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European Technical Assessment

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General part

Technical Assessment Body issuing the ETA	Technický a zkušební ústav stavební Praha, s.p.
Trade name of the construction product	DMX®
Product family to which the construction product belongs	Product area: 13 Three-dimensional nailing plates
Manufacturer	DOMAX Sp.z o.o. Aleja Parku Krajobrazowego 109 84-207 Koleczkowo Łężyce Republic of Poland
Manufacturing plant	Aleja Parku Krajobrazowego 109 84-207 Koleczkowo Łężyce Republic of Poland
This European Technical Assessment contains	45 pages including 6 annexes, which form an integral part of this European technical assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	ETAG 015, edition April 2013, used as European Assessment Document (EAD)

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Specific part

1 TECHNICAL DESCRIPTION OF THE PRODUCT

The three-dimensional nailing plates DMX[®] are one-piece, non-welded (KB, KK, KL, KM, KP, KR, KRB, KSB, KWB, KWC,WBZ) or welded (PSL, PSP, PSPO, PST, PS 84L) or multi-piece, welded (PSR, PSRT, PSRU) elements made of the cold-formed steel sheet grade DX51D according to EN 10346 with zinc coating mass of 275 g/m², electrogalvanized steel DC01 according to EN 10131 with corrosion protection Fe/Zn 12 + powder coating 60 µm or structural steel S235 according to EN 10025-2 with zinc coating mass of 275 g/m² or with corrosion protection Fe/Zn 12 (see list below). The three-dimensional nailing plates DMX[®] correspond to the drawings and dimensions given in Annex 1.

Table 1 Technical description of the product

Type of Domax connector	Made of	Kind of corrosion protection
KB 4	S 235	Fe/Zn 12
KK 0	DC01	Fe/Zn 12 + Powder Coating 60 µm
KK 11	DX51D	Z275
KK 12	DX51D	Z275
KL 6	DX51D	Z275
KM 17	DX51D	Z275
KM 18	DX51D	Z275
KP 2	DX51D	Z275
KP 9	DX51D	Z275
KR 4	S 235	Z275
KR 5	DX51D	Z275
KR 6	DC01	Fe/Zn 12
KR 7	DC01	Fe/Zn 12
KRB 7	DC01	Fe/Zn 12 + Powder Coating 60 µm
KSB 1	DC01	Fe/Zn 12 + Powder Coating 60 µm
KWB1	DC01	Fe/Zn 12 + Powder Coating 60 µm
KWC 1	DC01	Fe/Zn 12 + Powder Coating 60 µm
WBZ 14	DX51D	Z275
PSL 50, 70, 90, 100	S 235	Z275
PSP 70, 90, 100, 120	S 235	Z275
PSPO 80, 100	S 235	Z275
PSR 80, 110	S 235	Z275
PSRT	S 235	Z275
PSRU	S 235	Z275
PST 70, 90, 100, 120, 140	S 235	Z275
PS 84 L	S 235	Z275

1.1 Identification

The identification parameters and reference to product specifications for identifying the materials and components which constitute the three dimensional nailing plates are given in Annex 1.

2 SPECIFICATION OF THE INTENDED USE(S) IN ACCORDANCE WITH THE APPLICABLE EUROPEAN ASSESSMENT DOCUMENT (HEREINAFTER EAD)

The DMX[®] three-dimensional nailing plates are intended to be used for connecting the mutually perpendicular, load-bearing, solid timber elements, in side-grain to side-grain

configurations, in joints for which requirements for mechanical resistance and stability in the sense of the basic work requirement 1 of Regulation (EU) No 305/2011 shall be fulfilled.

Ring shank nails according to EN 14592+A1 with the diameter ≥ 4 mm, characteristic yield moment $M_{y,k} = 7168$ N·mm, characteristic withdrawal parameter $f_{ax,k} = 7.8$ N·mm⁻² and characteristic tensile capacity $f_{tens,k} = 7.3$ kN shall be used for connections made with the DMX® three-dimensional nailing plates.

In respect of the requirements concerning corrosion resistance, DMX® three-dimensional nailing plates are for use in timber structures subjected to the internal conditions defined by service classes 1, 2 and 3 (connectors with additional powder coating) according to EN 1995-1-1 (Eurocode 5), in corrosion aggressiveness categories C1 and C2 according to EN ISO 12944-2, without action of acid gases or vapours.

The provisions made in this European Technical Assessment are based on an assumed working life of the product of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, 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.

The assessment of the fitness of the DMX® three-dimensional nailing plates for the intended use has been made in compliance with the ETAG 015 “*Three-dimensional nailing plates*” used as European Assessment Document (EAD).

2.1 Installation of three-dimensional nailing plates

The installation instructions including special installation techniques and provisions for the qualification of the personnel are given in the manufacturer’s technical documentation.

3 PERFORMANCE OF THE PRODUCT AND REFERENCES TO THE METHODS USED FOR ITS ASSESSMENT

3.1 BWR 1 Mechanical resistance and stability

3.1.1 Strength

The characteristic load-carrying capacities of joints loaded according to static diagrams (shown in Annex 2), determined by tests or calculations carried out according to ETAG 015, clause 5.1.3 and EN 1995-1-1 are given in Annex 3. The characteristic load-carrying capacities of joints for other load directions shall be calculated on the basis of EN 1995-1-1 (Eurocode 5) or according to national regulations. The design values shall be determined according to EN 1995-1-1 (Eurocode 5).

Following the requirements of ETAG 015 for the minimum number of specimens for determining the characteristic load-bearing capacities through testing the applicant provided the laboratory with 5 specimens of each test assembly distinguished by a connector type, configuration of the connection and static scheme (direction of force actions).

The modifications of standard procedures applied come from the requirements of ETAG 015. The procedure specified in standard ref. 6 is modified as required in EOTA TR 016 *Method of testing “Three-Dimensional Nailing Plates, with examples”*, namely the procedure corresponding to the case “*Test specimens fulfil EN ISO 8970*”, which as stated above was relevant in all cases.

As agreed in between the applicant and the laboratory, conditioning and transportation of the test assemblies into the laboratory was carried out by the applicant under specified conditions.

The conditions were as follows:

The timber members used – sawn timber blanks of European whitewood, grade C24, free from major defects in the area of the connector. Selection of timber members within a test group (the five specimens) referring to densities should comply with the requirements of EN ISO 8970. During testing of connectors were used timber specimens with characteristic density about $450 \text{ kg}\cdot\text{m}^{-3}$.

The samples came in four successive deliveries in condition “fit for direct testing” meaning that conditioning the timber elements to equilibrium moisture content in line with the requirements of cl. 2.4.1.1.3.3. ETAG 015 was carried out by the applicant. The completed and conditioned test assemblies were delivered protected by a plastic wrap.

Conditioning in the laboratory consisted in equalisation of temperatures of the specimens and the ambient temperature by storing in the laboratory for 3 days as a minimum, during which time the specimens remained wrapped in plastic cover. In the majority of cases the term of storing was much longer.

Dimensions of the timber members, relative moisture content and weight of the assemblies were determined for control whether the density of timber blanks complies with the requirements of EN ISO 8970. This was carried out with specimens unwrapped just before the load testing of each specimen. It is stated that in the majority of cases the requirement of the standard have been met. In several cases when the mean wood density was above the scope stated by the standard, allowance was made in line with the respective provision of EOTA TR 016.

3.1.2 Stiffness

No performance assessed.

3.1.3 Ductility in cyclic testing

No performance assessed.

3.2 BWR 2 Safety in case of fire

3.2.1 Reaction to fire

The steel elements are classified as class A1 of reaction to fire (non-combustible products) in accordance with EN 13501-1+A1 and to European Commission Decision 96/603/EC amended by European Commission Decision 2000/605/EC.

3.2.2 Resistance to fire

Performance in relation to fire resistance would be determined for the complete structural element with any associated finishes, therefore there is no performance assessed option used to this Basic Work Requirement.

3.3 BWR 3 Hygiene, health and the environment

According to the manufacturer’s declaration the DMX® three-dimensional nailing plates do not contain harmful or dangerous substances as defined in the EU database.

In addition to the specific clauses relating to dangerous substances contained in this ETA, there may be other requirements applicable to the products falling within their 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.

3.4 BWR 7 Sustainable use of natural resources

For the sustainable use of natural resources no performance was assessed for this product.

3.5 Aspects of durability, serviceability and identification

3.5.1 Durability and serviceability

The DMX[®] three-dimensional nailing plates have been assessed as having satisfactory durability and serviceability when used in conditions defined by service classes 1 and 2 according to EN 1995-1-1 (Eurocode 5).

3.5.2 Identification

Each three-dimensional nailing plate is to be marked with the symbol and the product type according to the Annex 1.

4 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE (HEREINAFTER AVCP) SYSTEM APPLIED, WITH REFERENCE TO ITS LEGAL BASE

4.1 AVCP system

According to the Decision 97/638/EC¹ of the European Commission, the system of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table applies:

Product	Intended use	Level or class	System
Three-dimensional nailing plates	For structural timber products	Reaction to fire class and resistance to fire classes according to EN 13501-2+A1	2+

5 TECHNICAL DETAILS NECESSARY FOR THE IMPLEMENTATION OF THE AVCP SYSTEM, AS PROVIDED FOR IN THE APPLICABLE EAD

5.1 Tasks of the manufacturer

5.1.1 *Factory production control*

The manufacturer has introduced a system of factory production control in the plant and exercises permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer are documented in a systematic manner in the form of written policies and procedures. This production control system ensures that the product is in conformity with the European technical assessment.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the control plan². The incoming raw materials shall be subject to controls and tests by the manufacturer before acceptance. Check of materials, such as sheet metal, shall include control of the inspection documents presented by suppliers (comparison with nominal values) by verifying dimension and determining material properties, e.g. chemical composition, mechanical properties.

The manufactured components are checked visually and for dimensions.

The control plan, which is part of the technical documentation of this European technical assessment, includes details of the extent, nature and frequency of testing and controls to be performed within the factory production control and has been agreed between the assessment holder and the Technický a zkušební ústav stavební Praha, s.p.

The manufacturer shall make a Declaration of Performance, stating that the construction product is in conformity with the provisions of this European technical assessment.

¹ 97/638/EC - Commission Decision of date 01/10/1997, published in the Official Journal of the European Union (OJEU) L 268/36.

² The control plan has been deposited at Technický a zkušební ústav stavební Praha, s.p. and is only made available to the approved bodies involved in AVCP procedure.

5.1.2 *Assessment of the performance of the product*

For assessment of the performance of the product the results of the tests performed as part of the assessment for the European technical assessment shall be used unless there are changes in the production line or plant. In such cases the necessary assessment has to be agreed between Technický a zkušební ústav stavební Praha, s.p. and the notified body.

5.2 Tasks of notified product certification body

5.2.1 *Initial inspection of the manufacturing plant and of factory production control*

The Notified body shall ascertain that, in accordance with the control plan, the factory and the factory production control are suitable to ensure continuous and orderly manufacturing of the connectors according to the specifications mentioned in 1 as well as to the Annexes to the European technical assessment.

5.2.2 *Continuing surveillance, assessment and evaluation of factory production control*

The Notified body shall visit the factory at least once a year for regular inspection. It has to be verified that the system of factory production control and the specified automated manufacturing process are maintained taking account of the control plan.

Continuing surveillance and assessment of factory production control have to be performed according to the control plan.

The results of product certification and continuing surveillance shall be made available on demand by the certification body or inspection body, respectively, to the Technický a zkušební ústav stavební Praha, s.p. In cases where the provisions of the European technical assessment and the control plan are no longer fulfilled the conformity certificate shall be withdrawn.

5.3 CE marking

The CE-marking shall be affixed on each packaging of three-dimensional nailing plates. The symbol "CE" shall be accompanied by the following information (at least):

- identification number of the Technical Assessment Body,
- name or identifying mark of the manufacturer and manufacturing plant,
- last two digits of the year in which the CE-marking was affixed,
- number of certificate of constancy of performance for the product,
- number of the European technical assessment,

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Technický a zkušební ústav stavební Praha, s.p.

Issued in Prague on 10/03/2016

By
Ing. Mária Schaan
Head of the TAB

Annexes:

- Annex No. 1 Product details and definitions*
- Annex No. 2 Loading according to static diagrams
Calculations according to static diagrams*
- Annex No. 3 The characteristic load-carrying capacities of connectors*
- Annex No. 4 Nailing patterns*
- Annex No. 5 Specification of connection elements*
- Annex No. 6 Reference documents*

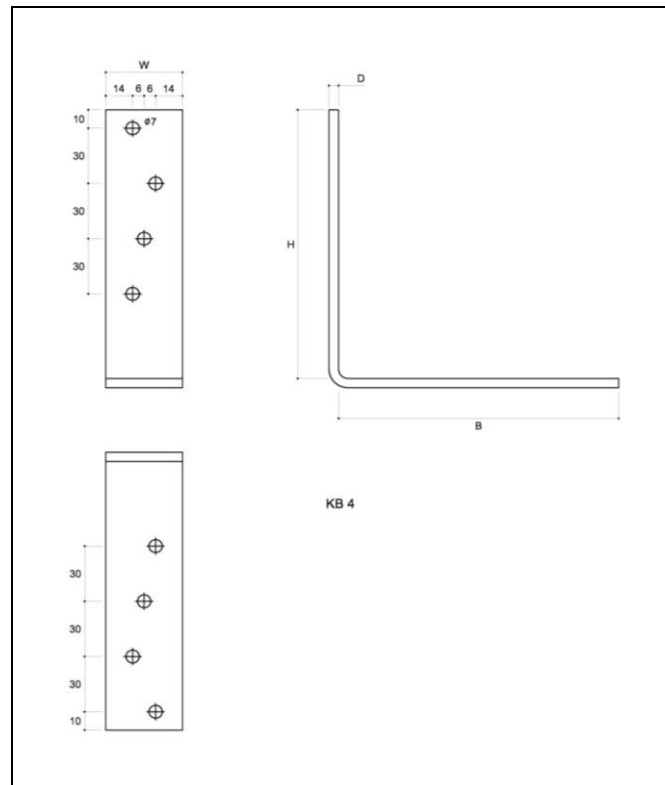


Figure 1 Type KB 4

Table 2 KB three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm				Quantity of openings
	W	H	B	D	ø7
KB 4	40	146	146	5	8

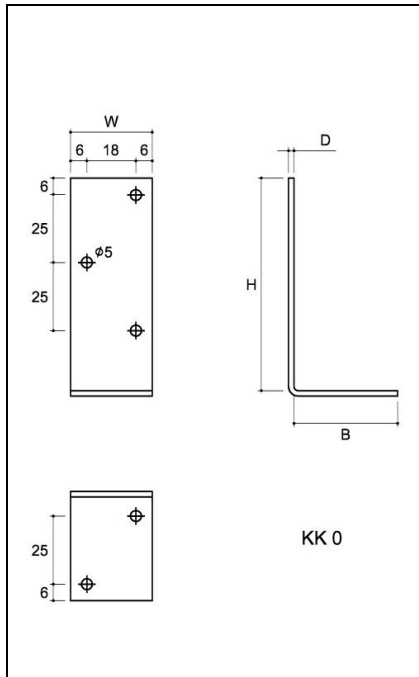


Figure 2 Type KK 0

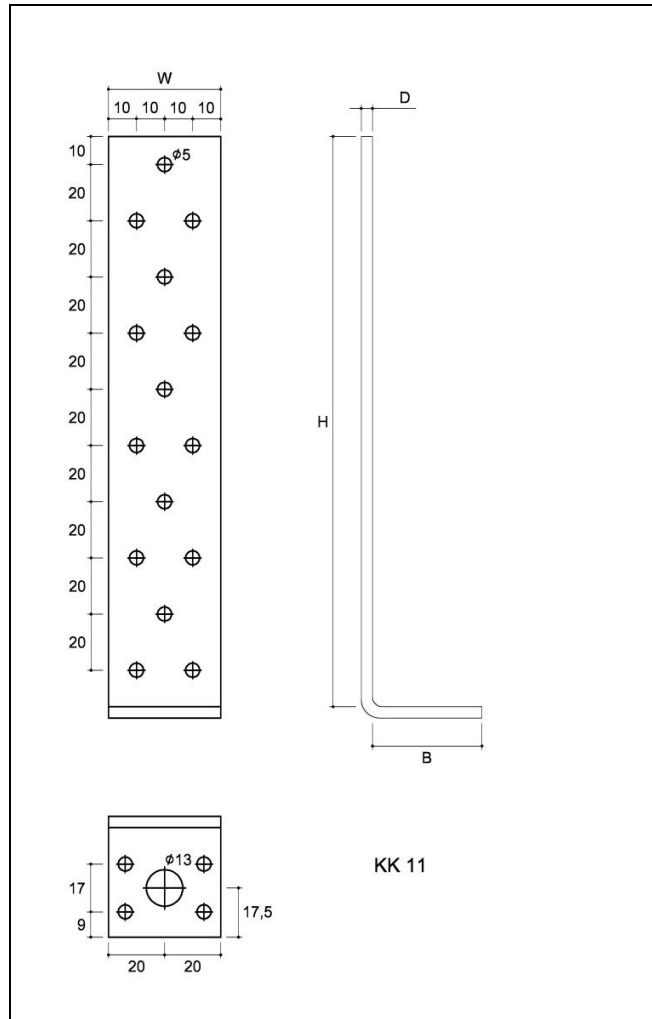


Figure 3 Type KK 11

Table 3 KK three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm				Quantity of openings	
	W	H	B	D	ø5	ø13
KK 0	30	78	38	2	5	-
KK 11	40	206	39	4	19	1

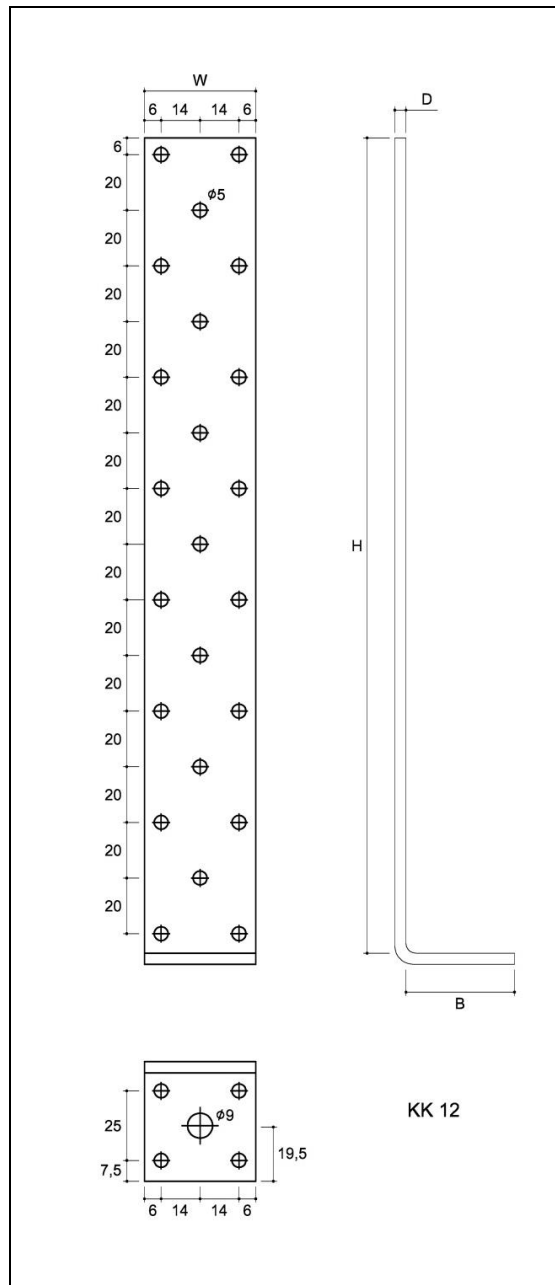


Figure 4 Type KK 12

Table 4 KK three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm				Quantity of openings	
	W	H	B	D	$\phi 5$	$\phi 9$
KK 12	40	296	39	4	27	1

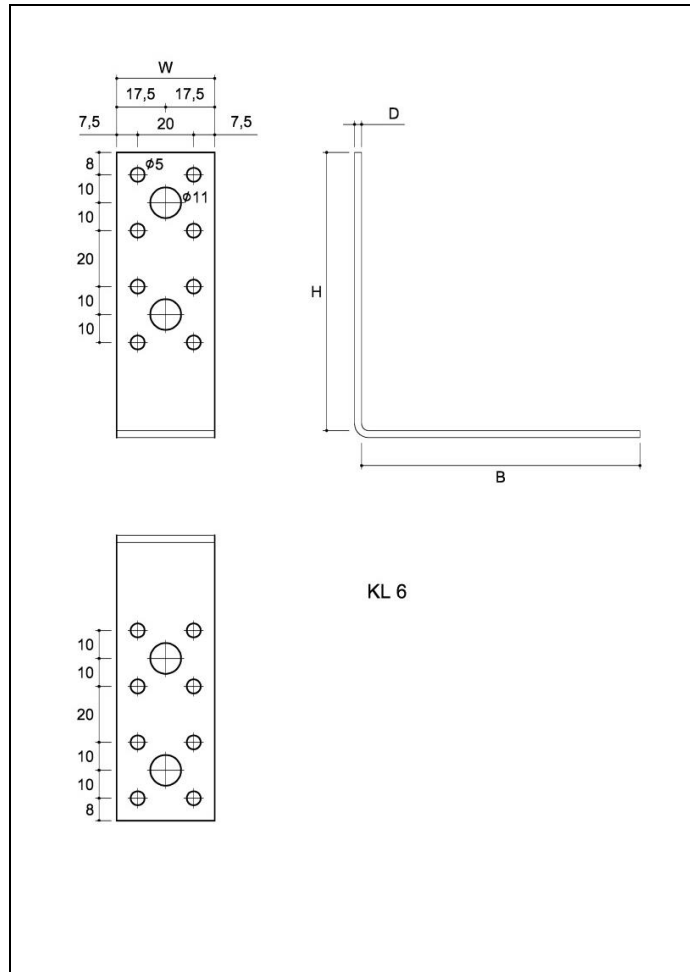


Figure 5 Type KL 6

Table 5 KL three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm				Quantity of openings	
	W	H	B	D	ø5	ø11
KL 6	35	99.5	99.5	2.5	16	4

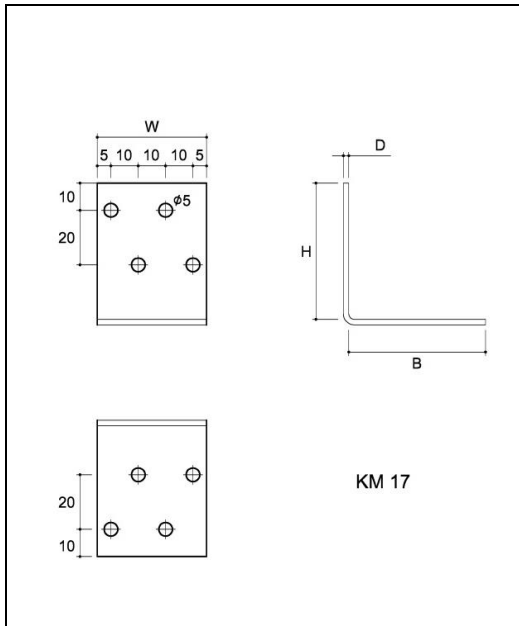


Figure 6 Type KM 17

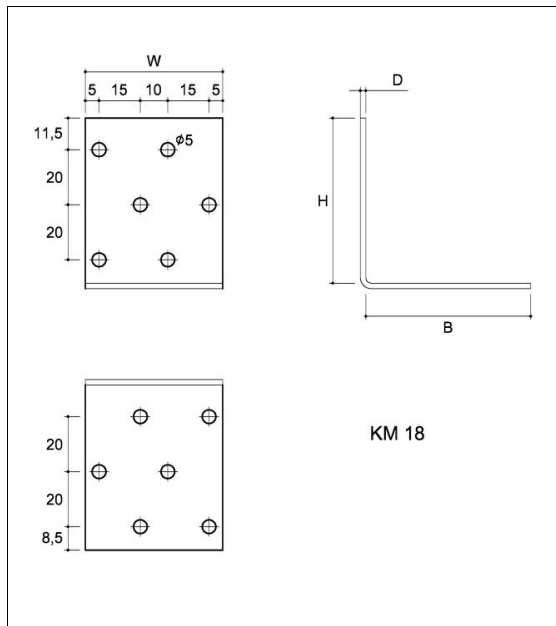


Figure 7 Type KM 18

Table 6 KM three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm				Quantity of openings	
	W	H	B	D	ø5	ø14
KM 17	40	50	50	2	8	
KM 18	50	60	60	2	12	

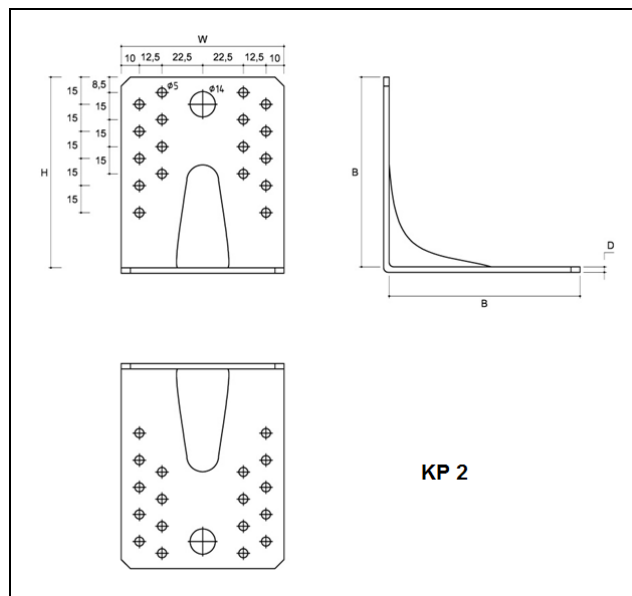


Figure 8 Type KP 2

Table 7 KP three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm				Quantity of openings	
	W	H	B	D	ø5	ø14
KP 2	90	105.5	105.5	3	36	2

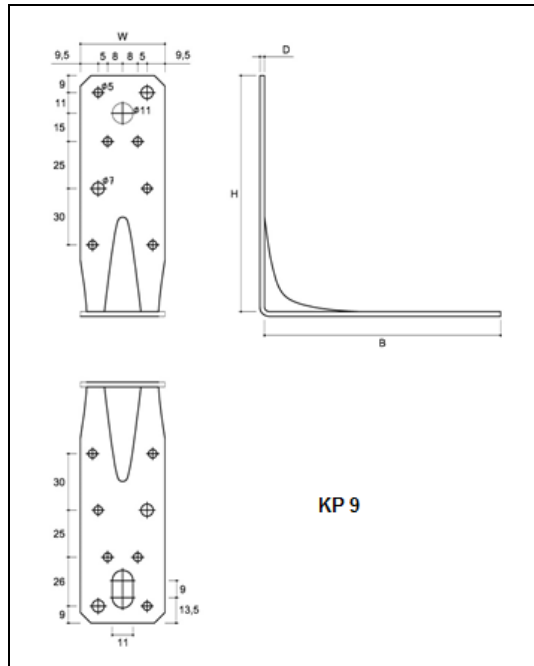


Figure 9 Type KP 9

Table 8 KP three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm				Quantity of openings		
	W	H	B	D	ø5	ø7	ø11
KP 9	45	126	126	2.5	12	4	1

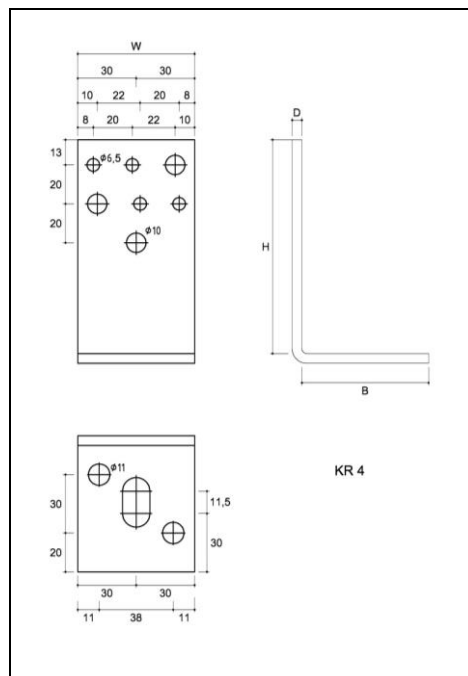


Figure 10 Type KR 4

Table 9 KR three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm				Quantity of openings		
	W	H	B	D	ø6.5	ø10	ø11
KR 4	60	110	65	5	4	3	2

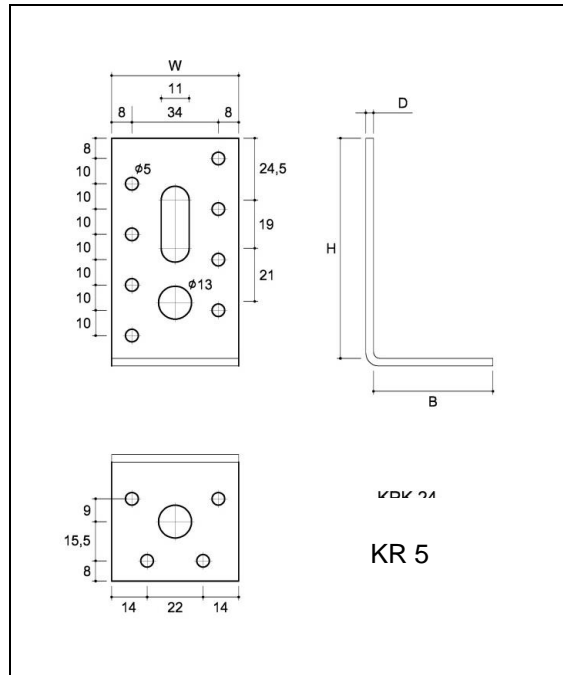


Figure 11 Type KR 5

Table 10 KR three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm				Quantity of openings	
	W	H	B	D	ø5	ø13
KR 5	50	87	47	3	12	2

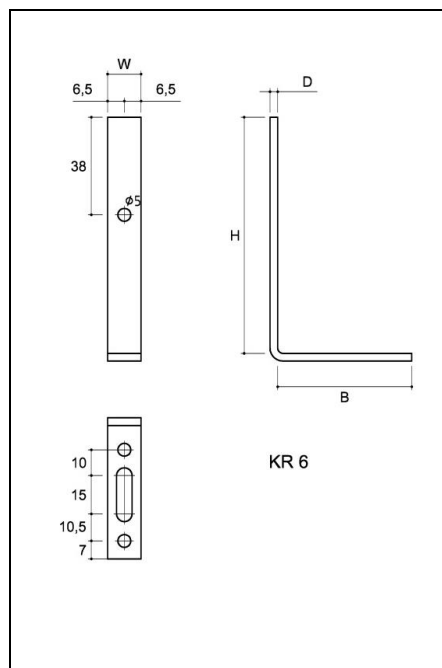


Figure 12 Type KR 6

Table 11 KR three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm				Quantity of openings
	W	H	B	D	ø5
KR 6	13	92	52	3	3

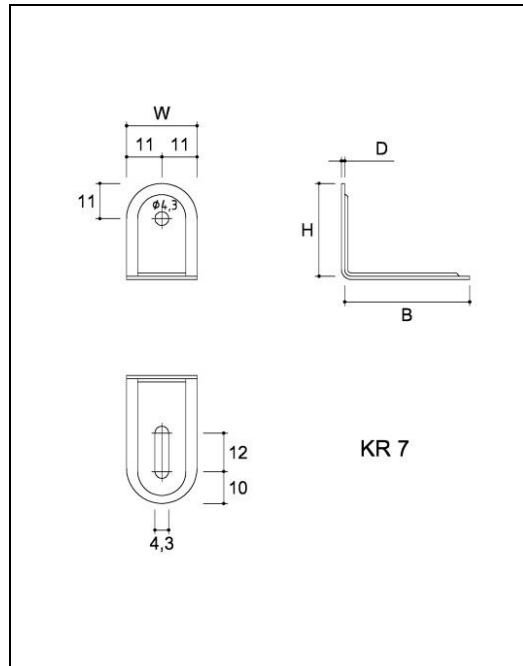


Figure 13 Type KR 7, KRB 7

Table 12 KR, KRB three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm				Quantity of openings
	W	H	B	D	∅4.3
KR 7	22	29	39	1	1
KRB 7	22	29	39	1	1

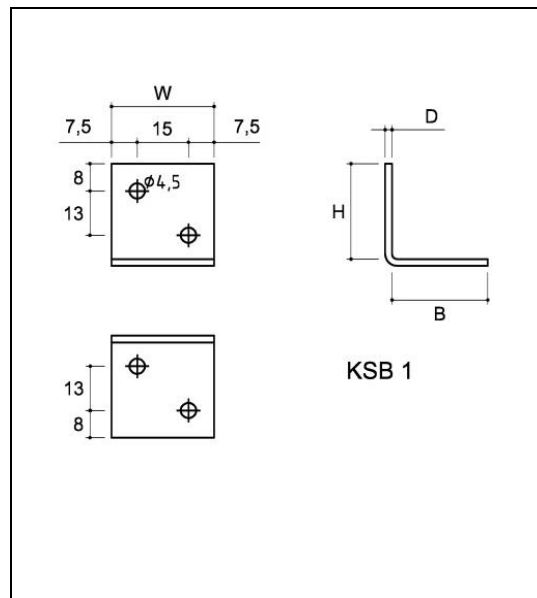


Figure 14 Type KSB 1

Table 13 KSB three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm				Quantity of openings
	W	H	B	D	∅4,5
KSB 1	30	28	28	2	4

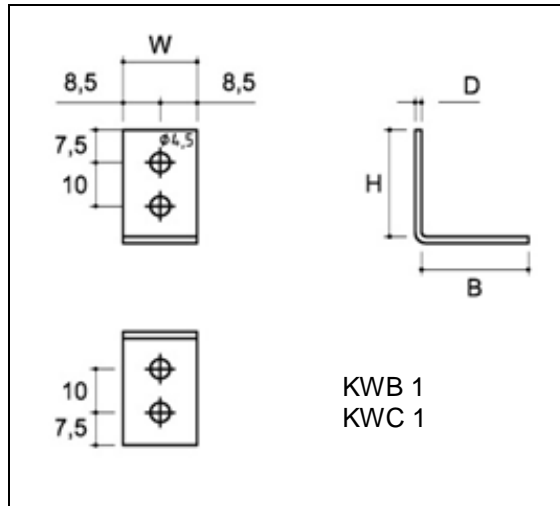


Figure 15 Type KWB 1, KWC 1

Table 14 KWB, KWC three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm				Quantity of openings
	W	H	B	D	
KWB 1	17	24.5	24.5	2	4
KWC 1	17	24.5	24.5	2	4

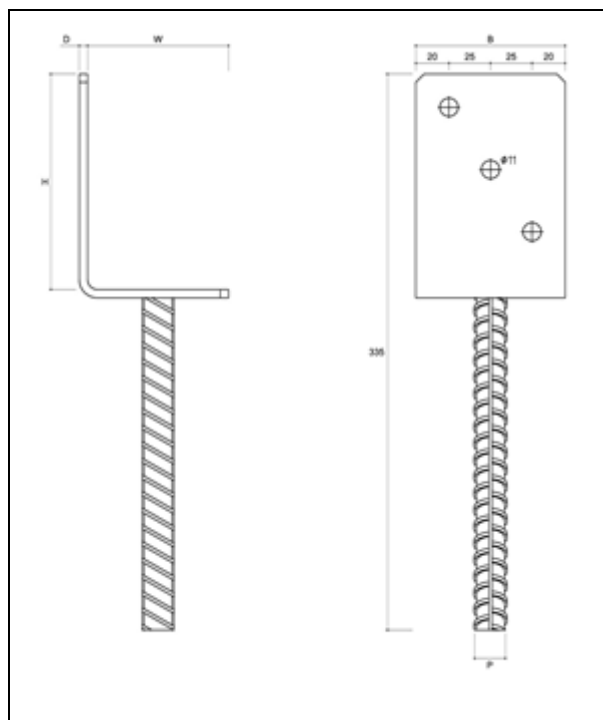


Figure 16 Type PS 84L

Table 15 PS 84 three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm					Quantity of openings
	W	H	B	D	P	
PS 84L	90	130	90	5	18	3

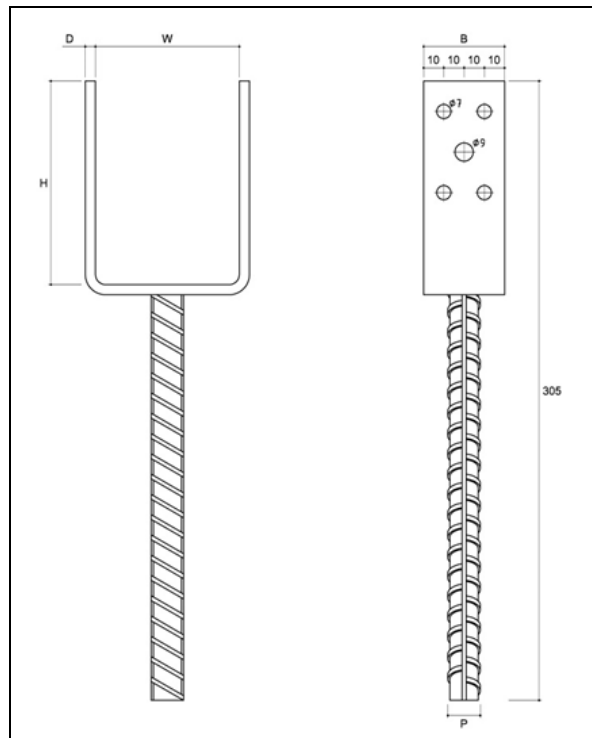


Figure 17 Type PSL 70

Table 16 PSL three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm					Quantity of openings	
	W	H	B	D	P	ø7	ø9
PSL 50	51	100	40	5	ø16	8	2
PSL 70	71	100	40	5	ø16	8	2
PSL 90	91	100	40	5	ø16	8	2
PSL 100	101	100	40	5	ø16	8	2

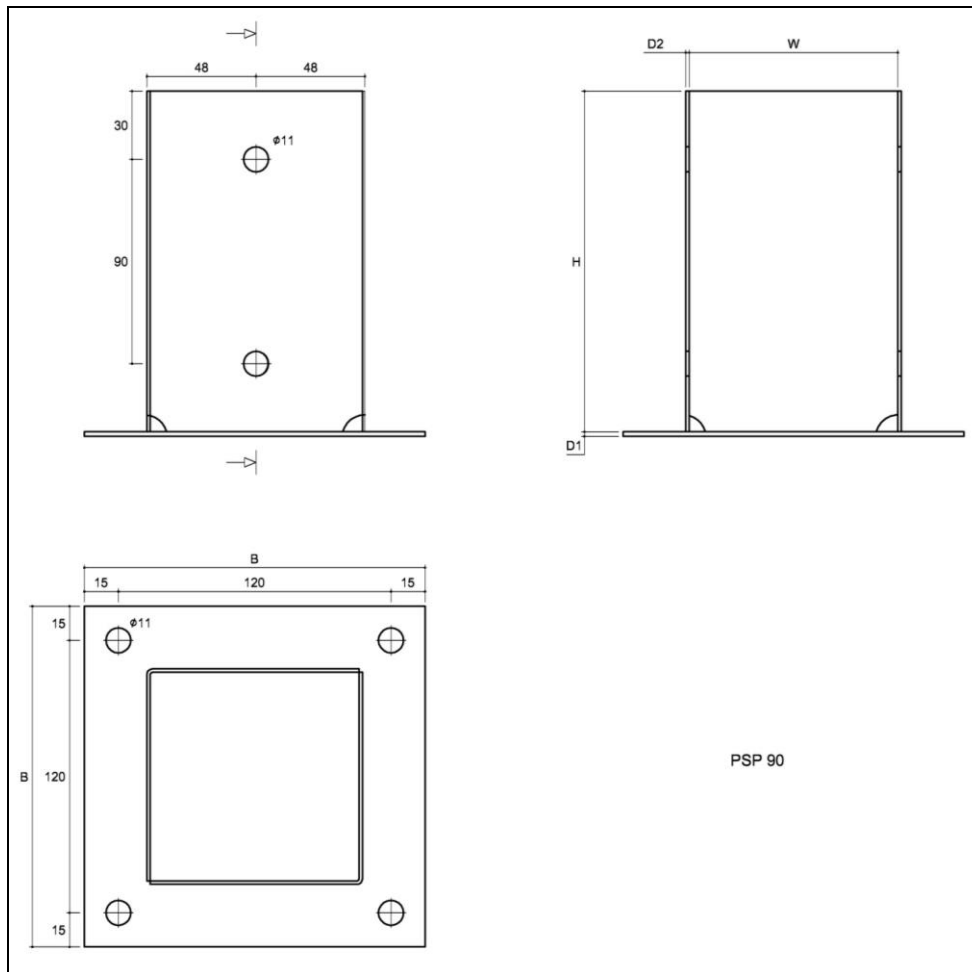


Figure 18 Type PSP 90

Table 17 PSP three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm					Quantity of openings
	W	H	B	D1	D2	Ø11
PSP 70	72	150	150	2	1.5	8
PSP 90	92	150	150	2	1.5	8
PSP 100	102	150	150	2	2	8
PSP 120	122	150	180	2	2	8

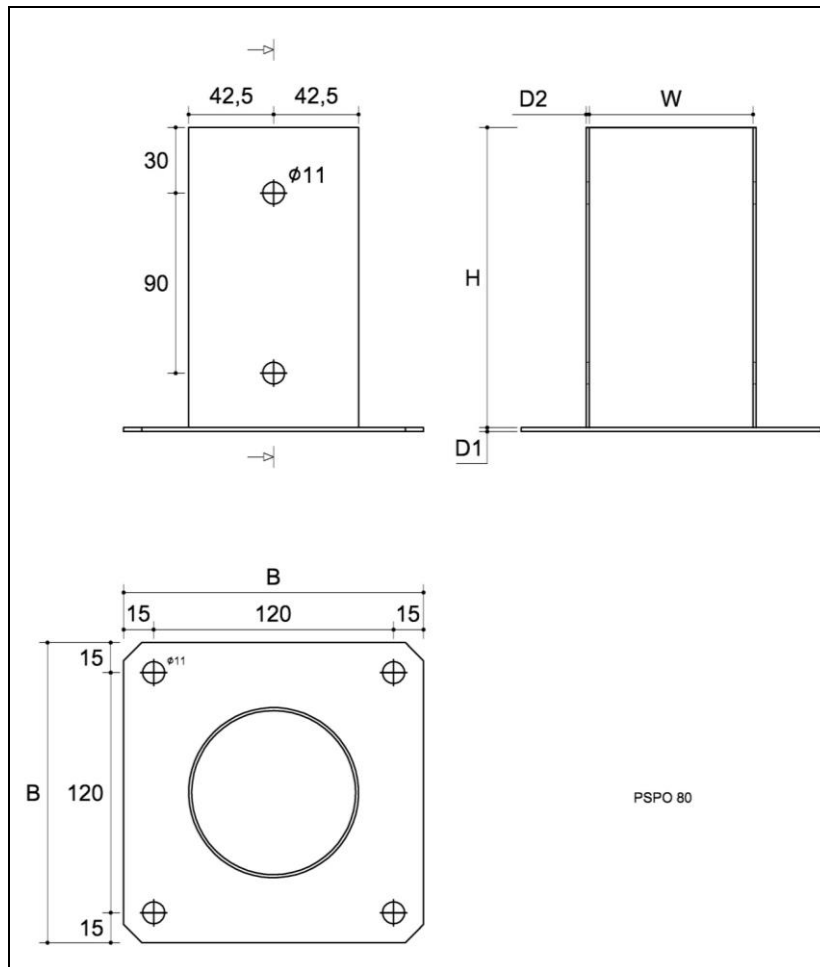


Figure 19 Type PSPO 80

Table 18 PSPO three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm					Quantity of openings
	W	H	B	D1	D2	ø11
PSPO 80	ø82	150	150	2	1.5	8
PSPO 100	ø102	150	150	2	1.5	8

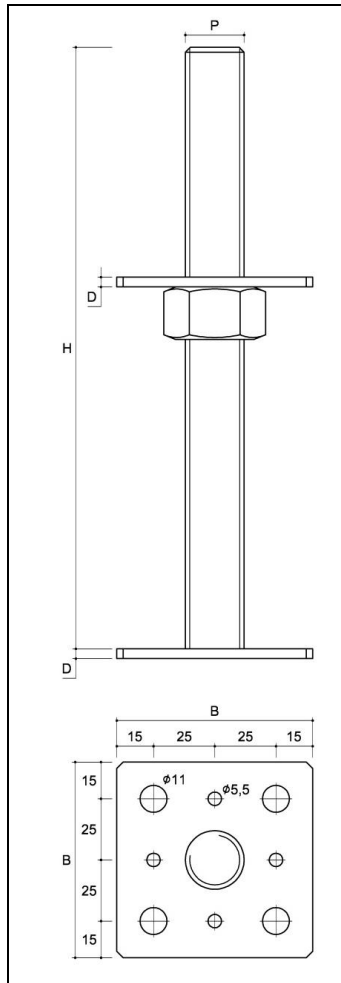


Figure 20 Type PSR 80

Table 19 PSR three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm				Quantity of openings	
	H	B	D	P	$\phi 5.5$	$\phi 11$
PSR 80	246	80	4	M24	8	8
PSR 110	246	110	4	M24	8	8

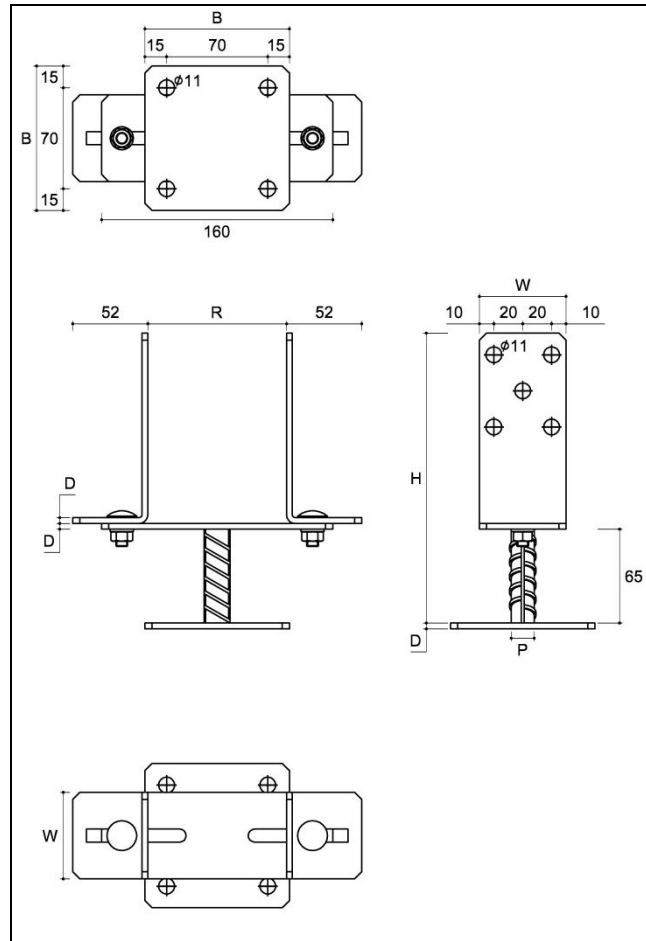


Figure 21 Type PSRT

Table 20 PSRT three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions of the timber beam	Dimensions, mm						Quantity of openings
	[mm]	W	H	B	D	R	P	$\varnothing 11$
PSRT	60x120	60	200	100	4	60	$\varnothing 18$	14
	70x120	60	200	100	4	70	$\varnothing 18$	14
	80x120	60	200	100	4	80	$\varnothing 18$	14
	90x120	60	200	100	4	90	$\varnothing 18$	14

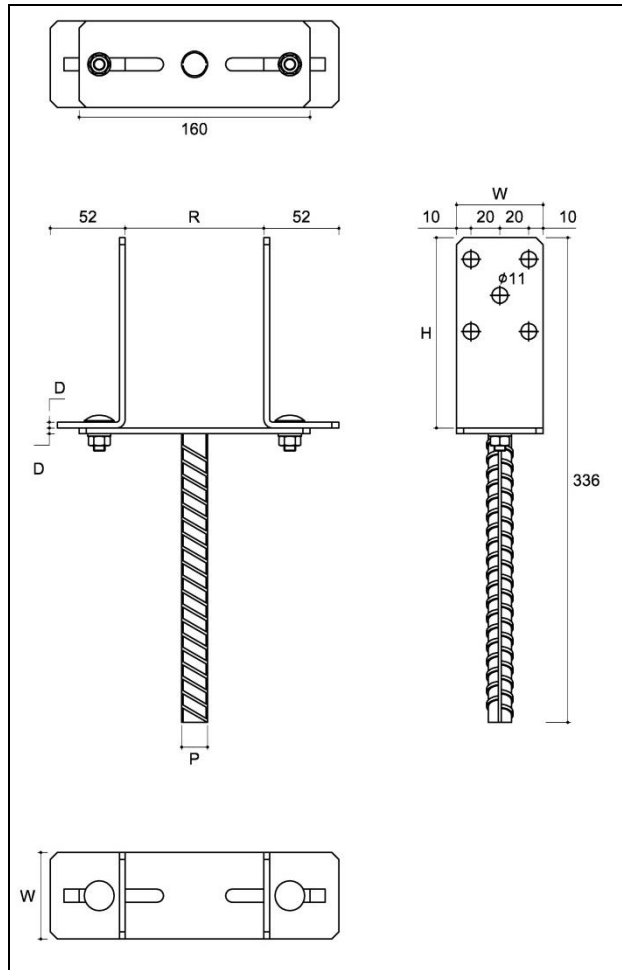


Figure 22 Type PSRU

Table 21 PSRU three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions of the timber beam	Dimensions, mm					Quantity of openings
	[mm]	W	H	P	R	D	ø11
PSRU	60x120	60	132	ø18	60	4	10
	70x120	60	132	ø18	70	4	10
	80x120	60	132	ø18	80	4	10
	90x120	60	132	ø18	90	4	10

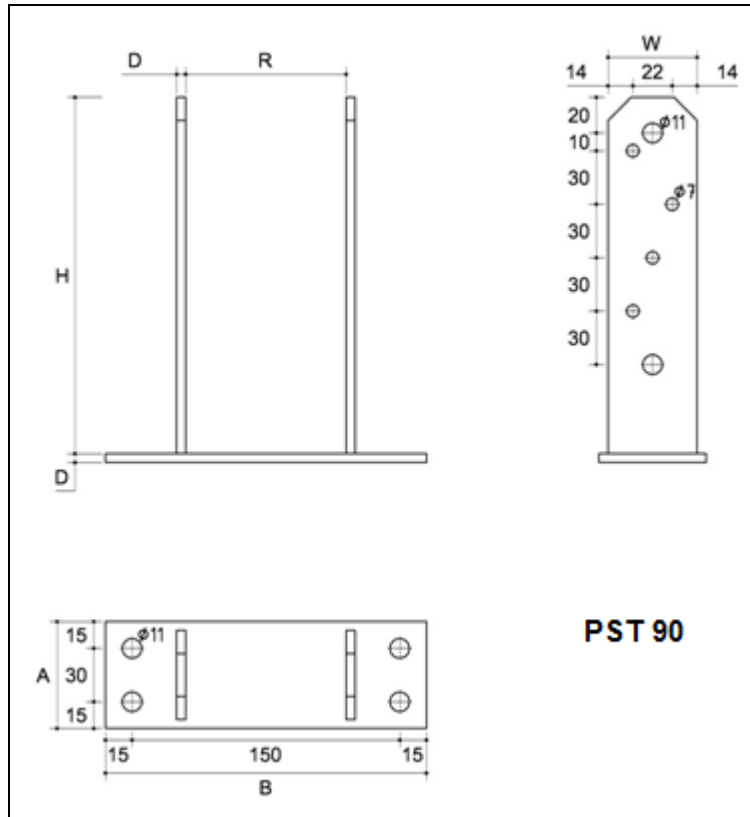


Figure 23 Type PST 90

Table 22 PST three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm						Quantity of openings	
	W	H	R	A	B	D	ø7	ø11
PST 70	50	200	70	60	160	5	8	8
PST 90	50	200	90	60	180	5	8	8
PST 100	50	200	100	60	190	5	8	8
PST 120	50	200	120	60	210	5	8	8
PST 140	50	200	140	60	230	5	8	8

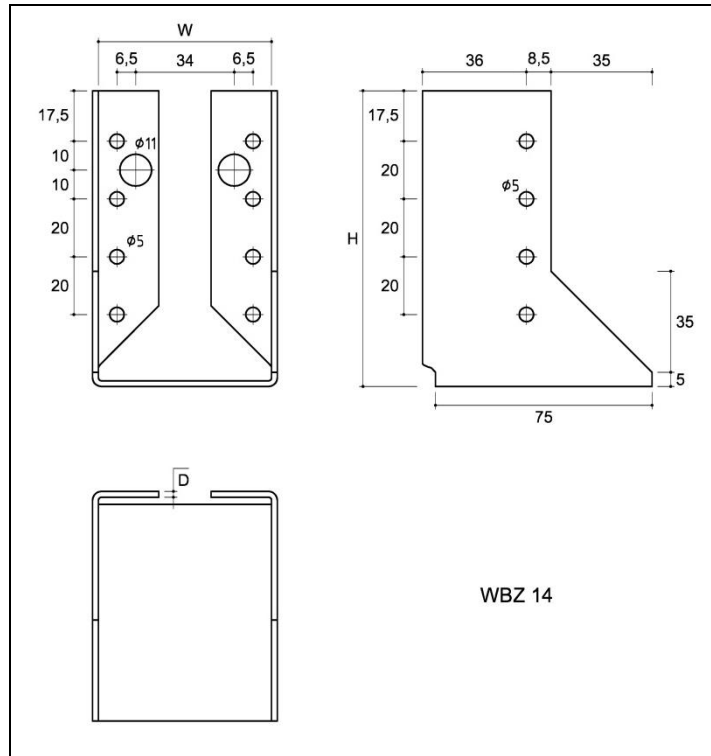
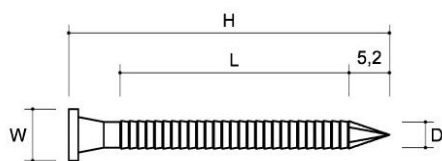


Figure 24 Type WBZ 14

Table 23 WBZ 14 three-dimensional nailing plate symbols and dimensions

Symbol	Dimensions, mm			Quantity of openings	
	W	H	D	ø5	ø11
WBZ 14	60	102	2	16	2

CONNECTION ELEMENTS

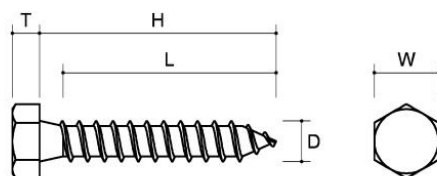


ANG 50

Figure 25 Type ANG 50

Table 24 ANCHOR dowel type connector symbols and dimensions

Symbol	Dimensions, mm			
	D	H	L	W
ANG 50	4	50	36.8	8

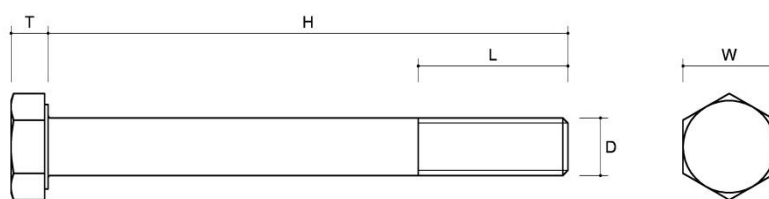


Ø6x35

Figure 26 Type 6x35

Table 25 Ø6x35 type connector symbols and dimensions

Symbol	Dimensions, mm					Standard
	D	H	L	W	T	
Ø6x35	6	35	31	9.7	4	DIN 571



M10x90

Figure 27 Type M10x90

Table 26 M bolt type connector symbols and dimensions

Symbol	Dimensions, mm					Standard
	D	H	L	W	T	
M12x110	12	110	30	18	7.5	ISO 4014
M10x160	10	160	32	16	6.5	ISO 4014
M10x140	10	140	32	16	6.5	ISO 4014
M10x130	10	130	32	16	6.5	ISO 4014

Symbol	Dimensions, mm					Standard
	D	H	L	W	T	
M10x120	10	120	26	16	6.5	ISO 4014
M10x110	10	110	26	16	6.5	ISO 4014
M10x90	10	90	26	16	6.5	ISO 4014
M10x70	10	70	26	16	6.5	ISO 4014
M8x120	8	120	22	13	5.2	ISO 4014
M8x110	8	110	22	13	5.2	ISO 4014
M8x100	8	100	22	13	5.2	ISO 4014
M8x90	8	90	22	13	5.2	ISO 4014
M8x70	8	70	22	13	5.2	ISO 4014

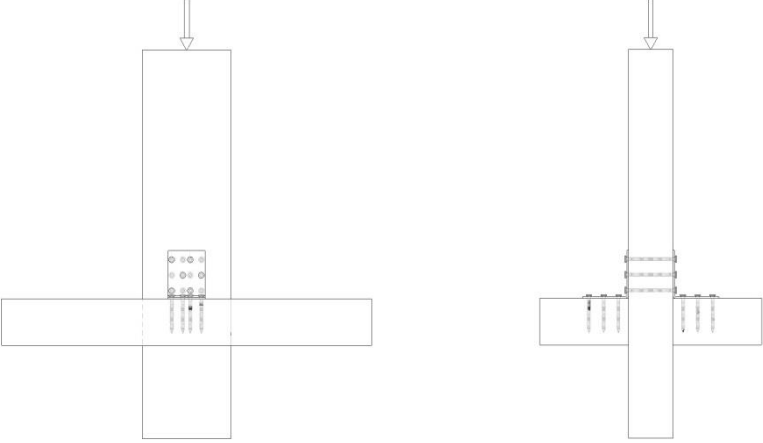
No.	Scheme	Connector types
1		KB 4 KK 0 KL 6 KM 17 KM 18 KP 2 KP 9 KR 5 KR 6 KR 7 KRB 7 KSB 1 KWB 1 KWC 1

Figure 28 Scheme 1

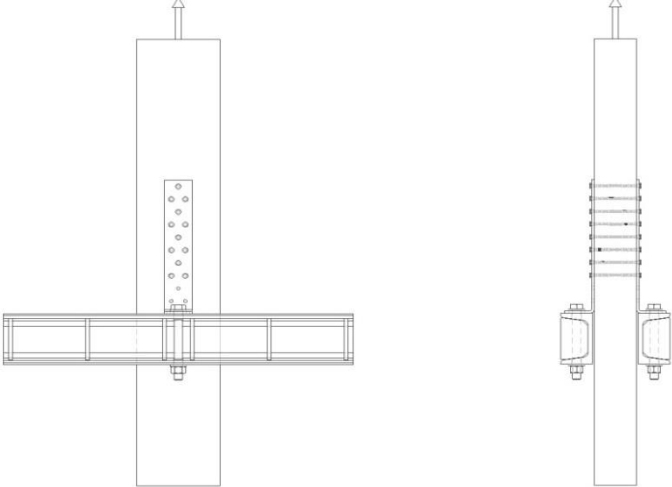
No.	Scheme	Connector types
2		KK 11 KK 12 KR 4

Figure 29 Scheme 2

No.	Scheme	Connector type
3		WBZ 14

Figure 30 Scheme 3

No.	Scheme	Connector type
4		PSL 50 PSL 70 PSL 90 PSL 100

Figure 31 Scheme 4

No.	Scheme	Connector type
5		PSP 70 PSP 90 PSP 100 PSP 120 PSPO 80 PSPO 100 PST 70 PST 90 PST 100 PST 120 PST 140

Figure 32 Scheme 5


No.	Scheme	Connector type
6		<p>PSR 80 PSR 110</p>

Figure 33 Scheme 6

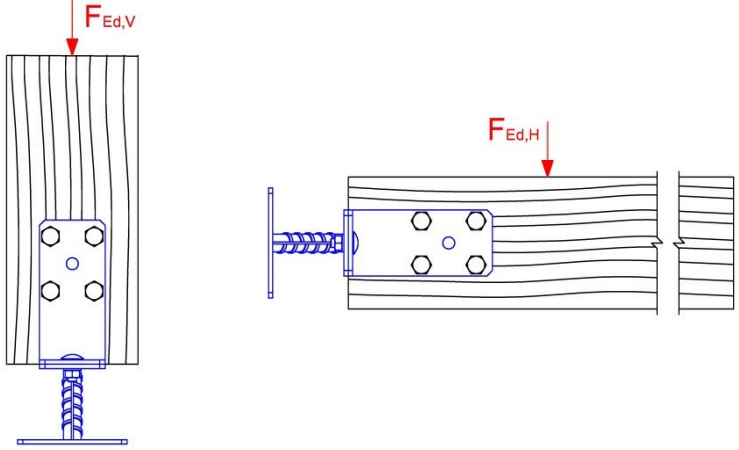
No.	Scheme	Connector type
7		<p>PSRT</p>

Figure 34 Scheme 7

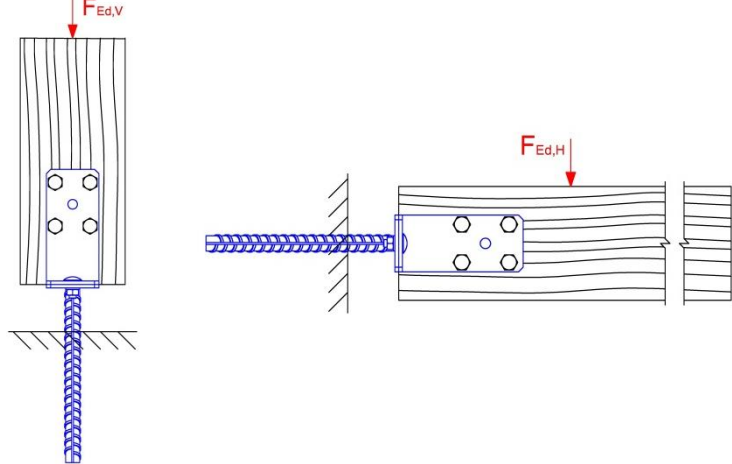
No.	Scheme	Connector type
8		<p>PSRU</p>

Figure 35 Scheme 8

No.	Scheme	Connector type
9		PS 84L

Figure 36 Scheme 9

DMX®	ANNEX 3 ETA 15/0725
THE CHARACTERISTIC LOAD-CARRYING CAPACITIES OF CONNECTORS (LOAD)	

Table 27

Connector	Type of Load	Timber Moisture [%]	Density	$P_{max,mean}$	$P_{max,k}$	Connectors per connection	Method of determination	Document No.	Note
			ρ_{mean} 12% [kg*m ⁻³]	(350 kg*m ⁻³) [kN]	(350 kg*m ⁻³) [kN]				
KB 4	pressure	12.7	420	21.9	19.3	2	testing	KB4-01-0001/15	2)
KK 0	pressure	12	411	9.7	7.7	2	testing	KK0-01-0001/15	2)
KK 11	pull out	11.7	429	32.8	26.5	2	testing	KK11-01-0001/15	2)
KK 12	pull out	11.4	439	20.7	18.3	2	testing	KK12-01-0001/15	2)
KL 6	pressure	11.9	435	16.2	13.6	2	testing	KL6-01-0001/15	2)
KM 17	pressure	11.4	456	11.2	9.3	2	testing	KM17-01-0001/15	2)
KM 18	pressure	14.3	437	13.5	11.2	2	testing	KM18-01-0001/15	2)
KP 2	pressure	11	C24	24.3	21.9	2	testing	LCE-O-ML-01	2)
KP 9	pressure	12.2	440	21.6	18.2	2	testing	KP130-01-0001/15	2)
KR 4	pull out	11.4	461	17.4	14.9	2	testing	KR4-01-0001/15	2)
KR 5	pressure	11.5	450	17.4	14.7	2	testing	KR5-01-0001/15	2)
KR 6	pressure	11.7	429	7.7	6.7	2	testing	KR6-01-0001/15	2)
KR 7	pressure	11.3	414	3.5	3	2	testing	KR7-01-0001/15	2)
KRB 7	pressure	11.3	414	3.5	3	2	testing	KR7-01-0001/15	2)
KSB 1	pressure	-	C24	3.7	3.4	2	testing	LCE-O-ML-01	2)
KWB 1	pressure	13.8	439	5.7	5	2	testing	KWC1-01-0001/15	2)

Connector	Type of Load	Timber Moisture [%]	Density	$P_{max,mean}$	$P_{max,k}$	Connectors per connection	Method of determination	Document No.	Note
			ρ_{mean} 12% [kg*m ⁻³]	(350 kg*m ⁻³) [kN]	(350 kg*m ⁻³) [kN]				
KWC 1	pressure	13.8	439	5.7	5	2	testing	KWC1-01-0001/15	2)
WBZ 14	pressure	-	C24	-	9.3	1	calculation	LCE-O-WBZ-01	1)

Notes:

1) The forces are given for the complete connection consisting of one connector

2) The forces are given for the complete connection consisting of two connectors, hence force per one connector (one angle bracket) is half of the given value.

$P_{max,k}$ characteristic load-bearing capacity of connector

DMX®	ANNEX 3 ETA 15/0725
THE CHARACTERISTIC LOAD-CARRYING CAPACITIES OF CONNECTORS (CALCULATIONS)	

Table 28

Connector	Beam dimensions [mm]	Pressure $F_{Ed,V}$		Shear $F_{Ed,H1}$		Shear $F_{Ed,H2}$		Document No.
		Timber	Steel	Timber	Steel	Timber	Steel	
		$N_{Rk,V,w}$ [kN]	$N_{Rd,V,s}$ [kN]	$N_{Rk,H1,w}$ [kN]	$N_{Rd,H1,s}$ [kN]	$N_{Rk,H2,w}$ [kN]	$N_{Rd,H2,s}$ [kN]	
PSL 50	50x65	40.8	51.7	2.9	2.4	5.6	1.3	KAO-L-PSL-01
PSL 70	70x70	60.5	51.7	2.9	2.4	8.2	1.3	
PSL 90	90x90	77.3	51.7	2.9	2.4	11.2	1.3	
PSL 100	100x100	85.7	51.7	2.9	2.4	11.2	1.3	
PSP 70	70x70	13.4	21.6	11.4	11.2	11.4	11.2	KAO-L-PSP-01
PSP 90	90x90	13.4	21.6	14.6	15.3	14.6	15.3	
PSP 100	100x100	14.1	28.8	16.3	23.2	16.3	23.2	
PSP 120	120x120	14.1	28.8	19.5	28.6	19.5	28.6	
PSPO 80	ø80	13.4	21.6	9.8	25.2	9.8	25.2	KAO-L-PSPO-01
PSPO 100	ø100	13.4	21.6	15.2	30.8	15.2	30.8	
PSR 80	90x90	115.3	49.3	-	-	-	-	KAO-L-PSR-01
PSR 110	120x120	235	49.3	-	-	-	-	
PSRT	60x120	75.6	57.3	13	0.5	-	-	KAO-L-PSRT-01
	70x120	88.2	57.3	15.2	0.5	-	-	
	80x120	100.8	57.3	17.4	0.5	-	-	
	90x120	113.4	57.3	19.5	0.5	-	-	
PSRU	60x120	75.6	57.3	13	0.5	-	-	KAO-L-PSRU-01
	70x120	88.2	57.3	15.2	0.5	-	-	
	80x120	100.8	57.3	17.4	0.5	-	-	
	90x120	113.4	57.3	19.5	0.5	-	-	

Connector	Beam dimensions [mm]	Pressure $F_{Ed,V}$		Shear $F_{Ed,H1}$		Shear $F_{Ed,H2}$		Document No.
		Timber	Steel	Timber	Steel	Timber	Steel	
		$N_{Rk,V,w}$ [kN]	$N_{Rd,V,s}$ [kN]	$N_{Rk,H1,w}$ [kN]	$N_{Rd,H1,s}$ [kN]	$N_{Rk,H2,w}$ [kN]	$N_{Rd,H2,s}$ [kN]	
PST 70	70x80	31.9	117.5	2.5	3.7	8.8	7.1	KAO-L-PST-01
PST 90	90x90	31.9	117.5	2.5	3.7	12	7.1	
PST 100	100x100	31.9	117.5	2.5	3.7	13	7.1	
PST 120	120x120	31.9	117.5	2.5	3.7	13	7.1	
PST 140	140x140	31.9	117.5	2.5	3.7	13	7.1	
PS 84 L	160x100	29.3	57.3	5.3	2.2	12.2	1.8	KAO-L-PS84-01

It is always necessary to put nails in the black marked holes. This is the only one proper pattern because too many or too long nails can weaken the wood, it's quite close to edge (rule is stated below).

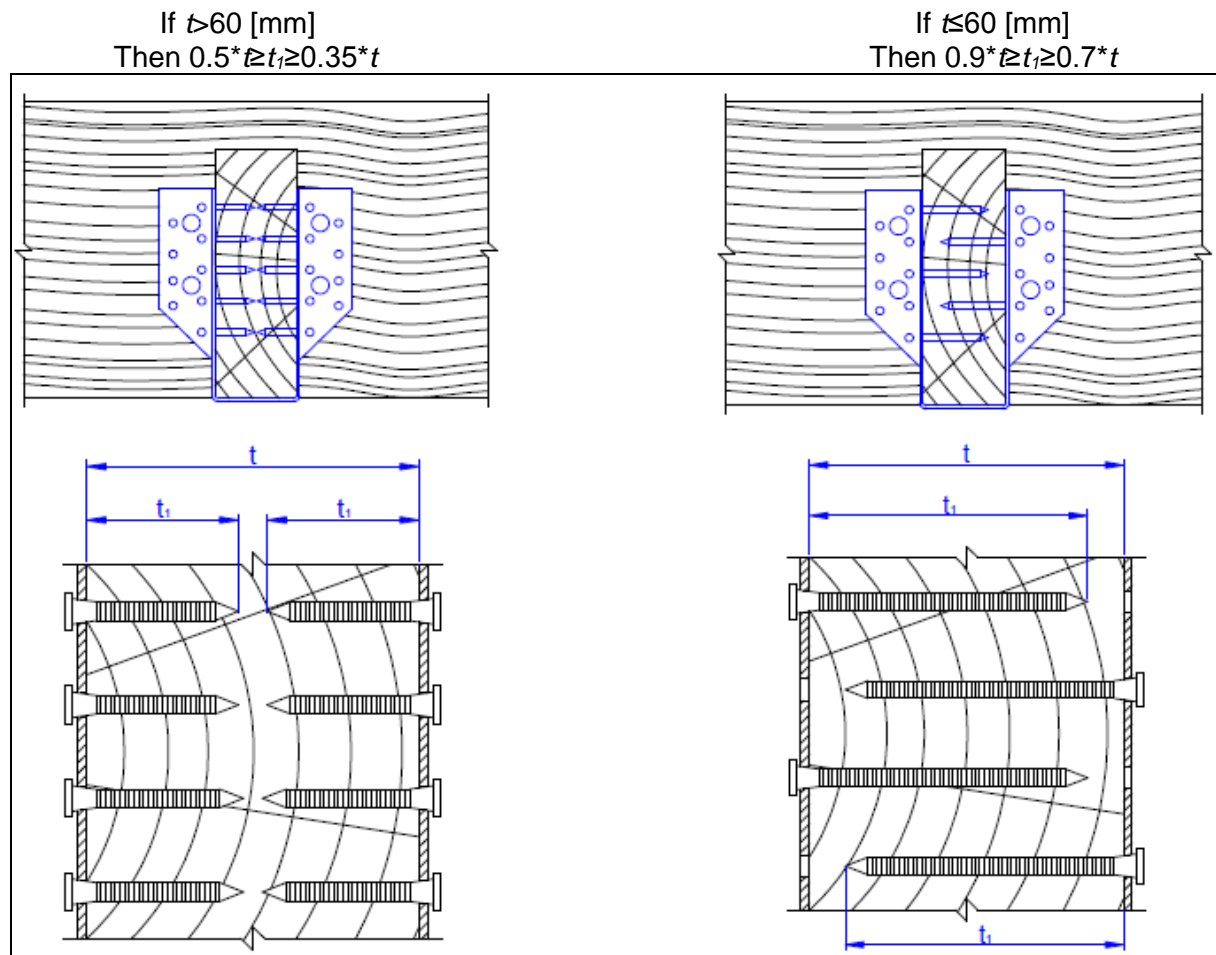


Figure 37 Rule for placement nails

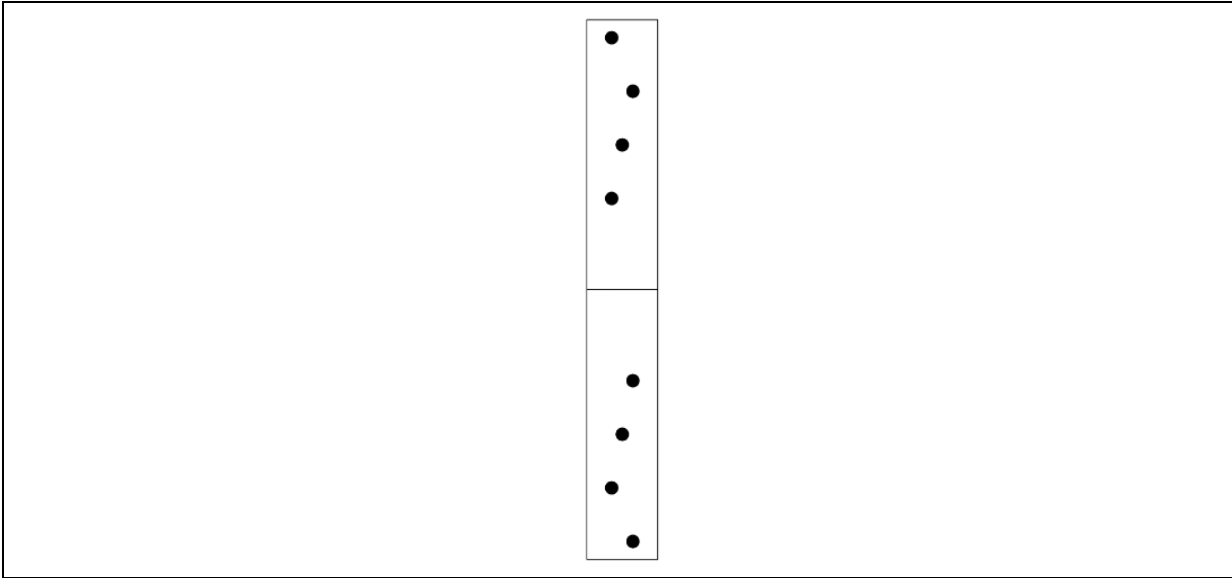


Figure 38 Type KB 4

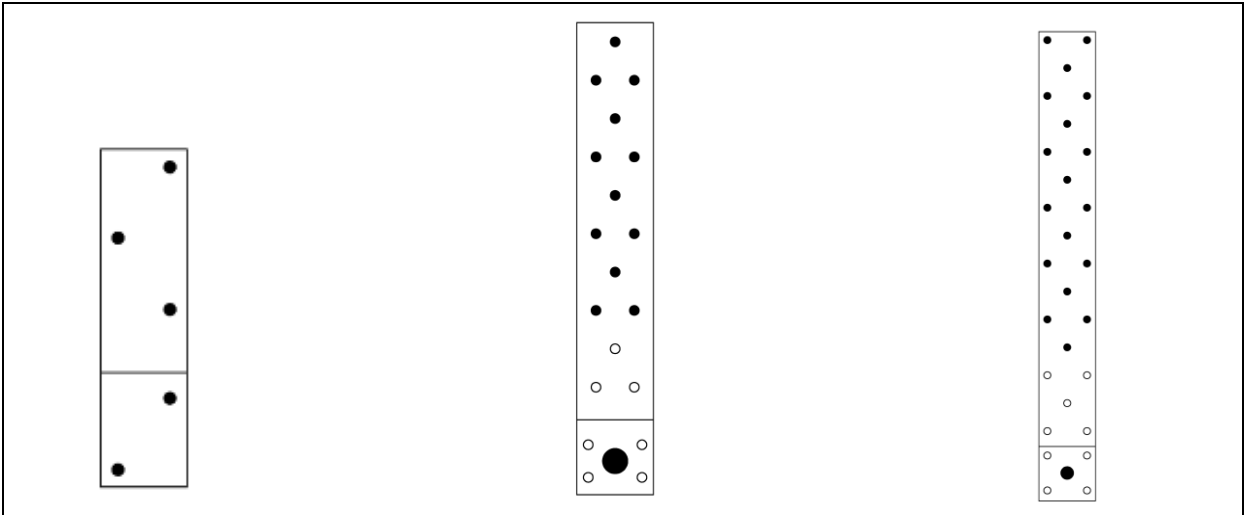


Figure 39 Type KK 0

Figure 40 Type KK 11

Figure 41 Type KK 12

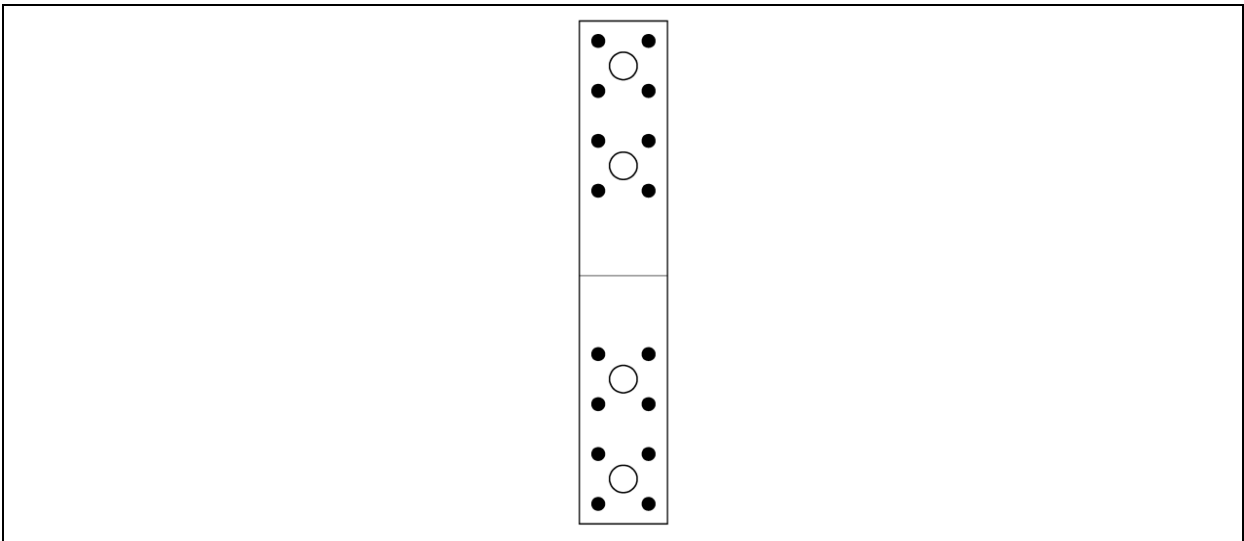


Figure 42 Type KL 6

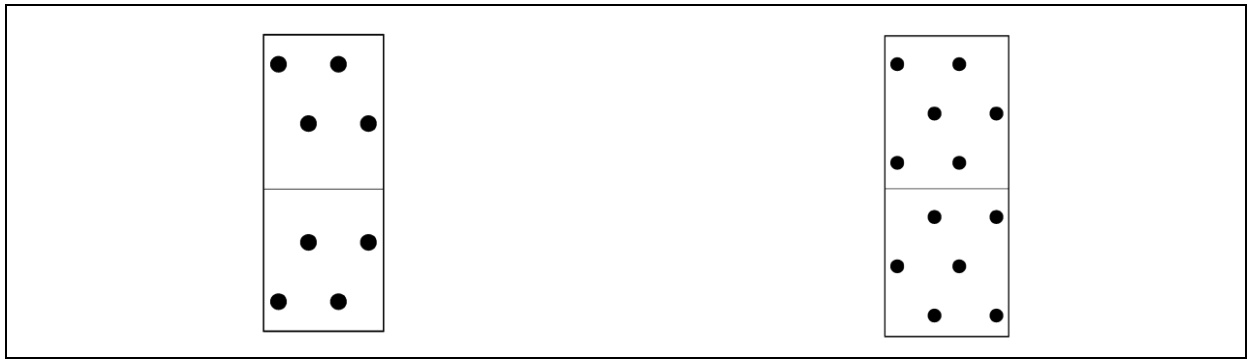


Figure 43 Type KM 17

Figure 44 Type KM 18

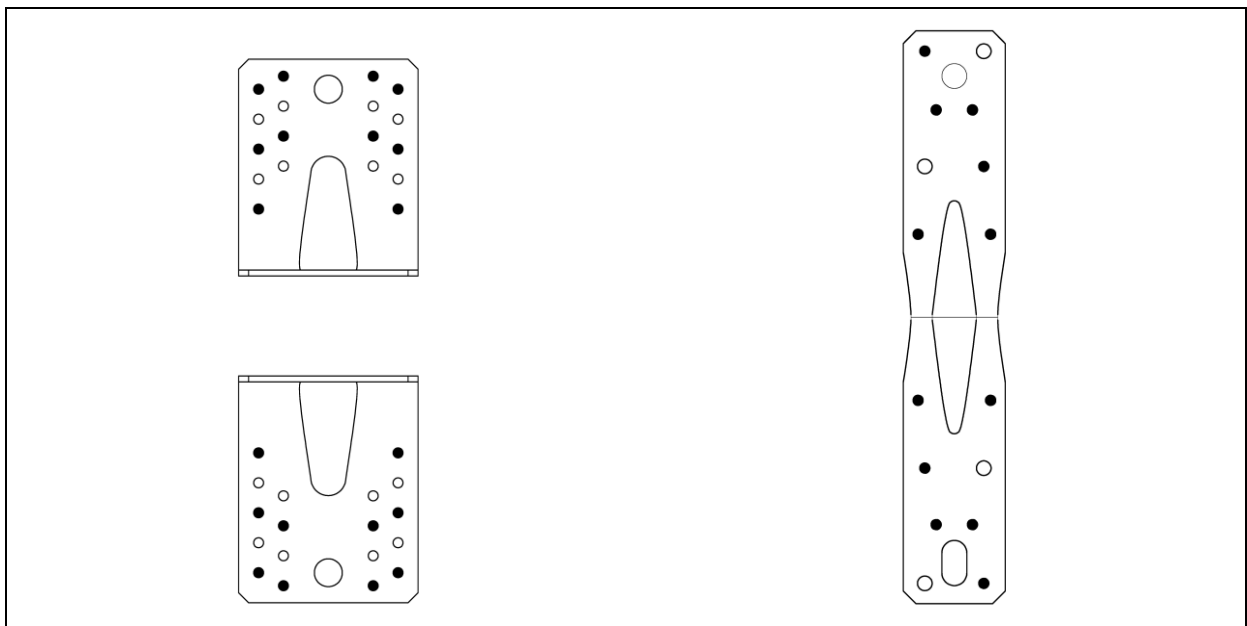


Figure 45 Type KP 2

Figure 46 Type KP 9

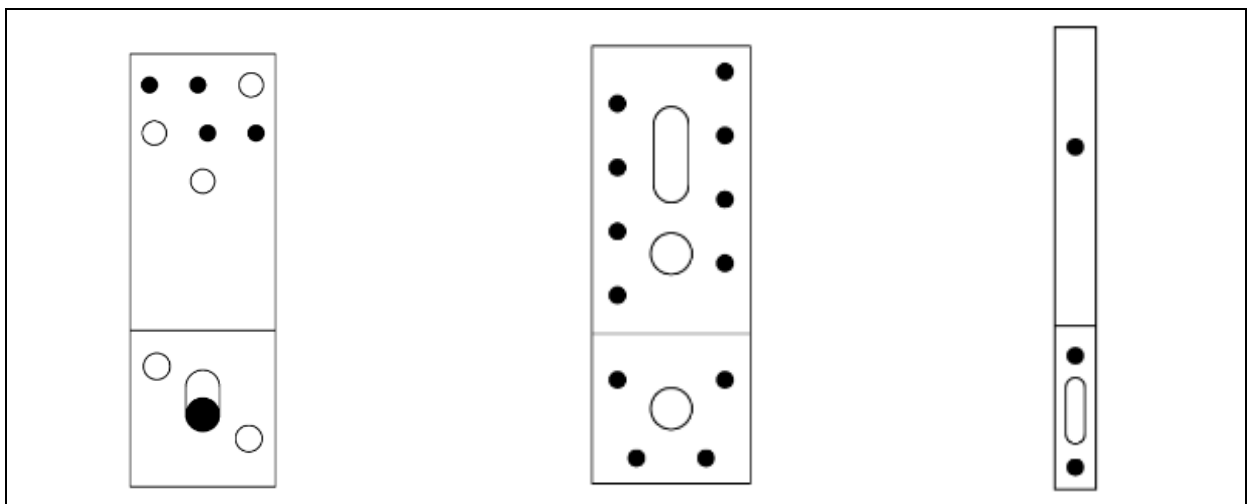


Figure 47 Type KR 4

Figure 48 Type KR 5

Figure 49 Type KR 6

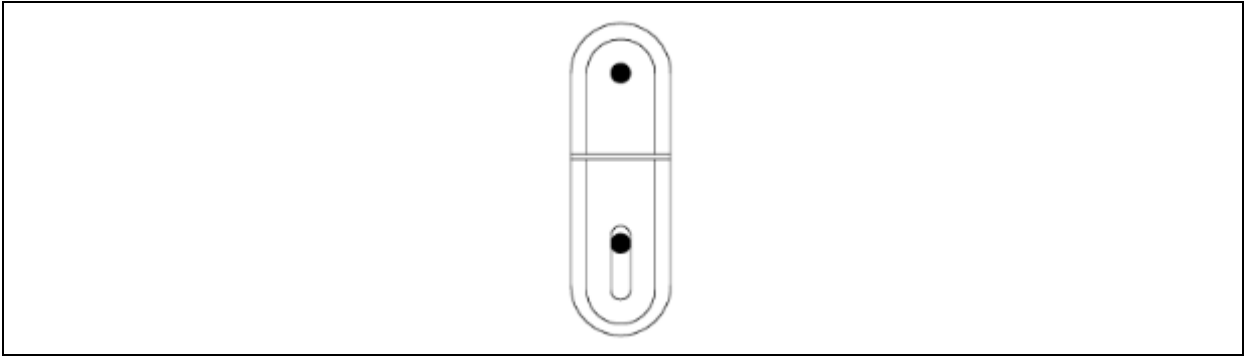


Figure 50 Type KR 7, KRB 7

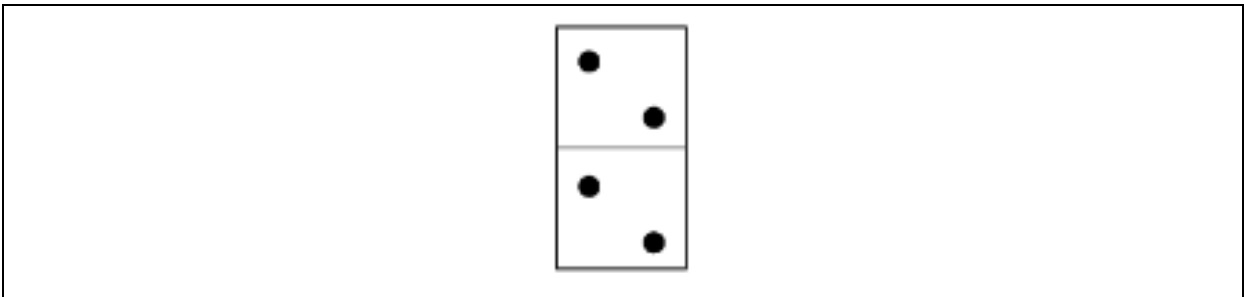


Figure 51 Type KSB 1

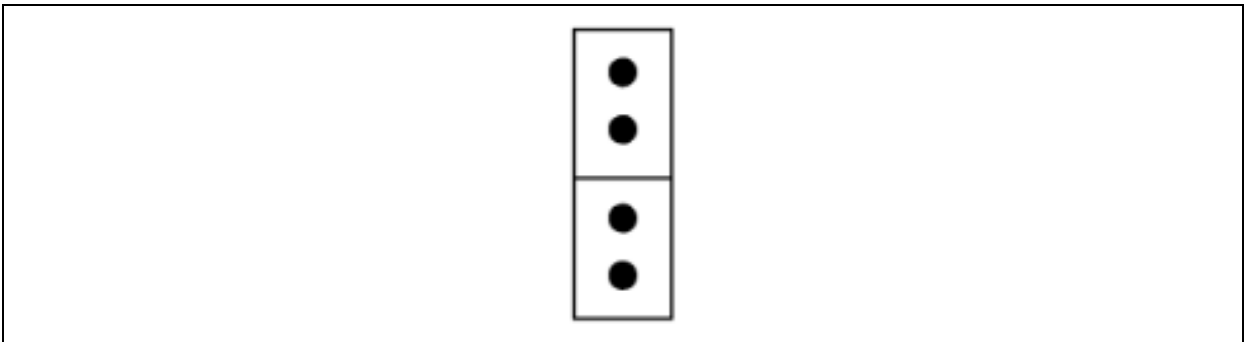


Figure 52 Type KWB 1, KWC 1

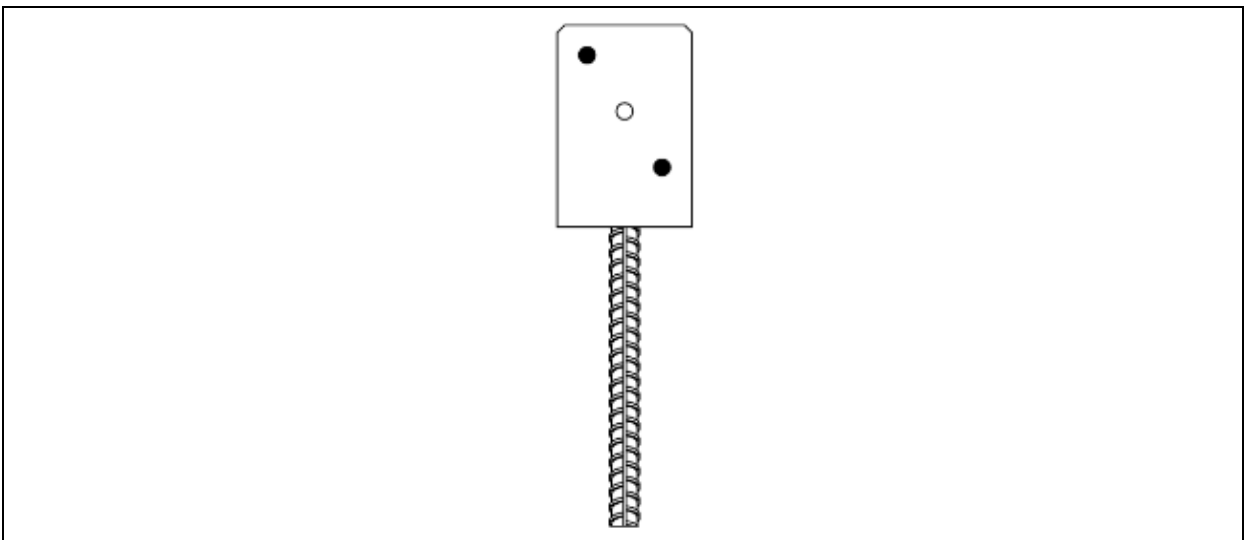


Figure 53 Type PS 84 L

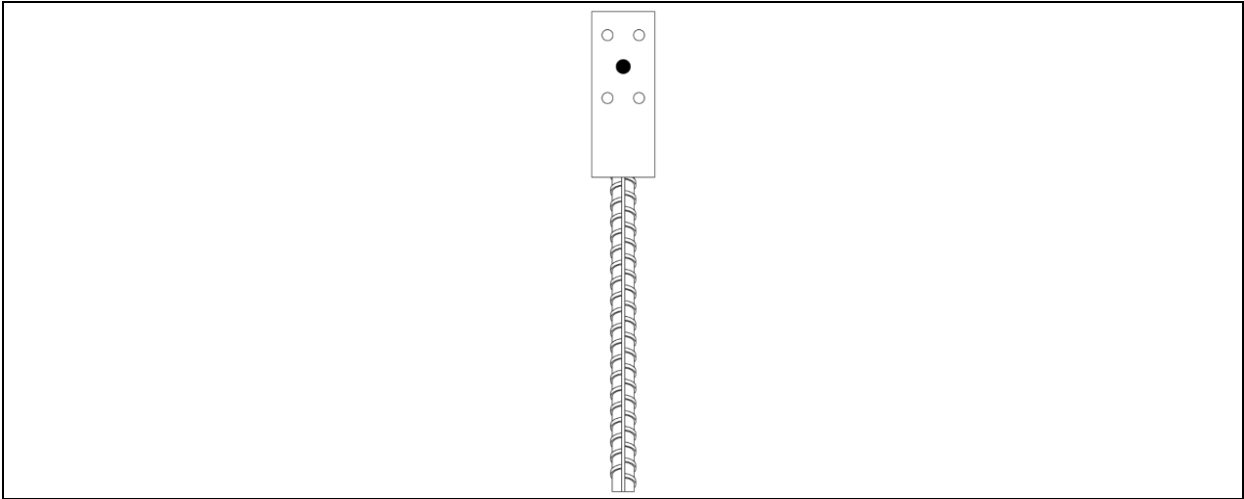


Figure 54 Type PSL

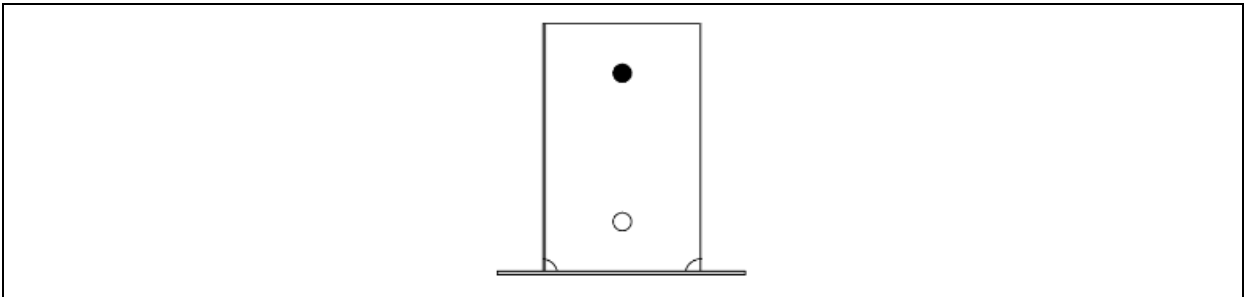


Figure 55 Type PSP

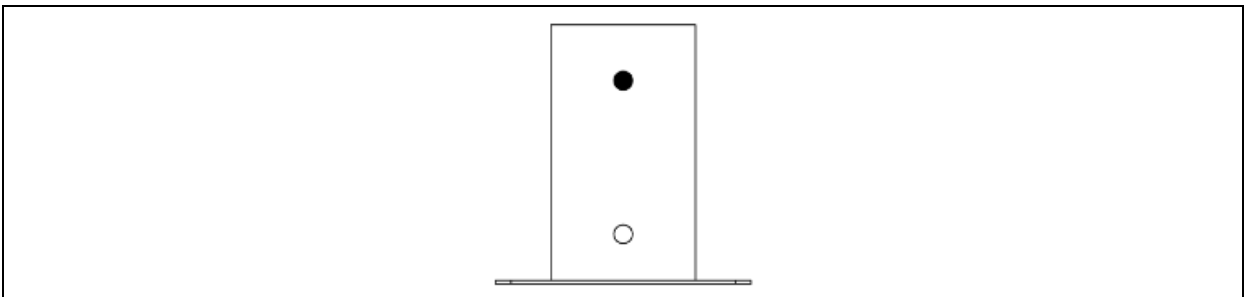


Figure 56 Type PSPO

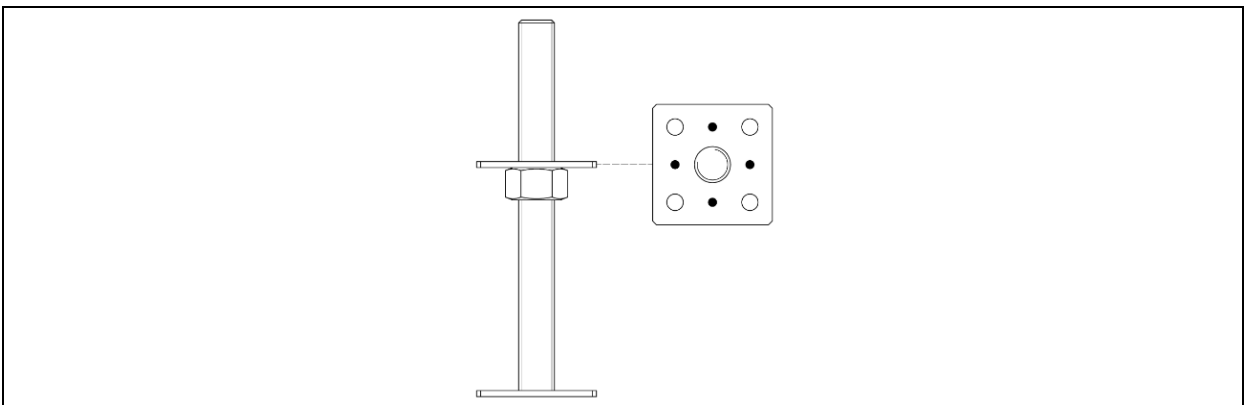


Figure 57 Type PSR

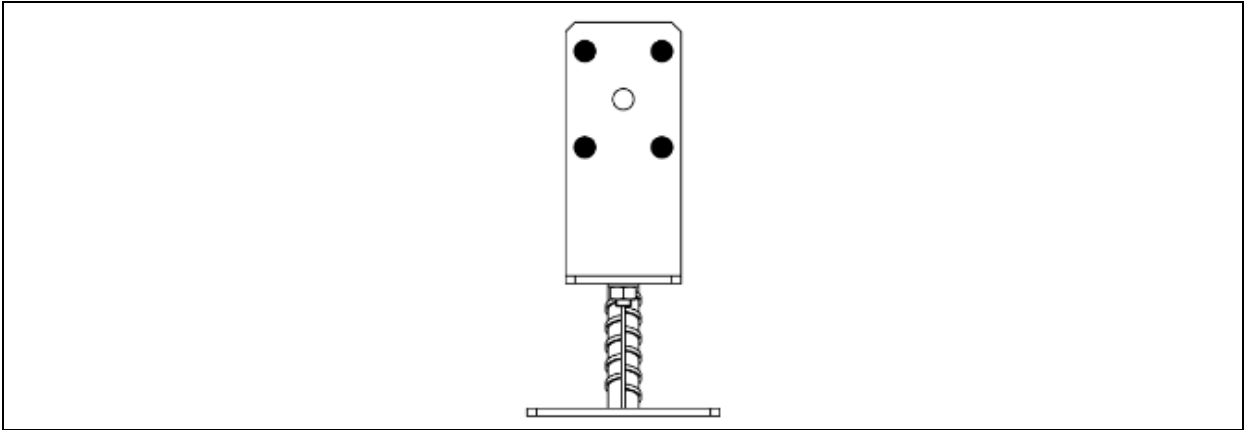


Figure 58 Type PSRT

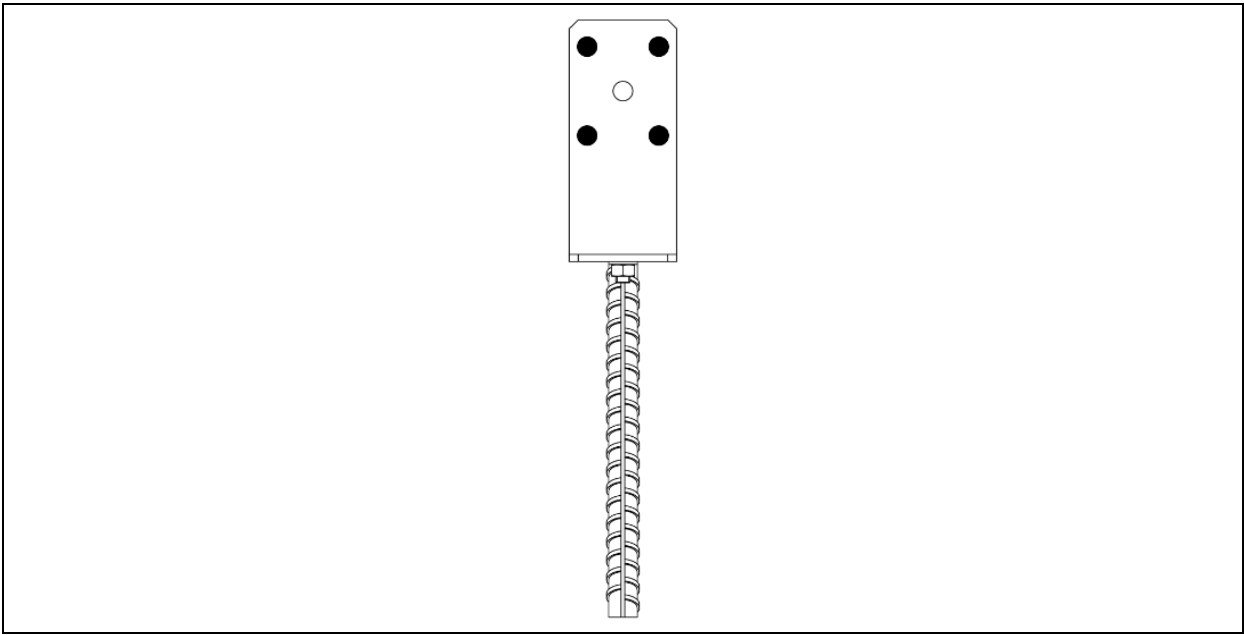


Figure 59 Type PSRU

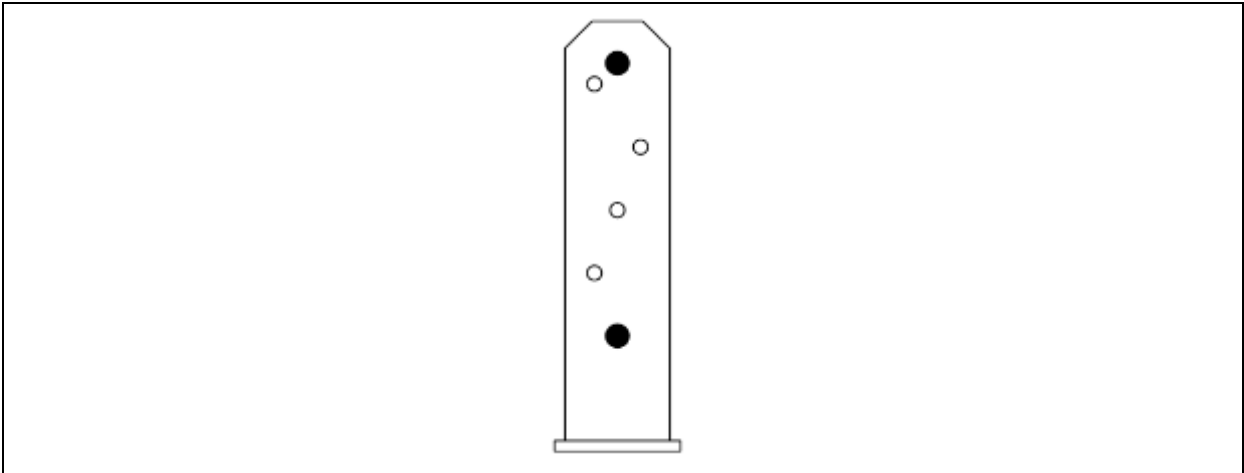


Figure 60 Type PST

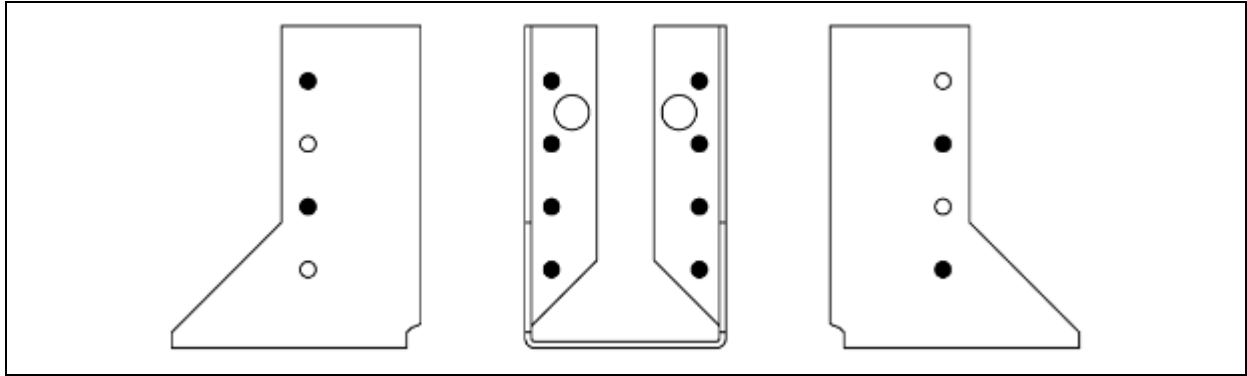


Figure 61 Type WBZ

DMX®	ANNEX 5 ETA 15/0725
SPECIFICATION OF CONNECTION ELEMENTS	

Table 29

Connector	Dowel type connectors	Connectors per Detail [pc.]	Connectors per Connection [pc.]
KB 4	DIN 571 \varnothing 6x35	8	16
KK 0	ANCHOR \varnothing 4x50	5	10
KK 11	ANCHOR \varnothing 4x50 / ISO 4014 M12x110-5.8	12 / 1	24 / 2
KK 12	ANCHOR \varnothing 4x50 / ISO 4014 M8x100-5.8	18 / 1	36 / 2
KL 6	ANCHOR \varnothing 4x50	16	32
KM 17	ANCHOR \varnothing 4x50	8	16
KM 18	ANCHOR \varnothing 4x50	12	24
KP 2	ANCHOR \varnothing 4x50	20	40
KP 9	ANCHOR \varnothing 4x50	12	24
KR 4	DIN 571 \varnothing 6x35 / ISO 4014 M12x110-5.8	4 / 1	8 / 2
KR 5	ANCHOR \varnothing 4x50	12	24
KR 6	ANCHOR \varnothing 4x50	3	6
KR 7	ANCHOR \varnothing 4x50	2	4
KRB 7	ANCHOR \varnothing 4x50	2	4
KSB 1	ANCHOR \varnothing 4x50	4	8
KWB 1	ANCHOR \varnothing 4x50	4	8
KWC 1	ANCHOR \varnothing 4x50	4	8
WBZ 14	ANCHOR \varnothing 4x50 / ANCHOR \varnothing 4x50	8 / 4	8 / 4
PSL 50	ISO 4014 M8x70-5.8	1	1
PSL 70	ISO 4014 M8x90-5.8	1	1
PSL 90	ISO 4014 M8x110-5.8	1	1
PSL 100	ISO 4014 M8x120-5.8	1	1
PSP 70	ISO 4014 M10x90-5.8	1	1
PSP 90	ISO 4014 M10x110-5.8	1	1
PSP 100	ISO 4014 M10x120-5.8	1	1
PSP 120	ISO 4014 M10x130-5.8	1	1
PSPO 80	ISO 4014 M10x100-5.8	1	1
PSPO 100	ISO 4014 M10x120-5.8	1	1
PSR 80	ANCHOR \varnothing 4x50	4	4
PSR 110	ANCHOR \varnothing 4x50	4	4
PSRT	ISO 4014 M10-5.8	4	4
PSRU	ISO 4014 M10-5.8	4	4
PST 70	ISO 4014 M10x90-5.8	2	2
PST 90	ISO 4014 M10x110-5.8	2	2
PST 100	ISO 4014 M10x120-5.8	2	2
PST 120	ISO 4014 M10x140-5.8	2	2
PST 140	ISO 4014 M10x160-5.8	2	2
PS 84 L	ISO 4014 M10x120-5.8 (washer ISO 7094)	2	2

DMX®	ANNEX 6 ETA 15/0725
REFERENCE DOCUMENTS	

ETAG 015, edition April 2013, *“Three-dimensional nailing plates”* used as European Assessment Document (EAD)

EOTA TR 016 *“Method of testing Three-Dimensional Nailing Plates, with examples”*

EN 10346 Continuously hot-dip coated steel flat products - Technical delivery conditions

EN 10131 Cold rolled uncoated and zinc or zinc-nickel electrolytically coated low carbon and high yield strength steel flat products for cold forming - Tolerances on dimensions and shape

EN 10025-2 Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels

EN 14592+A1 Timber structures - Dowel-type fasteners – Requirements

EN 1995-1-1 Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings

EN ISO 12944-2 Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 2: Classification of environments

EN ISO 8970 Timber structures - Testing of joints made with mechanical fasteners - Requirements for wood density

EN 26891 Timber structures – Joints made with mechanical fasteners – General principles for the determination of strength and deformation characteristics

EN 384 Structural timber – Determination of characteristic values of mechanical properties and density

EN 13183-2 Moisture content of a piece of sawn timber - Part 2: Estimation by electrical resistance method

EN 1309-1 Round and sawn timber - Method of measurement of dimensions - Part 1: Sawn timber

EN 14358 Timber structures – Calculation of characteristic 5-percentile values and acceptance criteria for a sample

EN 13501-1+A1 Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests