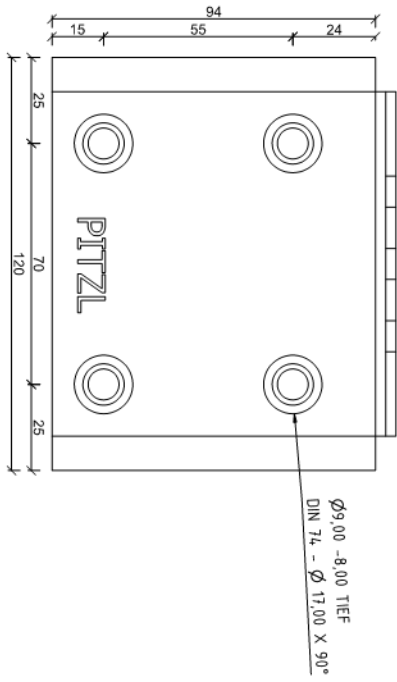
Table B.2: Foundation factors  $k_{t,1}$

Foundation factor	$k_{t,1} = \square \cdot F_{Ed} + \square$		
	C25/30	S235	with Syldyn
80	+ 1,432	+ 1,409	$2,09E-05 \cdot F_{1,t,Ed} + 1,454$
100	+ 1,414	+ 1,407	$1,06E-04 \cdot F_{1,t,Ed} + 1,346$
240	+ 1,401	+ 1,399	$2,00E-05 \cdot F_{1,t,Ed} + 1,369$

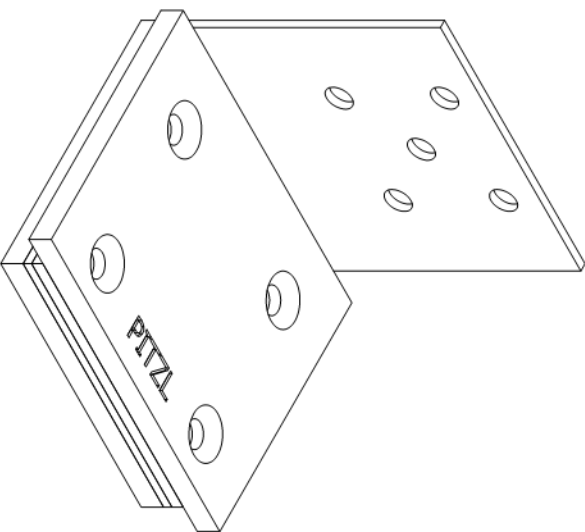
### Annex C Dimensions and assembling



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BAUTEILLISTE			
OBJEKT	ANZAHL	BAUTEILNUMMER	BESCHREIBUNG
1	1	81001.0100	Stahlwinkel für Gepl - Connect 100x100x3x100 mm
2	1	81200.3100	Sylodyn 8mm
3	1	81200.2095	Sylodyn 4mm
4	1	81002.0100	Stahlplatte für Gepl Connect 120x94x8 mm



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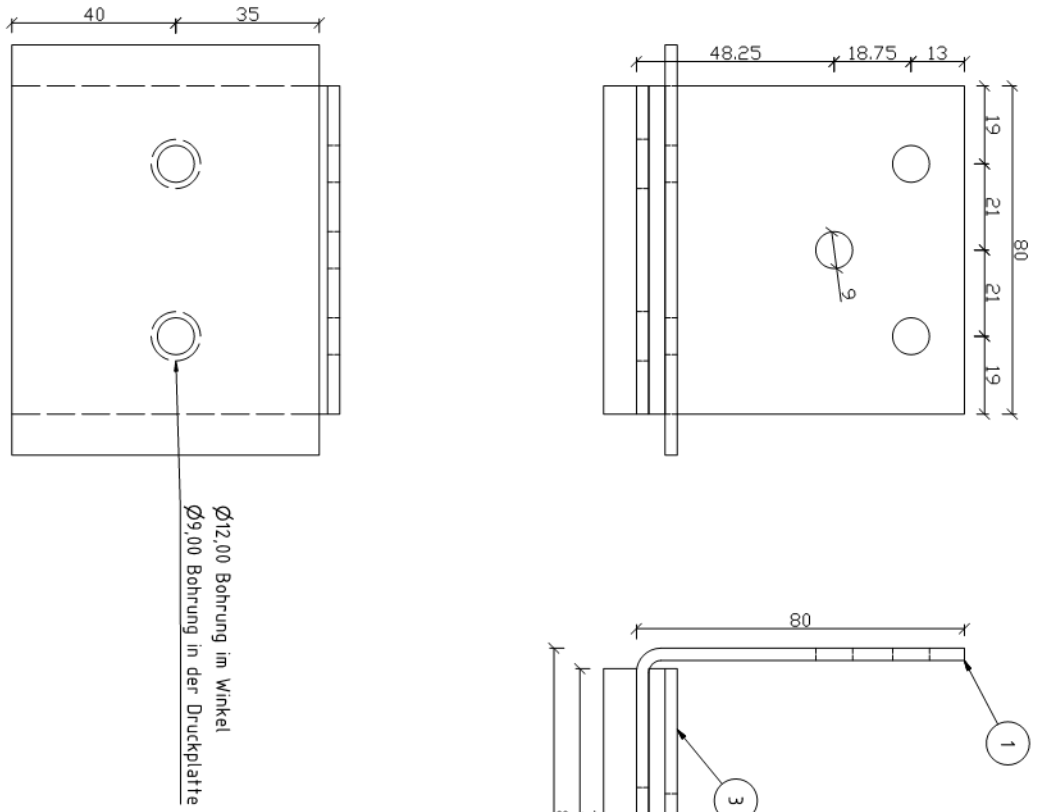
Telefon +49(0) 8703 9346-0  
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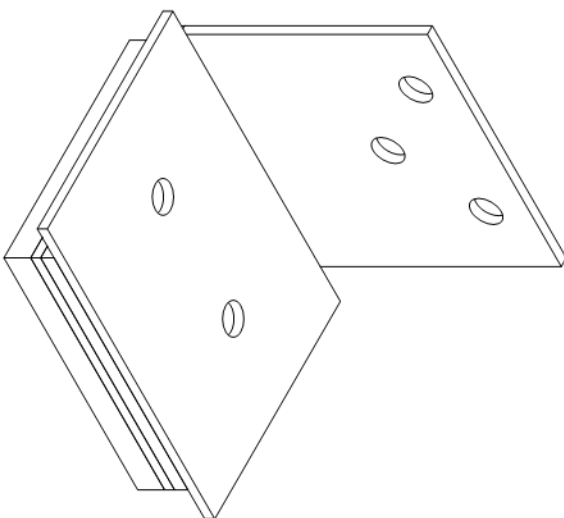
Artikelnummer:

**81000.0100**

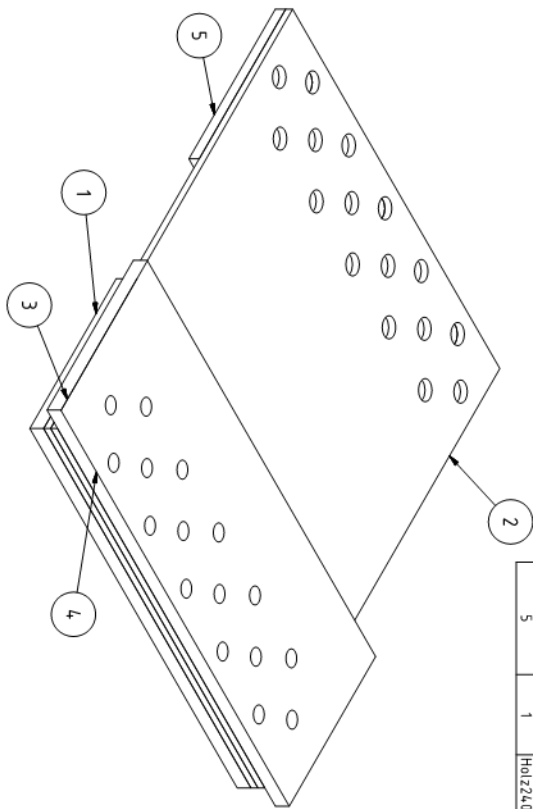
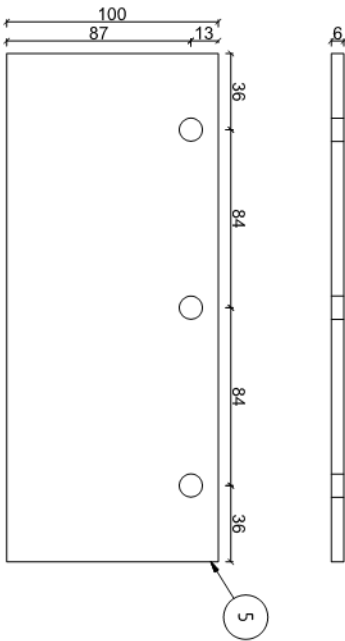
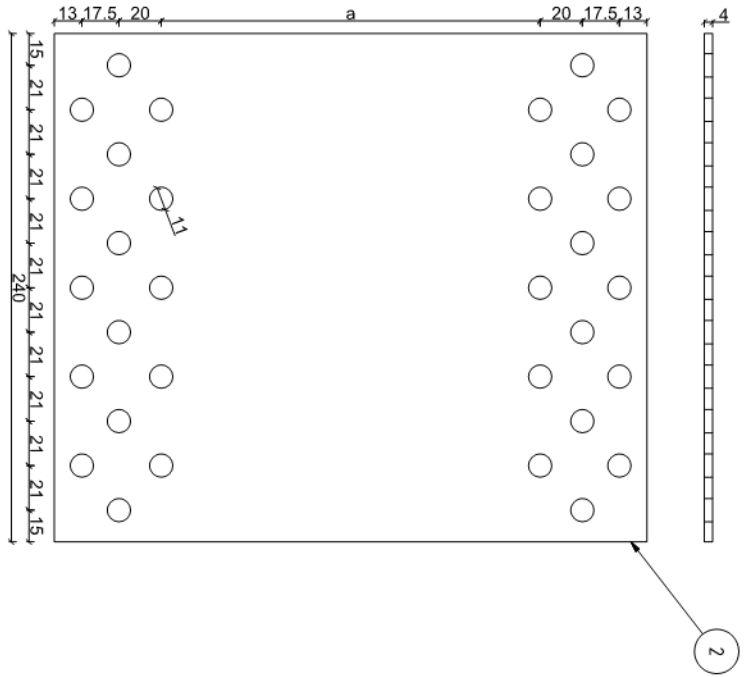
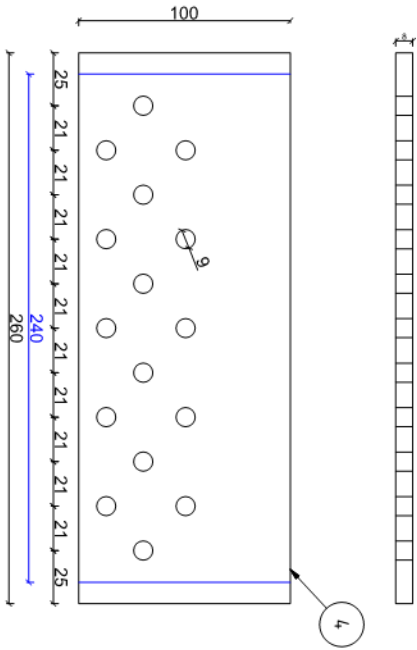





BAUTEILLISTE			
OBJEKT	ANZAHL	BAUTEILNUMMER	BESCHREIBUNG
1	1	80x80x3	
2	1	Sylodyn 4mm GEP180	
3	1	Druckplatte Gep180	
4	1	81200.3100	Sylodyn 8mm GEP180



	Pitzl Metallbau GmbH & Co. KG Siemensstraße 26 D - 84051 Altheim Tel ++49(0) 8703 9346-0 Fax ++49(0) 8703 9346-55 www.pitzl.de	Art.-Teilenummern <b>81000.0080</b>



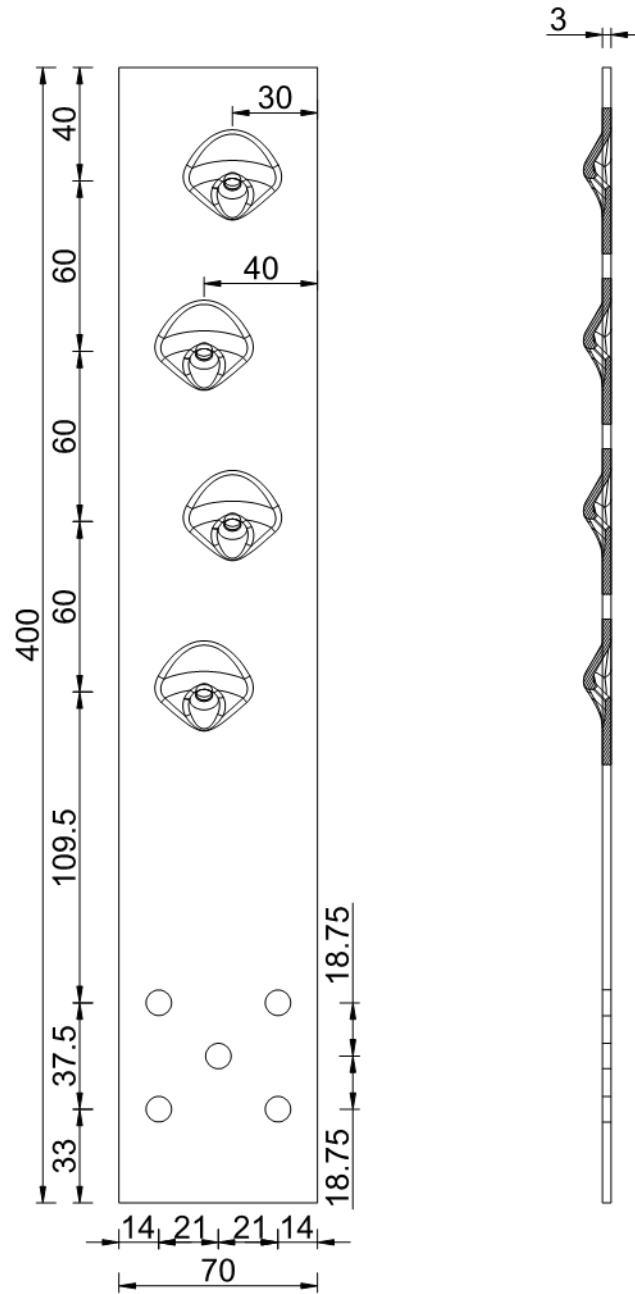
BAUTEILLISTE			
OBJEKT	ANZAHL	BAUTEILNUMMER	BESCHREIBUNG
1	1	Sylodyn240x100x8	
2	1	Stahlplatte240x4	
3	1	Sylodyn240x100x4	
4	1	Stahlplatte60x100x8	
5	1	Holz240x100x6	



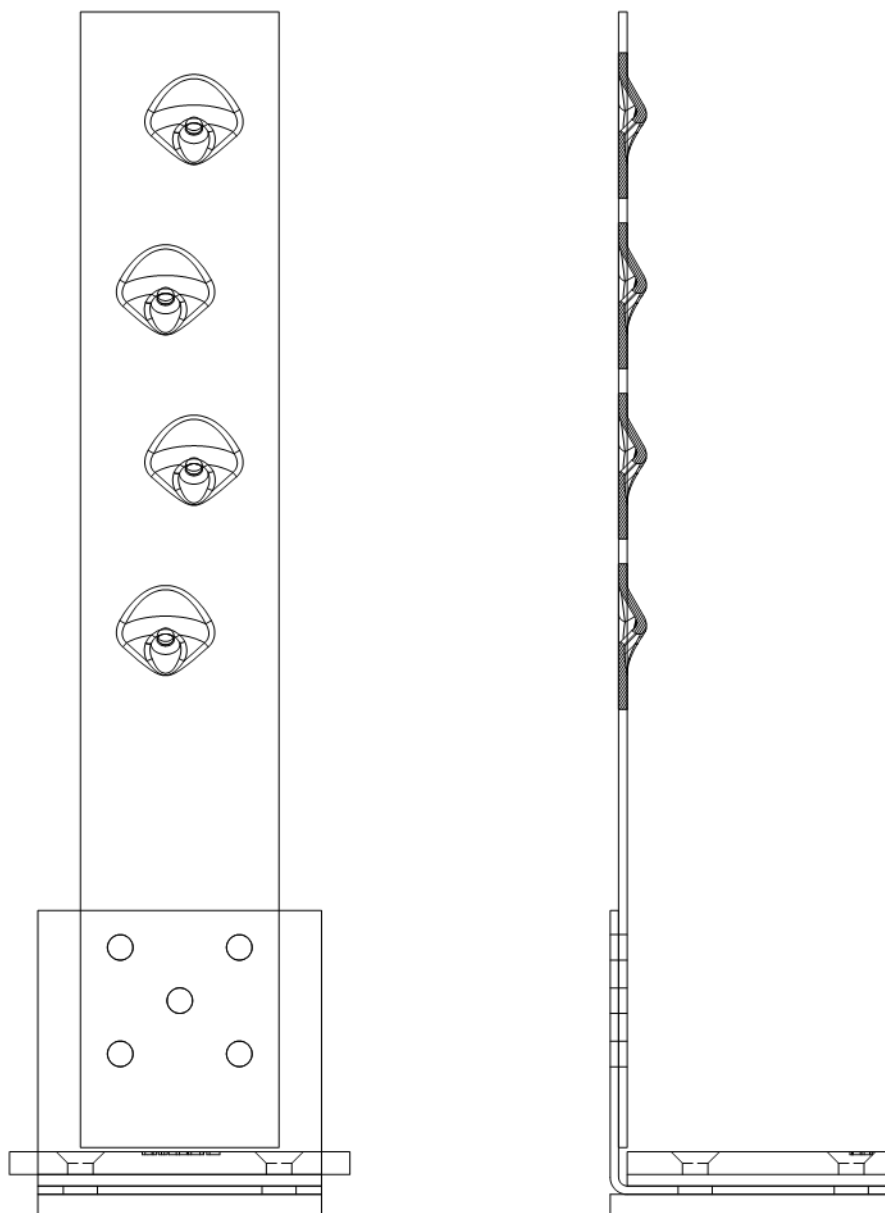
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Artikelnummer:  
**81000.1240**

**Tension plates, example**



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