European Technical Assessment ETA-15/0187 of 2023/11/28

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:	Pitzl HVP connectors
Product family to which the above construction product belongs:	Three-dimensional nailing plate (Angle brackets and hold-downs for timber-to-timber or timber-to-concrete or steel connections)
Manufacturer:	Pitzl Metallbau GmbH & Co. KG Siemensstraße 26 DE-84051 Altheim Tel.: +49 (0) 8703 9346-0 Telefax: +49 (0) 8703 9346-55 Internet: www.pitzl-connectors.com
Manufacturing plant:	Production plant 2
This European Technical Assessment contains:	130 pages including 10 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:	European Assessment Document No. EAD 130186-00-0603 Three dimensional nailing plates
This version replaces:	The ETA with the same number issued on 2017-08-11

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

Pitzl HVP connectors are two-piece, face-fixed beam hangers to be used in timber to timber or timber to concrete or steel connections.

The PITZL HVP CONNECTORS, RIGID, ISO-CONNECTORS and STAIR TREAD CONNECTORS are made from aluminum EN AW-6082 T6 according to EN 755-2 Mechanical properties, EN 755-9 Tolerance and EN 573-3 Chemical analysis. Dimensions, hole positions and typical installations are shown in annexes A and C. For the HVP Connectors it is also possible to work with a parameterised geometry to allow an suitable flexibility for different dimensions of the structural parts (see Annex A1). The thicknesses of the aluminum base plates are between 9 mm up to 20 mm.

Dimensions, hole positions and typical installations are shown in the Annexes. The thickness of the aluminum base plates is between 9 mm up to 20 mm.

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

HVP connectors are intended for use in making connections in load bearing timber structures, as a connection between a wood based joist and a solid timber or wood based header or columns as well as connections between a timber joist and a concrete structure or a steel member, 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 HVP connectors can be installed as connections between wood based members such as:
- Structural solid timber according to EN 338 and/or EN 14081,
- Glulam and glued solid timber according to EN 14080,
- LVL according to EN 14374,
- Parallam PSL,
- Intrallam LSL,
- Cross laminated timber acc. to a valid ETA
- Hardwood, e.g. BauBuche ETA

However, the calculation methods are only allowed for a characteristic wood density of up to 460 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 of the connections with HVP connectors. The design of the connections shall be in accordance with EN 1995-1-1 or a similar national Timber Code.

It is assumed that the forces acting on the connection are the following $F_{1,Ed}$, $F_{2,Ed}$, $F_{3,Ed}$ and $F_{4,Ed}$. The force $F_{1,Ed}$ acts perpendicular to the connector plate, $F_{2,Ed}$ shall act in and $F_{3,Ed}$ against the direction of insertion. The force $F_{4,Ed}$ is assumed to act with an eccentricity e_{45} with regard to the centre of gravity of the connector plates. With the exception of $F_{2,Ed}$ it is assumed that the forces are acting in the centre plane of the connector.
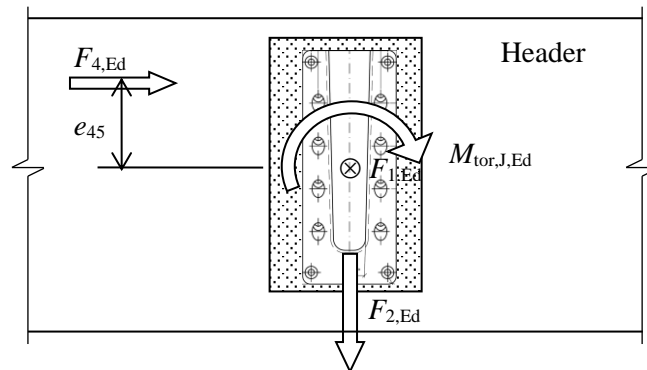

Figure 1: Torsional moment, basic mechanical model

The HVP connectors are for use in timber structures subject to the dry, internal conditions defined by the service classes 1,2 and 3 of EN 1995-1-1:2015, (Eurocode 5).

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 connectors 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 E, G and H
Joint Stiffness	See annex E
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 connectors are made from aluminium 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 connectors 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 to 3.7.

3.4 Methods of verification

The characteristic load-carrying capacities are based on the characteristic values of the screw connections and the aluminum plates. To obtain design values the capacities have to be divided by different partial factors for the material properties, the screw connection 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 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 capacity of the screws and the material itself are determined also for timber, concrete and steel failure $F_{timber,Rk}$, $F_{concrete,Rk}$, $F_{steel,Rk}$ (obtaining the embedment strength of screws subjected to shear or the withdrawal capacity of the most loaded screw) as well as for aluminum plate failure $F_{alu,Rk}$. The design value of the load–carrying capacity is the smaller value of both load–carrying capacities of the connected materials.

$$F_{Rd} = \min \begin{cases} k_{mod} \cdot \dfrac{F_{timber,Rk}}{\gamma_{M,timber}} \\[2ex] \dfrac{F_{concrete,Rk}}{\gamma_{M,concrete}} \\[2ex] \dfrac{F_{steel,Rk}}{\gamma_{M,steel}} \\[2ex] \dfrac{F_{alu,Rk}}{\gamma_{M,alu}} \end{cases} \quad (1)$$

Therefore, for timber failure the load duration class and the service class are included. The different partial factors γ_M for aluminum, timber concrete and steel should also correctly taken into account according the Eurocodes or other

3.5 Mechanical resistance and stability

See Annex B for characteristic load-carrying capacities of the HVP connectors, Annex for the ISO CONNECTORS and Annex XX for the STAIR TREAD CONNECTORS.

The characteristic capacities of the connectors are determined by calculation assisted by tests as described in EAD 130186-00-0603. 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 100 in Annex E:

- *Screws in accordance with EN 14592 or an ETA based on the relevant conditions*

In the formulas in Annex B the capacities for screws calculated from the formulas of Eurocode 5 are used assuming a thin steel plate when calculating the lateral fastener load-carrying-capacity.

No performance has been assessed 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.

See annex B for the joint's stiffness properties - to be used for the analysis of the ultimate or serviceability limit state.

3.6 Aspects related to the performance of the product

Corrosion protection in service class 1, 2 and 3. In accordance with EAD 130186-00-0603 the HVP, RIGID STAIR TREAD and ISO-CONNECTORS are produced from aluminium alloy EN AW-6082 T6 according to EN 755-2 Mechanical properties, EN 755-9 Tolerance and EN 573-3 Chemical analysis.

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

The performance given in this ETA are based on the following assumptions

Header/column – support conditions
- The header beam or the column shall be restrained against rotation and be free from wane under the HVP connector.

  If the header carries joists only on one side the eccentricity moment from the joists

$$M_{ec,Ed} = F_{joist,Ed} \cdot \frac{b_{header}}{2} \quad (2)$$

Where
F_{joist} Reaction force from the joists
b_{header} Width of the header beam/column

shall be considered for HVP connectors at the strength verification of the header beam/column. The same applies when the header has HVP connectors on both sides, but with vertical forces which differ more than 20%.

> The HVP connectors are intended for use for connections subject to static or quasi static loading

- For a header with joists from both sides but with different reaction forces a similar consideration applies.

HVP, STAIR TREAD and ISO-CONNECTORS: Timber-to-timber, timber-to-concrete and timber-to-steel connections

- The connectors are fastened to timber-based joists or headers/columns with screws.

- The connectors are fastened to concrete or steel joists or headers/columns with screws.

- There shall be screws in all holes.

- The connector joint is designed in accordance with Eurocode 5, Eurocode 2, Eurocode 3 or an appropriate national code.

- The gap between the end of the joist and the surface, where contact stresses can occur during loading shall be limited. This means that for HVP, Rigid and Stair Tread Connectors the gap between the surface of the connector plates and the timber surface shall be maximum 1 mm.

- The end grain of the joist and the surface of the header or column shall have a plane surface against the whole connector.

- The depth of the joist for HVP-Connectors shall be so large that the bottom of the joist is at least 10 mm below the lower screw tip in the joist.

- Screws to be used shall have a diameter and head shape which fits the holes of the aluminium connectors.

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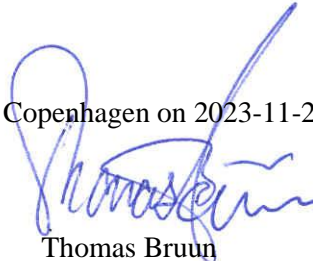
4.1 AVCP system

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 2023-11-28 by

Thomas Bruun
Managing Director, ETA-Danmark

Annex A
HVP-CONNECTORS: Product details and definitions, timber-to-timber applications

HVP CONNECTOR: Parametric Model

$m \leq 6$
$n \leq 15$

$m=1$

$\boxed{n}_{\varnothing}$

$\boxed{n-1}_{\varnothing}$

$\boxed{n-2}_{\varnothing}$

$\geq 4*d$

$\boxed{n=1}$

$\geq 1,25*d$

$\geq 1,25*d$

$\boxed{n}_{\varnothing}$

$\boxed{n-1}_{\varnothing}$

$\boxed{n-2}_{\varnothing}$

$\geq 4*d$

$\boxed{n=1}$

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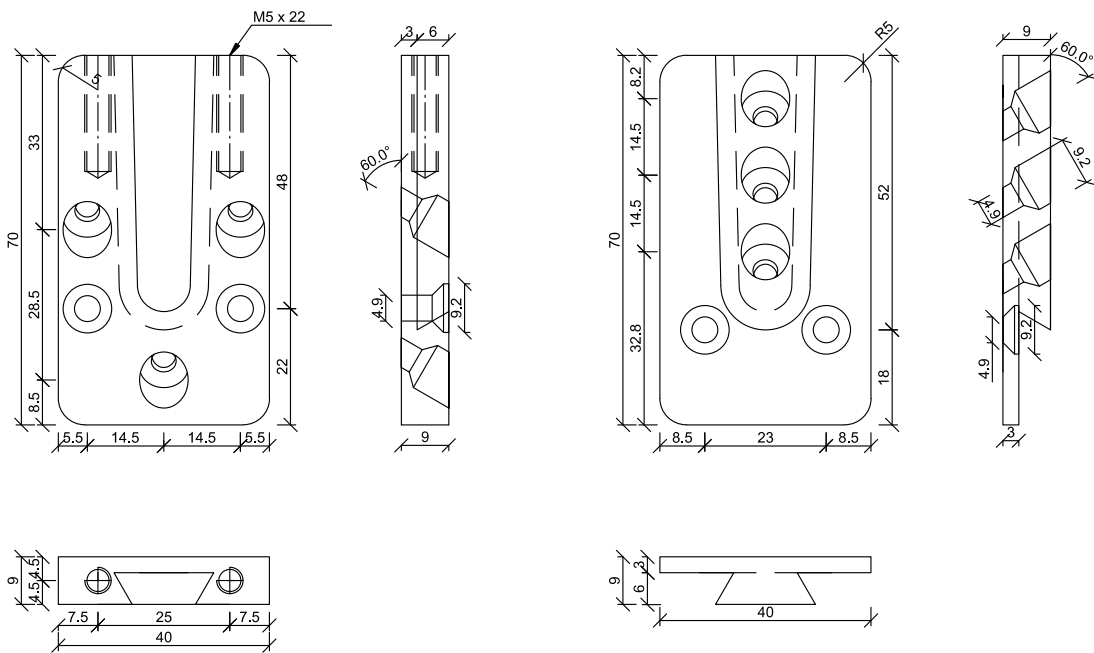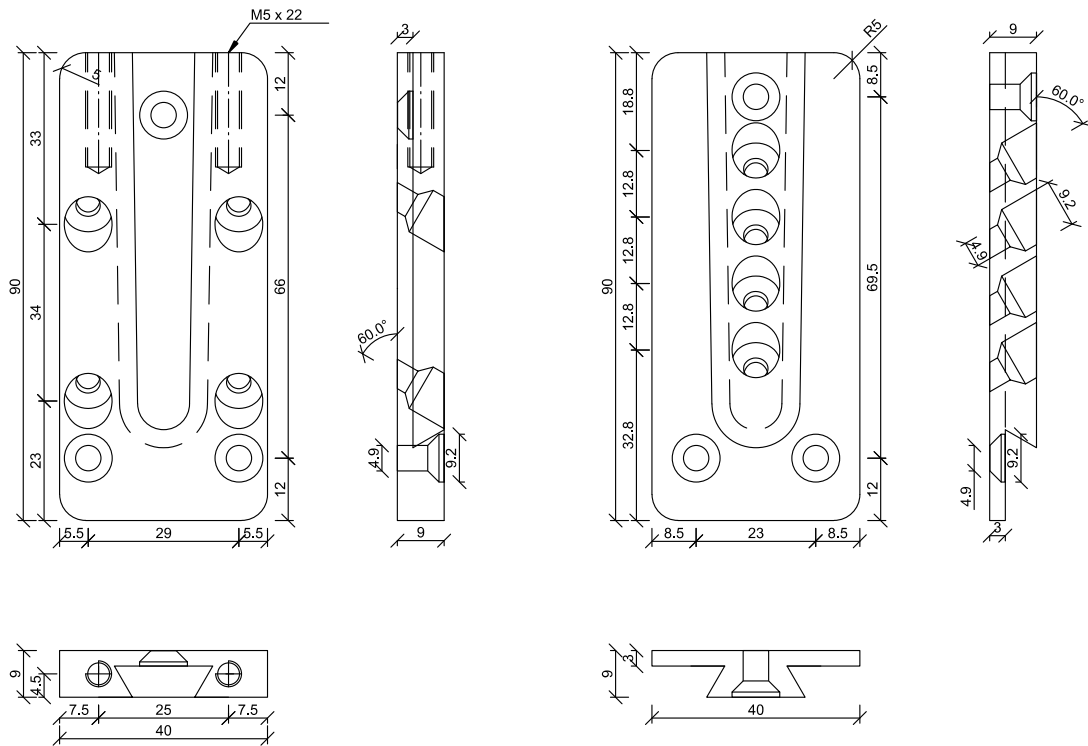| HVP Connector	Annex A1
Parametric model	

SERIES 88004

Ø 3,6 x 12

R5

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88004.0000
with uplift protection
88004.1000

HVP Connector	Annex A2
88004.0000 and 88004.1000	

SERIES 88006

Ø 3,6 x 12

R5

60
51.5
8.5
10
23
27
6 13 6

3 6

4.9
9.2
9
60.0°

R5

60
51.5
18.5
33
8.5
6 13 6

60.0°

9.2
4.9
4.9
9.2
3
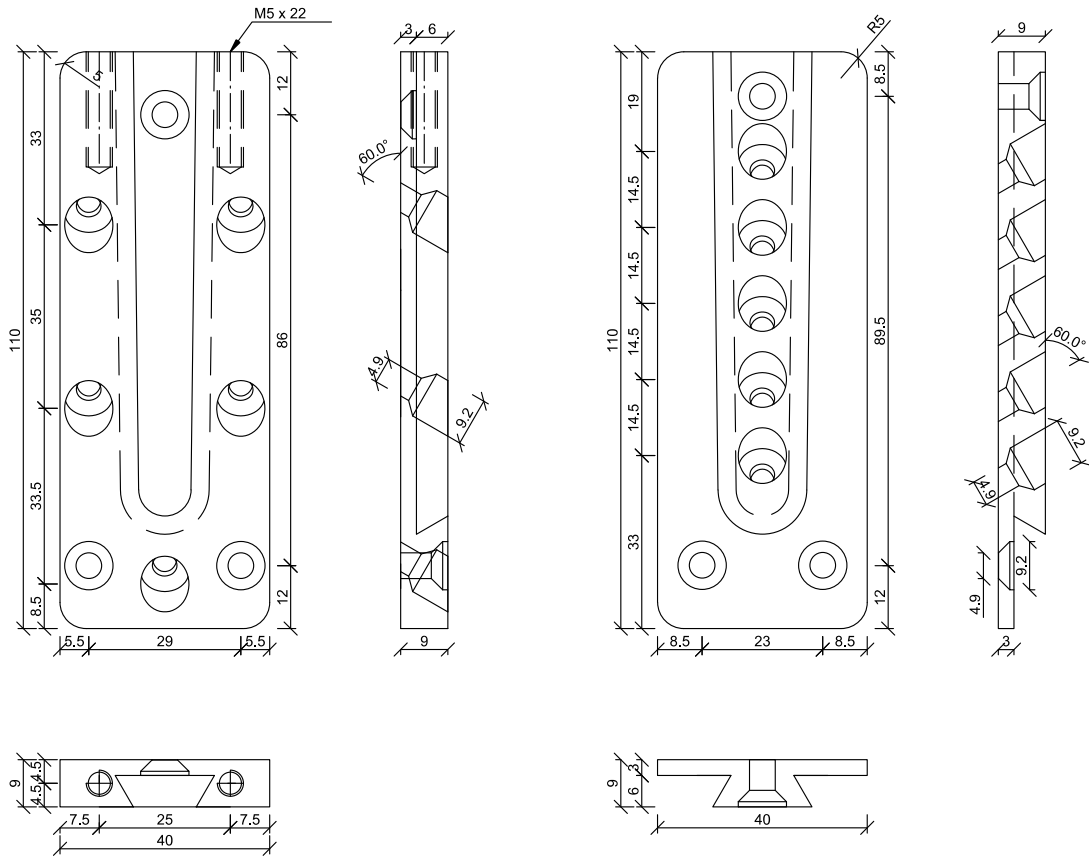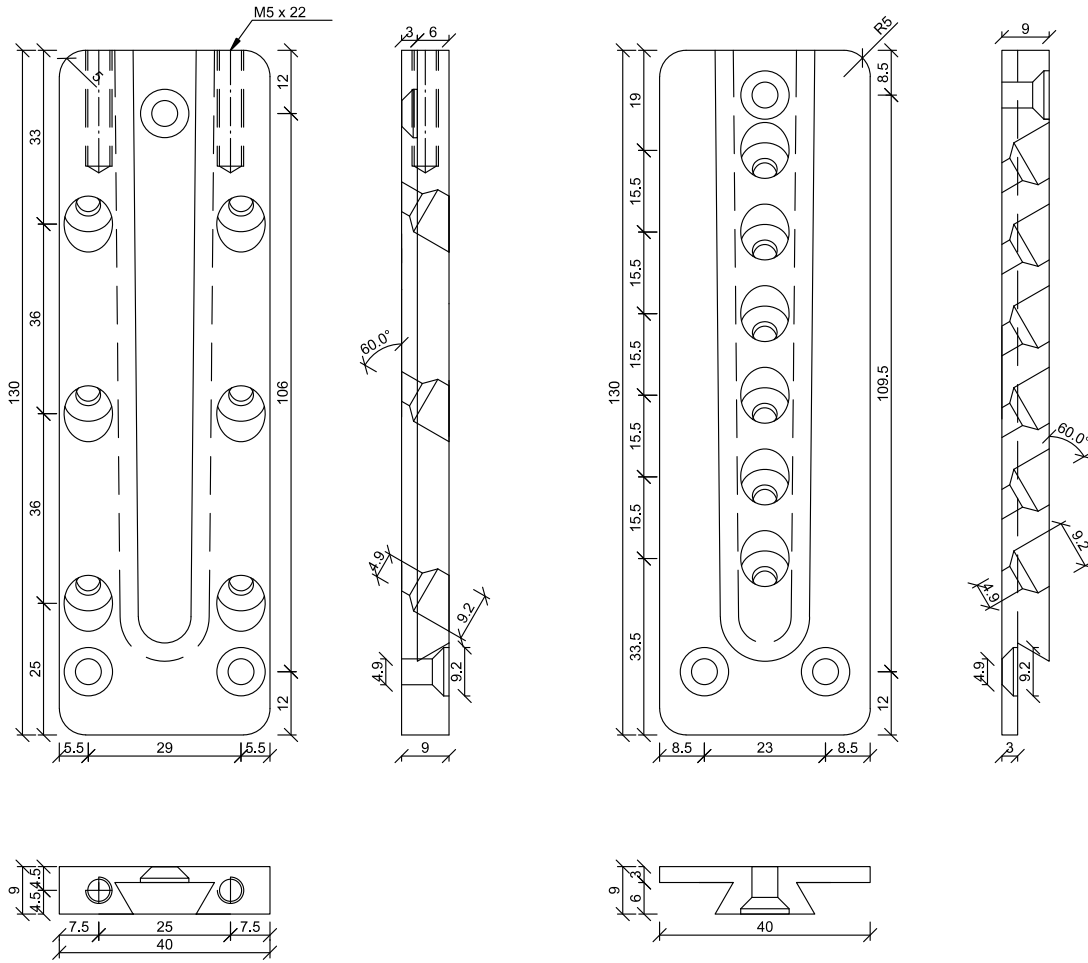
25
3 6 9

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9 6 3

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HVP Connector	Annex A3
88006.0000 and 88006.1000	

SERIES 88008

Ø 3,6 x 12

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| HVP Connector | Annex A4 |
| 88008.0000 and 88008.1000 | |

SERIES 88010

Ø 3,6 x 12

60.0°

R5

60.0°

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HVP Connector

88010.0000 and 88010.1000

Annex A5

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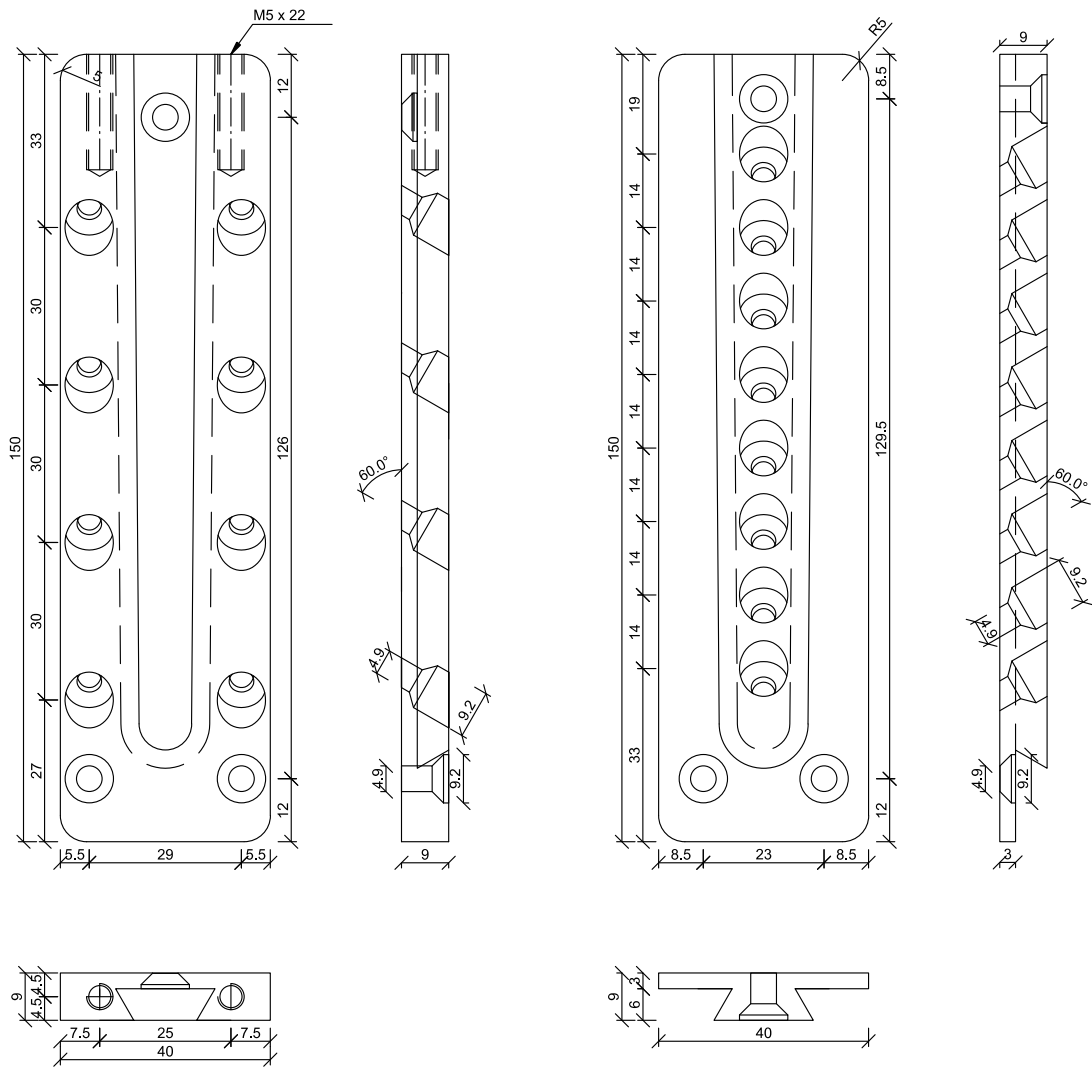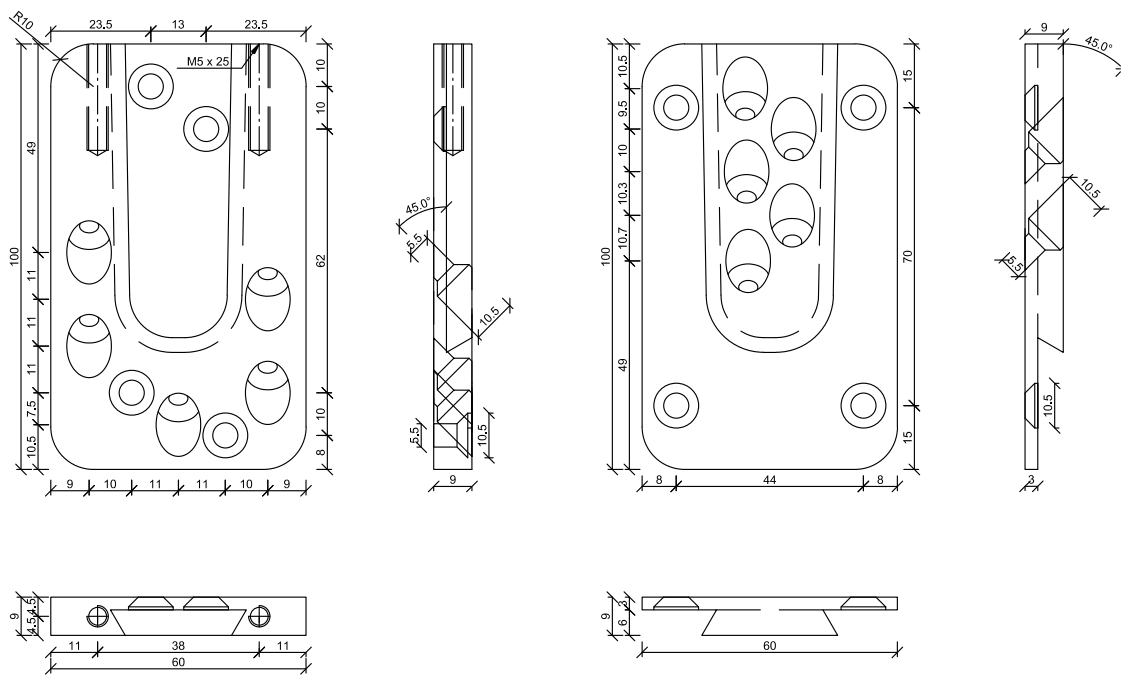| HVP Connector	Annex A6
88107.0000 and 88107.1000	

SERIES 88109

M5 x 22

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with uplift protection
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HVP Connector	
88109.0000 and 88109.1000	Annex A7

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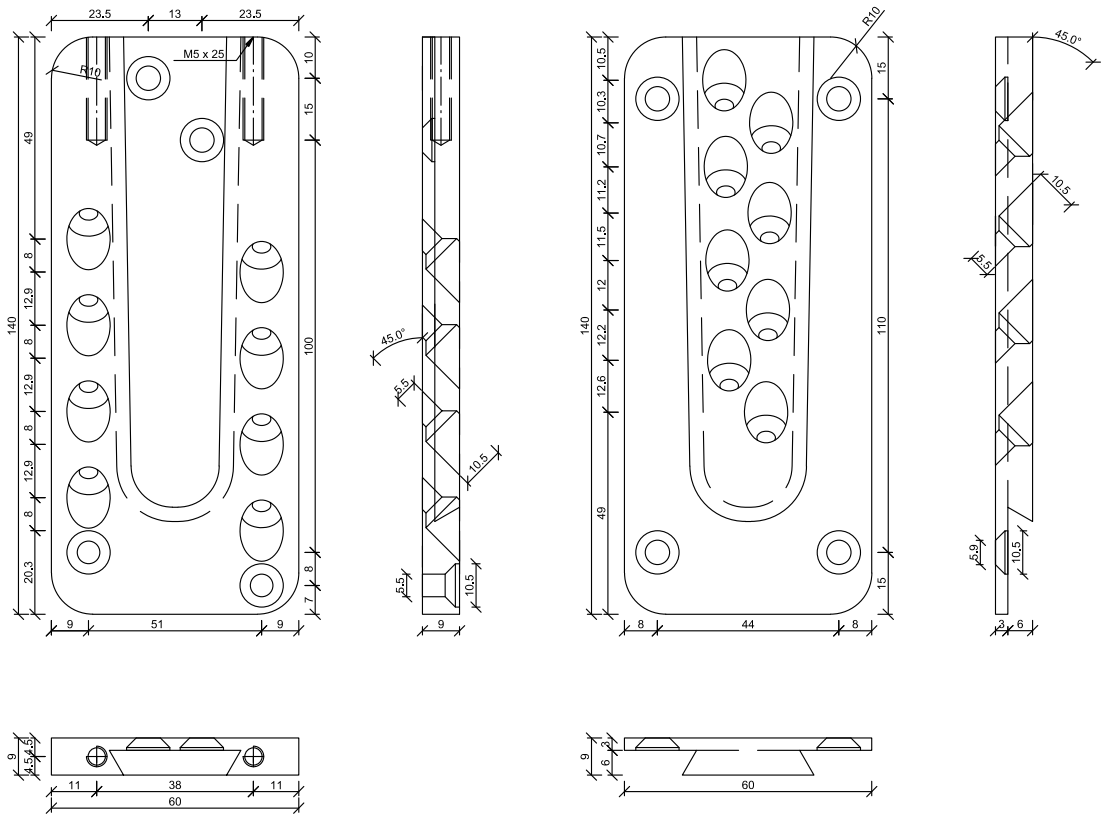

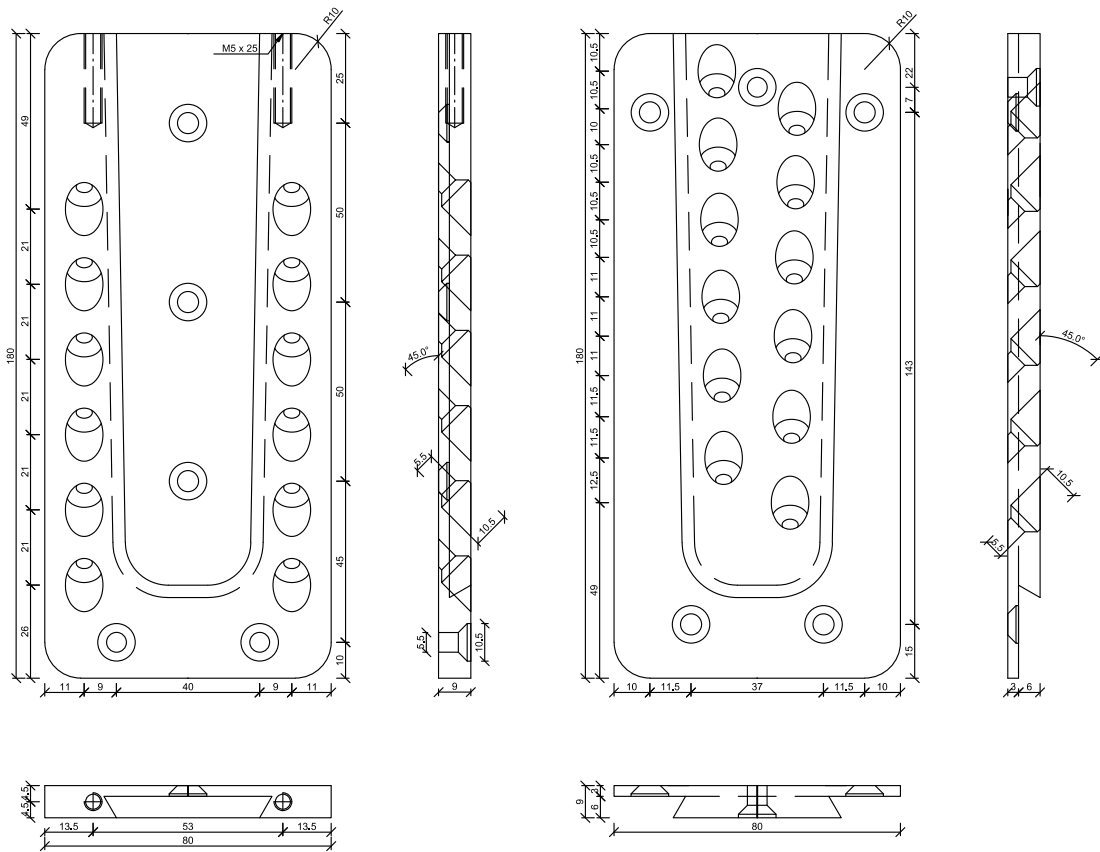Annex A9

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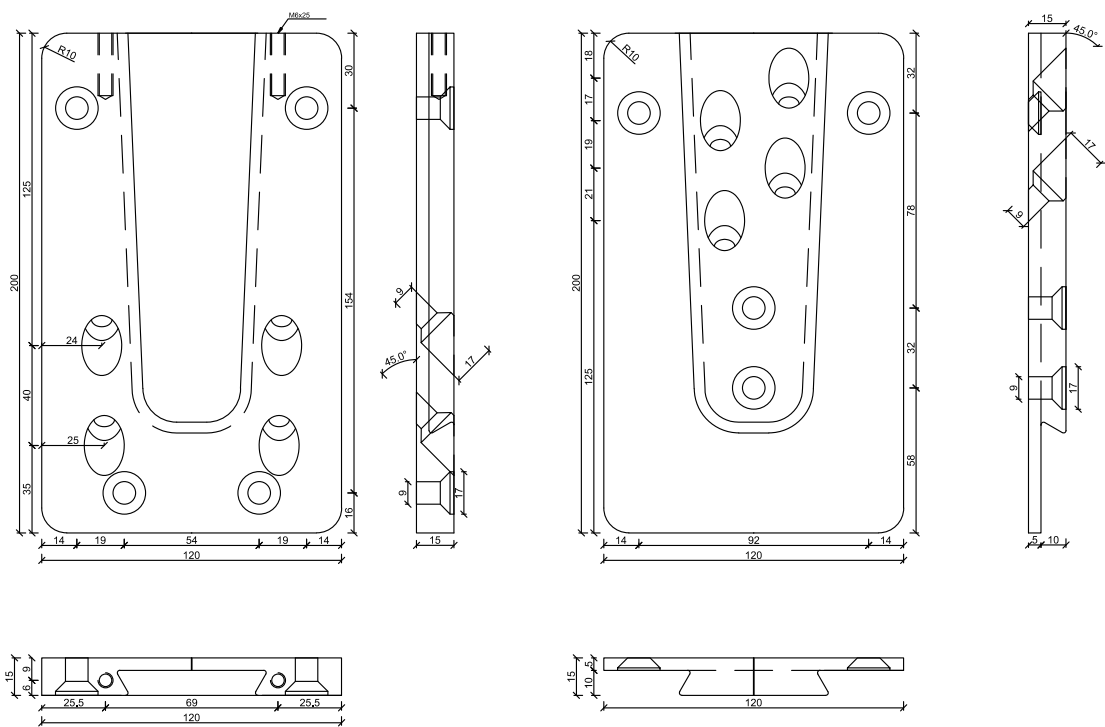
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88113.0000
with uplift protection
88113.1000

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M5 x 22

60.0°

R5

60.0°

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HVP Connector	Annex A11
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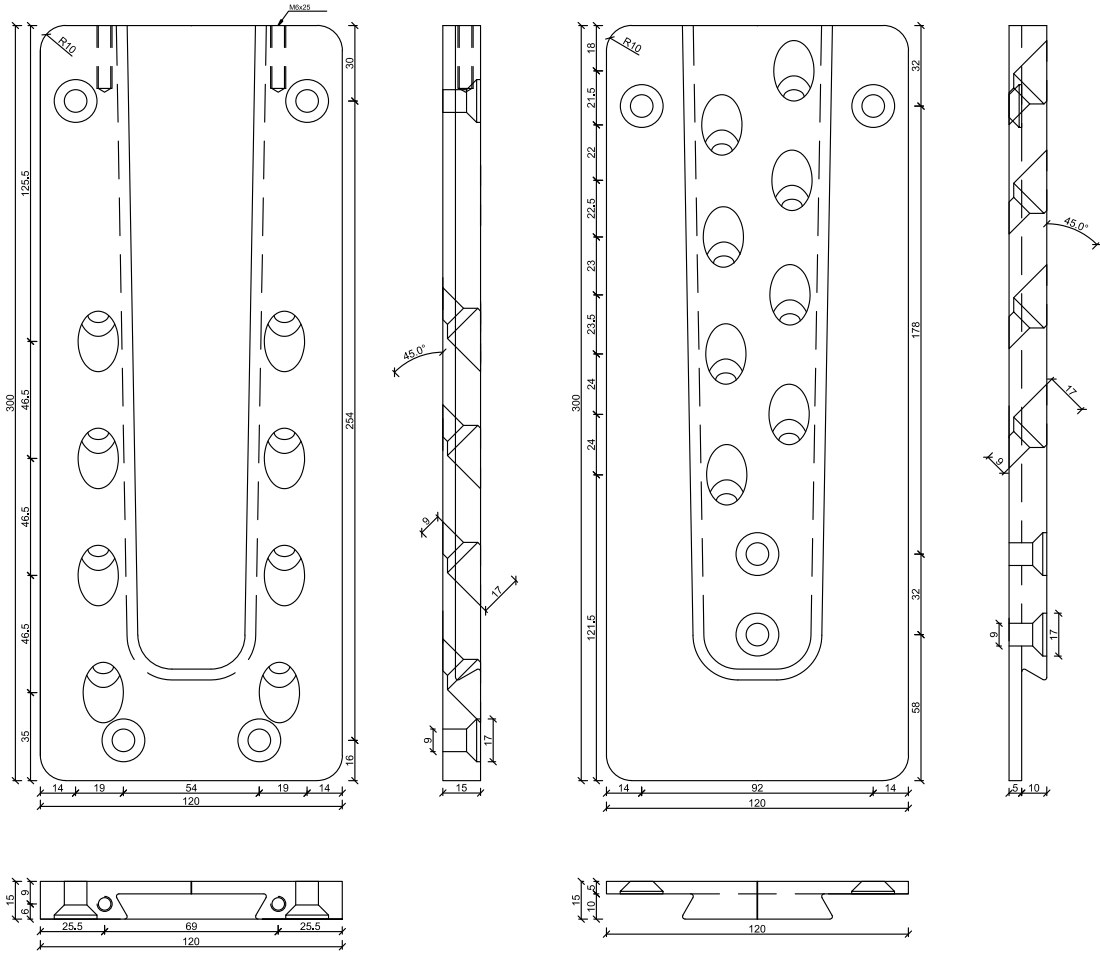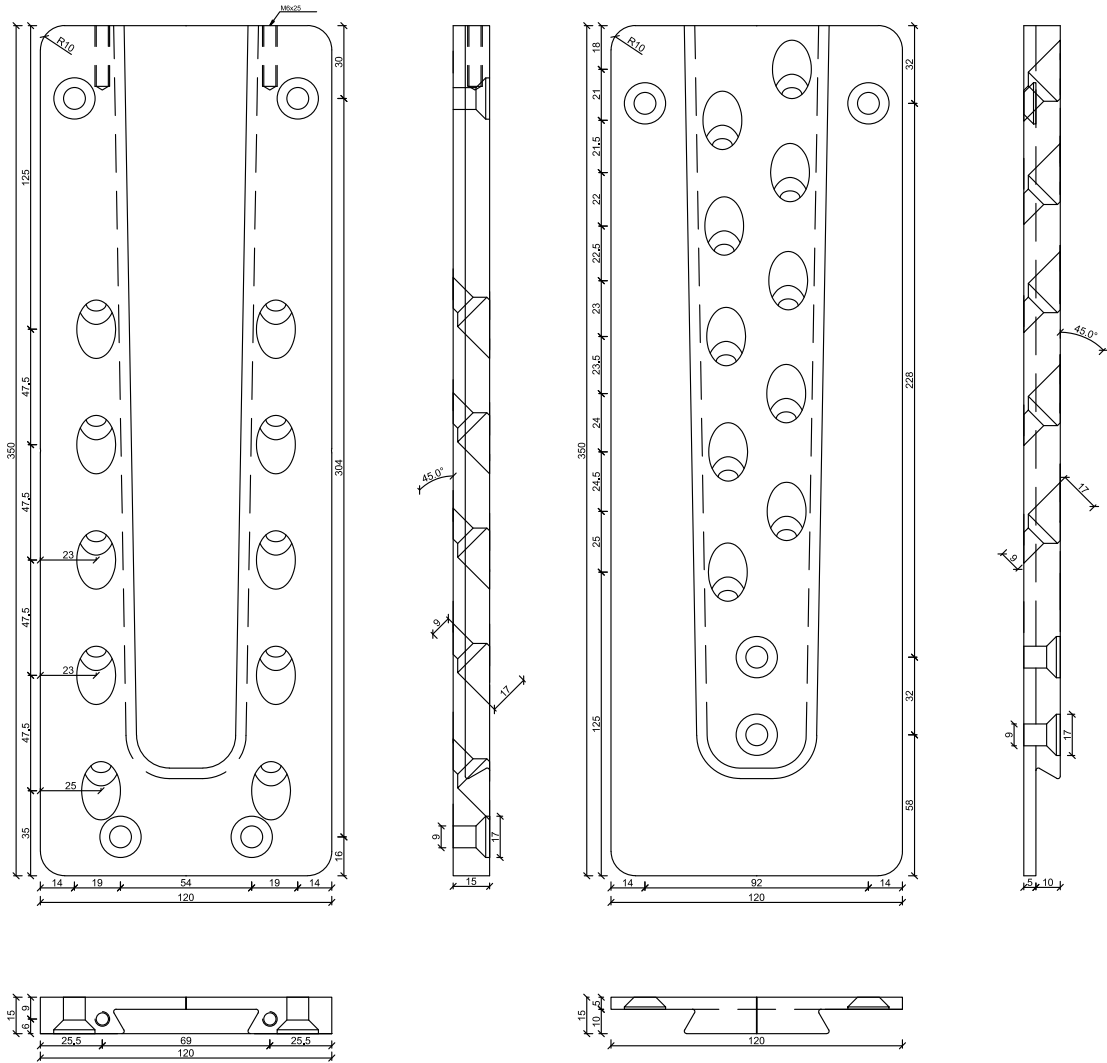| HVP Connector	Annex A12
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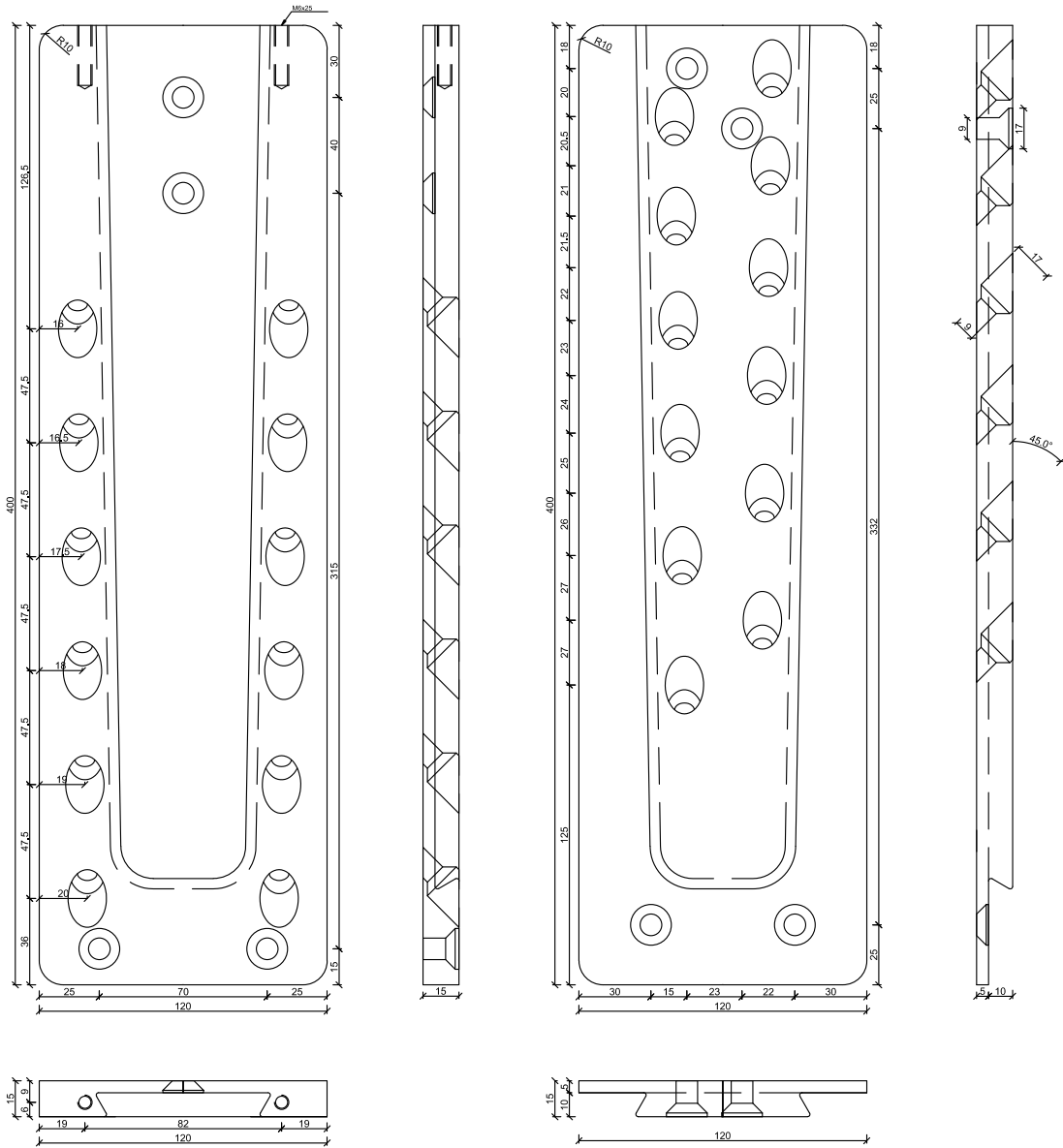HVP Connector

88420.1000

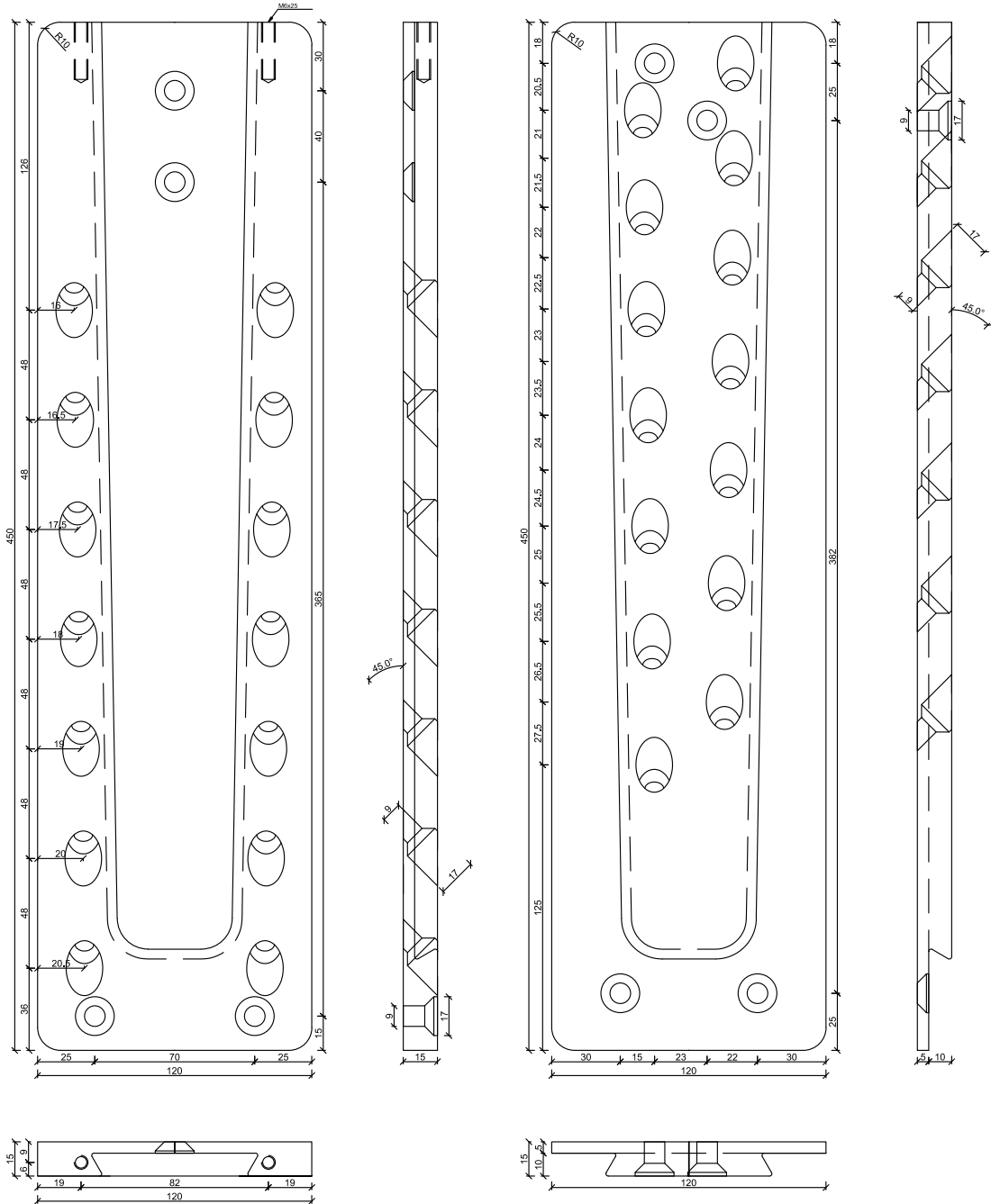Annex A15

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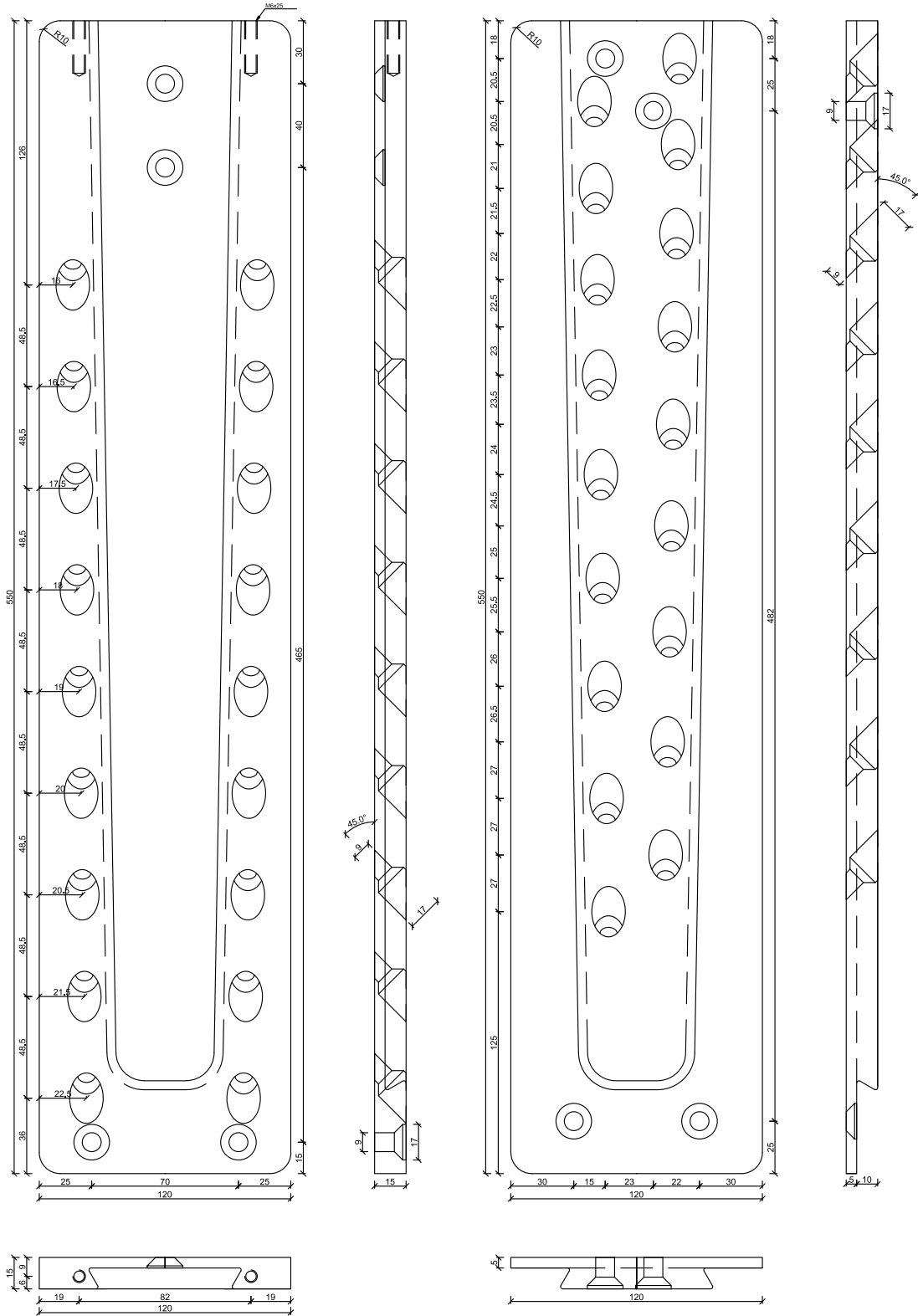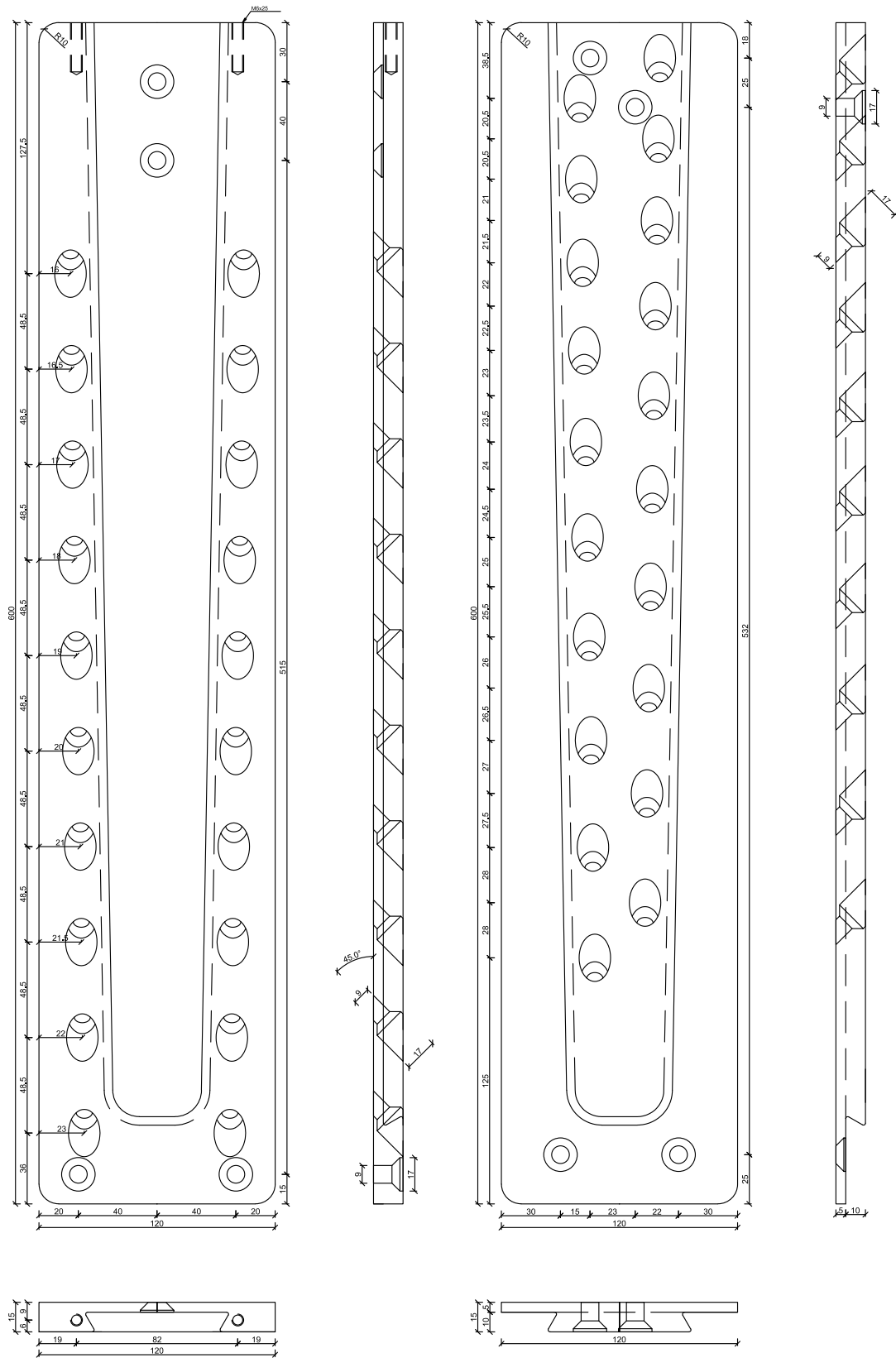Annex A17

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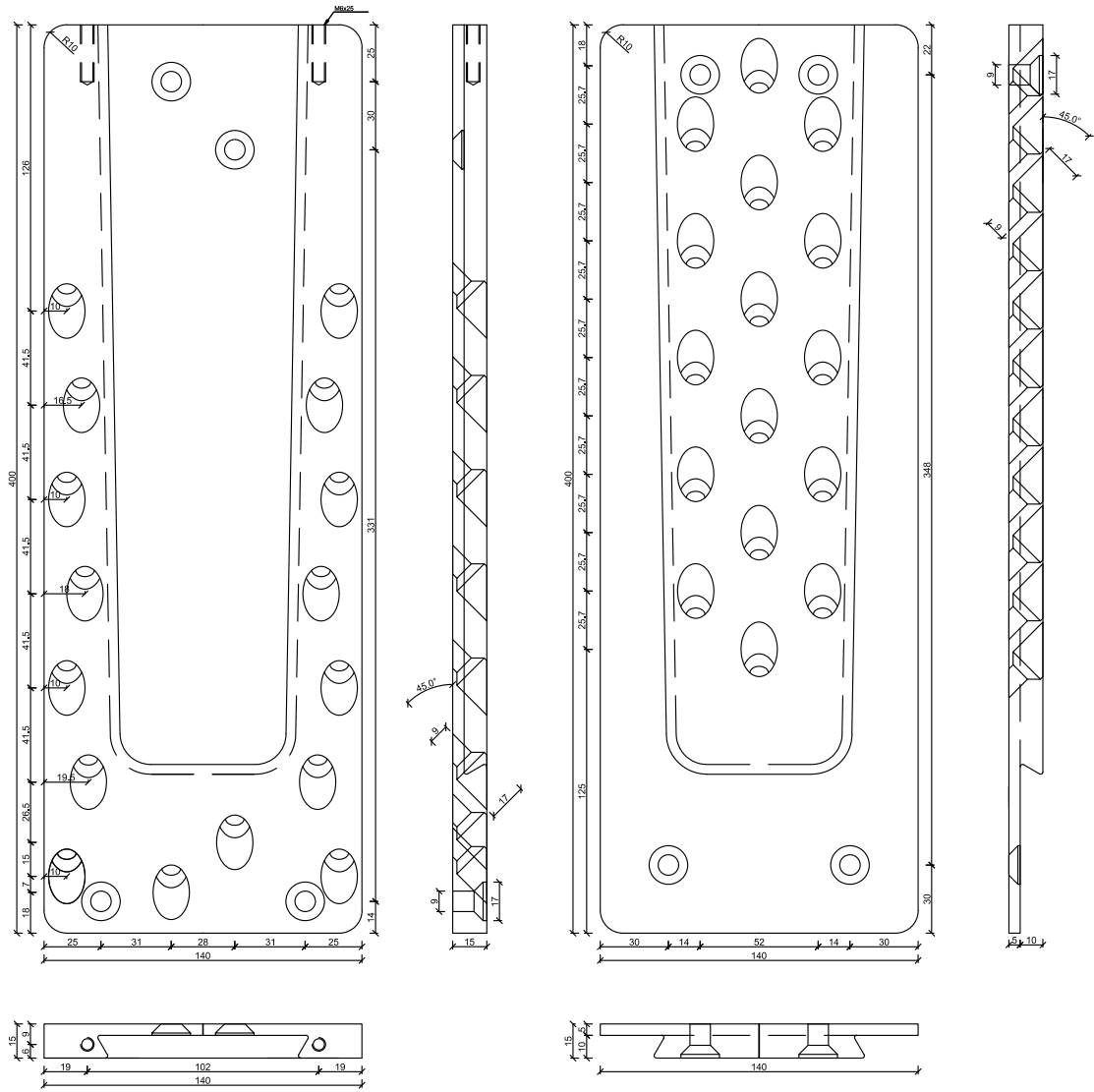| HVP Connector	Annex A19
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HVP Connector

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Annex A21

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HVP Connector

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Annex A22

SERIES 88460

HVP Connector

88460.1000

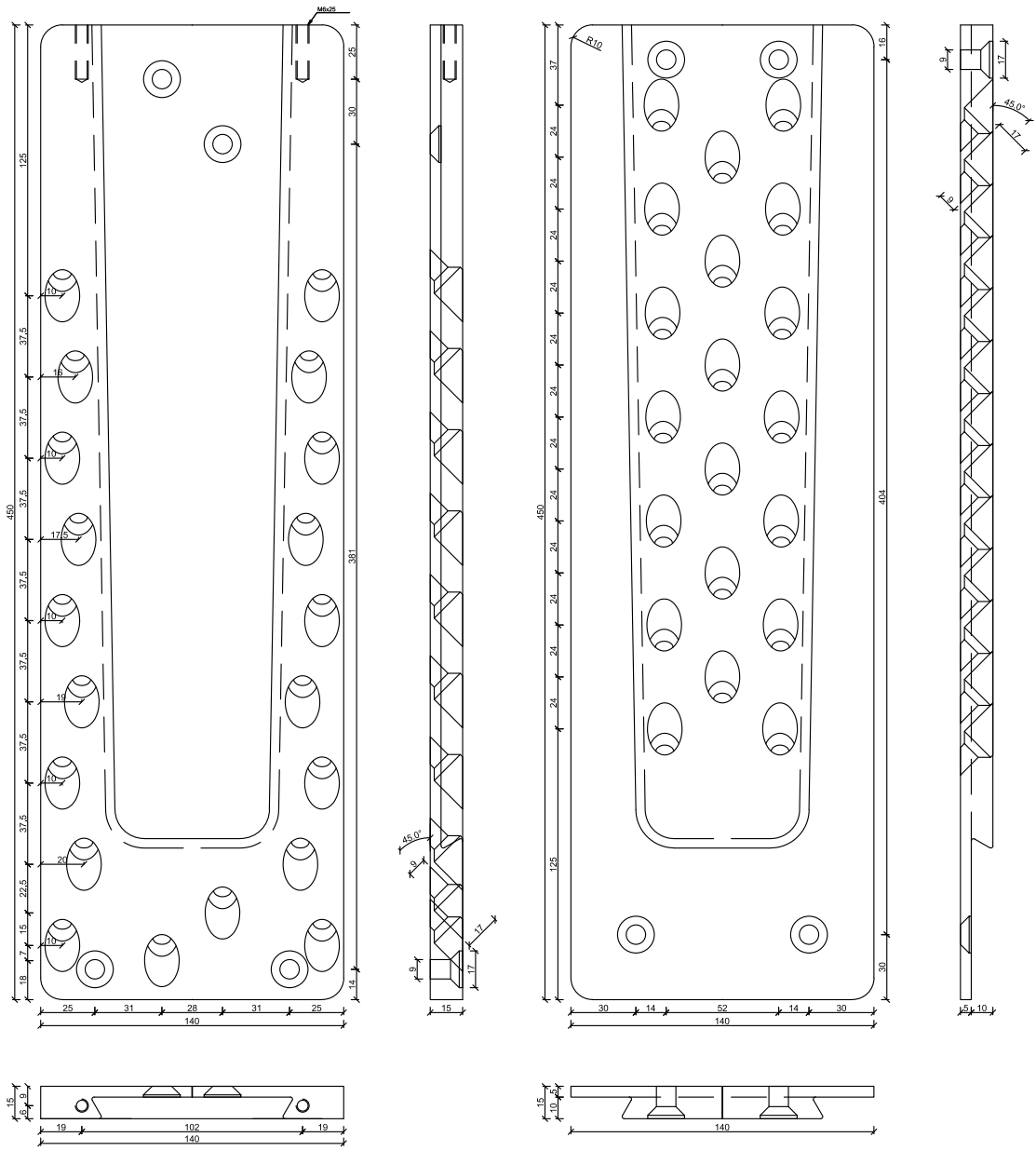Annex A23

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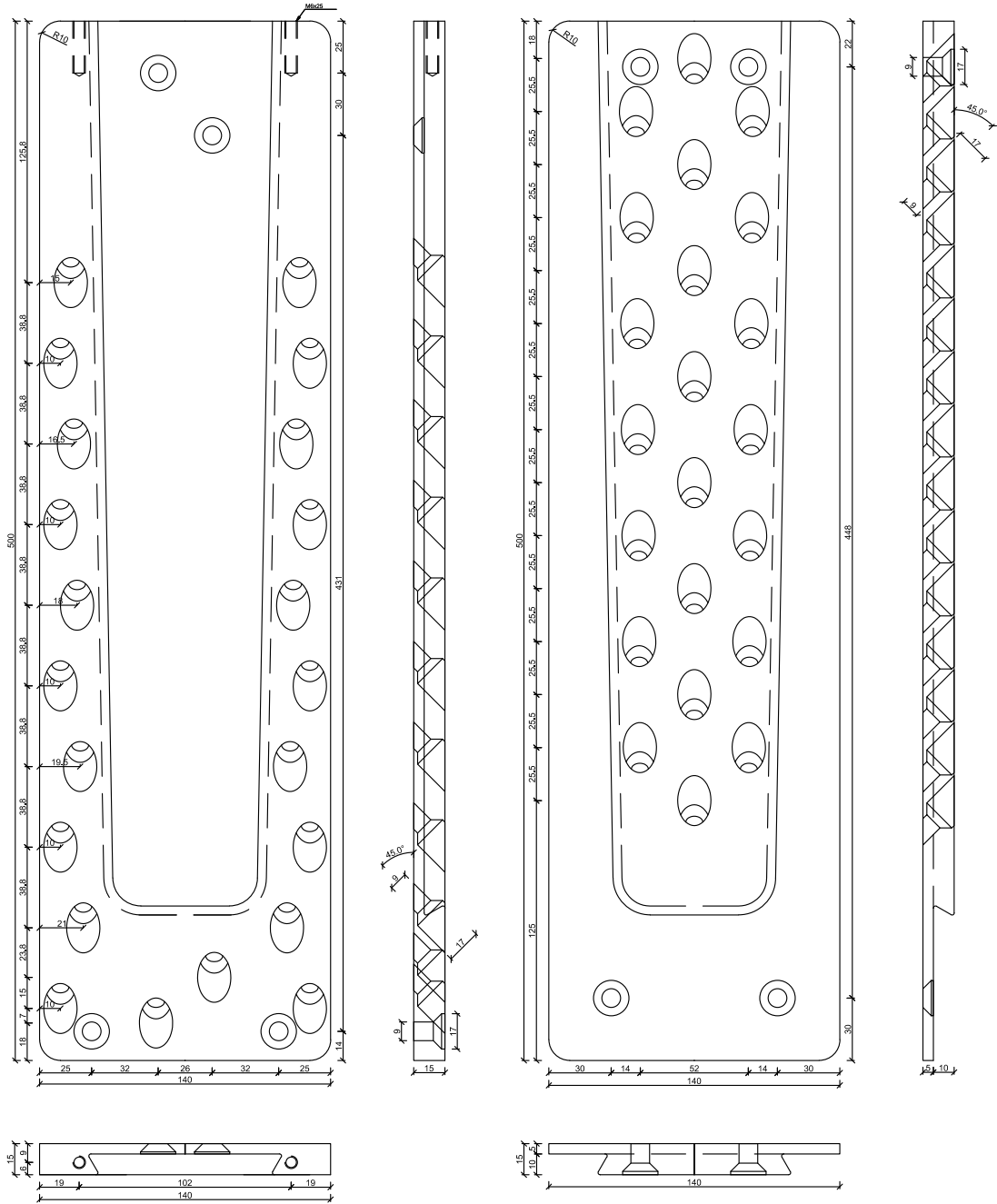

HVP Connector

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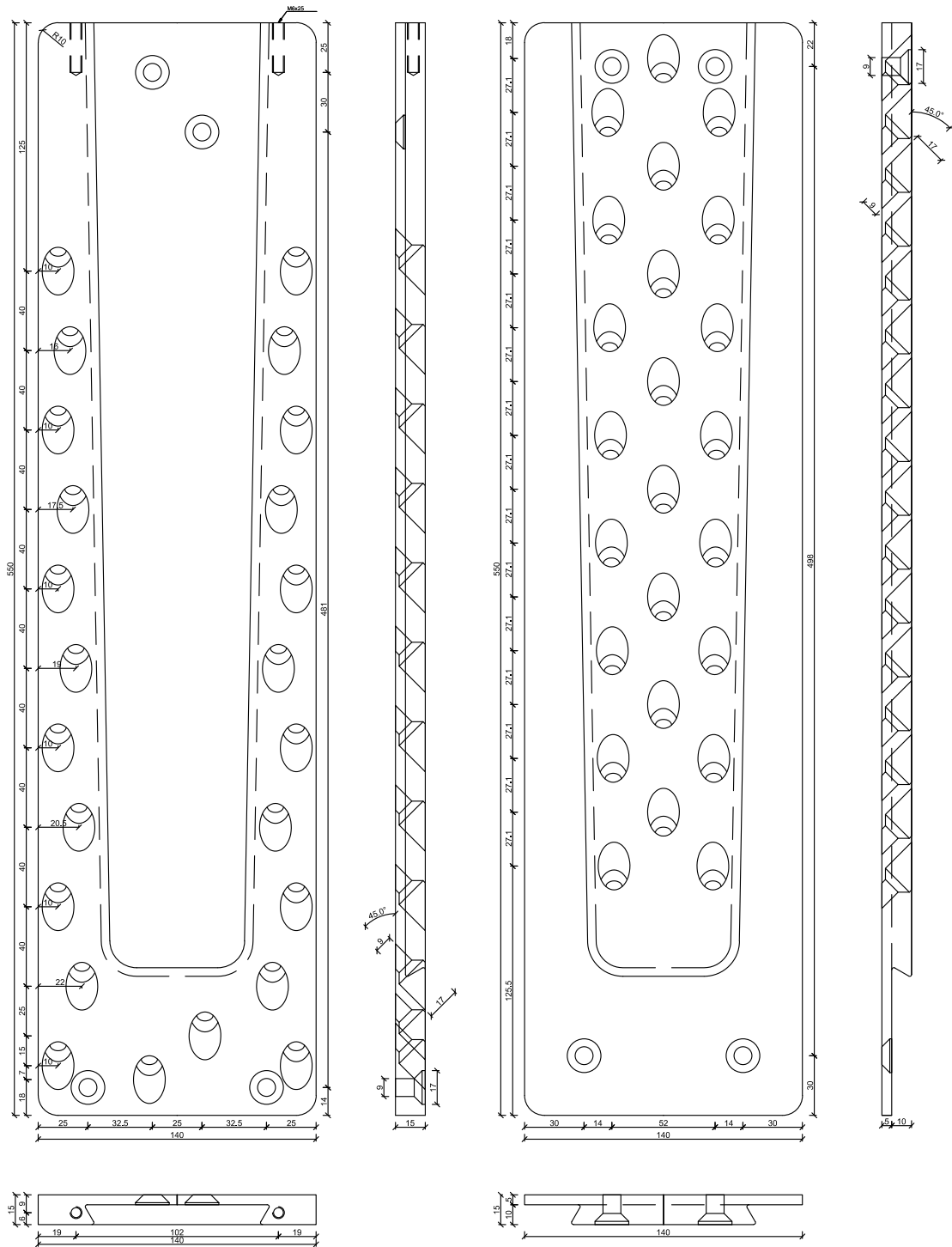Annex A25

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Artikelnummer: 88550.1000

HVP Connector

88550.1000

Annex A26

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SERIES 88210

R10　　　　　　　　　　　　M5 x 25

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HVP Connector

88210.2000

Annex A29

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Siemensstraße 26
D - 84051 Altheim
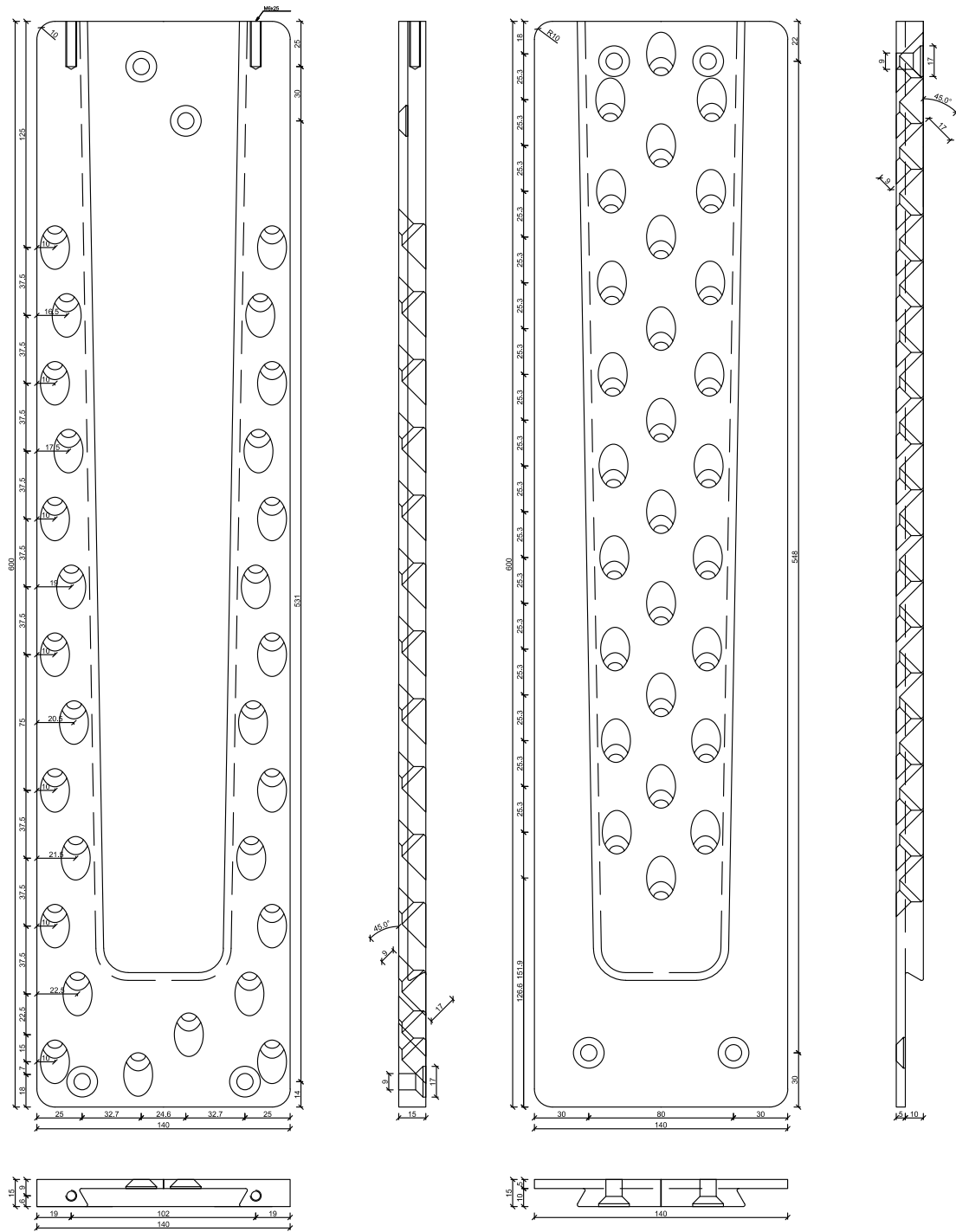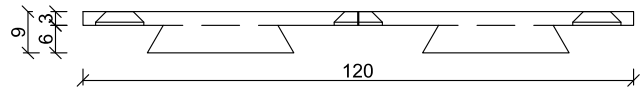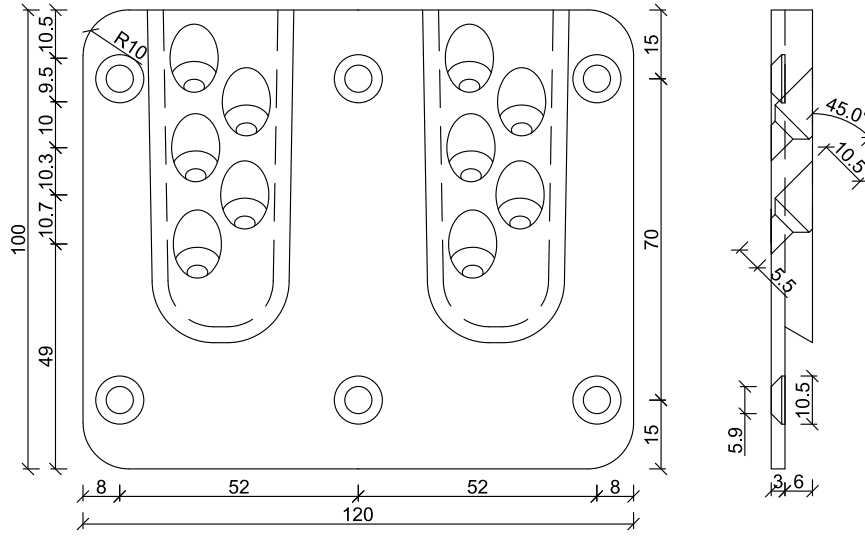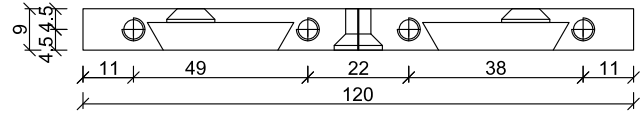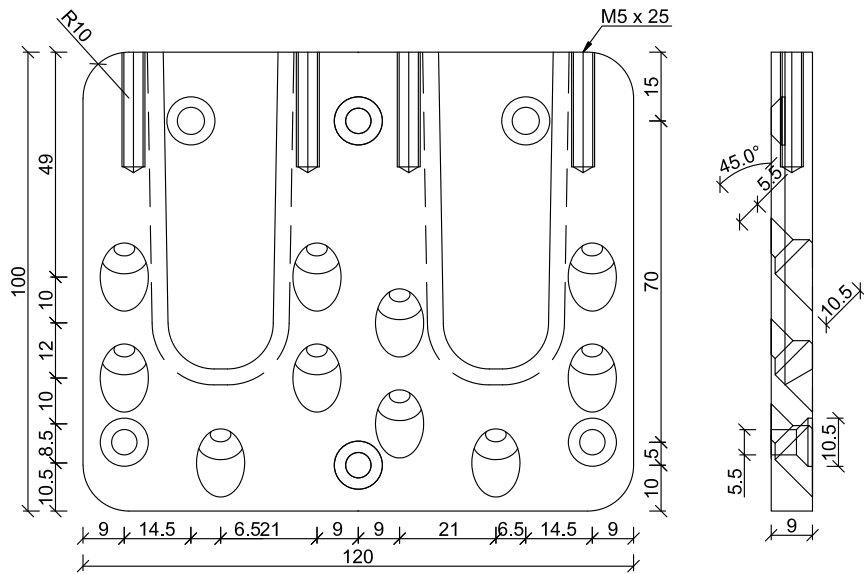Tel +49(0) 8703 9346-0
Fax +49(0) 8703 9346-55
www.pitzl.de

Artikelnummer:
88214.2000

HVP Connector

88214.2000

Annex A30

SERIES 88318

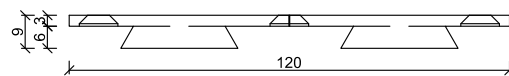| HVP Connector	Annex A31
88318.2000	

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Artikelnummer: 88318.2000

SERIES 88322

| Pitzl Metallbau GmbH & Co.KG | Artikelnummer: |
| Siemensstraße 26 D - 84051 Altheim Tel +49(0) 8703 9346-0 Fax +49(0) 8703 9346-55 www.pitzl.de | 88322.2000 |

HVP Connector

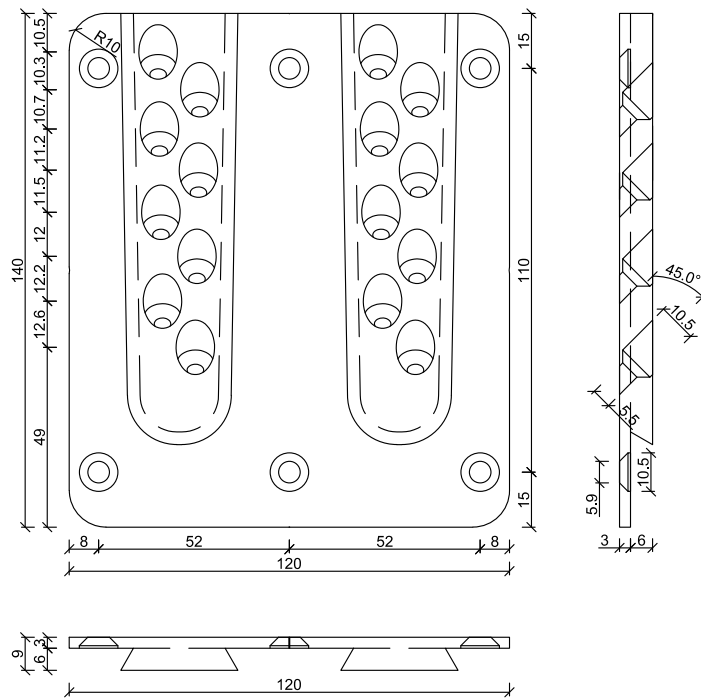88322.2000

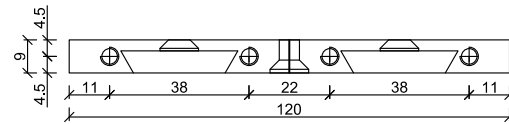Annex A32

SERIES 88322

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Artikelnummer:
88322.2300

HVP Connector

88322.2300
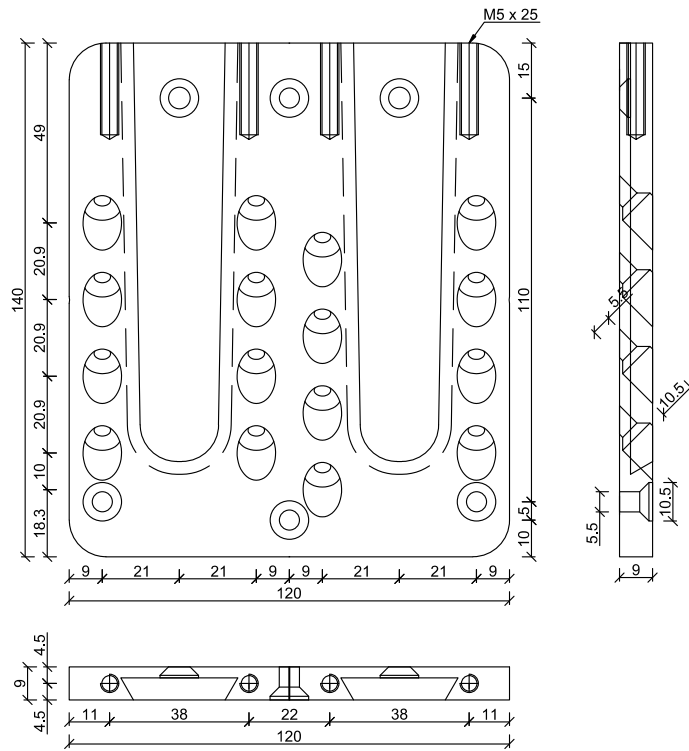
Annex A33

SERIES 88420

Pitzl Metallbau GmbH & Co.KG
Siemensstraße 26
D - 84051 Altheim
Tel +49(0) 8703 9346-0
Fax +49(0) 8703 9346-55
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Artikelnummer:
88420.2000

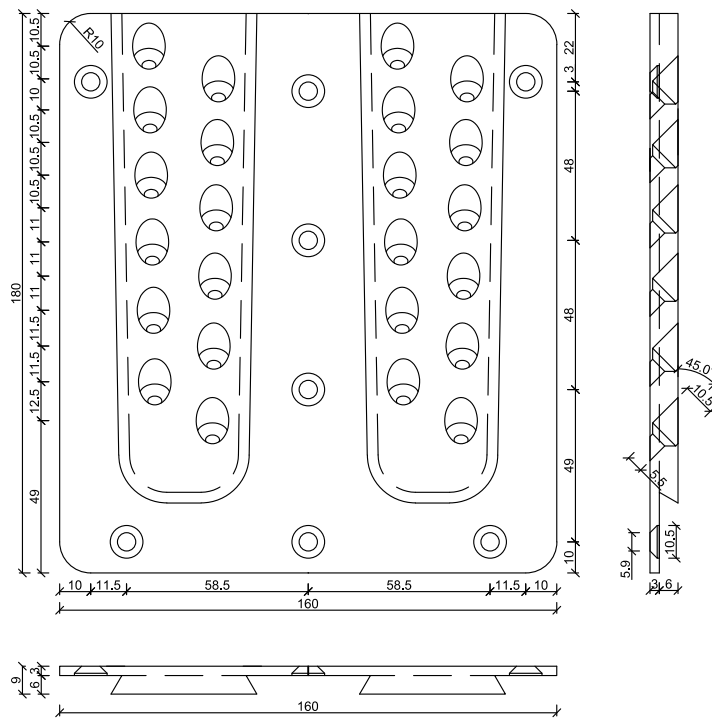| HVP Connector	Annex A34
88420.2000	

SERIES 88425

Pitzl Metallbau GmbH & Co.KG
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D - 84051 Altheim
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Artikelnummer:
88425.2000

HVP Connector

88425.2000

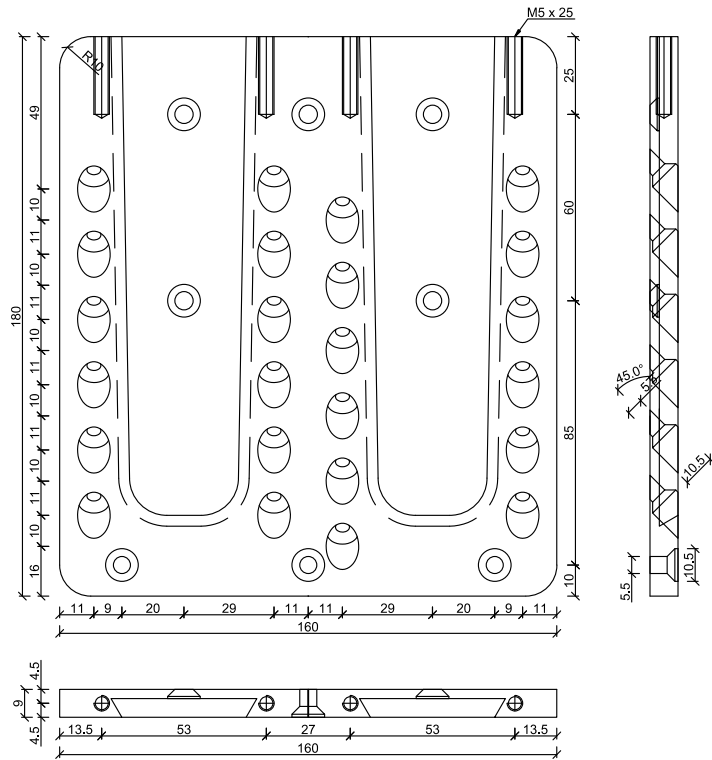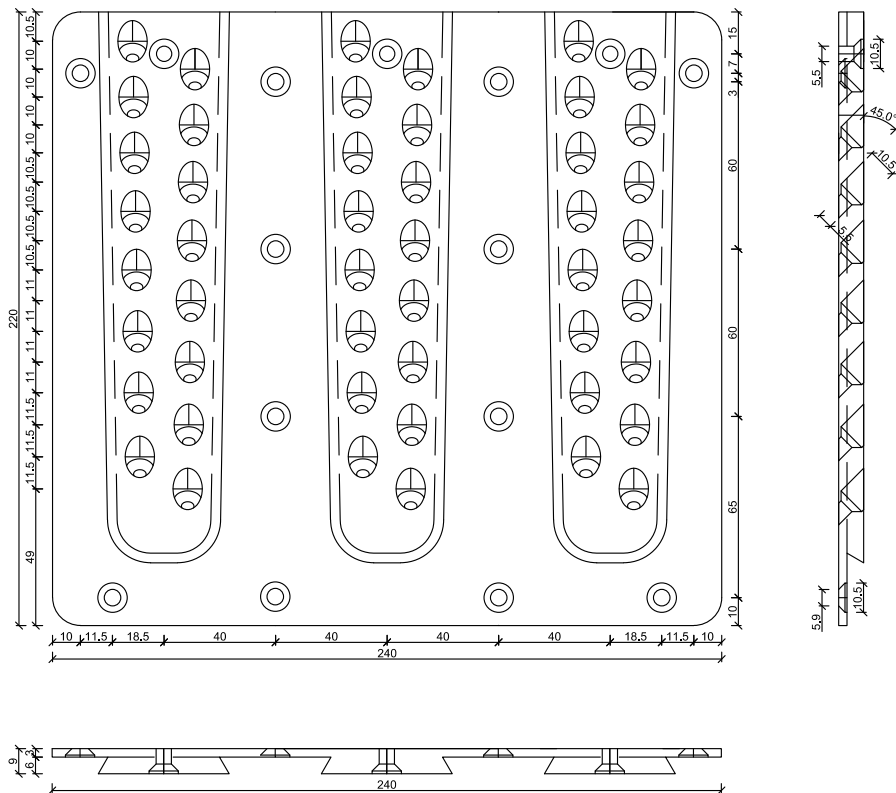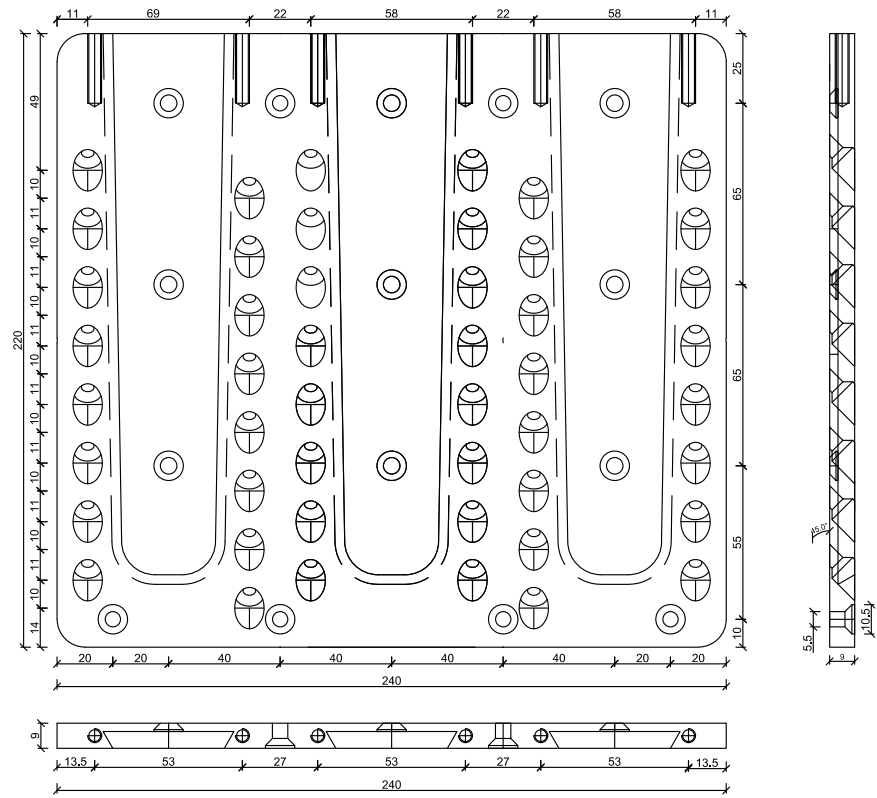Annex A35

SERIES 88430

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Artikelnummer:
88430.2000

HVP Connector	
88430.2000	Annex A36

SERIES 88435

M6 x 25

R10

125
350
23 74
15
32.5
23 74
15
32.5
23 74
15
32.5
23 74
15
32.5
25 70
15
20

14 19 87 87 19 14
240

30
10
294
16

45.0°
9
17
9 17
15

15 9
6
25.5 69 51 69 25.5
240

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D - 84051 Altheim	88435.2000
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Fax +49(0) 8703 9346-55	
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HVP Connector

88435.2000, part 1

Annex A37

SERIES 88435

	Pitzl Metallbau GmbH & Co.KG	Artikelnummer:
Pitzl®	Siemensstraße 26 D - 84051 Altheim Tel +49(0) 8703 9346-0 Fax +49(0) 8703 9346-55 www.pitzl.de	88435.2000 Teil2

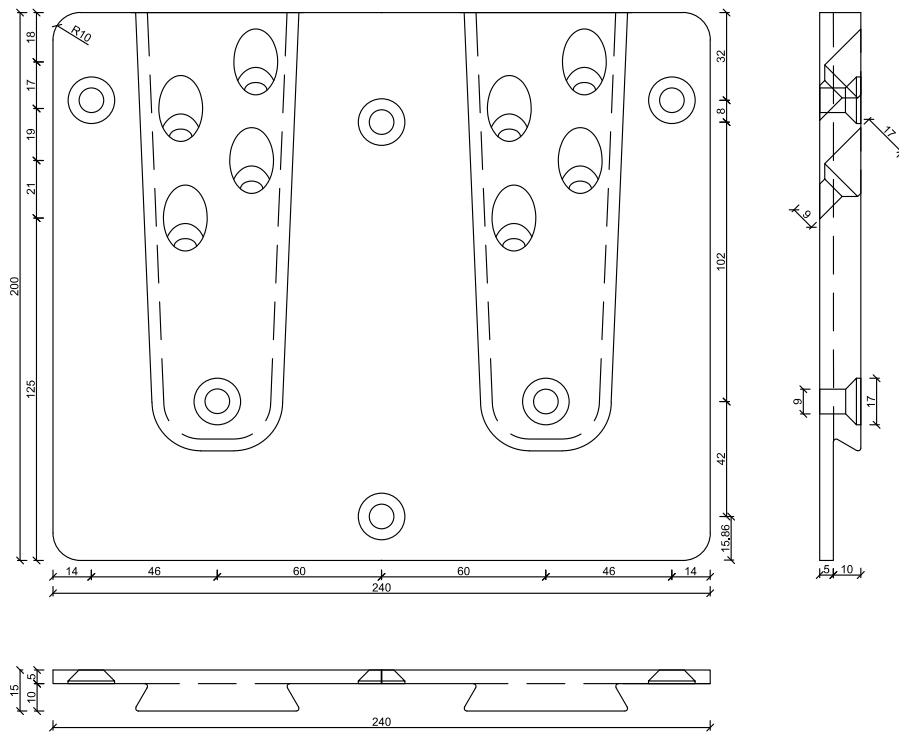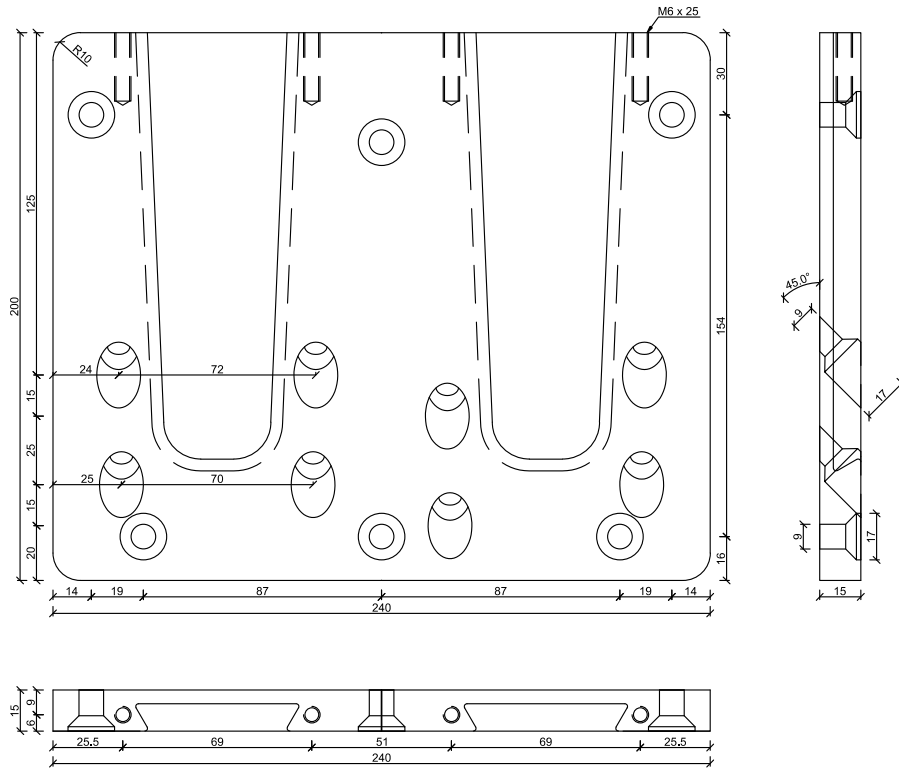| HVP Connector	Annex A38
88435.2000, part 2	

SERIES 88440	

M6 x 25

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D - 84051 Altheim
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Artikelnummer:
88440.2000
Teil1

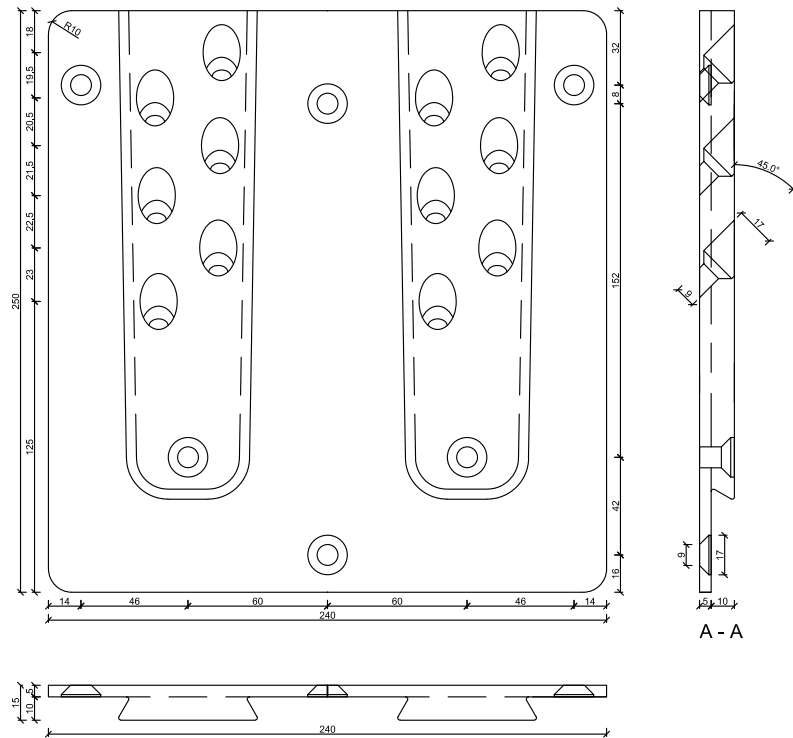| HVP Connector	Annex A39
88440.2000, part 1	

SERIES 88440

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Siemensstraße 26
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Artikelnummer:
88440.2000
Teil2

HVP Connector

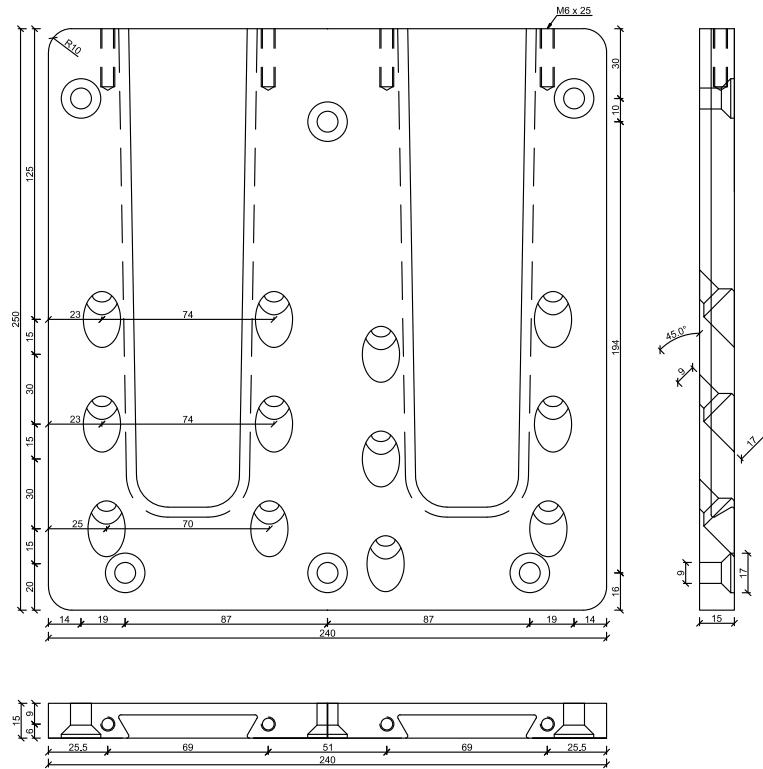88440.2000, part 2

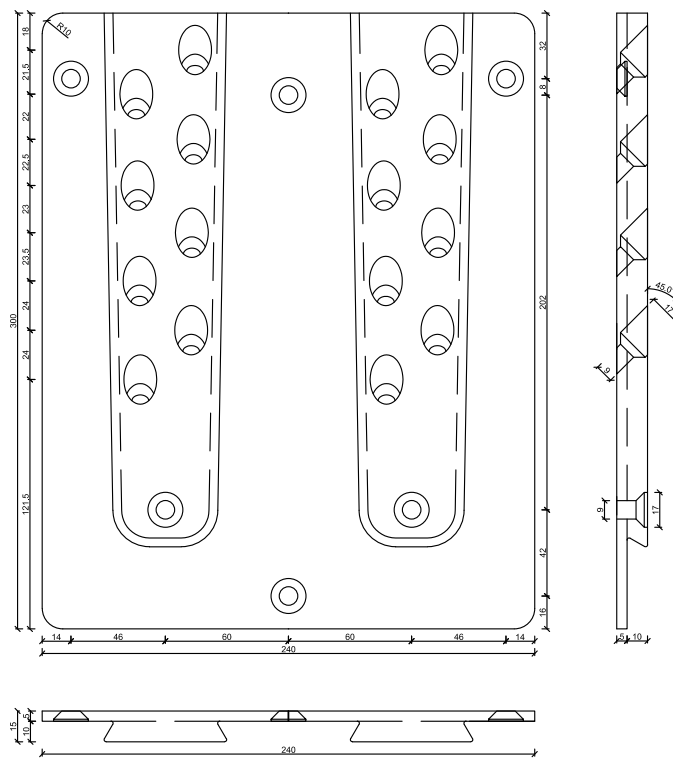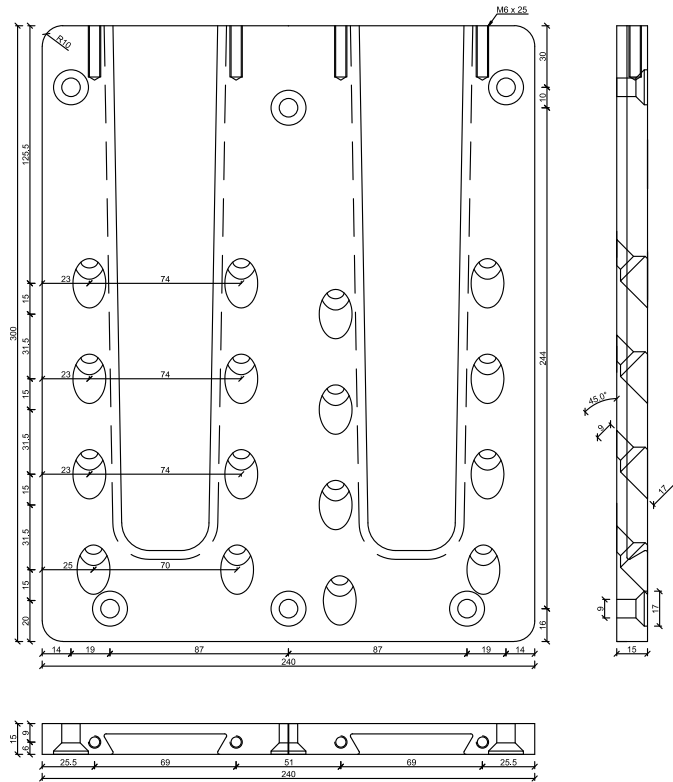**Annex A40**

SERIES 88445

Pitzl Metallbau GmbH & Co.KG
Siemensstraße 26
D - 84051 Altheim
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Fax +49(0) 8703 9346-55
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Artikelnummer:
88445.2000
Teil1

HVP Connector

88445.2000, part 1

Annex A41

SERIES 88445

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Fax +49(0) 8703 9346-55		
www.pitzl.de		

HVP Connector	Annex A42
88445.2000, part 2	

SERIES 88450

M6 x 25

R10

125,2

500

460

30

10

15

16 — 88
17 — 86
17,5 — 85
18,5 — 83
19 — 82
20 — 80
21 — 78
21,5 — 77

15 / 33,4 (repeated)

21

25 | 35 | 60 | 60 | 35 | 25

240

45,0°

9

17

15

15 | 6 | 9

19 | 82 | 38 | 82 | 19

240

	Pitzl Metallbau GmbH & Co.KG	Artikelnummer:
	Siemensstraße 26 D - 84051 Altheim	
Pitzl®	Tel +49(0) 8703 9346-0 Fax +49(0) 8703 9346-55 www.pitzl.de	88450.2000 Teil1

HVP Connector

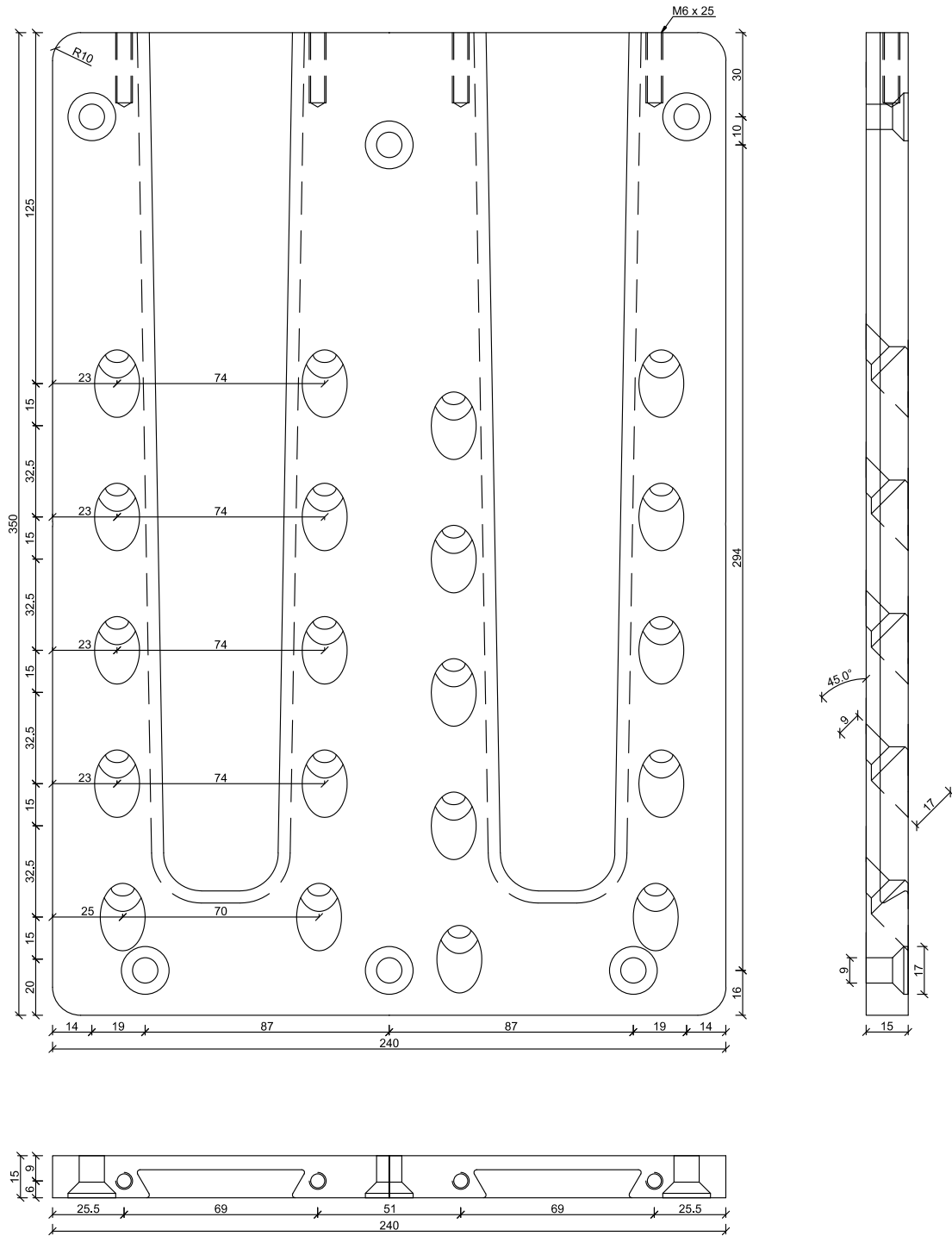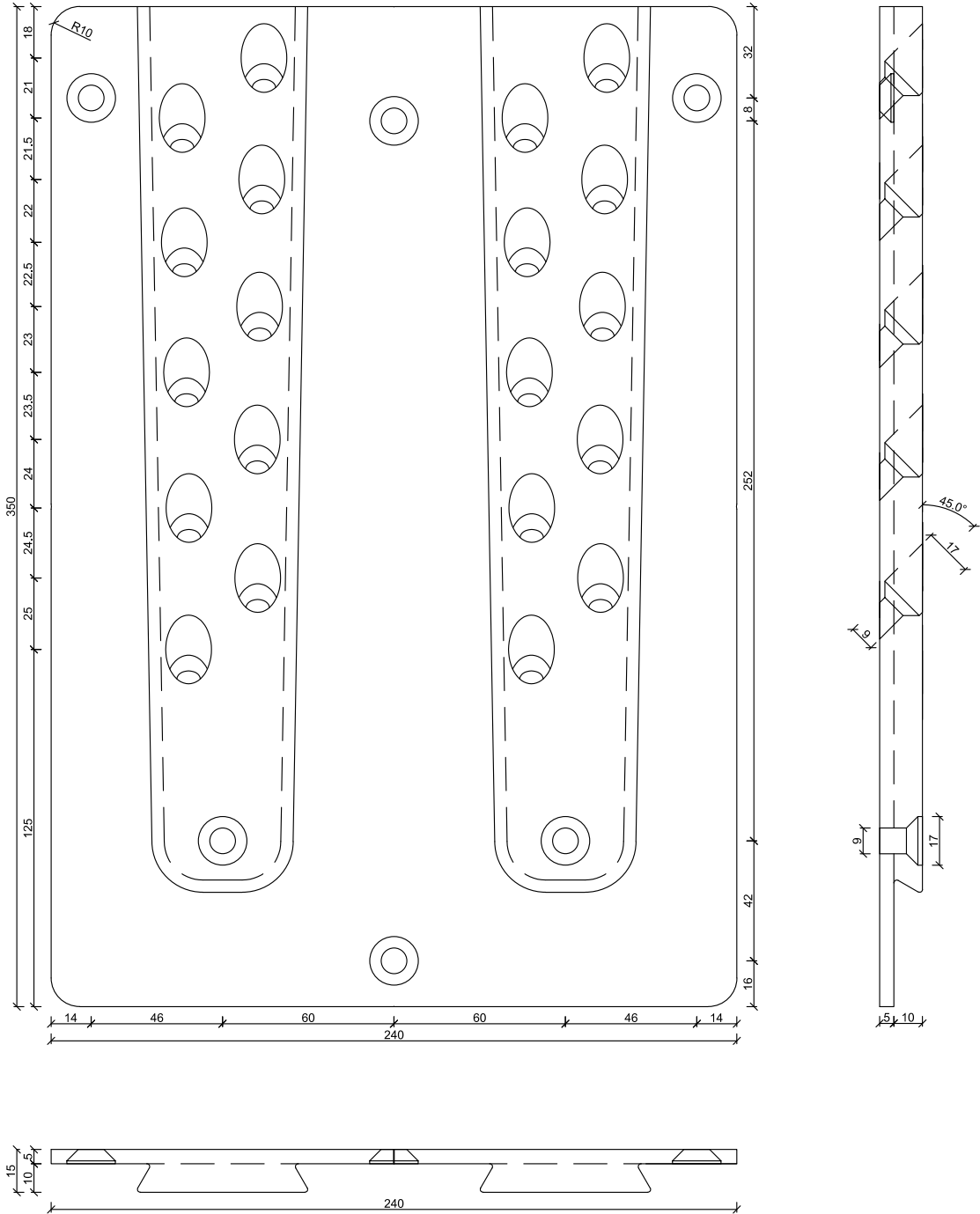88450.2000, part 1

Annex A43

SERIES 88450

Pitzl Metallbau GmbH & Co.KG
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Artikelnummer:
88450.2000
Teil2

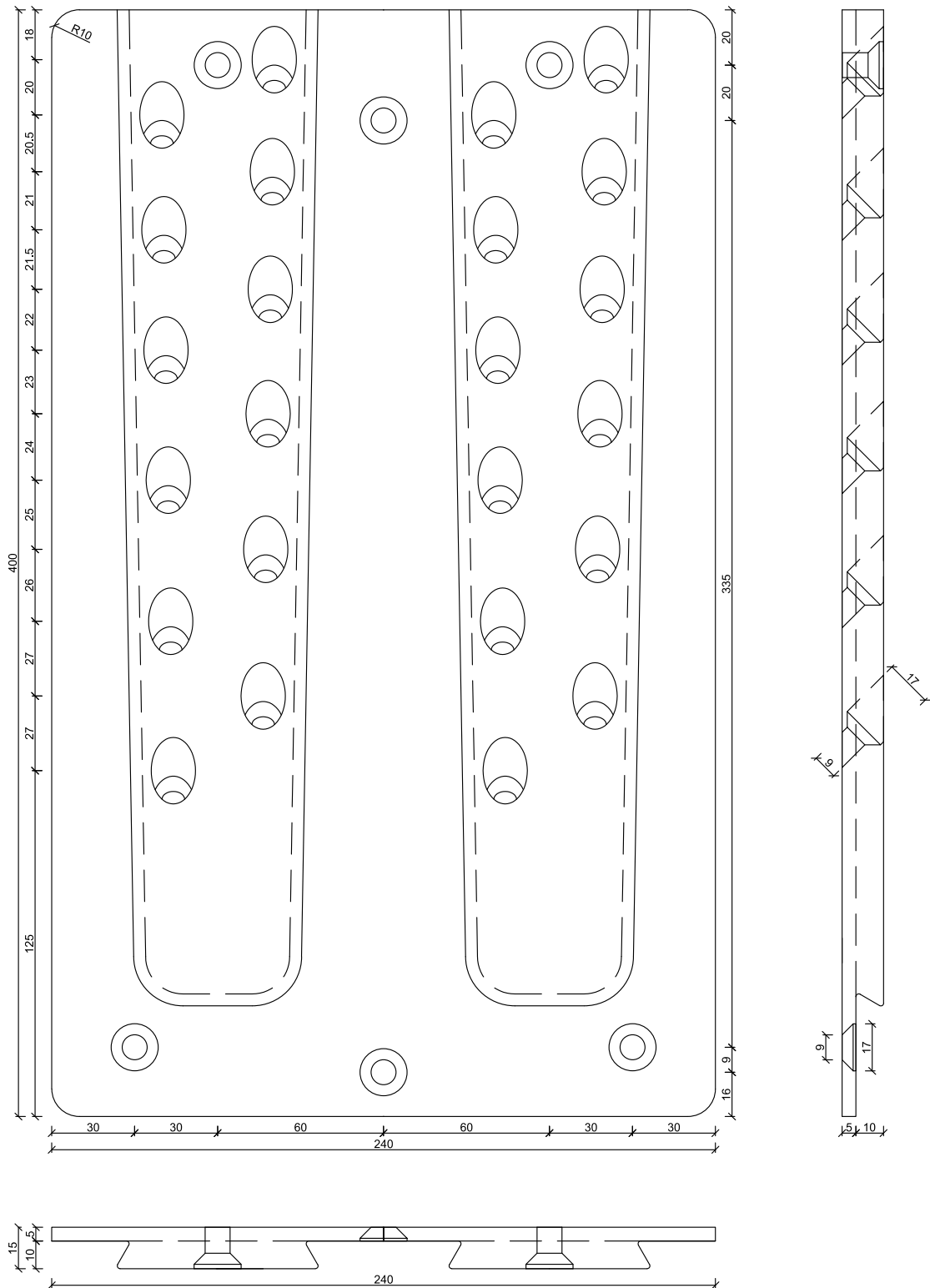| HVP Connector	Annex A44
88450.2000, part 2	

SERIES 88455

Pitzl Metallbau GmbH & Co.KG
Siemensstraße 26
D - 84051 Altheim
Tel +49(0) 8703 9346-0
Fax +49(0) 8703 9346-55
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Artikelnummer:
88455.2000
Teil1

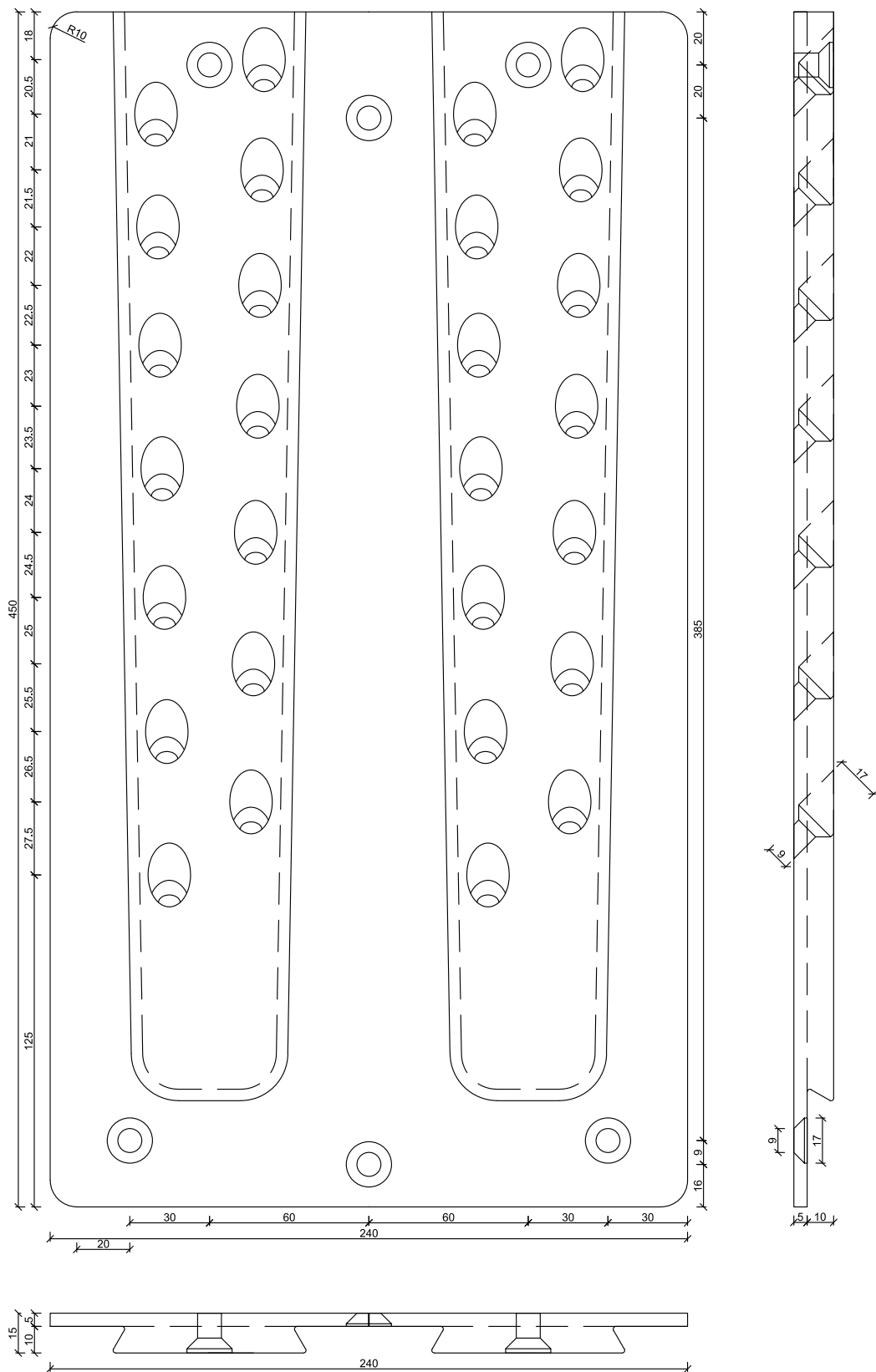| HVP Connector	Annex A45
88455.2000, part 1	

SERIES 88455

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Artikelnummer:
88455.2000
Teil2

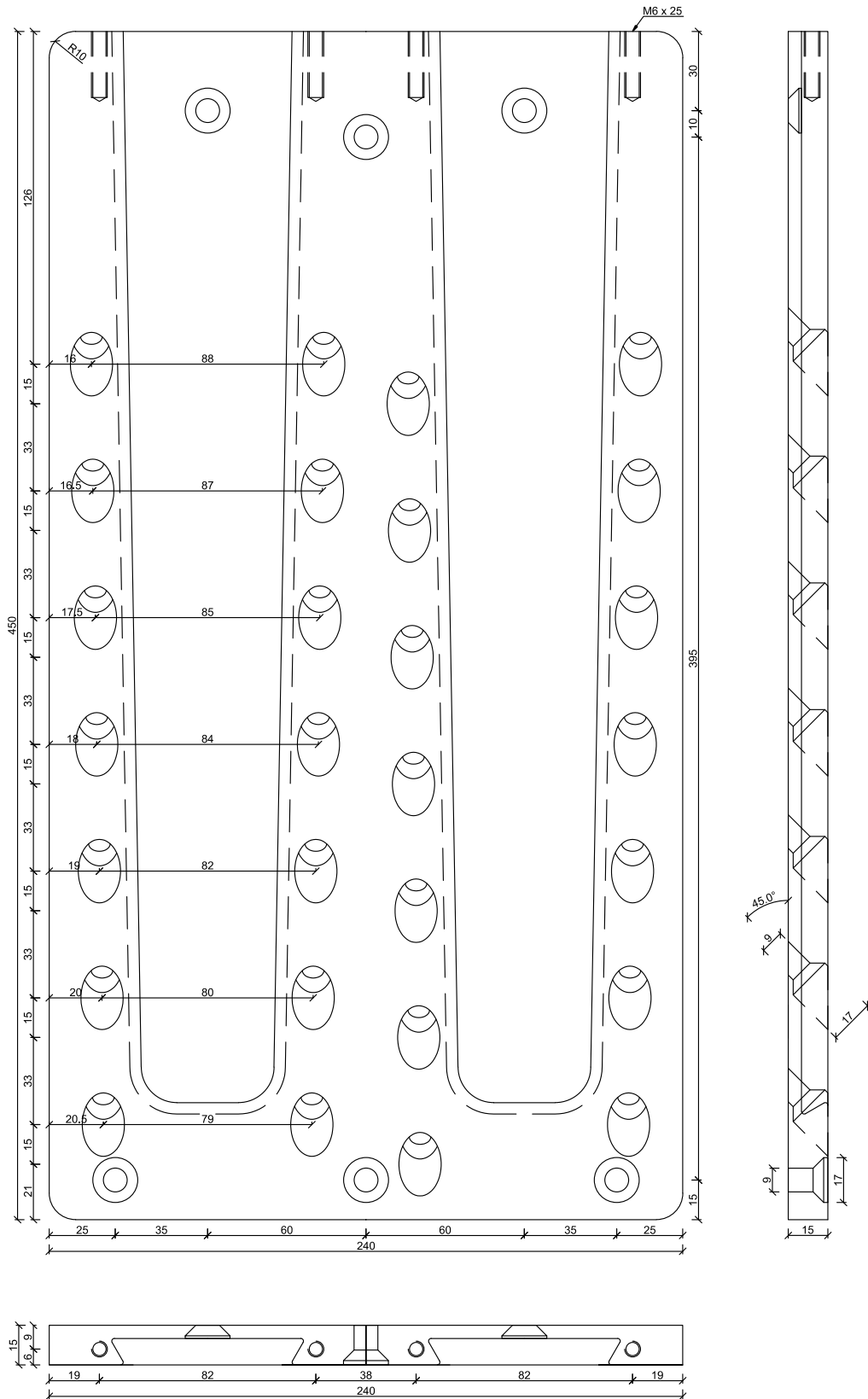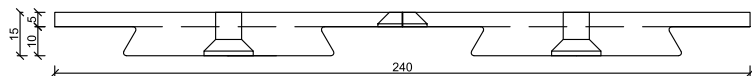| HVP Connector	
88455.2000, part 2	Annex A46

SERIES 88460

M6 x 25

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Artikelnummer:
88460.2000
Teil1

HVP Connector

88460.2000, part 1

Annex A47

SERIES 88460

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		Siemensstraße 26	
		D - 84051 Altheim	88460.2000
		Tel +49(0) 8703 9346-0	Teil2
		Fax +49(0) 8703 9346-55	
		www.pitzl.de	

| HVP Connector | Annex A48 |
| 88460.2000, part 2 | |

SERIES 88420

HVP Connector	Annex A49
88420.0100	

SERIES 88425

	Pitzl Metallbau GmbH & Co.KG	Artikelnummer:
	Siemensstraße 26 D - 84051 Altheim Tel +49(0) 8703 9346-0 Fax +49(0) 8703 9346-55 www.pitzl.de	88425.0100

HVP Connector	Annex A50
88425.0100	

SERIES 88430

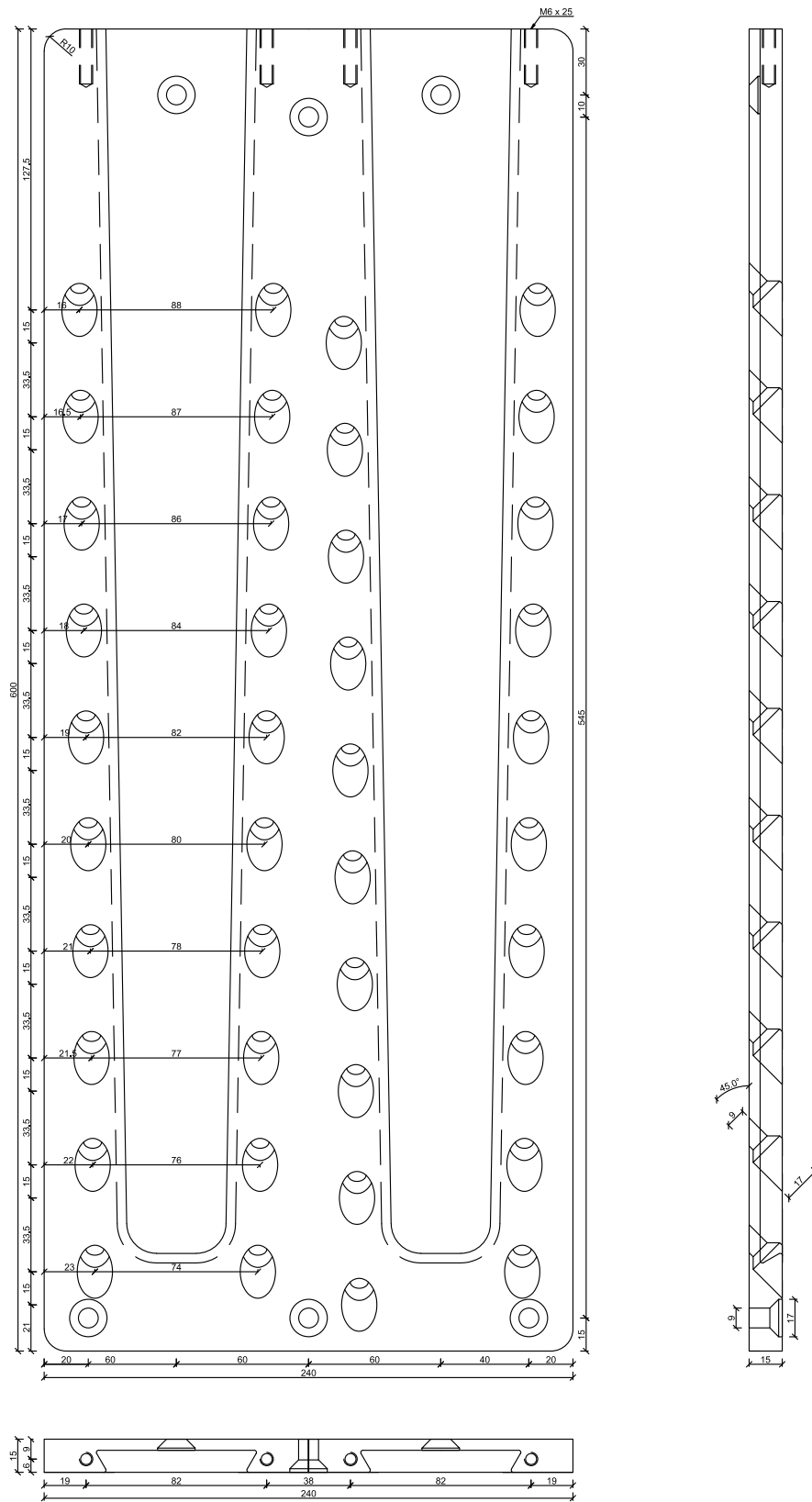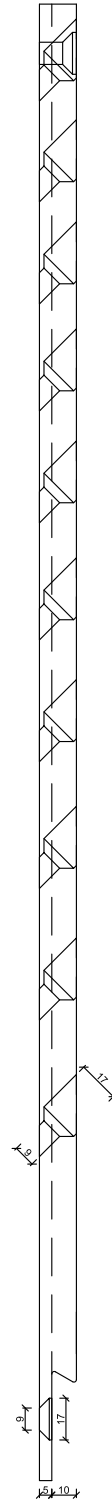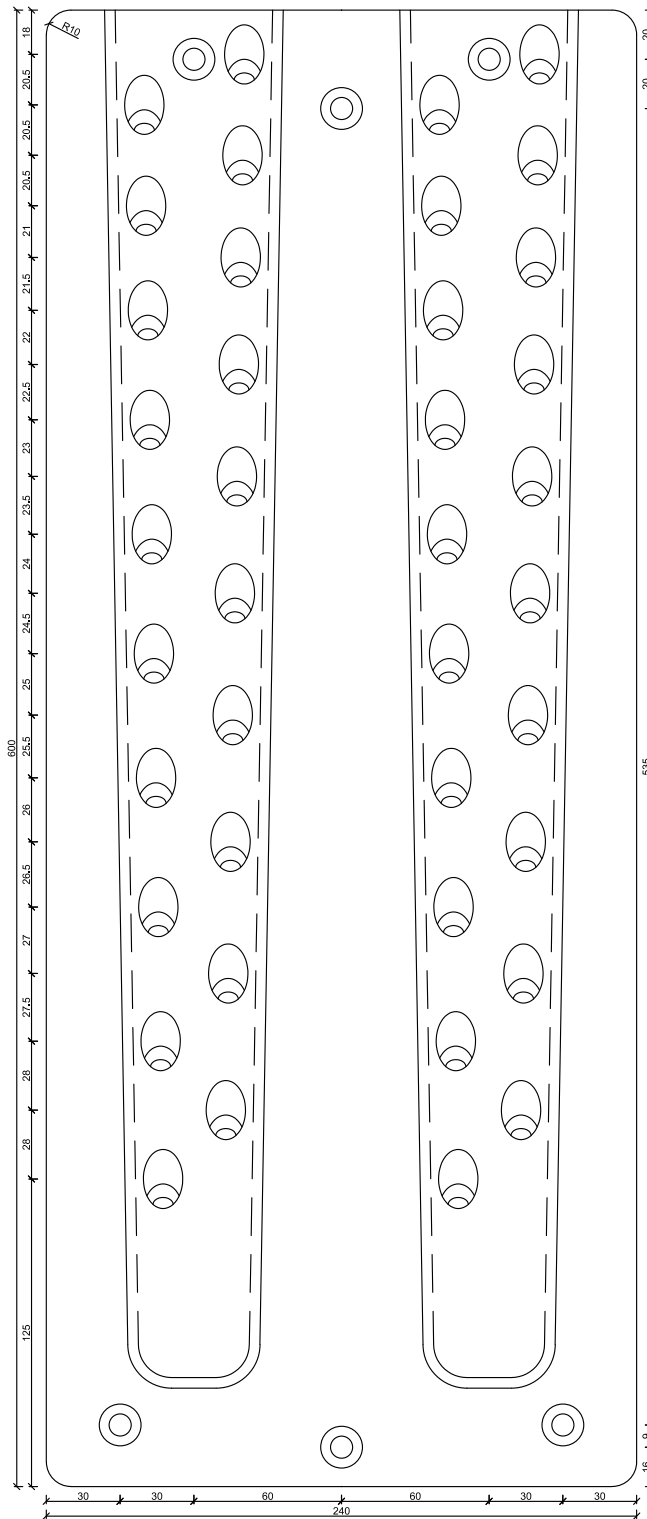| HVP Connector	Annex A51
88430.0100	

SERIES 88435

Pitzl Metallbau GmbH & Co.KG
Siemensstraße 26
D - 84051 Altheim
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Artikelnummer:
88435.0100

HVP Connector	Annex A52
88435.0100	

SERIES 88440

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HVP Connector

88440.0100

Annex A53

SERIES 88445

	Artikelnummer:
Pitzl Metallbau GmbH & Co.KG	
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Fax +49(0) 8703 9346-55	
www.pitzl.de	

HVP Connector	Annex A54
88445.0100	

SERIES 88450

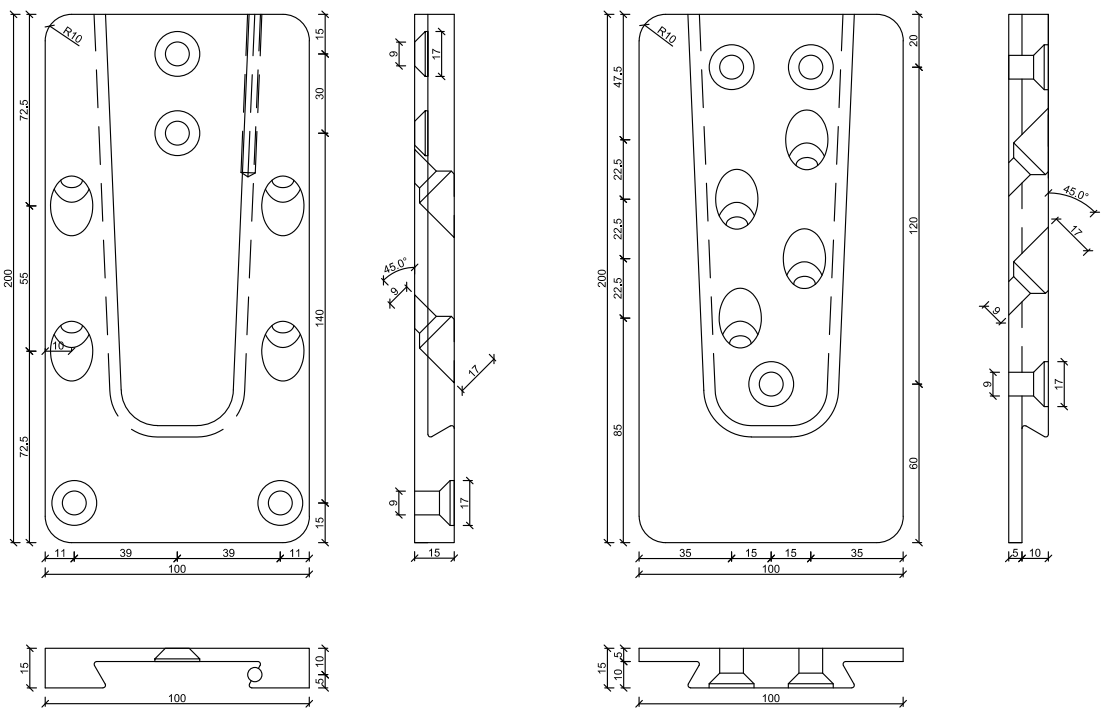| HVP Connector	Annex A55
88450.0100	

SERIES 88455

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Artikelnummer:
88455.0100

HVP Connector

88455.0100

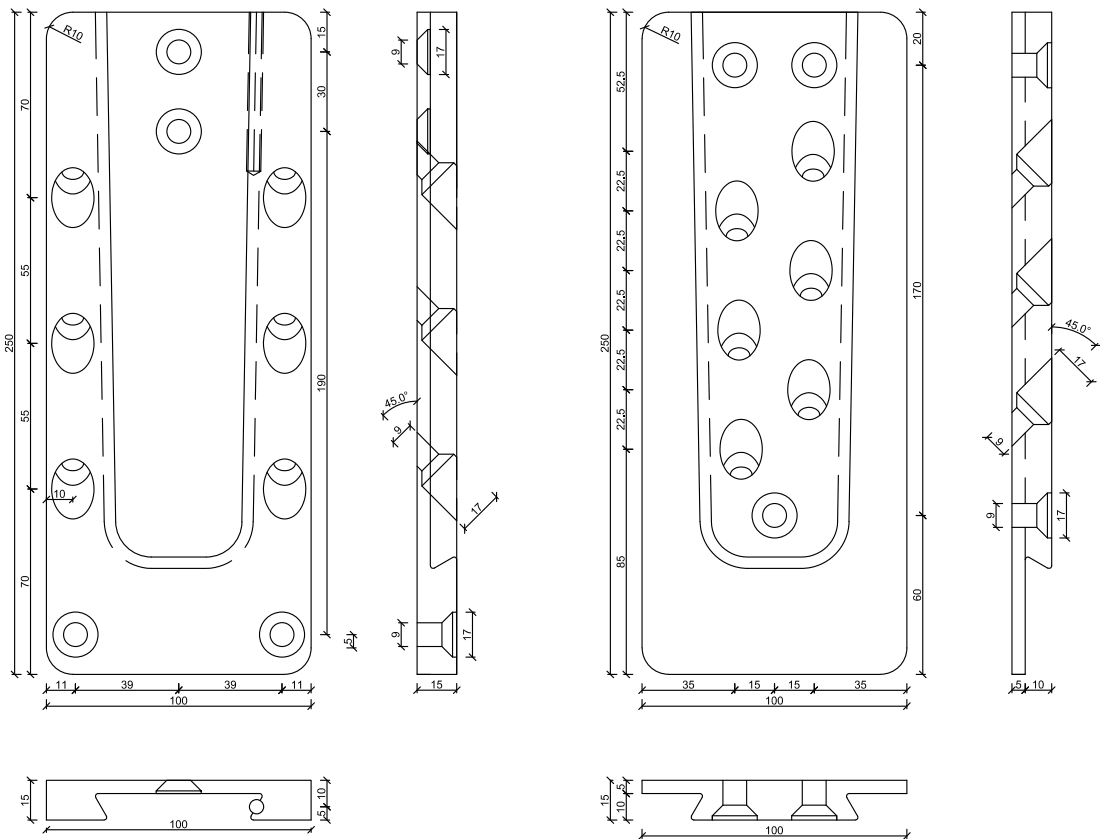Annex A56

SERIES 88460

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Fax +49(0) 8703 9346-55
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Artikelnummer:
88460.0100

HVP Connector

88460.0100

Annex A57

Annex B
HVP: Product details and definitions, concrete and steel to timber applications

SERIES 88210

M5 x 22
R10
34
100
50
16
16 58 16
90
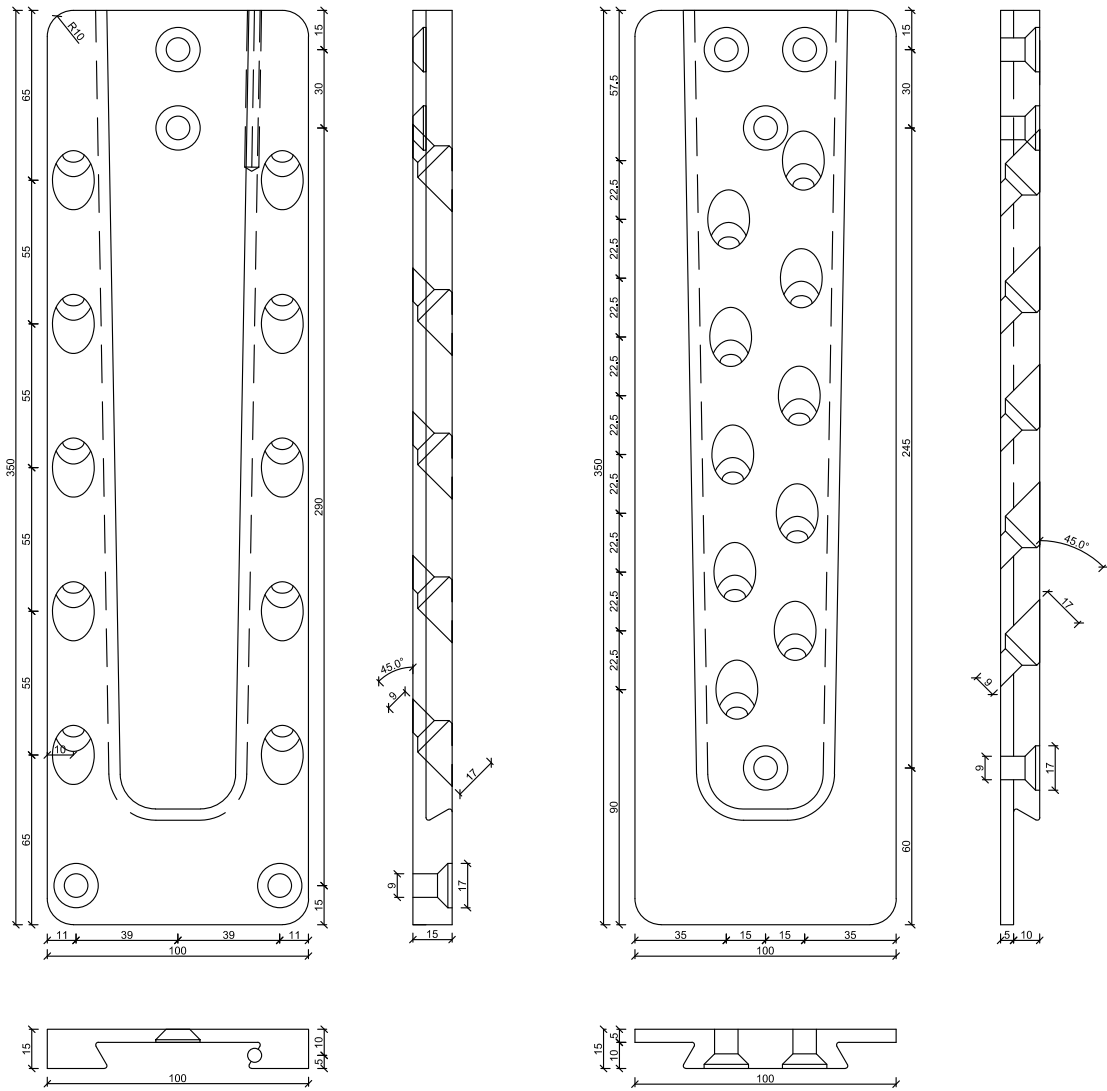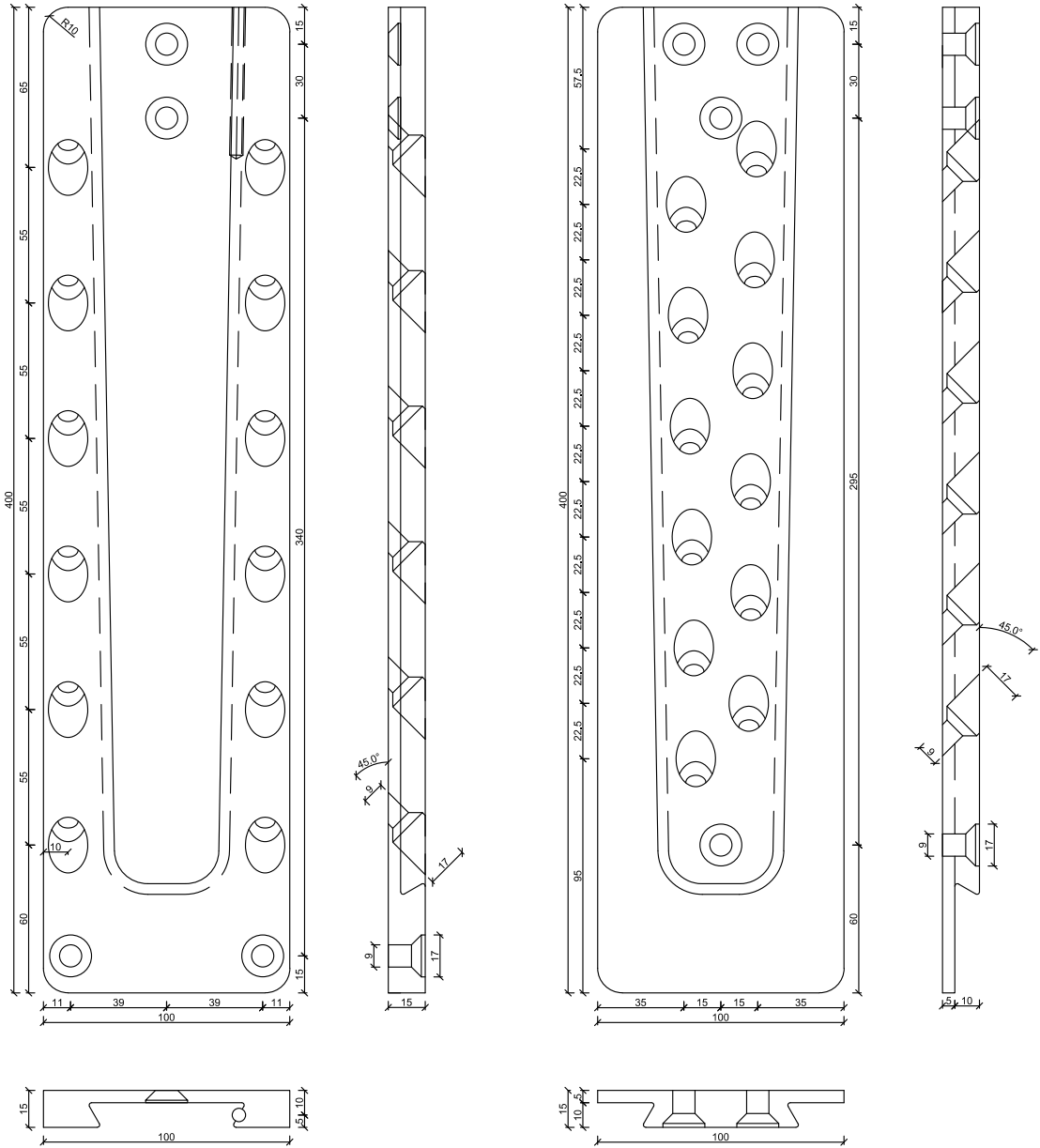13
25
90.0°
15
15
26 38 26
90
10.5
4.5

	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	Artikelnummer: 88210.3000 Teil1

HVP Connector	Annex B1
88210.3000, part 1	

SERIES 88210

M5 x 22

R10

34

100

54

12

12

56

12

80

11

20

90.0°

10

10

21

38

21

80

Artikelnummer:

88210.3010

HVP Connector

88210.3010, part 1

Annex B2

SERIES 88214

M5 x 22

R10

35

140

85

20

16   58   16

90

13   25   90.0°
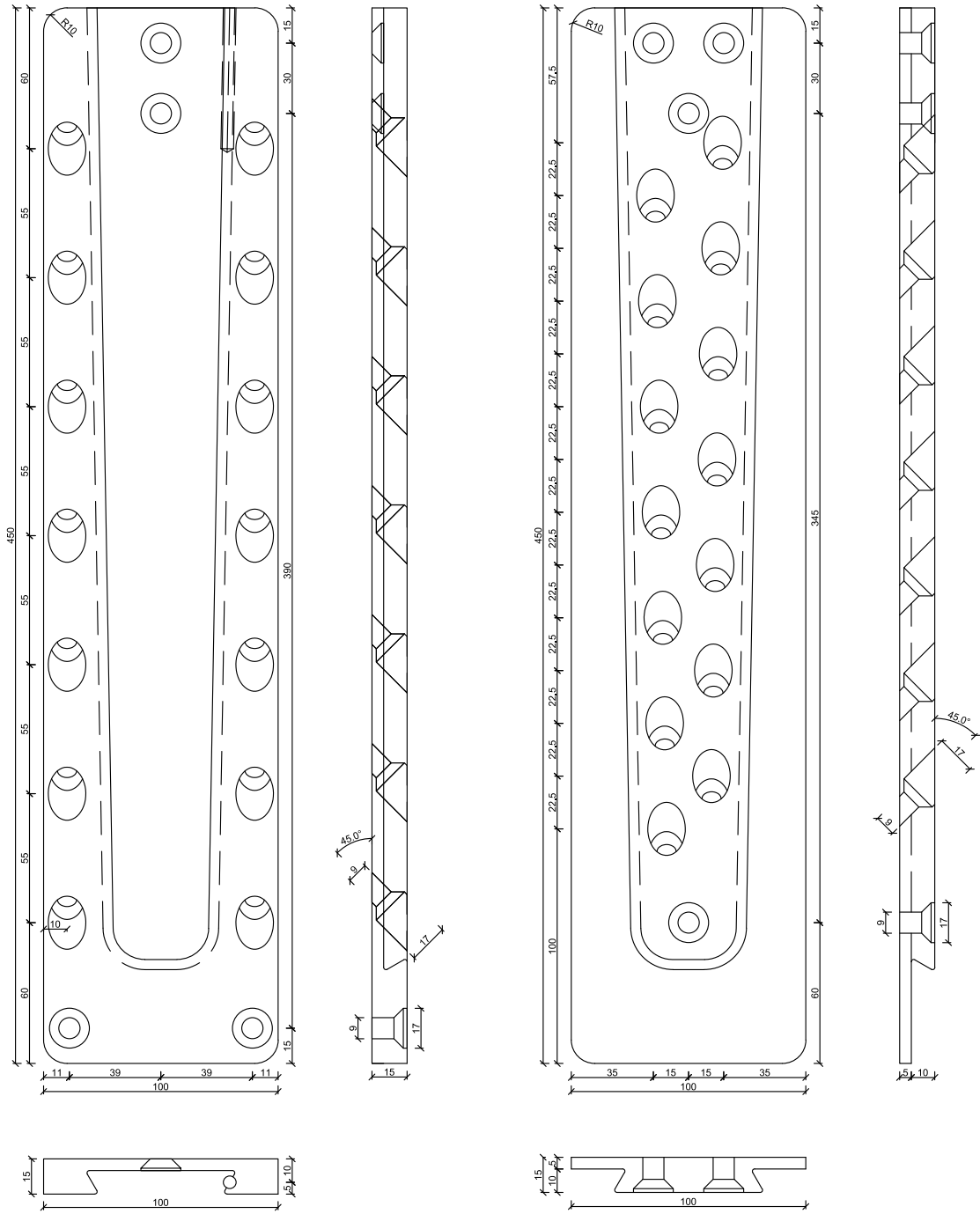
15

15   10.5

26   38   26

4.5

90

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Artikelnummer:
88214.3000
Teil1

HVP Connector

88214.3000, part 1

Annex B3

SERIES 88214

M5 x 22

R10

35

140

85

20

12   56   12

80

11   20   90.0°
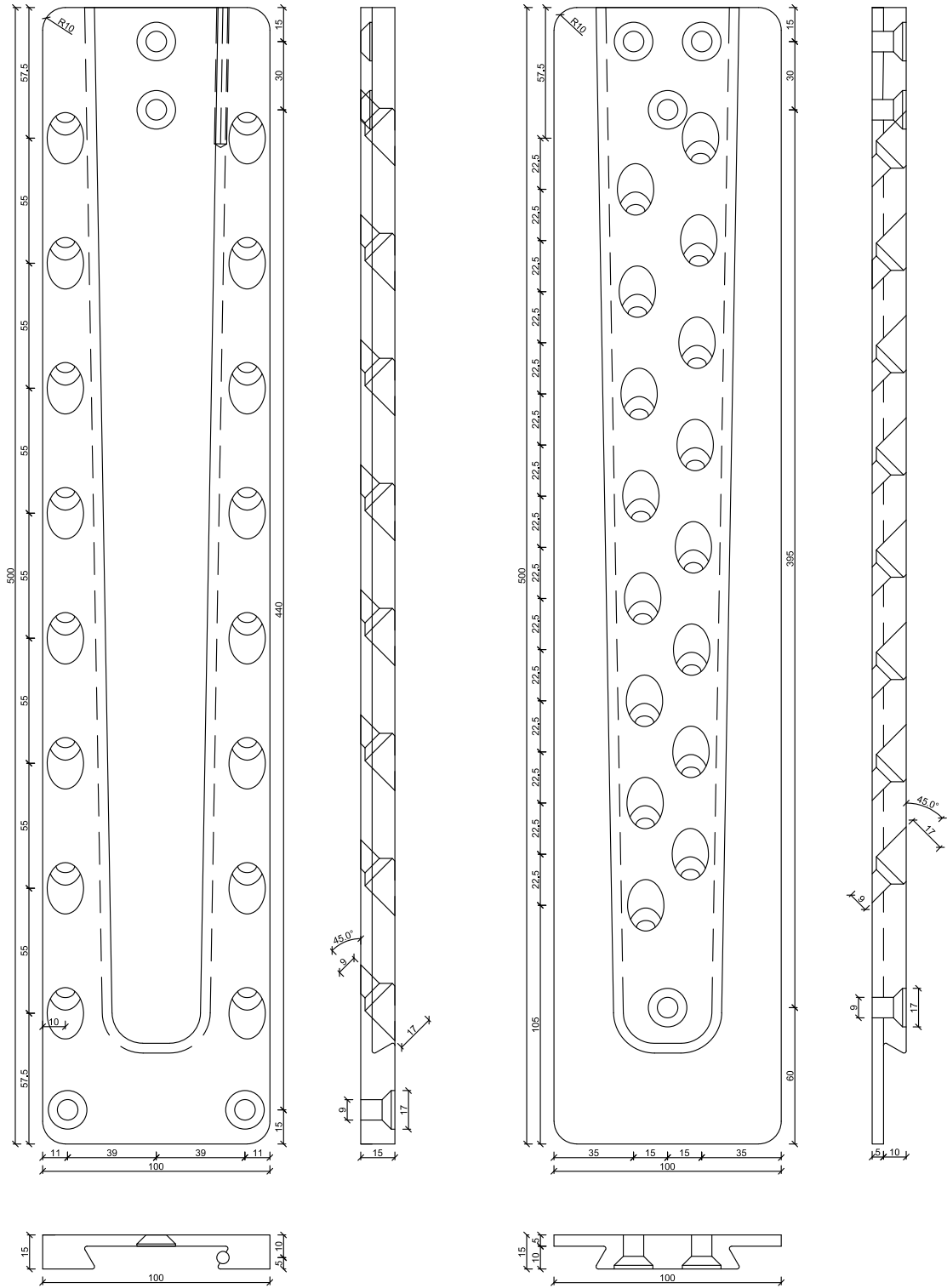
10

10

21   38   21

80

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Artikelnummer:
88214.3010

HVP Connector

88214.3000, part 1

Annex B4

SERIES 88318

M5 x 22

R10

35

180

125

20

17   76   17

110

15

28.5   53   28.5

110

10.5

4.5

13

25

90.0°

15

HVP Connector	Annex B5
88318.3000, part 1	

SERIES 88318

M5 x 22

R 10

35
180
125
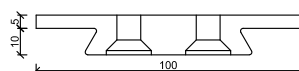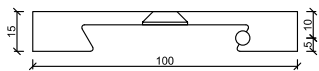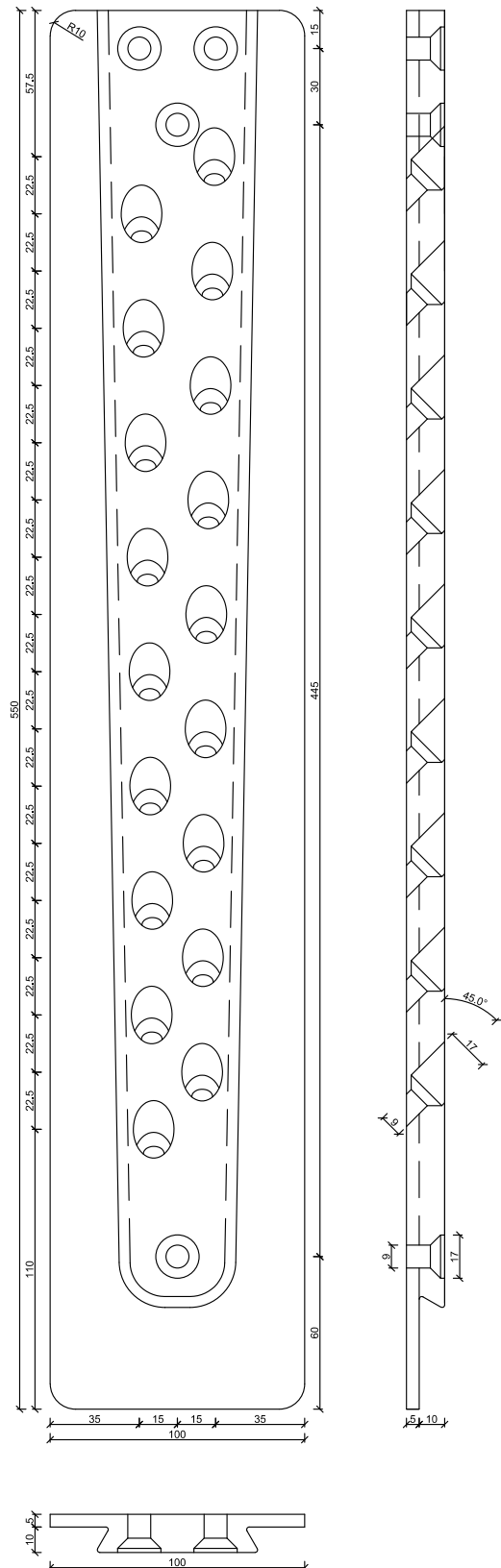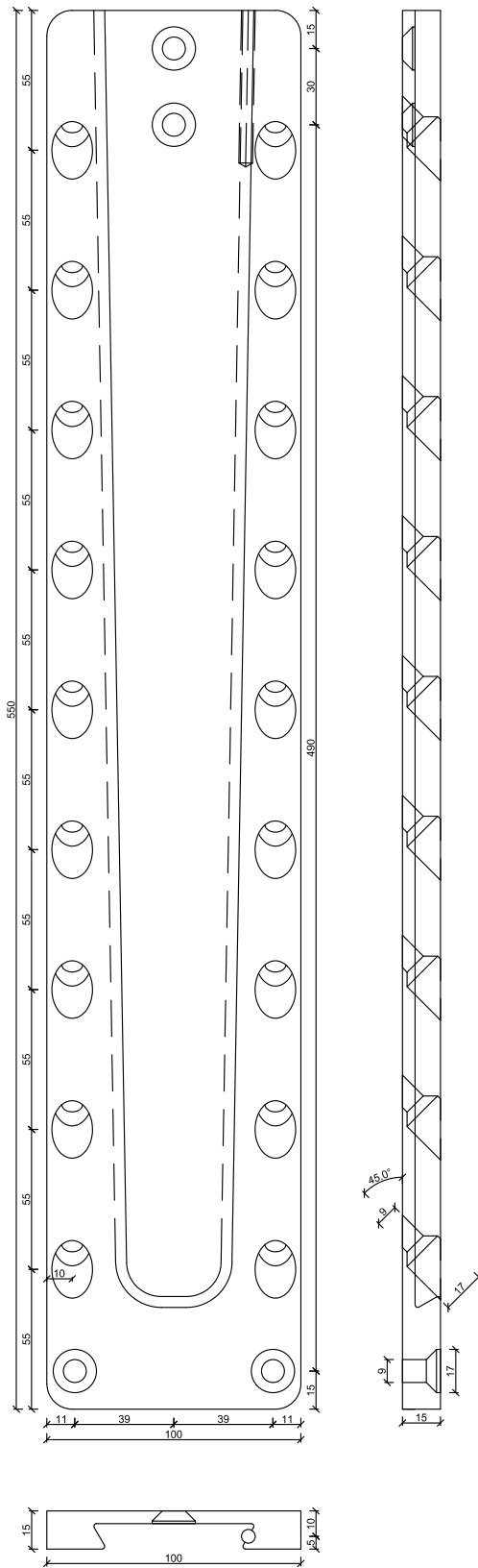20

15 85 15
100

11
20
90.0°

15

15
23.5 53 23.5
100

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D - 84051 Altheim
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Artikelnummer:
88318.3010

HVP Connector

88318.3010, part 1

Annex B6

SERIES 88322

M5 x 22

R10

35

220

165

20

17   76   17

110

13   25   90.0°

15

15   10.5

28.5   53   28.5   4.5

110

HVP Connector

88322.3000, part 1

Annex B7

SERIES 88322

M5 x 22

R10

35

220

165

20

15 | 70 | 15
100

11

20
90.0°

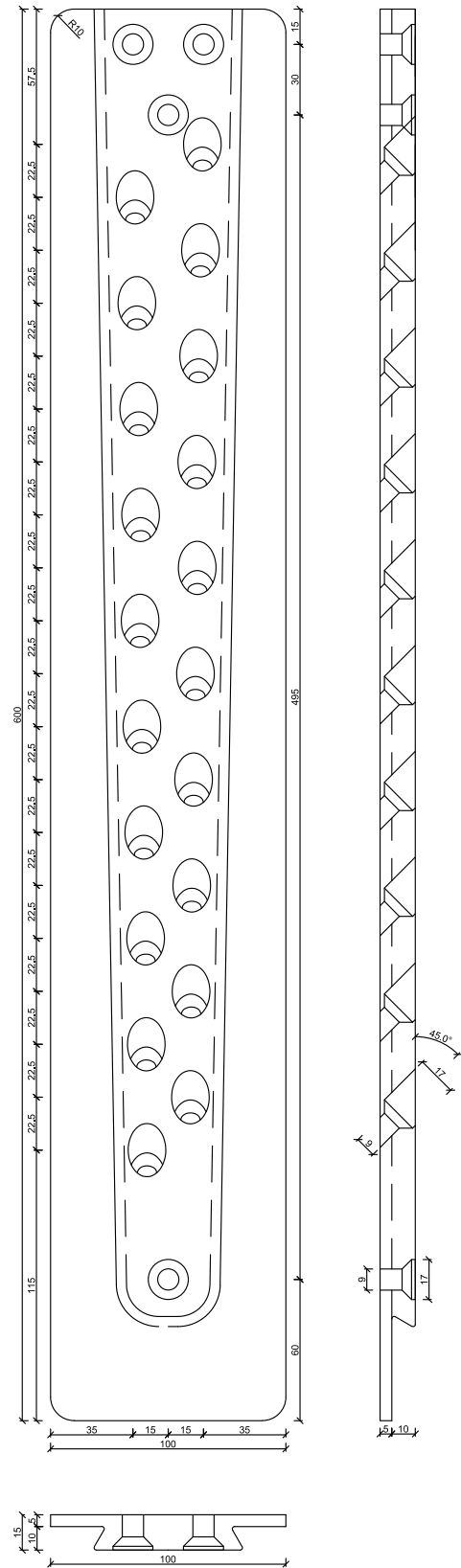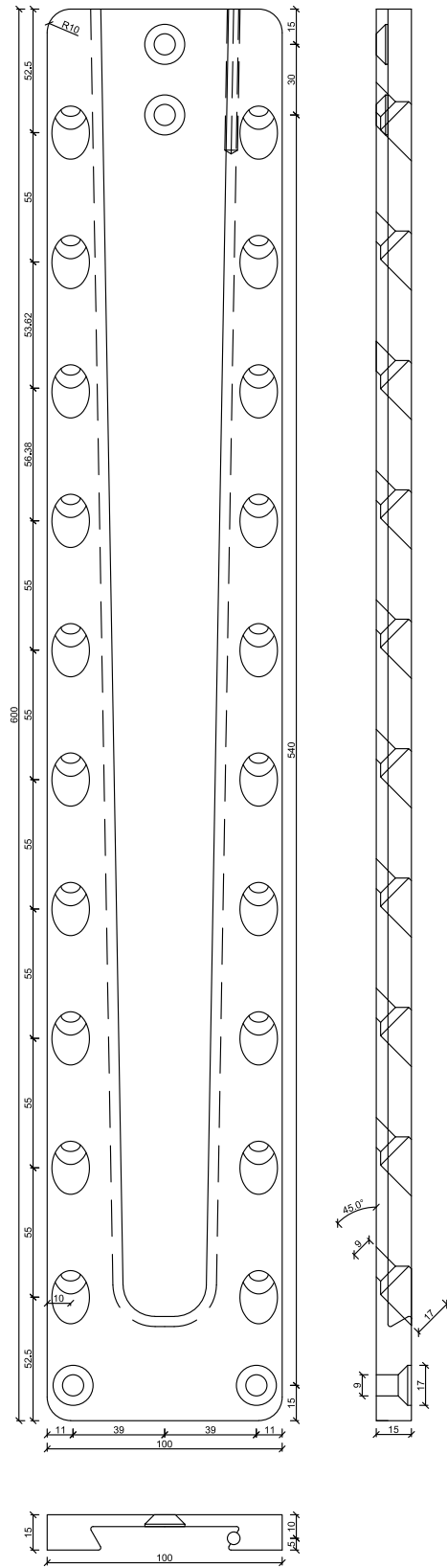15

15

23.5 | 53 | 23.5
100

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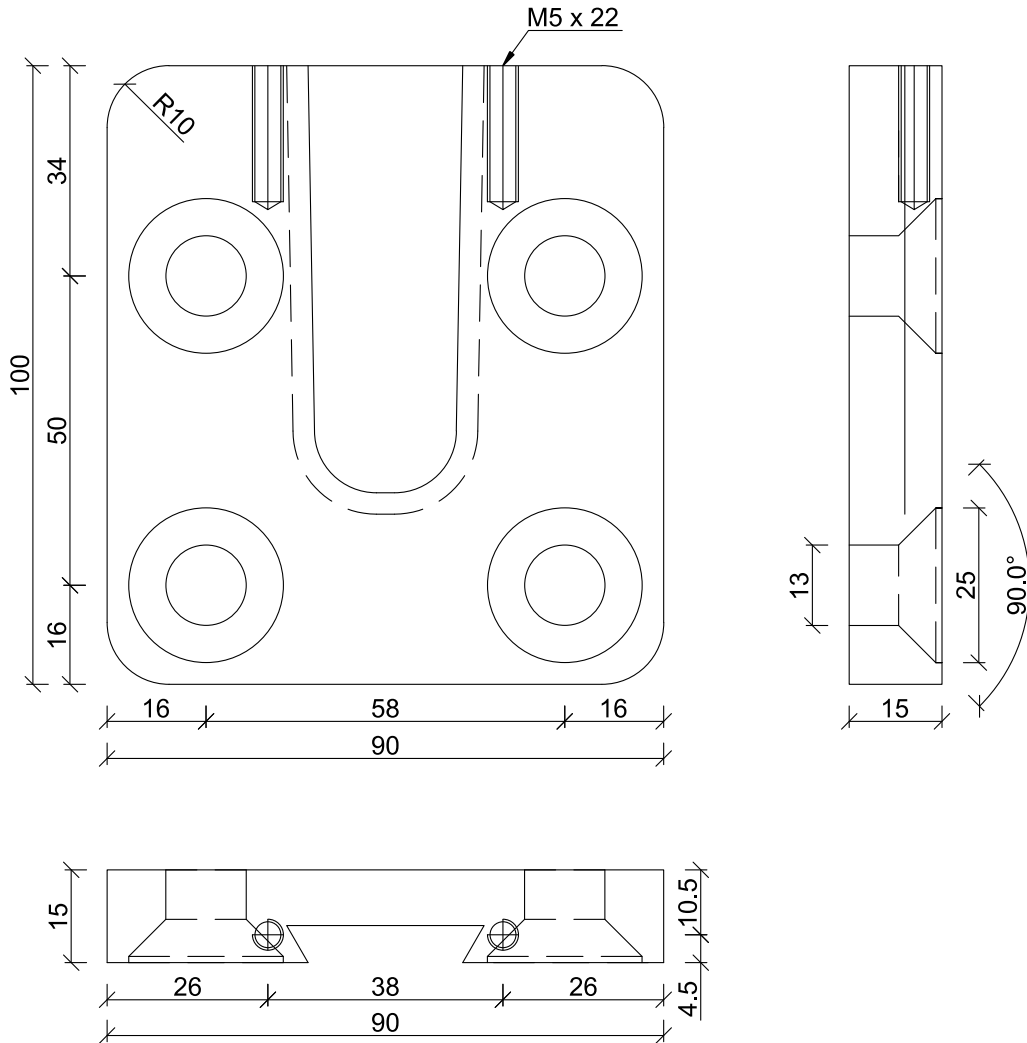Artikelnummer:
88322.3010

HVP Connector

88322.3010, part 1

Annex B8

SERIES 88420

M6 x 25

R10

35

200

140

25

25   100   25

150

20

40.5   69   40.5

150

14   30   90.0°

20

HVP Connector

88420.3000, part 1

Annex B9

SERIES 88425

M6 x 25

R10

35

250

190

25

25   100   25

150

40.5   69   40.5
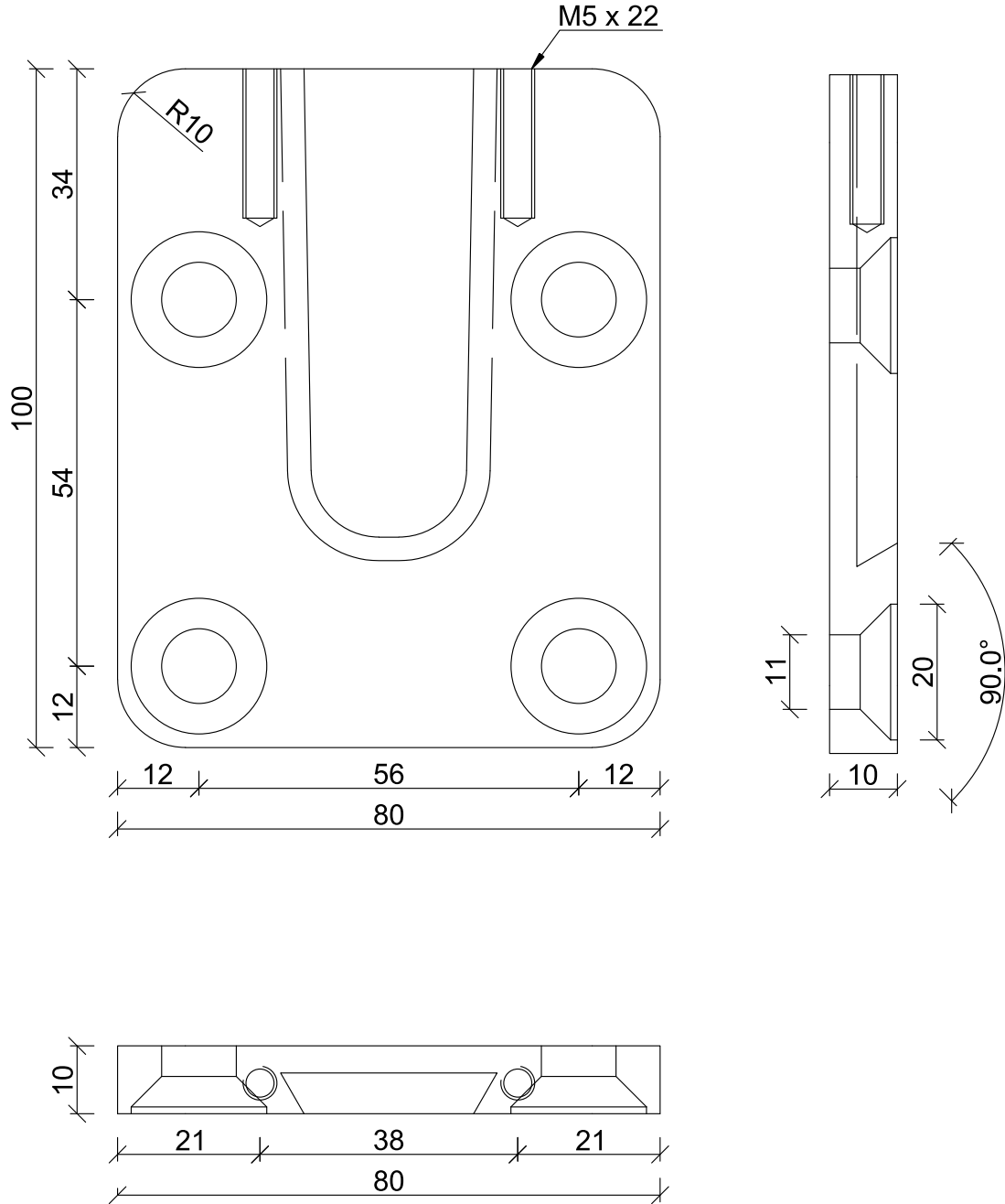
150

20

14

30

90.0°

20

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Artikelnummer:

88425.3000
Teil1

HVP Connector

88425.3000, part 1

Annex B10

SERIES 88430

M6 x 25
R10
50
300
200
50
25
100
25
150
14
30
90.0°
20
20
14
6
40.5
69
40.5
150

| Pitzl Metallbau GmbH & Co.KG | Artikelnummer: |
| Siemensstraße 26 D - 84051 Altheim Tel +49(0) 8703 9346-0 Fax +49(0) 8703 9346-55 www.pitzl.de | 88430.3000 Teil1 |

| HVP Connector | Annex B11 |
| 88430.3000, part 1 | |

SERIES 88435	

M6 x 25

R10

50

350

250

50

25 100 25

150

90,0°

14

30

20

20

14

6

40.5 69 40.5

150

HVP Connector	Annex B12
88435.3000, part 1	

SERIES 88435

M6 x 25

R10

50

350

250

50

25   100   25
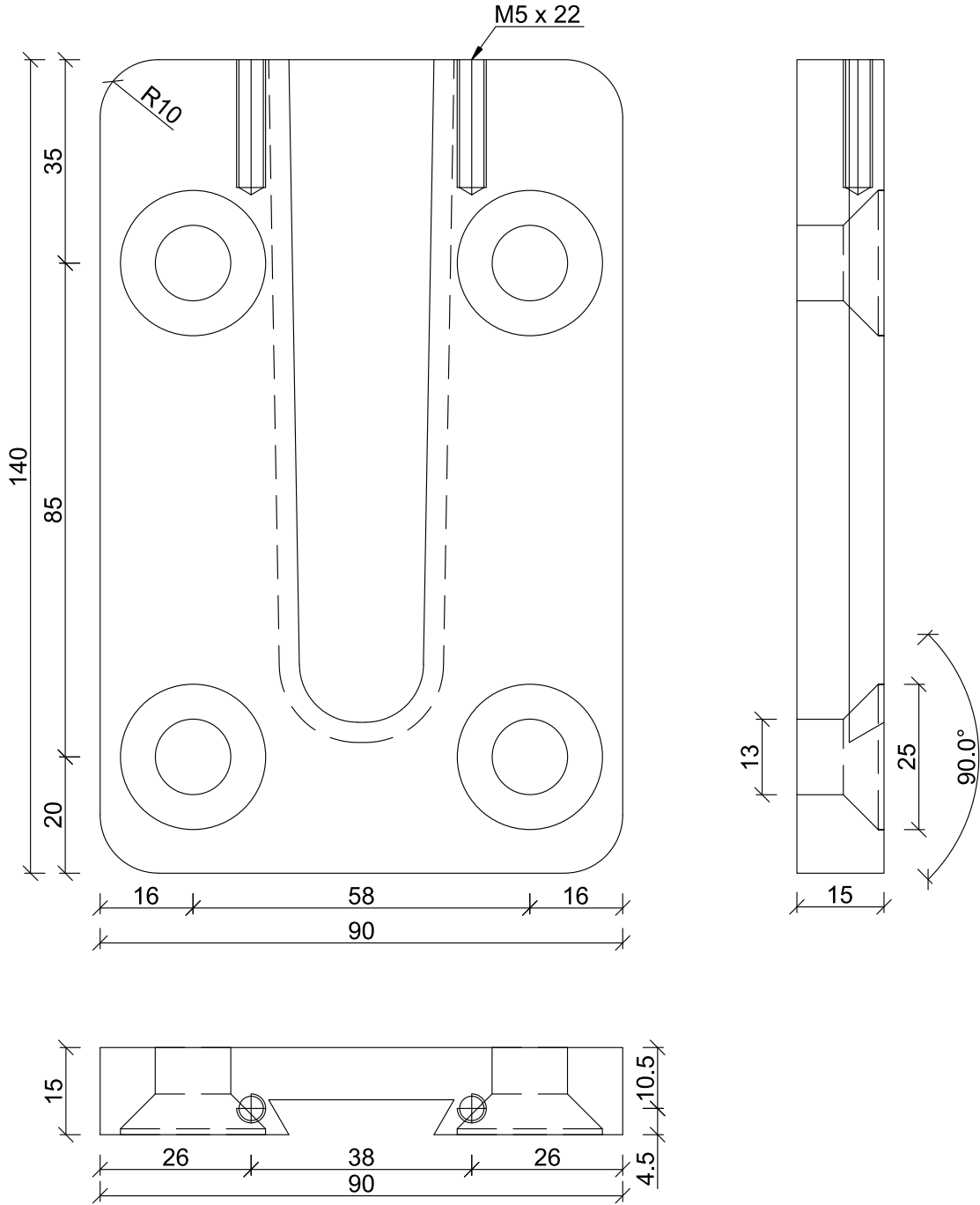150

18   36   90.0°

20

20

14   6

40.5   69   40.5
150

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Artikelnummer:
88435.3001
Teil1

HVP Connector

88435.3001, part 1

Annex B13

SERIES 88440

M6 x 25

R10

75

400

250

75

25 100 25
150

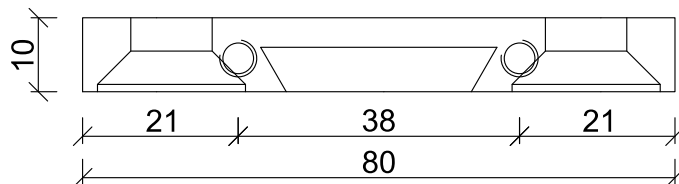20

14

30

90.0°
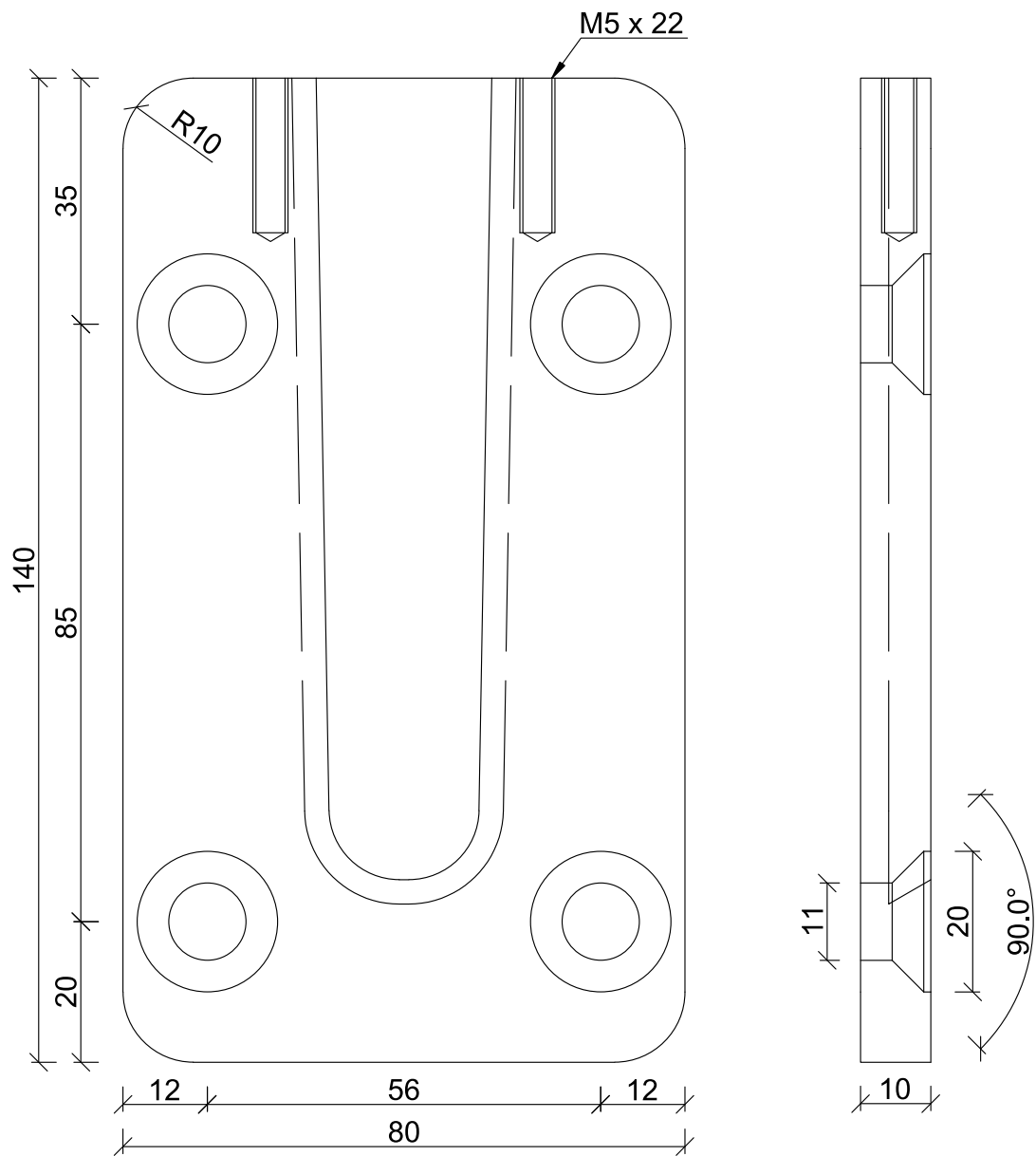
20

6 14

34 82 34
150

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Artikelnummer:
88440.3000
Teil1

HVP Connector

88440.3000, part 1

Annex B14

SERIES 88440

M6 x 25

R10

75

400
250

75

25 110 25
160

18 36 90.0°

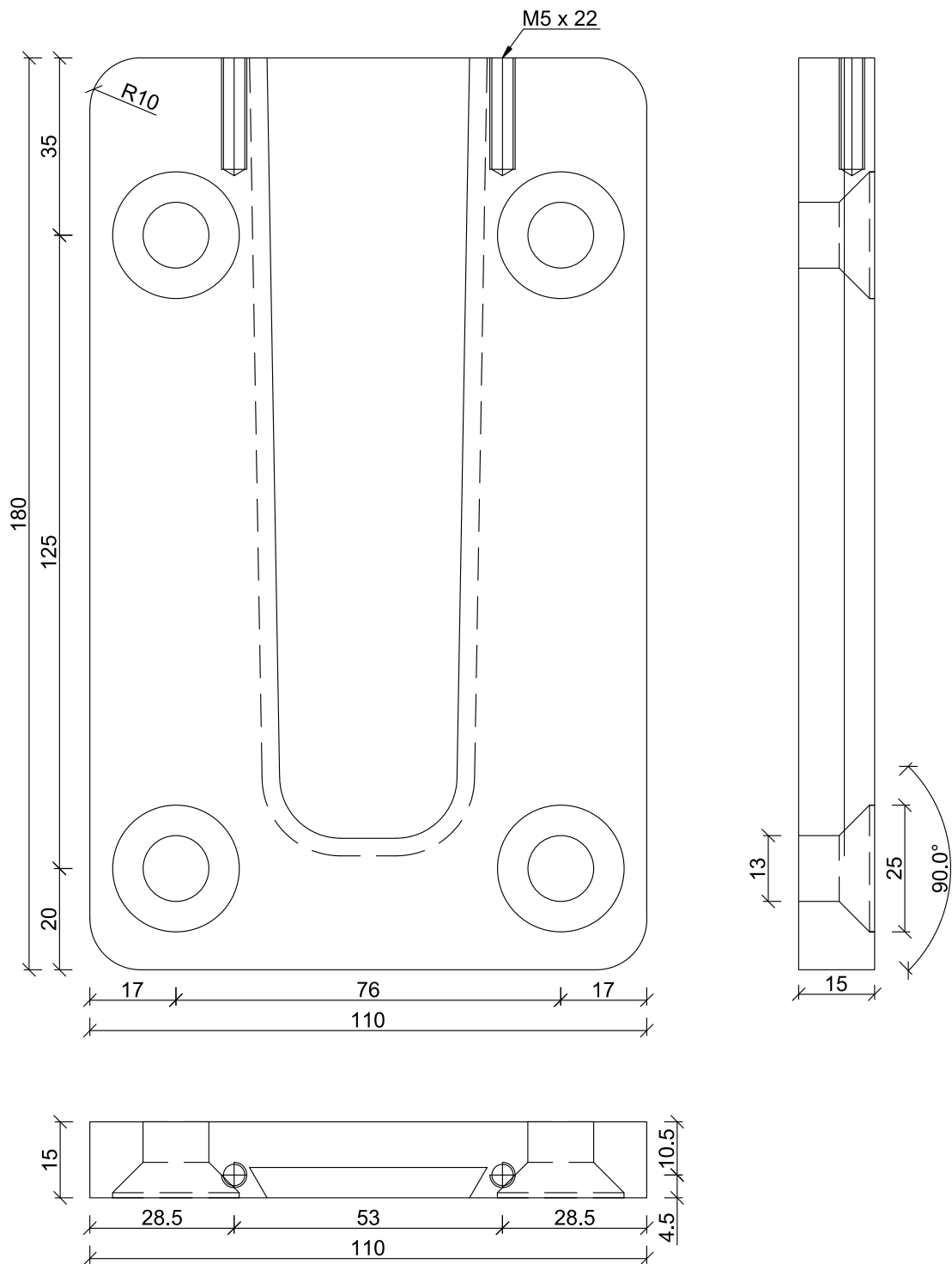20

20 14 6

39 82 39
160

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Artikelnummer:
88440.3001
Teil1

HVP Connector

88440.3001, part 1

Annex B15

SERIES 88440

M6 x 25

R10

50

150

400

150

50

25   100   25
150

Injektionsbohrung

14   30

20

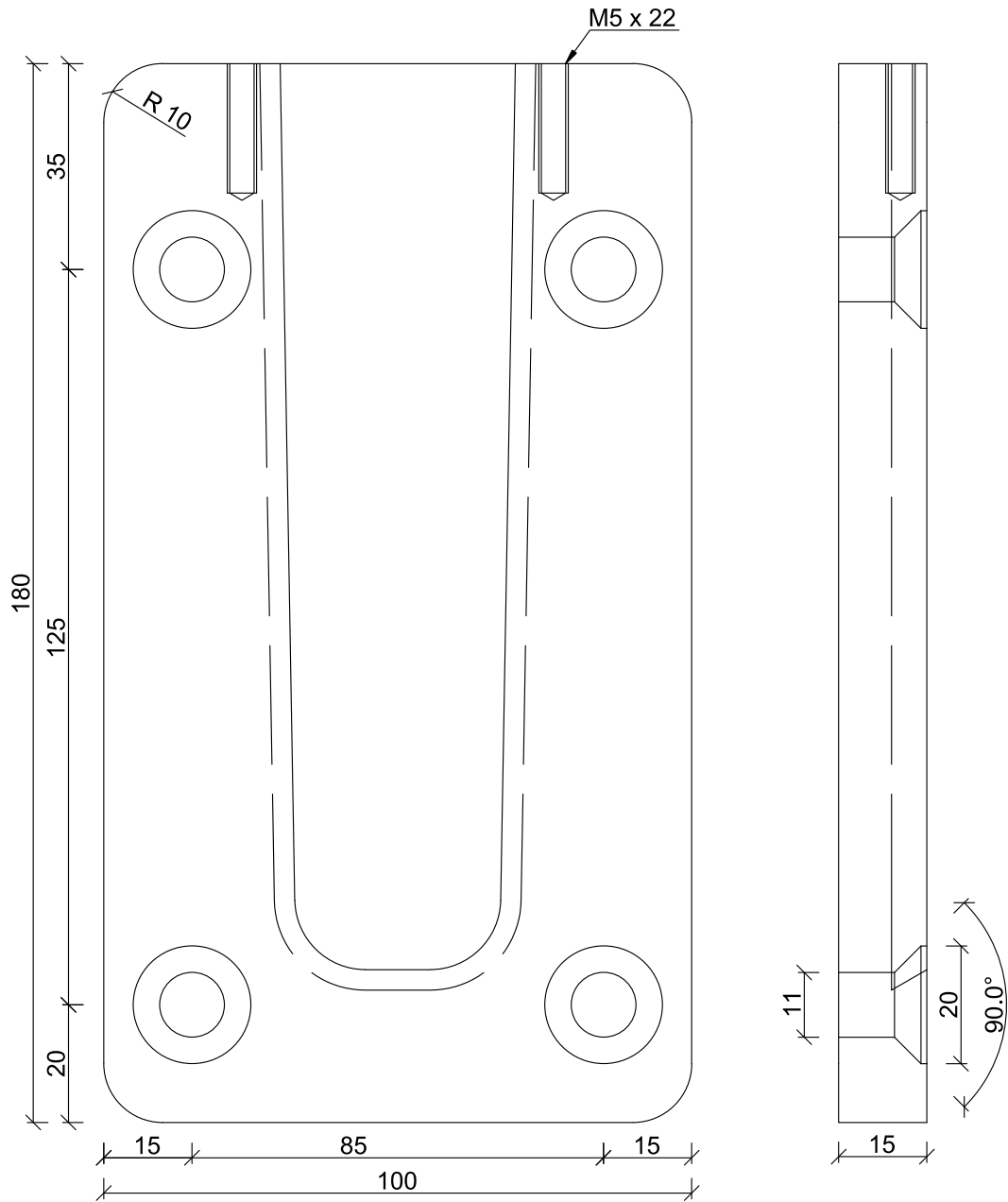20   14
6

34   82   34
150

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Artikelnummer:

88440.3002
Teil1

HVP Connector

88440.3002, part 1

Annex B16

SERIES 88440

M6 x 25

R10

50

150

400

150

50

18

36

90,0°

20

Injektionsbohrung
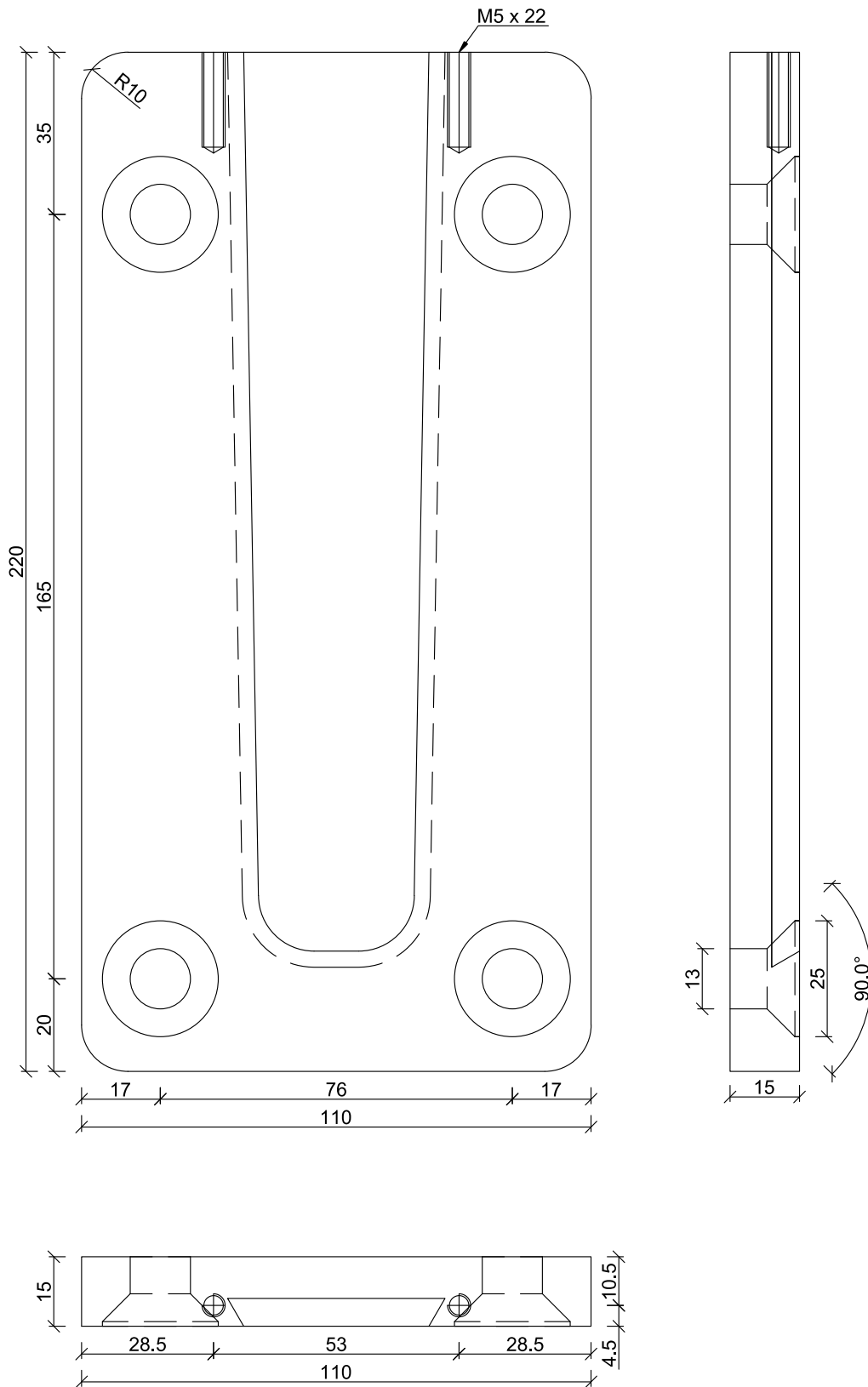
25   110   25
160

20   14   6

39   82   39
160

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Artikelnummer:
88440.3003
Teil1

HVP Connector	Annex B17
88440.3003, part 1	

SERIES 88445

M6 x 25

R10

50

175

450

175

50

25 | 100 | 25
150

Injektionsbohrung
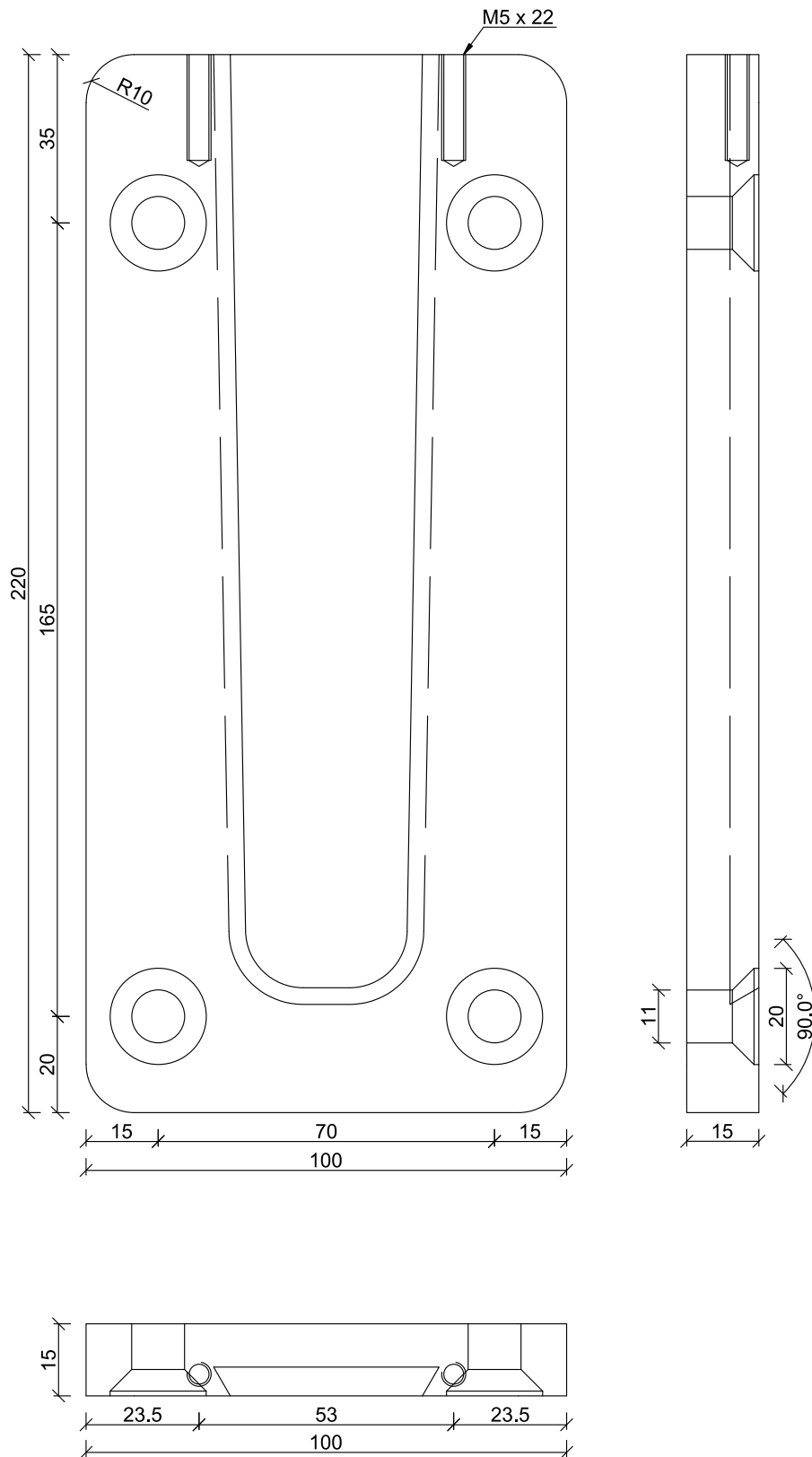
14

30

90,0°

20

20 | 14

6

34 | 82 | 34
150

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Artikelnummer:
88445.3000
Teil1

HVP Connector

88445.3000, part 1

Annex B18

SERIES 88445

M6 x 25

R10

50

175

450

175

50

Injektionsbohrung

25 110

160
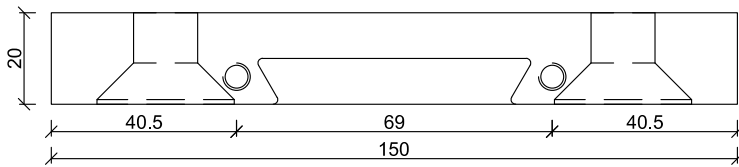
25

20

18

36

90.0°

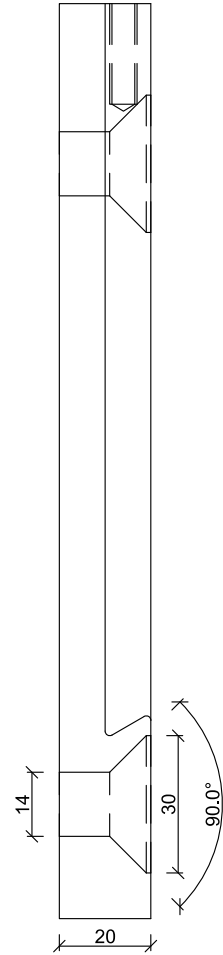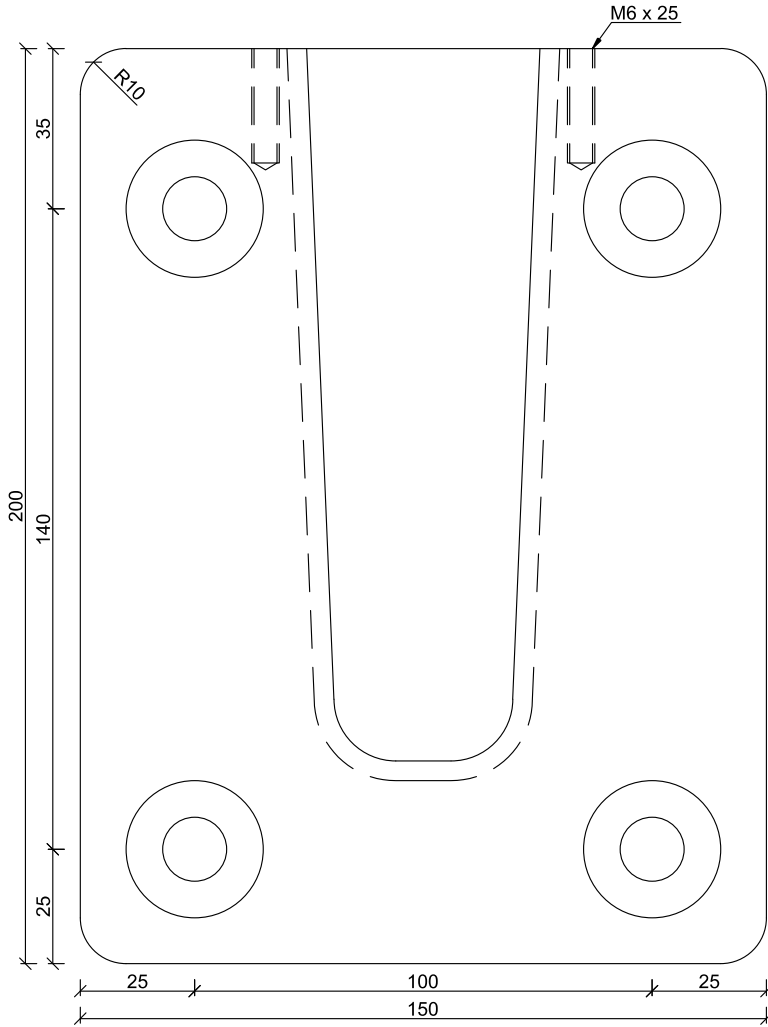20

39 82 39

160

6 14

20

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Artikelnummer:
88445.3001
Teil1

HVP Connector

88445.3001, part 1

Annex B19

SERIES 88450

M6 x 25

R10

50

200

500

200

50

25 · 100 · 25
150

Injektionsbohrung

14 · 30 · 90,0°

20
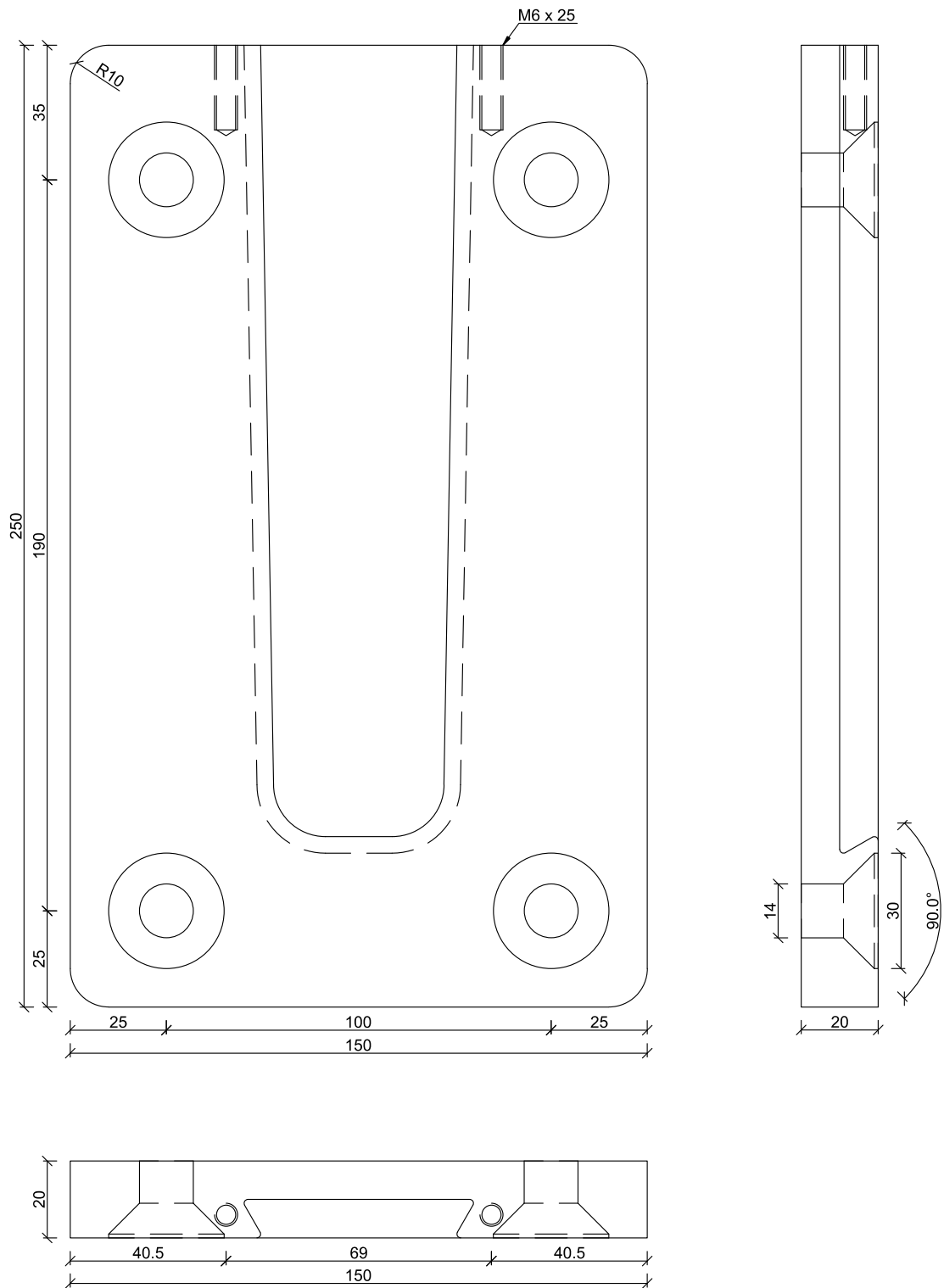
20 · 14 · 6
34 · 82 · 34
150

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Artikelnummer:
88450.3000
Teil1

HVP Connector	Annex B20
88450.3000, part 1	

SERIES 88450

M6 x 25

R10

50

200

500

200

50

Injektionsbohrung

18

36

90,0°

25 | 110 | 25
160

20

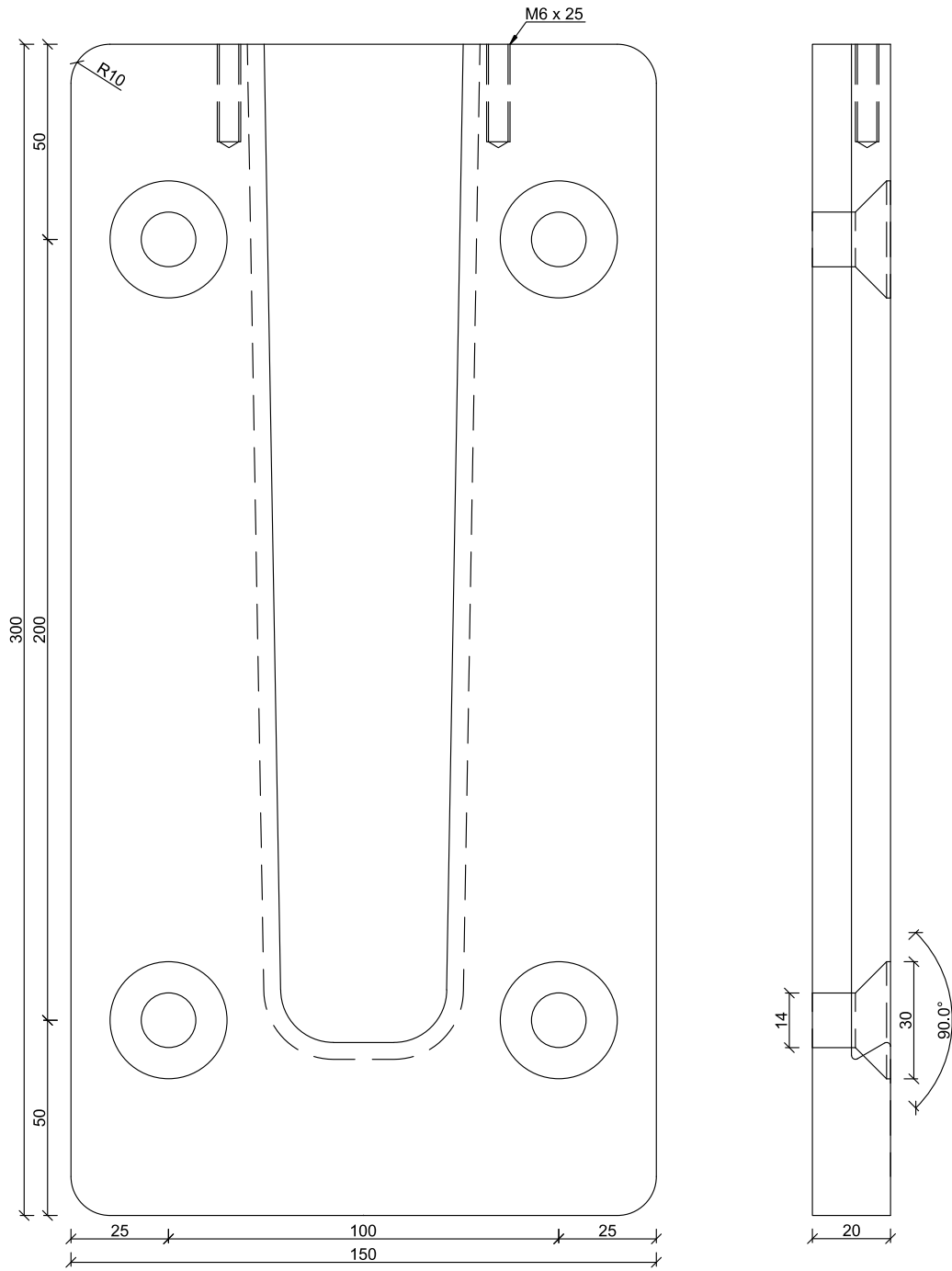20

14

6

39 | 82 | 39
160

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Artikelnummer:

88450.3001
Teil1

HVP Connector

88450.3001, part 1

Annex B21

SERIES 88455

M6 x 25

R10

50

225

550

225

50

Injektionsbohrung

14

30
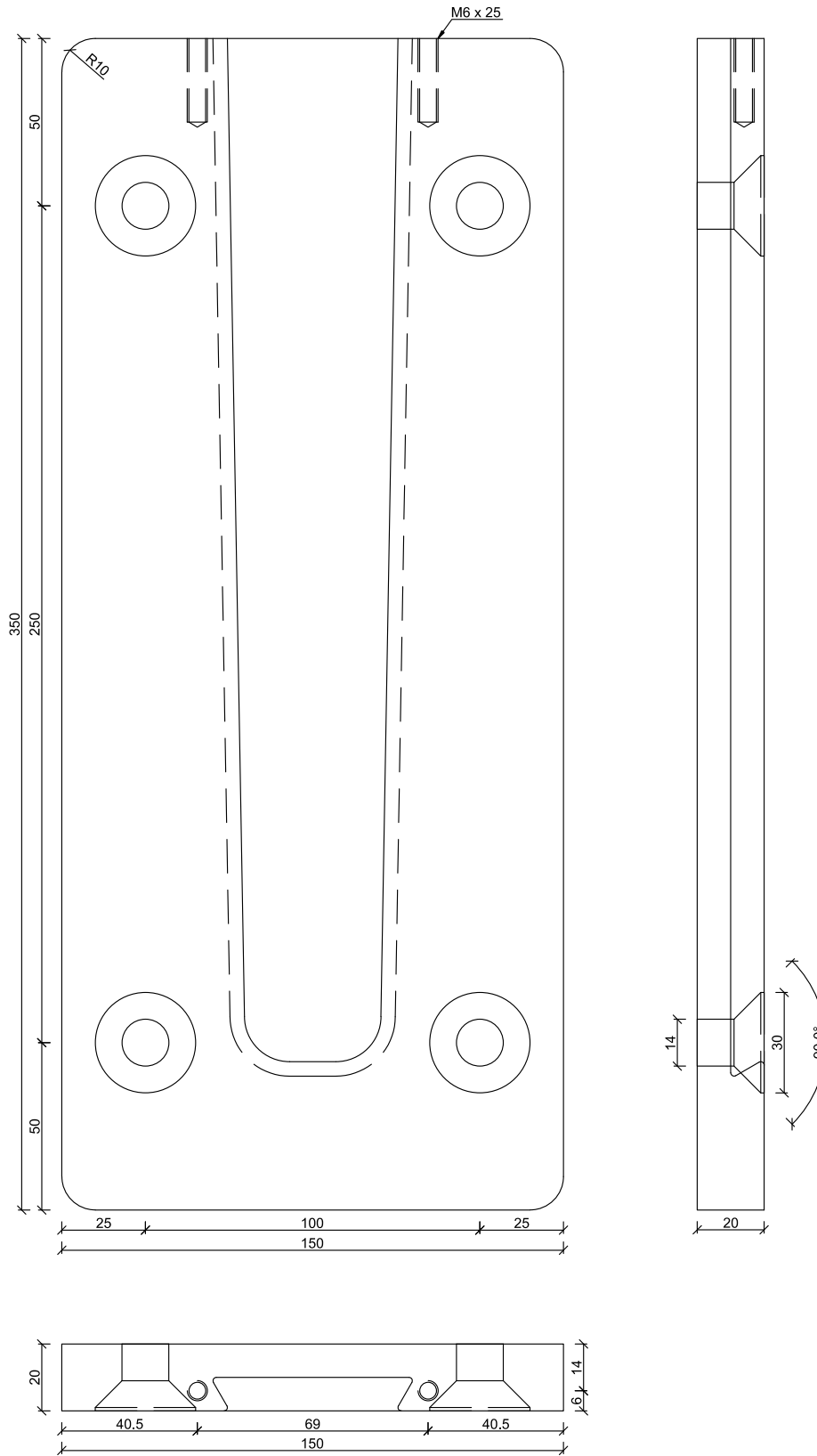
90,0°

20

25 100 25
150

20

34 82 34
150

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Artikelnummer:
88455.3000
Teil1

HVP Connector	Annex B22
88455.3000, part 1	

SERIES 88455

M6 x 25

R10

50

225

550

225

50

Injektionsbohrung

25   110   25
160

18   36   90,0°

20

20   14   6

39   82   39
160

HVP Connector

88455.3001, part 1

Annex B23

SERIES 88460

M6 x 25

R10

50

250

600

250

50

Injektionsbohrung

14

30

90,0°

20

25   100   25
150
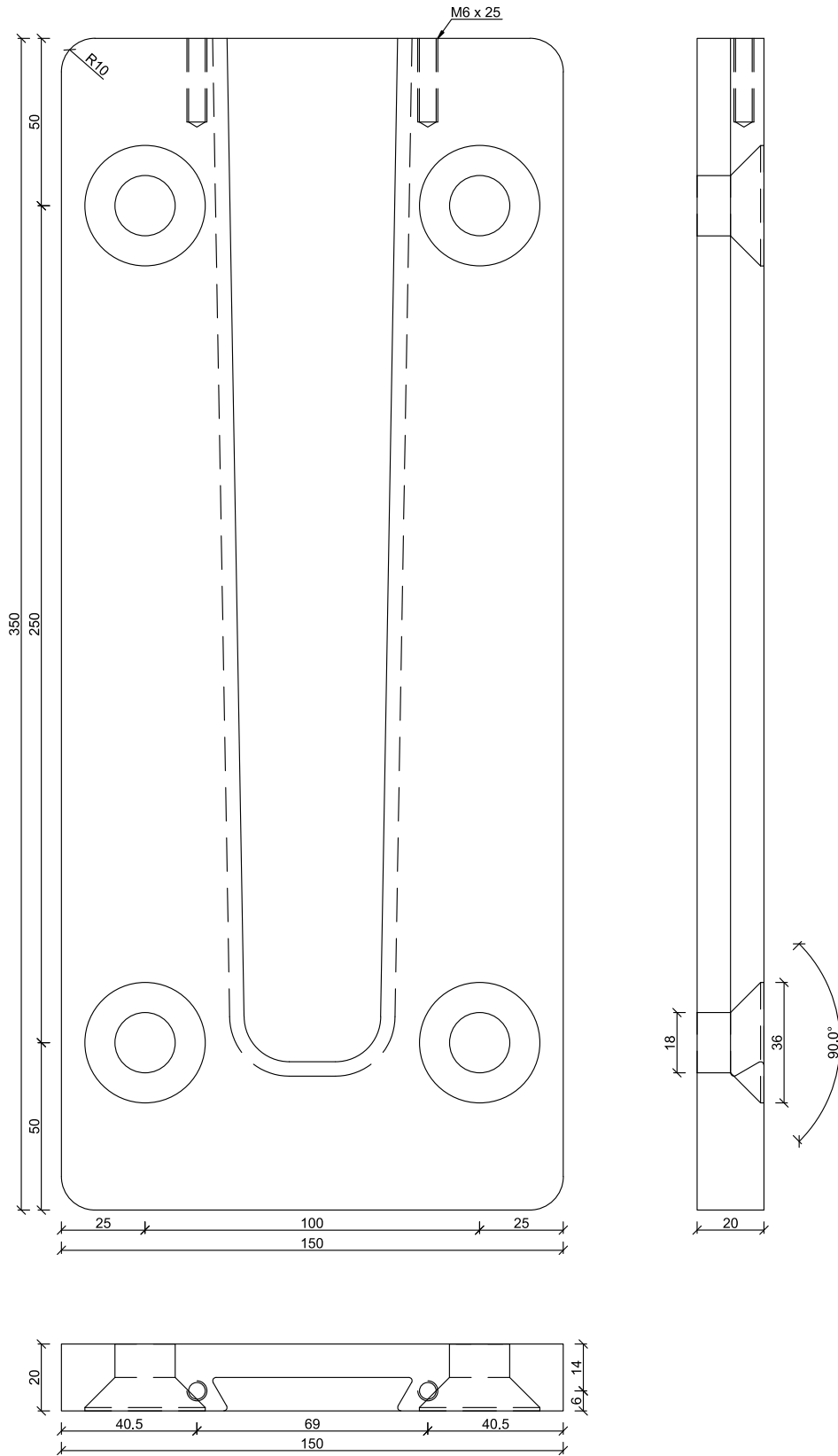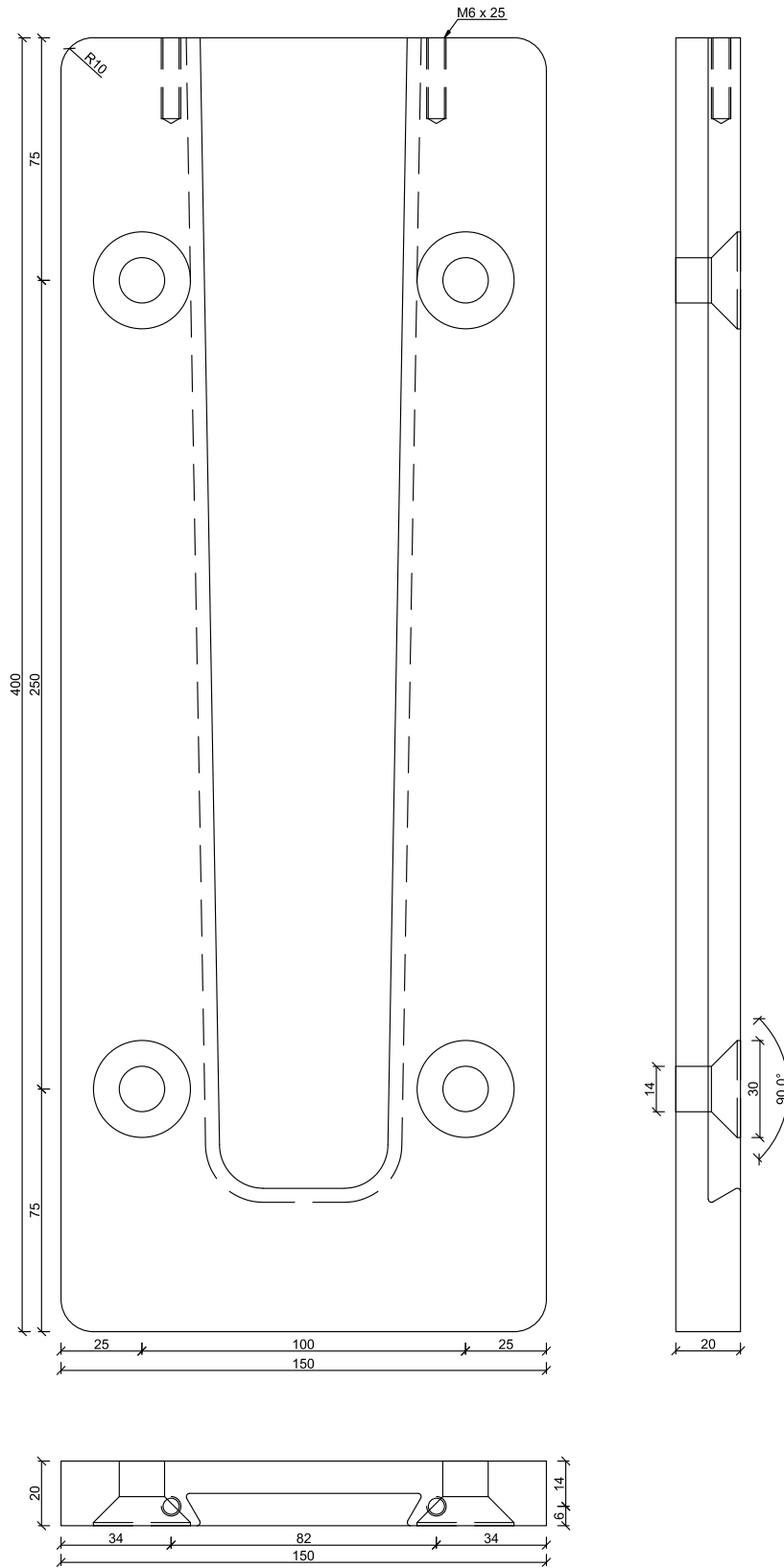
20   14

34   82   34
150

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Artikelnummer:
88460.3000
Teil1

HVP Connector

88460.3000, part 1

Annex B24

SERIES 88460

M6 x 25

R10

50

250

600

250

50

Injektionsbohrung

90,0°

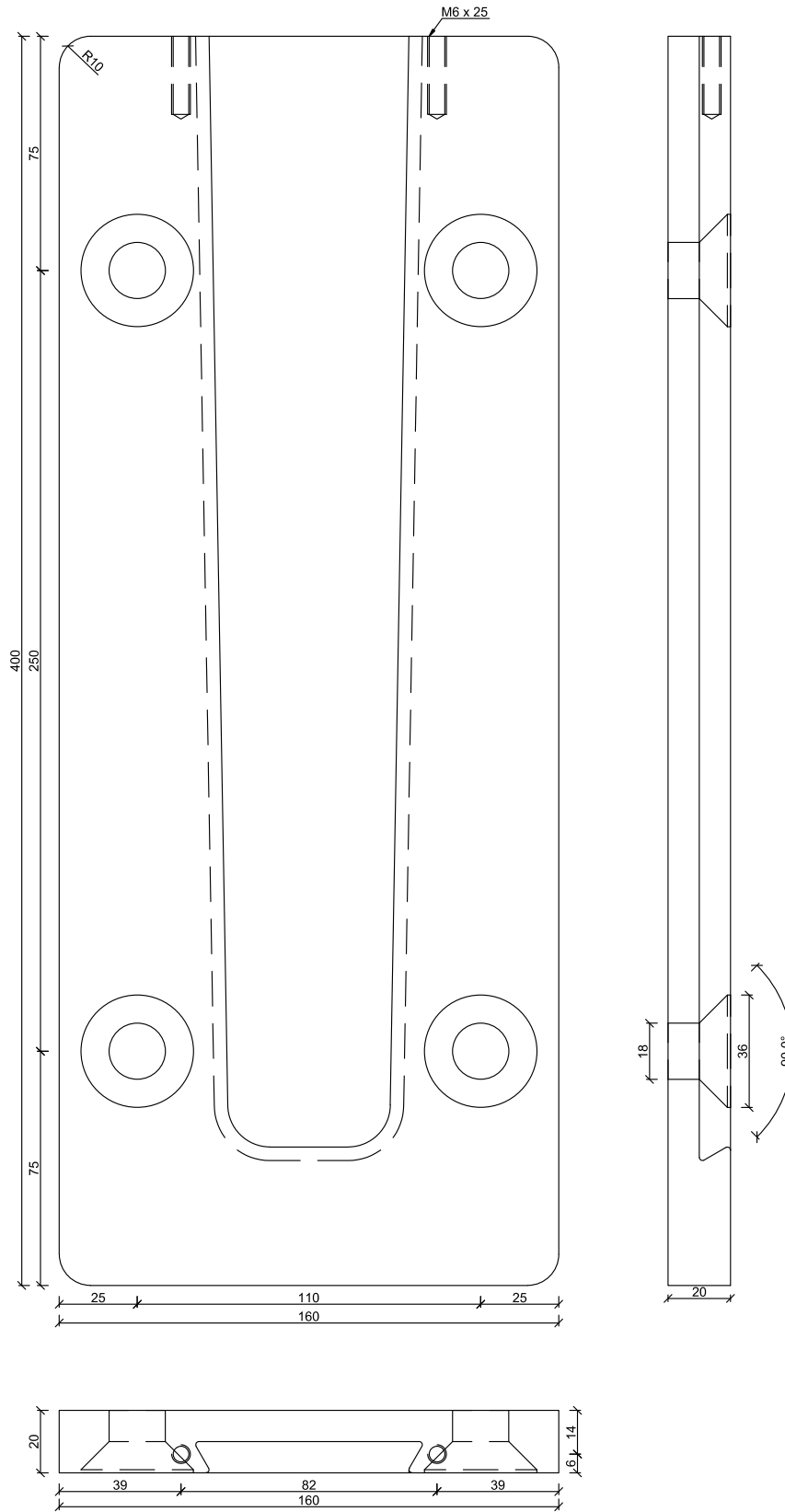36

18

20

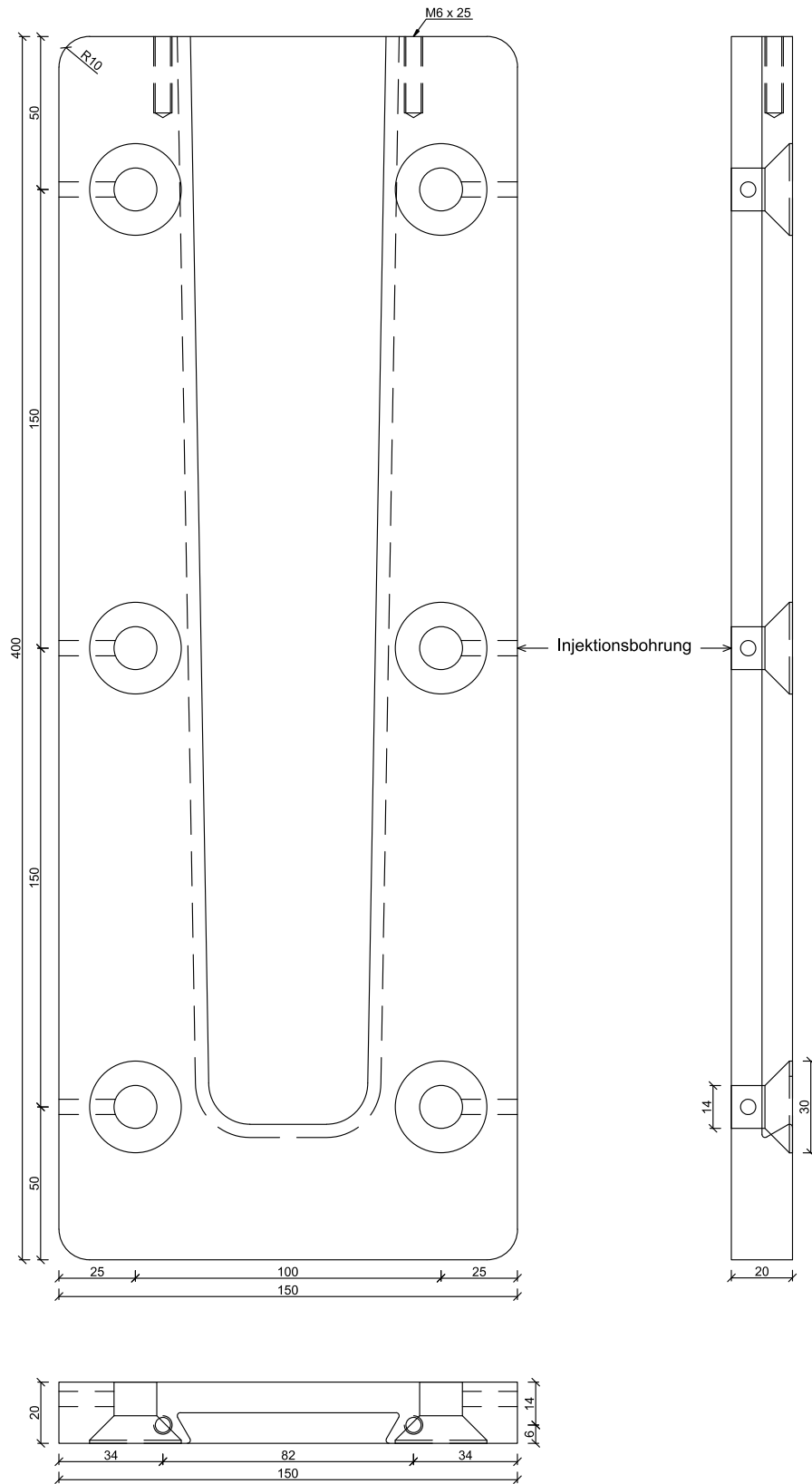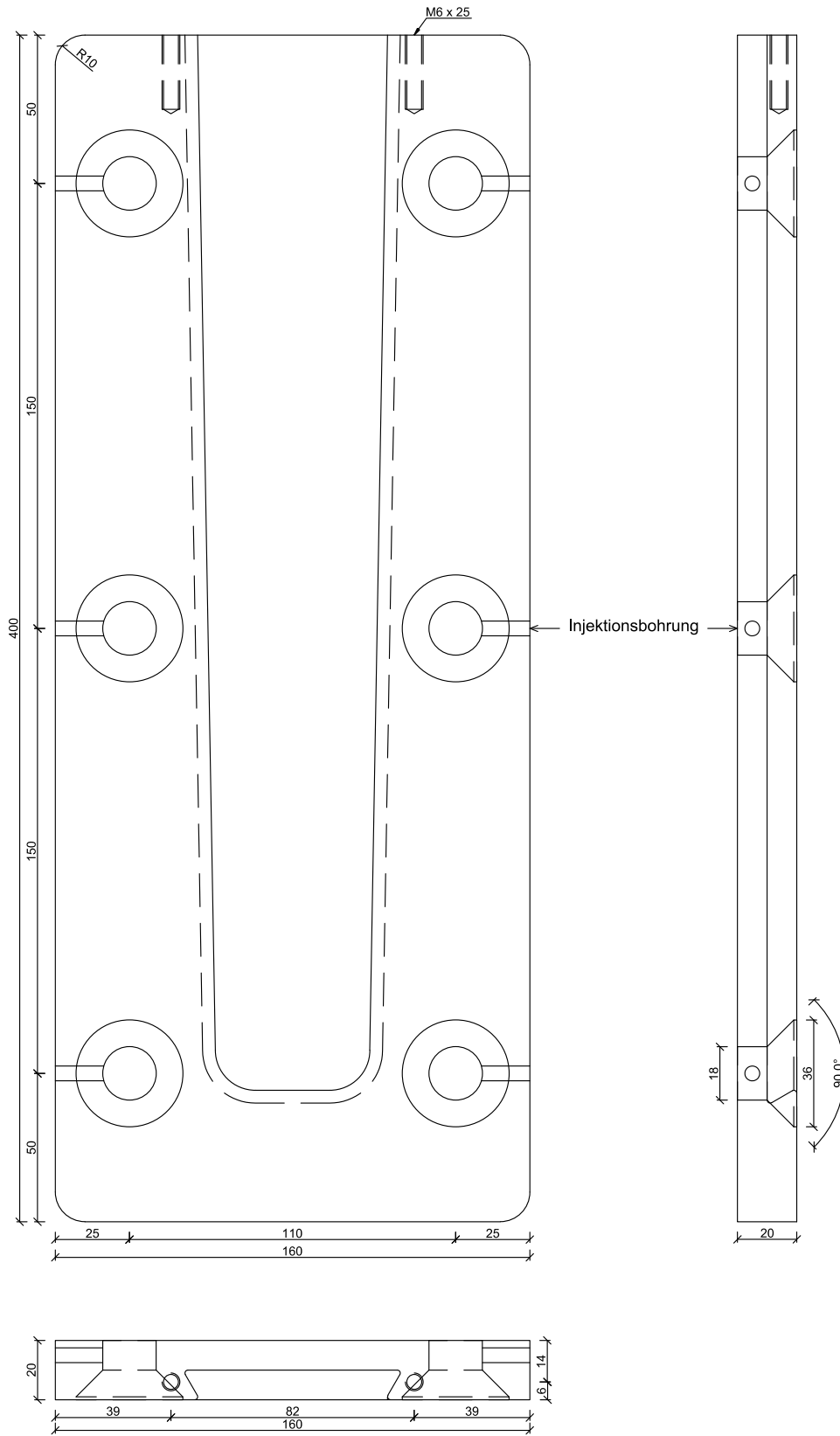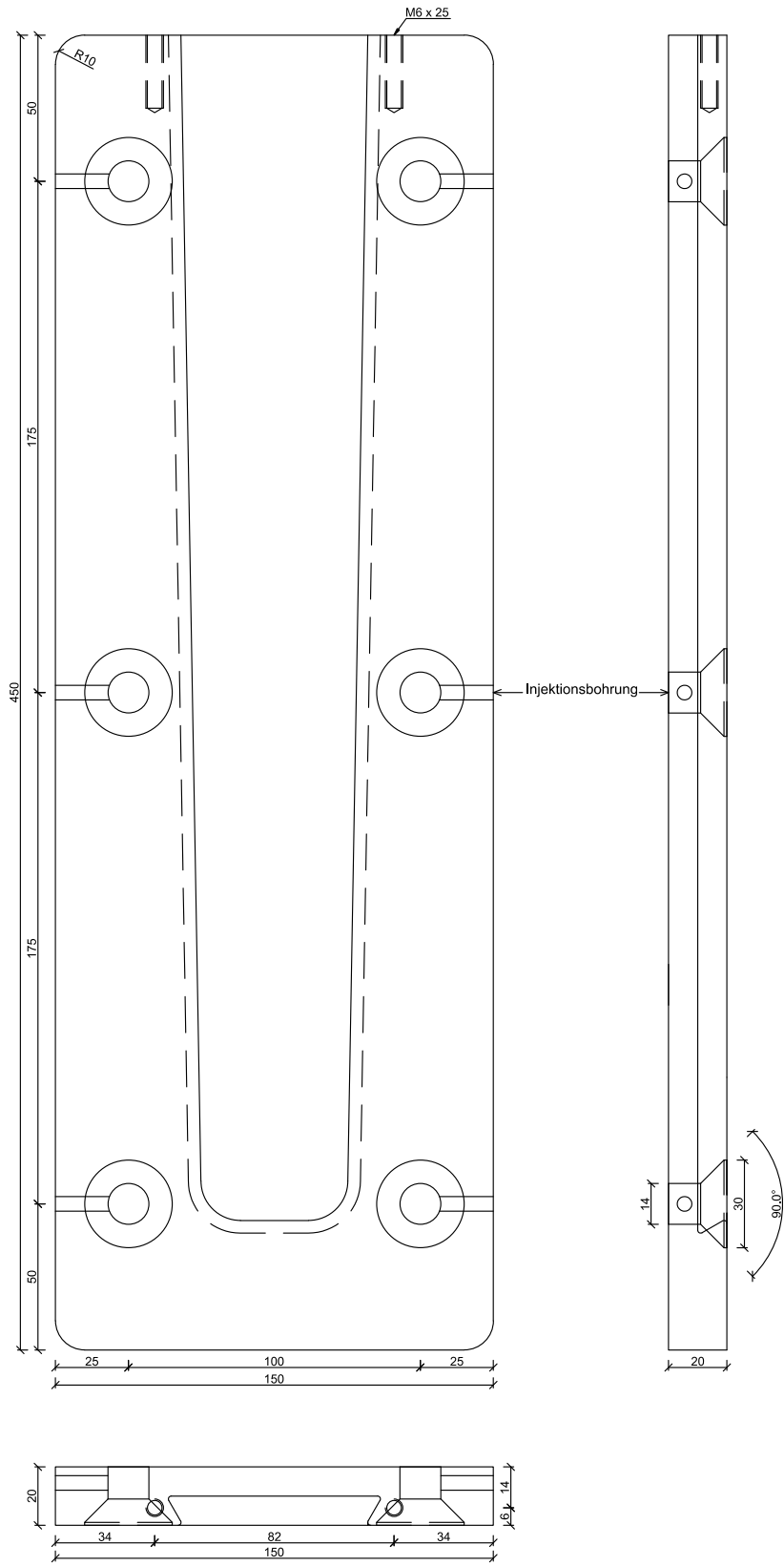25 | 110 | 25

160

20

39 | 82 | 39

160

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Artikelnummer:
88460.3001
Teil1

HVP Connector

88460.3001, part 1

Annex B25

Annex C
HVP Lift Lock System: Product details and definitions

Lift Lock Systems

87
69
9   9
18   8.2
6.2
t = 8 mm
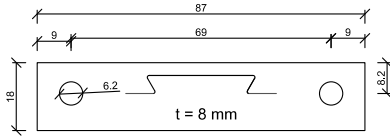
Für HVP Verbinder:
88420.1000
88425.1000
88430.1000
88435.1000

38
6.5   25
10   5.2   4.2
t = 6 mm
6.5
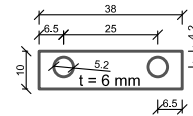
Für HVP Verbinder:
88107.1000
88109.1000
88111.1000
88113.1000
88115.1000

100
82
9   9
18   8.2
6.2
t = 8 mm
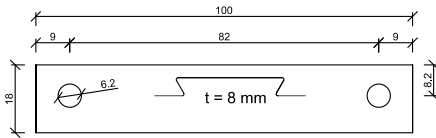
Für HVP Verbinder:
88440.1000
88445.1000
88450.1000
88455.1000
88460.1000

51
6.5   38   6.5
10   5.2   4.2
t = 6 mm
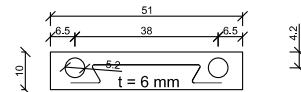
Für HVP Verbinder:
88210.1000
88214.1000

120
102
9   9
18   8.2
6.2
t = 8 mm
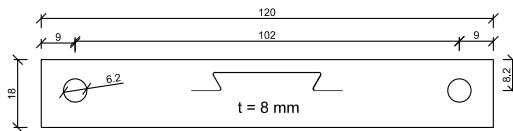
Für HVP Verbinder:
88540.1000
88545.1000
88550.1000
88555.1000
88560.1000

66
6.5   53   6.5
10   5.2   4.2
t = 6 mm
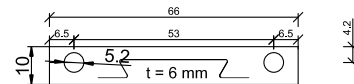
Für HVP Verbinder:
88318.1000
88322.1000

Material HVP Leisten EN AW 6082 Al Mg Si 1

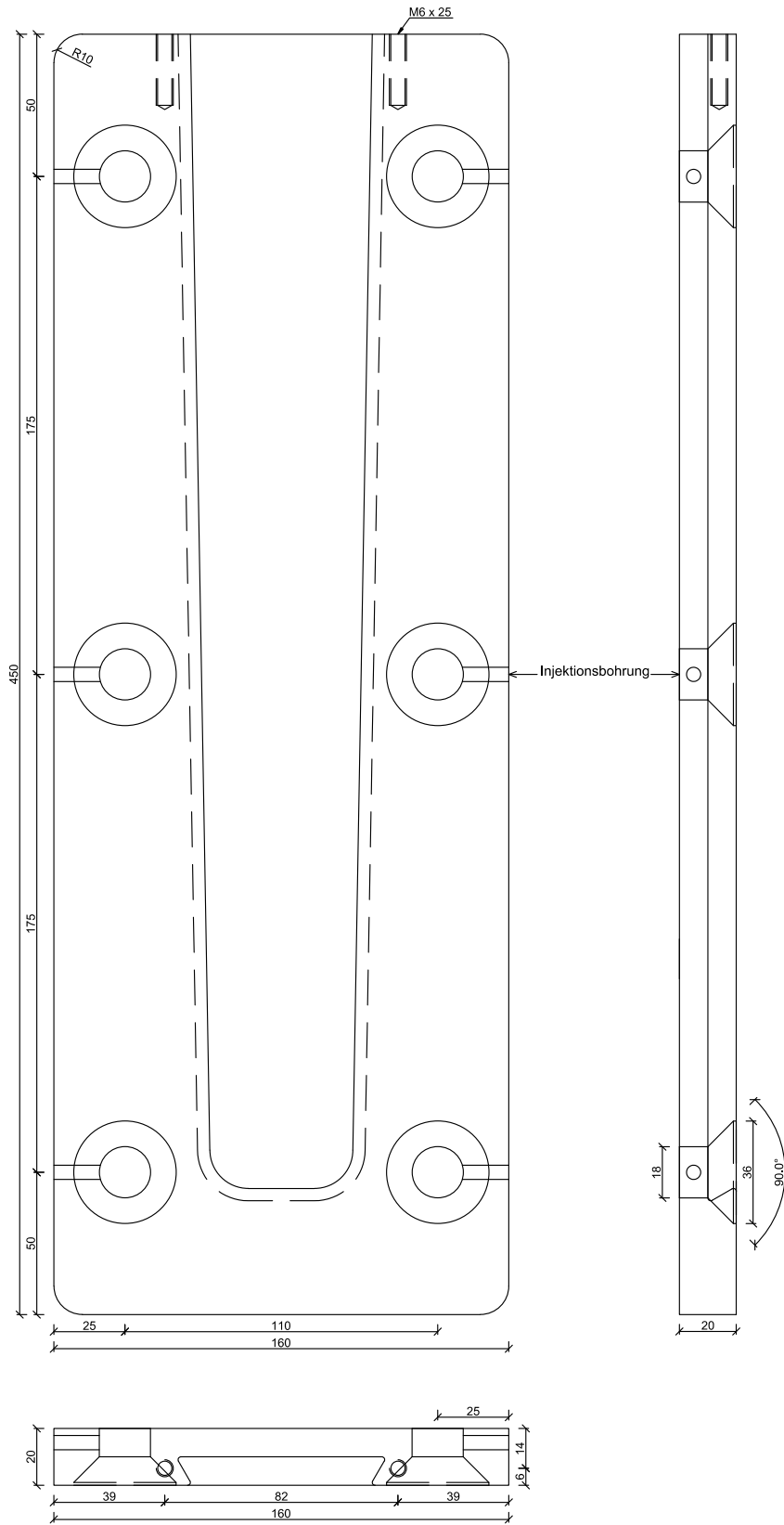| HVP Connector	
Lift Lock system	Annex C1

Lift Lock Systems - Installations

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Artikelnummer:

Abhubsicherung

HVP Connector	Annex C2
Lift Lock system, installation	

Annex D
RIGID: Product details and definitions

SERIES 82830
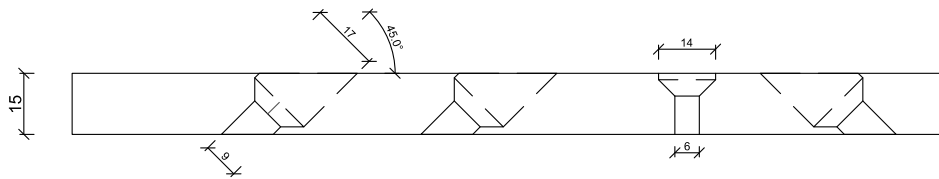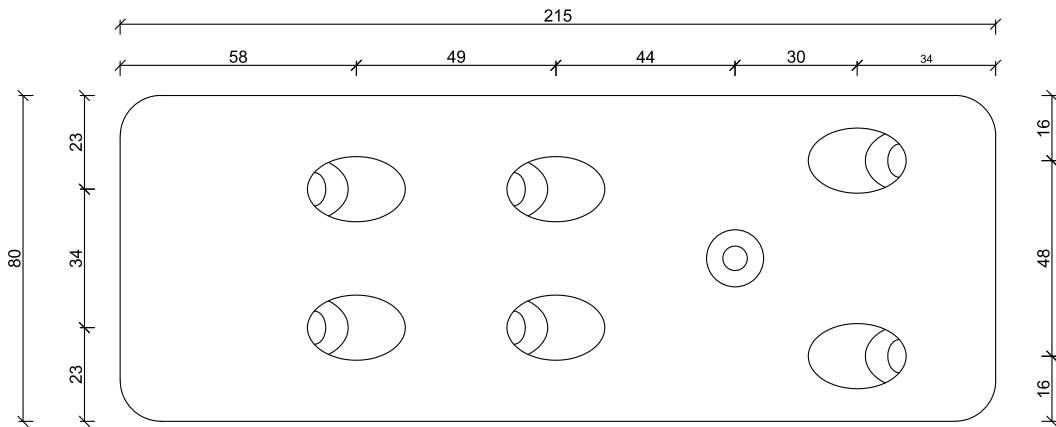
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Fax +49(0) 8703 9346-55	
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HVP RIGID	Annex D1
82830.0215	

SERIES 82830

Dimensions (top view):
- Overall width: 250
- Horizontal spacing: 33 | 27.48 | 31.52 | 45 | 38 | 41 | 34
- Overall height: 120
- Vertical spacing: 31 | 29 | 29 | 31

Section view:
- 15
- 17 (45.0°)
- 9
- 17
- 9
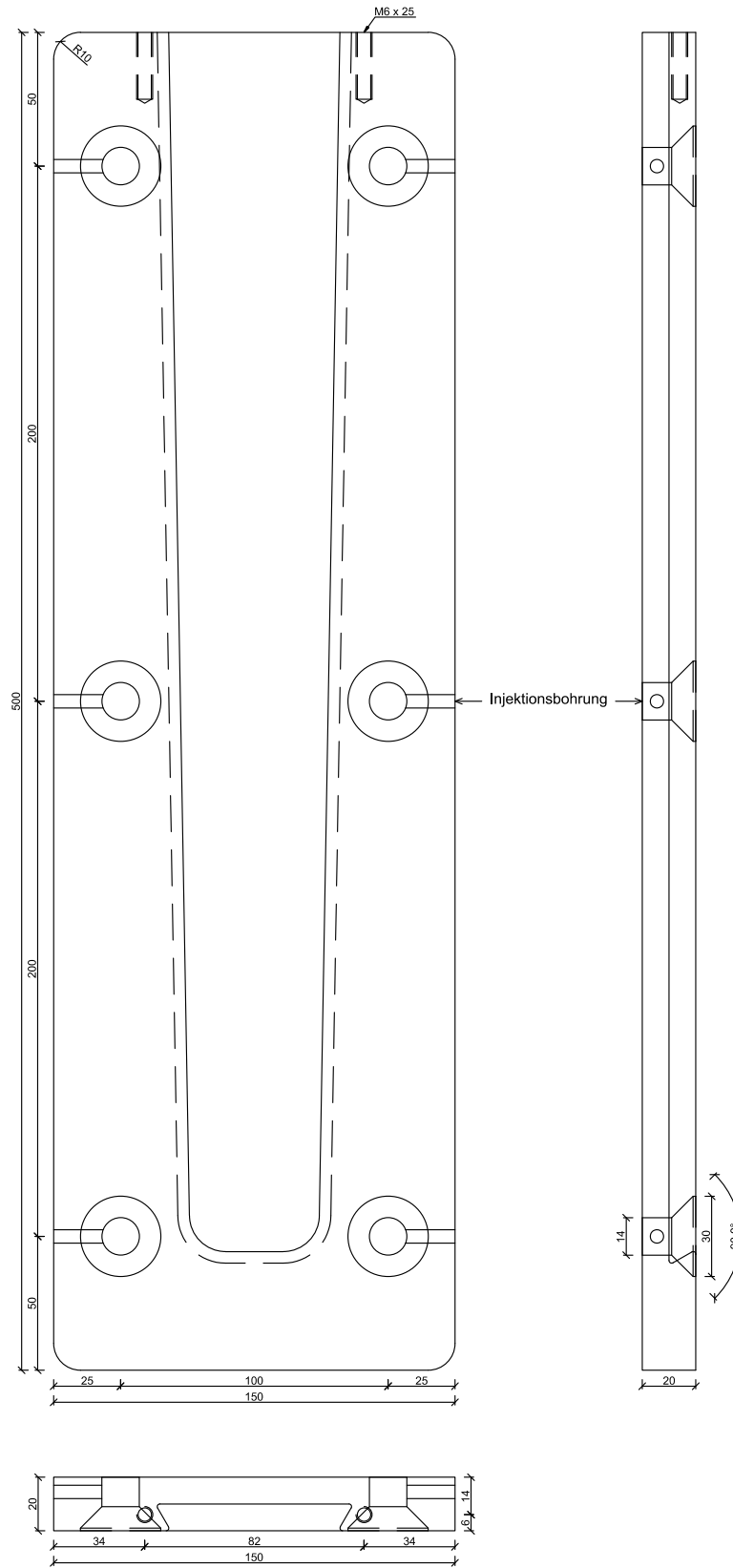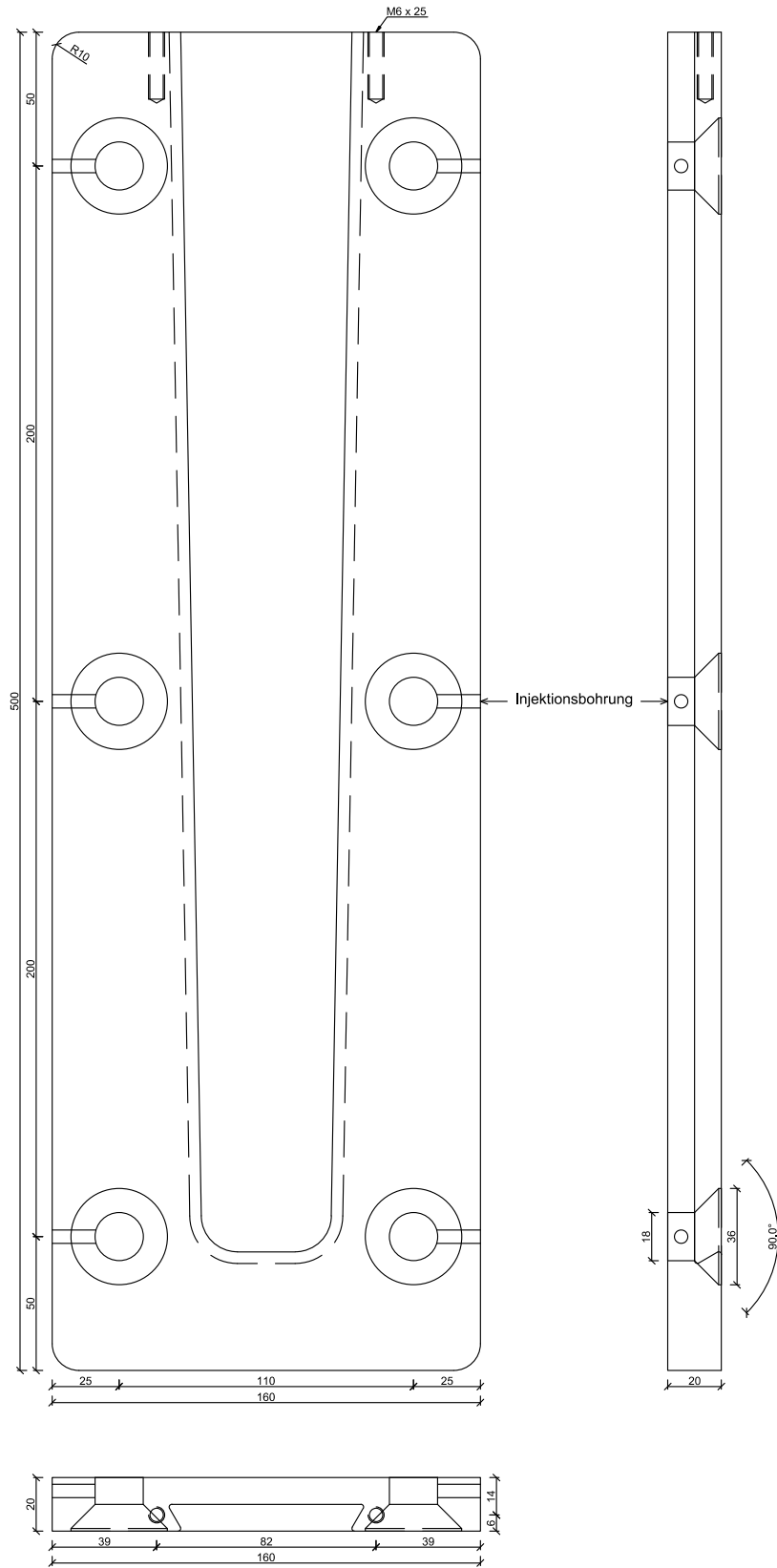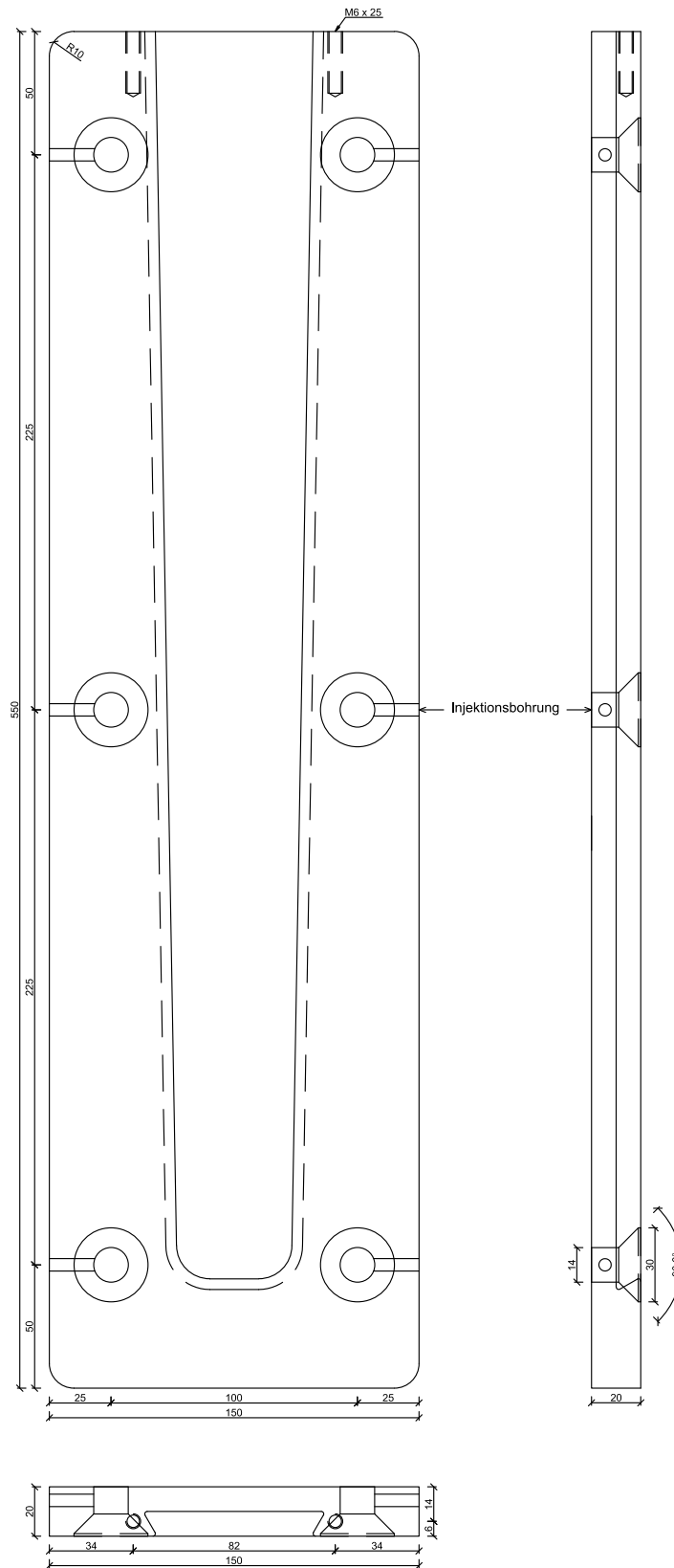
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Artikelnummer:
82830.0250

HVP RIGID

82830.0250

Annex D2

SERIES 82830	

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HVP RIGID	Annex D3
82830.0325	

HVP RIGID - APPLICATIONS

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HVP RIGID	Annex D4
Installation - Application	

HVP RIGID - APPLICATIONS

OBJEKT	ANZAHL	BAUTEILLISTE BAUTEILNUMMER	BESCHREIBUNG
1	1	St tze200x200	
2	1	884.30.0000-Teil1	
3	12	HECO-TOPIX 8 x 160, Senkkopf, T-Drive, Vollgewinde, verzinkt blau, A2K, gleitbeschichtet,	HT-HECO-TOPIX, countersunk head

OBJEKT	ANZAHL	BAUTEILLISTE BAUTEILNUMMER	BESCHREIBUNG
1	1	St tze200x200	
2	1	Riegel200x400	
3	1	82835.0250	
4	3	HECO-TOPIX 8 x 120, Senkkopf, T-Drive, Vollgewinde, verzinkt blau, A2K	HT-HECO-TOPIX, countersunk head
5	1	HECO-TOPIX 8 x 160, Senkkopf, T-Drive, Vollgewinde, verzinkt blau, A2K	HT-HECO-TOPIX, countersunk head
6	6	HECO-TOPIX 8 x 200, Senkkopf, T-Drive, Vollgewinde, verzinkt blau, A2K	HT-HECO-TOPIX, countersunk head

OBJEKT	ANZAHL	BAUTEILLISTE BAUTEILNUMMER	BESCHREIBUNG
1	1	Riegel200x400	
2	1	884.30.0000-Teil2	
3	12	HECO-TOPIX 8 x 160, Senkkopf, T-Drive, Vollgewinde, verzinkt blau, A2K,	HT-HECO-TOPIX, countersunk head

Rahmen1

Rahmen 1

HVP RIGID	Annex D5
Installation - Application	

Annex A
HVP-CONNECTORS: Minimum edge distances

HVP CONNECTOR – INSTALLATION
Minimum distances to the edges

HVP connectors 880xx to 881xx:

Header or column:

Joist:
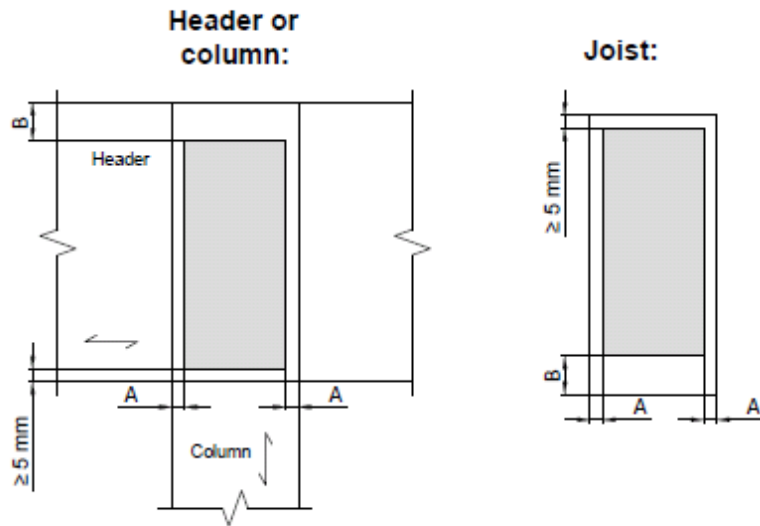
HVP connectors 882xx to 885xx:

Header or column:

Joist:
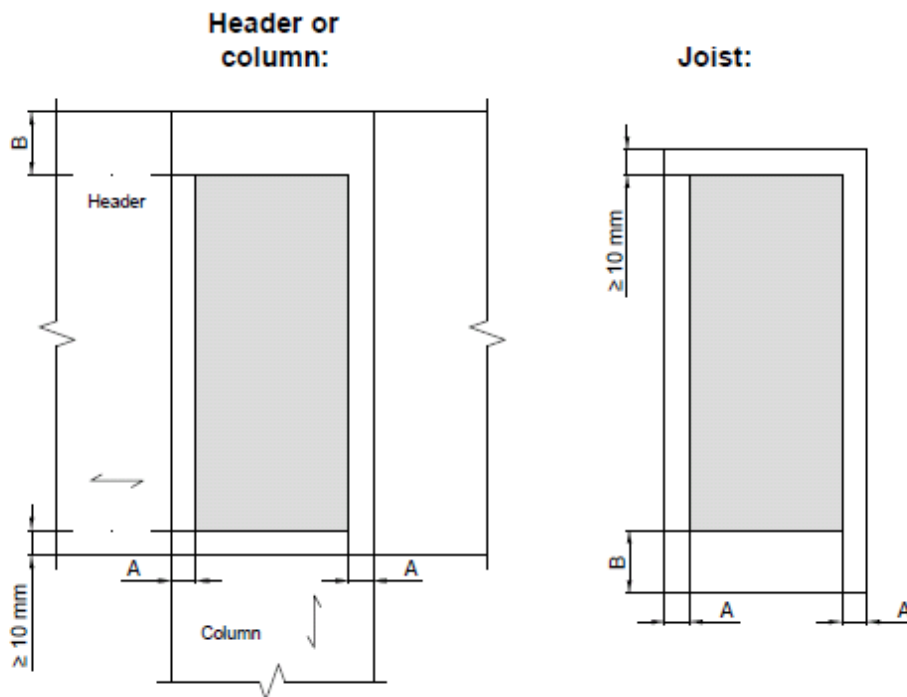
HVP CONNECTOR	Annex E1
Installation – Minimum Distances	

HVP CONNECTOR – INSTALLATION
Minimum distances to the edges

Table 1: Minimum edge distance for screws d=4,5 mm

Screws	HVP connectors		
	880xx to 881xx	880xx	881xx
	B	A	A
Ø 4,5 x 50	5 mm		
Ø 4,5 x 60	10 mm	10 mm	Part 1: 10 mm
Ø 4,5 x 70	15 mm		Part 2: 5 mm
Ø 4,5 x 80	20 mm		

Table 2: Minimum edge distance for screws *d*=5,0 mm

Screws	HVP connectors 882xx to 883xx	
	B	A
Ø 5 x 60	10 mm	
Ø 5 x 80	25 mm	10 mm
Ø 5 x 100	40 mm	

Table 3: Minimum edge distance for screws *d*=8,0 mm

Screws	HVP connectors			
	884xx to 885xx	884xx.x000	884xx.0100	885xx
	B	A	A	A
Ø 8 x 160	10 mm			
Ø 8 x 180	25 mm	10 mm	10 mm	10 mm
Ø 8 x 200	40 mm			

HVP CONNECTOR	Annex E2
Installation – Minimum Distances	

HVP CONNECTOR – INSTALLATION
Screw types and dimensions

Table 4: Screw Dimensions for timber-to-timber connections

SCREW diameter	Length	Screw type
4.0	10	Self-tapping screw according to DIN 7500-1:2009-06
5.0	20	Cylinder head screw according to DIN 912
6.0	20	Cylinder head screw according to DIN 912
4.5	≥50	Self-tapping screws according to EN 14592 or ETA
5.0	≥60	Self-tapping screws according to EN 14592 or ETA
8.0	≥100	Self-tapping screws according to EN 14592 or ETA
Note: Failure of the screws itself in tension must also be considered, see also Table 6		

Table 5: Screw Dimensions for timber-to-concrete or steel connections

BOLTS or METAL ANCHORS diameter	Corresponding hole diameter in aluminum plate	Fastener type
12.0 16.0	Max. 2 mm larger than the bolt or dowel diameter	Bolts according to EN 14592, metal anchors according to manufacturer's specification

HVP CONNECTOR	Annex E3
Installation – Minimum Distances	

Annex B
Characteristic values of load-carrying-capacities and stiffness

HVP CONNECTOR – STRUCTURAL DESIGN

The forces perpendicular to the connector plate are assumed to act in the middle of the joist.

Only a full fastener pattern is specified, where there are screws in all the holes of the joist and header connection. For the inclined screws a maximum allowed axial force of each screw should be considered with the Table below.

Table 6: Maximum tension force for each screw to avoid head-pull through at the HVP Connector

Nominal screw diameter d [mm]	$F_{ax,\,max,Rk}$ [kN]
4,5	10,5
5,0	12,0
8,0	20,0

Timber-to-timber connections with screws - torsional restrained header beam

Loading perpendicular to the connector plane

$$F_{1,Rk} = \min\left\{ h \cdot 200 \,;\, n_{90,J} \cdot F_{ax,0,J,Rk} \right\} \text{ in N} \tag{B.1}$$

Loading in the direction of insertion for $e_2 \leq e_{lim}$

$$F_{2,Rk} = \min \begin{cases} F_{2,J,Rk} \\ F_{2,H,Rk} \\ F_{2,ALU,Rk} \end{cases} \tag{B.2}$$

$$K_{2,ser} = \frac{F_{2,Rk}}{3\,mm} \tag{B.3}$$

HVP connectors 880xx to 881xx:

$$F_{2,J,Rk} = \frac{n_{60} \cdot F_{ax,\alpha,J,Rk}}{\sqrt{2}} \tag{B.4}$$

$$F_{2,H,Rk} = \frac{n_{60} \cdot F_{ax,\alpha,H,Rk}}{\sqrt{2}} \tag{B.5}$$

HVP connectors 882xx to 885xx:

$$F_{2,J,Rk} = \frac{1,25 \cdot \sum_{i=1}^{n_{45}} F_{ax,\alpha,J,Rk,i}}{\sqrt{2}} \tag{B.6}$$

$$F_{2,H,Rk} = \frac{1,25 \cdot \sum_{i=1}^{n_{45}} F_{ax,\alpha,H,Rk,i}}{\sqrt{2}} \tag{B.7}$$

HVP CONNECTOR	Annex E4
Structural Design	

HVP CONNECTOR – STRUCTURAL DESIGN

Loading in the direction of insertion for $e_2 > e_{lim}$

$$F'_{2,Rk} = \frac{F_{2,Rk}}{\left(1+\left(\dfrac{e_2 - e_{lim}}{e_M}\right)^3\right)^{1/3}} \tag{B.8}$$

Torsional Spring stiffness without RIGID plate

$$K_{2,\varphi,ser} = \frac{100 \cdot M_{2,Rk}}{rad} \tag{B.9}$$

Torsional Spring stiffness with RIGID plate

$$K_{2,\varphi,ser} = \frac{40 \cdot M_{2,Rk}}{rad} + \frac{M_{2,Rk}}{\tan^{-1}\left(\dfrac{M_{2,Rk}}{z^2 \cdot K_{Rigid}}\right)} \tag{B.10}$$

With

$$K_{Rigid} = \sum_{i=1}^{n}\left(K_{v,ser,i} \cdot \sin\alpha \cdot (\sin\alpha - \mu \cdot \cos\alpha) + K_{ax,ser,i} \cdot \cos\alpha \cdot (\cos\alpha + \mu \cdot \cos\alpha)\right) \tag{B.11}$$

and

$$K_{v,ser,i} = 120 \cdot (0,7 \cdot d_i)^{1,7} \tag{B.12}$$

$$K_{ax,ser,i} = 25 \cdot d_i \cdot l_{ef,i} \tag{B.13}$$

Where

$M_{2,Rk}$ The lower characteristic moment capacity of the joist or header/column connection, see Annex E7

μ If it is ensured that a permanent compression stress between the surface of the RIGID Connector and the timber surface exists, effects of friction can be considered up to μ=0,25

$K_{ax,ser,i}$ Slip modulus of a screw axially to the screw axis

$K_{v,ser,i}$ Slip modulus of a screw perpendicular to the screw axis

z Distance from the center of the HVP-Connector to the RIGID Connector

Loading against the direction of insertion

HVP connectors 880xx: $F_{3,Rk} = n_L \cdot 3,3\,kN$ (B.14)

HVP connectors 881xx to 883xx: $F_{3,Rk} = \min \begin{cases} (n_{90,J} + n_{45,J}) \cdot F_{la,J,Rk} \\ (n_{90,H} + n_{45,H}) \cdot F_{la,H,Rk} \\ 21,8\,kN \end{cases}$ (B.15)

HVP connectors 884xx to 885xx: $F_{3,Rk} = \min \begin{cases} (n_{90,J} + n_{45,J}) \cdot F_{la,J,Rk} \\ (n_{90,H} + n_{45,H}) \cdot F_{la,H,Rk} \\ 36,4\,kN \end{cases}$ (B.16)

HVP CONNECTOR	Annex E5
Structural Design	

HVP CONNECTOR – STRUCTURAL DESIGN

Loading perpendicular to the direction of insertion

$$F_{4,Rk} = \min \begin{cases} \dfrac{F_{la,J,Rk}}{\sqrt{\left(\dfrac{1}{(n_{90}+n_{45/60})}+\dfrac{e_{45}}{e_{1,J}}\right)^2+\left(\dfrac{e_{45}}{e_{2,J}}\right)^2}} \\[2em] \dfrac{F_{la,H,Rk}}{\sqrt{\left(\dfrac{1}{(n_{90}+n_{45/60})}+\dfrac{e_{45}}{e_{1,H}}\right)^2+\left(\dfrac{e_{45}}{e_{2,H}}\right)^2}} \end{cases}$$ (B.17)

Loading by a torsional moment around the joist axis

$$M_{tor,J,Rk} = F_{la,J,Rk} \cdot e_3$$ (B.18)

$$K_{tor,ser} = \frac{40 \cdot M_{tor,J,Rk}}{rad}$$ (B.19)

Where:

h	Depth of the connector plate
α	Angle between screw axis and grain direction
$\ell_{ef,J}$	Penetration depth of the threaded part of a joist screw
$\ell_{ef,H}$	Penetration depth of the threaded part of a header screw
$\rho_{k,J}$	Characteristic density of the joist
$\rho_{k,H}$	Characteristic density of the header/column
$n_{45/60}$	Number of inclined screws in the joist or header/column plate of the HVP connector
n_{90}	Number of screws perpendicular to the joist or header/column plate of the HVP connector
n_L	Number of locking screws per joist or header/column plate for loads against the direction of insertion
$F_{la,J,Rk}$	Lateral capacity of a joist screw, $F_{la,J,Rk} = 2,3 \cdot \sqrt{0,8 \cdot M_{y,Rk} \cdot f_{h,k} \cdot d}$
$F_{la,H,Rk}$	Lateral capacity of a header/column screw, $F_{la,H,Rk} = 2,3 \cdot \sqrt{2 \cdot M_{y,Rk} \cdot f_{h,k} \cdot d}$
$M_{y,Rk}$	Characteristic yield moment of a screw
$f_{h,k}$	Characteristic embedding strength according to EN 1995-1-1
d	Outer thread diameter of a screw
$F_{ax,\alpha,J,Rk}$	Withdrawal capacity of an inclined joist screw, according to EN 1995-1-1

$$F_{ax,\alpha,J,Rk} = \frac{0,52 \cdot \sqrt{d} \cdot \ell_{ef,J}^{0,9} \cdot \rho_{k,J}^{0,8}}{1,2 \cdot \cos^2 \alpha + \sin^2 \alpha}$$ (B.20)

or screws according to ETA:

$$F_{ax,\alpha,J,Rk} = k_{ax} \cdot f_{ax,k} \cdot l_{ef} \cdot \left(\frac{\rho_{k,J}}{350}\right)^{0,8}$$ (B.21)

HVP CONNECTOR	Annex E6
Structural Design	

HVP CONNECTOR – STRUCTURAL DESIGN

$F_{ax,\alpha,H,Rk}$ Withdrawal capacity of an inclined header/column screw,

$$F_{ax,\alpha,H,Rk} = \frac{0{,}52 \cdot \sqrt{d} \cdot \ell_{ef,H}^{0,9} \cdot \rho_{k,H}^{0,8}}{1{,}2 \cdot \cos^2 \alpha + \sin^2 \alpha} \qquad (B.22)$$

or screws according to ETA:

$$F_{ax,\alpha,J,Rk} = k_{ax} \cdot f_{ax,k} \cdot l_{ef} \cdot \left(\frac{\rho_{k,J}}{350} \right)^{0,8} \qquad (B.23)$$

$F_{2,ALU,Rk}$ Load-carrying capacity of the aluminum connector itself (see Table 7)

e_2 Eccentricity of the force $F_{2,Ed}$ with regard to the joist end grain surface

e_{45} Eccentricity of the force $F_{4,Ed}$ with regard to the centre of the HVP connector

e_{lim} HVP connector dimension (see Table B.1)

e_M $M_{2,Rk}/F_{2,Rk}$

$M_{2,Rk}$ The lower characteristic moment capacity of the joist or header/column connection

$$M_{2,Rk} = F_{ax,Rk} \cdot e_Z + F_{2,Rk} \cdot e_{lim}$$

$F_{ax,Rk}$ Withdrawal capacity of a moment screw arranged perpendicular to the connector plate

e_Z HVP connector dimension (see Table 7)

$e_{1,J}$, $e_{2,J}$, $e_{1,H}$, $e_{2,H}$, e_3 HVP connector dimensions (see Table 7);

HVP CONNECTOR	Annex E7
Structural Design	

HVP CONNECTOR – Dimensions

Table 7: HVP connectors; dimensions, number of screws and $F_{2,ALU,Rk}$

HVP connector №	Width b [mm]	Depth h [mm]	Screw diameter [mm]	Number of screws Part 1 n_{90}	Number of screws Part 1 $n_{45/60}$	Number of screws Part 2 n_{90}	Number of screws Part 2 $n_{45/60}$	e_{lim} [mm]	e_Z [mm]	$e_{1,J}$ [mm]	$e_{2,J}$ [mm]	$e_{1,H}$ [mm]	$e_{2,H}$ [mm]	e_3 [mm]	$F_{2,ALU,Rk}$ [kN]
88004.1000	25	40	4,5	2	1	2	1	13	0	38	65	32	20	26	32,5
88006.1000	25	60	4,5	2	2	2	2	11	0	65	215	60	192	52	32,5
88008.1000	25	80	4,5	2	3	2	3	11	0	98	448	91	431	87	32,5
88010.1000	25	100	4,5	2	4	2	4	13	0	139	853	122	767	132	32,5
88107.1000	40	70	4,5	2	3	2	3	26	0	78	149	100	98	60	32,5
88109.1000	40	90	4,5	3	4	3	4	38	66	138	416	163	371	124	32,5
88111.1000	40	110	4,5	3	5	3	5	51	86	189	736	215	665	175	32,5
88113.1000	40	130	4,5	3	6	3	6	63	106	248	1180	278	1020	233	32,5
88115.1000	40	150	4,5	3	8	3	8	74	126	328	1850	355	1540	313	32,5
88210.1000	60	100	5,0	4	5	4	5	17	129	237	402	243	462	173	59,8
88214.1000	60	140	5,0	4	8	4	8	33	121	365	951	311	816	290	59,8
88318.1000	80	180	5,0	5	12	5	12	46	180	599	1540	588	1470	471	91,3
88322.1000	80	220	5,0	6	16	6	16	58	268	890	2890	867	2770	714	91,3
88420.1000	120	200	8,0	4	4	4	4	33	308	298	402	506	846	201	250
88425.1000	120	250	8,0	4	6	4	6	51	408	431	816	655	1450	319	250
88430.1000	120	300	8,0	4	8	4	8	67	508	612	1490	838	2310	482	250
88435.1000	120	350	8,0	4	10	4	10	84	608	827	2460	1060	3490	668	250
88440.1000	120	400	8,0	4	12	4	12	101	603	1210	7180	1230	4960	979	307
88445.1000	120	450	8,0	4	14	4	14	118	701	1480	10100	1520	6980	1215	307
88450.1000	120	500	8,0	4	16	4	16	135	800	1800	13700	1840	9520	1482	307
88455.1000	120	550	8,0	4	18	4	18	151	899	2170	18300	2190	12600	1822	307
88460.1000	120	600	8,0	4	20	4	20	167	998	2540	23500	2570	16200	2129	307
88540.1000	140	400	8,0	4	16	4	16	92	639	1360	6000	1580	4760	1104	395
88545.1000	140	450	8,0	4	20	4	20	102	738	1740	8790	2120	7260	1488	395
88550.1000	140	500	8,0	4	22	4	22	118	838	2110	11900	2510	9640	1778	395
88555.1000	140	550	8,0	4	24	4	24	134	937	2570	16100	2940	12500	2217	395
88560.1000	140	600	8,0	4	28	4	28	151	1037	3060	21100	3550	16600	2632	395
88210.2000	120	100	5,0	6	10	6	10	14	197	830	594	817	601	437	120
88214.2000	120	140	5,0	6	16	6	16	31	330	1020	1080	1030	1100	710	120
88318.2000	160	180	5,0	8	24	8	24	43	413	1620	1850	1880	1980	1102	183
88322.2000	160	220	5,0	10	32	10	32	56	589	2250	3130	2440	3270	1628	183
88420.2000	240	200	8,0	6	8	6	8	29	263	1150	902	1550	1130	605	500
88425.2000	240	250	8,0	6	12	6	12	47	398	1360	1380	1770	1700	809	500
88430.2000	240	300	8,0	6	16	6	16	64	539	1650	2070	2060	2470	1077	500
88435.2000	240	350	8,0	6	20	6	20	80	682	2000	2990	2440	3500	1379	500
88440.2000	240	400	8,0	6	24	6	24	97	1017	2610	5310	2860	4890	1932	614
88445.2000	240	450	8,0	6	28	6	28	114	1167	3120	7200	3390	6600	2368	614
88450.2000	240	500	8,0	6	32	6	32	131	1317	3715	9620	3980	8710	2889	614
88455.2000	240	550	8,0	6	36	6	36	148	1466	4380	12600	4630	11200	3481	614
88460.2000	240	600	8,0	6	40	6	40	164	1616	5050	15900	5330	14200	4046	614
88420.0100	100	200	8,0	3	4	4	4	71	120	233	934	436	926	202	252
88425.0100	100	250	8,0	3	6	4	6	86	170	371	2100	612	1680	339	252
88430.0100	100	300	8,0	3	8	4	8	101	220	530	3890	828	2790	486	252
88435.0100	100	350	8,0	4	10	4	10	117	268	800	7330	1080	4330	727	252
88440.0100	100	400	8,0	4	12	4	12	132	318	1030	11200	1380	6370	937	252
88445.0100	100	450	8,0	4	14	4	14	163	367	1290	16100	1710	8650	1173	252
88450.0100	100	500	8,0	4	16	4	16	166	417	1580	22300	2090	12300	1432	252
88455.0100	100	550	8,0	4	18	4	18	183	467	1890	29900	2500	16300	1717	252
88460.0100	100	600	8,0	4	20	4	20	199	517	2230	39000	2960	21100	2026	252

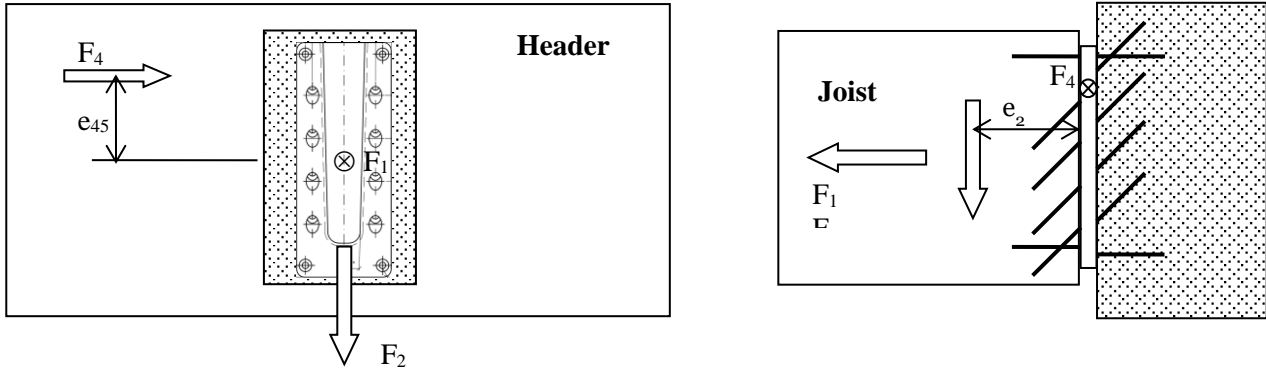| HVP CONNECTOR	Annex E8
Dimensions	

HVP CONNECTOR – STRUCTURAL DESIGN

Figure B1: Definition of e_2 and e_{45}

For combined loading of the HVP connector, the following condition should be fulfilled:

$$\left(\frac{F_{1,Ed}}{F_{1,Rd}}\right)^2 + \left(\frac{F_{2,Ed}}{F_{2,Rd}}\right)^2 + \left(\frac{F_{3,Ed}}{F_{3,Rd}}\right)^2 + \left(\frac{F_{4,Ed}}{F_{4,Rd}}\right)^2 + \left(\frac{M_{tor,J,Ed}}{M_{tor,J,Rd}}\right)^2 \leq 1 \tag{E.24}$$

Here, $F_{1,Ed}$, $F_{2,Ed}$, $F_{3,Ed}$ and $F_{4,Ed}$ are the design loads perpendicular to the connector plate and parallel and perpendicular to the direction of insertion, respectively.

B.2 Timber-to-concrete or timber-to-steel connections with screws and bolts or metal anchors - torsionally restrained header beam (HVP connectors 88210.3000 to 88460.3000)

Loading in the direction of insertion

$$F_{2,Rk} = \min \begin{cases} F_{2,J,Rk} \\ F_{2,H,Rk} \end{cases} \tag{E.25}$$

$$F_{2,J,Rk} = \frac{1,25 \cdot n_{45,J} \cdot F_{ax,\alpha,J,Rk}}{\sqrt{2}} \tag{E.26}$$

$$F_{2,H,Rk} = n_{90,H} \cdot F_{la,H,Rk} \tag{E.27}$$

Where:

$n_{90,H}$ Number of bolts or metal anchors perpendicular to the header plate of the HVP connector, $n_{90,H} \geq 2$

$F_{la,H,Rk}$ Lateral capacity of a header bolt or metal anchor

HVP CONNECTOR	Annex E9
Structural Design	

HVP CONNECTOR – STRUCTURAL DESIGN

Resistance to fire

If a fire resistance is required, the HVP connector plates shall be protected on all sides by a timber or wood-based panel of an additional thickness of a component for increased mechanical stress ability of a connection a_{fi} depending on the fire resistance given with the Table B.3. It has to be considered that these values are valid up to a reduction factor in accordance to EN 1995-1-2 with

$$\eta = \frac{G_k + \psi_{fi} \cdot Q_{k,1}}{\gamma_G \cdot G_k + \gamma_{Q,1} \cdot Q_{k,1}} \leq 0,60 \qquad (E.28)$$

Table 8: Minimum values for a_{fi} depending on the required fire resistance

Fire Resistance	Equation
R30	$a_{fi} = \beta_n \cdot 1,5 \cdot (t_{req} - 5)$
R60	$a_{fi} = \beta_n \cdot 1,5 \cdot (t_{req} - 12)$
R90	$a_{fi} = \beta_n \cdot 1,5 \cdot (t_{req} - 22)$
R120	$a_{fi} = \beta_n \cdot 1,5 \cdot (t_{req} - 32)$

Where:

a_{fi} Required thickness of the timber or wood-based panel protection

β_n Design notional charring rate under standard fire exposure according to EN 1995-1-2

t_{req} Required time of fire resistance in min, $t_{req} \leq 120$ min

The laterally loaded screws of the HVP connectors should be designed according to section 6.3.2 of EN 1995-1-2 „Eurocode 5 – Design of timber structures – Part 1-2: General – Structural fire design" as protected connections with steel plates as side members.

The axially loaded screws should be designed according to section 6.4 of EN 1995-1-2 „Eurocode 5 – Design of timber structures – Part 1-2: General – Structural fire design".
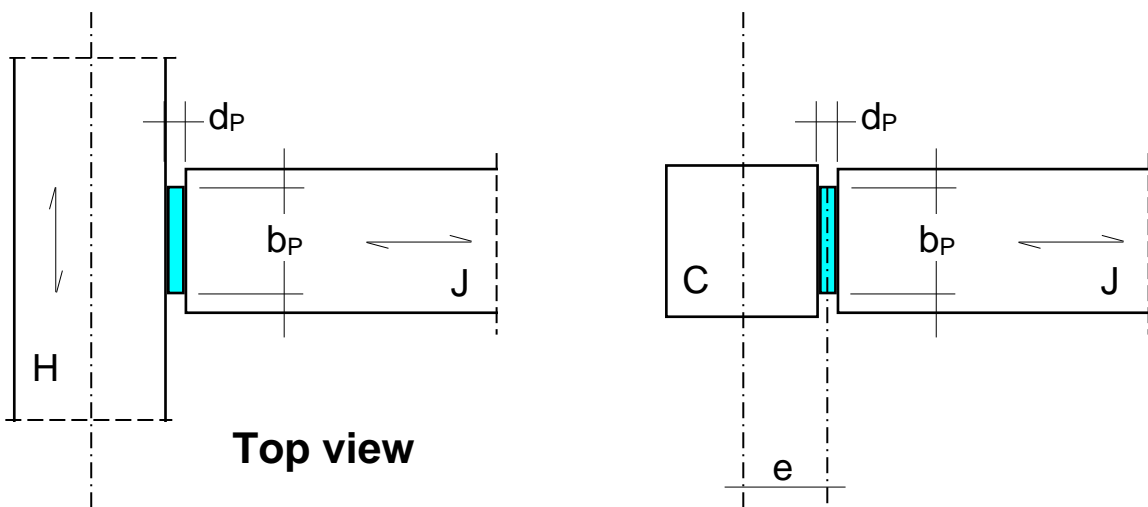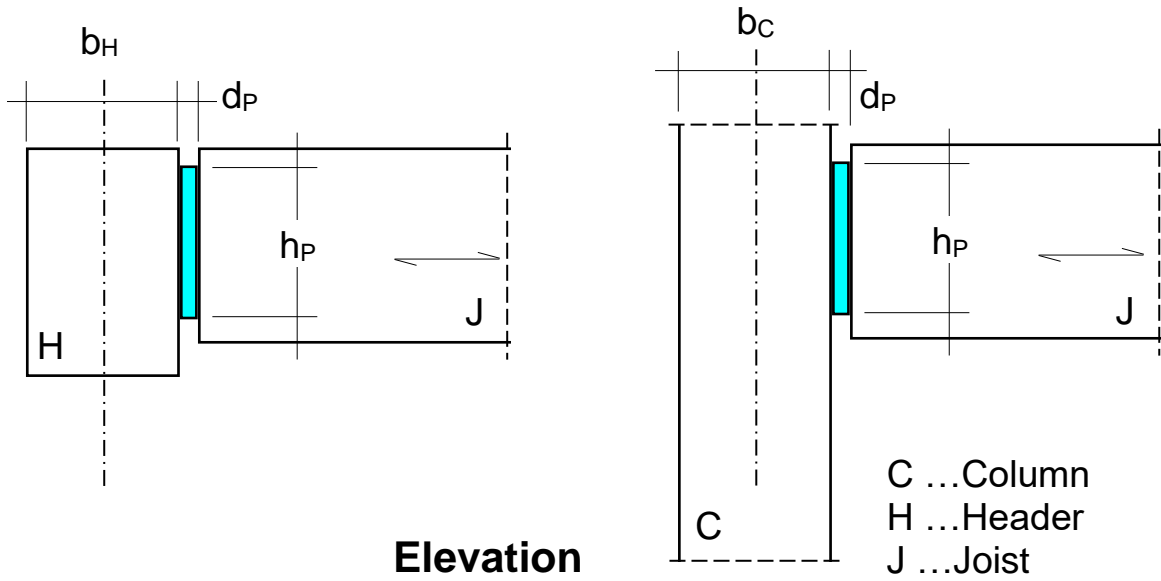
HVP CONNECTOR	Annex E10
FIRE DESIGN	

Annex F
HVP Connectors: Structural Design

HVP CONNECTOR – STRUCTURAL DESIGN

h_P …Connector plate depth
b_P …Connector plate width
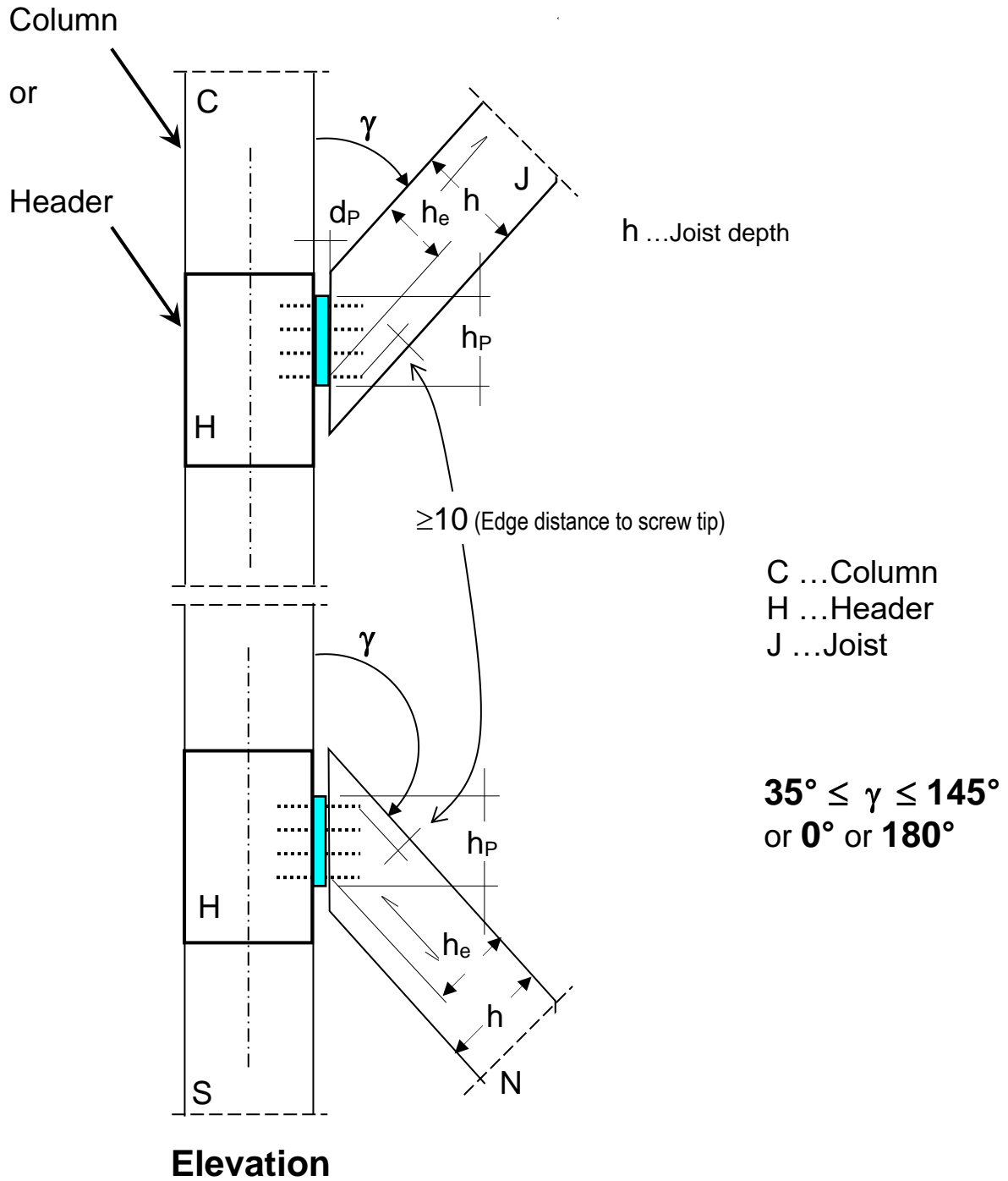d_P …Total thickness of HVP connector plates

Elevation

C …Column
H …Header
J …Joist

Top view

HVP CONNECTOR	Annex F1
FIRE DESIGN	

HVP CONNECTOR – STRUCTURAL DESIGN

Column

or

Header

h …Joist depth

≥10 (Edge distance to screw tip)

C …Column
H …Header
J …Joist

$35° \leq \gamma \leq 145°$
or $0°$ or $180°$

Elevation

h_P …Connector plate depth
b_P …Connector plate width
d_P …Total thickness of HVP connector plates

HVP CONNECTOR	
FIRE DESIGN	Annex F2

HVP CONNECTOR – STRUCTURAL DESIGN

d_P

b_P

≥10 (Edge distance to screw tip)

20 (Centre connector plates to joist axis)

C …Column
H …Header
J …Joist

b_J …Joist width

25° ≤ β ≤ 155°
or **0°** or **180°**

Top view

HVP CONNECTOR	Annex F3
FIRE DESIGN	

| HVP CONNECTOR – STRUCTURAL DESIGN | Annex F4 |

Header connected to supporting joist

Tensile member C connected to header
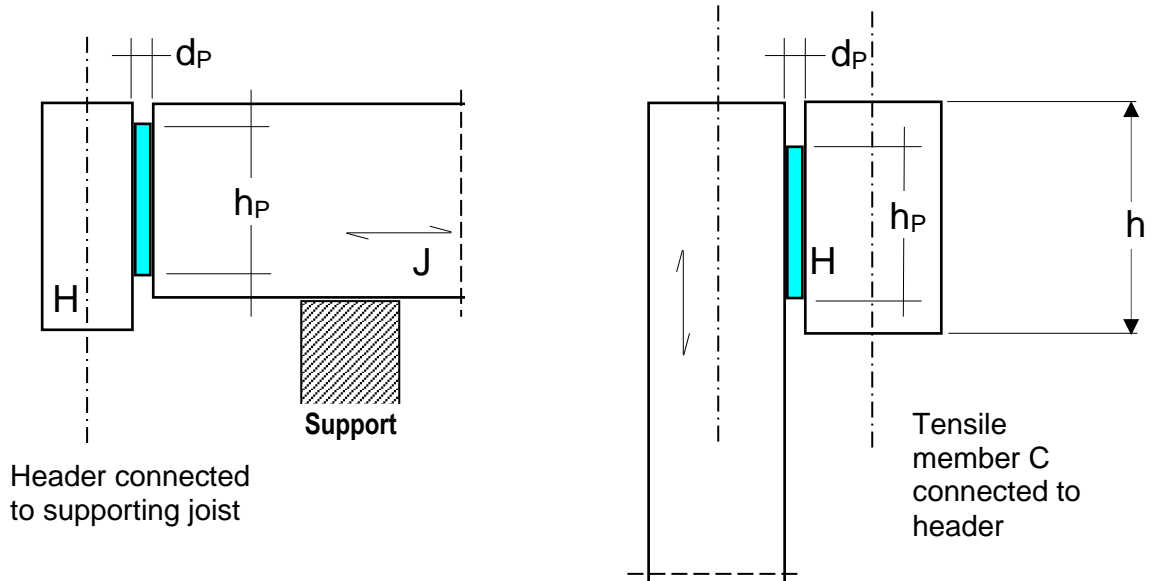
Elevation

C …Column
H …Header
J …Joist
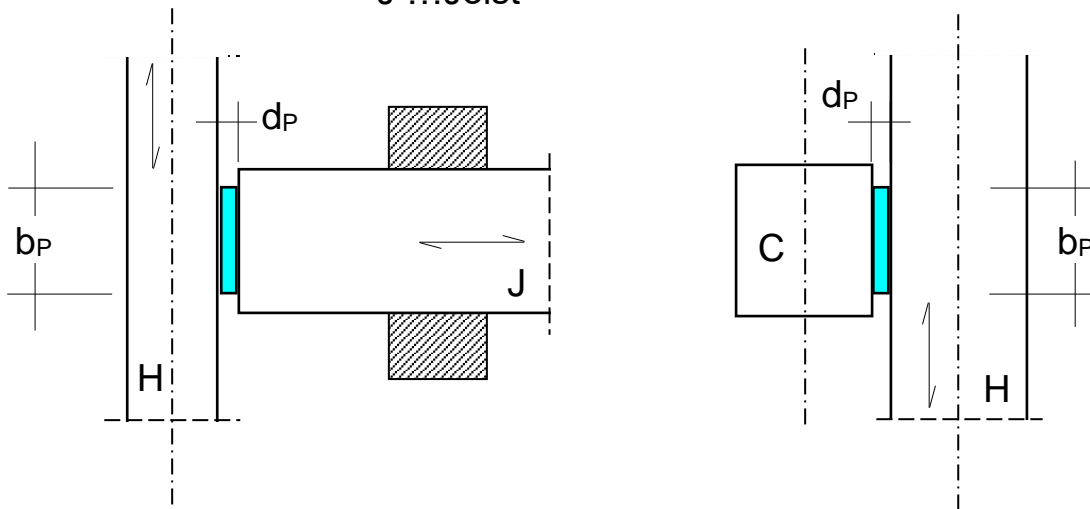
Top view

h_P …Connector plate depth
b_P …Connector plate width
d_P …Total thickness of HVP connector plates

| HVP CONNECTOR | Annex F4 |
| FIRE DESIGN | |

HVP CONNECTOR – STRUCTURAL DESIGN
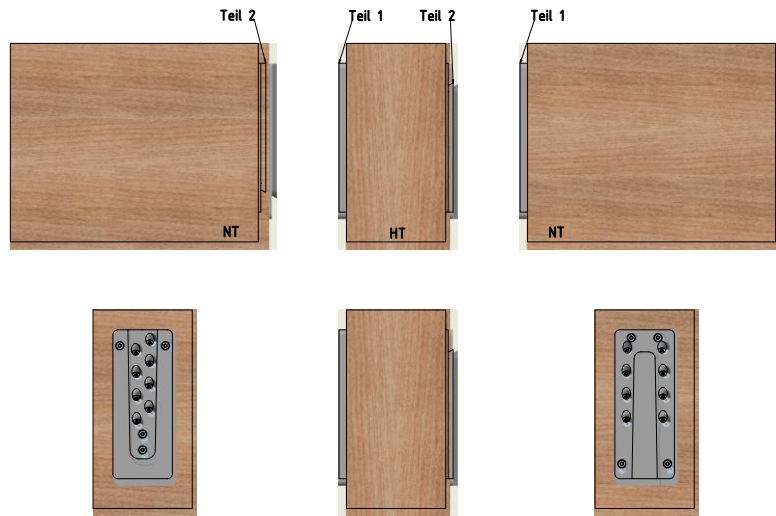
Mounting with a gap

Top view	Side view
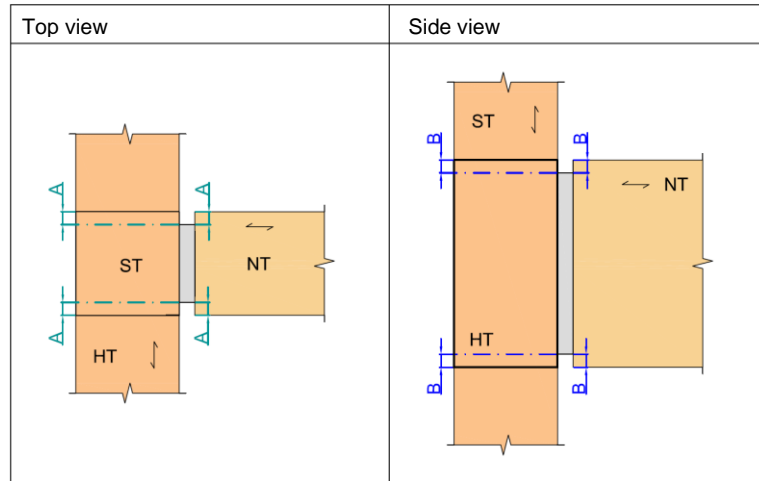
Mounting without a gap

Milling out optionally in the main and secondary

Top view	Side view

HVP CONNECTOR	Annex F5
FIRE DESIGN	

Annex G
ISO CONNECTOR: Geometry, Application and Structural Design

ISO-CONNECT – SERIES 83100

ISO-CONNECT	Annex G1
83100	

ISO-CONNECT – SERIES 83200

27.5

32.5

20

LK 55

Ø80

9

M12

M8

27.5

17

45.0°

15

Ø80

15

20 40 20

80

ISO-CONNECT	Annex G2
83200.0...	

ISO-CONNECT – SERIES 83200

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ISO-CONNECT	Annex G3
83200.0...	

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Annex G4

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ISO-CONNECT	Annex G6
83400.1...	

ISO-CONNECT – SERIES 83500

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ISO-CONNECT	Annex G7
83500.0...	

ISO-CONNECT – SERIES 83500

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ISO-CONNECT	Annex G8
83500.1...	

ISO-CONNECT – SERIES 83600

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ISO-CONNECT	Annex G9
83600.0...	

ISO-CONNECT – SERIES 83300 and 83600
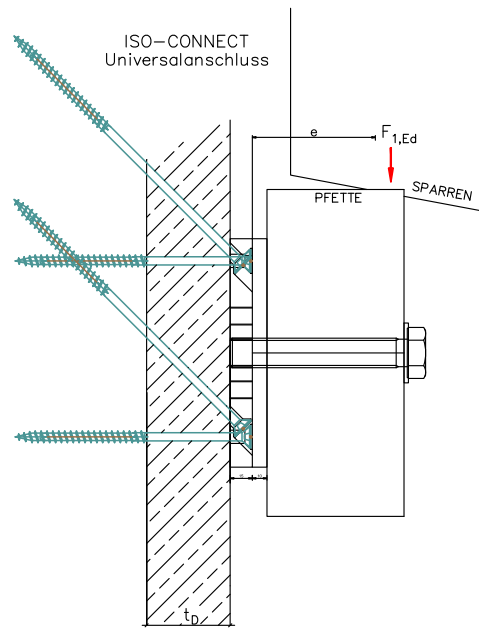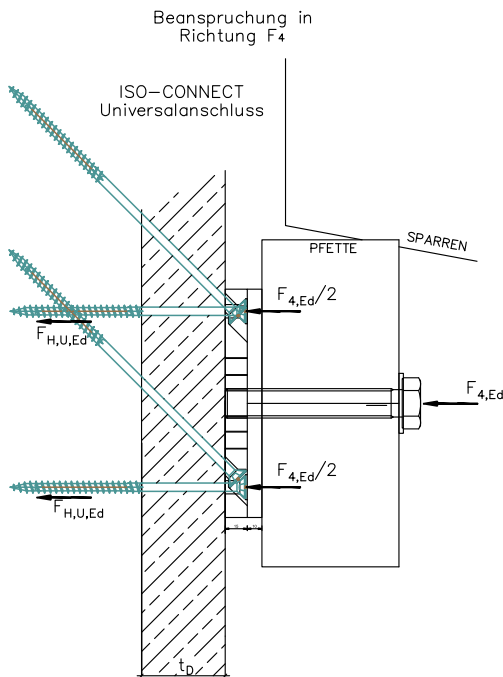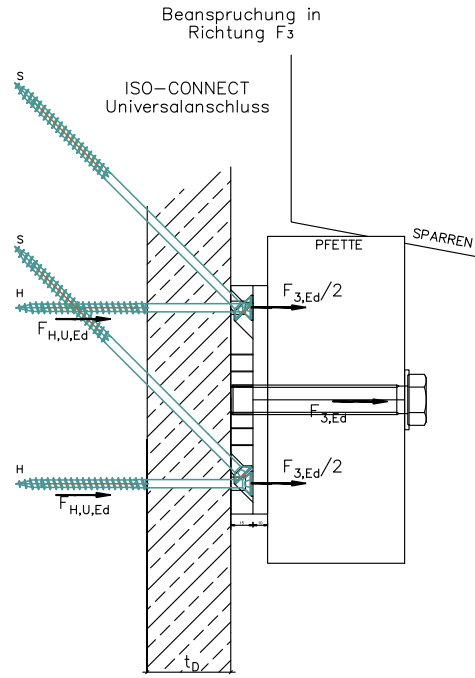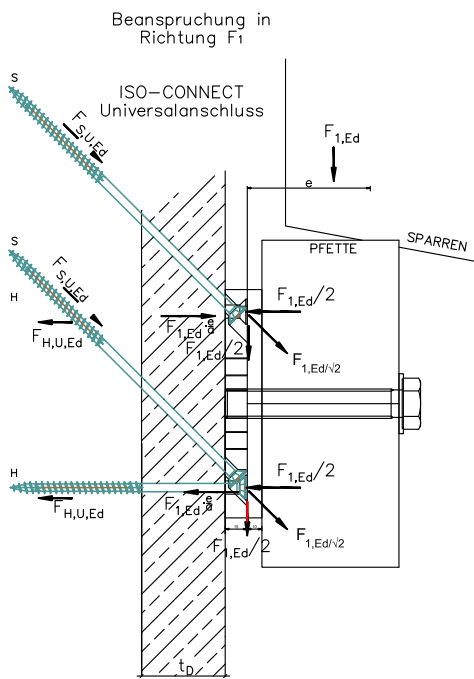

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ISO-CONNECT	Annex G10
83300.0..., 83600.0...	

ISO-CONNECT – STRUCTURAL DESIGN

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ISO-CONNECT	Annex G11
STRUCTURAL DESIGN	

ISO-CONNECT – STRUCTURAL DESIGN

Structural Design

For the ISO-CONNECTOR fischer Power-Fast or fischer PowerFast II screws must be used.
According to Annex G10 and G11 the acting bending moment M_{Ed} on the ISO-Connector must be transferred with the parallel arranged screws fixed perpendicular to the structural parts. The inclined screws handle the shear load V_{Ed}. For the screws which transfer the compressive forces buckling effects must be considered.

The characteristic load-bearing capacity in compression $F_{ax,Rk}$ of a screw if the head of the screw is supported like shown in Figure G1.1 between two aluminium, steel or stainless steel plates and if the thread is completely screwed in perpendicular to the to the grain direction of the timber, the following calculation model can be assumed:
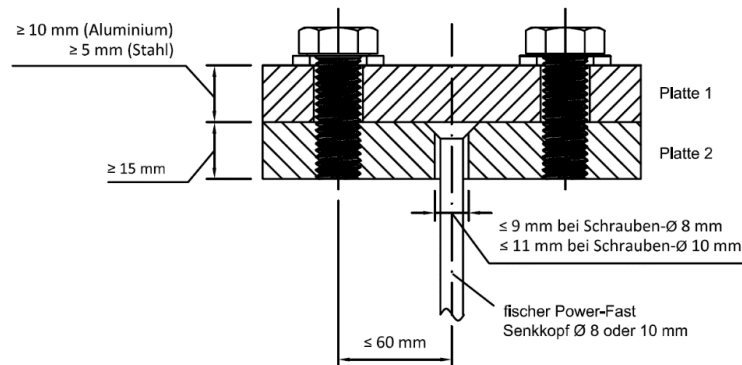

≥ 10 mm (Aluminium)
≥ 5 mm (Stahl)

Platte 1

Platte 2

≥ 15 mm

≤ 9 mm bei Schrauben-Ø 8 mm
≤ 11 mm bei Schrauben-Ø 10 mm

fischer Power-Fast
Senkkopf Ø 8 oder 10 mm

≤ 60 mm

Figure G1.1: Screw head support

The design compressive capacity $F_{ax,Rd}$ of »fischer PowerFast II« screws with the thread completely embedded in timber and a free screw length protruding from the timber member, including the screw head, shall be calculated as following.

$$F_{ax,\alpha,Rd} = \min \begin{cases} F_{ax,\alpha,Rd} \\ F_{b,Rd} \end{cases} \tag{G.1}$$

Where
$F_{ax,\alpha,Rd}$ Withdrawal capacity of the screw [N]
$F_{b,Rd}$ Buckling strength [N]

$$F_{b,Rd} = 1,10 \cdot \kappa_c \cdot N_{pl,Rd} \tag{G.2}$$

With

$$\kappa_c = 1 \qquad \text{for } \overline{\lambda} \leq 0,2$$
$$\kappa_c = \frac{1}{k + \sqrt{k^2 - \overline{\lambda}^2}} \qquad \text{for } \overline{\lambda} > 0,2 \tag{G.3}$$

and

$$k = 0,5 \cdot \left[1 + 0,49 \cdot \left(\overline{\lambda} - 0,2 \right) + \overline{\lambda}^2 \right] \tag{G.4}$$

ISO-CONNECT	Annex G12
STRUCTURAL DESIGN	

ISO-CONNECT – STRUCTURAL DESIGN

Structural Design

The relative slenderness ratio shall be calculated with

$$\overline{\lambda} = \sqrt{\frac{N_{pl,k}}{N_{b,k}}} \tag{G.5}$$

With the characteristic value for the axial capacity in case of plastic analysis

$$N_{pl,k} = \frac{d_s^2 \cdot \pi}{4} \cdot f_{y,k} \tag{G.6}$$

With
d_s Outer shank diameter of the screw [mm]
$f_{y,k}$ Yield strength, of the screw [N/mm²]
$N_{pl,k}$ Characteristic value of the plastic axial capacity [N]

With the characteristic value for buckling strength

$$N_{b,k} = \frac{\pi^2 \cdot E_s I_s}{l_{ef}^2} \tag{G.7}$$

With the
Modulus of elasticity

$$E_s = 210.000 \text{ N/mm}^2 \tag{G.8}$$

and the second moment of area

$$I_s = \frac{\pi \cdot d_s^4}{64} \tag{G.9}$$

Where

d_s Outer shank diameter d_s [mm]

l_{ef} Buckling length [mm]
         with l_{ef}=0,7□l

l Free screw length protruding of the timber member including the screw head [mm]

Note: The compressive capacity must be modified for $F_{ax,\alpha,Rd}$ with the factors k_{mod} and γ_M for timber connections according to EN 1995-1-1, while $N_{pl,Rd}$ the partial-factor $\gamma_{M,1}$ for steel buckling according to EN 1993-1-1 and/or national standards respectively have to be considered. For γ_M, $\gamma_{M,1}$ the values γ_M =1,3 and $\gamma_{M,1}$ =1,1 are recommended.
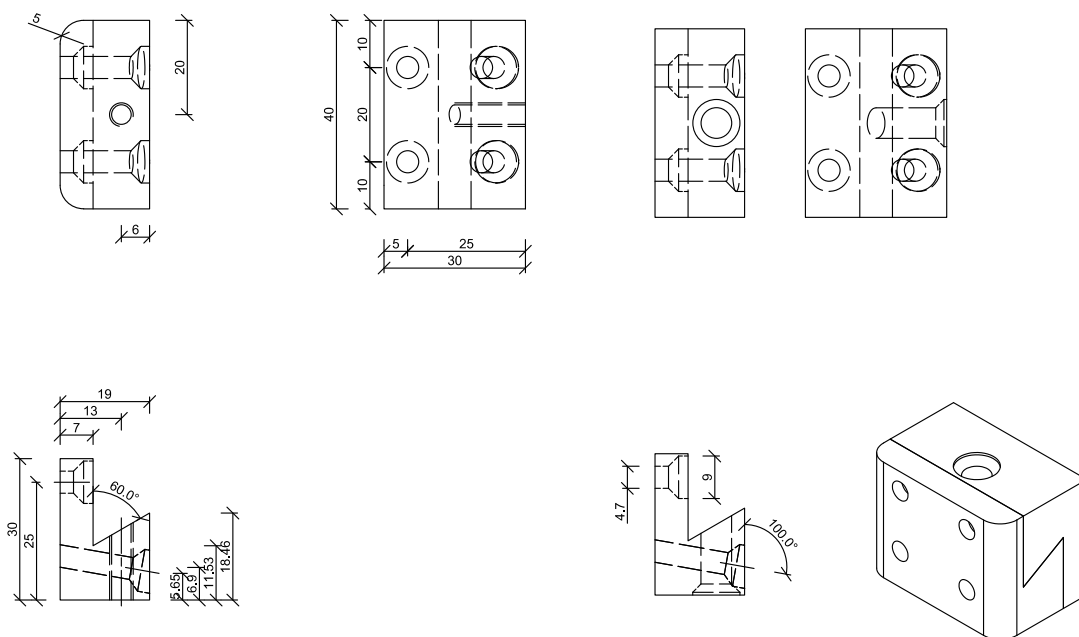
ISO-CONNECT	Annex G12
STRUCTURAL DESIGN	

Annex G
STAIR TREAD CONNECTOR: Geometry and Structural Design

STAIR TREAD CONNECTOR – SERIES 88630

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STAIR TREAD CONNECTOR	Annex H1
88630.0000	

STAIR TREAD CONNECTOR – SERIES 88630

180

32.5 28.75 28.75 28.75 28.75 32.5

30 20 5 5

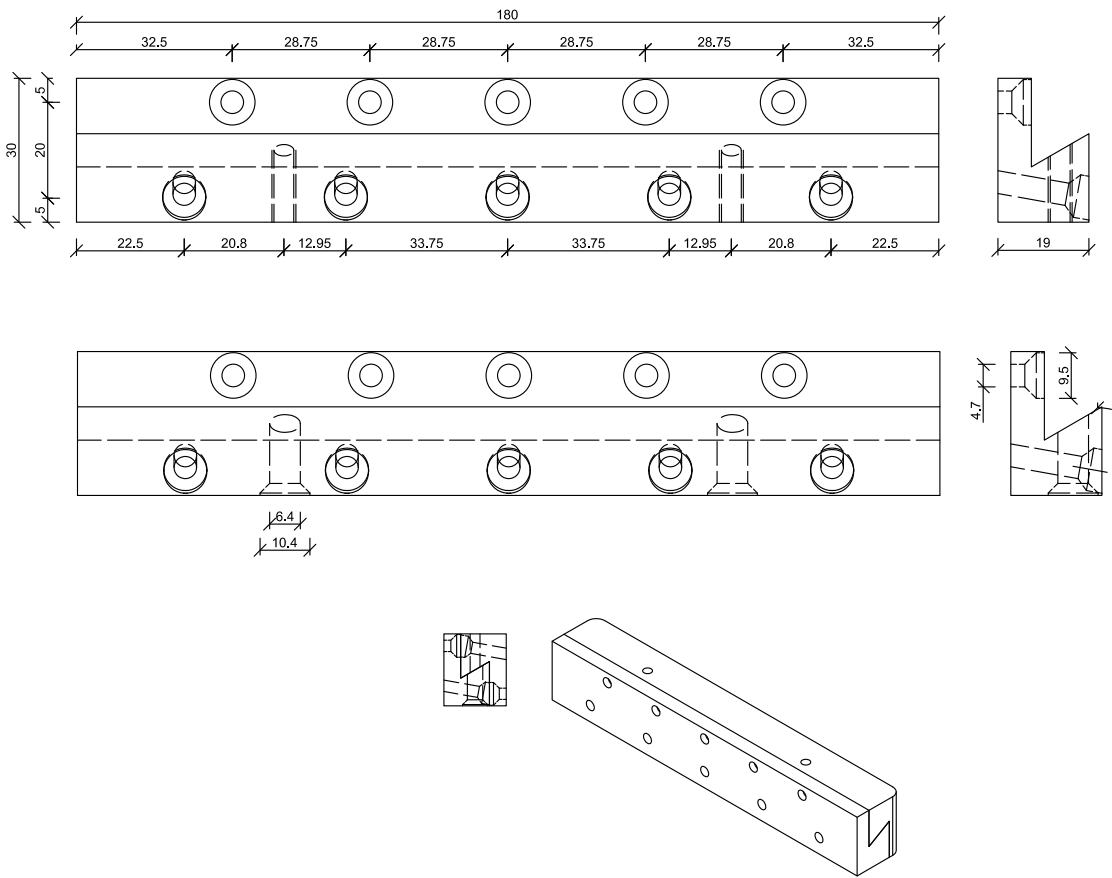22.5 20.8 12.95 33.75 33.75 12.95 20.8 22.5

19

4.7 9.5

6.4
10.4

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Artikelnummer:
88630.0180

STAIR TREAD CONNECTOR	Annex H2
88630.0180	

STAIR TREAD CONNECTOR – STRUCTURAL DESIGN

Structural Design of the Stair Tread Connector

The load-carrying capacity of the system for loads perpendicular should be calculated according to the EN 1995-1-1.

For the screws with the dimension 4,5x60 mm (e.g. HECO screws) arranged parallel to the grain direction the following approach for the determination of the embedment strength is recommended:

$$f_{h,k} = 0,0076 \cdot \rho_k^{1,24} \cdot d^{-0,3} \tag{G.1}$$

Additional forces onto the screws due to the eccentricity of the connector system must not be considered. The number of screws each side may be set with $n_{ef}=n$.

Effects of tension perp. to the grain should be considered according to EN 1995-1-1.

CLT-Connector	Annex H3
STRUCTURAL DESIGN	

CLT CONNECTOR – STRUCTURAL DESIGN

Structural design

For the structural design of the CLT Connector the layup of the CLT panels have to be considered. The embedment strength is applied proportionally as a function of the orientation of the threaded rod to the grain direction of the lamellas. The total axial strength of the connector can be calculated with the help of equation (J.1).

$$F_{ax,Rd} = \frac{k_{mod}}{1,25} \cdot \sum_i 88 \cdot t_i \cdot f_{h,\alpha,i,k} \leq \frac{62,8 \cdot 10^3}{\gamma_{M2}} \tag{J.1}$$

Where

$F_{ax,Rk}$ Characteristic load-carrying capacity parallel to the threaded rod [N]

t_i Contact depth with a Layer (Lamella) of the CLT panel, see also Figure J.1 [mm]

Note: $\sum_i t_i = 50$ mm

$f_{h,\alpha,i,k}$ Embedment strength depending on the orientation to the grain direction [N/mm²] with

- $\alpha=0°$, $f_{h,0,k}=21$ N/mm²
- $\alpha=45°$, $f_{h,45,k}=12$ N/mm²
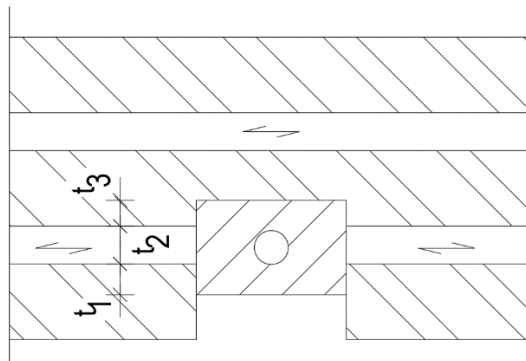- $\alpha=90°$, $f_{h,90,k}=k_{c,90}\cdot2,5$ N/mm²; $k_{c,90}=1,5$

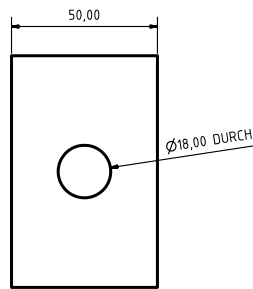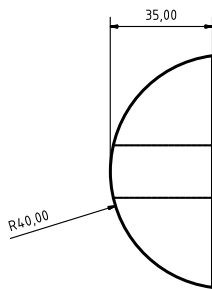Figure J.1: Contact area of the CLT Connector and the CLT layup (section)

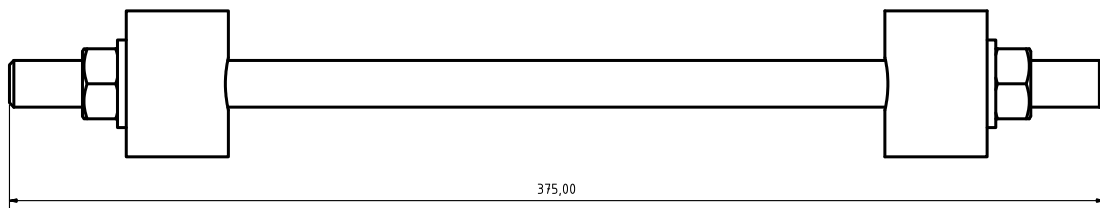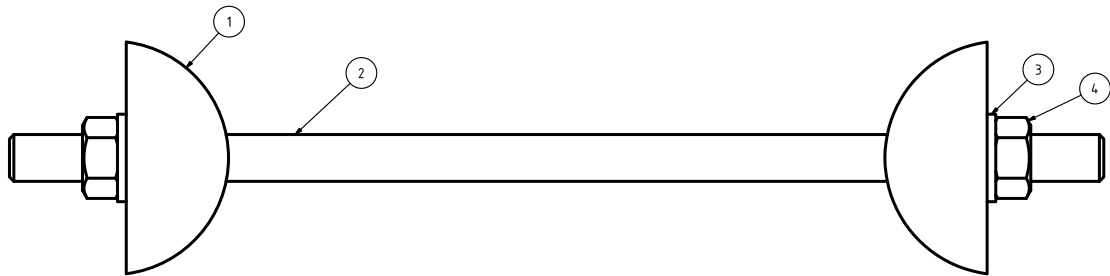| STAIR TREAD CONNECTOR	Annex J1
STRUCTURAL DESIGN	

CLT CONNECTOR – DRAWINGS

BAUTEILLISTE			
OBJEKT	ANZAHL	BAUTEILNUMMER	BESCHREIBUNG
1	2	Aluminium Halbrund	EN AW-6060 (AlMgSi0,5)
2	1	Gewindestange M16	Güte 4.8
3	2	Unterlegscheibe	Unterlegscheibe
4	2	Sechskantmutter M16	Sechskantmutter

375,00
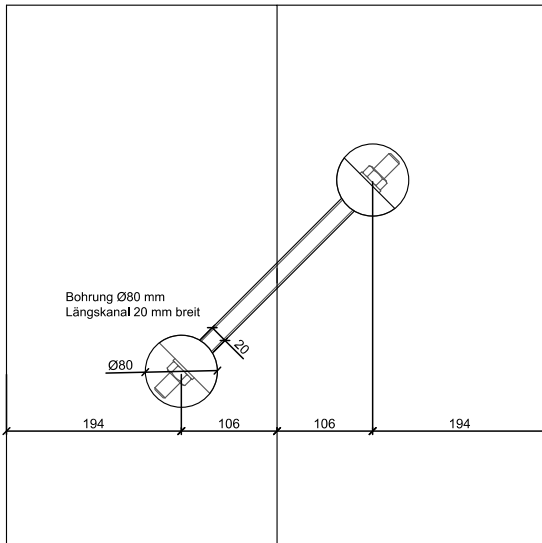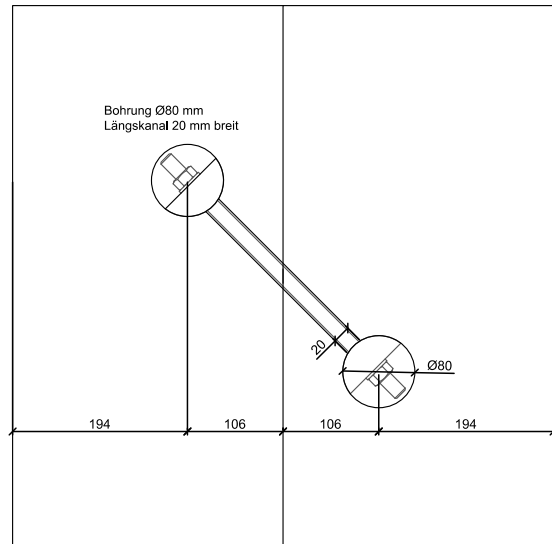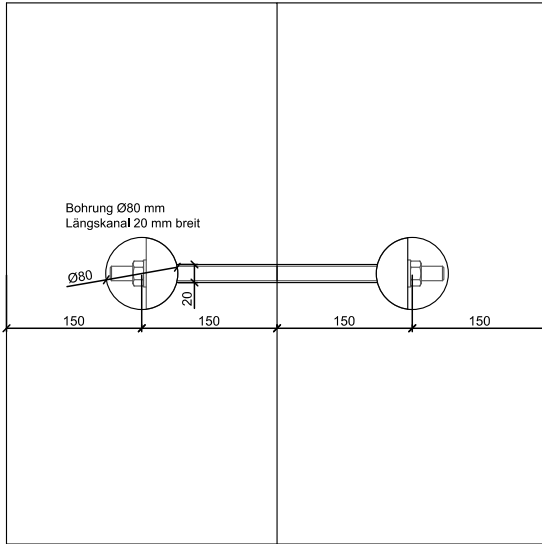
35,00

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Ø18,00 DURCH

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Artikelnummer:

CLT-Verbinder

STAIR TREAD CONNECTOR

STRUCTURAL DESIGN

Annex J2

CLT CONNECTOR – APPLICATIONS

Bohrung Ø80 mm
Längskanal 20 mm breit

Ø80

20

150 150 150 150

Bohrung Ø80 mm
Längskanal 20 mm breit

20

Ø80

194 106 106 194

Bohrung Ø80 mm
Längskanal 20 mm breit

Ø80

20

194 106 106 194

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CLT Connector	Annex J3
STRUCTURAL DESIGN	