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

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

European Technical Assessment ETA-22/0754 of 2022/12/02

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:	Column base: Z101, COMP102, NEW103, T104, TL110, P105 Base for wooden walls: AIRTECH
Product family to which the above construction product belongs:	Three dimensional nailing plates (Bases for timber columns; bases curb for supporting wooden walls)
Manufacturer:	Soltech S.r.l. Via F.lli Mengaroni, 5/7 61025 Montelabbate (PU) - Italy Tel. +39 0721 498461 Fax +39 0721 908245 Internet www.soltechonline.com
Manufacturing plant:	Via F.lli Mengaroni, 5/7 61025 Montelabbate (PU) - Italy
This European Technical Assessment contains:	60 pages including 2 annexes which form an integral part of the document
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:	EAD 130186-00-0603 for Three-dimensional nailing plates
This version replaces:	

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

Technical description of the product
Soltech column bases are made of 2.0 mm to 8 mm thick steel plates, in combination with threaded rods for post bases P105.

The column bases are made from steel grade S235JR according to EN10025-2 (f_{yk}=235N/mm^2, f_{tk}=360N/mm^2, KV=27J at 20°C), they have a zinc coating grade Fe/Zn 12c according to ISO2081, with execution class EXC2 according to EN1090-2. Dimensions, hole positions and typical installations are shown in Annex A.

The column bases are fixed on the timber side (column) with S235 grade steel dowels threaded at the ends, and on the concrete side (foundation) with 4.8 grade steel threaded rods fixed in holes with chemical or mechanical anchor.

Base curbs

Soltech Airtech base curbs for timber walls are made with 3.0mm thick steel plates.

The base curbs are made from:

- steel grade S355J0WP structural steel with improved atmospheric corrosion resistance (cor-ten) according to EN10025-5 (f_{yk}=355N/mm^2, f_{tk}=510N/mm^2, KV=27J at 0°C); the steel can have an additional protective zinc coating grade Fe/Zn 12c according to ISO2081.
- stainless steel grade 1.4307 according to EN10088 (f_{yk}=220N/mm^2, f_{tk}=520N/mm^2).

Execution class is EXC2 in accordance with EN1090-2. Dimensions, hole positions and typical installations are shown in Annex A.

The base curbs are fixed on the timber side (column) with ringed shank nails or self-tapping screws, and on the concrete side (foundation) with 4.8 grade steel threaded rods fixed in holes with chemical or mechanical anchor.

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

Column bases
The column bases are intended for use in making end-grain connections in load bearing timber structures, as a connection between header or column and concrete foundation, where requirements for mechanical resistance, stability and safety in use in the sense of the Basic Works Requirements 1 and 4 of Regulation (EU) 305/2011 shall be fulfilled.

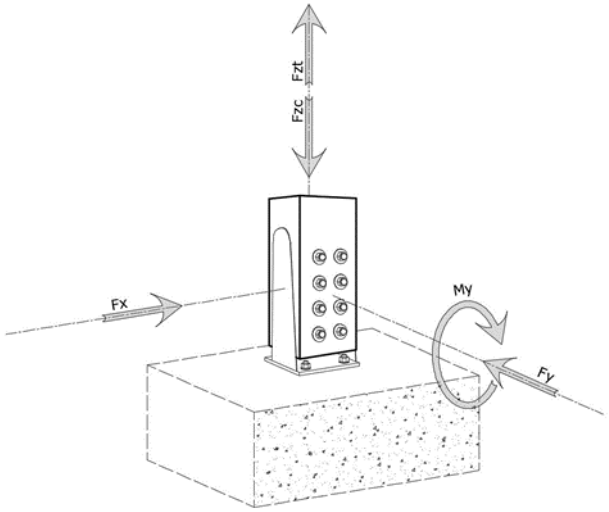
The column bases can be installed as the connection between concrete foundation and wood based header or column such as:

- Structural solid timber according to EN 14081,
- Glulam, block glued glulam and glued solid timber according to EN 14080,
- LVL according to EN 14374,
- FST according to ETA 14/0354,
- Parallam PSL,
- Intrallam LSL,

The calculation methods are allowed for all timber strength classes.

Annex B states the formulas for the load-carrying capacities of the column bases. The design of the connections shall be in accordance with Eurocode 5 or a similar national Timber Code.

It is assumed that the forces acting on the column bases are *FZ,t* or *FZ,c* along the column axis without eccentricity, *FX* and *FY* perpendicular to the column axis acting in the middle of the dowelled connection with eccentricity as reported in annex B table B1.3.



The column bases are intended for use as connections subject to static or quasi static loading.

The zinc-coated column bases are for use in timber structures subject to the dry, internal conditions defined by the service classes 1 and 2 of EN 1995-1-1:2014, (Eurocode 5).

The scope of the column bases 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 construction.

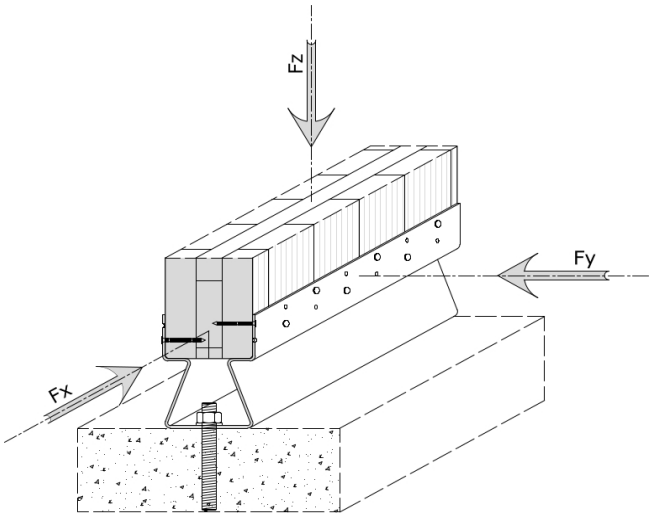
Base curbs
The curbs are intended for use in making base for walls in load bearing timber structures, as a connection between timber walls and concrete foundation, where requirements for mechanical resistance and stability and safety in use in the sense of the Basic Works Requirements 1 and 4 of Regulation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

The base curbs can be installed as connection between concrete foundation and wooden walls such as:
- Platform-frame and Log walls (made with structural solid timber according to EN 14081, glulam and glued solid timber in accordance with EN 14080, LVL in accordance with EN 14374, FST according to ETA 14/0354, Parallam PSL, Intrallam LSL,)
- Cross laminated timber according to ETA,

However, the calculation methods for compression are only allowed for a mean wood density of up to 420 kg/m^3. Even though the wood based material may have a higher density, this must not be used in the formulas for the load-carrying capacity for compression of the base curbs.

Annex B states the formulas for the load-carrying capacities of the base curbs. The design of the connections shall be in accordance with Eurocode 5 or a similar national Timber Code.

It is assumed that the forces acting on the base curbs are *FZ* vertical down, *Fx* horizontal in plane shear and *Fy* horizontal out of plane shear. The force *FZ* shall act in the plane of symmetry of the base curbs. It is assumed that the forces are acting without eccentricity.



Fz = vertical compression;
Fx = in plane shear (panel shear);
Fy = out of plane shear (planar shear).
The base curbs are intended for use for connections subject to static or quasi static loading.
The base curbs made of cor-ten steel and stainless steel are for use in timber structures subject to the dry, internal conditions defined by the service classes 1, 2 and 3 of EN 1995-1-1:2014, (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 B
Joint Stiffness	Column bases: no performance determined Base curbs: see Annex B
Joint ductility	No performance assessed
Resistance to seismic actions	No performance assessed
Resistance to corrosion and deterioration	See section 3.6
3.2 Safety in case of fire (BWR2)	
Reaction to fire	The column bases and base curbs are made from steel classified as Euroclass A1 in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364
3.3 General aspects related to the performance of the product	The column bases and base curbs 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
Identification	See Annex A

*) See additional information in section 3.4 – 3.7.

3.4 Methods of verification

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

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

Therefore, to obtain design values according to the Eurocodes or appropriate national codes of practice, the capacities have to be multiplied with different partial factors for the material properties and – for the connectors mounted in wood – also the coefficient k_{mod} that takes into account service class and load duration class.

Thus, the characteristic values of the load–carrying capacity are determined also for timber failure $F_{Rk,T}$ as well as for steel plate failure $F_{Rk,S}$ and for connection failure $F_{Rk,C}$.

The design value of the load– carrying capacity is the smallest value of both load– carrying capacities.

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

Therefore, for timber failure the load duration class and the service class are included. The different partial factors γ_M for steel ($\gamma_{M,S}$), timber ($\gamma_{M,T}$) or connections ($\gamma_{M,C}$), respectively, are also correctly taken into account.

For use in seismic areas, the column bases and the base curbs must be considered non-dissipative zones; the calculation can be made considering the appropriate values of the partial factor γ_M and k_{mod} for the seismic combination, according to the relevant calculation code (e.g. EN 1998 Eurocode - Design of structures for earthquake resistance).

3.5 Mechanical resistance and stability

See annex B for characteristic load-carrying capacities of the column bases and the base curbs.

The characteristic capacities of the column bases are determined by calculation as described in the EAD 130186-00-0603 clause 2.2.1.1. They should be used for designs in accordance with Eurocode 5 or a similar national Timber Code.

The characteristic capacities of the base curbs are determined by testing and calculation as described in the EAD 130186-00-0603 clause 2.2.13 and clause 2.2.1.1. They should be used for designs in accordance with Eurocode 5 or a similar national Timber Code.

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

- *Threaded nails (ringed shank nails), screws, bolts, dowels or self-drilling dowels in accordance to EN 14592 or threaded nails (ringed shank nails) according to ETA*

In the formulas in Annex B the lateral load-carrying-capacity of threaded nails is calculated from the formulas of Eurocode 5 by assuming a thick steel plate, according to ETA-13/0523.

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.

For the column bases no performance has been assessed in relation to the joint's stiffness properties to be used for the analysis of the serviceability limit state.

For the base curbs performance has been determined in relation to the joint's stiffness properties to be used for the analysis of the serviceability limit state, see Annex B.

3.6 Aspects related to the performance of the product

3.6.1 Corrosion protection in service class 1 and 2.
In accordance with EAD 130186-00-0603 and Eurocode 5:

- the column bases have a zinc coating grade Fe/Zn 12c according to ISO2081 and are suitable for service classes 1 and 2;
- the base curbs are made with structural steel with improved atmospheric corrosion resistance (cor-ten) according to EN10025-5 or stainless steel according to EN 10088-1 and are suitable for service classes 1, 2 and 3

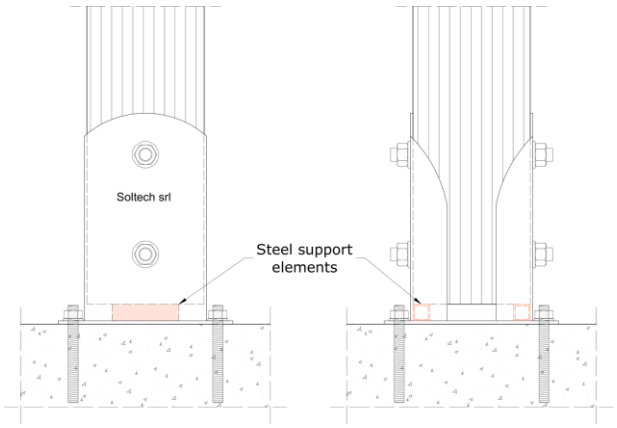
3.7 General aspects related to the use of the product

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

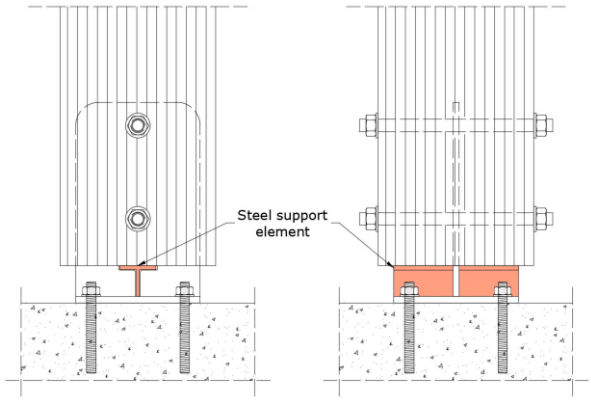
Column bases

- The characteristic capacity of the column bases is calculated according to the manufacturer's technical documentation, dated 2022-05-31; the column bases are designed in accordance with Eurocode 5 or an appropriate national code.
- The columns shall be constrained in the degrees of freedom where the column base has no strength (see annex B table B1.1 and B1.2).
- The assembly of the wooden column can be mounted on the column bases Z101, Comp102, New103 and T104 on a shim (steel support) or held by the dowels (not in contact with the base plate). For the base columns Z101, Comp102 and New103, the shim is

made up of two steel elements; for the base column T104 the shim is made up of one steel element (see the drawings in annex A).



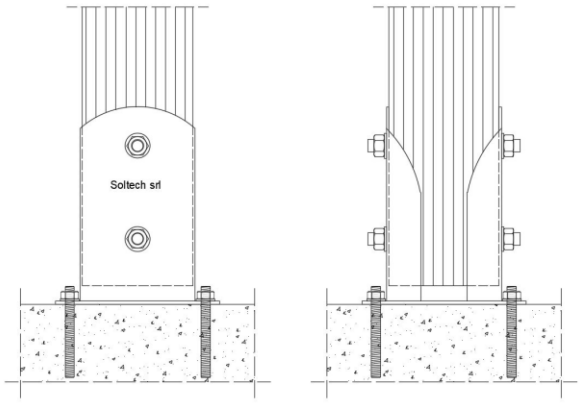
Column bases Z101, Comp102 and New 103; assembly with shim.



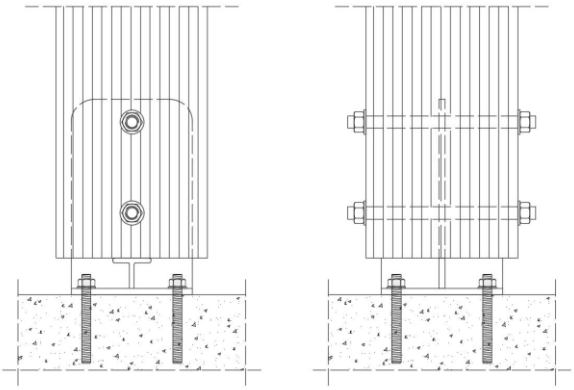
Column base T104. Assembly with shim.

In the case of mounting with a shim, the base surface of the column shall have a flat and horizontal surface in contact with the base shim with no gap.

In the case of mounting held by the dowels (not in contact with the base plate), the base surface of the column shall have a gap of about 20mm for column bases Z101, Comp102 and New103, and about 40mm for colun base T104 with respect to the base of column base.



Column bases Z101, Comp102 and New 103; held by the dowels (not in contact with the base plate).

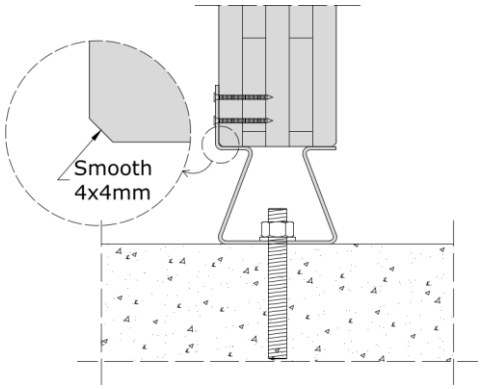


Column bases Z101, Comp102 and New 103; held by the dowels (not in contact with the base plate).

- The assembly of the wooden column with TL110 and P105 shall be mounted in contact with base plate; the base surface of the column shall have a flat and horizontal surface in contact with the base plate of the column bases.
- The assembly of the timber column into the bases shall not have lateral gaps between the wood and the steel plates.
- The timber columns are fastened to the bases by steel end threaded dowels 10mm or 12mm or 16mm diameter as described in Annex A.
- Column bases are fastened to concrete foundations by ϕ=10mm or ϕ=12mm or ϕ=16mm threaded rods with chemical or mechanical anchors; the anchorage of the column base to the foundation is not part of this ETA. This anchorage must be checked by the designer of the structure to ensure it is not less than the post base capacity and, if necessary, the post base capacity must be reduced accordingly. Therefore the specifications for the eccentricity in Annex B have to be considered. The eccentricity is the distance between the top edge of the foundation and the load.

Base curbs

- The characteristic capacity of the base curbs is calculated according to the manufacturer's technical documentation, dated 2022-06-17; the base curbs are designed in accordance with Eurocode 5 or an appropriate national code.
- The wall shall be restrained against rotation out of plane.
- The base of the wall shall have a flat and horizontal surface in contact with the horizontal part of the curb with no gap; the lower edges must have a bevel of about 4x4mm.



- The wall must have the same thickness as the support base on the curb.

Base curbs are fastened to concrete foundations by ϕ=16mm threaded rods with chemical or mechanical anchors; the anchorage of the column base to the foundation is not part of this ETA. It must be checked by the designer of the structure to ensure it is not less than the post base capacity and, if necessary, the post base capacity reduced accordingly. Therefore the specifications for the eccentricity in Annex B have to be considered. The eccentricity is the distance between the top edge of the foundation and the load

4 Attestation and verification of constancy of performance (AVCP)

4.1 AVCP system

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

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

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

Issued in Copenhagen on 2022-12-02 by

Thomas Bruun
Managing Director, ETA-Danmark

Annex A
Product details definitions

Column bases
Steel grade S235JR (EN10025-2)
Zinc-coating grade Fe/Zn 12c in accordance with ISO2081.
Execution class EXC2 in accordance with EN1090-2.

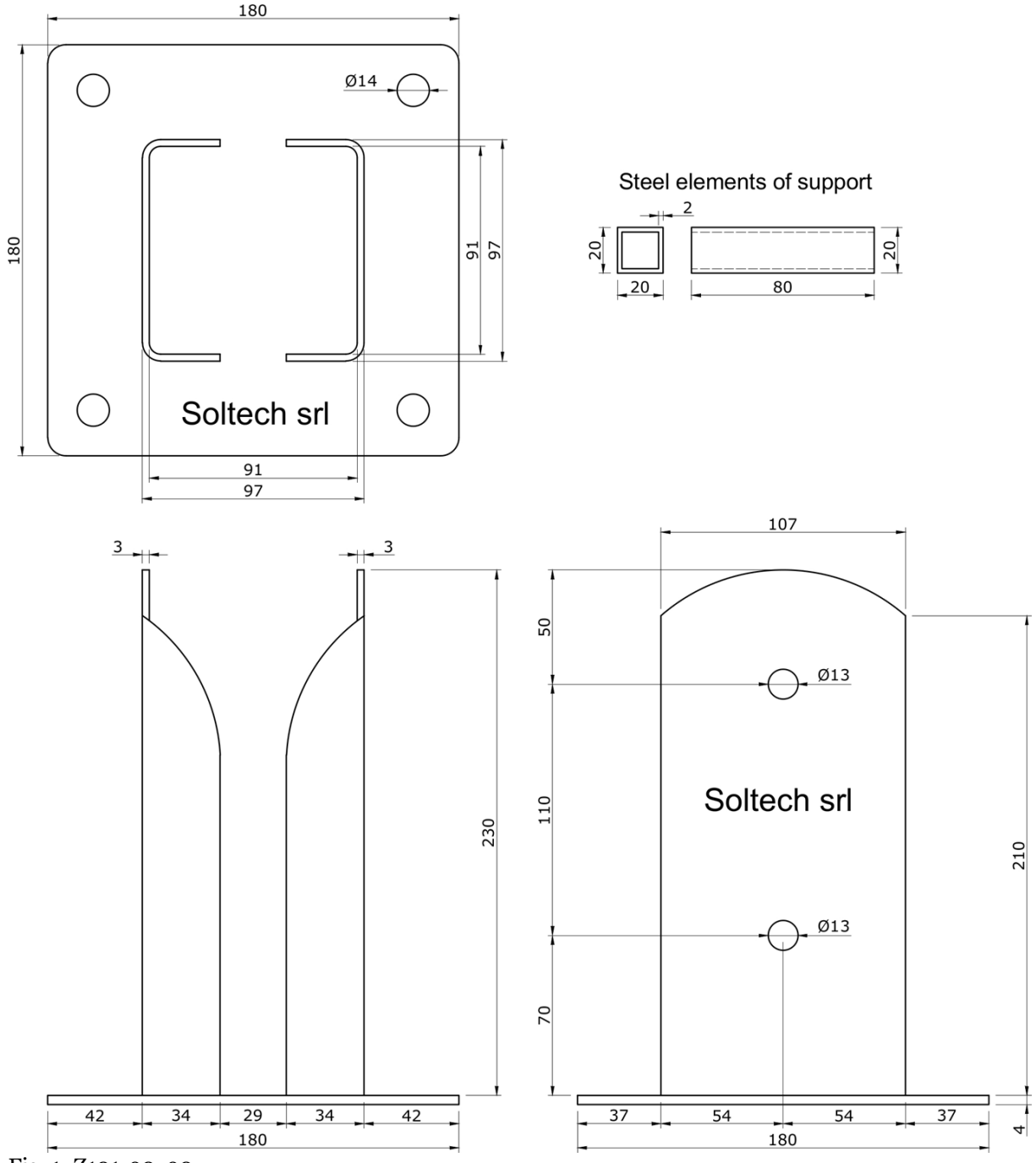


Fig. 1: Z101-90x90

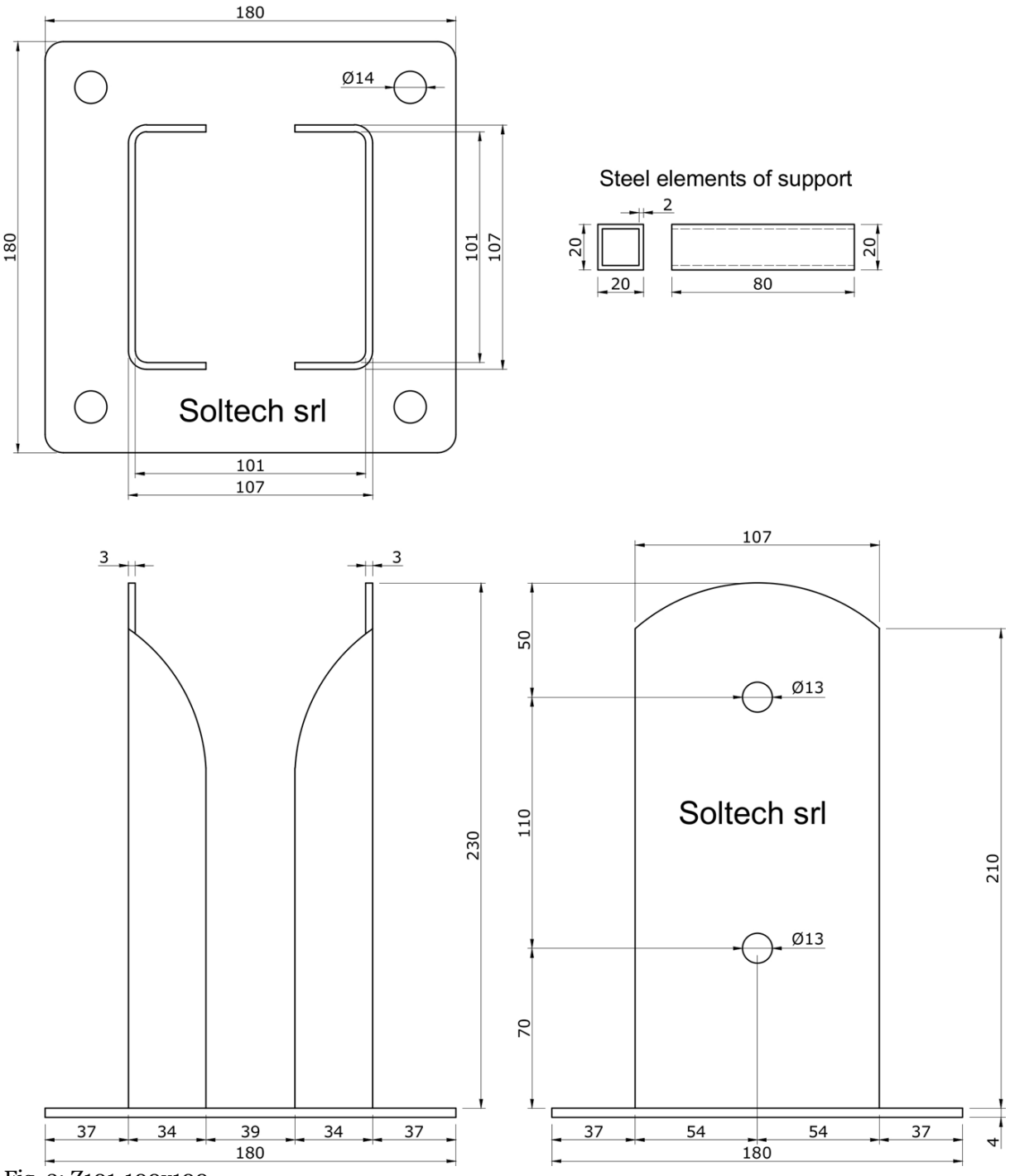


Fig. 2: Z101-100x100

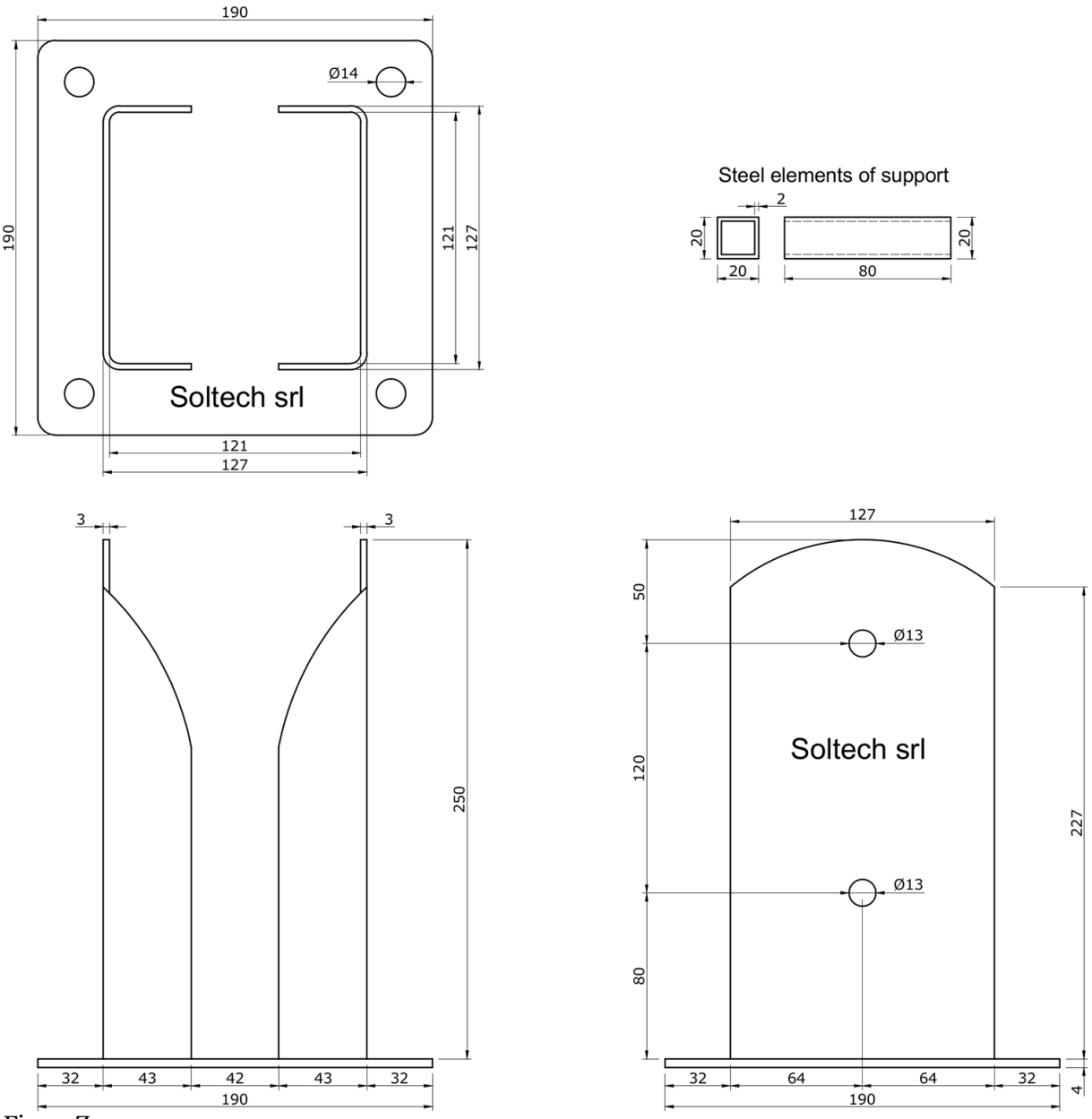


Fig. 3: Z101-120x120

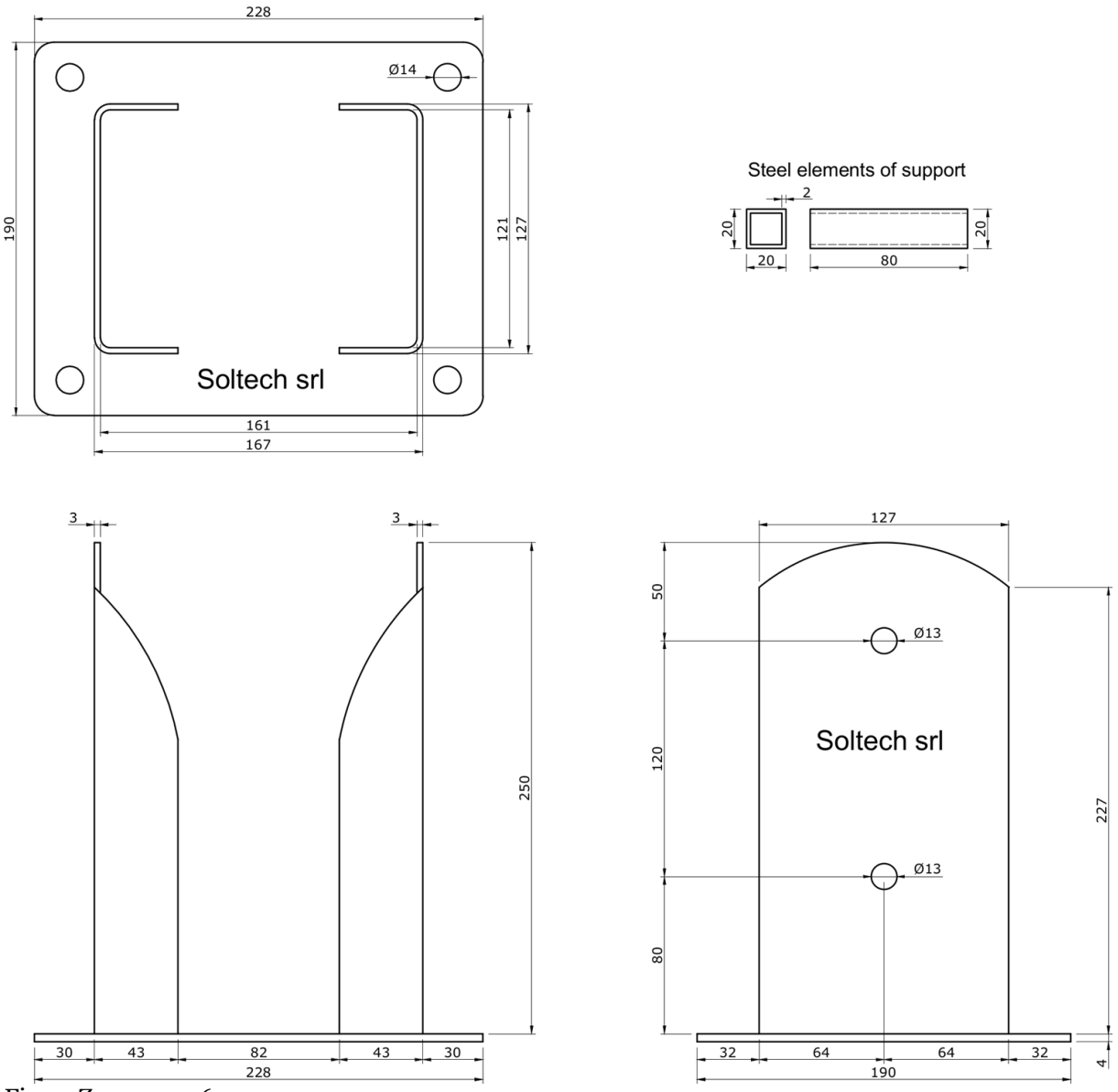


Fig. 4: Z101-120x160

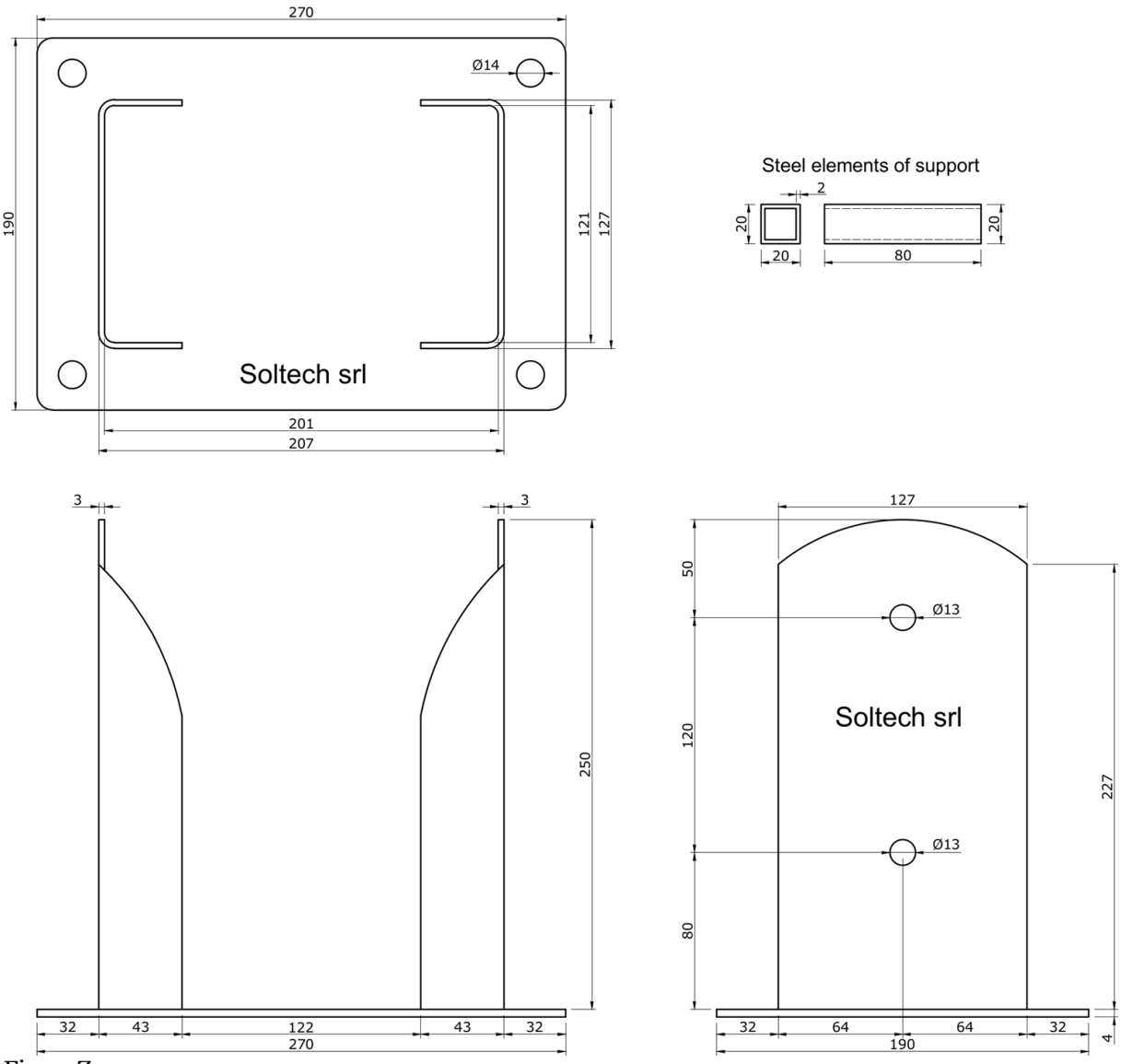


Fig. 5: Z101-120x200

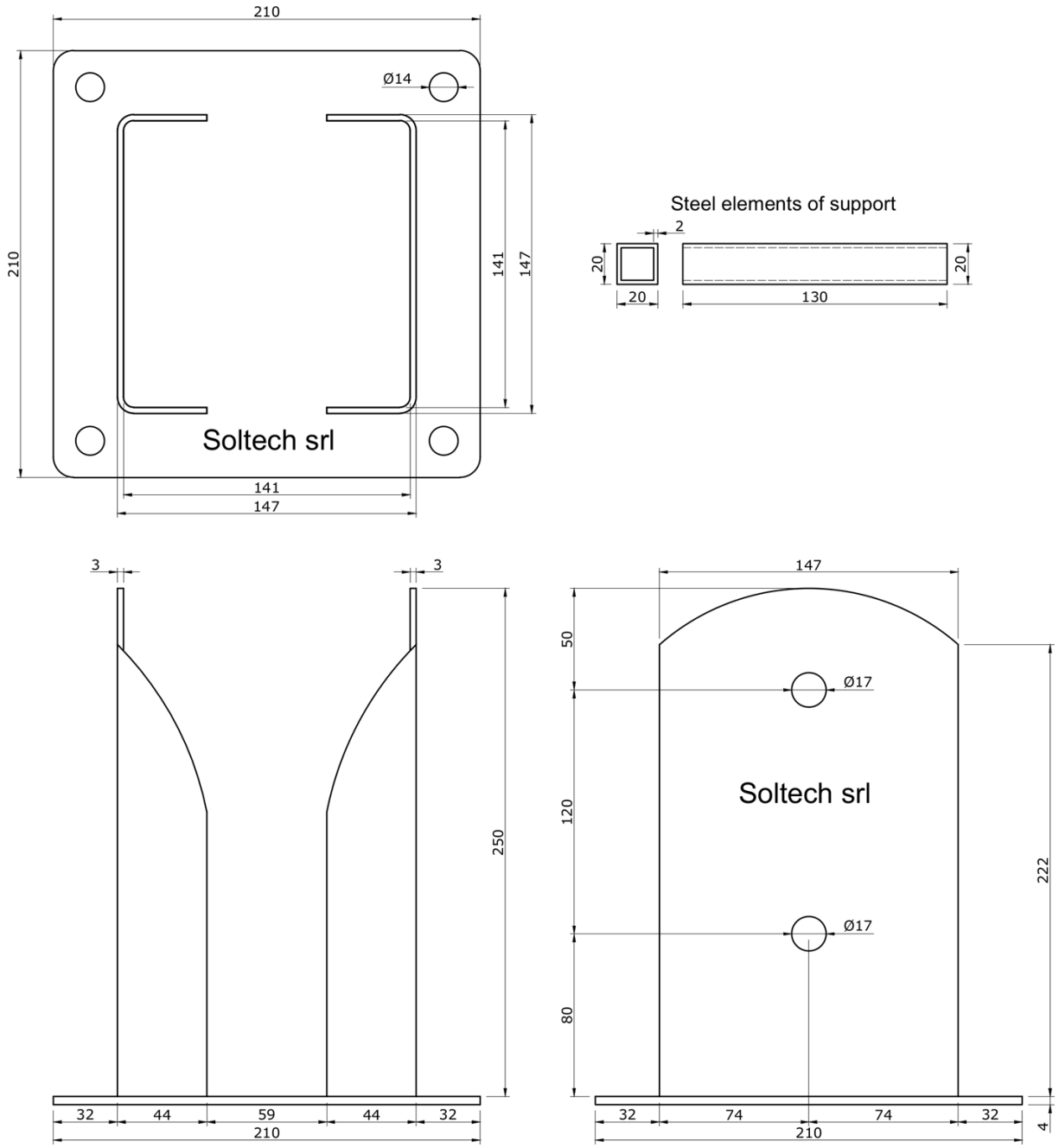


Fig. 6: Z101-140x140

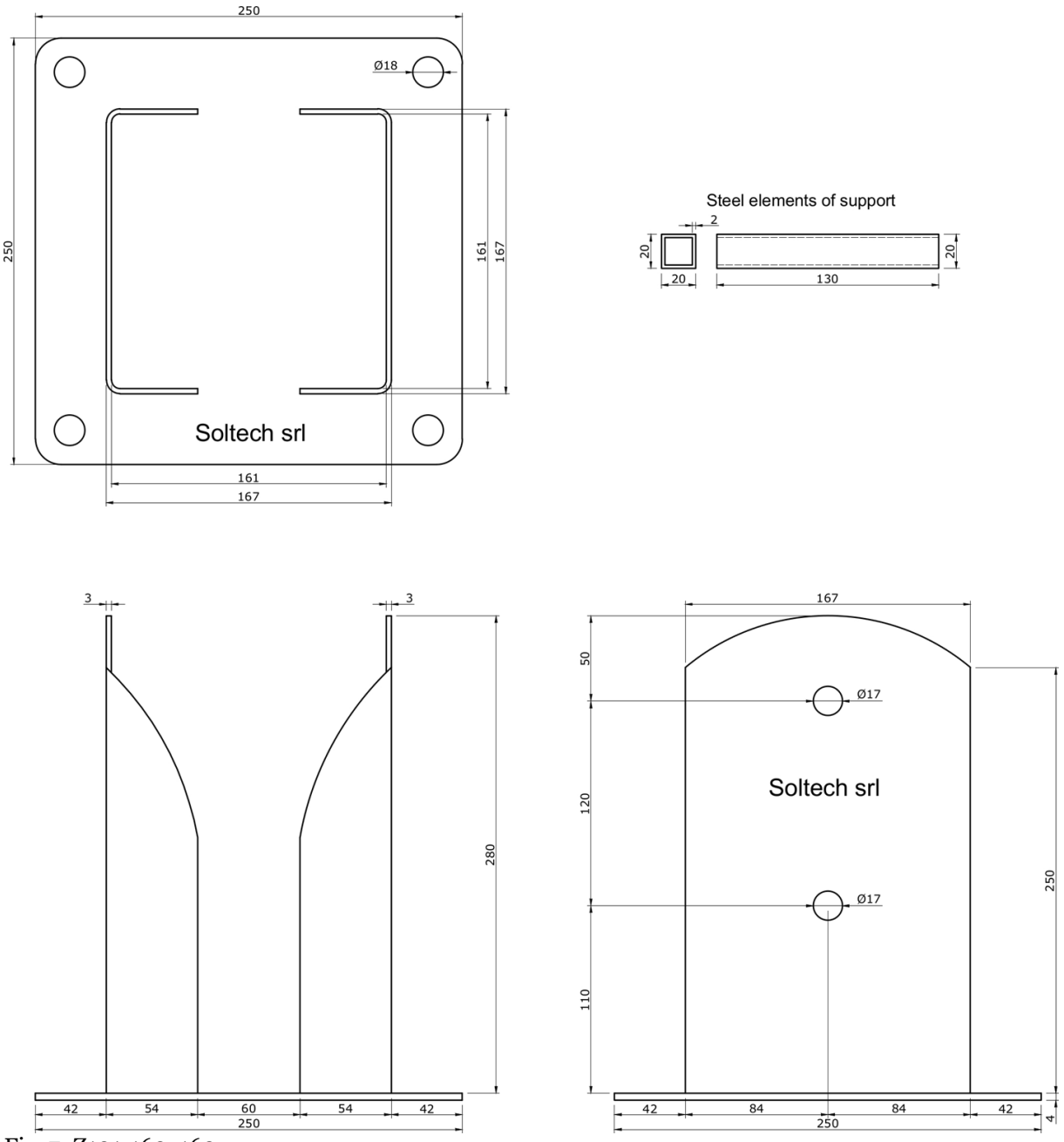


Fig. 7: Z101-160x160

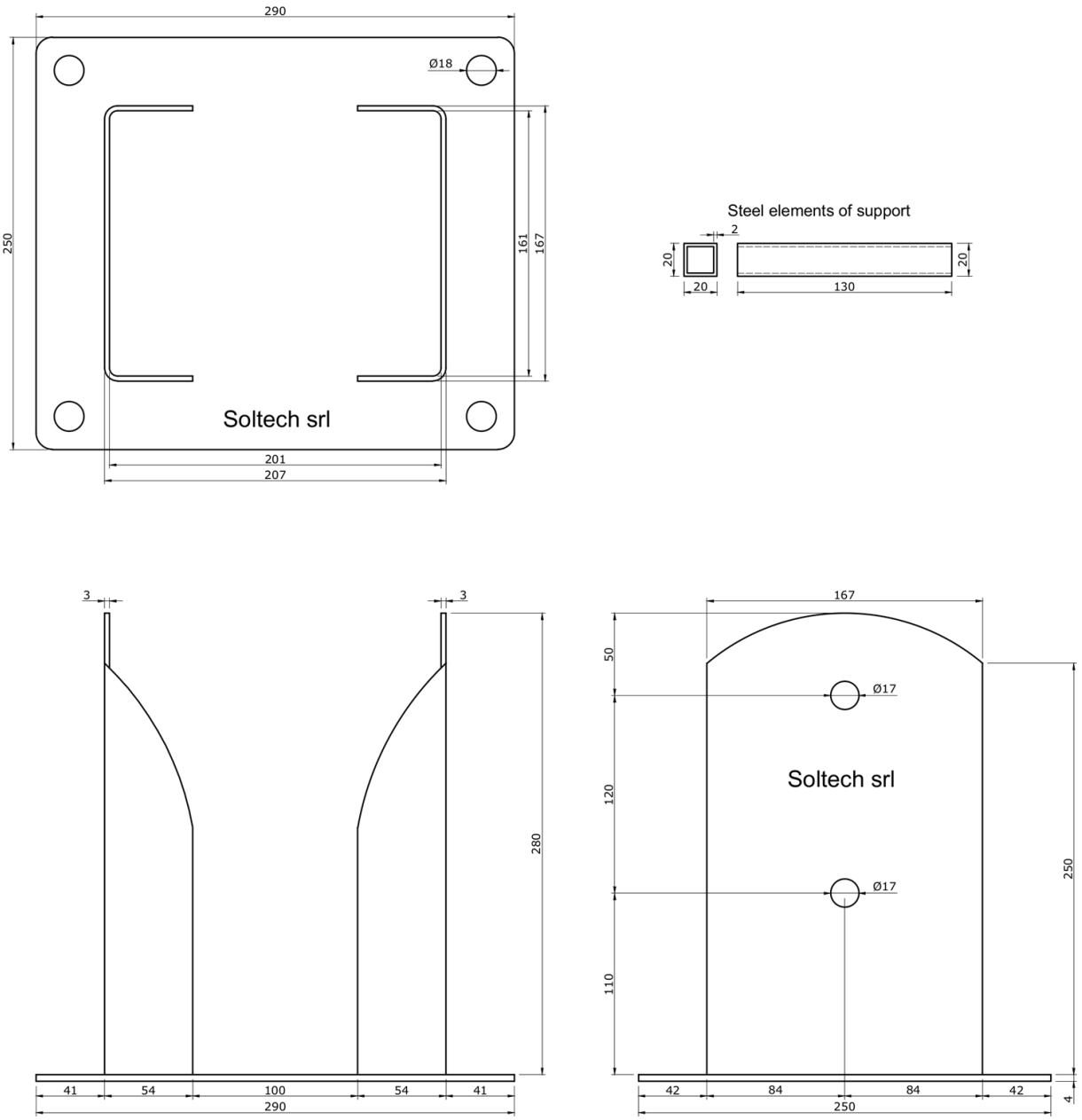


Fig. 8: Z101-160x200

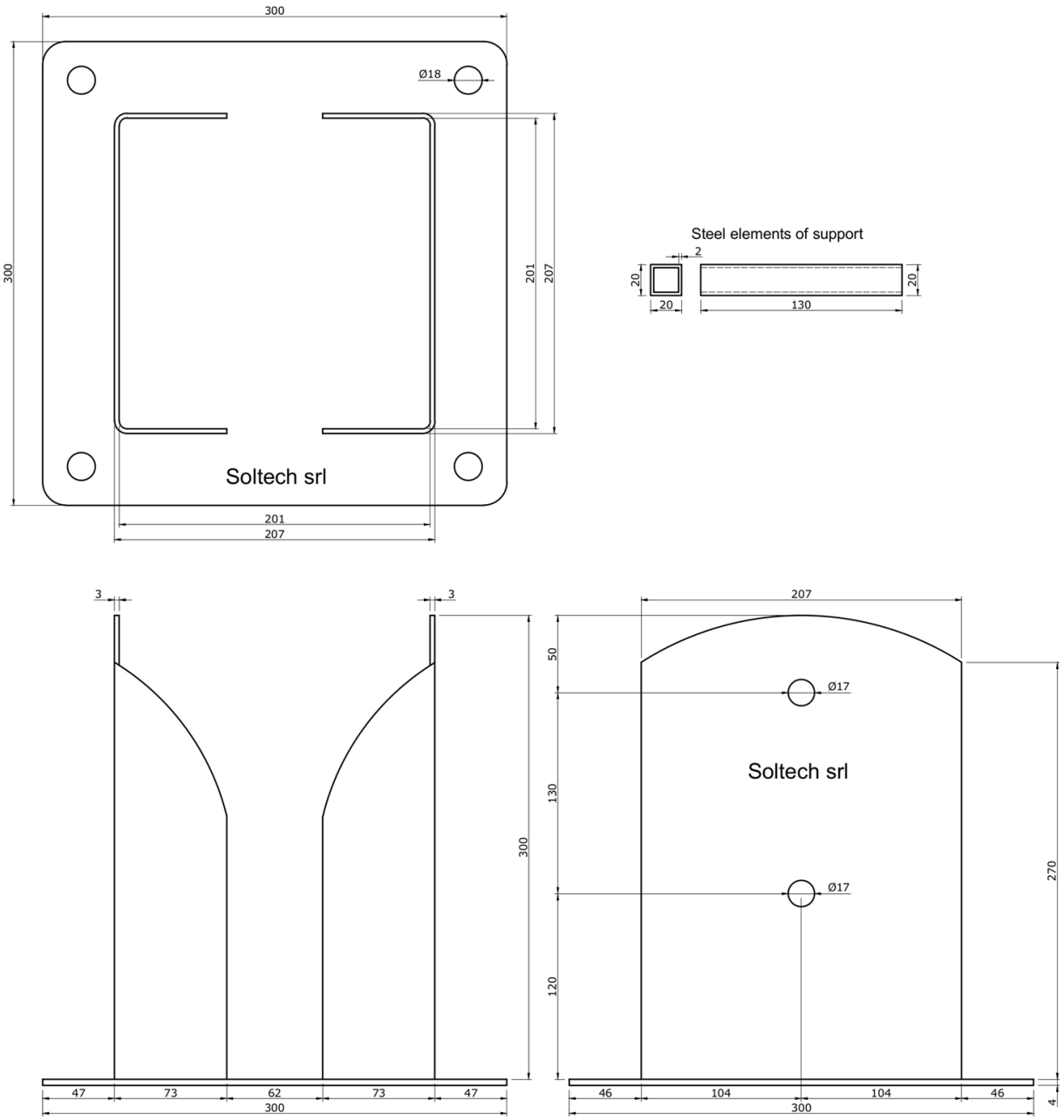


Fig. 9: Z101-200x200

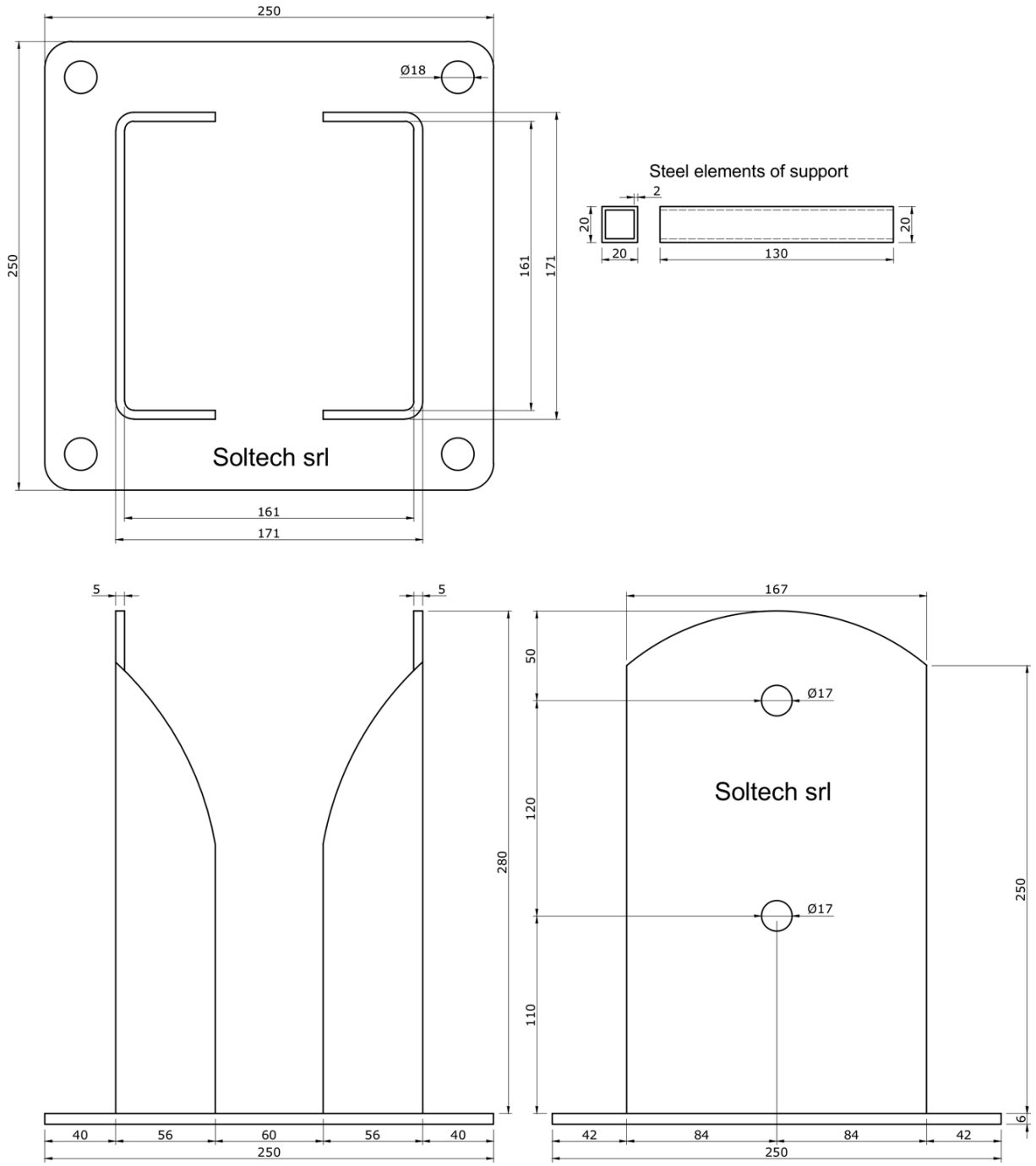


Fig. 10: Z101-160x160-P

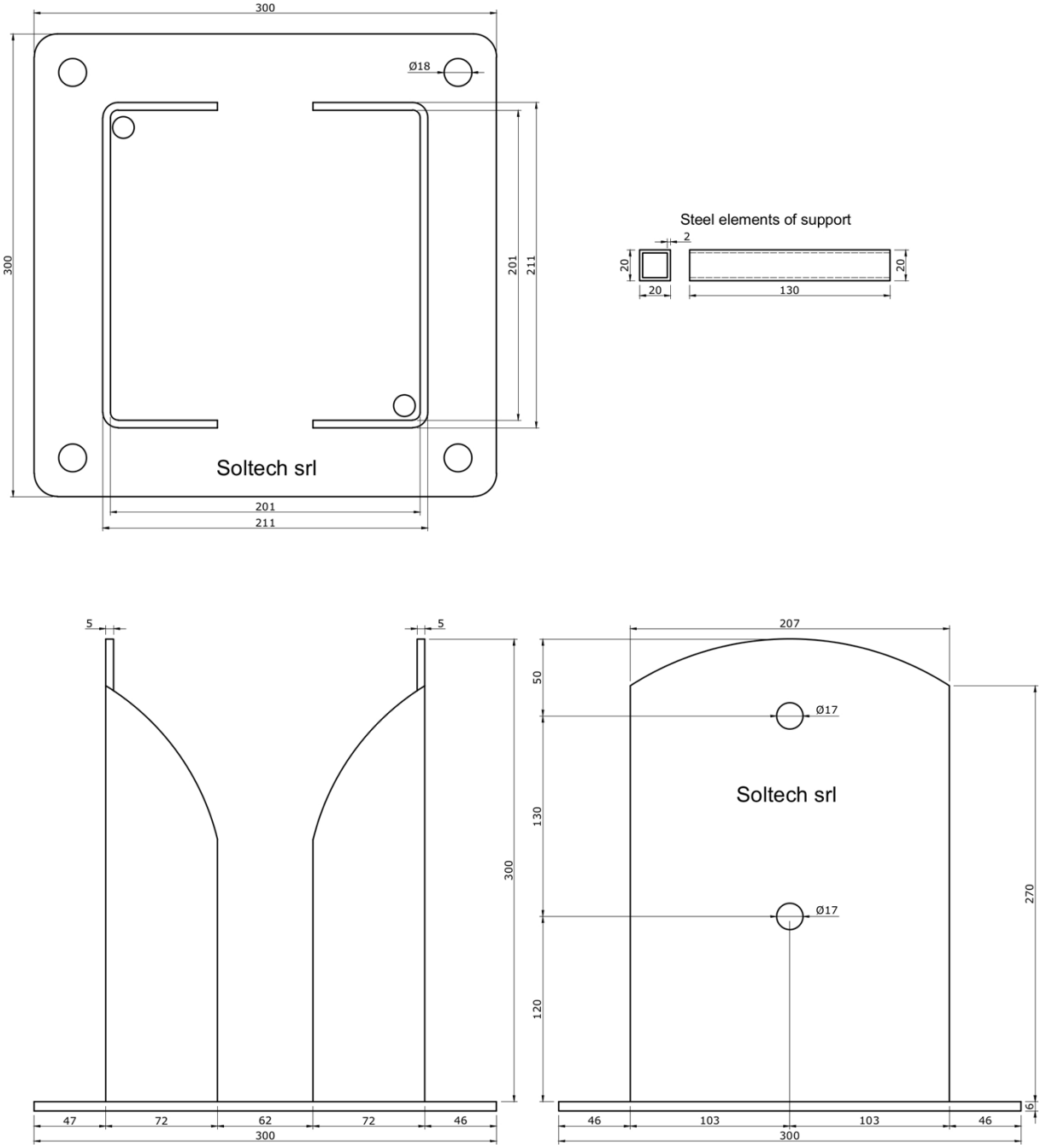


Fig. 11: Z101-200x200-P

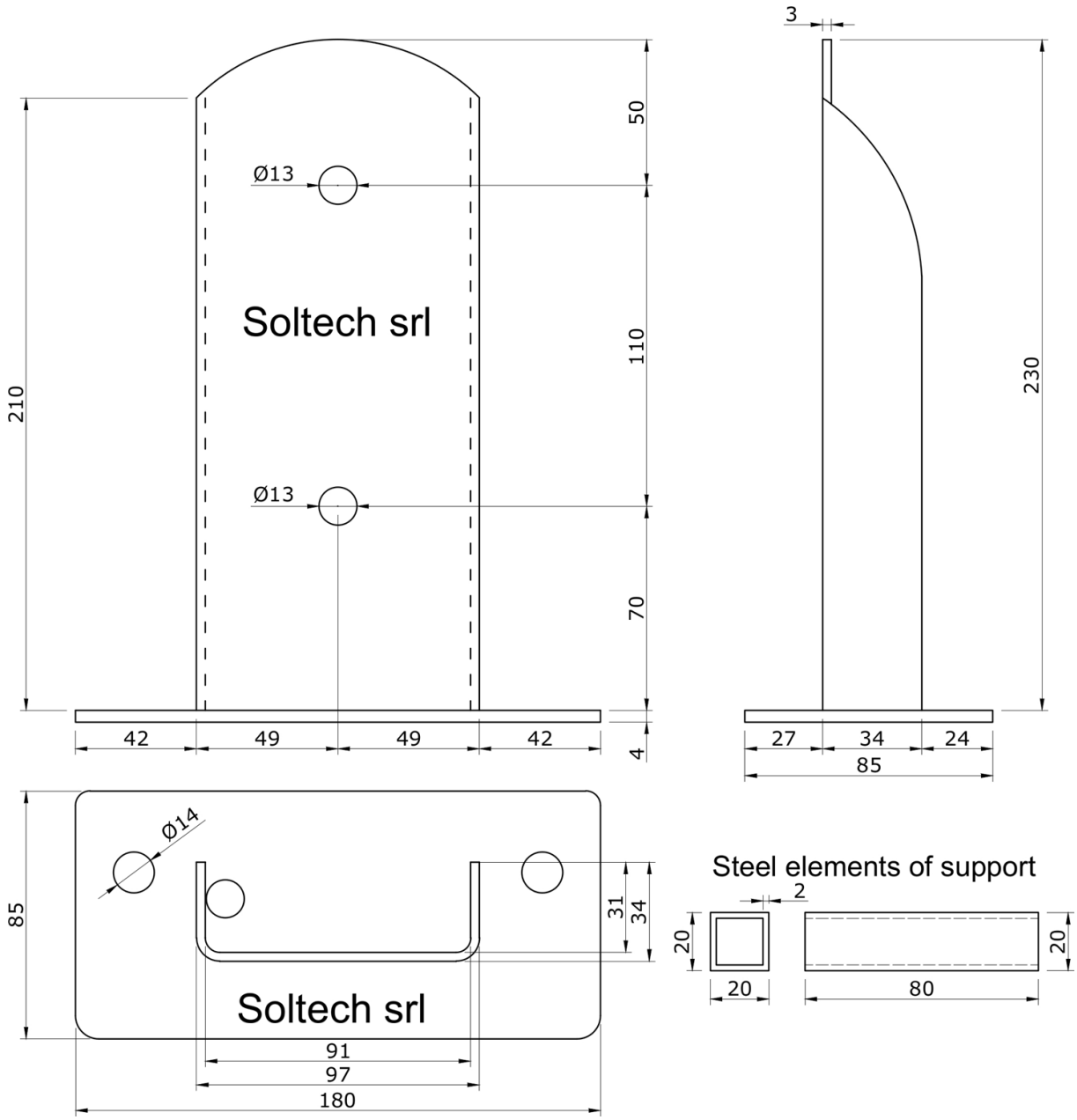


Fig. 12: COMP102-90

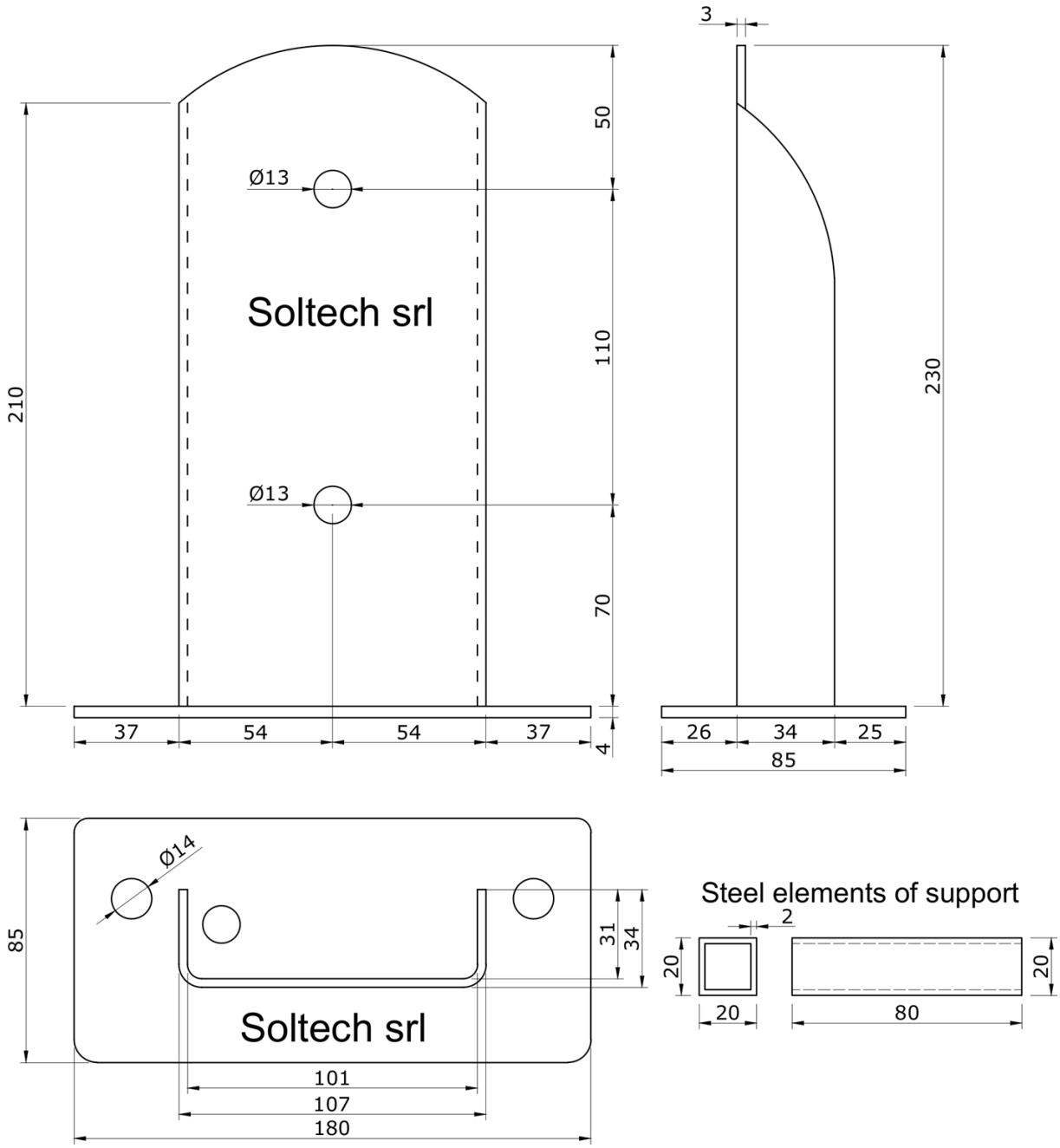


Fig. 13: COMP102-100

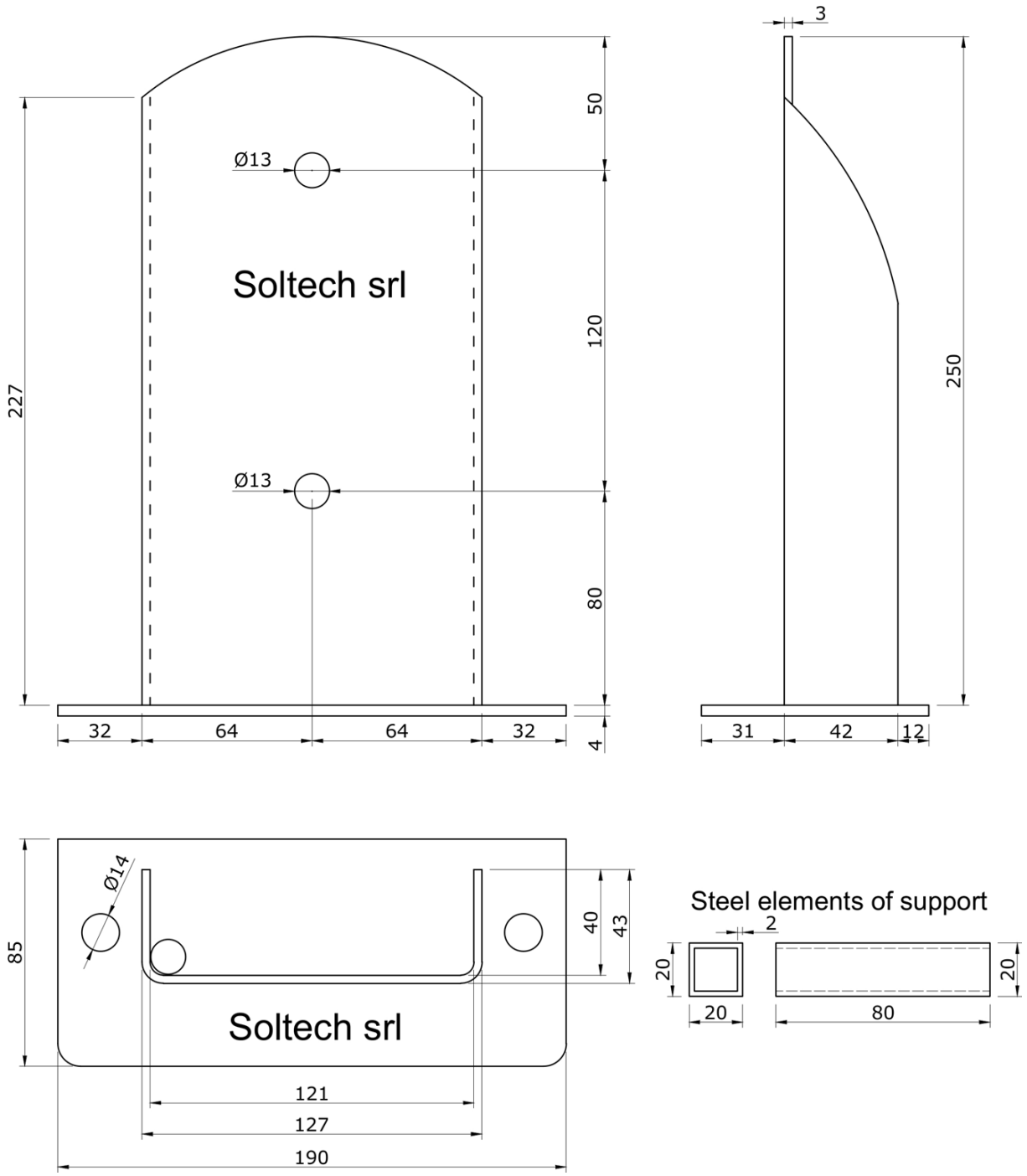


Fig. 14: COMP102-120

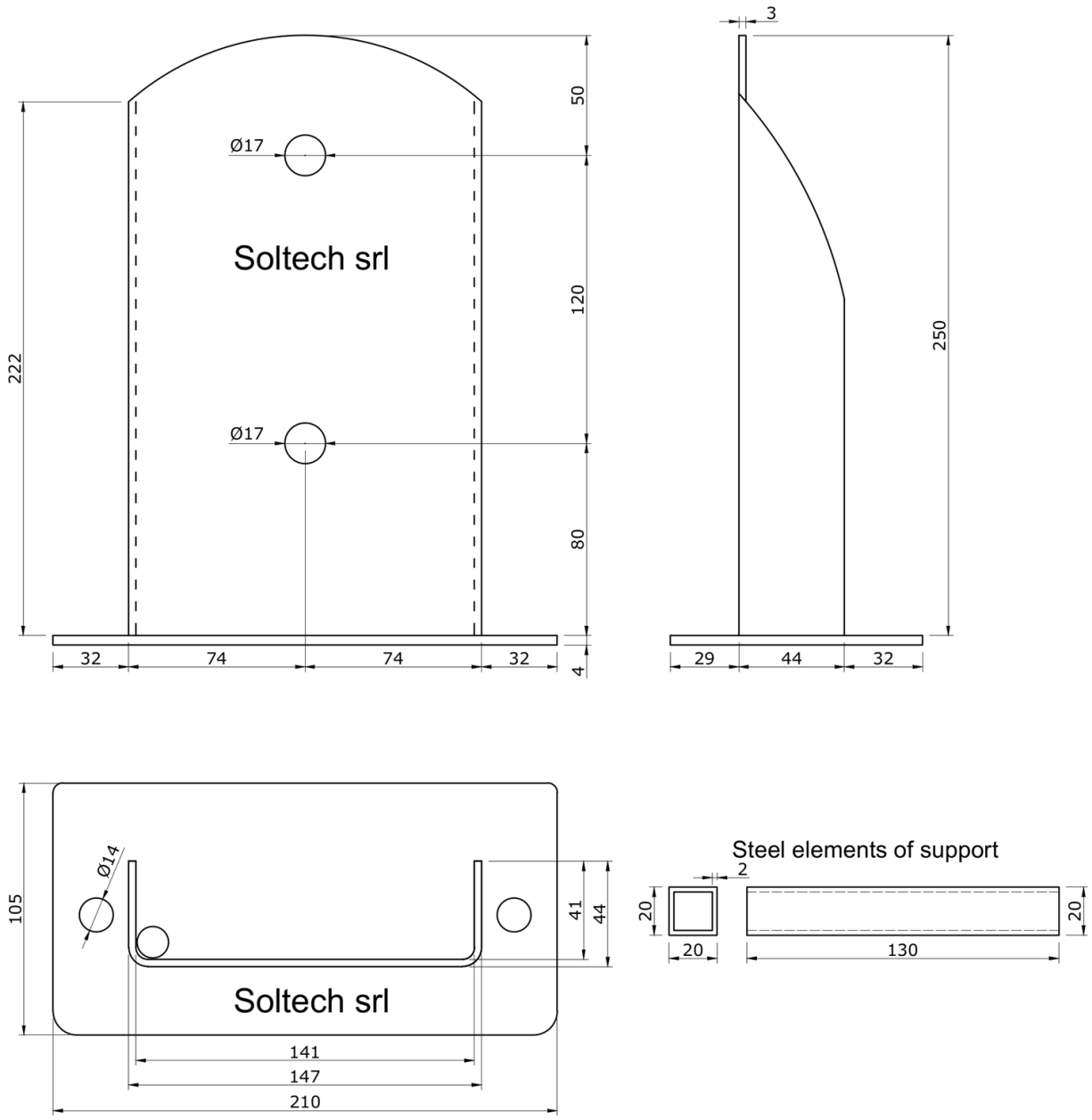


Fig. 15: COMP102-140

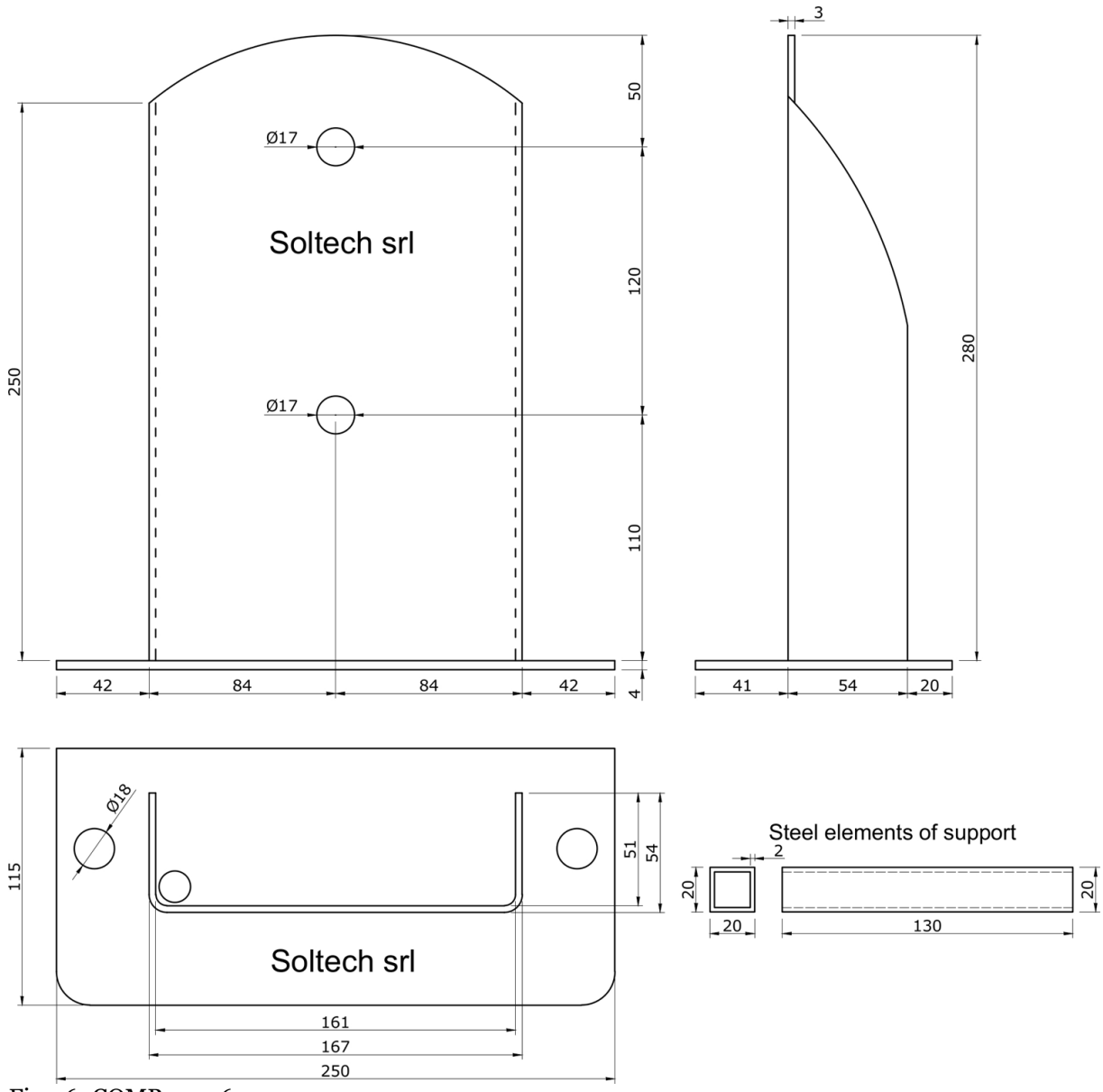


Fig. 16: COMP102-160

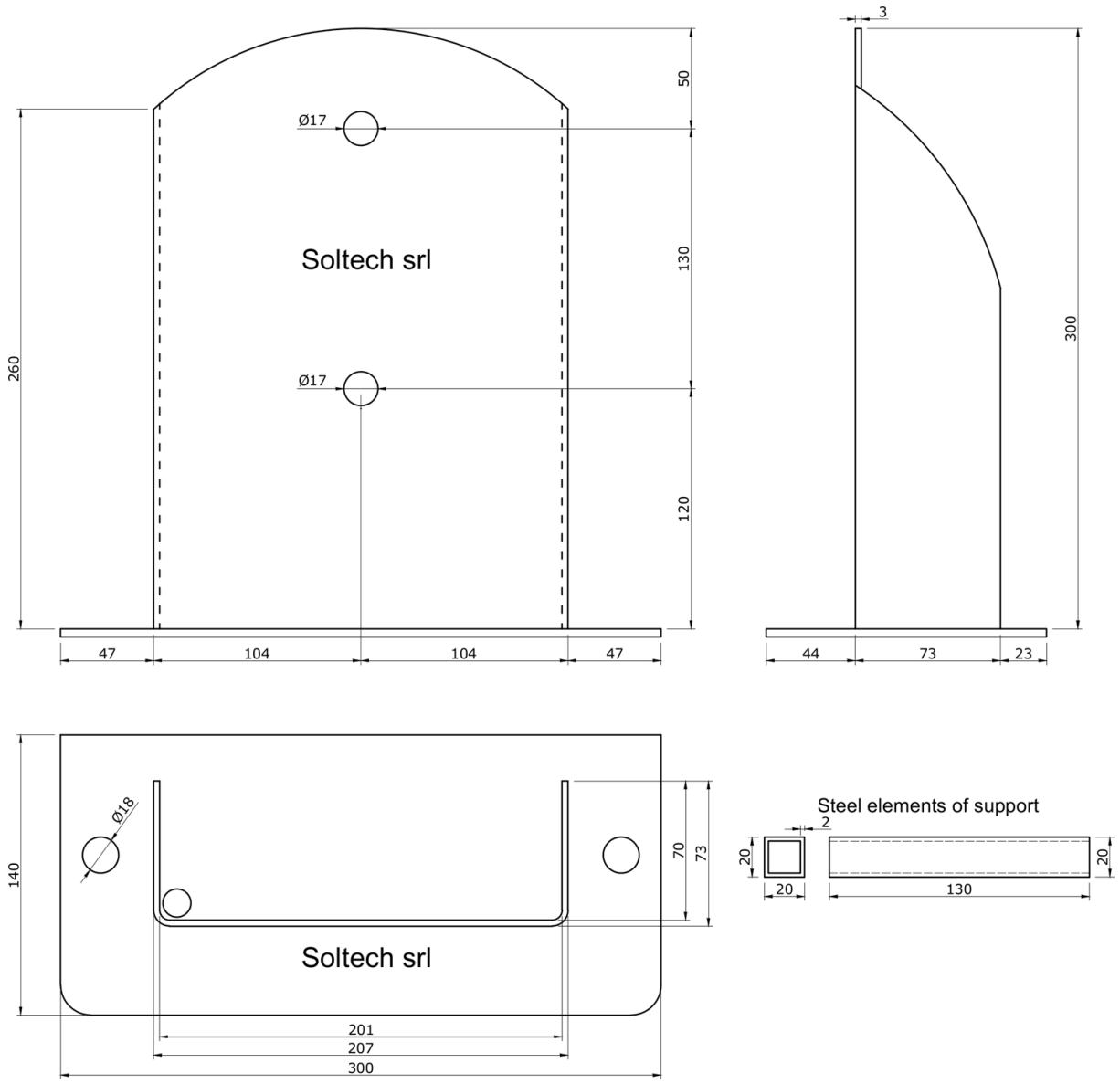


Fig. 17: COMP102-200

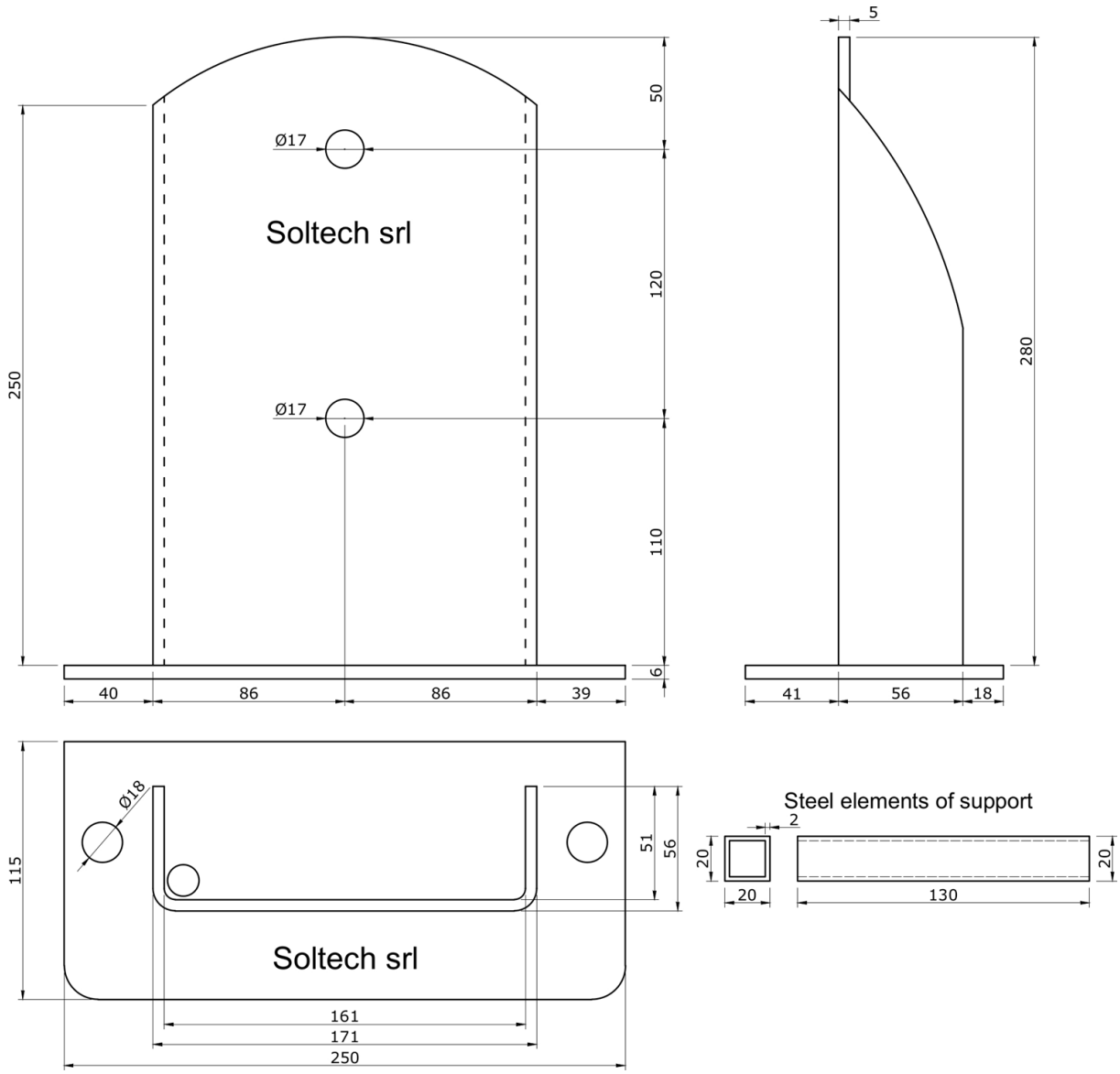


Fig. 18: COMP102-160-P

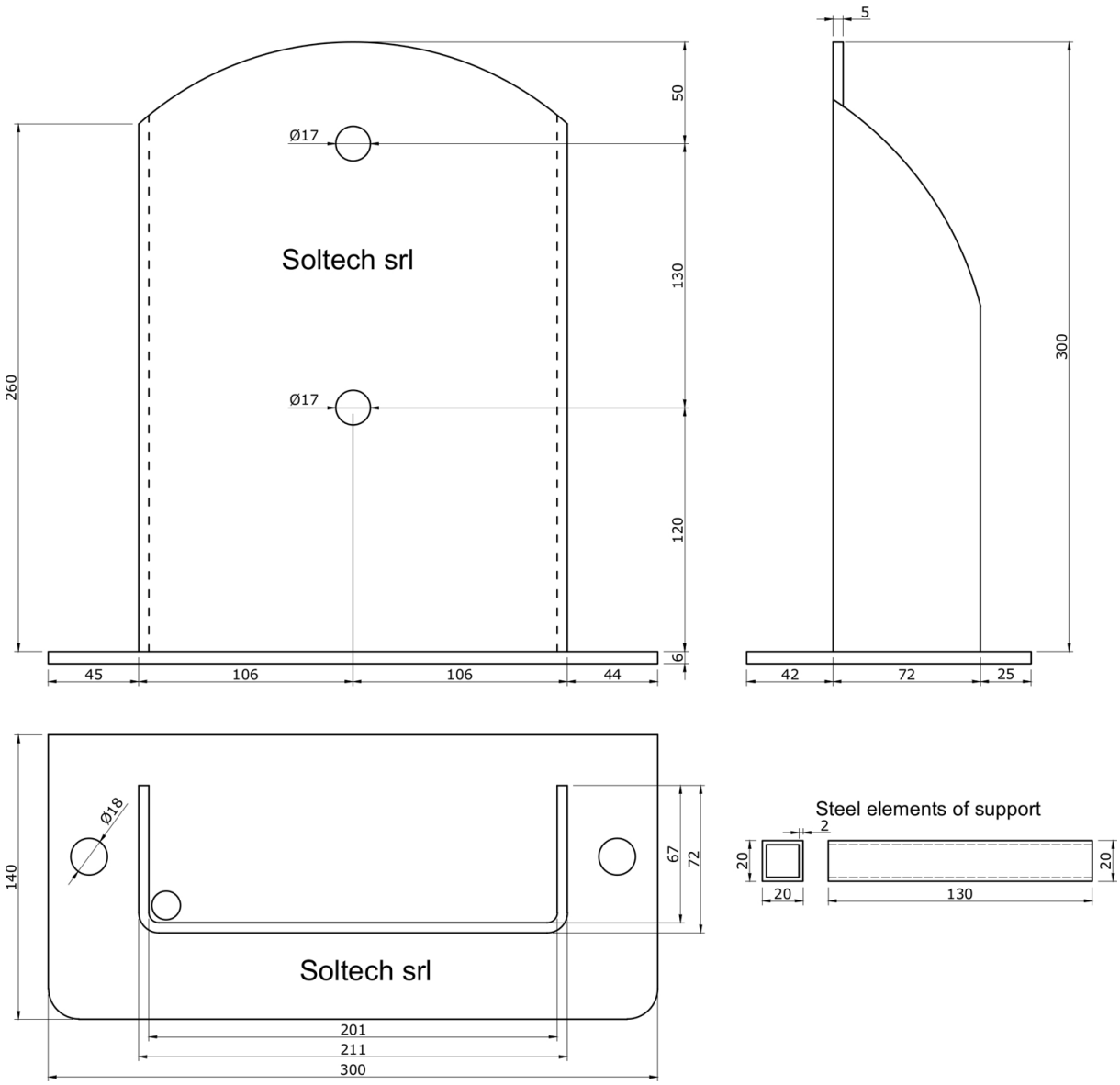


Fig. 19: COMP102-200-P

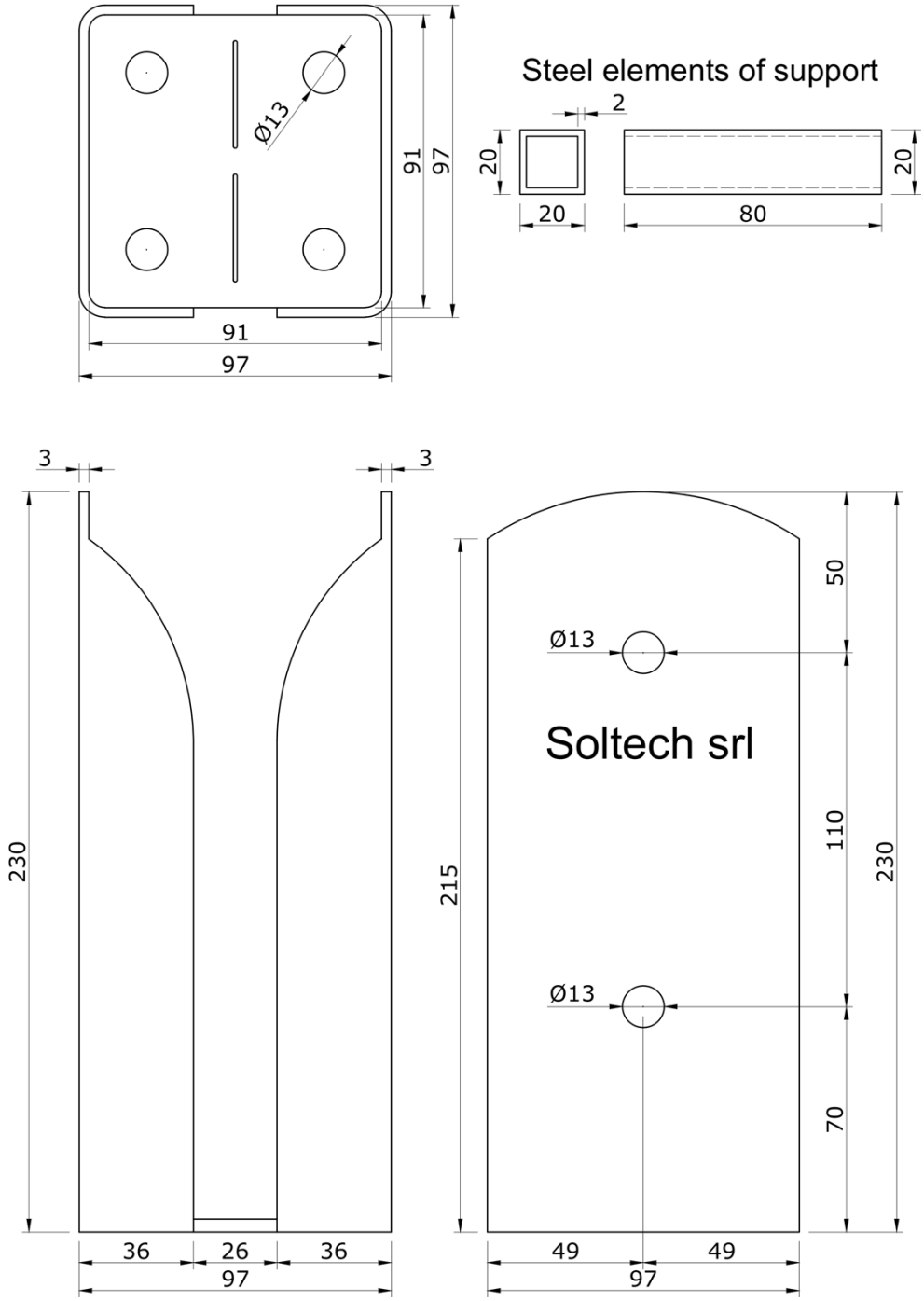


Fig. 20: NEW103-90X90

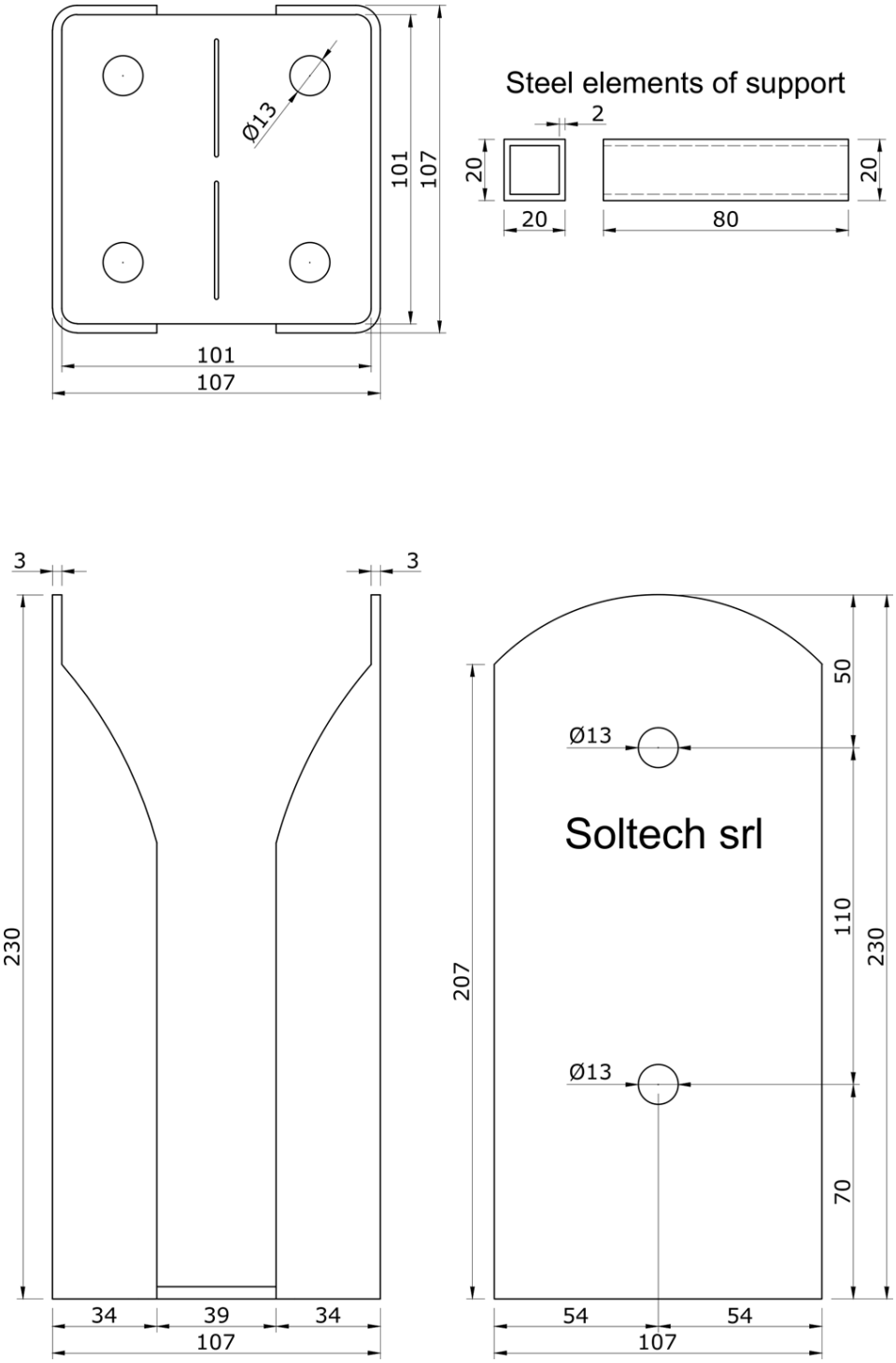


Fig. 21: NEW103-100X100

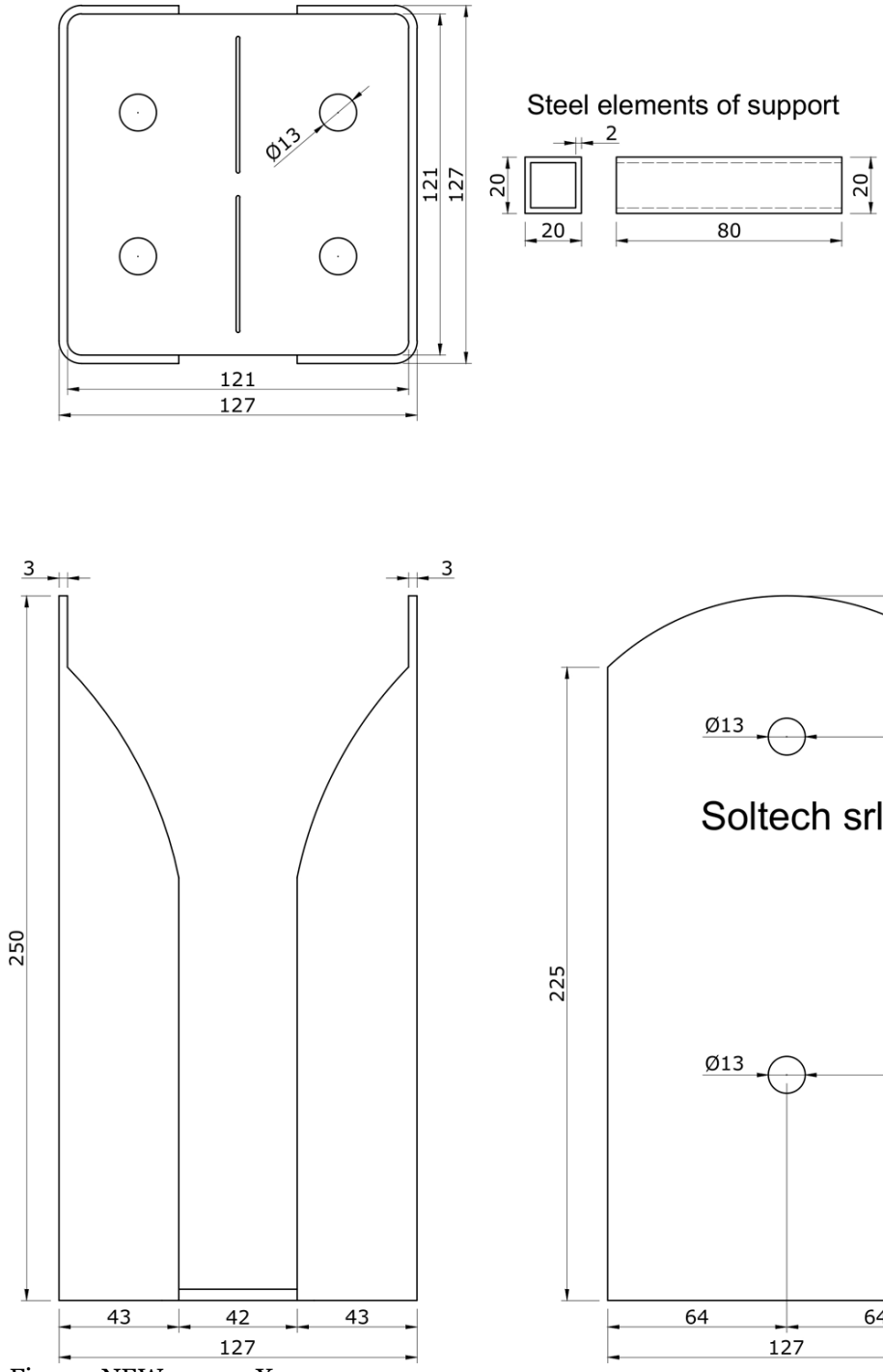
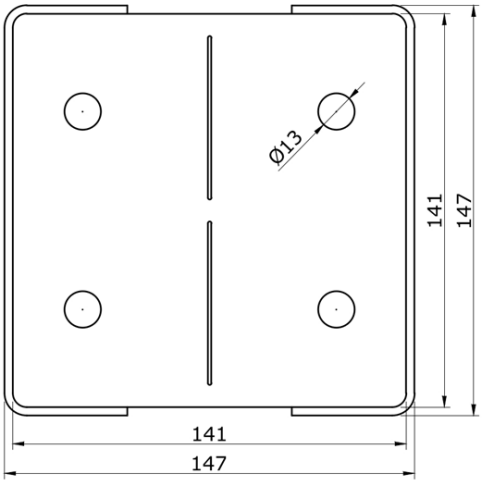
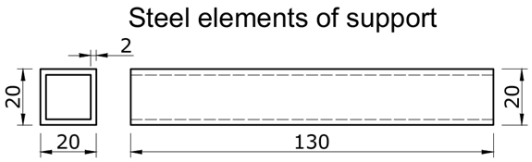
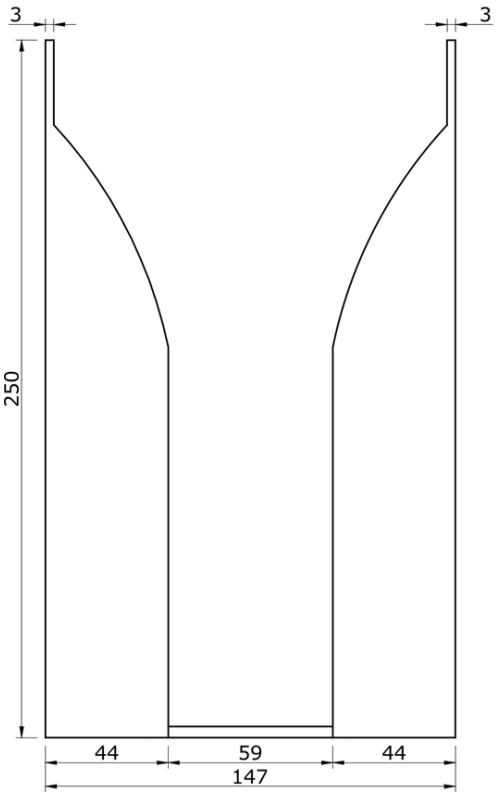


Fig. 22: NEW103-120X120







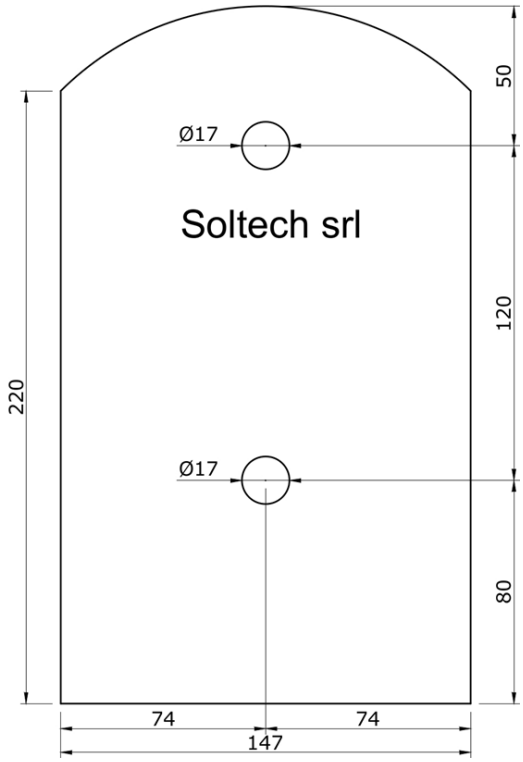
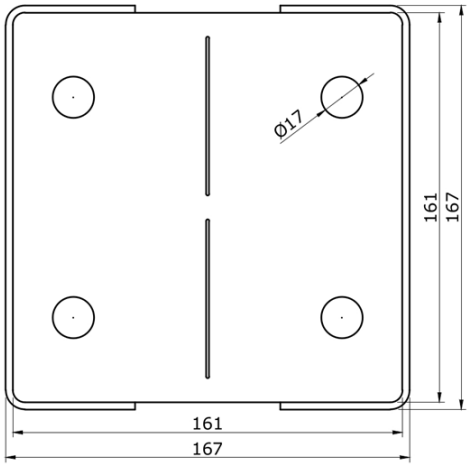
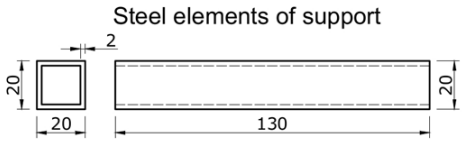
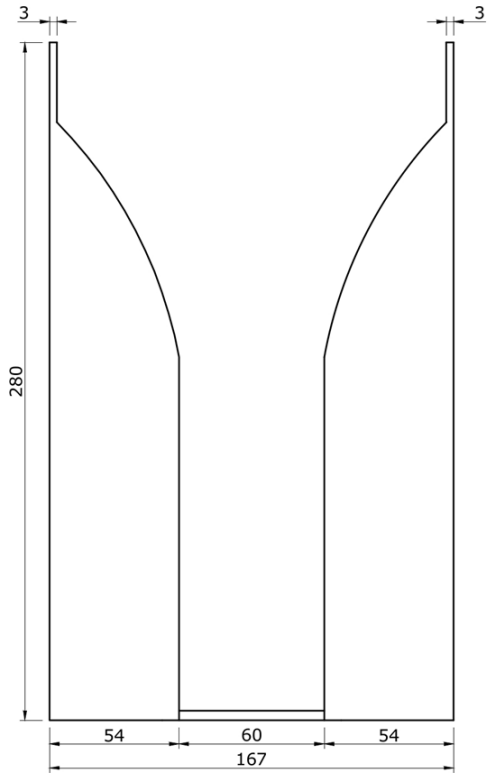


Fig. 23: NEW103-140X140







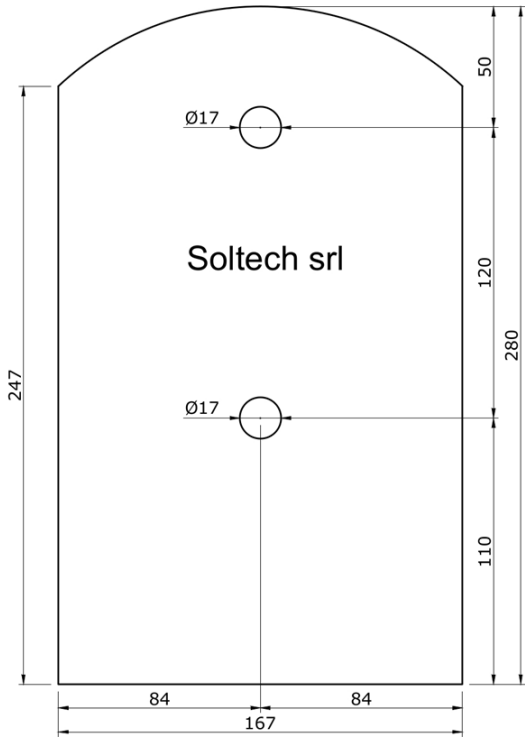
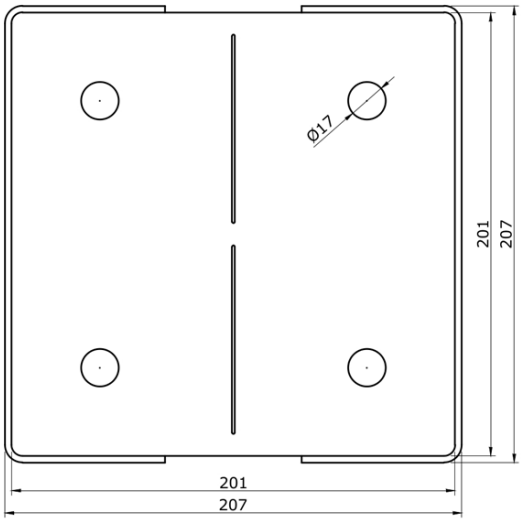
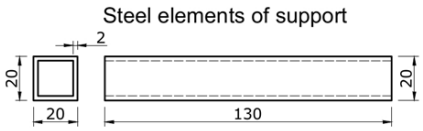
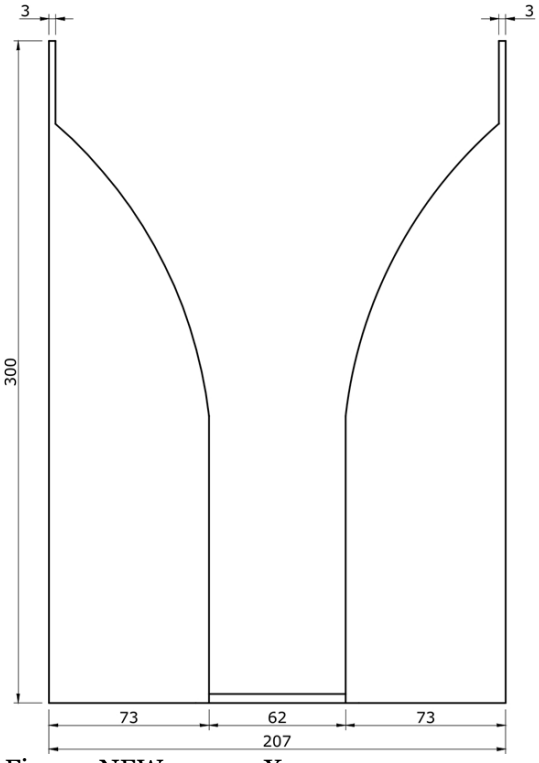


Fig. 24: NEW103-160X160







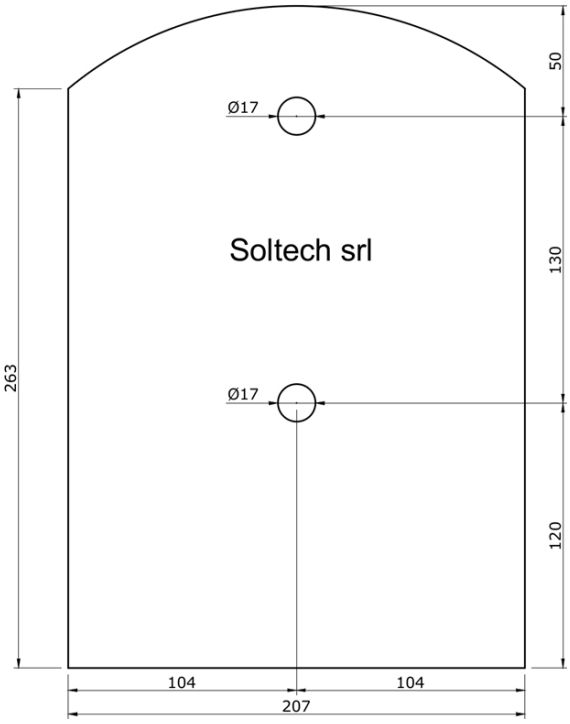
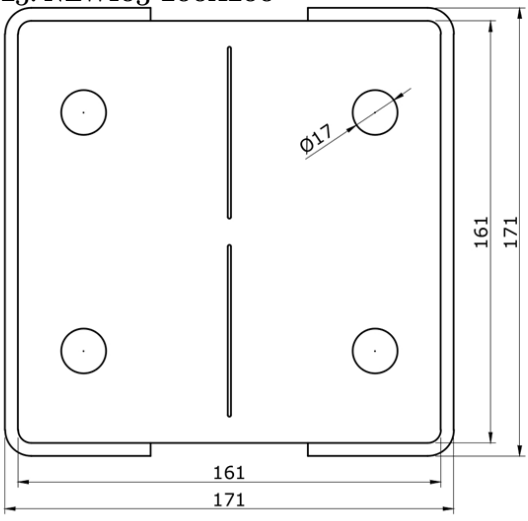
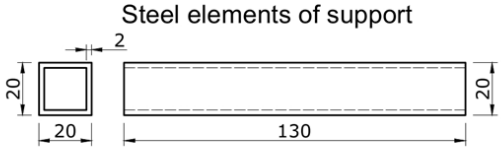


Fig. 25: NEW103-200X200





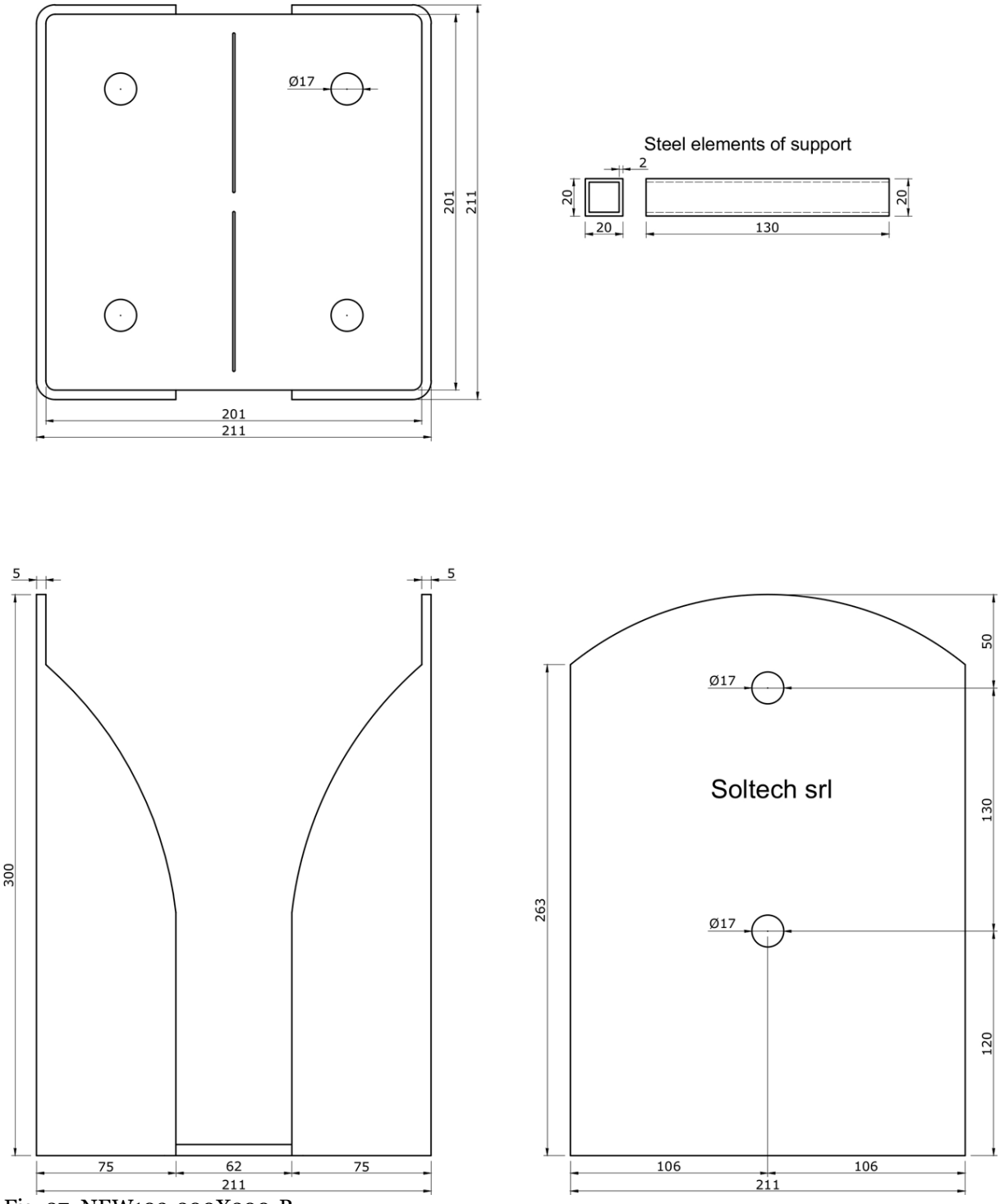


Fig. 27: NEW103-200X200-P

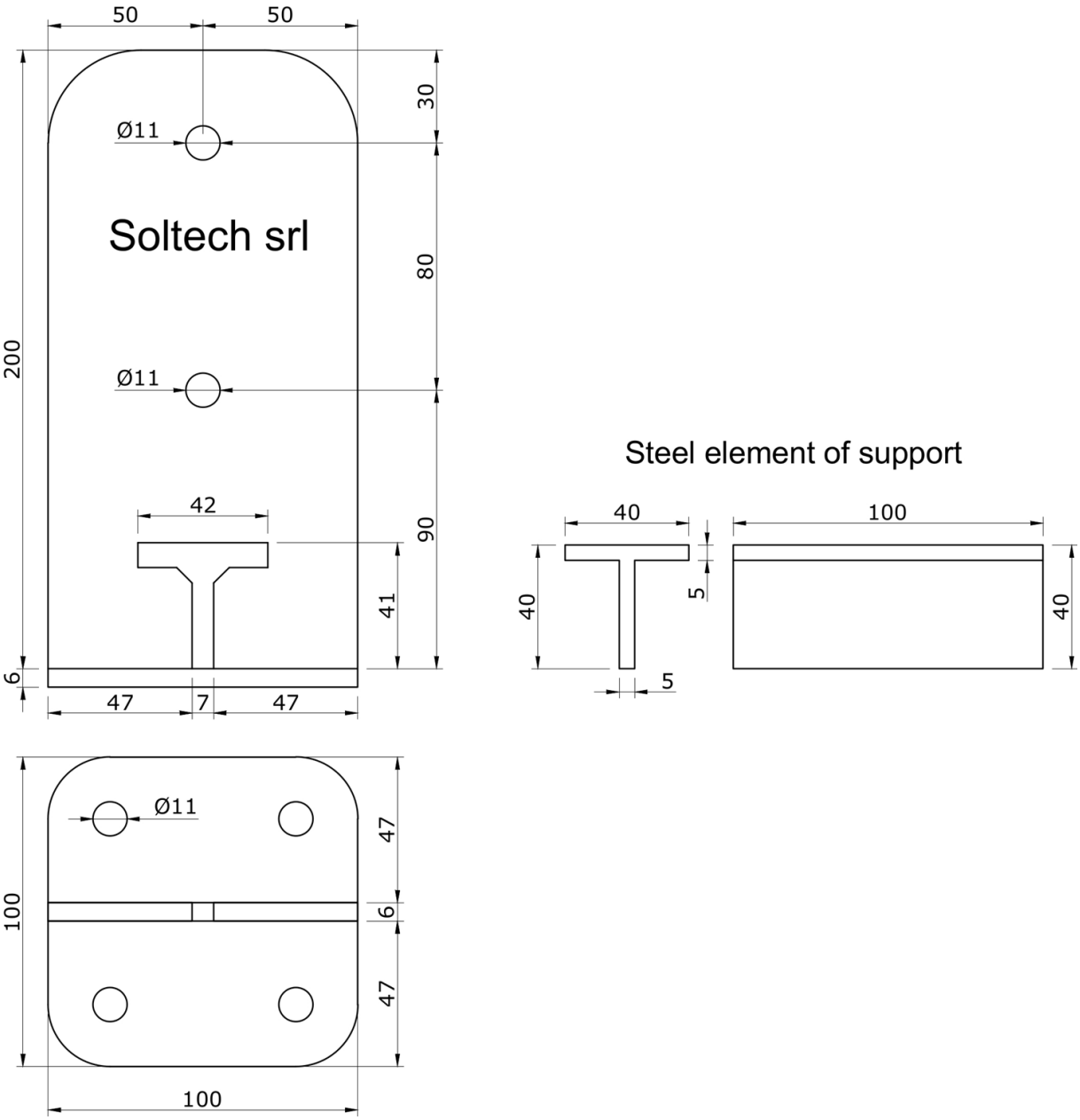


Fig. 28: T104-100

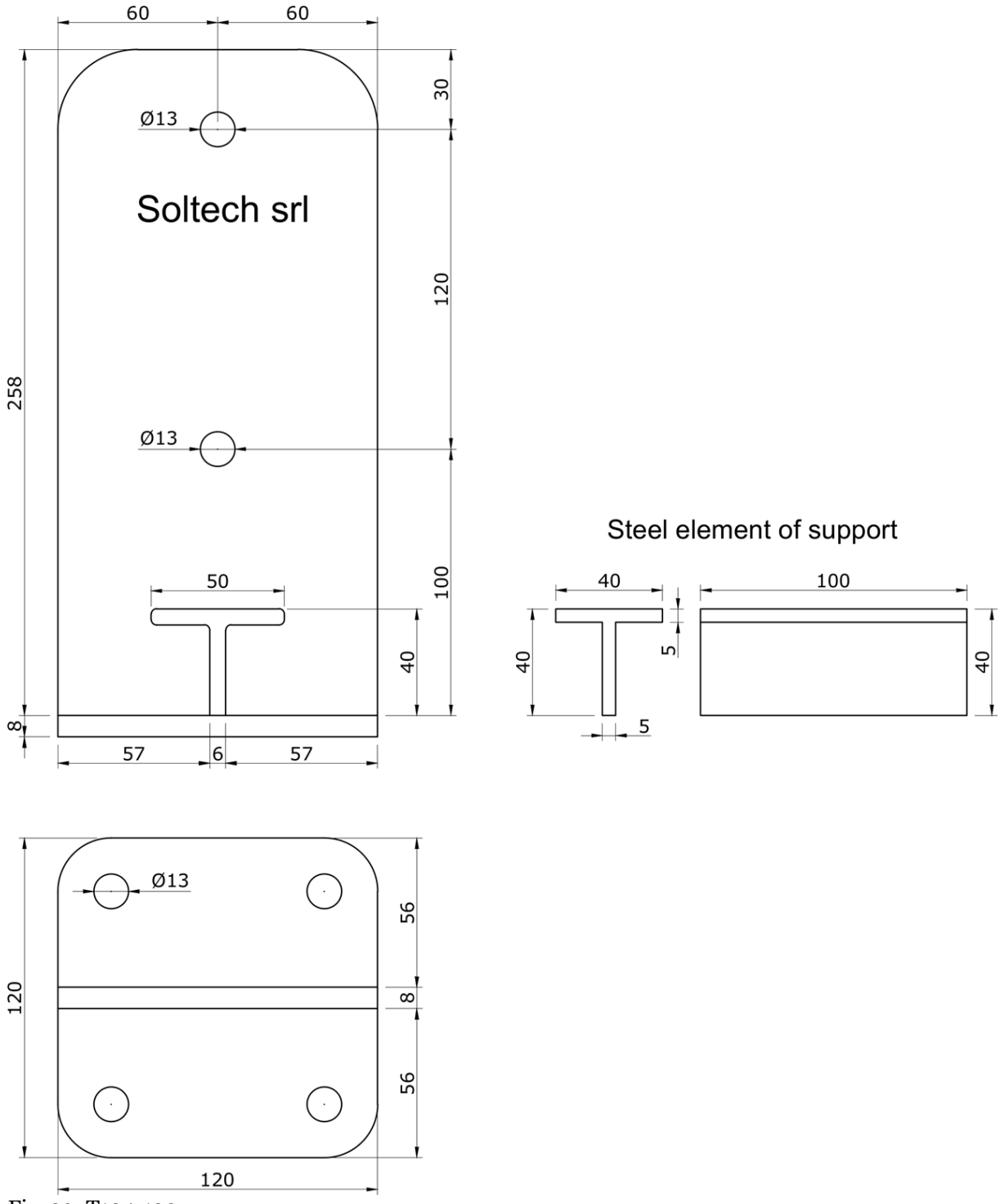


Fig. 29: T104-120

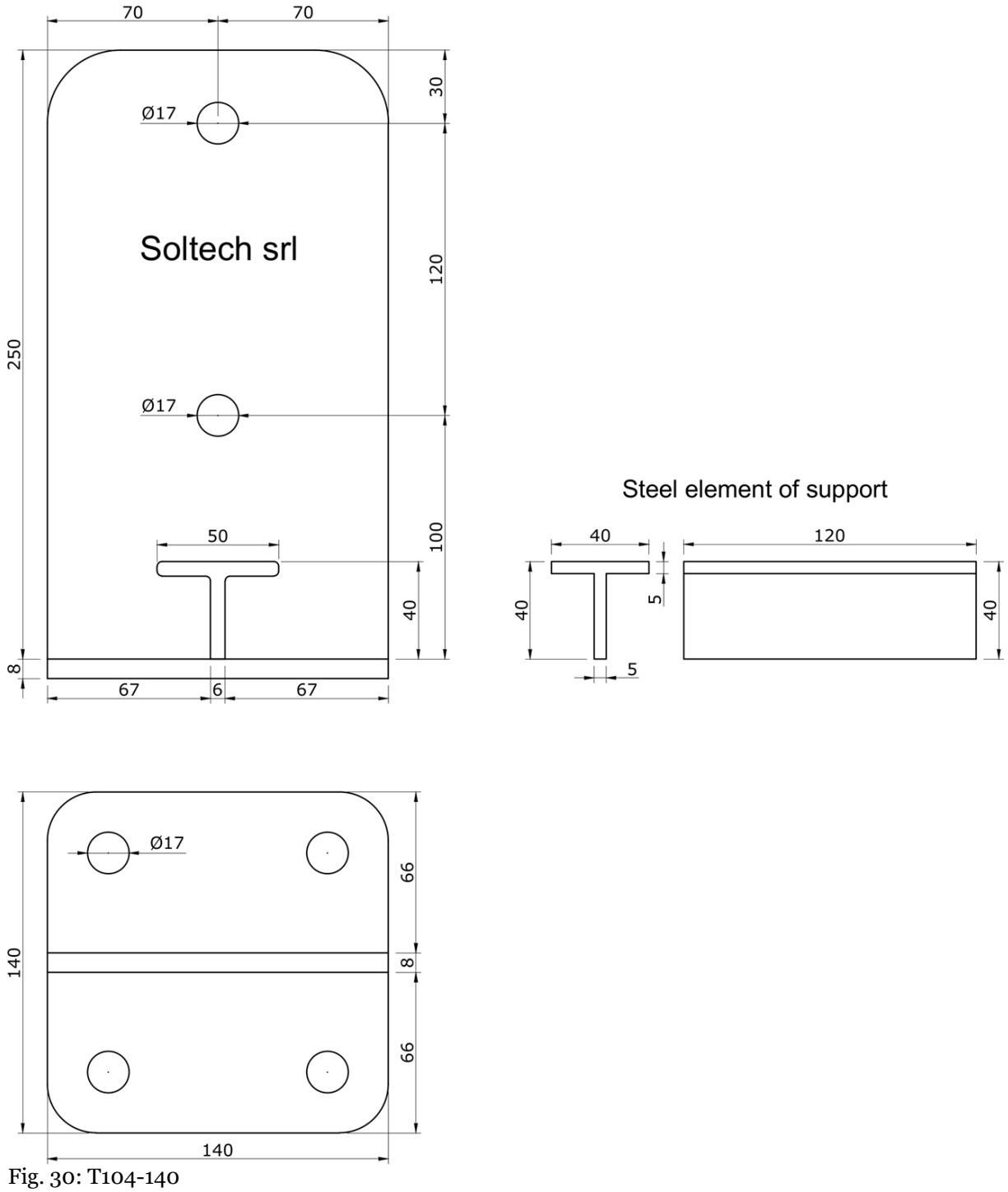
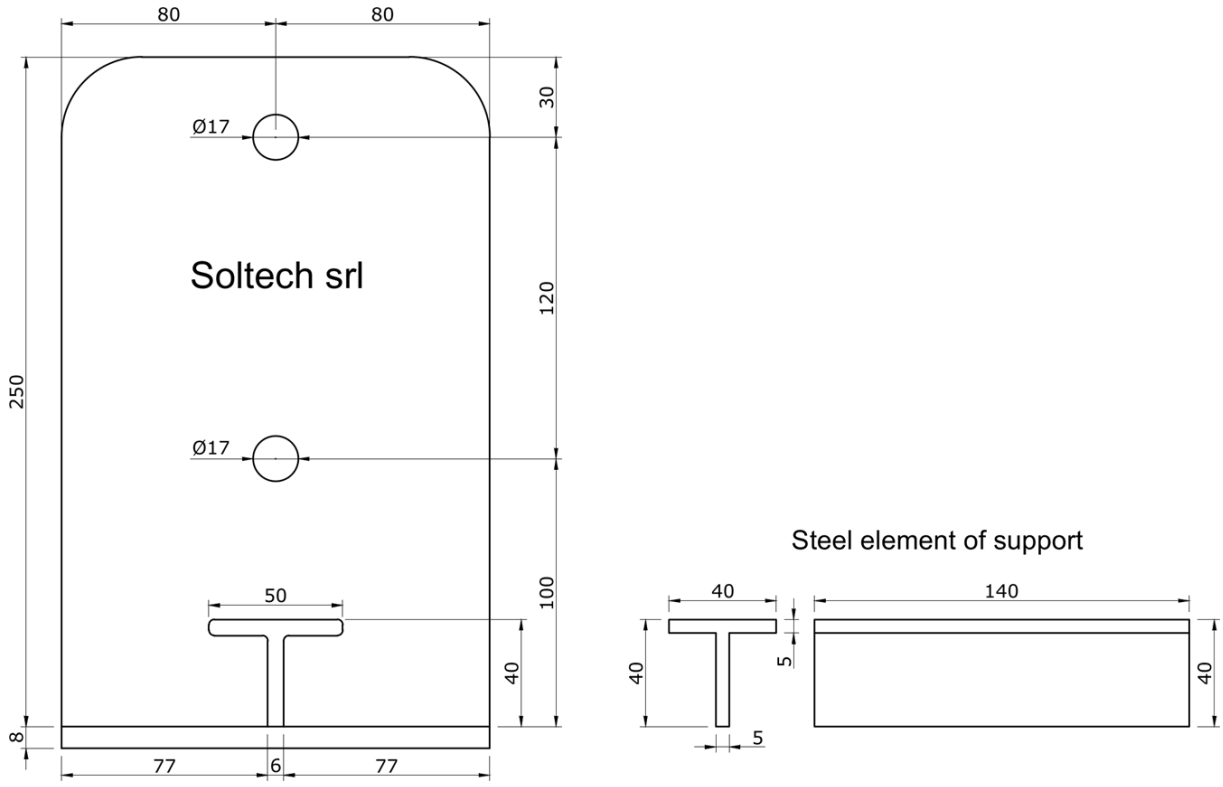


Fig. 30: T104-140



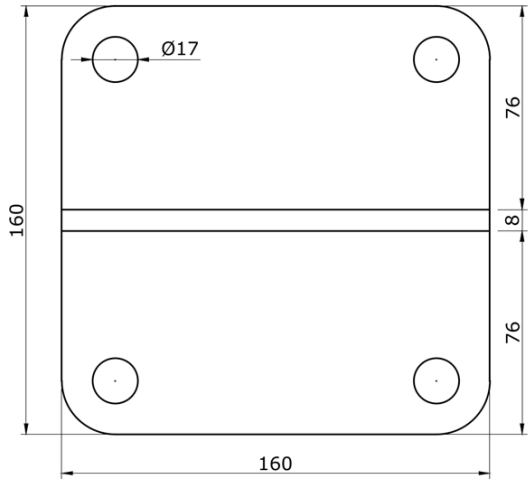
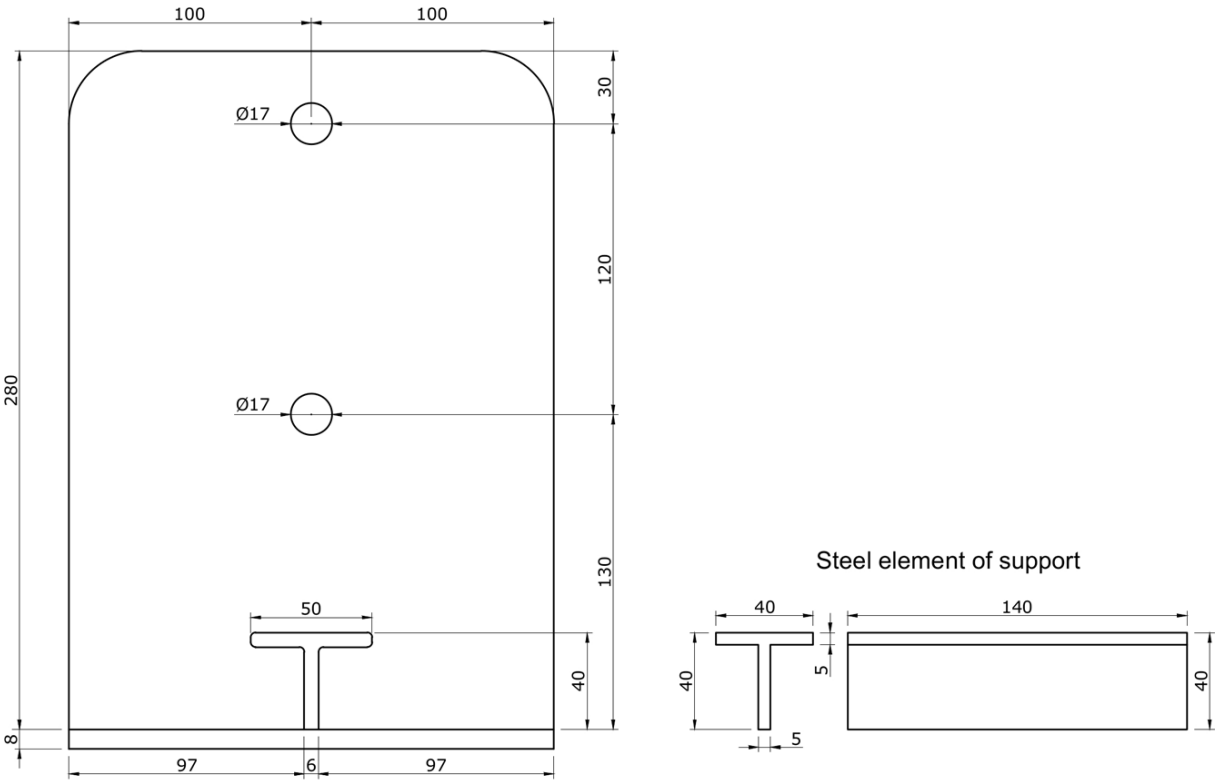


Fig. 31: T104-160



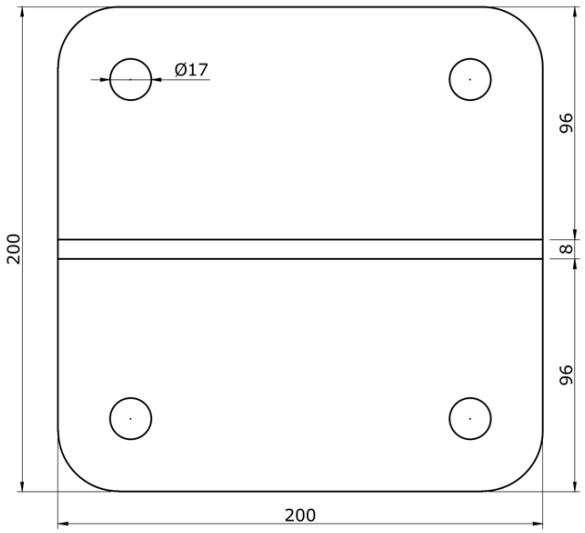


Fig. 32: T104-200

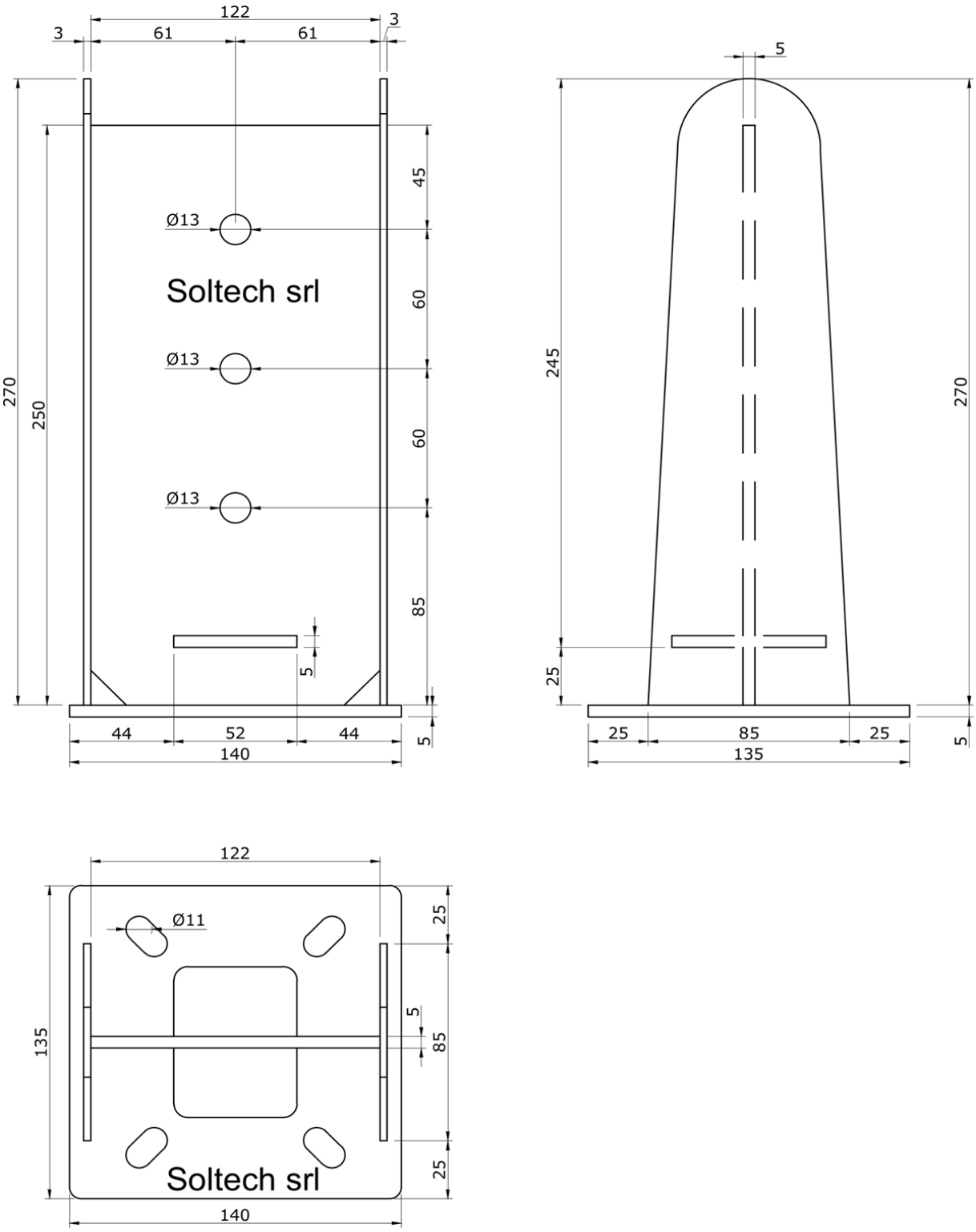


Fig. 33: TL110-120

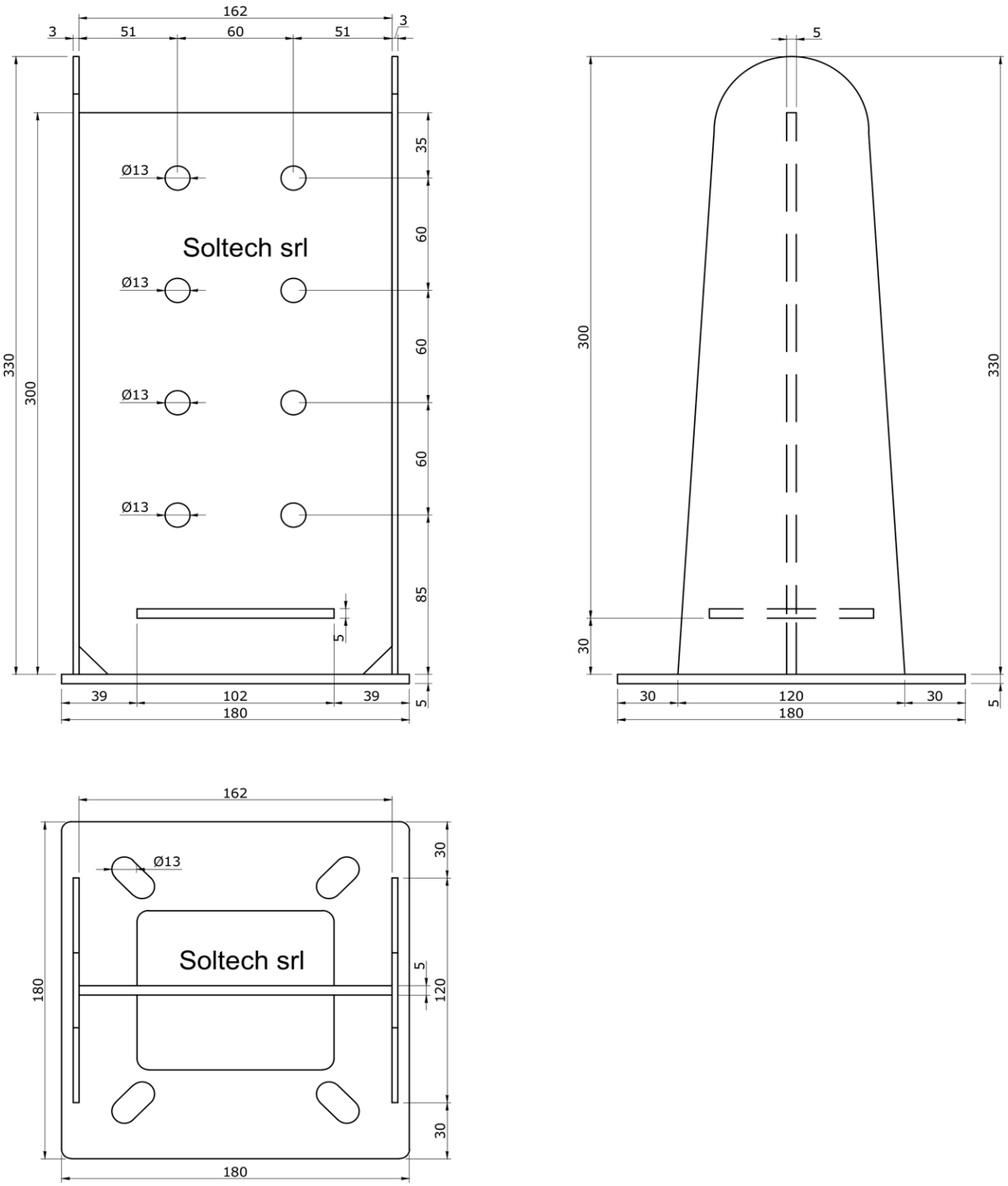


Fig. 34: TL110-160

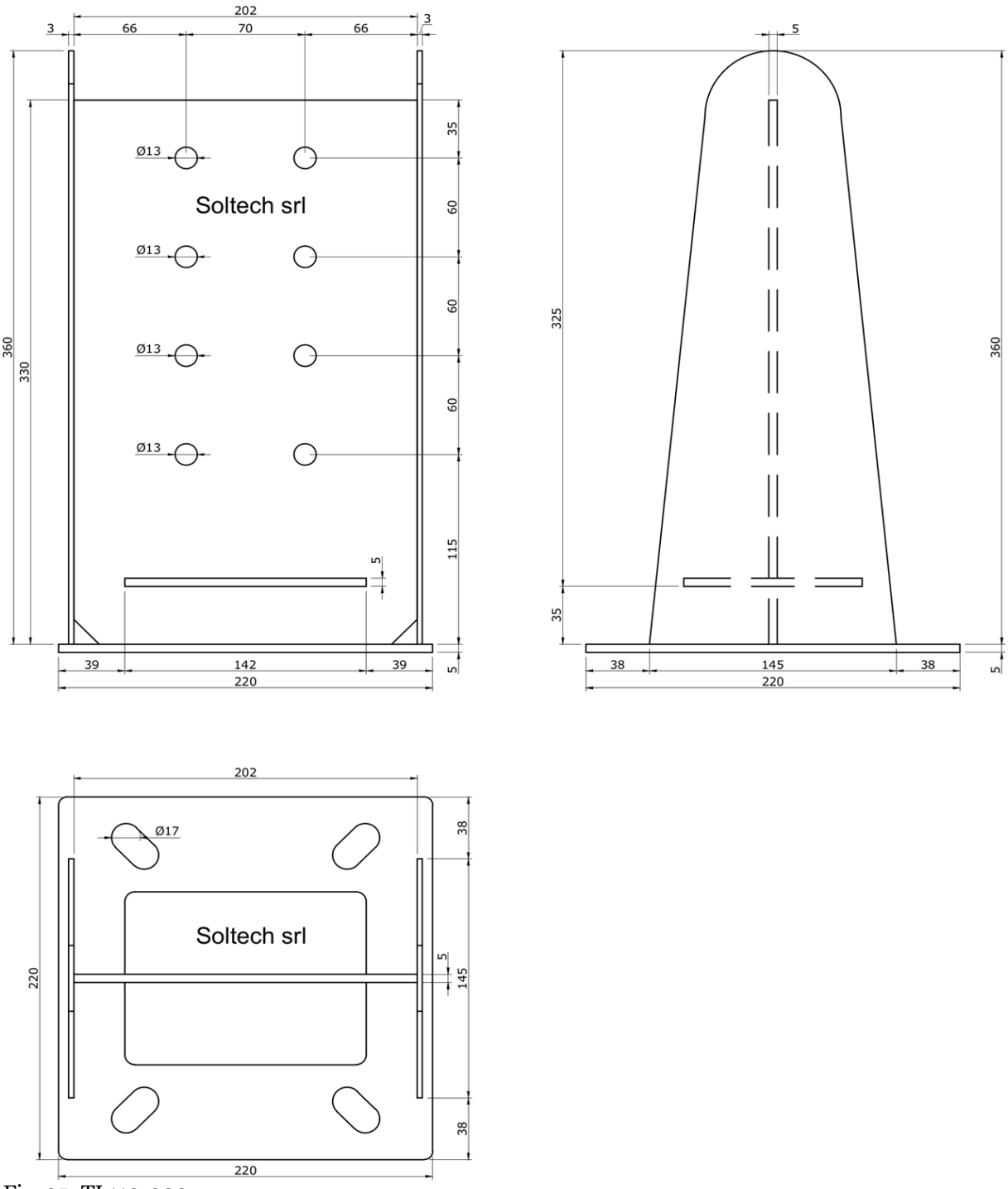
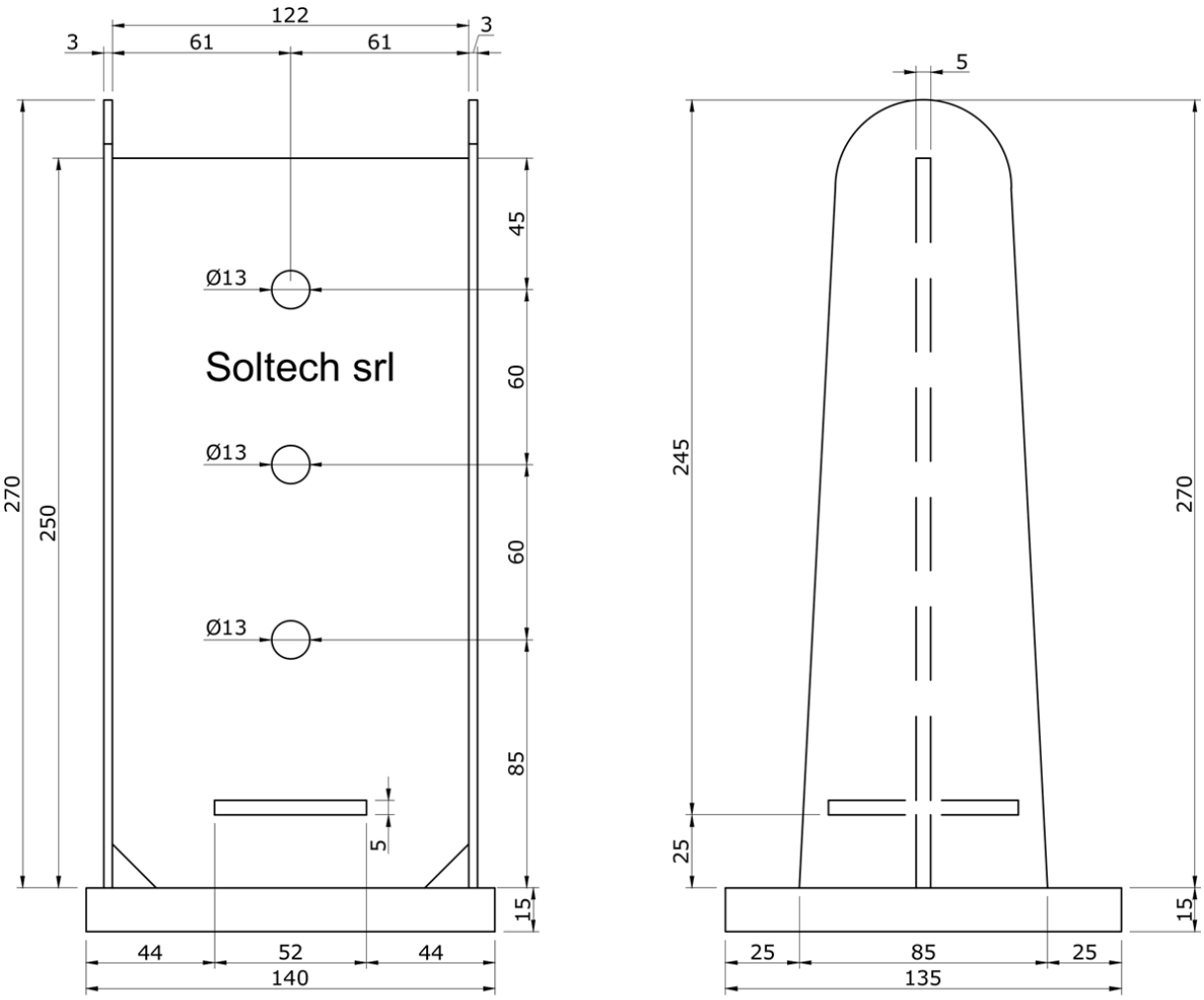


Fig. 35: TL110-200



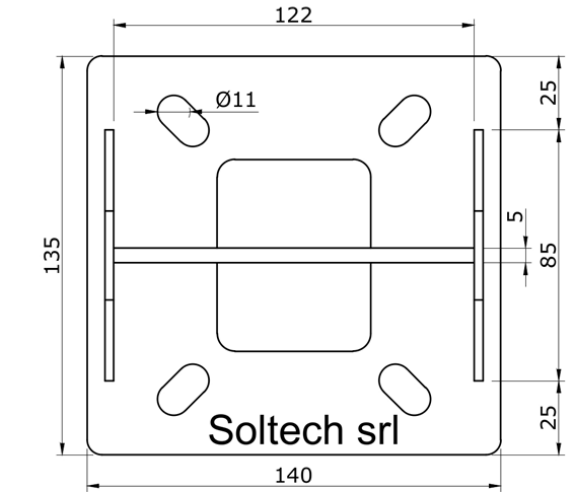
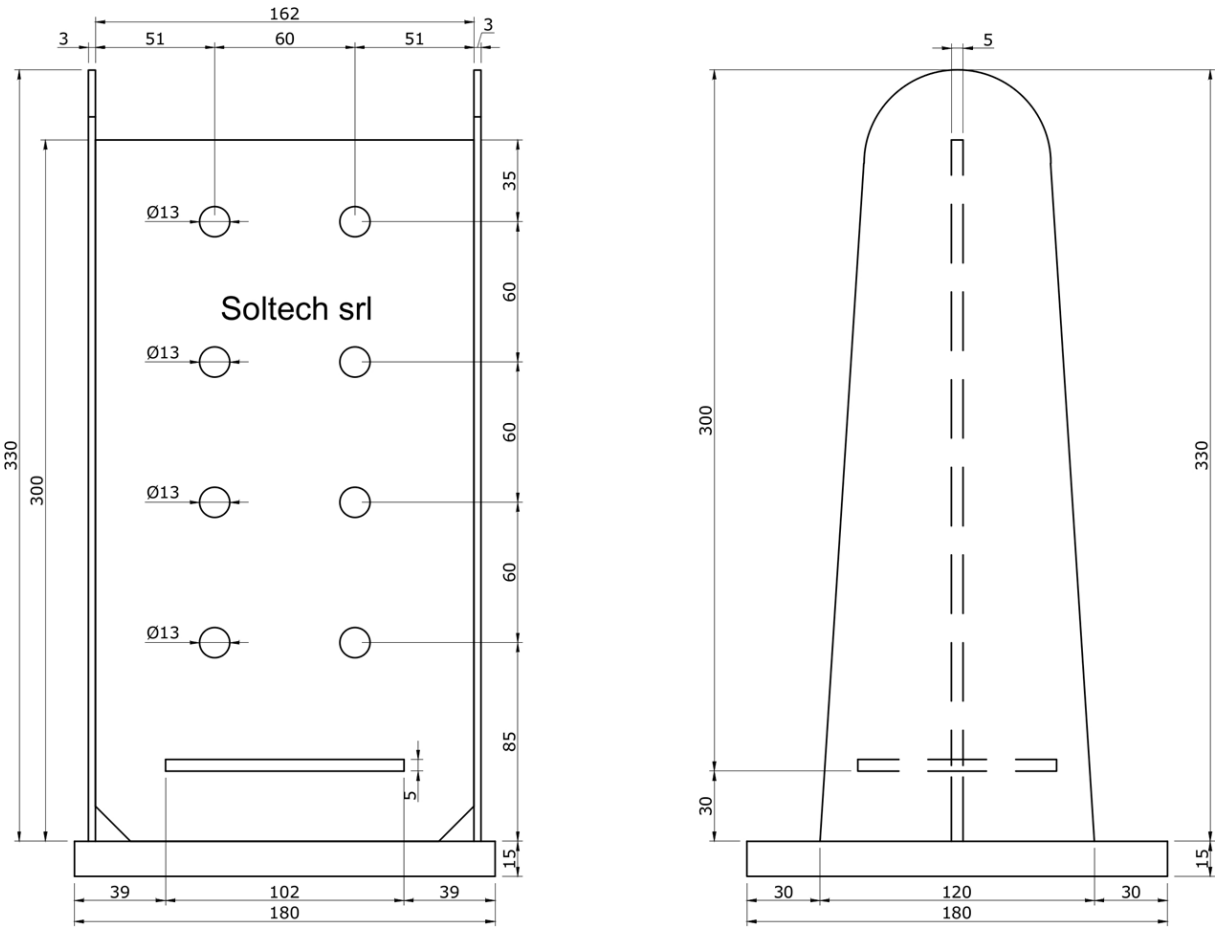


Fig. 36: TL110-120-S



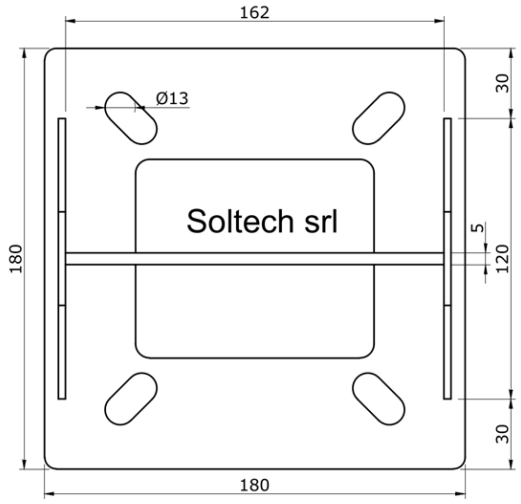
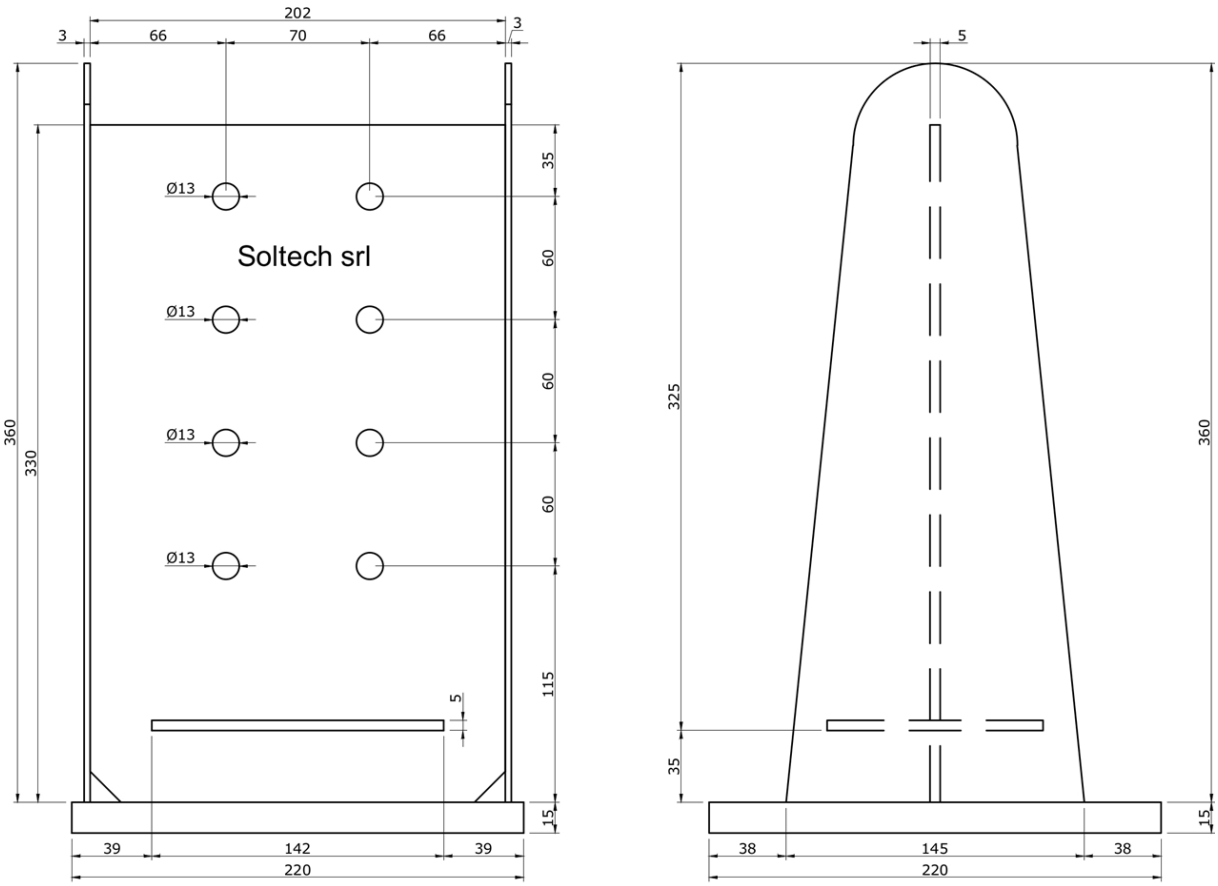


Fig. 37: TL110-160-S



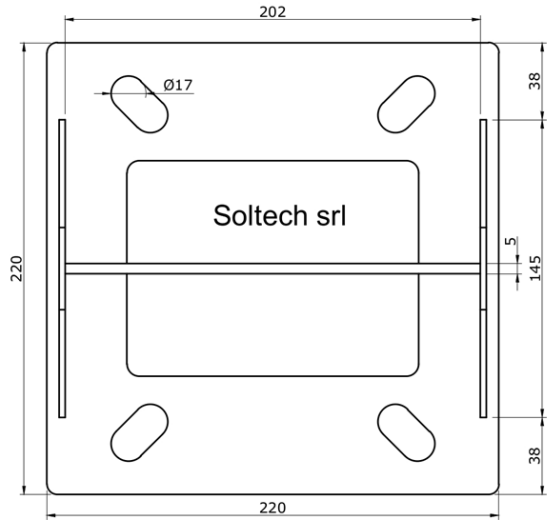


Fig. 38: TL110-200-S

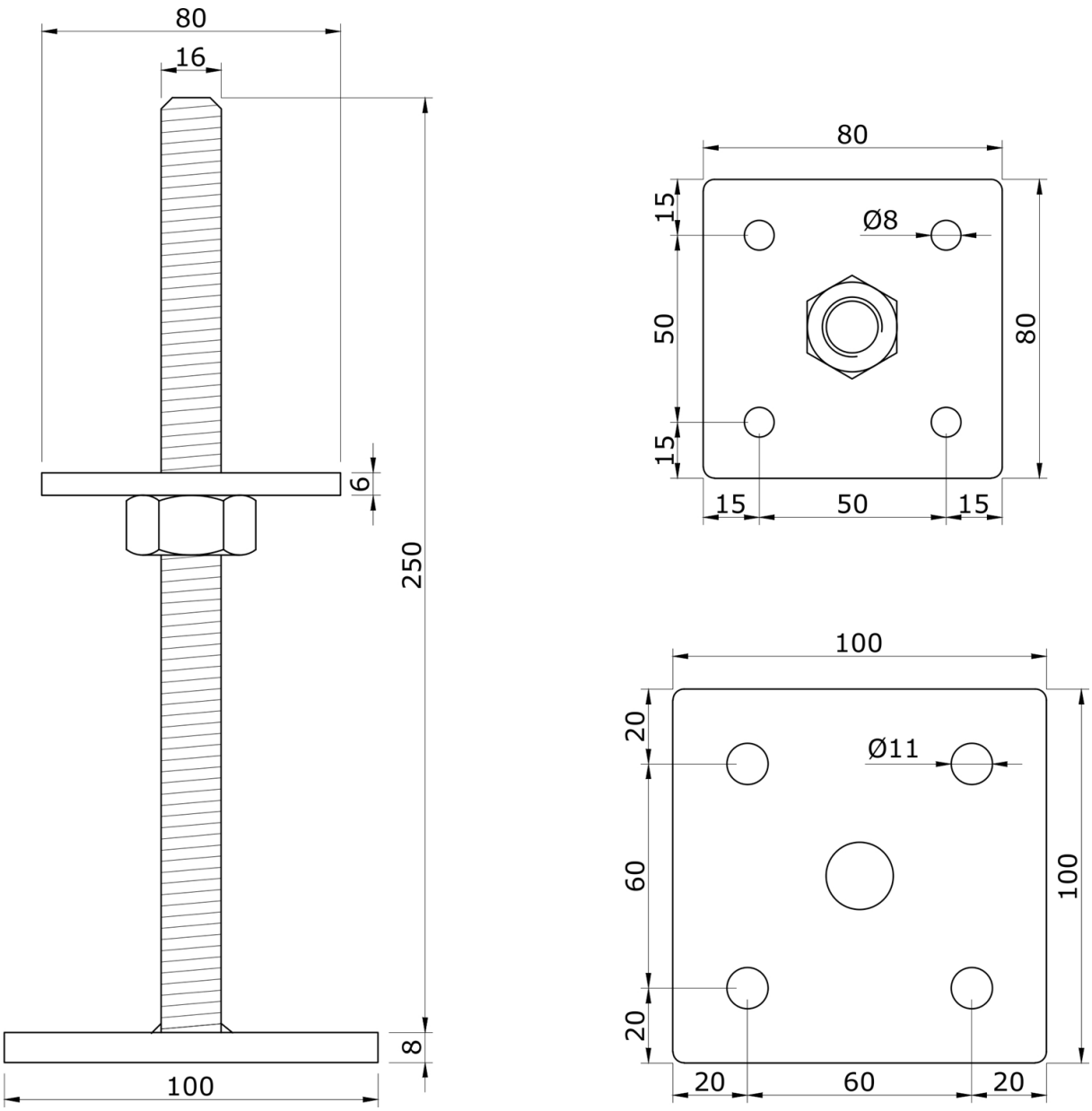


Fig. 39: P105-Ø16

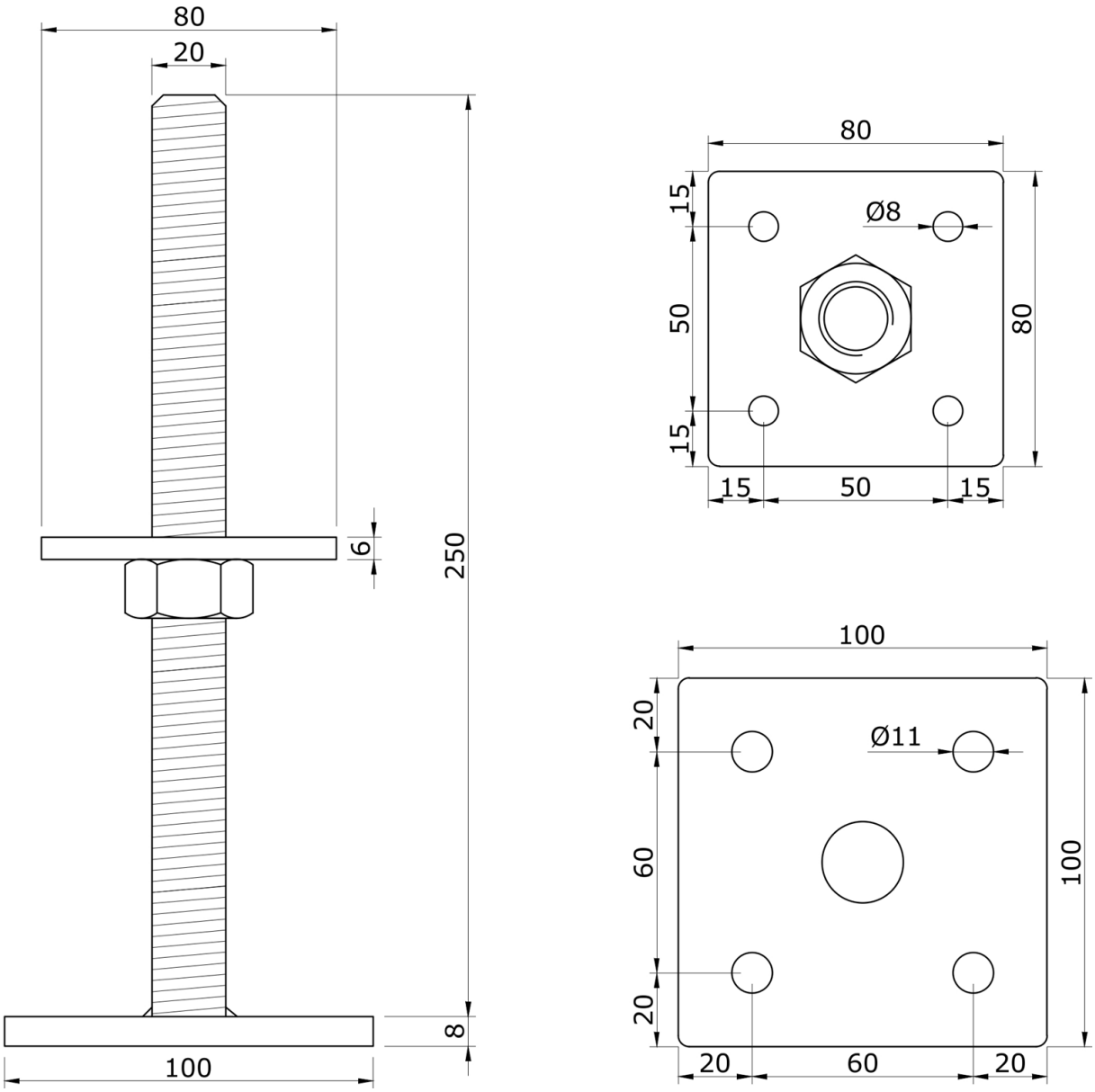
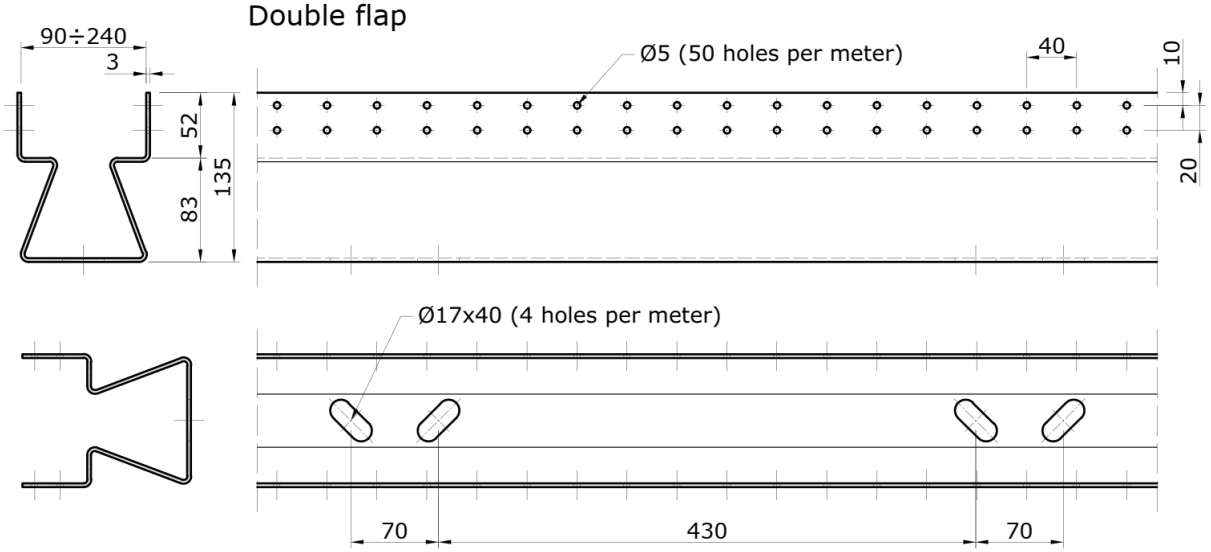


Fig. 40: P105-Ø20

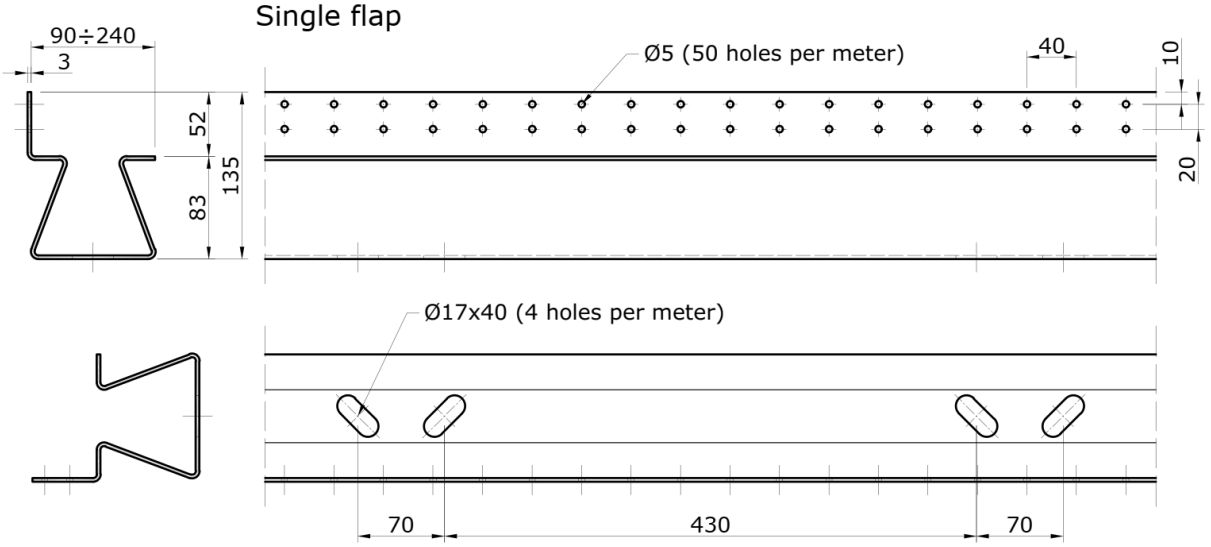
Base curbs

Cor-ten steel grade S355J0WP EN10025-5, thickness 3mm
Stainless steel grade 1.4307 (EN10088), thickness = 3mm
Execution class EXC2 in accordance with EN1090-2.

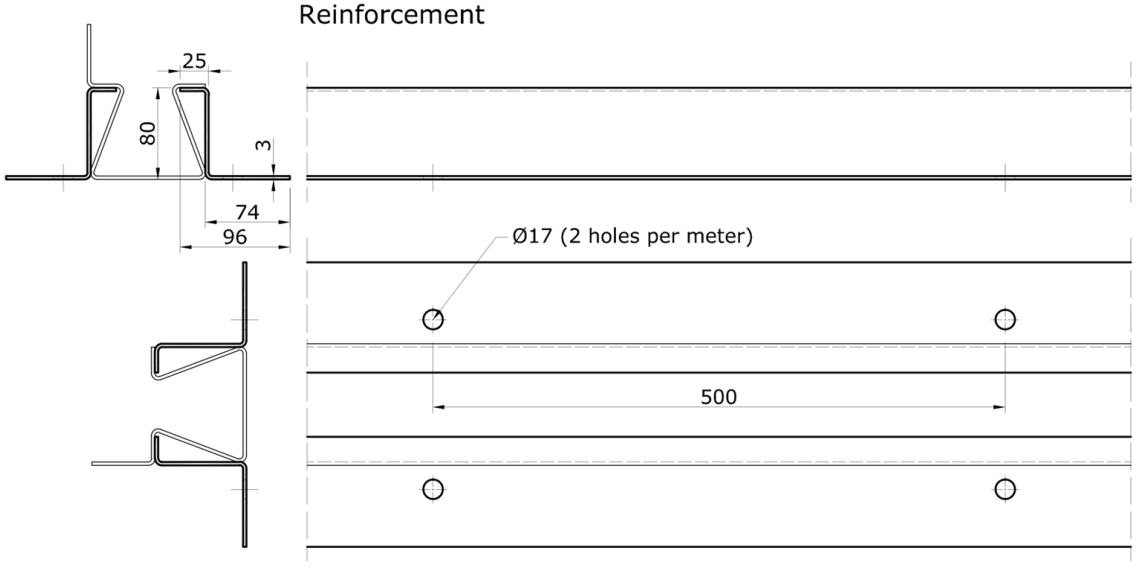
Double flap



Single flap



Reinforcement



Fasteners for base curbs		
Fastener	**Length min – max**	**Nail type**
Nail 4.0 mm	60 – 100 mm	Ringed shank nails according to EN 14592
Screw 5.0 mm	60 – 70 mm	Self-tapping screws according to EN 14592
GH-Nail 4.0 mm	40 – 100 mm	Ringed shank nails according to ETA-13/0523
GH-Screw 5.0 mm	60 – 70 mm	Self-tapping screws according to ETA-13/0523
In load-carrying-capacities of nailed or screwed connections in Annex B, the capacities calculated from the formulas of Eurocode 5 are used assuming a thick steel plate when calculating the lateral fastener load-carrying-capacity. The load-carrying-capacities of the base curbs have been determined based on the use of connector nails ø 4,0 mm or screws ø 5,0 mm in accordance with the European Technical Assessment of nails and screws. The characteristic withdrawal capacity of the GH nails must be calculated in accordance with ETA-13/0523, paragraph 3.9.1 (head pull-through is not relevant). For GH screws, the lateral load-carrying capacity and the withdrawal capacity must be calculated in accordance with ETA-13/0523, paragraph 3.9.2. For nails and screws of other companies, the formulas in Eurocode 5 or in specific ETA must be used. The shape of the nails or screws directly under the head shall be in the form of a truncated cone with a diameter under the head which fits or exceeds the hole diameter.		

Fasteners for column bases		
Dowels diameter [mm]	**Number of dowels**	**Product type**
12	2	Z101-90x90 / Z101-100x100 / Z101-120x120 / Z101-120x160 / Z101-120x200
16	2	Z101-140x140 / Z101-160x160 / Z101-160x200 / Z101-200x200 / Z101-160x160-P / Z101-200x200-P
12	2	COMP102-90x90 / COMP102-100x100 / COMP102-120x120
16	2	COMP102-160x160 / COMP102-200x200 / COMP102-160x160-P / COMP102-200x200-P / COMP102-140x140
12	2	NEW103-90x90 / NEW103-100x100 / NEW103-120x120
16	2	NEW103-140x140 / NEW103-160x160 / NEW103-200x200 / NEW103-160x160-P / NEW103-200x200-P
10	2	T104-100x100
12	2	T104-120x120
16	2	T104-140x140 / T104-160x160 / T104-200x200
12	3	TL110-120X120 / TL110-140X120 / TL110-160X120 / TL110-200X120
12	8	TL110-120X160 / TL110-140X160 / TL110-160X160 / TL110-200X160 / TL110-160X200 / TL110-200X200 / TL110-240X200 / TL110-280X200
Steel threaded dowels grade S355 (EN 10025) Hole diameter in steel plate: Max. 1 mm larger than the dowel diameter.		

Annex B
Load-carrying-capacities

B.1 Soltech column base "Z101, COMP102, NEW103, T104, TL110, P105"

Dowels must be placed in all the holes of the column base.

Table B1.1: Soltech column bases, characteristic strength valid for timber grade C24.

	$F_{Zt,Rk}$ [kN]		$F_{Zc,Rk}$ [kN]			$F_{X,Rk}$ [kN]		$F_{Y,Rk}$ [kN]		$M_{Y,Rk}$ [kNm]	
Product	**Timber**	**Steel**	**Timber hanging**	**Timber supported**	**Steel**	**Timber**	**Steel**	**Timber**	**Steel**	**Timber**	**Steel**
Z101-90x90	36,1	4,64	36,1	67,2	-	35,4	2,60	-	2,60	X	X
Z101-100x100	36,1	5,11	36,1	67,2	-	35,4	2,86	-	2,86	X	X
Z101-120x120	36,9	5,89	36,9	67,2	-	35,4	3,16	-	3,27	X	X
Z101-120x160	36,9	5,70	36,9	109	-	35,4	3,13	-	4,05	X	X
Z101-120x200	36,9	5,70	36,9	109	-	35,4	3,13	-	4,94	X	X
Z101-140x140	52,2	5,70	52,2	109	-	52,2	3,54	-	3,67	X	X
Z101-160x160	52,2	5,09	52,2	109	-	52,2	3,14	-	3,56	X	X
Z101-160x200	52,2	5,09	52,2	109	-	52,2	3,14	-	4,24	X	X
Z101-200x200	52,2	5,09	52,2	109	-	52,2	3,44	-	3,97	X	X
Z101-160x160-P	59,1	12,0	59,1	109	-	57,6	7,40	-	8,39	X	X
Z101-200x200-P	60,2	11,8	60,2	109	-	57,6	7,90	-	9,23	X	X
COMP102-90x120	36,1	5,58	36,1	67,2	-	35,4	3,13	-	1,47	X	X
COMP102-100x120	36,1	6,34	36,1	67,2	-	35,4	3,55	-	1,62	X	X
COMP102-120x120	36,9	6,58	36,9	67,2	-	35,4	3,71	-	2,14	X	X
COMP102-140x160	52,2	7,16	52,2	109	-	52,2	4,45	-	3,26	X	X
COMP102-160x160	52,2	5,82	52,2	109	-	52,2	3,69	-	2,11	X	X
COMP102-200x200	53,3	5,66	53,3	109	-	52,2	3,98	-	2,39	X	X
COMP102-160x160-P	59,1	13,7	59,1	109	-	57,6	8,72	-	4,99	X	X
COMP102-200x200-P	60,2	13,1	60,2	109	-	57,6	9,19	-	5,52	X	X
NEW103-90x120	36,1	5,57	36,1	67,2	-	35,4	1,23	-	1,25	X	X
NEW103-100x120	36,1	5,51	36,1	67,2	-	35,4	1,35	-	1,37	X	X
NEW103-120x120	36,9	5,31	36,9	67,2	-	35,4	0,97	-	1,42	X	X
NEW103-140x160	52,2	5,31	52,2	109	-	52,2	1,35	-	1,82	X	X
NEW103-160x160	52,2	5,92	52,2	109	-	52,2	1,58	-	2,22	X	X
NEW103-200x200	53,3	4,76	53,3	109	-	52,2	1,56	-	1,82	X	X
NEW103-160x160-P	59,1	13,3	59,1	109	-	57,6	3,56	-	5,03	X	X
NEW103-200x200-P	60,2	10,7	60,2	109	-	57,6	3,50	-	4,13	X	X
T104-100x100	26,3	10,0	26,3	79,0	-	25,0	2,31	-	1,24	X	X
T104-120x120	38,7	14,8	38,7	77,3	-	34,4	3,69	-	1,96	X	X
T104-140x140	57,7	15,7	57,7	94,1	-	53,5	4,40	-	2,69	X	X
T104-160x160	61,3	12,0	61,3	111	-	56,2	4,50	-	3,53	X	X
T104-200x200	69,3	12,6	69,3	111	-	62,3	4,65	-	5,56	X	X
TL110-120X120	47,5	5,88	47,5	-	-	52,0	1,40	-	1,72	X	X
TL110-140X120	51,4	5,88	51,4	-	-	55,1	1,40	-	1,72	X	X
TL110-160X120	55,8	5,88	55,8	-	-	58,6	1,40	-	1,72	X	X
TL110-200X120	60,2	5,88	60,2	-	-	66,5	1,40	-	1,72	X	X
TL110-120X160	123	5,54	123	-	-	139	1,54	-	1,76	3,69	0,27
TL110-140X160	133	5,54	133	-	-	147	1,54	-	1,76	3,92	0,27
TL110-160X160	145	5,54	145	-	-	156	1,54	-	1,76	4,17	0,27
TL110-200X160	156	5,54	156	-	-	177	1,54	-	1,76	4,72	0,27
TL110-160X200	145	5,33	145	-	-	156	1,55	-	1,94	4,30	0,32

	$F_{Zt,Rk}$ [kN]		$F_{Zc,Rk}$ [kN]			$F_{X,Rk}$ [kN]		$F_{Y,Rk}$ [kN]		$M_{Y,Rk}$ [kNm]	
Product	**Timber**	**Steel**	**Timber hanging**	**Timber supported**	**Steel**	**Timber**	**Steel**	**Timber**	**Steel**	**Timber**	**Steel**
TL110-200X200	156	5,33	156	-	-	177	1,55	-	1,94	4,87	0,32
TL110-240X200	156	5,33	156	-	-	189	1,55	-	1,94	5,20	0,32
TL110-280X200	156	5,33	156	-	-	189	1,55	-	1,94	5,20	0,32
TL110-120X120-S	47,5	52,9	47,5	-	-	52,0	12,6	-	15,5	X	X
TL110-140X120-S	51,4	52,9	51,4	-	-	55,1	12,6	-	15,5	X	X
TL110-160X120-S	55,8	52,9	55,8	-	-	58,6	12,6	-	15,5	X	X
TL110-200X120-S	60,2	52,9	60,2	-	-	66,5	12,6	-	15,5	X	X
TL110-120X160-S	123	49,9	123	-	-	139	13,8	-	15,8	3,69	2,42
TL110-140X160-S	133	49,9	133	-	-	147	13,8	-	15,8	3,92	2,42
TL110-160X160-S	145	49,9	145	-	-	156	13,8	-	15,8	4,17	2,42
TL110-200X160-S	156	49,9	156	-	-	177	13,8	-	15,8	4,72	2,42
TL110-160X200-S	145	48,0	145	-	-	156	13,9	-	17,4	4,30	2,85
TL110-200X200-S	156	48,0	156	-	-	177	13,9	-	17,4	4,87	2,85
TL110-240X200-S	156	48,0	156	-	-	189	13,9	-	17,4	5,20	2,85
TL110-280X200-S	156	48,0	156	-	-	189	13,9	-	17,4	5,20	2,85
P105 - Ø16 H_W=100	X	X	X	134	25,6	X	X	X	X	X	X
P105 - Ø16 H_W=150	X	X	X	134	36,3	X	X	X	X	X	X
P105 - Ø16 H_W=200	X	X	X	134	46,4	X	X	X	X	X	X
P105 - Ø20 H_W=100	X	X	X	134	49,7	X	X	X	X	X	X
P105 - Ø20 H_W=150	X	X	X	134	63,3	X	X	X	X	X	X
P105 - Ø20 H_W=200	X	X	X	134	75,2	X	X	X	X	X	X

Timber Characteristic strength, timber side,

Steel Characteristic strength, steel side;

Hanging Assembly of the timber column held by dowels, not in contact with the base plate;

Supported Assembly of the timber column mounted on the base plate on a shim (steel support);

$F_{Zt,Rk}$ Characteristic axial tensile strength;

$F_{Zc,Rk}$ Characteristic axial compressive strength;

$F_{X,Rk,}$ Characteristic shear strength in X direction;

$F_{Y,Rk}$ Characteristic shear strength in Y direction;

$M_{Y,Rk}$ Characteristic strength to bending moment around Y axis;

H_{wood} Length of threaded rod inserted in the timber column;

X Equal to zero;

- Not determinant.

Table B1.2: Soltech column bases, characteristic strength valid for other timber classes (different from C24).

	$F_{Zt,Rk}$		$F_{Zc,Rk}$			$F_{X,Rk}$		$F_{Y,Rk}$		$M_{Y,Rk}$	
	Timber	**Steel**	**Timber hanging**	**Timber supported**	**Steel**	**Timber**	**Steel**	**Timber**	**Steel**	**Timber**	**Steel**
	a1		**a1**	**a2**		**b1**				**q1**	
Z101-90x90	3,50	(*)	3,50	3,20	-	4,00	(*)	-	(*)	X	X
Z101-100x100	3,50	(*)	3,50	3,20	-	4,00	(*)	-	(*)	X	X
Z101-120x120	3,50	(*)	3,50	3,20	-	4,00	(*)	-	(*)	X	X
Z101-120x160	3,25	(*)	3,25	5,20	-	4,00	(*)	-	(*)	X	X
Z101-120x200	3,25	(*)	3,25	5,20	-	4,00	(*)	-	(*)	X	X
Z101-140x140	3,25	(*)	3,25	5,20	-	4,00	(*)	-	(*)	X	X
Z101-160x160	3,25	(*)	3,25	5,20	-	4,00	(*)	-	(*)	X	X
Z101-160x200	3,25	(*)	3,25	5,20	-	4,00	(*)	-	(*)	X	X
Z101-200x200	3,32	(*)	3,32	5,20	-	4,00	(*)	-	(*)	X	X
Z101-160x160-P	3,42	(*)	3,42	3,20	-	4,00	(*)	-	(*)	X	X
Z101-200x200-P	3,42	(*)	3,42	3,20	-	4,00	(*)	-	(*)	X	X
COMP102-90x120	3,50	(*)	3,50	3,20	-	4,00	(*)	-	(*)	X	X
COMP102-100x120	3,25	(*)	3,25	5,20	-	4,00	(*)	-	(*)	X	X
COMP102-120x120	3,25	(*)	3,25	5,20	-	4,00	(*)	-	(*)	X	X
COMP102-140x160	3,32	(*)	3,32	5,20	-	4,00	(*)	-	(*)	X	X
COMP102-160x160	3,25	(*)	3,25	5,20	-	4,00	(*)	-	(*)	X	X
COMP102-200x200	3,32	(*)	3,32	5,20	-	4,00	(*)	-	(*)	X	X
COMP102-160x160-P	3,42	(*)	3,42	3,20	-	4,00	(*)	-	(*)	X	X
COMP102-200x200-P	3,42	(*)	3,42	3,20	-	4,00	(*)	-	(*)	X	X
NEW103-90x90	3,50	(*)	3,50	3,20	-	4,00	(*)	-	(*)	X	X
NEW103-100x100	3,25	(*)	3,25	5,20	-	4,00	(*)	-	(*)	X	X
NEW103-120x120	3,25	(*)	3,25	5,20	-	4,00	(*)	-	(*)	X	X
NEW103-140x140	3,32	(*)	3,32	5,20	-	4,00	(*)	-	(*)	X	X
NEW103-160x160	3,25	(*)	3,25	5,20	-	4,00	(*)	-	(*)	X	X
NEW103-200x200	3,32	(*)	3,32	0,00	-	4,00	(*)	-	(*)	X	X
NEW103-160x160-P	3,31	(*)	3,31	3,76	-	4,00	(*)	-	(*)	X	X
NEW103-200x200-P	3,50	(*)	3,50	3,68	-	4,00	(*)	-	(*)	X	X
T104-100x100	3,25	(*)	3,25	4,48	-	4,00	(*)	-	(*)	X	X
T104-120x120	3,25	(*)	3,25	5,28	-	4,00	(*)	-	(*)	X	X
T104-140x140	3,25	(*)	3,25	5,28	-	4,00	(*)	-	(*)	X	X
T104-160x160	4,23	(*)	4,23		-	6,00	(*)	-	(*)	X	X
T104-200x200	4,23	(*)	4,23		-	6,00	(*)	-	(*)	X	X
TL110-120X120	4,23	(*)	4,23	-	-	6,00	(*)	-	(*)	X	X
TL110-140X120	4,23	(*)	4,23	-	-	6,00	(*)	-	(*)	X	X
TL110-160X120	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,426	(*)
TL110-200X120	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,426	(*)
TL110-120X160	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,426	(*)
TL110-140X160	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,426	(*)
TL110-160X160	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,440	(*)
TL110-200X160	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,440	(*)
TL110-160X200	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,440	(*)
TL110-200X200	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,440	(*)
TL110-240X200	4,23	(*)	4,23		-	6,00	(*)	-	(*)	X	X
TL110-280X200	4,23	(*)	4,23		-	6,00	(*)	-	(*)	X	X
TL110-120X120-S	4,23	(*)	4,23	-	-	6,00	(*)	-	(*)	X	X

	$F_{Zt,Rk}$		$F_{Zc,Rk}$			$F_{X,Rk}$		$F_{Y,Rk}$		$M_{Y,Rk}$	
	Timber	**Steel**	**Timber hanging**	**Timber supported**	**Steel**	**Timber**	**Steel**	**Timber**	**Steel**	**Timber**	**Steel**
	a1		**a1**	**a2**		**b1**				**q1**	
TL110-140X120-S	4,23	(*)	4,23	-	-	6,00	(*)	-	(*)	X	X
TL110-160X120-S	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,426	(*)
TL110-200X120-S	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,426	(*)
TL110-120X160-S	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,426	(*)
TL110-140X160-S	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,426	(*)
TL110-160X160-S	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,440	(*)
TL110-200X160-S	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,440	(*)
TL110-160X200-S	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,440	(*)
TL110-200X200-S	10,98	(*)	10,98	-	-	16,0	(*)	-	(*)	0,440	(*)
TL110-240X200-S	X	X	X	6,40	(*)	X	X	X	X	X	X
TL110-280X200-S	X	X	X	6,40	(*)	X	X	X	X	X	X
P105 - Ø16 H_W=100	X	X	X	6,40	(*)	X	X	X	X	X	X
P105 - Ø16 H_W=150	X	X	X	6,40	(*)	X	X	X	X	X	X
P105 - Ø16 H_W=200	X	X	X	6,40	(*)	X	X	X	X	X	X
P105 - Ø20 H_W=100	3,50	(*)	3,50	3,20	-	4,00	(*)	-	(*)	X	X
P105 - Ø20 H_W=150	3,50	(*)	3,50	3,20	-	4,00	(*)	-	(*)	X	X
P105 - Ø20 H_W=200	3,50	(*)	3,50	3,20	-	4,00	(*)	-	(*)	X	X

$F_{Zt,Rk,T} = F_{Zc,Rk,T} = \alpha_1 \cdot F_{V,Rk}$

$F_{V,Rk}$ characteristic lateral load-carrying capacity per shear plane per fastener parallel to the grain according to Eurocode 5 §8.2.3.

$F_{Zc,Rk,T} = \alpha_2 \cdot f_{c,0,k}$ [kN]

$f_{c,0,k}$ characteristic strength in compression parallel to the grain in N/mm^2

$F_{X,Rk,T} = \beta_1 \cdot F_{V,Rk}$

$F_{V,Rk}$ characteristic lateral load-carrying capacity per shear plane per fastener perpendicular to the grain according to Eurocode 5 §8.2.3.

$M_{Y,Rk,T} = F_{V,Rk} \cdot \theta_1$

$F_{V,Rk}$ characteristic lateral load-carrying capacity per shear plane per fastener perpendicular to the grain according to Eurocode 5 §8.2.3.

Timber Characteristic strength, timber side,

Steel Characteristic strength, steel side;

Hanging Assembly of the timber column shel by dowels, not in contact with the base plate;

Supported Assembly of the timber column mounted on the base plate on a shim (steel support);

$F_{Zt,Rk}$ Characteristic axial tensile strength;

$F_{Zc,Rk}$ Characteristic axial compressive strength;

$F_{X,Rk,}$ Characteristic shear strength in X direction;

$F_{Y,Rk}$ Characteristic shear strength in Y direction;

$M_{Y,Rk}$ Characteristic strength to bending moment around Y axis;

H_{wood} Length of threaded rod inserted in the timber column;

X Equal to zero;

- Not determinant;

(*) Take the value in Table B1.1

The design load carrying capacities are:

$F_{Zt,Rd} = \min(\frac{F_{Zt,Rk,T} \cdot k_{mod}}{\gamma_{M,T}}; \frac{F_{Zt,Rk,S}}{\gamma_{M,S}})$ **design axial strengt in tension**

$F_{Zc,Rd} = \frac{F_{Zc,Rk,T} \cdot k_{mod}}{\gamma_{M,T}}$ design axial strengt in compression

$F_{Z2,Rd} = \min(F_{Z2,Rd,T}; F_{Z2,Rd,S})$ **design axial strengt in compression for supported column**

$F_{X,Rd,T} = \frac{F_{X,Rk,T} \cdot k_{mod}}{\gamma_{M,T}}$ design shear strength in X direction - timber side

$F_{X,Rd,S} = \frac{F_{X,Rk,S}}{\gamma_{M,s}}$ design shear strength in X direction - steel side

$F_{X,Rd} = \min(F_{X,Rd,T}; F_{X,Rd,S})$ **design shear strength in X direction**

$F_{Y,Rd} = \frac{F_{Y,Rk,S}}{\gamma_{M,s}}$ **design shear strength in Y direction**

$M_{Y,Rd} = \min(\frac{M_{Y,Rk,T} \cdot k_{mod}}{\gamma_{M,T}}; \frac{M_{Y,Rk,S}}{\gamma_{M,s}})$ **design bending moment strength around Y axis**

$g_{M,s}$ partial safety factor for steel

k_{mod}, $g_{M,T}$ modification factor and partial safety factor for connections

If $F_{X,Ed}$, $F_{Y,Ed}$, $F_{Z,Ed}$ and $M_{Y,Ed}$ load the connection simultaneously, the following interaction equation shall be fulfilled:

$$\left(\frac{F_{X,Ed}}{F_{X,Rd}}\right)^2 + \left(\frac{F_{Y,Ed}}{F_{Y,Rd}}\right)^2 + \left(\frac{F_{Z,Ed}}{F_{Z,Rd}}\right)^2 + \left(\frac{M_{Y,Ed}}{M_{Y,Rd}}\right)^2 \leq 1$$

Fx,Ed External shear load in x direction.

FY,Rd External shear load in y direction.

FZ,Rd External axial load (compression or tension).

The stresses on the anchors between the column bases and the concrete must be calculated considering that:

- the axial load acts centred with the support;
- the shear in X direction acts with eccentricity "e_x" with respect to the bottom of the column base;
- the shear in Y direction acts with eccentricity "e_y" with respect to the bottom of the column base.

Table B1.3: Soltech column bases, eccentricity "e_x" and "e_y" of the shear loads with respect to the bottom of the column base.

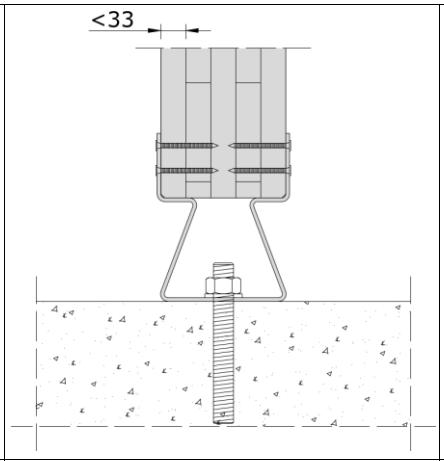
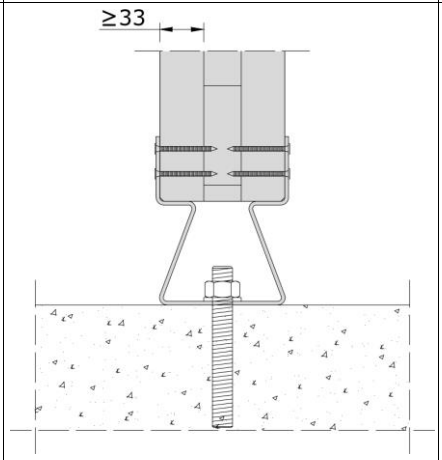
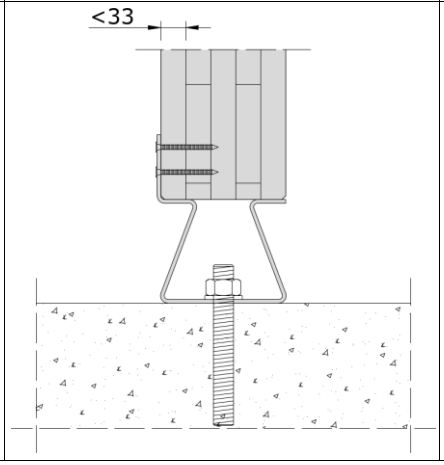
Product	**e_X (mm)**	**e_Y (mm)**
Z101-90x90	125	153
Z101-100x100	125	153
Z101-120x120	140	167
Z101-120x160	140	167
Z101-120x200	140	167
Z101-140x140	140	167
Z101-160x160	170	187
Z101-160x200	170	187
Z101-200x200	185	200
Z101-160x160-P	170	187
Z101-200x200-P	185	200
COMP102-90x120	125	153
COMP102-100x120	125	153
COMP102-120x120	140	167
COMP102-140x160	140	167
COMP102-160x160	170	187
COMP102-200x200	185	200
COMP102-160x160-P	170	187
COMP102-200x200-P	185	200
NEW103-90x90	125	153
NEW103-100x100	125	153
NEW103-120x120	140	167
NEW103-140x140	140	167
NEW103-160x160	170	187
NEW103-200x200	185	200
NEW103-160x160-P	170	187
NEW103-200x200-P	185	200
T104-100x100	130	133
T104-120x120	160	167
T104-140x140	160	167
T104-160x160	160	167
T104-200x200	190	187
TL110-120X120	145	167
TL110-140X120	145	167
TL110-160X120	145	167
TL110-200X120	145	167
TL110-120X160	175	200
TL110-140X160	175	200

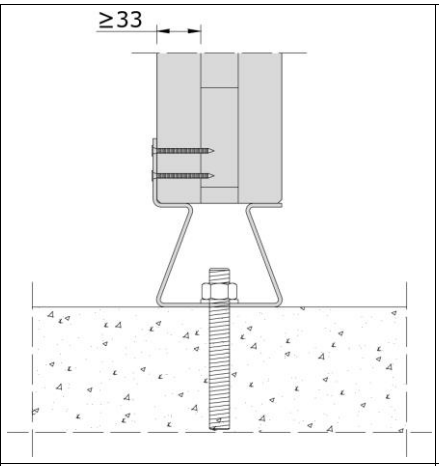
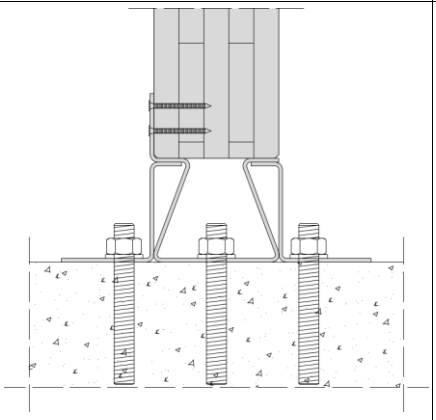
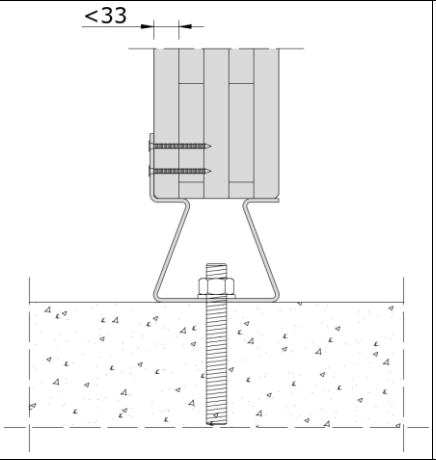
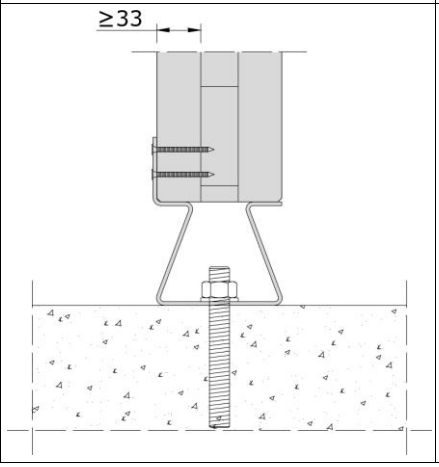
TL110-160X160	175	200
TL110-200X160	175	200
TL110-160X200	205	220
TL110-200X200	205	220
TL110-240X200	205	220
TL110-280X200	205	220

B.2 Soltech base curb "AIRTECH"

The minimum of 25 nails or screws per meter for each flap must be respected; nails or screws should be placed alternately on the upper and lower rows.

Table B2.1: Soltech "**AIRTECH**" base curbs - Shear strength $F_{X,Rk}$ - Shear strength $F_{Y,Rk}$ - Compression strength $F_{Z,Rk}$ - Stiffnesses in compression $K_{ser,z} = K_{u,z}$

Group	*Materials and layout*		*Mechanical properties*
1	3mm thick steel grade **S355** **Double flap** **CLT,** thickness of the outer layer (vertical grain) **< 33mm** **Light-frame and log walls**		**$F_{x,Rk}$ = 2,214 kN for each nail** **$F_{y,Rk}$ = 9,260 kN/m** **$F_{z,Rk}$ =260 kN/m** **$K_{ser,z} = K_{u,z}$ = 175 kN/mm/m**
2	3mm thick steel grade **S355** **Double flap** **CLT,** thickness of the outer layer (vertical grain) **≥ 33mm**		**$F_{x,Rk}$ = 2,214 kN for each nail** **$F_{y,Rk}$ = 9,260 kN/m** **$F_{z,Rk}$ =460 kN/m** **$K_{ser,z} = K_{u,z}$ = 205 kN/mm/m**
3	3mm thick steel grade **S355** **Single flap** **CLT,** thickness of the outer layer (vertical grain) **< 33mm** **Light-frame and log walls**		**$F_{x,Rk}$ = 2,214 kN for each nail** **$F_{y,Rk}$ = 4,630 kN/m** **$F_{z,Rk}$ =210 kN/m** **$K_{ser,z} = K_{u,z}$ = 175 kN/mm/m**

Group	*Materials and layout*		*Mechanical properties*
4	3mm thick steel grade **S355** **Single flap** **CLT,** thickness of the outer layer (vertical grain) **≥ 33mm**		**$F_{x,Rk}$ = 2,214 kN for each nail** **$F_{y,Rk}$ = 4,630 kN/m** **$F_{z,Rk}$ =280 kN/m** **$K_{ser,z}$ = $K_{u,z}$ = 235 kN/mm/m**
5	3mm thick steel grade **S355** **Single flap with bolted reinforcements** **CLT, any thickness** of the outer layer (vertical grain) **Light-frame and log walls**		**$F_{x,Rk}$ = 2,214 kN for each nail** **$F_{y,Rk}$ = 4,630 kN/m** **$F_{z,Rk}$ =750 kN/m** **$K_{ser,z}$ = $K_{u,z}$ = 360 kN/mm/m**
6	3mm thick **stainless steel** **Single flap** **CLT,** thickness of the outer layer (vertical grain) **< 33mm** **Light-frame and log walls**		**$F_{x,Rk}$ = 2,214 kN for each nail** **$F_{y,Rk}$ = 2,870 kN/m** **$F_{z,Rk}$ =180 kN/m** **$K_{ser,z}$ = $K_{u,z}$ = 100 kN/mm/m**
7	3mm thick **stainless steel** **Single flap** **CLT,** thickness of the outer layer (vertical grain) **≥ 33mm**		**$F_{x,Rk}$ = 2,214 kN for each nail** **$F_{y,Rk}$ = 2,870 kN/m** **$F_{z,Rk}$ =190 kN/m** **$K_{ser,z}$ = $K_{u,z}$ = 100 kN/mm/m**

The design load carrying capacities are:

for wooden walls with characteristic density rk 350 kg/m^3 :

$$F_{x,Rd} = n_{nails} \cdot \frac{F_{x,Rk} \cdot k_{mod}}{\gamma_{M,T}} \qquad \text{(B.X)}$$

for other characteristic density, the characteristic lateral load carrying capacity of a nail or a screw in single shear Fx,Rk must be calculateted as described in fastener specification.

$$F_{y,Rd} = \frac{F_{y,Rk}}{\gamma_{M,S}} \qquad \text{(B.X)}$$

for wooden walls with mean density rm 420 kg/m^3 or higher:

$$F_{z,Rd} = \frac{F_{z,Rk}}{\gamma_{M,S}} \qquad \text{(B.X)}$$

for wooden walls with mean density of less than rm 420 kg/m^3 (rm in kg/m^3):

$$F_{z,Rd} = \frac{F_{z,Rk}}{\gamma_{M,S}} \cdot \left(\frac{\rho_m}{420}\right)^{1,2} \qquad \text{(B.X)}$$

gM,S	partial safety factor for steel
k_{mod}, gM,T	modification factor and partial safety factor for connections, see Eurocode 5 or national code.
n_{nails}	total numer of nails or screws per meter (≥ 25 per meter for each flap)

The following interaction equation shall be fulfilled:

$$\left(\frac{F_{X,Ed}}{F_{X,Rd}}\right)^2 + \left(\frac{F_{Y,Ed}}{F_{Y,Rd}}\right)^2 + \left(\frac{F_{Z,Ed}}{F_{Z,Rd}}\right)^2 \leq 1 \qquad \text{(B.X)}$$

Fx,Ed	External in plane shear stress.
FY,Rd	External out of plane shear stress.
FZ,Rd	External vertical compression stress.

The stresses on the anchors between the base curbs and the concrete must be calculated considering that:

- the axial load acts centred with the support;
- the shear in X direction and in Y direction acts with eccentricity e=115mm with respect to the bottom of the base curbs