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MEMBER OF EOTA



European Technical Assessment ETA-10/0422 of 08/01/2016

I General Part

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

Trade name of the construction product:

Rotho Blaas GmbH/srl post bases type F10, F20, F30, F40, F50, F60, FD10, FD20, FD30, FD40, FD50, FD60, M10, M20, M30, M50, M60, M70, R10, R20, R30, R40, R50, R60, R70, R80, R90, S10, S20, S30, S40, FI10, FI50, RI40 and MI20

Product family to which the above construction product belongs:

Three-dimensional nailing plate (Post bases for the support of timber columns and posts as load-bearing elements)

Manufacturer:

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Manufacturing plant:

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This European Technical Assessment contains:

52 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:

Guideline for European Technical Approval (ETAG) No. 015 Three Dimensional Nailing Plates, April 2013, used as European Assessment Document (EAD).

This version replaces:

The ETA with the same number issued on 2011-01-11 and expiry on 2016-01-11

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II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product and intended use

Technical description of the product

The Rotho Blas post bases are made of 2.0 mm to 8.0 mm thick steel plates. The post bases are produced of steel grade S235JR according to EN 10025-2:2005-04 with a minimum characteristic yield strength of $R_{eH} = 235 \text{ N/mm}^2$ and a minimum characteristic tensile strength of $R_m = 360 \text{ N/mm}^2$ or of steel grade 1.4301 according to EN 10088-3:2005-09 with a minimum characteristic yield strength of $R_{p0.2} = 190 \text{ N/mm}^2$ and a minimum characteristic tensile strength of $R_m = 500 \text{ N/mm}^2$.

For the connections with metal fasteners bolts $\varnothing 10 \text{ mm}$, screws HBS+/GHS+ 8x60 mm according to EN 14592 and screws HBS+/GHS+ 8x40 mm with minimum characteristic tensile strength of $R_m = 360 \text{ N/mm}^2$ are used. The screws shall be driven into pre-drilled holes according to EN 1995-1-1, 10.4.5. The outer diameter for washers of bolts shall be not less than $3 \cdot d_B$, where d_B is the diameter of the bolts. The thickness shall be not less than $0,3 \cdot d_B$.

For anchorage in the foundation reinforcement bars or steel profiles are used.

Dimensions are shown in Annex A and B.

2 Specification of the intended use in accordance with the applicable EAD

The intended use of the post bases is the support of timber columns and posts as load-bearing elements, 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 static and kinematical behaviour of the timber members or the supports shall be as described in Annex B.

The timber posts may be of solid timber of strength class C20 or better according to EN 338:2003-09. Minimum dimensions for the post have to be considered (Annex A). The end grain of the timber post in general must be plane on the base plate of the post base. Post bases type M20 and M50 have a clearance between the end grain of the timber post and the base plate due to the geometry of

the post bases. In order to avoid fungal attack due to permanent high moisture content, the end grain of timber posts with contact or only a very small distance to the foundation (post bases type F10, F20, F30, F40, FD30, FD50, FD60, M30 and M70) should be protected from humidity by other means.

The maximum distance between the foundation and the base plate of the post base shall in general be 100 mm. For post bases type R20, R30, R40; R50, R60; R80, R90, S10, S20, S30 and RI40 larger distances are allowed.

Annex B states the load-carrying capacities of the post bases for solid timber of strength class C24 according to EN 338:2003-09. Thus, when solid timber of strength class C20 is used, the characteristic load-carrying capacities of timber should be reduced by a factor of 0,9. The design of the connections shall be in accordance with Eurocode 3 and Eurocode 5 or a similar national code. The anchorage of the post base in the foundation (except for type M70) and imperfections exceeding the assumptions in Eurocode 5, 5.4.4 are not part of this ETA.

The post bases are for use in timber structures subject to the service classes 1, 2 and 3 of Eurocode 5 and for connections subject to static or quasi-static loading. The corrosion protection is given by stainless steel or zinc coating with minimum thickness of $55 \mu\text{m}$ according to EN1461, or by equivalent measures. The metal fasteners must also be of stainless steel or have a zinc coating for the intended use in service class 3 of EN 1995-1-1 (zinc coating Fe/Zn 25c according to EN ISO 2081). Galvanic zinc coating Fe/Zn 12c according EN ISO 2081 as well as Z275 galvanized plate according EN 10346:2009 are only suitable for service classes 1 and 2.

The scope of the joist hangers 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)	
Characteristic load-carrying capacity	See Annex B
Stiffness	No performance assessed
Ductility in cyclic testing	No performance assessed
3.2 Safety in case of fire (BWR2)	
Reaction to fire	The post bases are made from steel classified as Euroclass A1 in accordance with EN 13501-1 and EC decision 96/603/EC, amended by EC Decision 2000/605/EC
3.3 Hygiene, health and the environment (BWR3)	
Influence on air quality	The product does not contain/release dangerous substances specified in TR 034, dated March 2012 0**)
3.7 Sustainable use of natural resources (BWR7)	
	No Performance Determined
3.8 General aspects related to the performance of the product	
	The post bases 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 3.9 – 3.12.

**) In addition to the specific clauses relating to dangerous substances contained in this European technical Assessment, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

3.9 Methods of verification

The characteristic load-carrying capacities are based on the characteristic values of the connections with metal fasteners, the steel plates, the timber post and the foundation (only for type M70).

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

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

In the case of foundation failure, the design value shall be calculated according to EN 1997-1 by reducing the characteristic values of the load-carrying capacity with different partial factors.

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

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

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

3.10 Mechanical resistance and stability

See Annex B for the characteristic load-carrying capacity in the different directions F_1 to F_5 for solid timber of strength class C24 according to EN 338:2003-09. Solid timber of strength class C20 may be included by a reducing factor of 0,9 for the characteristic load-carrying capacity of timber. Using the load-carrying capacities of the post bases, the specifications in Annex A must be fulfilled. The end grain of the timber post must in general be plane on the base plate of the post base. Post bases type M20 and M50 have a clearance between the end grain of the timber post and the base plate due to the geometry of the post bases.

The characteristic capacities of the post bases are determined by calculation according to Eurocode 3 and Eurocode 5. They should be used for designs in accordance with Eurocode 3 and Eurocode 5 or a similar national code. For post base type M70 the

characteristic capacities of the foundation are determined by calculation according to Eurocode 7 on condition that following soil characteristics are provided: bulk density $\gamma = 18 \text{ kN/m}^3$, angle of shearing resistance $\varphi = 30^\circ$, cohesion $c = 5 \text{ kN/m}^2$. The characteristic capacities of post bases type R10 and R30 were determined by using test results of Holzforschung Austria.

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

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

No performance has been determined in relation to the anchorage of the post bases in the foundation (except for type M70). 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 lever arms $e_{F2/F3}$ (for load case F_2 / F_3) and $e_{F4/F5}$ (for load case F_4 / F_5) in annex A have to be considered. The lever arm is the distance between the top edge of the foundation and the load.

3.11 Aspects related to the performance of the product

3.11.1 Corrosion protection in service class 1, 2 and 3.

In accordance with ETAG 015 the requirement is a zinc coating weight of min. 275 g/m^2 . In accordance with ETAG 015 the post bases are made from steel grade S235JR according to EN 10025-2:2005-04 with minimum characteristic yield strength of $R_{eH} = 235 \text{ N/mm}^2$ and a minimum characteristic tensile strength of $R_m = 360 \text{ N/mm}^2$ with a zinc coating with minimum thickness of $55 \text{ }\mu\text{m}$ according to EN1461, or by equivalent measures.

3.11.2 Corrosion protection in service class 3

In accordance with ETAG 015 the requirement is a zinc coating of steel post bases is Fe/Zn 25c.

This requirement is fulfilled by post bases with a corrosion protection hot-dip galvanized of approximately $55 \text{ }\mu\text{m}$ according to EN ISO 1461:1999 or stainless steel grade 1.4301 according to EN 10088-3:2005-09 with a minimum characteristic yield strength of $R_{p0,2} = 190 \text{ N/mm}^2$ and a minimum characteristic tensile strength of $R_m = 500 \text{ N/mm}^2$.

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

Rotho Blaas post bases are manufactured in accordance with the provisions of this European Technical Assessment using the manufacturing processes as identified in the inspection of the plant by the notified inspection body and laid down in the technical documentation.

- The timber post
 - shall be restrained against rotation, and supported at the lower and upper end
 - shall be strength class C20 according to EN 338:2009 or better
 - shall be free from wane in the post base
 - must fulfil the requirements regarding minimum dimensions (see Annex A)
 - end grain must in general be plane on the base plate of the post base. post bases type M20 have a clearance between the end grain of the timber post and the base plate of the post base due to the geometry of the post bases
- The actual end bearing capacity of the timber member to be used in conjunction with the post base is 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.
- To provide for constructive wood preservation, appropriate measures should be taken to protect the end grain of timber posts with contact or little distance to the foundation (post bases type F10, F20, F30, F40, FD30, FD50, FD60, M30 and M70).
- There are no specific requirements relating to preparation of the timber members.
- The maximum distance between the foundation and the base plate of the post base shall in general be 100 mm. For post bases type R20, R30, R40; R50, R60; R80, R90, S10, S20, S30 and RI40 larger distances are allowed.
- In case of post base type M70 the characteristic capacities of the foundation are determined by calculation according to Eurocode 7 on condition that following soil characteristics are provided: bulk density $\gamma=18 \text{ kN/m}^3$, angle of shearing resistance $\varphi=30^\circ$, cohesion $c=5 \text{ kN/m}^2$.
- The anchorage of the post base in the foundation – except for post base type M70 - 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 lever arms $e_{F2/F3}$ (for load case F_2 / F_3) and $e_{F4/F5}$ (for load case F_4 / F_5) in Annex A have to be considered. The lever arm is the distance between the top edge of the foundation and the load
 - The secondary structural member – the concrete support - to which the post bases are fixed shall be:
 - Made from concrete of at least strength class C15, unless otherwise is indicated in annex B of this ETA.
 - To ensure sufficient capacity the designer has to take into account splitting of the timber.
 - The timber member shall be free from wane.
 - There shall be no gap between the timber and the horizontal contact area
 - Otherwise the gap between the timber member and the post base may not exceed 3 mm.

4 Attestation and verification of constancy of performance (AVCP)

4.1 AVCP system

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

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

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

Issued in Copenhagen on 2016-01-08 by



Thomas Bruun
Managing Director, ETA-Danmark

Annex A
Product details and definitions

Table A.1 Specifications of the post bases

Post base			Quantity	Metal Fasteners	Post [mm]	Distances [mm]		
Type	Dimension	Art.-Nr.				min b/h	max. a	e _{F2/F3}
F10	71x71	F10_1	1	2x HBS+/GHS+ 8x60mm	71/71	-	77	77
	91x91	F10_2	1	4x HBS+/GHS+ 8x40mm	91/91	-	77	77
F20	81	F20_1	1	4x HBS+/GHS+ 8x40mm	81	-	77	77
	101	F20_2	1	4x HBS+/GHS+ 8x40mm	101	-	77	77
	121	F20_3	1	4x HBS+/GHS+ 8x60mm	121	-	77	77
	141	F20_4	1	4x HBS+/GHS+ 8x60mm	141	-	77	77
F30	71x71	F30_1	1	4x HBS+/GHS+ 8x60mm	71/71	-	122	122
	91x91	F30_2	1	4x HBS+/GHS+ 8x40mm	91/91	-	122	122
F40	71x71	F40_1	1	4x HBS+/GHS+ 8x60mm	71/71	-	122	122
	91x91	F40_2	1	4x HBS+/GHS+ 8x40mm	91/91	-	122	122
F50	101x101	F50_1	1	4x HBS+/GHS+ 8x60mm	101/101	-	83	83
	121x121	F50_2	1	4x HBS+/GHS+ 8x60mm	121/121	-	83	83
	141x141	F50_3	1	4x HBS+/GHS+ 8x60mm	141/141	-	83	83
	161x161	F50_4	1	4x HBS+/GHS+ 8x60mm	161/161	-	108	108
	181x181	F50_5	1	4x HBS+/GHS+ 8x60mm	181/181	-	108	108
	201x201	F50_6	1	4x HBS+/GHS+ 8x60mm	201/201	-	108	108
F60	121x120x150	F60_1	1	4x HBS+/GHS+ 8x60mm	121/120	-	119	84
	141x140x150	F60_2	1	4x HBS+/GHS+ 8x60mm	141/140	-	119	84
	161x160x200	F60_3	1	4x HBS+/GHS+ 8x60mm	161/160	-	119	109
	201x200x200	F60_4	1	4x HBS+/GHS+ 8x60mm	201/200	-	119	109
	161x160x150	F60_5	1	4x HBS+/GHS+ 8x60mm	161/160	-	119	84
	201x200x150	F60_6	1	4x HBS+/GHS+ 8x60mm	201/200	-	119	84
FD10	121x...	FD10_1	2	4x HBS+/GHS+ 8x60mm	121/120	-	108	40
	141x...	FD10_2	2	4x HBS+/GHS+ 8x60mm	141/131	-	108	40
	161x...	FD10_3	2	4x HBS+/GHS+ 8x60mm	161/151	-	108	40
	181x...	FD10_4	2	4x HBS+/GHS+ 8x60mm	181/171	-	108	40
	201x...	FD10_5	2	4x HBS+/GHS+ 8x60mm	201/191	-	108	40
FD20	121x...	FD20_1	2	4x HBS+/GHS+ 8x60mm	121/76	-	94	41
	141x...	FD20_2	2	4x HBS+/GHS+ 8x60mm	141/92	-	94	41
	161x...	FD20_3	2	4x HBS+/GHS+ 8x60mm	161/106	-	94	41
	201x...	FD20_4	2	4x HBS+/GHS+ 8x60mm	201/140	-	94	41
FD30	60x180	FD30_1	2	4x HBS+/GHS+ 8x40mm	80/120	-	-	38
	80x240	FD30_2	2	4x HBS+/GHS+ 8x40mm	80/120	-	-	38
FD30 internal	60x180	FD30_1	2	2x Bo 10mm	80/120	-	-	38
	80x240	FD30_2	2	2x Bo 10mm	80/120	-	-	38
FD40	60x180	FD40_1	2	4x HBS+/GHS+ 8x40mm	80/120	-	-	46
	80x240	FD40_2	2	4x HBS+/GHS+ 8x40mm	80/120	-	-	46
FD40 internal	60x180	FD40_1	2	2x Bo 10mm	80/120	-	-	43
	80x240	FD40_2	2	2x Bo 10mm	80/120	-	-	43
FD50	46x46	FD50_1	2 / 4 ¹⁾	4x HBS+/GHS+ 8x60mm	82/82	-	-	-
	76x76	FD50_2	2 / 4 ¹⁾	4x HBS+/GHS+ 8x60mm	127/127	-	90	90

¹⁾ When 4 angle brackets are used, the characteristic load-carrying capacity may be increased by a factor of 2,0.

Continuation of Table A.1 Specifications of the post bases

Post base		Quantity	Metal Fasteners	Post [mm]	Distances [mm]			
Type	Dimension				Art.-Nr.	min b/h	max. a	eF2/F3
FD60	46x46	FD60_1	2 / 4 ²⁾	4x HBS+/GHS+ 8x60mm	82/82	-	-	-
	76x76	FD60_2	2 / 4 ²⁾	4x HBS+/GHS+ 8x60mm	112/112	-	89	89
M10	71x71	M10_1	1	4x HBS+/GHS+ 8x40mm	71/71	-	45	14
	91x91	M10_2	1	2x HBS+/GHS+ 8x60mm	91/91	-	45	14
M20	71x60	M20_1	1	5x HBS+/GHS+ 8x60mm	71/114	-	139	72
	91x60	M20_2	1	5x HBS+/GHS+ 8x60mm	91/114	-	139	72
	101x146	M20_3	1	5x HBS+/GHS+ 8x60mm	101/114	-	139	72
	121x146	M20_4	1	6x HBS+/GHS+ 8x60mm	121/114	-	139	72
M30	71x50	M30_1	1	2x HBS+/GHS+ 8x60mm	71/80	-	185	30
	81x50	M30_2	1	4x HBS+/GHS+ 8x40mm	81/80	-	185	30
	91x50	M30_3	1	4x HBS+/GHS+ 8x40mm	91/80	-	185	30
	101x50	M30_4	1	4x HBS+/GHS+ 8x40mm	101/80	-	185	30
	121x50	M30_5	1	4x HBS+/GHS+ 8x60mm	121/80	-	185	30
M50	71x150	M50_1	1	5x HBS+/GHS+ 8x60mm	71/114	100	235	77
	91x150	M50_2	1	5x HBS+/GHS+ 8x60mm	91/114	100	235	77
	101x150	M50_3	1	5x HBS+/GHS+ 8x60mm	101/114	100	235	77
	121x150	M50_4	1	6x HBS+/GHS+ 8x60mm	121/114	100	235	77
M60	80x130	M60_1	1	4x Bo 10mm	80/120	100	218	30
M70	71x71	M70_1	1	2x HBS+/GHS+ 8x60mm	71/71	-	-	-
	91x91	M70_2	1	4x HBS+/GHS+ 8x40mm	91/91	-	-	-
	81	M70_3	1	4x HBS+/GHS+ 8x40mm	81	-	-	-
	101	M70_4	1	4x HBS+/GHS+ 8x40mm	101	-	-	-
R10	120x120	R10_1	1	4x HBS+/GHS+ 6x90mm	80/80	136	-	-
	160x160	R10_2	1	4x HBS+/GHS+ 8x100mm	100/100	209	-	-
	200x200	R10_3	1	4x HBS+/GHS+ 8x100mm	140/140	257	-	-
R20	120x120	R20_1	1	4x HBS+/GHS+ 6x90mm	80/80	136	-	-
	160x160	R20_2	1	4x HBS+/GHS+ 8x100mm	100/100	209	-	-
	200x200	R20_3	1	4x HBS+/GHS+ 8x100mm	140/140	257	-	-
R30	120x120	R30_1	1	8x full thread 6x60mm	120/120	155	-	-
	160x160	R30_2	1	16x full thread 6x90mm	160/160	215	-	-
R40	105	R40_1	1	4x HBS+/GHS+ 8x60mm	70 / 70	105	-	-
	97	R40_2	1	4x HBS+/GHS+ 8x60mm	80 / 80	97	-	-
	150	R40_3	1	4x HBS+/GHS+ 8x60mm	100/100	150	-	-
	250	R40_4	1	4x HBS+/GHS+ 8x60mm	100/100	250	-	-
R50	170-285	R50_1	1	2x HBS+/GHS+ 8x60mm	100/100	277	-	-
	110-210	R50_2	1	2x HBS+/GHS+ 8x60mm	100/100	202	-	-
R60	160x100	R60_1	1	4x HBS+/GHS+ 8x60mm	100/100	194	-	-
R70	100x350x20	R70_1	1	4x HBS+/GHS+ 8x60mm	100/100	100	-	-
	140x450x24	R70_2	1	4x HBS+/GHS+ 8x60mm	140/140	100	-	-
	100x350x16	R70_3	1	4x HBS+/GHS+ 8x60mm	100/100	100	-	-

²⁾ When 4 angle brackets are used, the characteristic load-carrying capacities for F₁ (Tension), F₂₃ and F₄₅ may be increased by a factor of 2,0.

Continuation of Table A.1 Specifications of the post bases

Post base			Quantity	Metal Fasteners	Post [mm]	Distances [mm]		
Type	Dimension	Art.-Nr.				min b/h	max. a	eF2/F3
R80	160x100	R80_1	1	2-4x HBS+/GHS+ 8x60mm	80/80	195	-	-
R90	100x100	R90_1	1	4x HBS+/GHS+ 8x60mm	100/100	164	-	-
S10	140	S10_1	1	4x HBS+/GHS+ 8x60mm	140	118	-	-
	140	S10_2	1	4x HBS+/GHS+ 8x60mm	140	153	-	-
S20	160x100	S20_1	1	2x HBS+/GHS+ 8x60mm	100/100	118	-	-
	160x100	S20_2	1	2x HBS+/GHS+ 8x60mm	100/100	153	-	-
S30	100x160	S30_1	1	4x HBS+/GHS+ 8x60mm	100/100	166	-	-
	140x160	S30_2	1	4x HBS+/GHS+ 8x60mm	140/140	168	-	-
	100x120	S30_3	1	4x HBS+/GHS+ 8x60mm	100/100	166	-	-
	140x160	S30_4	1	4x HBS+/GHS+ 8x60mm	140/140	168	-	-
S40	71x60	S40_1	1	5x HBS+/GHS+ 8x60mm	71/98	-	86	-
	91x60	S40_2	1	5x HBS+/GHS+ 8x60mm	91/98	-	86	-
FI10	71x71	FI10_1	1	2x HBS+/GHS+ 8x60mm	71/71	-	107	77
	91x91	FI10_2	1	2x HBS+/GHS+ 8x60mm	91/91	-	107	77
FI50	101x101	FI50_1	1	4x HBS+/GHS+ 8x60mm	101/101	-	83	83
	121x121	FI50_2	1	4x HBS+/GHS+ 8x60mm	121/121	-	83	83
	141x141	FI50_3	1	4x HBS+/GHS+ 8x60mm	141/141	-	83	83
	161x161	FI50_4	1	4x HBS+/GHS+ 8x60mm	161/161	-	108	108
	201x201	FI50_6	1	4x HBS+/GHS+ 8x60mm	201/201	-	108	108
RI40	150	RI40_3	1	4x HBS+/GHS+ 8x60mm	100/100	150	-	-
	250	RI40_4	1	4x HBS+/GHS+ 8x60mm	100/100	250	-	-
MI20	71x60	MI20_1	1	5x HBS+/GHS+ 8x60mm	71/114	-	139	72
	91x60	MI20_2	1	5x HBS+/GHS+ 8x60mm	91/114	-	139	72
	101x60	MI20_3	1	5x HBS+/GHS+ 8x60mm	101/114	-	139	72
	121x60	MI20_4	1	6x HBS+/GHS+ 8x60mm	121/114	-	139	72

Table A.2 Specifications of the metal fasteners according to EN 14592

Fastener type (S235)	Size (mm)			Finish
	Diameter	Length	Thickness	
Screws HBS+/GHS+	8 mm	40/60/100 mm		Galvanic zinc coating
Screws HBS+/GHS+	6 mm	90 mm		Galvanic zinc coating
Screws, full thread	6 mm	60/90 mm		Galvanic zinc coating
Bolts	10 mm			Galvanic zinc coating
Washers	30 mm		3 mm	Galvanic zinc coating

The load-carrying-capacities of the metal fasteners were calculated according to Eurocode 5 for lateral loads. The contribution to the load-carrying capacity due to the rope effect was considered according to Eurocode 5.

Annex B
Characteristic load-carrying capacities

Table B.1 Characteristic load-carrying capacities for post bases in kN

Post Base		F1 (Compression)			F1 (Tension)			F ₂₃			F ₄₅		
Type	Art.Nr.	Timber	Steel		Timber	Steel		Timber	Steel		Timber	Steel	
F10	F10_1	50,8	-	-	6,2	4,3	-	5,0	4,5	-	7,6	9,5	-
	F10_2	84,8	-	-	8,2	3,8	-	9,9	4,7	-	13,3	10,2	-
		γ_m	-	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-
F20	F20_1	17,2	-	-	7,4	4,1	-	6,5	2,4	-	8,1	3,1	-
	F20_2	62,5	-	-	7,4	8,8	-	3,2	6,6	-	12,8	8,4	-
	F20_3	99,1	-	-	11,0	10,0	-	9,9	8,9	-	18,4	11,4	-
	F20_4	142,3	-	-	11,0	11,1	-	9,9	11,5	-	25,3	14,7	-
		γ_m	-	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-
F30	F30_1	50,8	-	-	7,1	6,5	-	7,6	2,9	-	7,6	2,9	-
	F30_2	84,8	-	-	9,5	13,0	-	7,6	2,9	-	7,6	2,9	-
		γ_m	-	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-
F40	F40_1	50,8	-	-	7,1	7,7	-	7,6	5,4	-	7,6	5,4	-
	F40_2	84,8	-	-	9,5	21,8	-	13,3	7,9	-	13,3	7,9	-
		γ_m	-	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-
F50	F50_1	29,4	29,1	-	7,1	-	-	17,2	9,0	-	17,2	9,0	-
	F50_2	33,6	33,3	-	7,1	11,5	-	17,2	8,7	-	17,2	8,7	-
	F50_3	42,0	41,6	-	7,1	-	-	17,2	11,9	-	17,2	11,9	-
	F50_4	42,0	41,6	-	7,1	13,8	-	20,4	10,6	-	20,4	10,6	-
	F50_5	42,0	41,6	-	7,1	16,1	-	20,4	13,9	-	20,4	13,9	-
	F50_6	46,2	45,7	-	7,1	17,3	-	21,0	14,4	-	21,0	14,4	-
		γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-
F60	F60_1	33,6	32,7	-	7,0	34,2	-	17,3	11,7	-	8,7	-	6,8
	F60_2	37,8	36,8	-	7,0	37,6	-	20,6	15,0	-	10,2	-	6,8
	F60_3	42,0	40,8	-	7,0	41,0	-	22,6	16,5	-	11,3	15,2	-
	F60_4	54,6	53,1	-	7,0	24,1	-	22,6	16,5	-	11,3	13,0	-
	F60_5	42,0	40,8	-	7,0	41,0	-	32,9	23,3	-	11,3	-	15,6
	F60_6	54,6	54,4	-	7,0	24,1	-	32,9	23,3	-	11,3	18,4	-
		γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	$\gamma_{m,2}$
FD10	FD10_1	33,6	33,5	-	7,1	4,7	-	20,9	2,6	-	10,2	10,4	-
	FD10_2	37,8	37,6	-	7,1	5,0	-	24,4	3,3	-	11,5	11,4	-
	FD10_3	42,0	41,8	-	7,1	5,6	-	24,4	4,1	-	12,7	12,5	-
	FD10_4	46,2	46,0	-	7,1	6,1	-	24,4	5,0	-	14,0	13,5	-
	FD10_5	54,6	54,4	-	7,1	6,0	-	24,4	6,0	-	15,3	14,0	-
		γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-
FD20	FD20_1	33,6	33,5	-	7,0	11,8	-	22,9	3,7	-	16,1	19,4	-
	FD20_2	37,8	37,6	-	7,0	13,3	-	31,6	4,7	-	17,7	21,4	-
	FD20_3	42,0	41,8	-	7,0	14,6	-	32,9	5,9	-	19,3	23,3	-
	FD20_4	54,6	54,4	-	7,0	17,0	-	27,5	2,6	-	17,0	27,2	-
		γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-

Continuation of Table B.1 Characteristic load-carrying capacities for post bases in kN

Post Base		F1 (Compression)			F1 (Tension)			F23			F45		
Type	Dimension	Timber	Steel		Timber	Steel		Timber	Steel		Timber	Steel	
FD30	FD30_1	77,6	71,9	-	7,0	4,7	-	-	-	-	9,3	3,2	-
	FD30_2	115,8	95,9	-	7,3	3,6	-	-	-	-	9,0	4,0	-
		γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	-	-	-	γ_m	$\gamma_{m,0}$	-
FD30 internal	FD30_1	77,6	12,5	-	13,5	4,7	-	-	-	-	2,1	3,2	-
	FD30_2	115,8	16,7	-	13,5	3,6	-	-	-	-	2,6	4,0	-
		γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	-	-	-	γ_m	$\gamma_{m,0}$	-
FD40	FD40_1	7,0	6,3	-	4,5	6,3	-	-	-	-	8,2	5,0	-
	FD40_2	7,3	8,4	-	9,0	8,4	-	-	-	-	8,6	6,5	-
		γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	-	-	-	γ_m	$\gamma_{m,0}$	-
FD40 internal	FD40_1	19,8	12,5	-	13,5	6,3	-	-	-	-	2,1	5,1	-
	FD40_2	20,7	16,7	-	13,5	8,4	-	-	-	-	2,6	5,2	-
		γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	-	-	-	γ_m	$\gamma_{m,0}$	-
FD50 ¹⁾	FD50_1	69,4	-	-	-	-	-	-	-	-	-	-	-
	FD50_2	203,8	-	-	7,8	10,0	-	-	-	-	-	-	-
		γ_m	-	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-
FD60 ²⁾	FD60_1	75,6	-	-	-	-	-	-	-	-	-	-	-
	FD60_2	263,4	-	-	7,8	17,7	-	-	-	-	-	-	-
		γ_m	-	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-
M10	M10_1	6,1	14,0	-	3,5	10,0	-	7,6	5,9	-	7,6	-	5,8
	M10_2	12,2	14,4	-	7,1	11,5	-	13,0	5,9	-	13,0	-	5,4
		γ_m	$\gamma_{m,1}$	-	γ_m	$\gamma_{m,1}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	$\gamma_{m,2}$
M20	M20_1	7,4	-	8,1	7,4	7,8	8,1	5,5	1,5	-	8,2	3,0	-
	M20_2	7,4	-	8,1	7,4	5,4	8,1	5,5	1,5	-	8,2	3,0	-
	M20_3	7,4	-	8,1	7,4	4,7	8,1	5,5	1,5	-	8,2	3,0	-
	M20_4	7,4	-	8,1	7,4	3,8	8,1	5,5	1,5	-	8,2	3,0	-
		γ_m	-	$\gamma_{m,2}$	γ_m	$\gamma_{m,0}$	$\gamma_{m,2}$	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-
M30	M30_1	89,2	-	-	3,7	12,9	-	2,7	1,2	-	8,5	5,9	-
	M30_2	101,8	-	-	5,1	21,8	-	3,7	1,2	-	9,7	5,6	-
	M30_3	114,4	-	-	5,1	21,8	-	3,7	1,2	-	10,9	5,6	-
	M30_4	127,0	-	-	5,1	21,8	-	3,7	1,2	-	12,1	5,6	-
	M30_5	152,2	-	-	7,4	21,8	-	5,5	1,2	-	14,0	5,9	-
		γ_m	$\gamma_{m,1}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-
M50	M50_1	7,4	7,8	8,5	7,8	7,8	-	5,5	1,8	2,7	8,6	3,3	-
	M50_2	7,4	5,5	8,5	7,8	5,5	-	5,5	1,8	2,7	8,6	3,3	-
	M50_3	7,4	4,8	8,5	7,8	4,8	-	5,5	1,6	2,7	8,6	3,3	-
	M50_4	7,4	3,8	8,5	7,8	3,8	-	5,5	1,2	2,7	8,6	3,3	-
		γ_m	$\gamma_{m,0}$	$\gamma_{m,2}$	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	$\gamma_{m,2}$	γ_m	$\gamma_{m,0}$	-

¹⁾ When 4 angle brackets are used, the characteristic load-carrying capacities may be increased by a factor of 2,0.

²⁾ When 4 angle brackets are used, the characteristic load-carrying capacities for F₁ (Tension), F₂₃ and F₄₅ may be increased by a factor of 2,0.

Continuation of Table B.1 Characteristic load-carrying capacities for post bases in kN

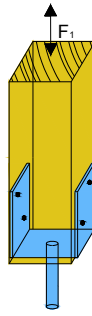
Post Base		F1 (Compression)			F1 (Tension)			F ₂₃			F ₄₅		
Type	Art.-Nr.	Timber	Steel		Timber	Steel		Timber	Steel		Timber	Steel	
M60	M60_1	51,0	55,1	-	26,4	-	65,3	11,8	2,8	3,6	2,2	5,7	-
		γ_m	$\gamma_{m,0}$	-	γ_m	-	$\gamma_{m,2}$	γ_m	$\gamma_{m,0}$	$\gamma_{m,2}$	γ_m	$\gamma_{m,0}$	-
Type	Art.-Nr.	Timber	Steel	Foun.	Timber	Steel	Foun.	Timber	Steel	Foun.	Timber	Steel	Foun.
M70	M70_1	6,1	12,1	1,6	-	-	-	7,6	7,6	5,2	7,6	7,6	5,2
	M70_2	8,6	9,4	3,0	-	-	-	10,1	6,7	9,9	10,1	6,7	9,9
	M70_3	8,1	-	2,3	-	-	-	8,1	6,5	3,3	8,1	6,5	3,3
	M70_4	8,1	-	3,1	-	-	-	10,3	6,9	3,8	10,3	6,9	3,8
		γ_m	$\gamma_{m,2}$	$\gamma_{R,v}$	-	-	-	γ_m	$\gamma_{m,0}$	$\gamma_{R,c}$	γ_m	$\gamma_{m,0}$	$\gamma_{R,c}$
Type	Art.-Nr.	Timber	Steel		Timber	Steel		-	-		-	-	
R10	R10_1	71,2	-	48,3	-	-	-	-	-	-	-	-	-
	R10_2	111,8	-	75,4	-	-	-	-	-	-	-	-	-
	R10_3	222,8	-	108,6	-	-	-	-	-	-	-	-	-
		γ_m	$\gamma_{m,0}$	$\gamma_{m,1}$	-	-	-	-	-	-	-	-	-
R20	R20_1	55,8	-	48,3	-	-	-	-	-	-	-	-	-
	R20_2	90,4	-	75,4	-	-	-	-	-	-	-	-	-
	R20_3	189,0	-	108,6	-	-	-	-	-	-	-	-	-
		γ_m	$\gamma_{m,0}$	$\gamma_{m,1}$	-	-	-	-	-	-	-	-	-
R30	R30_1	-	-	48,3	18,7	24,3	-	-	-	-	-	-	-
	R30_2	-	-	75,4	62,4	36,4	-	-	-	-	-	-	-
		γ_m	$\gamma_{m,0}$	$\gamma_{m,1}$	γ_m	$\gamma_{m,0}$	-	-	-	-	-	-	-
R40	R40_1	50,7	23,3	39,6	-	-	-	-	-	-	-	-	-
	R40_2	64,0	38,1	100,6	-	-	-	-	-	-	-	-	-
	R40_3	99,9	41,9	57,1	-	-	-	-	-	-	-	-	-
	R40_4	100,2	50,7	65,3	-	-	-	-	-	-	-	-	-
		γ_m	$\gamma_{m,0}$	$\gamma_{m,1}$	-	-	-	-	-	-	-	-	-
R50	R50_1	56,5	50,7	88,7	-	-	-	-	-	-	-	-	-
	R50_2	56,5	50,7	92,0	-	-	-	-	-	-	-	-	-
		γ_m	$\gamma_{m,0}$	$\gamma_{m,1}$	-	-	-	-	-	-	-	-	-
R60	R60_1	117,7	66,9	92,9	-	-	-	-	-	-	-	-	-
		γ_m	$\gamma_{m,0}$	$\gamma_{m,1}$	-	-	-	-	-	-	-	-	-
R70	R70_1	108,4	66,9	66,4	-	-	-	-	-	-	-	-	-
	R70_2	210,6	79,5	99,8	-	-	-	-	-	-	-	-	-
	R70_3	106,2	54,0	39,6									
		γ_m	$\gamma_{m,0}$	$\gamma_{m,1}$	-	-	-	-	-	-	-	-	-
R80	R80_1	125,5	69,7	107,7	-	-	-	-	-	-	-	-	-
		γ_m	$\gamma_{m,0}$	$\gamma_{m,1}$	γ_m	$\gamma_{m,0}$	-	-	-	-	-	-	-
R90	R90_1	71,6	42,6	39,7	-	-	-	-	-	-	-	-	-
		γ_m	$\gamma_{m,0}$	$\gamma_{m,1}$	γ_m	$\gamma_{m,0}$	-	-	-	-	-	-	-

Continuation of Table B.1 Characteristic load-carrying capacities for post bases in kN

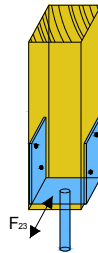
Post Base			F1 (Compression)			F1 (Tension)			F ₂₃			F ₄₅	
Type	Art.-Nr.		Timber	Steel		Timber	Steel		Timber	Steel		Timber	Steel
S10	S10_1		88,3	49,2	-	-	-	-	-	-	-	-	-
	S10_2		88,3	49,2	-	-	-	-	-	-	-	-	-
			γ_m	γ_m	$\gamma_{m,0}$	$\gamma_{m,1}$	-	-	-	-	-	-	-
S20	S20_1		88,3	49,2	-	-	-	-	-	-	-	-	-
	S20_2		88,3	49,2	-	-	-	-	-	-	-	-	-
			γ_m	γ_m	$\gamma_{m,0}$	$\gamma_{m,1}$	-	-	-	-	-	-	-
S30	S30_1		104,8	100,9	-	-	-	-	-	-	-	-	-
	S30_2		214,3	212,2	-	-	-	-	-	-	-	-	-
	S30_3		104,8	100,9	-	-	-	-	-	-	-	-	-
	S30_4		214,3	212,2	-	-	-	-	-	-	-	-	-
			γ_m	γ_m	$\gamma_{m,1}$	-	-	-	-	-	-	-	-
FI10	FI10_1		50,8	-	-	3,5	3,5	-	5,0	3,0	-	7,6	7,7
	FI10_2		84,8	-	-	3,5	3,1	-	5,0	3,7	-	13,0	9,1
			γ_m	$\gamma_{m,1}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$
FI50	FI50_1		29,4	24,0	-	-	-	-	15,5	7,3	-	15,5	7,3
	FI50_2		33,6	26,7	-	7,2	9,3	-	15,5	7,0	-	15,5	7,0
	FI50_3		42,0	33,3	-	7,2	-	-	15,5	10,7	-	15,5	10,7
	FI50_4		42,0	33,3	-	7,2	11,2	-	18,4	8,6	-	18,4	8,6
	FI50_6		46,2	36,7	-	7,2	14,0	-	18,9	13,0	-	18,9	13,0
			γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$	$\gamma_{m,2}$	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$
RI40	RI40_3		99,9	38,8	47,8	-	-	-	-	-	-	-	-
	RI40_4		100,2	47,1	57,0	-	-	-	-	-	-	-	-
			γ_m	$\gamma_{m,0}$	$\gamma_{m,1}$	-	-	-	-	-	-	-	-
MI20	MI20_1		7,4	-	11,2	7,4	6,3	-	5,5	1,2	-	8,2	2,4
	MI20_2		7,4	-	8,1	7,4	4,4	-	5,5	1,2	-	8,2	2,4
	MI20_3		7,4	-	8,1	7,4	3,8	-	5,5	1,2	-	8,2	2,4
	MI20_4		7,4	-	8,1	7,4	3,0	-	5,5	1,2	-	8,2	2,4
			γ_m	-	$\gamma_{m,2}$	γ_m	$\gamma_{m,0}$	$\gamma_{m,2}$	γ_m	$\gamma_{m,0}$	-	γ_m	$\gamma_{m,0}$
Type	Dimension	Angle	Timber	Steel		Timber	Steel		Timber	Steel		-	-
S40	S40_1	0°	7,4	6,6	8,5	7,4	6,6	8,5	5,5	2,1	5,5	-	-
		15°	7,4	3,5	8,1	7,4	3,5	8,1	5,5	1,9	5,0	-	-
		30°	7,4	2,5	6,1	7,4	2,5	6,1	5,5	1,9	4,9	-	-
		45°	7,4	2,1	5,2	7,4	2,1	5,2	5,5	2,1	5,2	-	-
		60°	7,4	1,9	4,9	7,4	1,9	4,9	5,5	2,5	6,1	-	-
	S40_2	0°	7,4	6,6	8,5	7,4	6,6	8,5	5,5	2,1	5,5	-	-
		15°	7,4	3,5	8,1	7,4	3,5	8,1	5,5	1,9	5,0	-	-
		30°	7,4	2,5	6,1	7,4	2,5	6,1	5,5	1,9	4,9	-	-
		45°	7,4	2,1	5,2	7,4	2,1	5,2	5,5	2,1	5,2	-	-
		60°	7,4	1,9	4,9	7,4	1,9	4,9	5,5	2,5	6,1	-	-
				γ_m	$\gamma_{m,0}$	$\gamma_{m,2}$	γ_m	$\gamma_{m,0}$	$\gamma_{m,2}$	γ_m	$\gamma_{m,0}$	$\gamma_{m,2}$	-

Definitions of forces, their directions and eccentricity

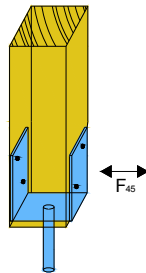
- Force F_1 : tensile or compression load



- Force F_2 / F_3 : horizontal load parallel to the side plates of the post base



- Force F_4 / F_5 : horizontal load perpendicular to the side plates of the post base



Acting forces

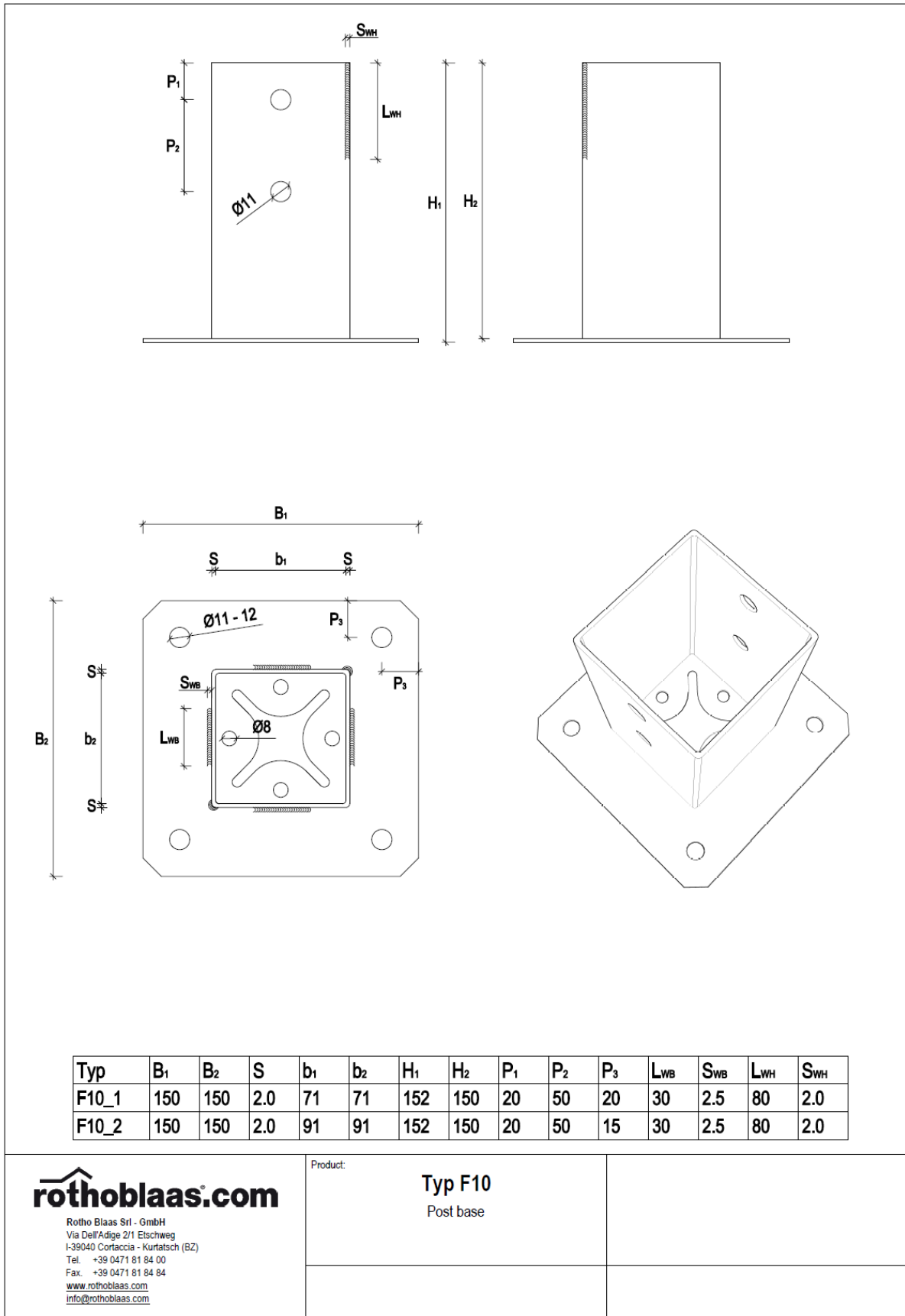
- F_1 axial force (tension or compression) acting along the central axis of the joint
- F_2 and F_3 horizontal force parallel to the side plates of the post base acting with the lever arm e_{F_2/F_3} above the foundation
- F_4 and F_5 horizontal force perpendicular to the side plates of the post base acting with the lever arm e_{F_4/F_5} above the foundation

Combined forces

If the forces F_1 and F_2/F_3 or F_4/F_5 act at the same time, the following inequality shall be fulfilled:

$$\sum \frac{F_{i,d}}{R_{i,d}} \leq 1$$

The forces F_2 and F_3 or F_4 and F_5 are forces with opposite direction. Therefore only one force F_2 or F_3 , and F_4 or F_5 , respectively, is able to act simultaneously with F_1 .

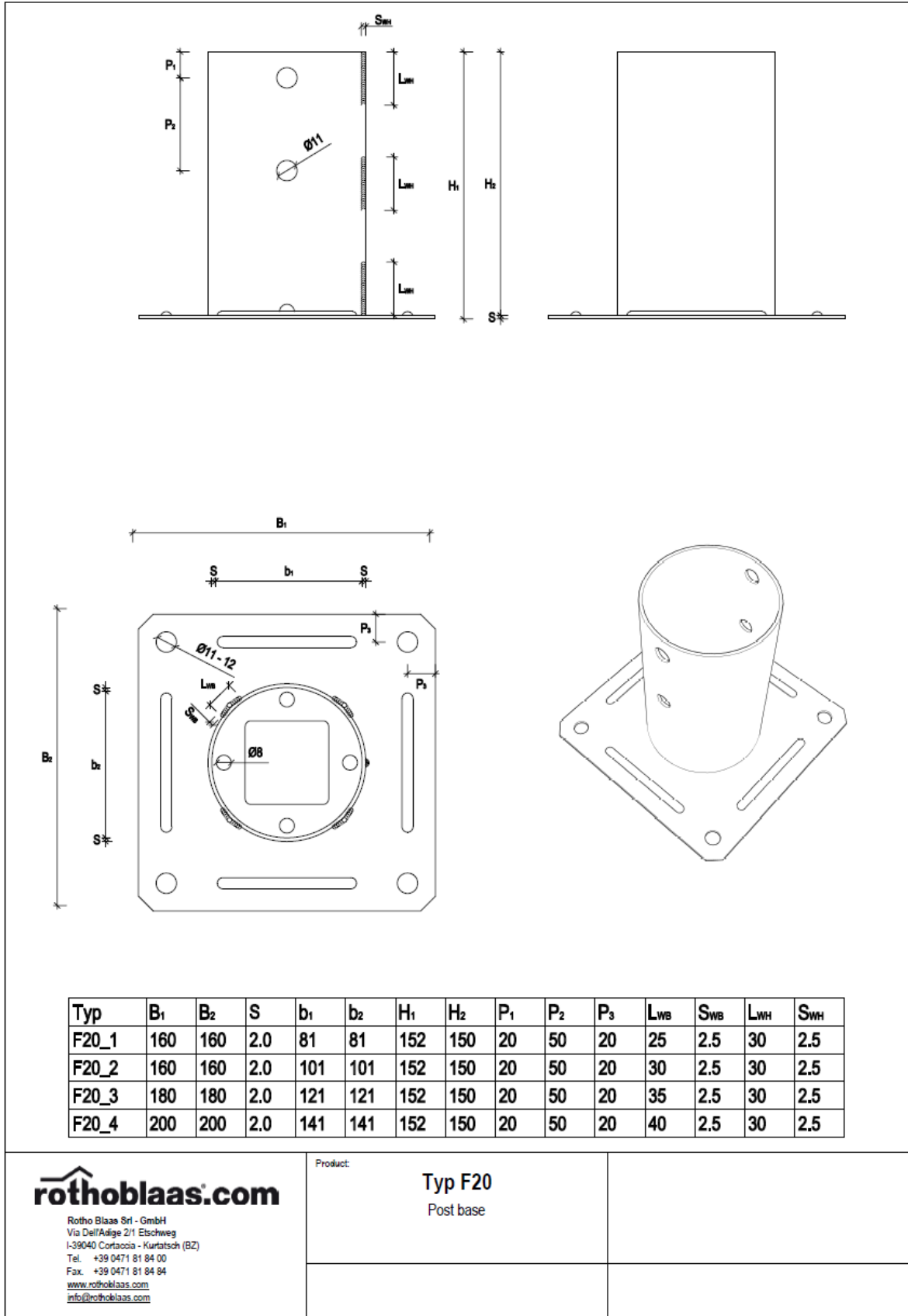


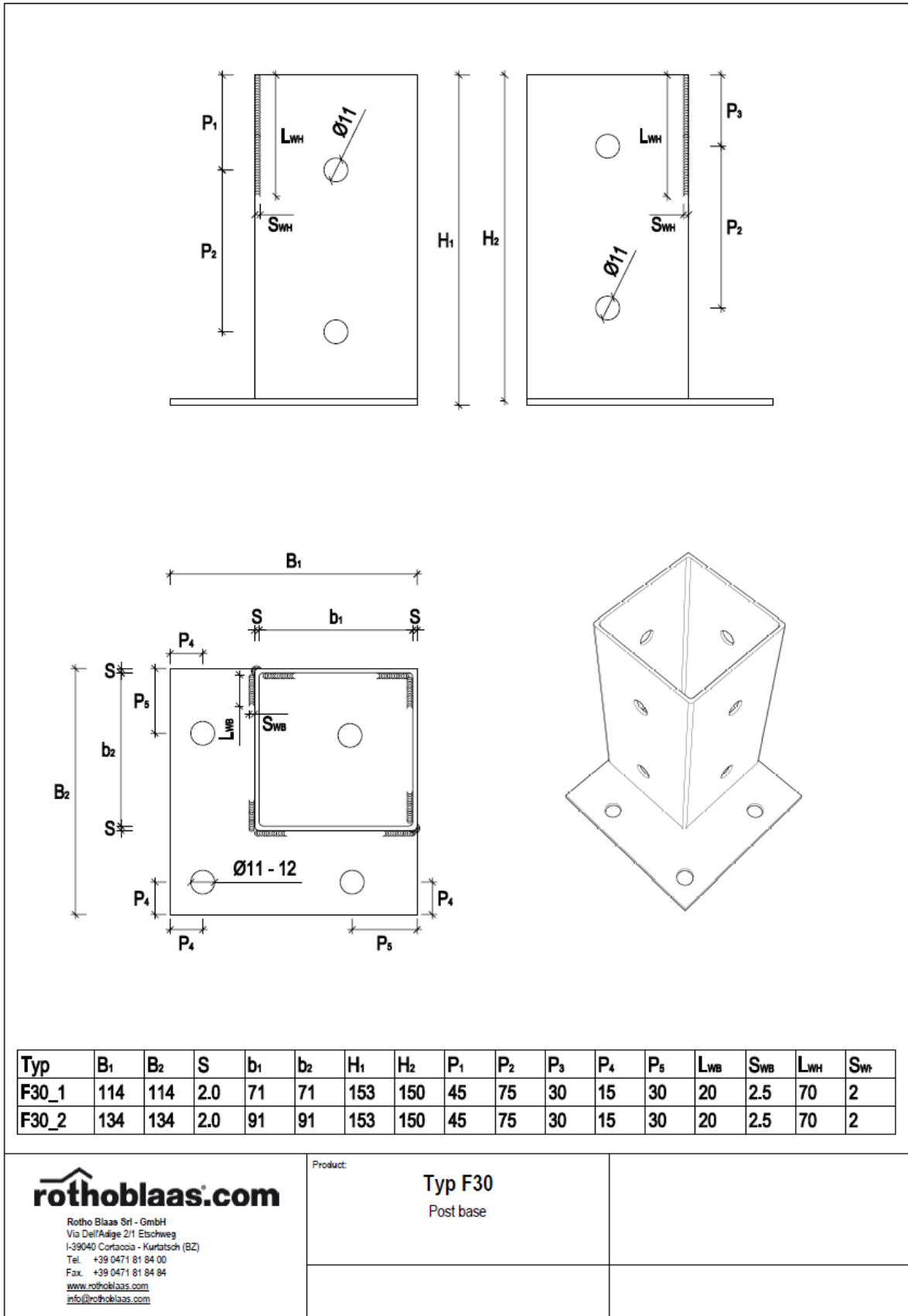
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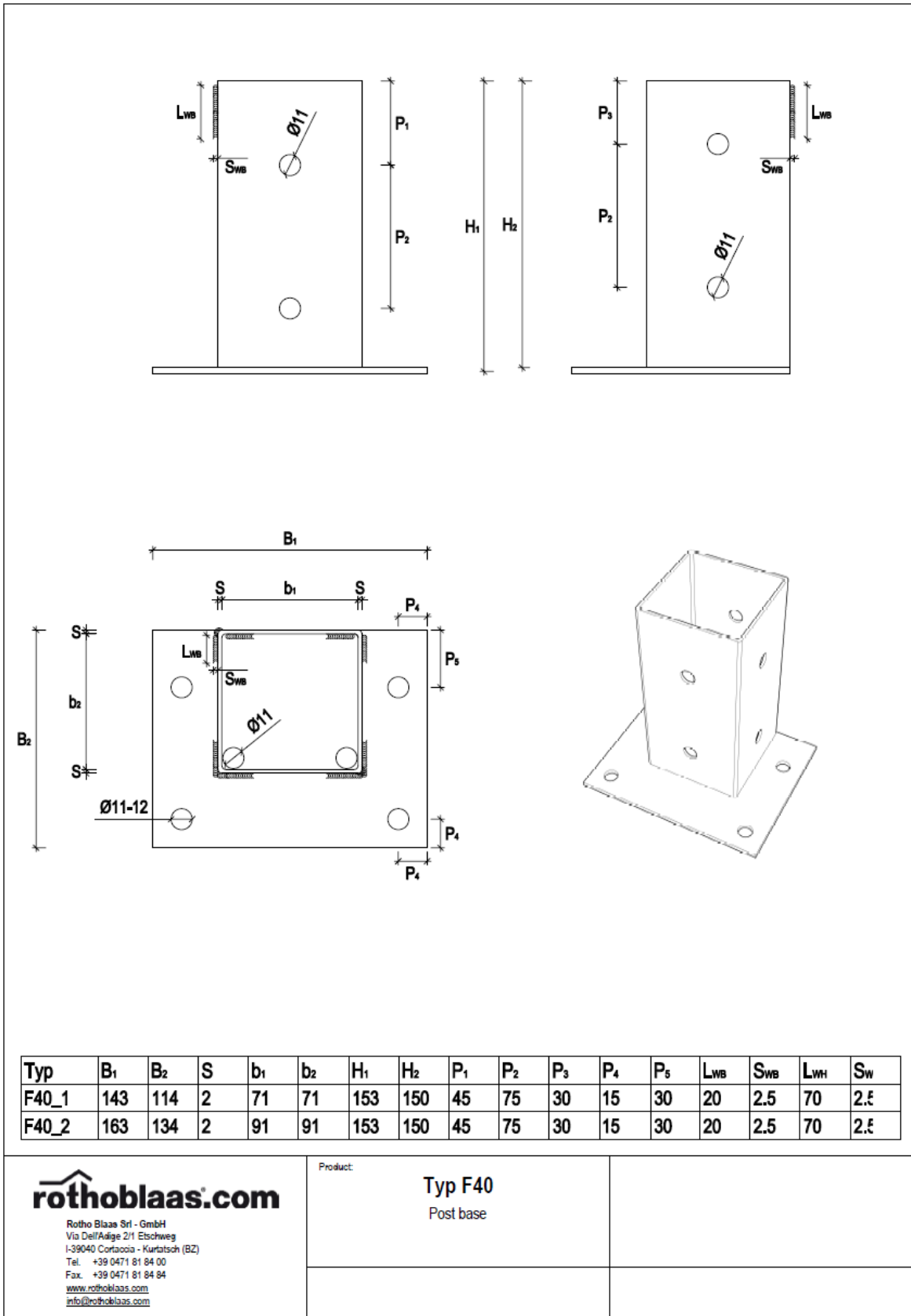
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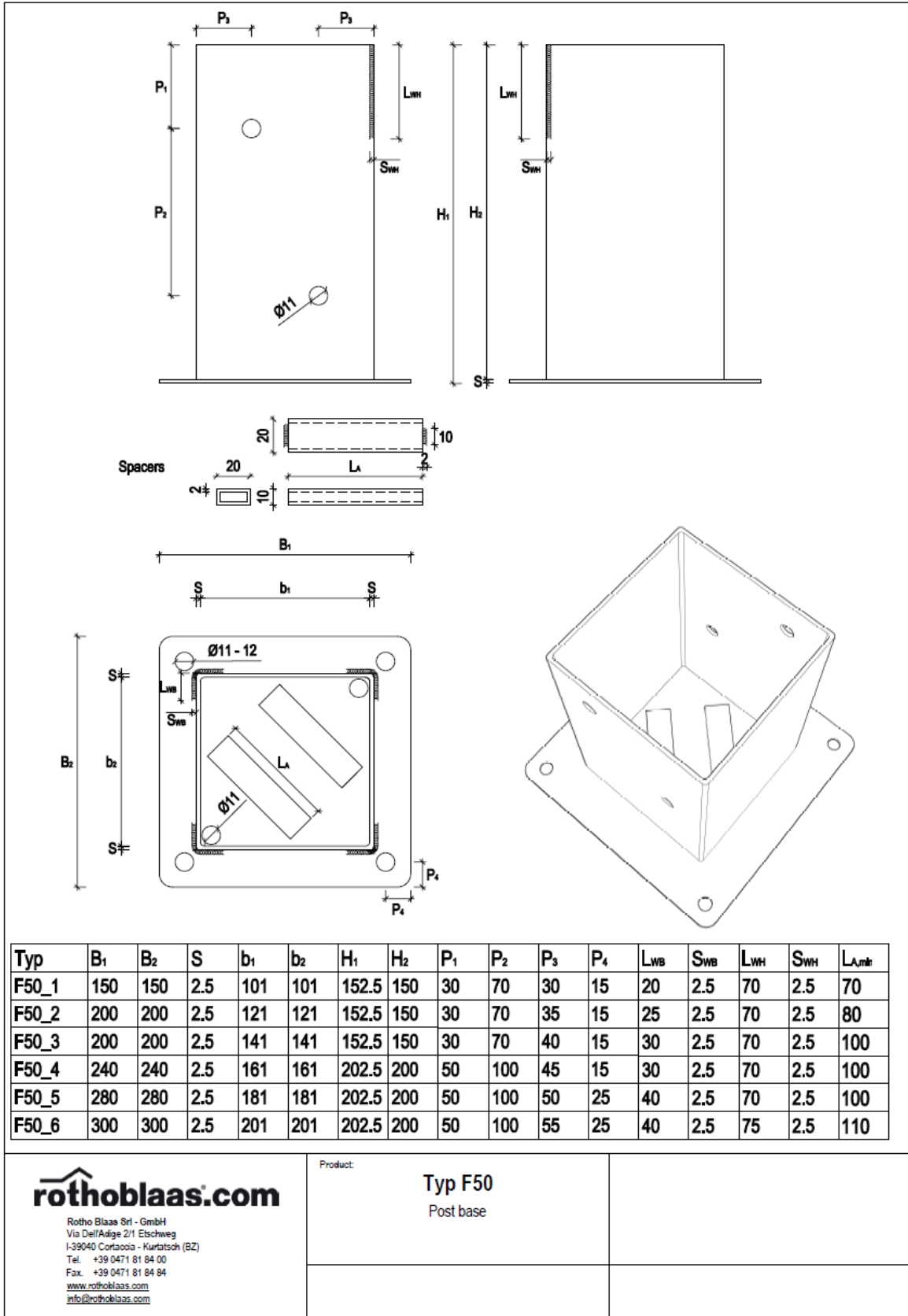
Typ	B_1	B_2	S	b_1	b_2	H_1	H_2	P_1	P_2	P_3	P_4	P_5	L_{WB}	S_{WB}	L_{WH}	S_W
F40_1	143	114	2	71	71	153	150	45	75	30	15	30	20	2.5	70	2.5
F40_2	163	134	2	91	91	153	150	45	75	30	15	30	20	2.5	70	2.5

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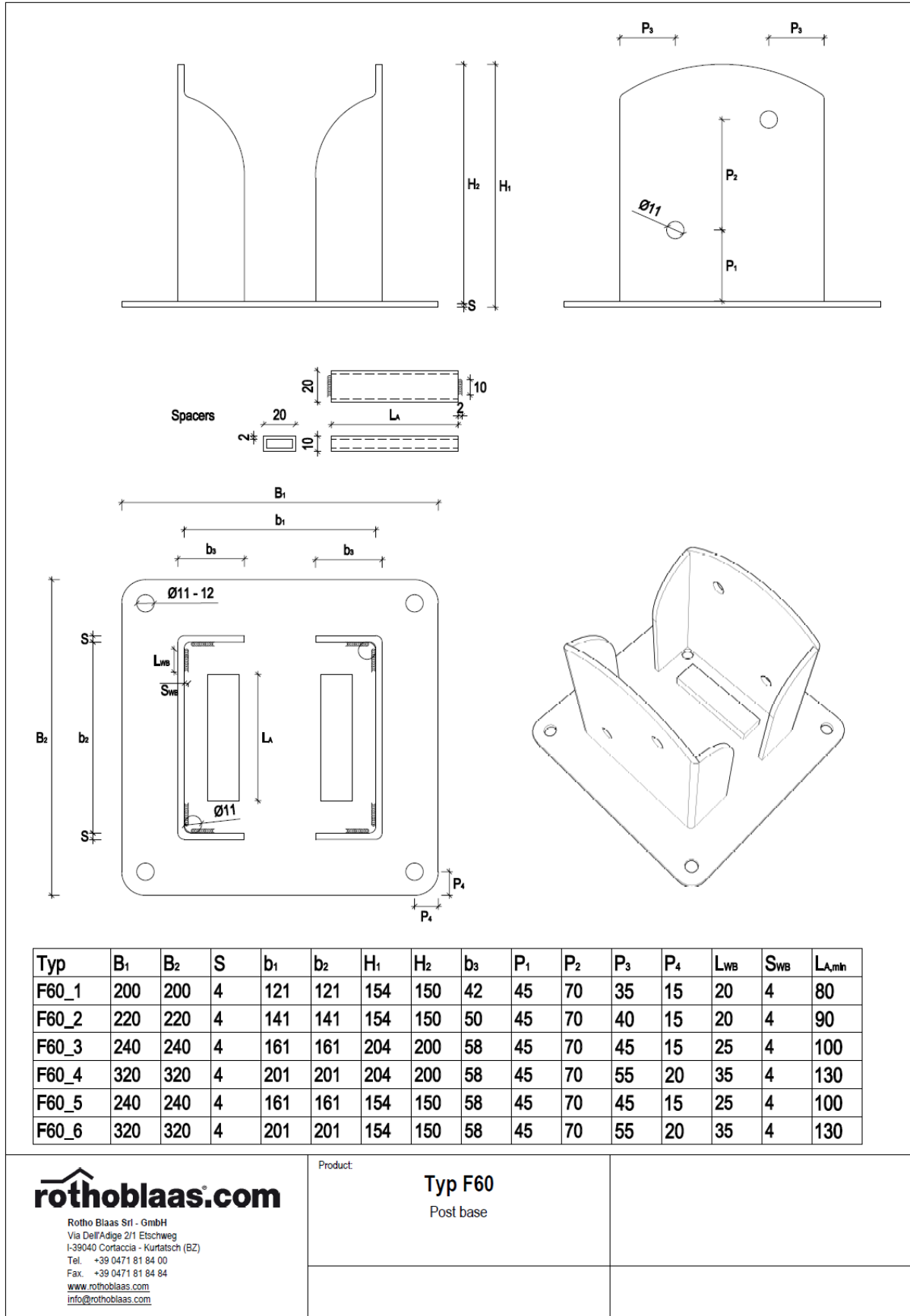


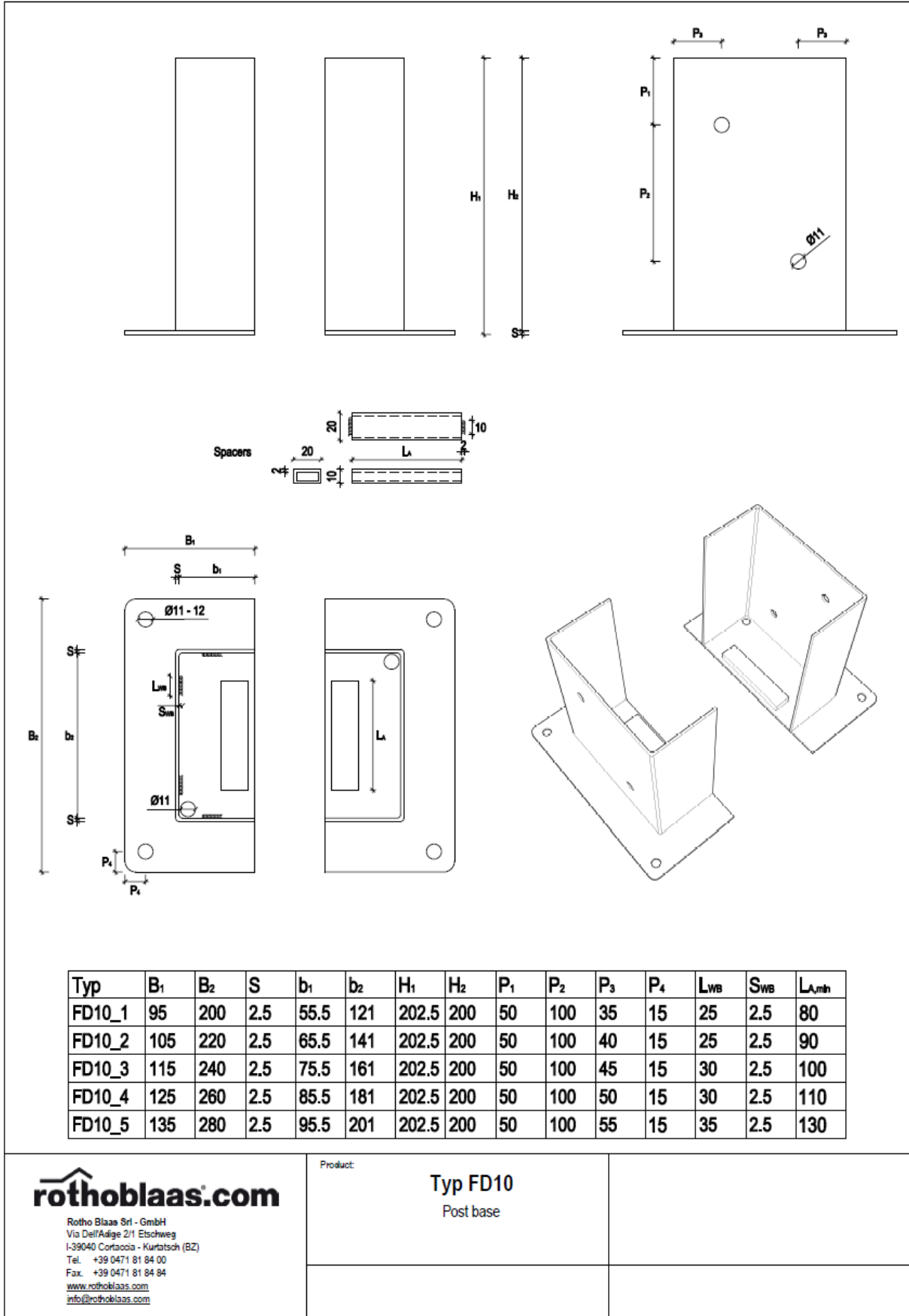
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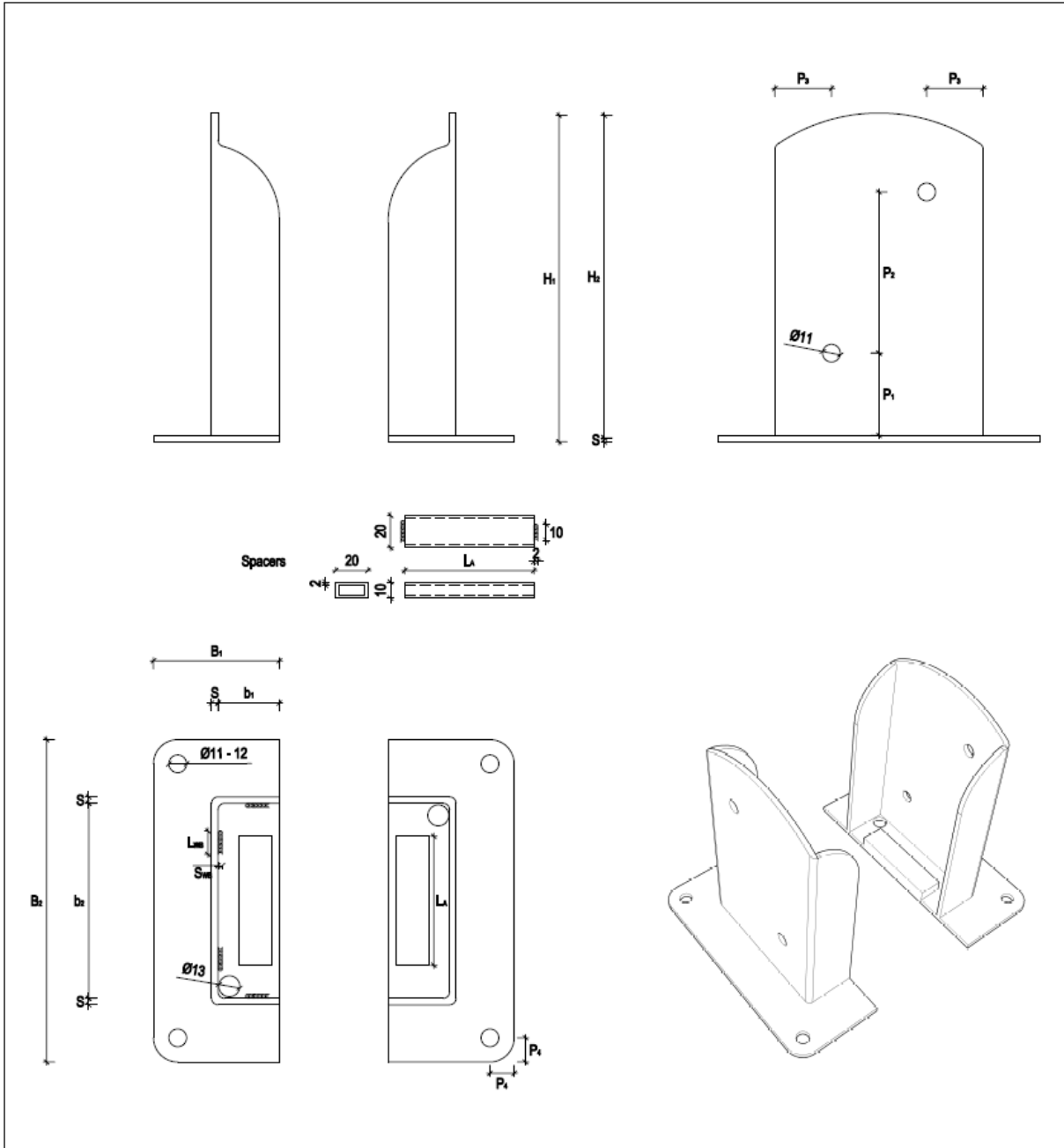
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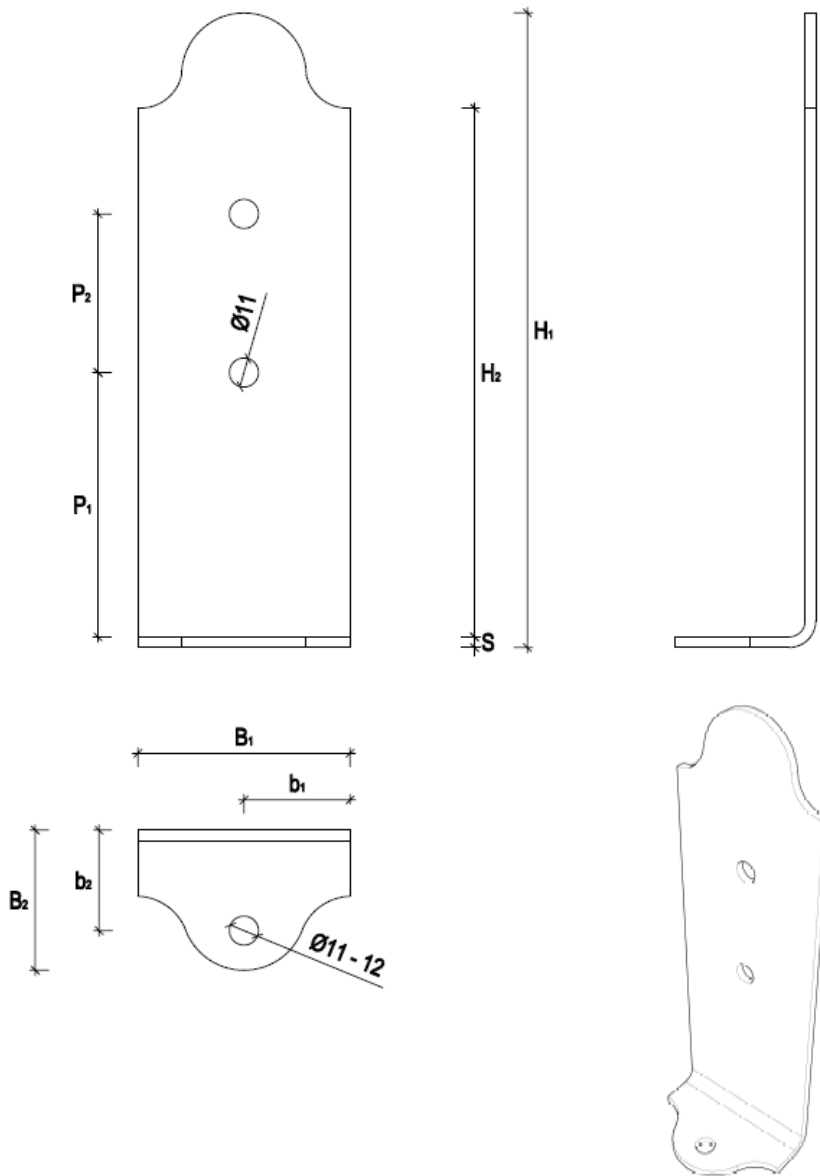
Typ	B ₁	B ₂	S	b ₁	b ₂	H ₁	H ₂	P ₁	P ₂	P ₃	P ₄	L _{WB}	S _{WB}	L _{Umin}
FD20_1	78	200	4	38	121	204	200	50	100	35	15	20	4	80
FD20_2	85	220	4	46	141	204	200	50	100	40	15	25	4	90
FD20_3	92	240	4	54	161	204	200	50	100	45	15	30	4	100
FD20_4	105	280	4	66	201	204	200	50	100	55	15	35	4	130

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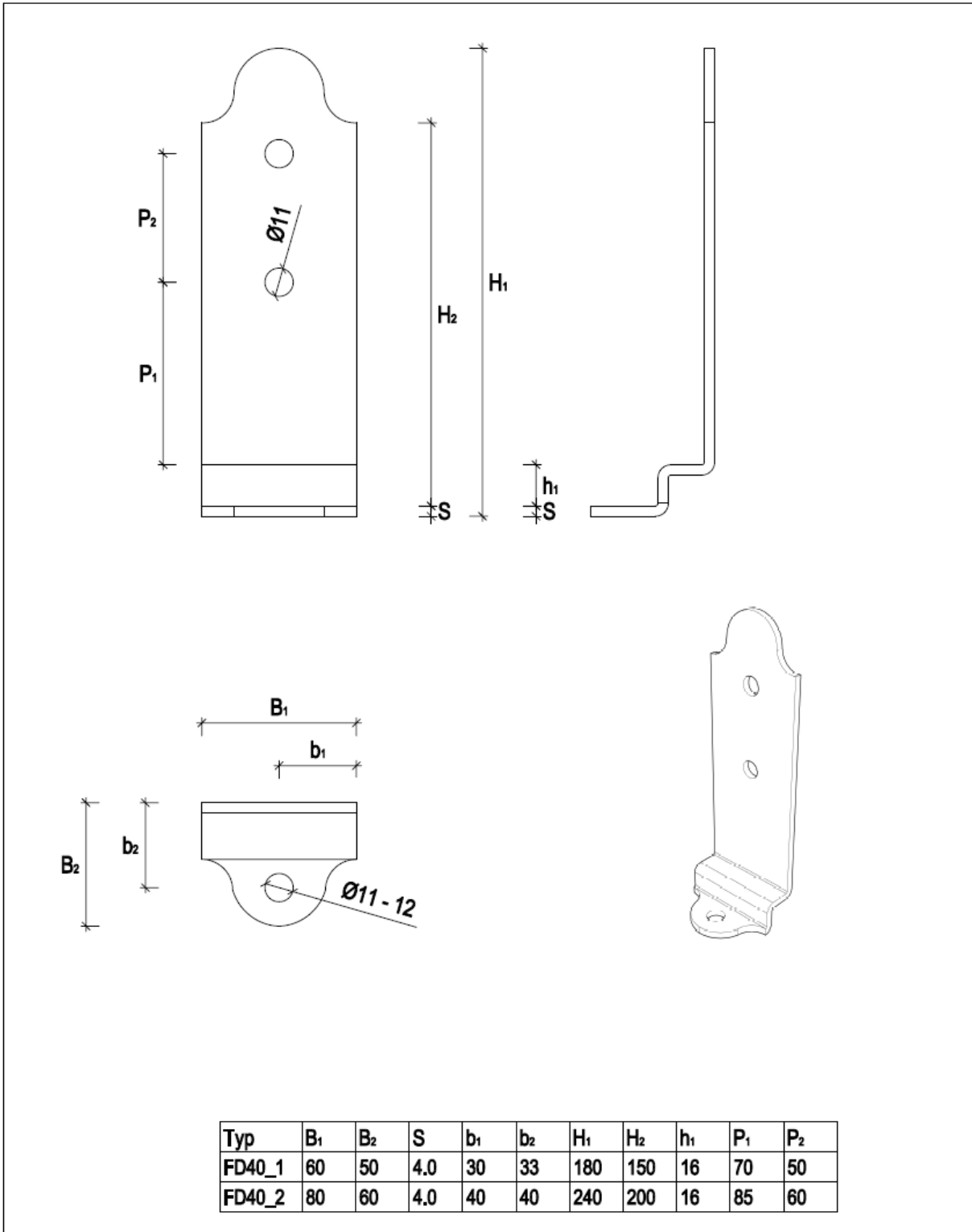
Typ	B ₁	B ₂	S	b ₁	b ₂	H ₁	H ₂	P ₁	P ₂
FD30_1	60	50	4.0	30	30	180	150	85	50
FD30_2	80	50	4.0	40	38	240	200	100	60

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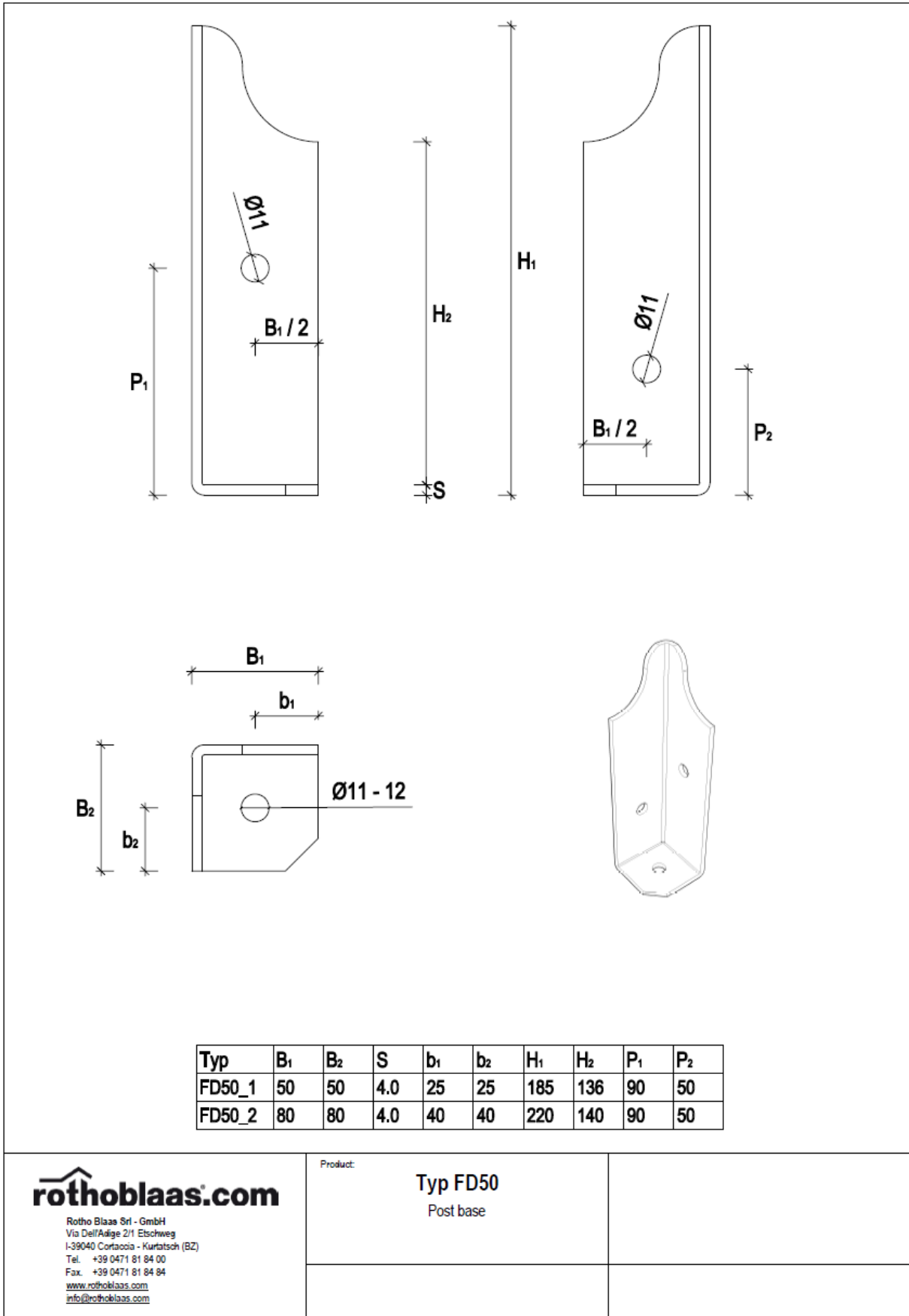


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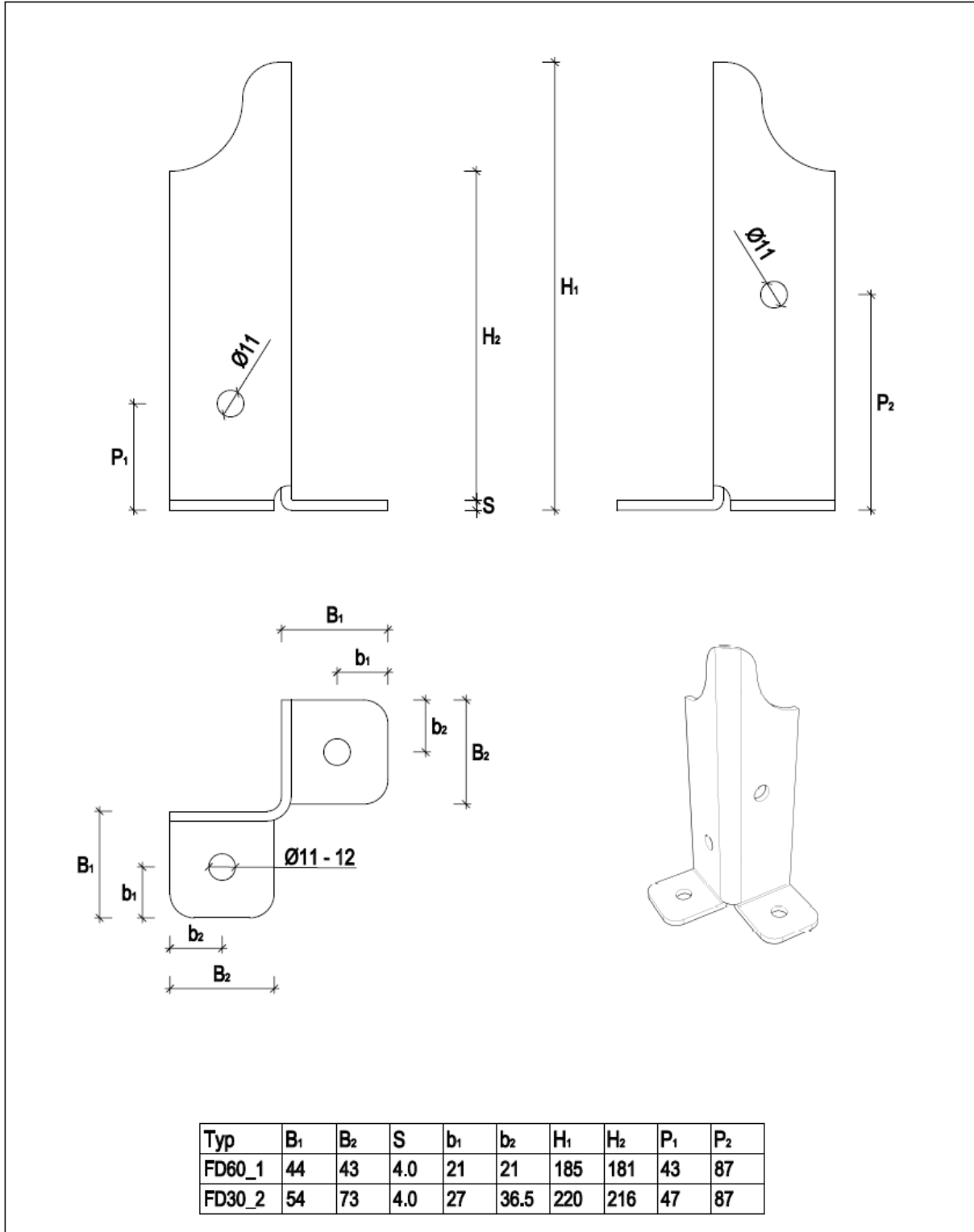



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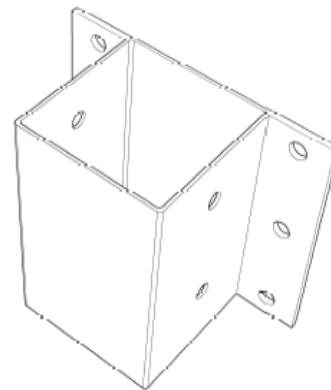
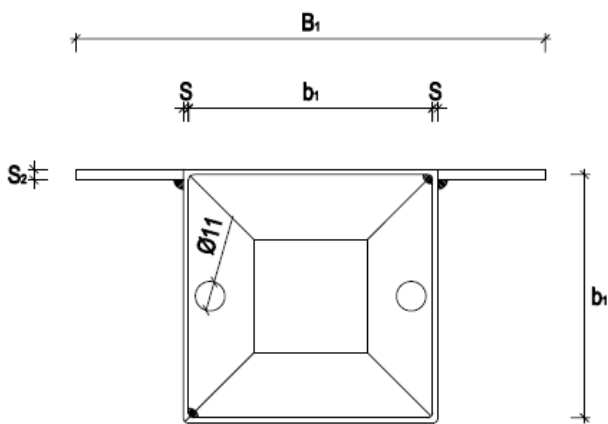
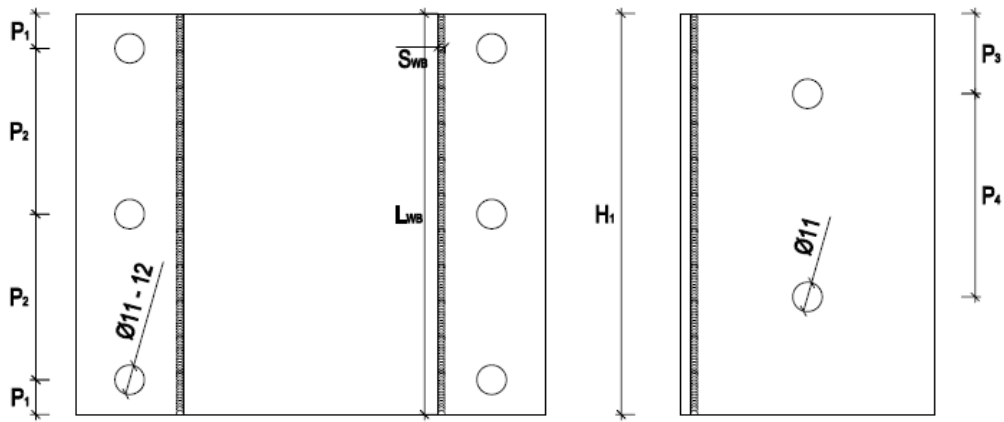
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Typ	B ₁	B ₂	S	b ₁	S ₂	H ₁	H ₂	P ₁	P ₂	P ₃	P ₄	L _{WB}	S _{WB}	L _{WH}	S _{WH}
M10_1	151	-	2	71	4	150	-	15	60	30	75	150	2.5	-	-
M10_2	175	-	2	91	4	150	-	15	60	30	75	150	2.5	-	-

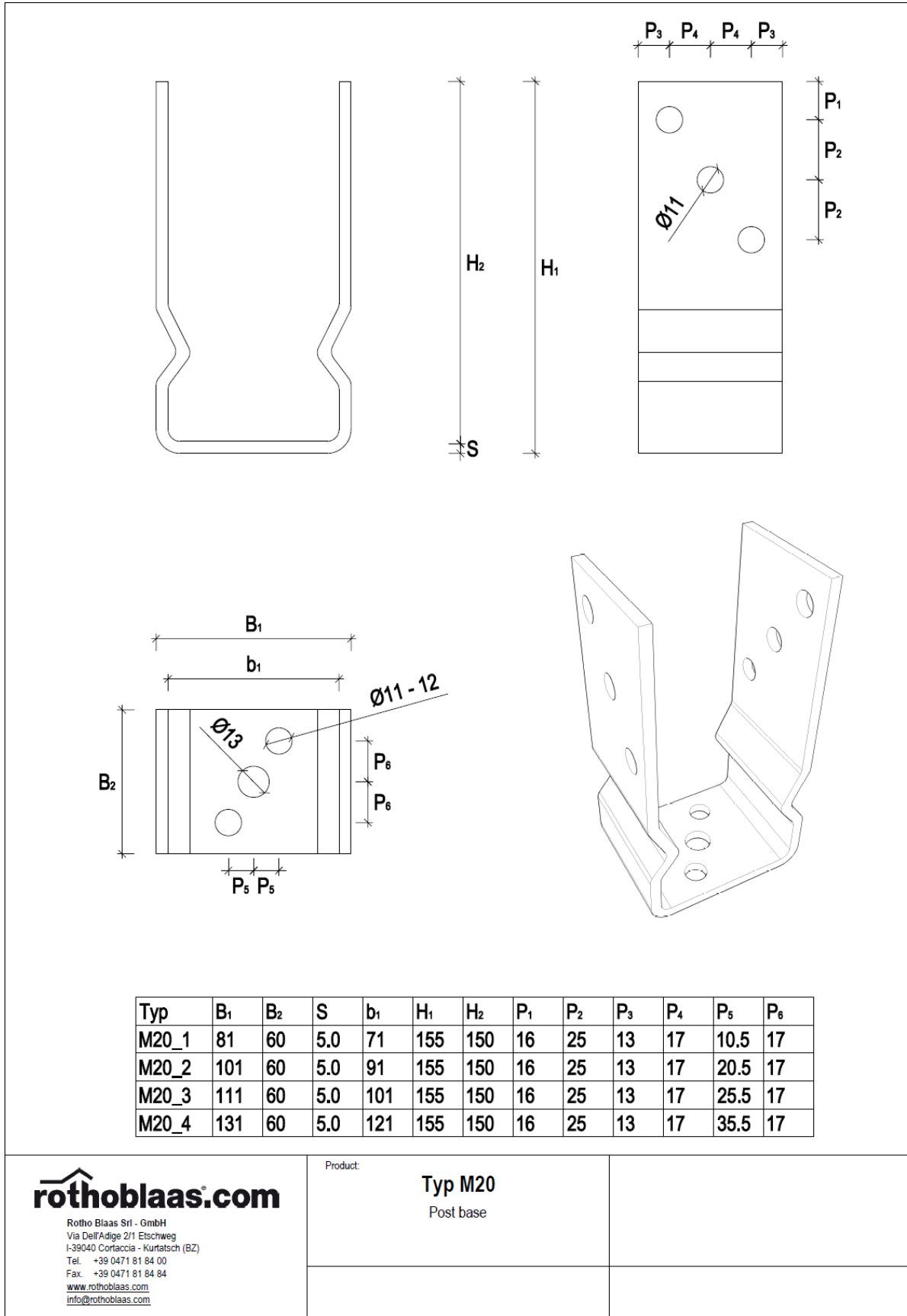
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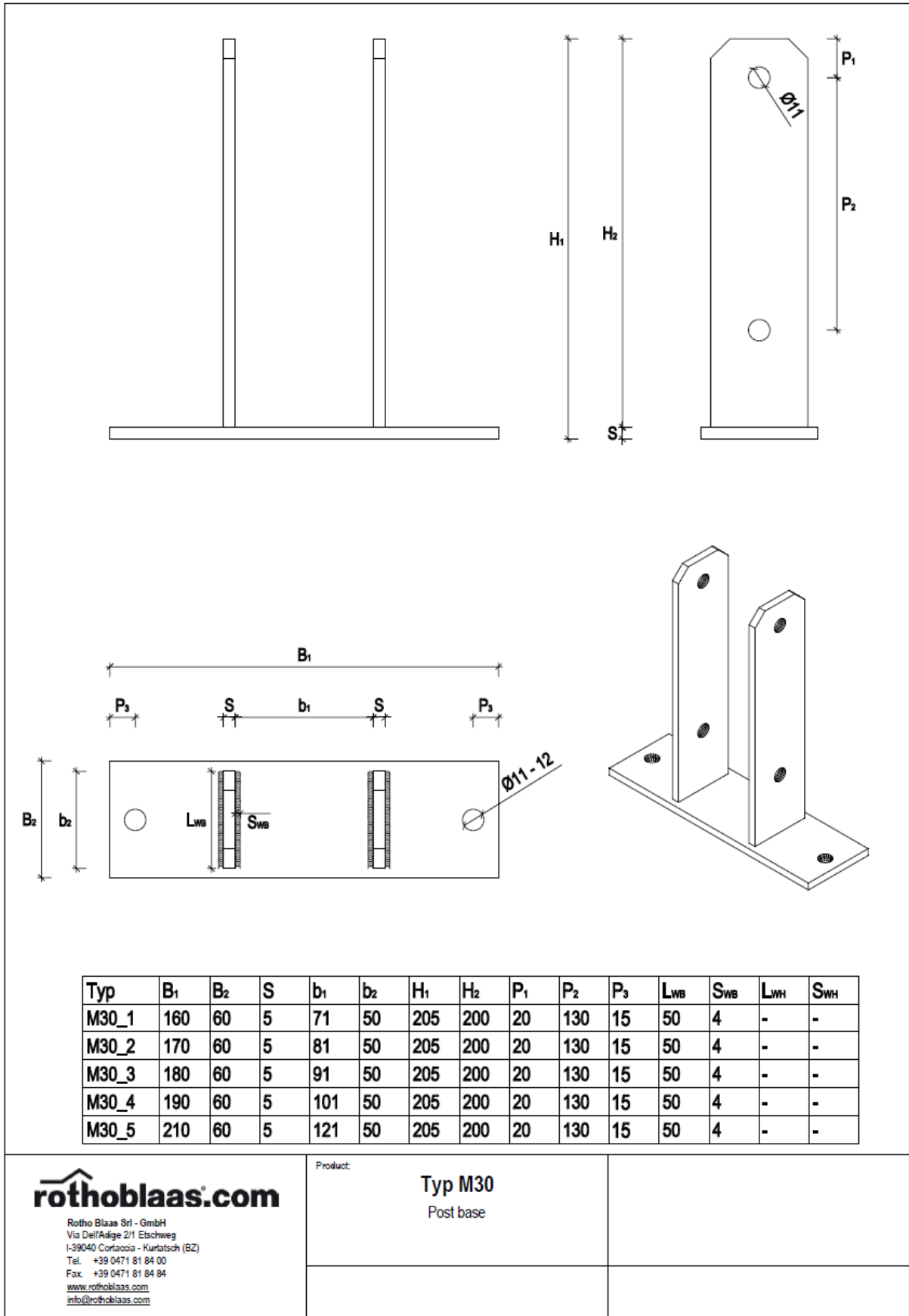
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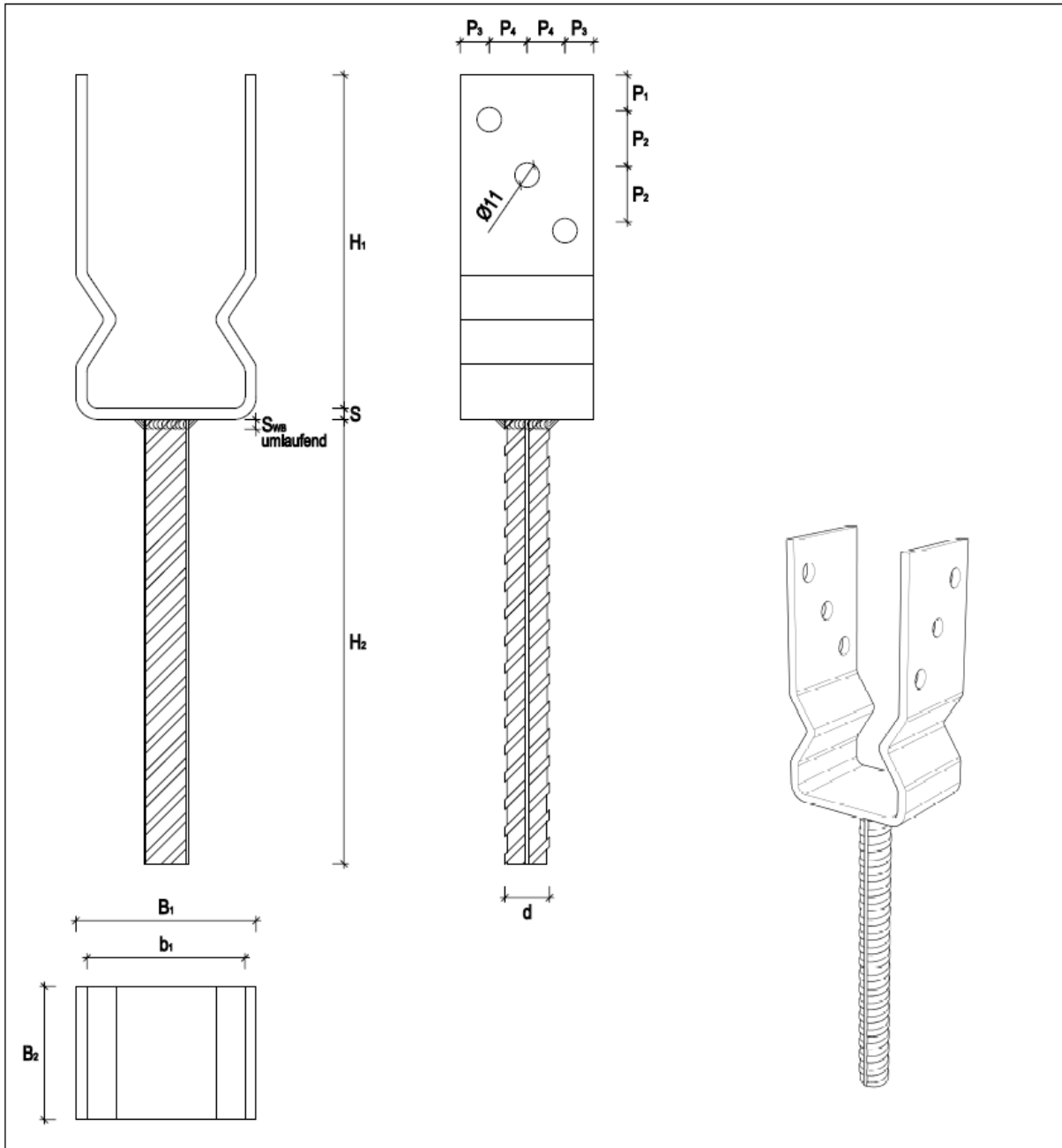


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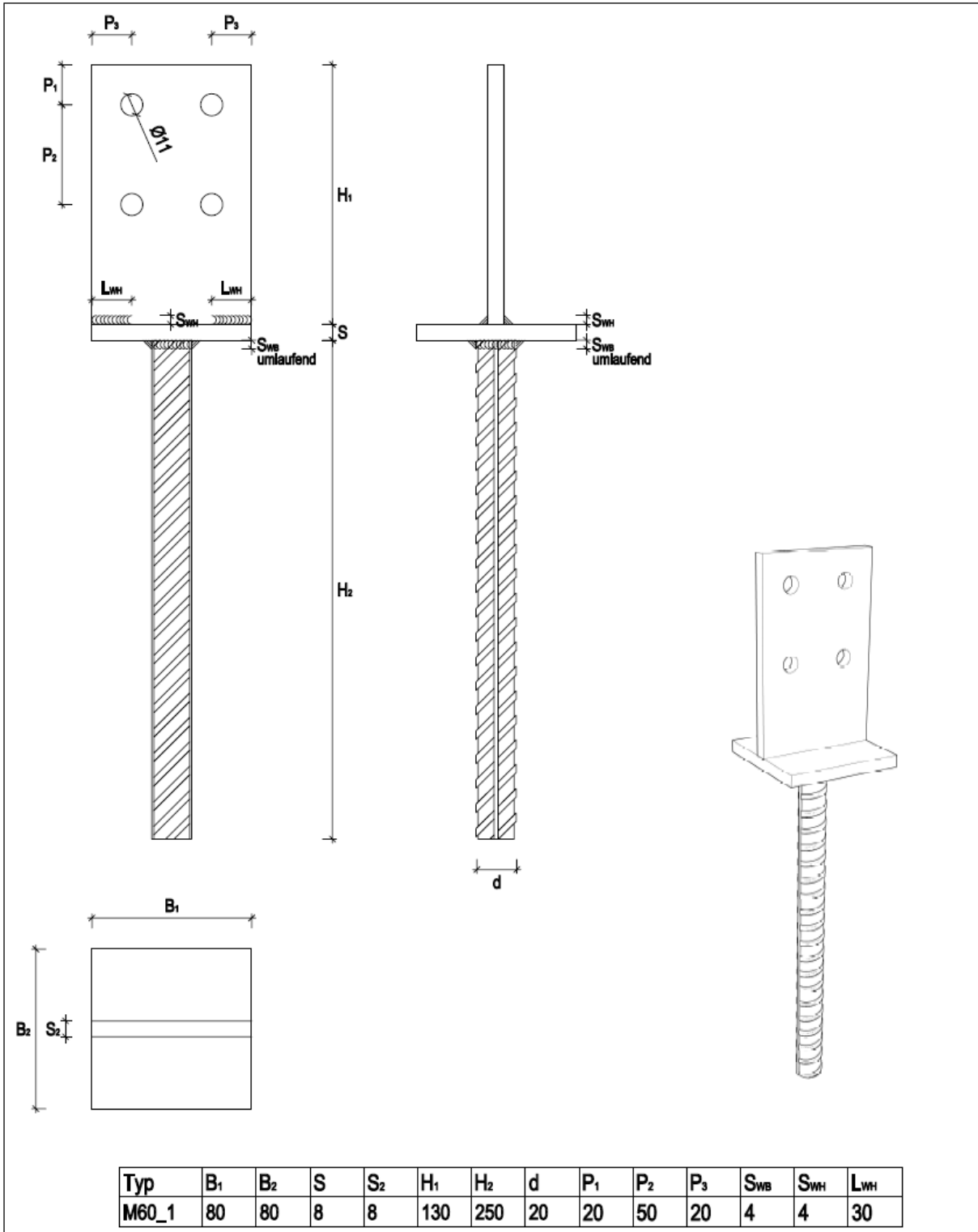
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M50_1	81	60	5.0	71	150	200	20	16	25	13	17	4
M50_2	101	60	5.0	91	150	200	20	16	25	13	17	4
M50_3	111	60	5.0	101	150	200	20	16	25	13	17	4
M50_4	131	60	5.0	121	150	200	20	16	25	13	17	4

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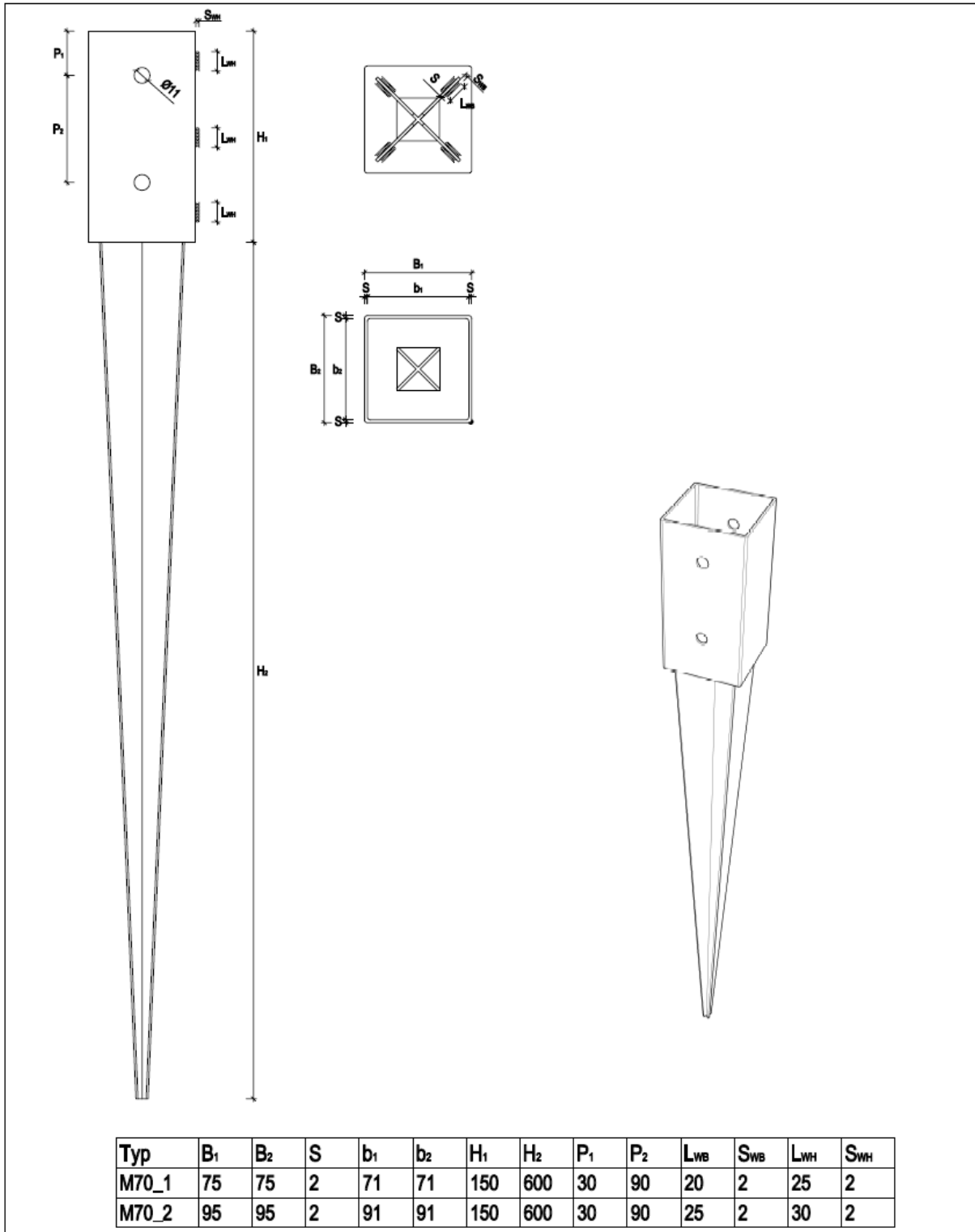



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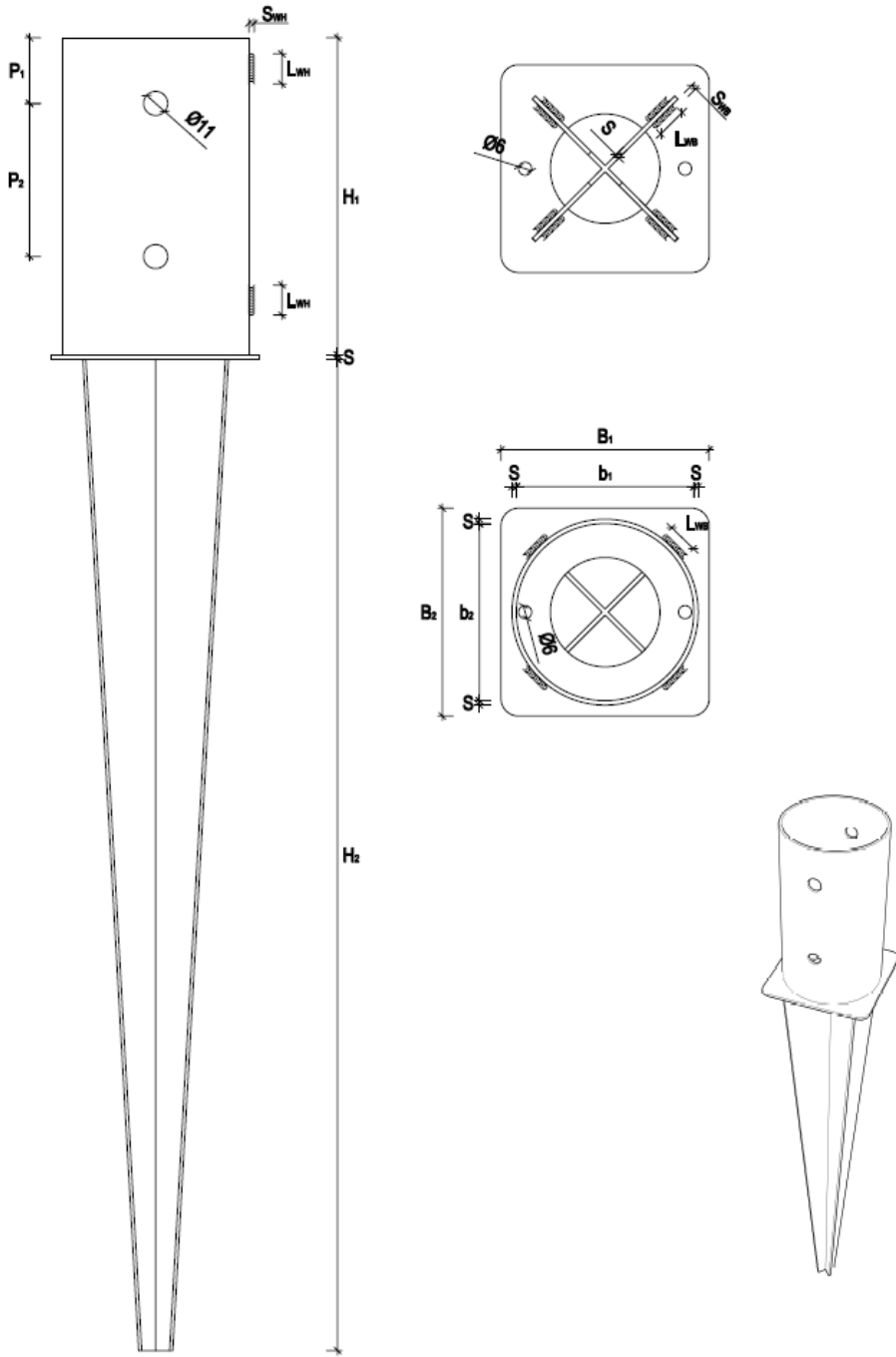
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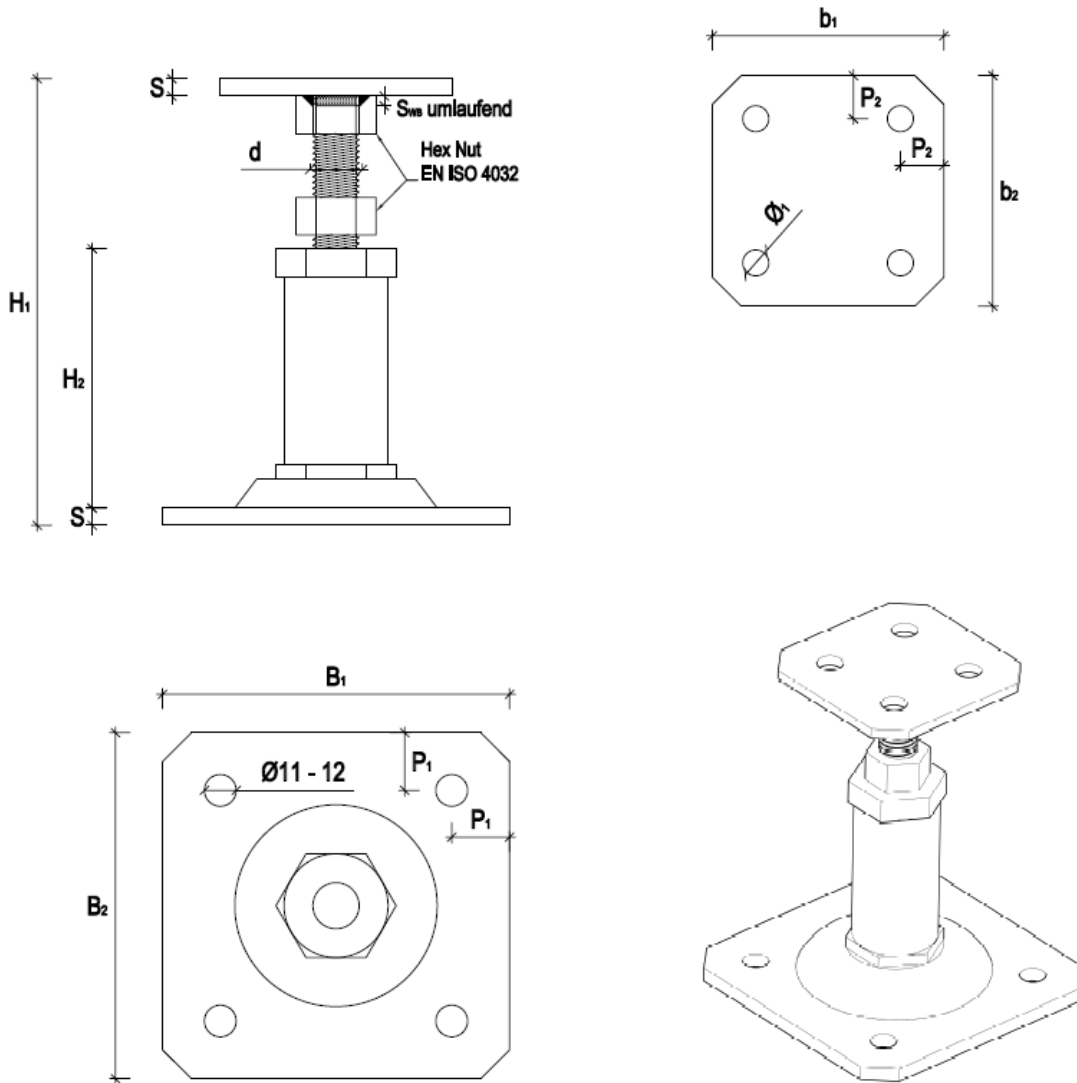
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M70_3	95	95	2	81	81	145	453	30	70	20	2.5	25	3
M70_4	110	110	2	101	101	145	453	30	70	30	2.5	35	3

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Product:

Typ M70_3, M70_4



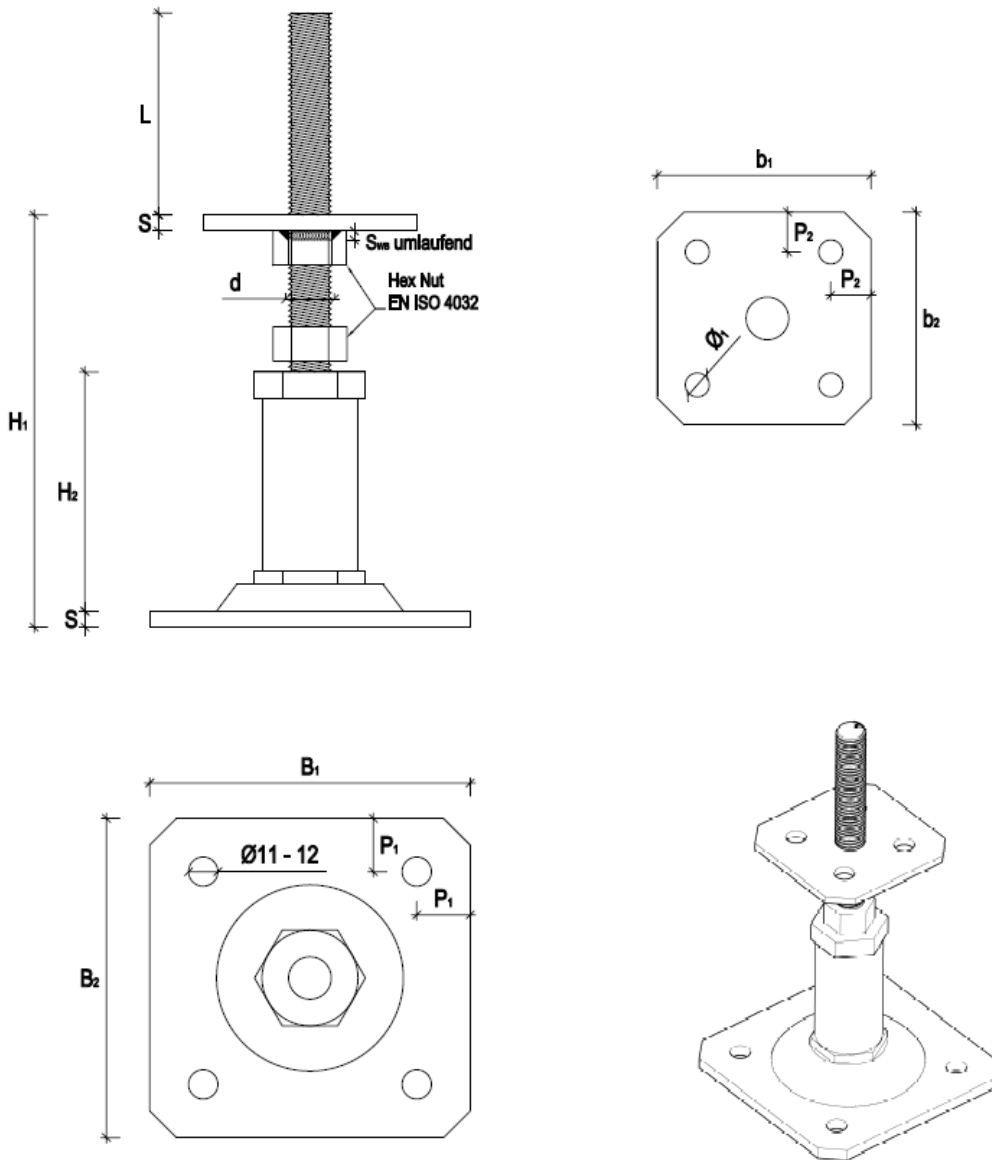
Typ	B ₁	B ₂	S	b ₁	b ₂	H ₁	H ₂	d	P ₁	P ₂	Ø ₁	S _{wb}
R10_1	120	120	6	80	80	130/165	90	16	20	15	9	4
R10_2	160	160	6	100	100	160/205	110	20	20	20	11	4
R10_3	200	200	8	140	140	190/250	130	24	20	20	11	4

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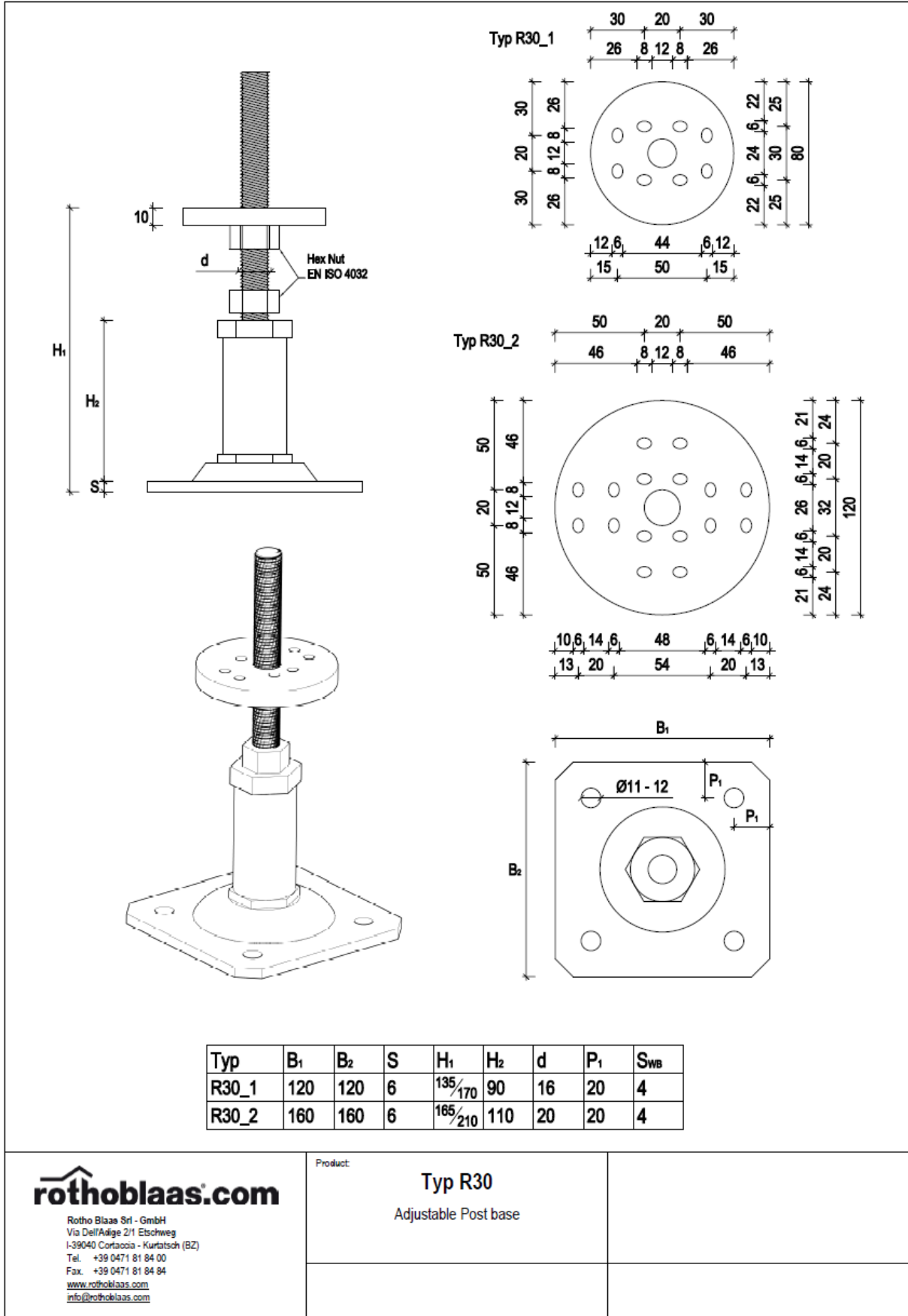
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R20_1	120	120	6	80	80	130/165	90	16	20	15	9	80	4
R20_2	160	160	6	100	100	160/205	110	20	20	20	11	120	4
R20_3	200	200	8	140	140	190/250	130	24	20	20	11	150	4

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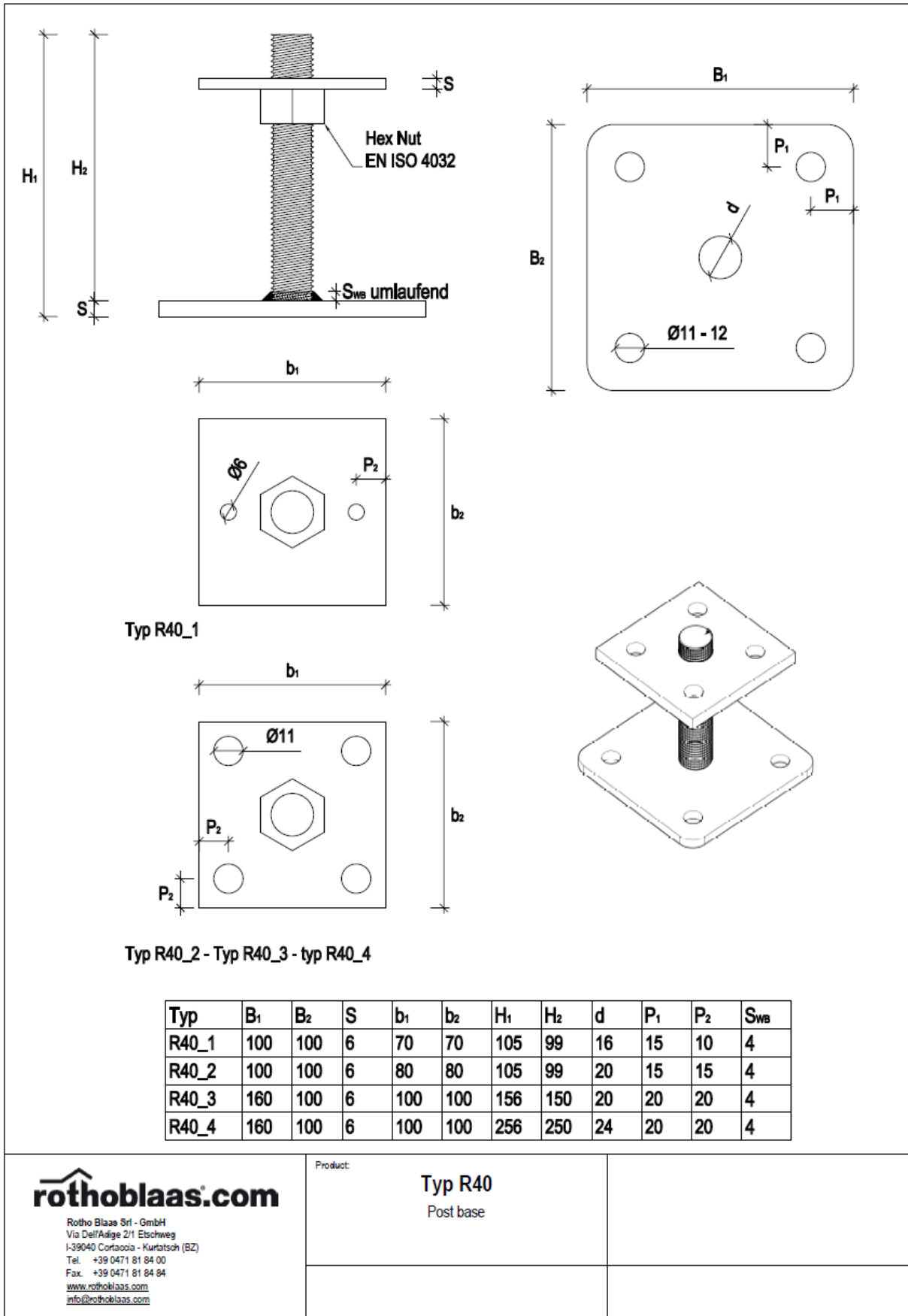


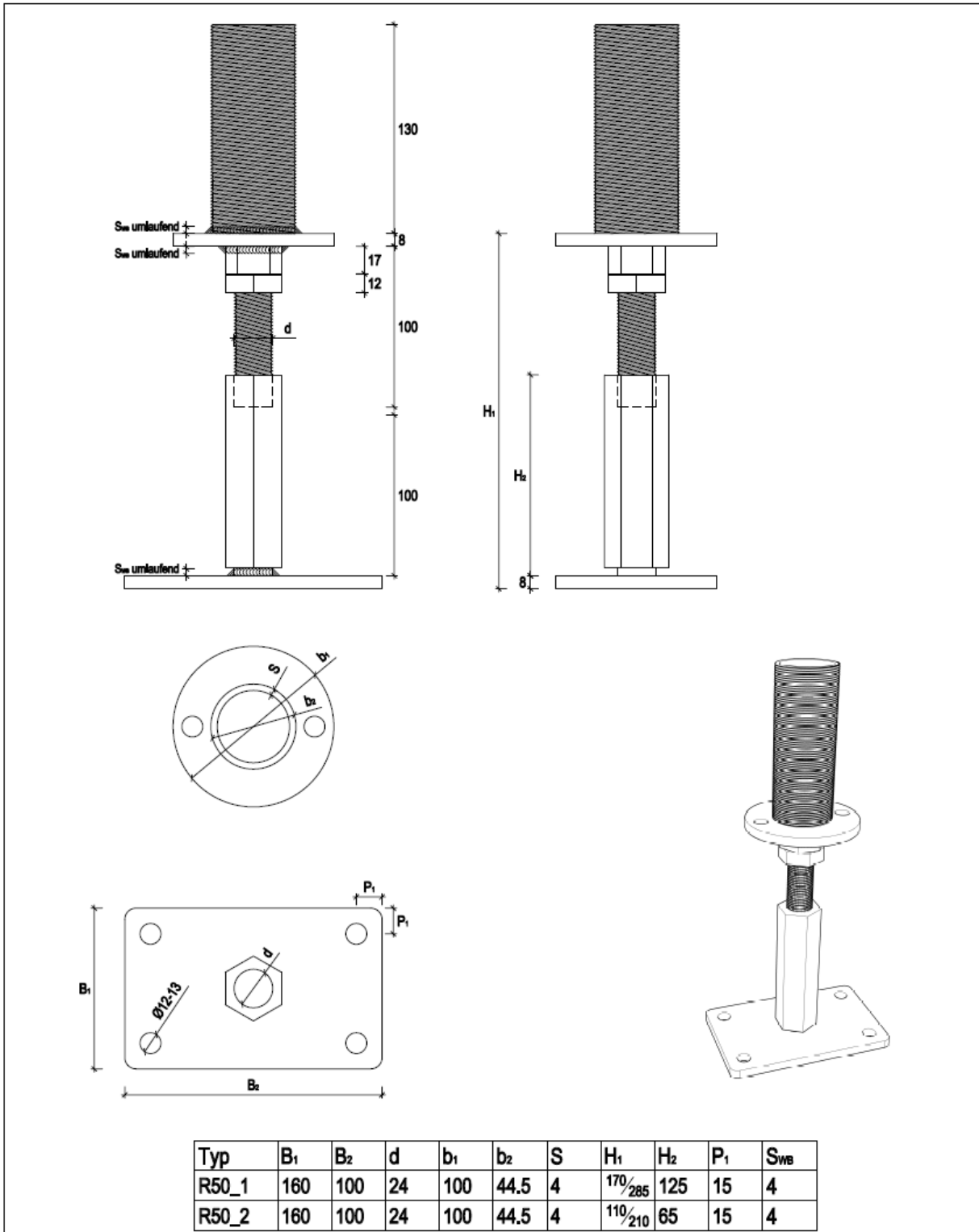
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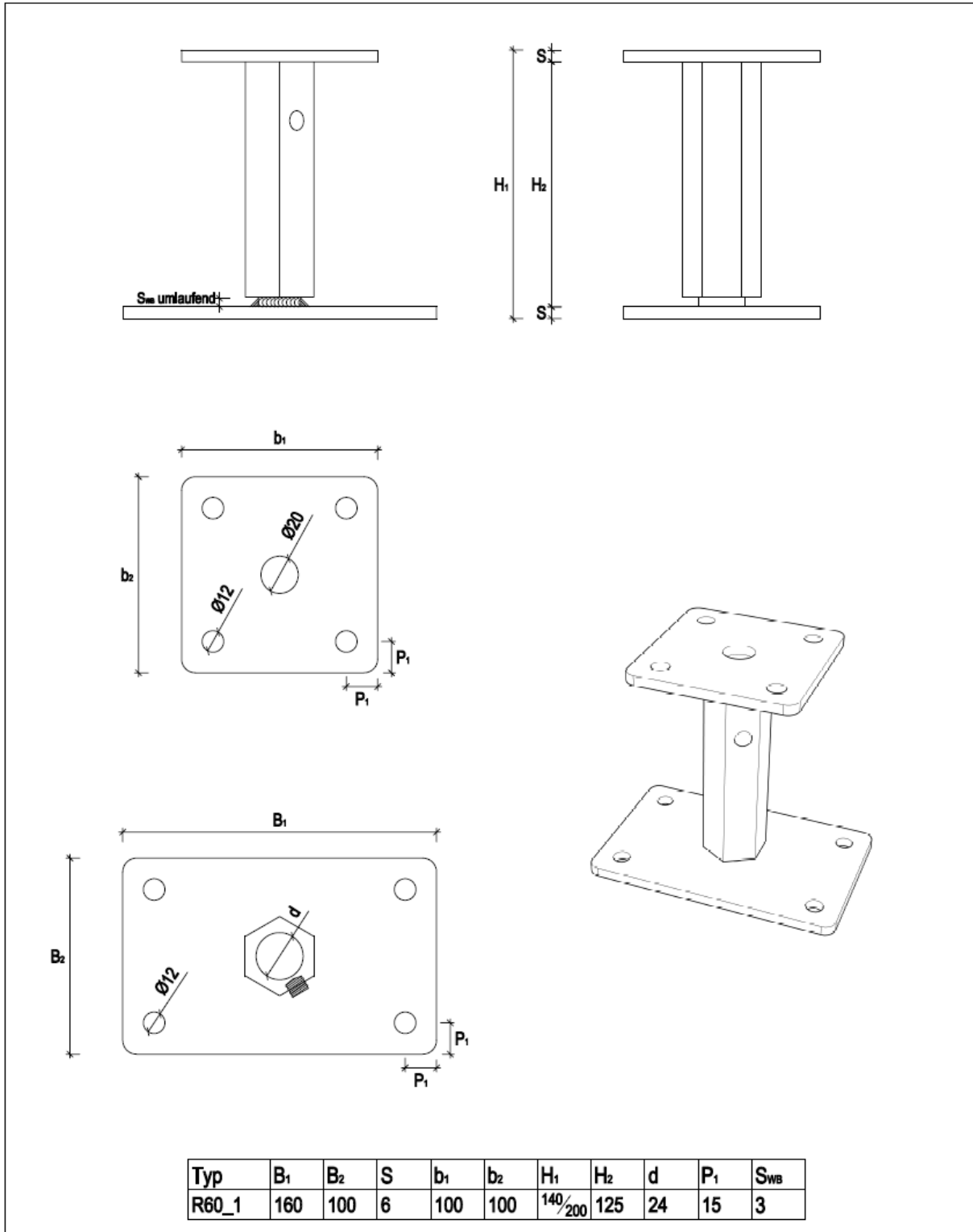
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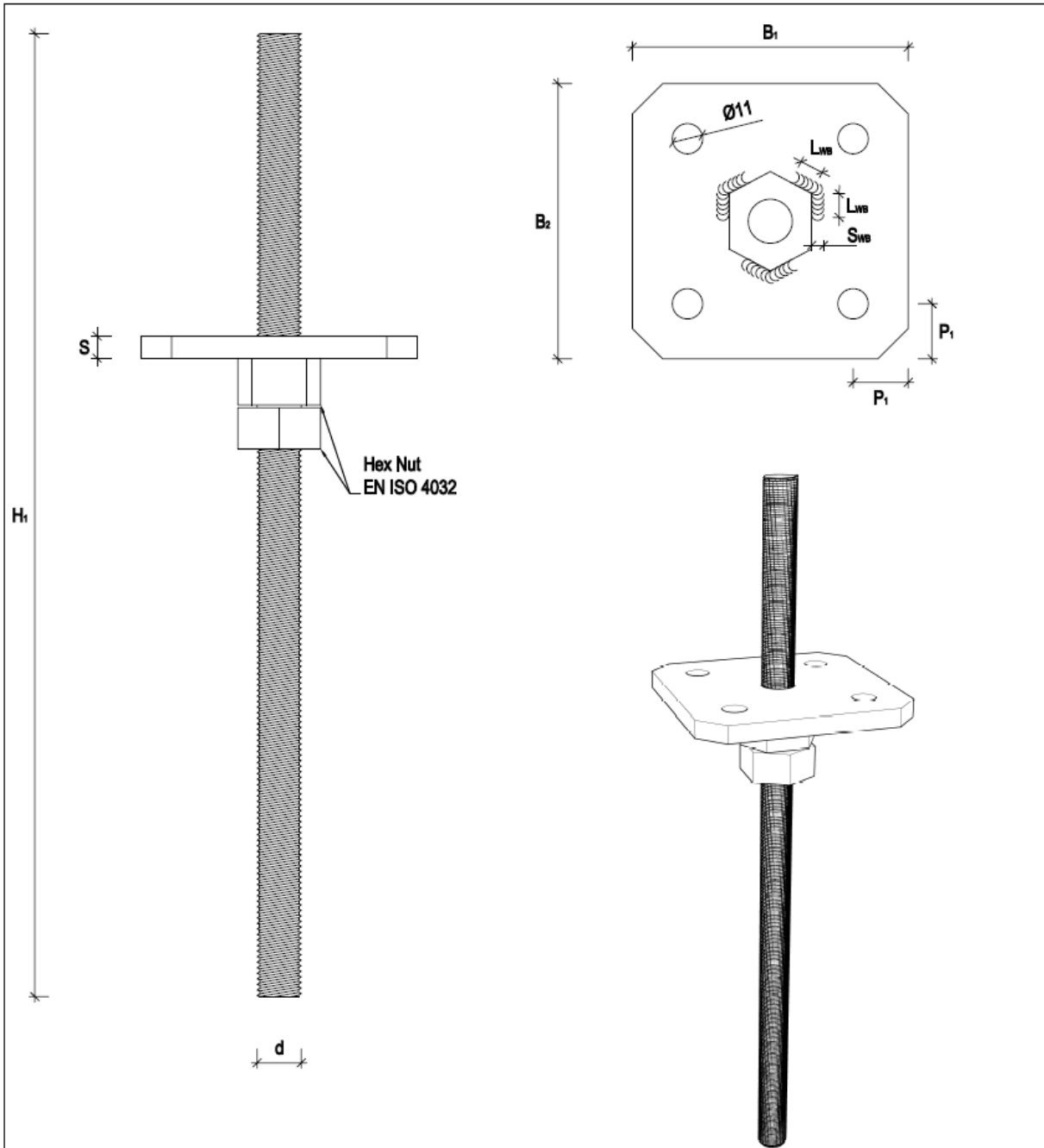




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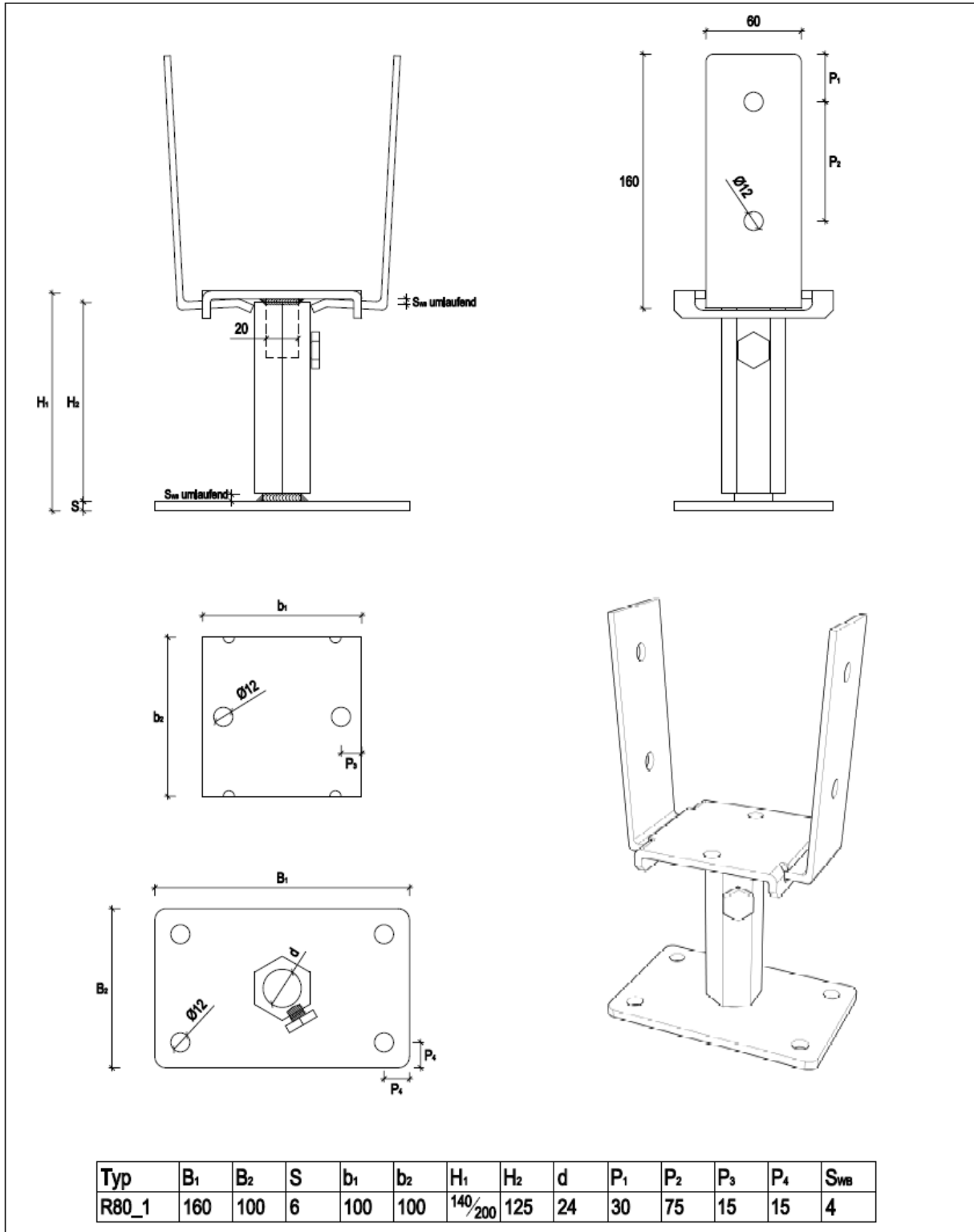
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R70_1	100	100	8	350	20	20	4	5
R70_2	140	140	8	450	24	20	4	8
R70_3	100	100	8	350	16	20	4	5

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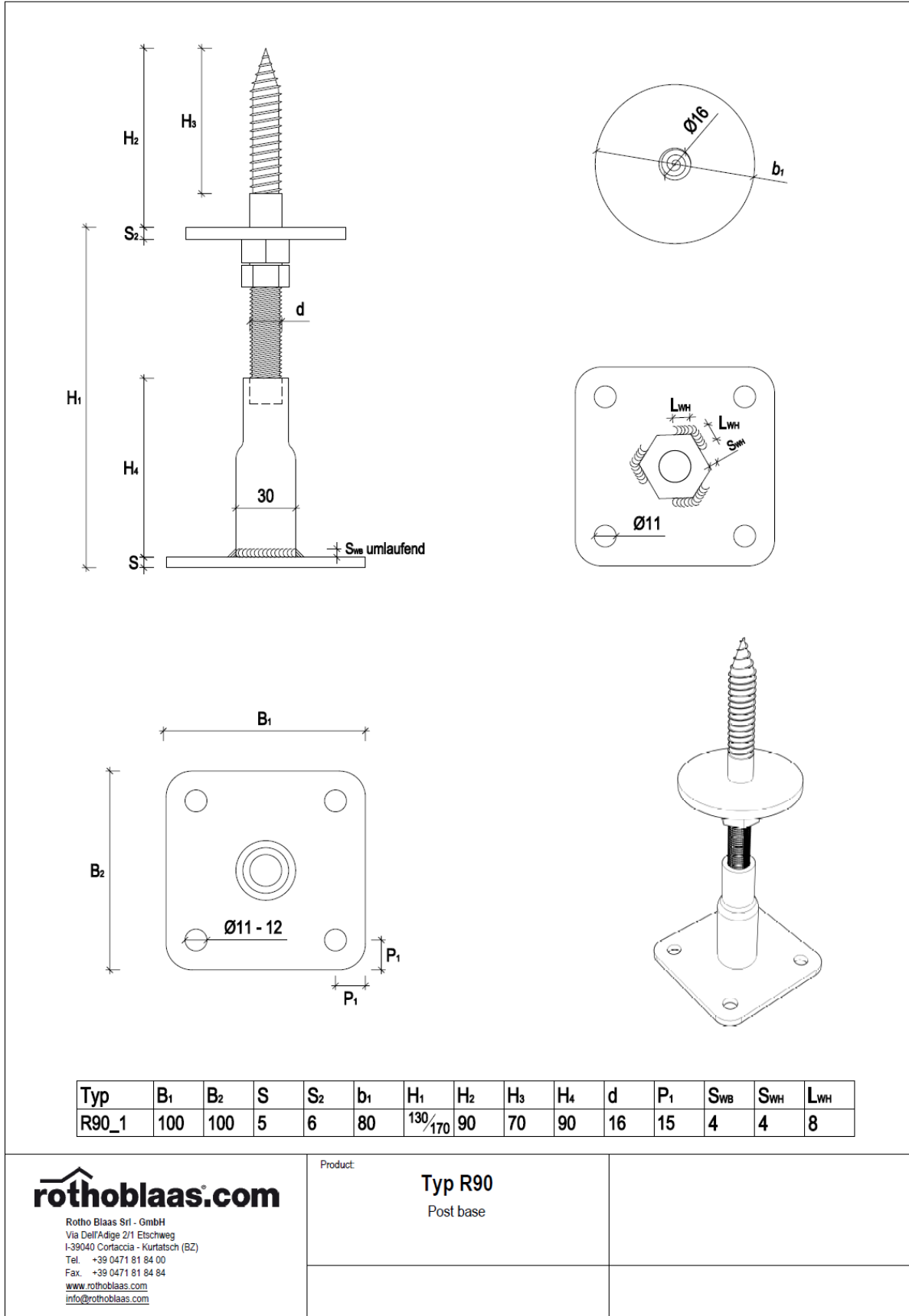


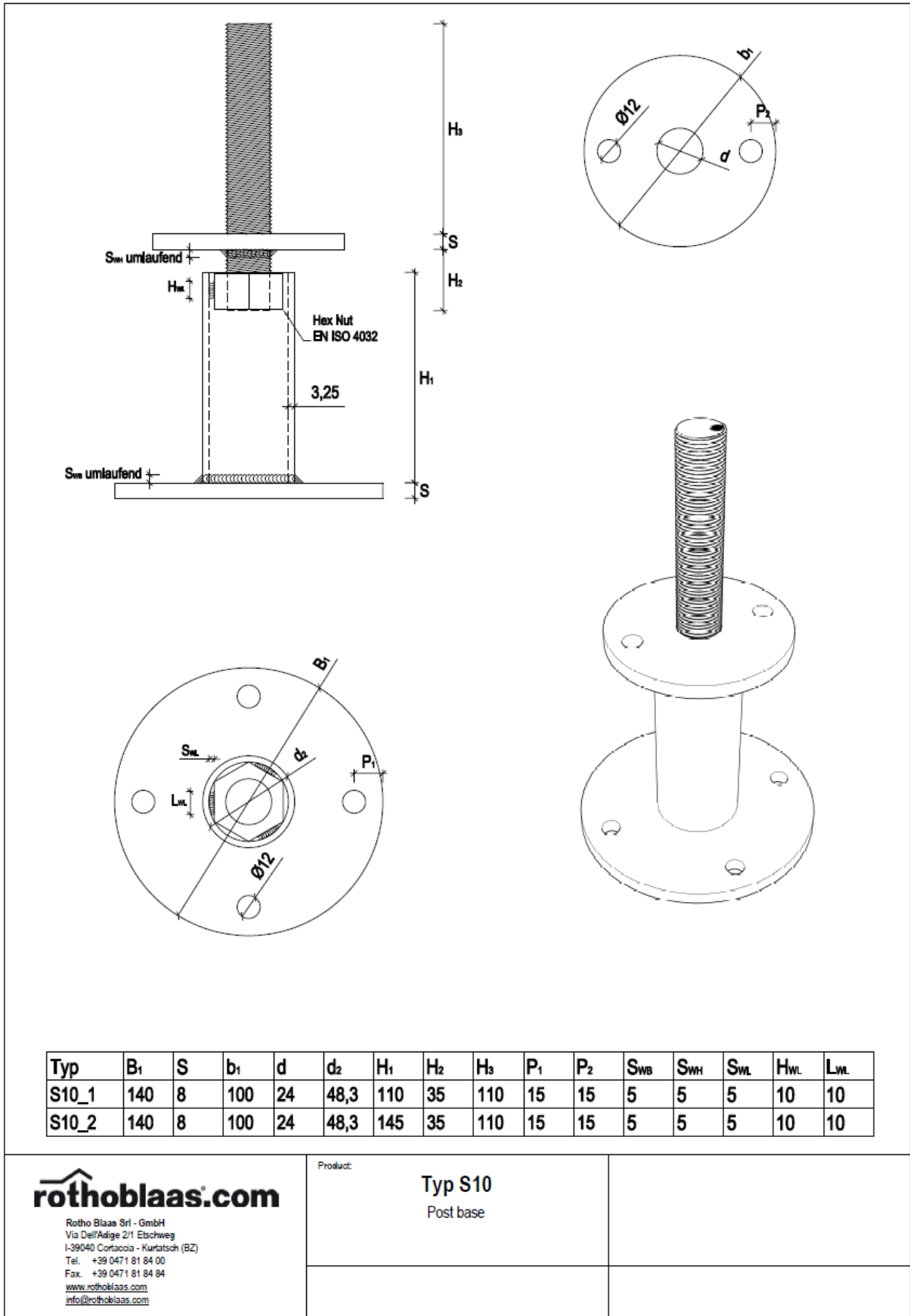
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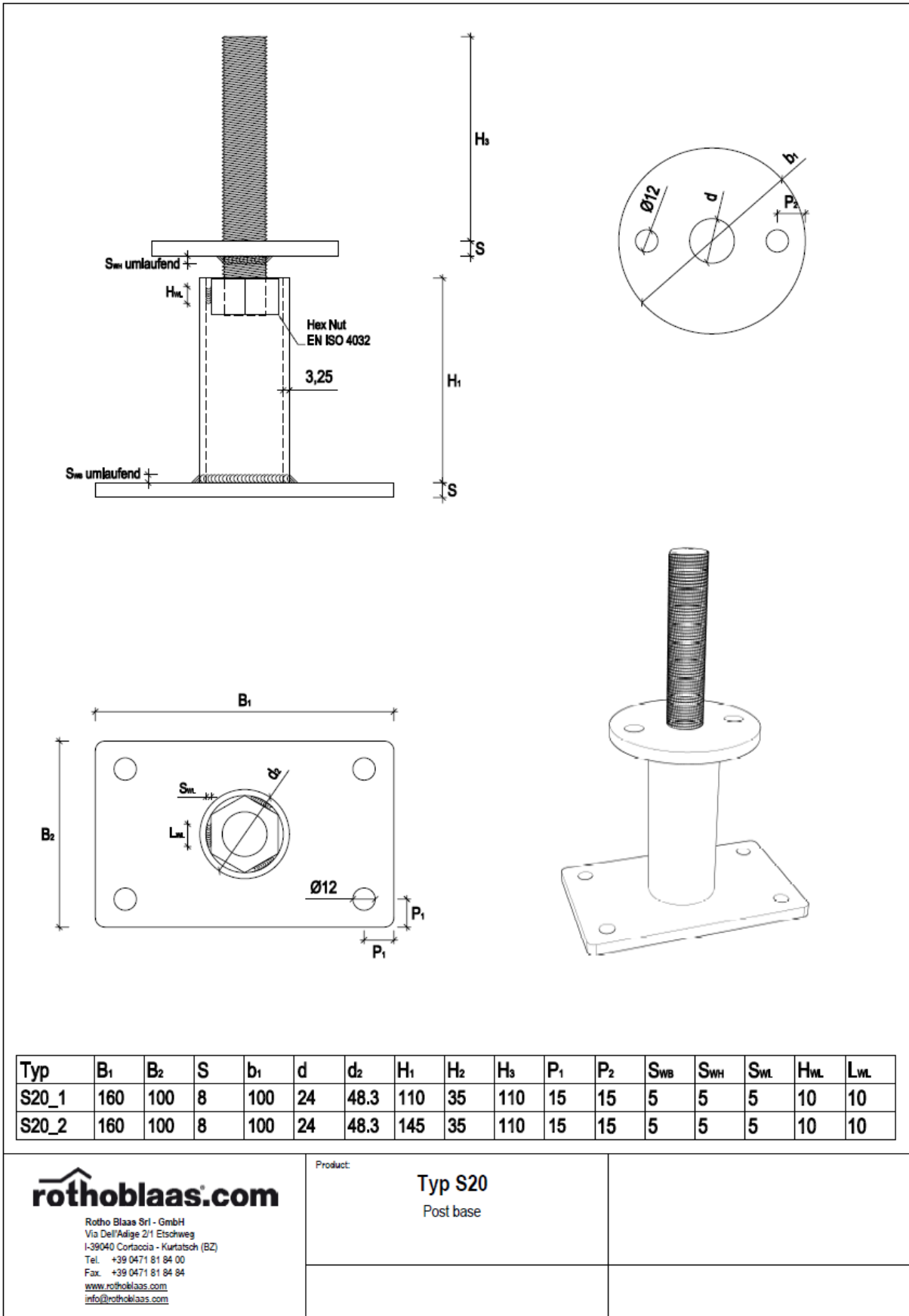


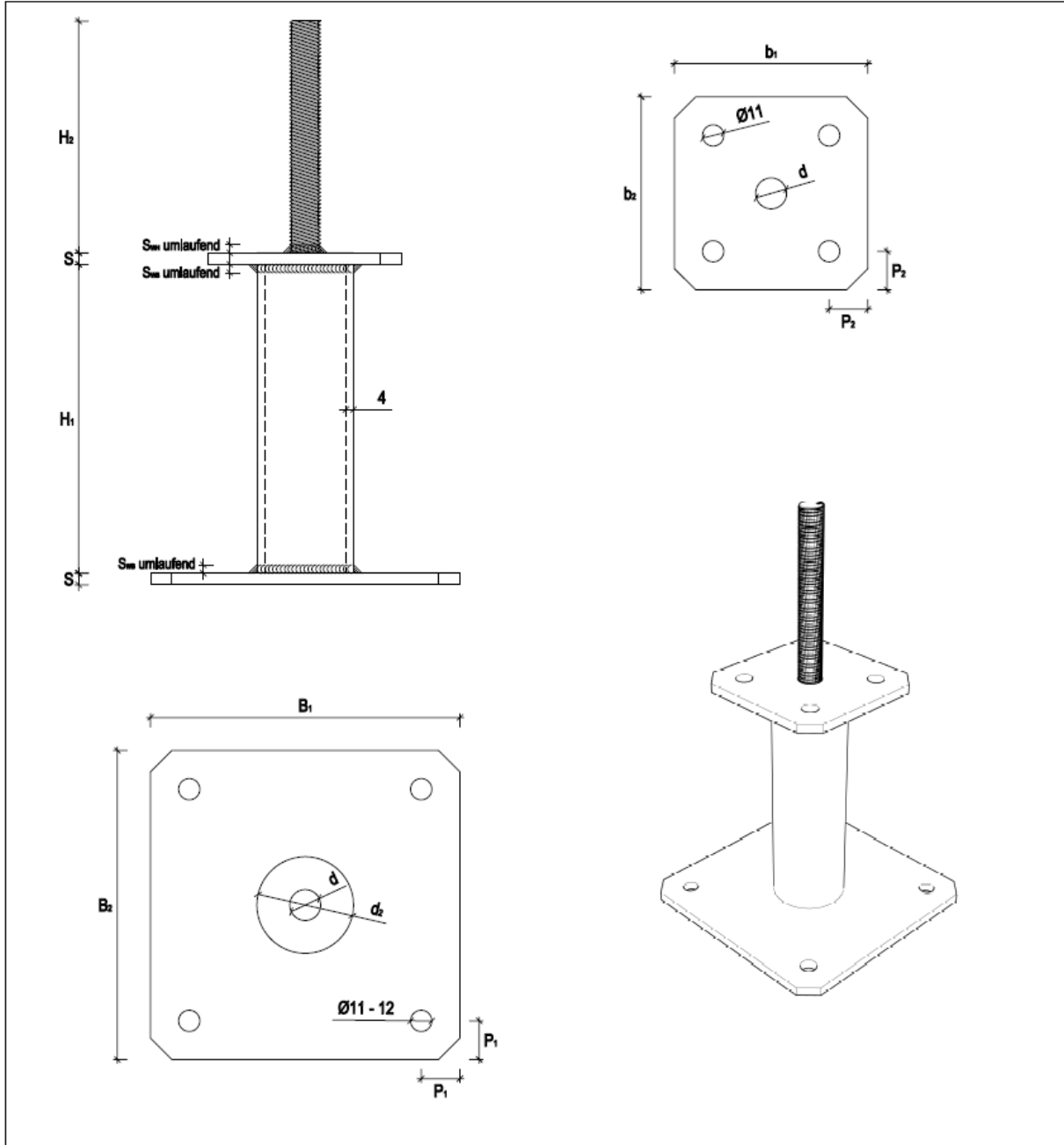
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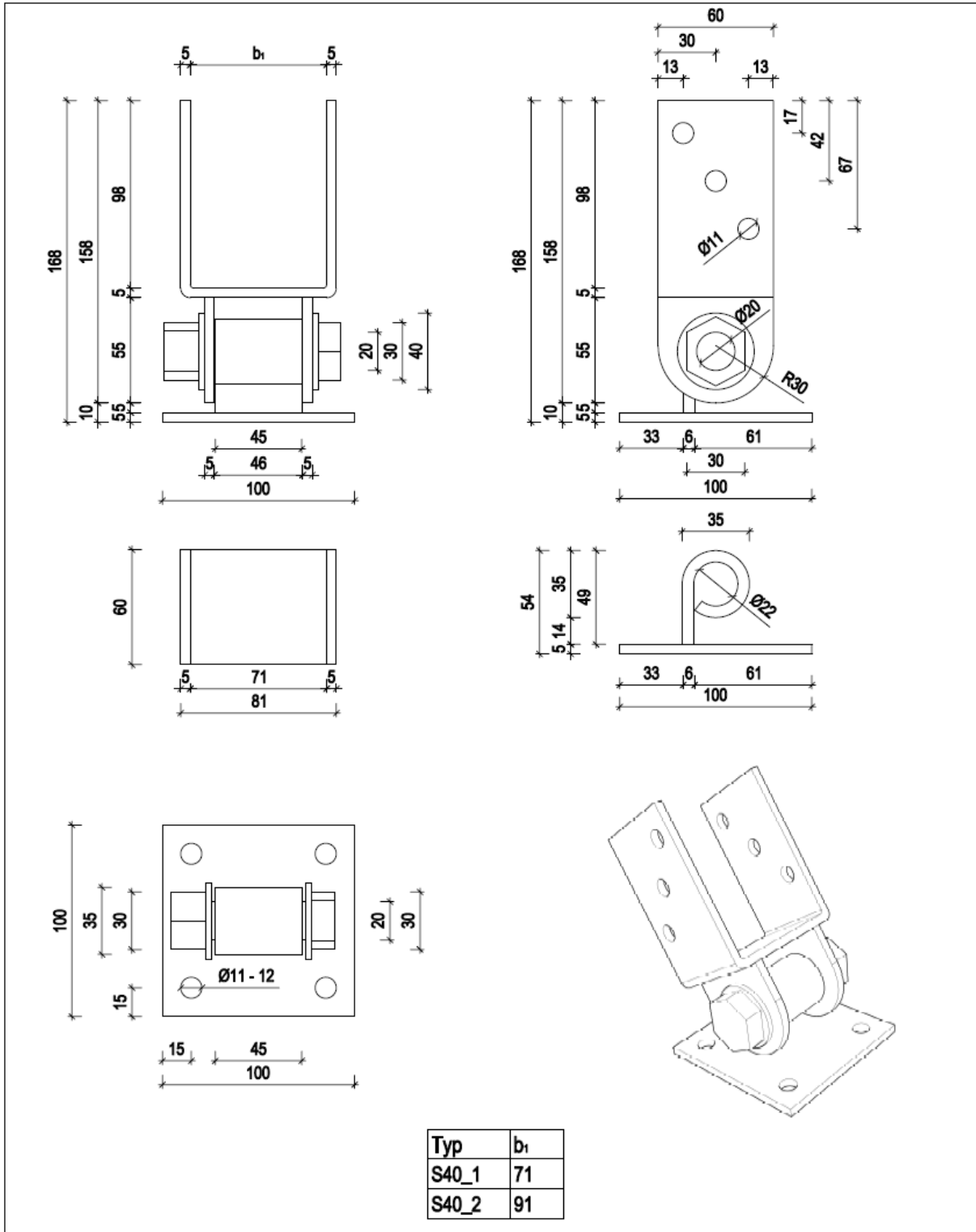
Typ	B ₁	B ₂	S	b ₁	b ₂	H ₁	H ₂	d	d ₂	P ₁	P ₂	S _{sw}	S _{wh}
S30_1	160	160	6	100	100	160	120	16	50	20	20	5	5
S30_2	200	200	8	140	140	160	150	20	80	20	20	5	5
S30_3	160	160	6	100	100	120	120	16	50	20	20	5	5
S30_4	200	200	8	140	140	160	120	20	80	20	20	5	5

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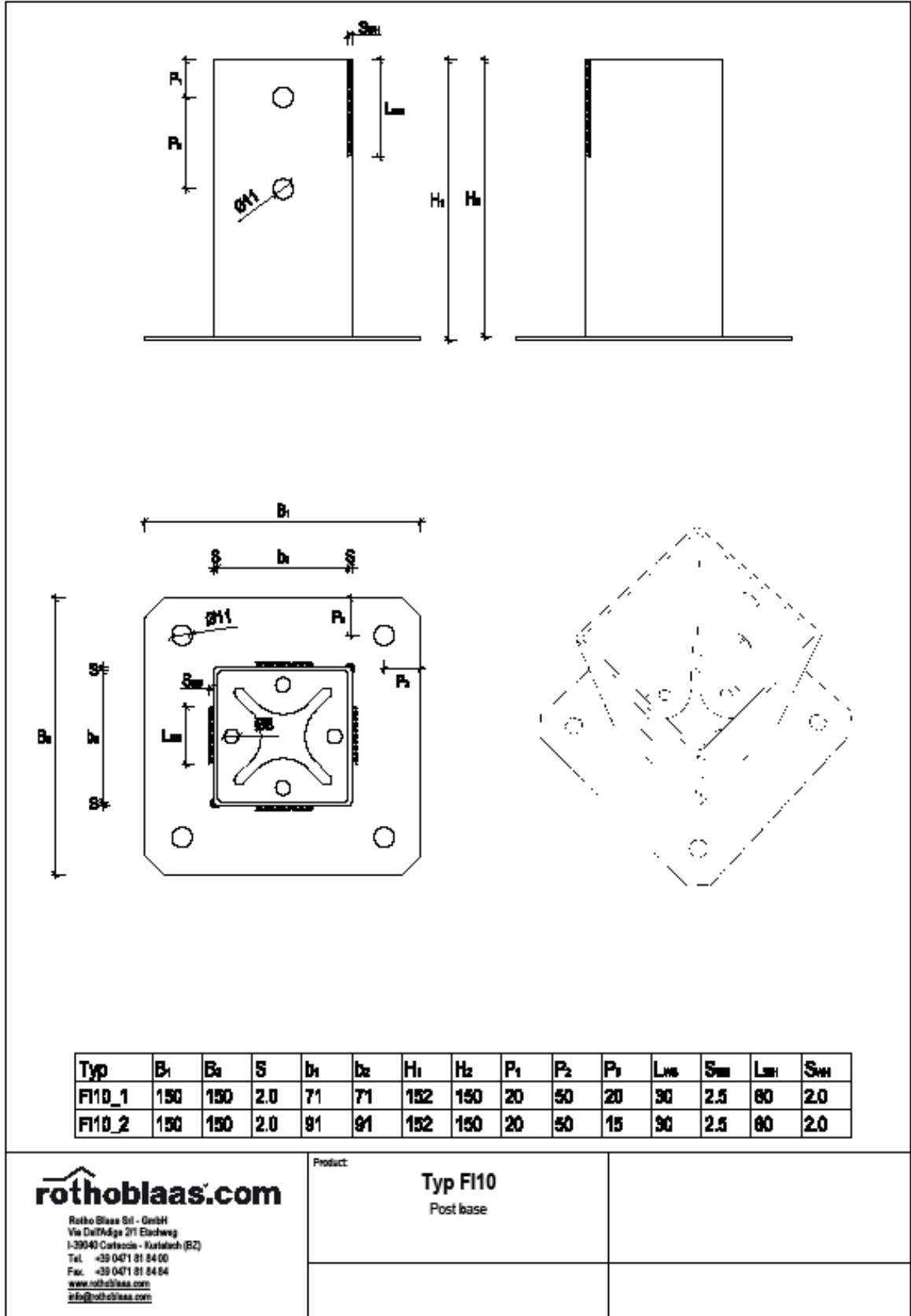


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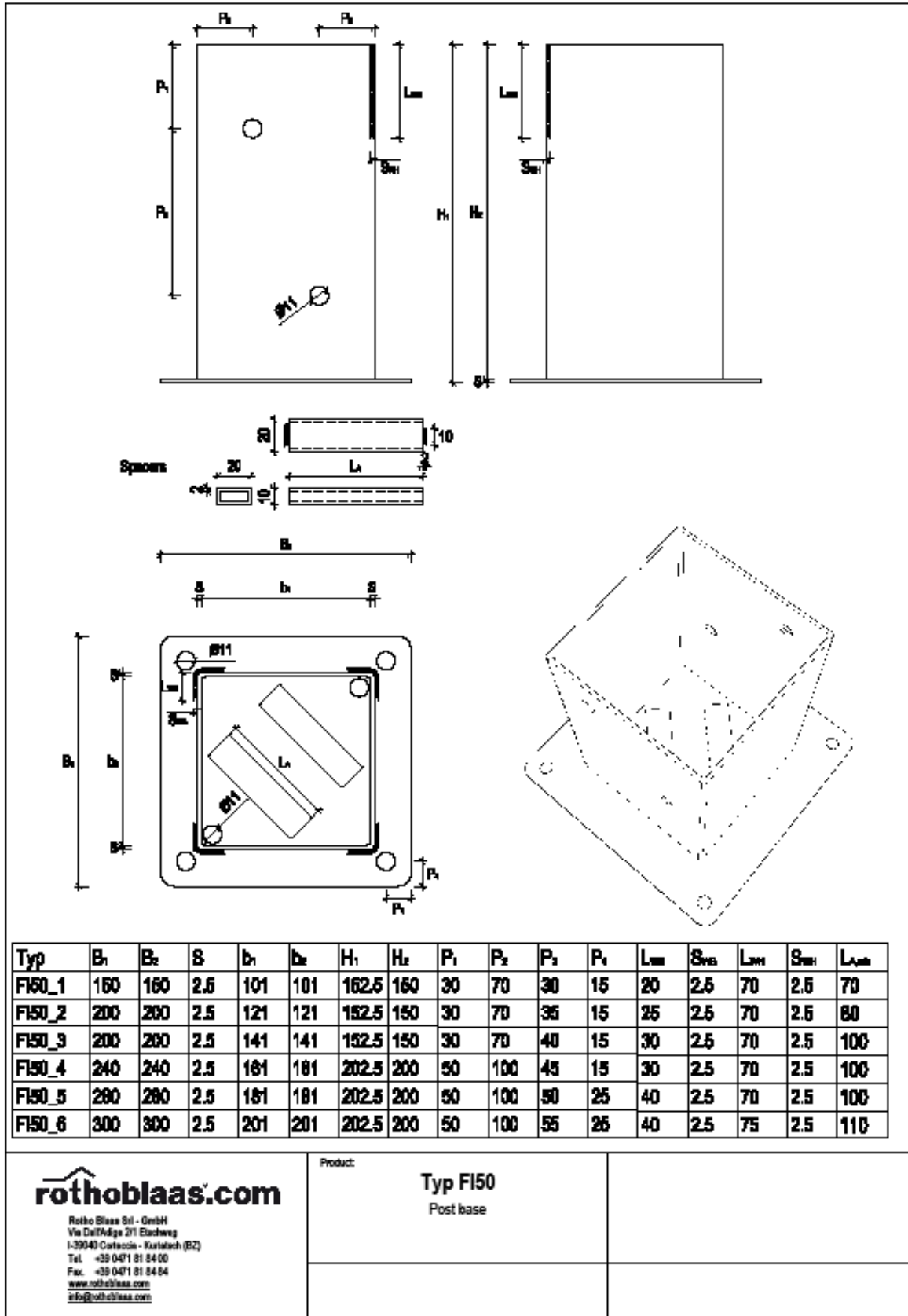


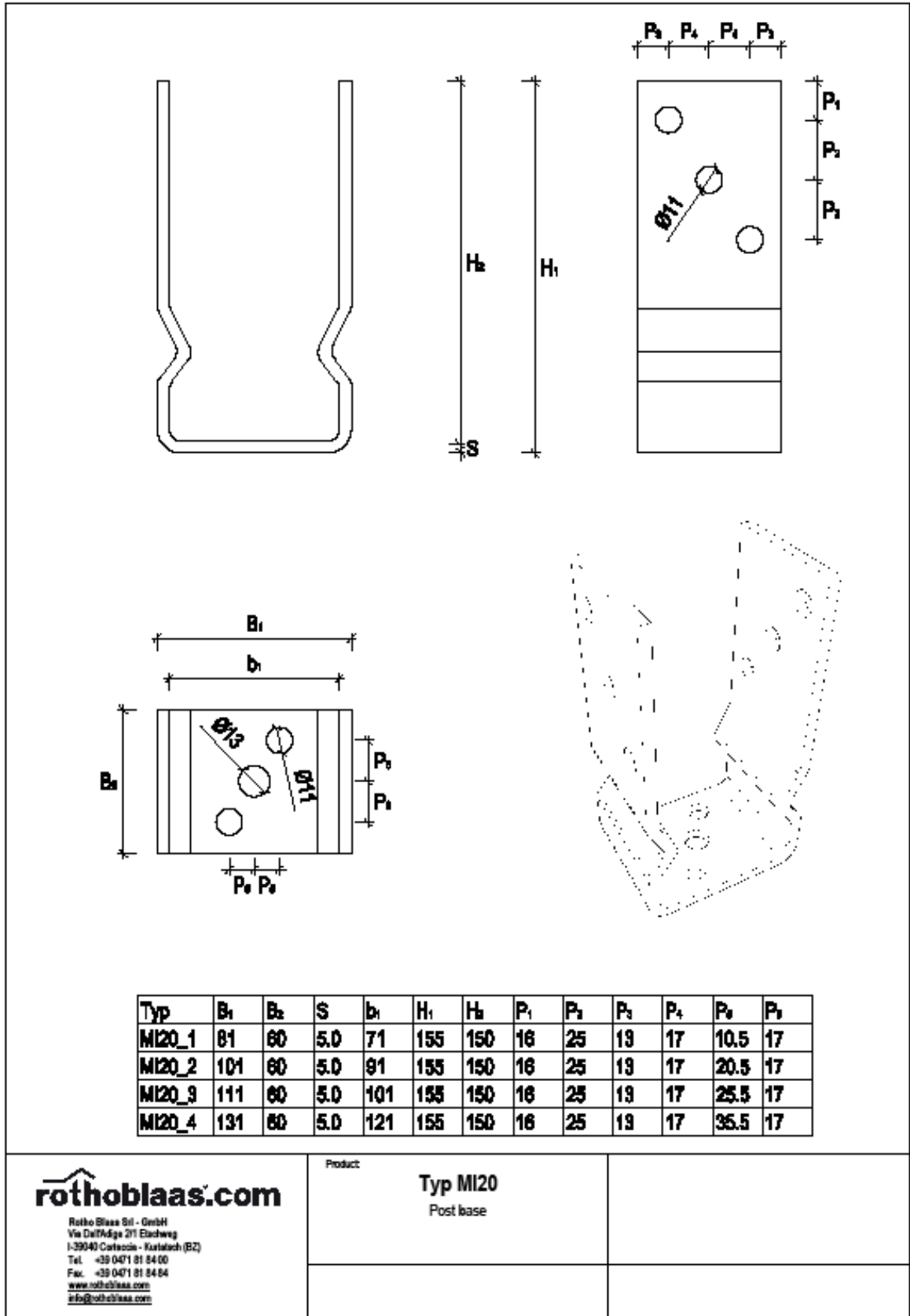
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