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European Technical Assessment

ETA 14/0425
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General Part

Technical Assessment Body issuing the European Technical Assessment

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 | DOMAX Sp.z o.o. Aleja Parku Krajobrazowego 109 84-207 Koleczkowo Łężyce Republic of Poland |
| This European Technical Assessment contains | 65 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 used as European Assessment Document (EAD) |
| This version replaces | ETA 14/0425, version 01, issued on 13/11/2014 |

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1 Technical description of the product

The three-dimensional nailing plates DMX[®] are one-piece, non-welded or welded (KKB, PS, SDP 90 A, SDP 90 B, SDP 100 A, SDP 100 B, SDP 120 A, SDP 120 B, SDSP 70 A, SDSP 70 B) elements, made of the cold-formed steel sheet grade DX51D according to EN 10346 with the zinc coating mass of 275 g/m², electrogalvanized steel DC01 according to EN 10131 with corrosion protection Fe/Zn 12 or S235 according to EN 10025-2 with minimum 12 μm of zinc layer. Elements SD and SDS have extra powder coating 60 μm (see list below). The three-dimensional nailing plates DMX[®] correspond to the drawings and dimensions given in Annex 1.

Technical description of the product

| Type of Domax connector | Made of | Kind of corrosion protection |
|-------------------------|---|---|
| KLR | DX51D | Z275 |
| KP | DX51D | Z275 |
| KPK | DX51D | Z275 |
| KPL | DX51D | Z275 |
| KR | KR 1 – DC01 KR 2 – DX51D KR 3 – DX51D | Fe/Zn 12 Z275 Z275 |
| KRD | DX51D | Z275 |
| LU | DX51D | Z275 |
| WBC | DX51D | Z275 |
| WBU | DX51D | Z275 |
| ŁB | S235 | Fe/Zn 12 |
| NT | DX51D | Z275 |
| KKB | S235 | Fe/Zn 12 |
| PS | S235 / B500 | Fe/Zn 12 |
| KPS | DX51D | Z275 |
| SD | SDLZ 1 – DX51D SDKLR 1 – DX51D SDKL 1 – DX51D SDP 90 A – S235 SDP 90 B – S235 SDP 100 A – S235 SDP 100 B – S235 SDP 120 A – S235 SDP 120 B – S235 SDD 85 A – DX51D SDD 85 B – DX51D | Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Fe/Zn 12 + Powder Coating 60 μm Fe/Zn 12 + Powder Coating 60 μm Fe/Zn 12 + Powder Coating 60 μm Fe/Zn 12 + Powder Coating 60 μm Fe/Zn 12 + Powder Coating 60 μm Fe/Zn 12 + Powder Coating 60 μm Fe/Zn 12 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm |
| SDS | SDSP 70 A – S235 SDSP 70 B – S235 SDSKW 2 – DX51D SDSKW 8 – DX51D SDSKP 1 – DX51D SDSKP 5 – DX51D SDSKM 7 – DX51D SDSWBZ 10 – DX51D SDSWBZ 11 – DX51D SDSWBZ 14 – DX51D SDSWBZ 21 – DX51D SDSWBZ 26 – DX51D SDSWBZ 30 – DX51D | Fe/Zn 12 + Powder Coating 60 μm Fe/Zn 12 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm Z275 + Powder Coating 60 μm |

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 in timber to timber connections as well as connections between a timber joist and a concrete structure or a steel member. 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 requirement 1 of Regulation (EU) No 305/2011 shall be fulfilled.

Ring shank nails according to EN 14592 with the diameter of 4 mm and characteristic tensile capacity $F_{ax,Rk}$ not less than 1.80 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 Approval 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 or approval 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.

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 fitness for use of the DMX[®] three-dimensional nailing plates can only be assumed if the following conditions of installation are met:

- installation is carried out by appropriately qualified personnel under the supervision of the person qualified for this work,
- the original three-dimensional nailing plates only are used, supplied by the manufacturer together with the appropriate ring shank nails defined in clause 2.2.2,
- three-dimensional nailing plates installation is in accordance with the manufacturer's installation guide,
- before placing the three-dimensional nailing plates, the characteristics of timber members (type, class and moisture content) in which the nailing plates are to be placed are checked to ensure that they are identical or better than the characteristics of timber members used in testing in which the characteristic load-carrying capacities were determined,
- timber member placed in three-dimensional nailing plate does not contain the waness and the gap between the connected elements does not exceed 3 mm.

3 Performance of the product and references to the methods used for its assessment

The assessment of the fitness for use of the three dimensional nailing plates according to the basic work requirements (BWR) were carried out in compliance with ETAG 015.

The European Technical Assessment is issued for the three dimensional nailing plates on the basis of agreed data and information, deposited at Technický a zkušební ústav stavební Praha, s.p., which identifies three dimensional nailing plates that has been assessed and judged. Changes to the plates or production process which could result in this deposited data and information being incorrect should be notified to Technický a zkušební ústav stavební Praha, s.p. before the changes are introduced. Technický a zkušební ústav stavební Praha, s.p. will decide whether or not such changes affect the ETA and consequently the validity of the CE marking on the basis of the ETA and if so whether further assessment or alternations to the ETA shall be necessary.

Table 1 Essential characteristics of the product

| | Essential characteristic | Performance |
|--|--|--|
| 3.1 BWR 1: Mechanical resistance and stability | | |
| 3.1.1 | Joint strength | See Annex 3 |
| 3.1.2 | Joint stiffness | NPA |
| 3.1.3 | Joint ductility in cyclic testing | NPA |
| 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 | NPA |
| 3.3 BWR 3: Hygiene, health and the environment | | |
| 3.3.1 | Content, emission and/or release of dangerous substances | See 3.3.1 |
| BWR 4: Safety and accessibility in use | | |
| Not relevant | | |
| BWR 5: Protection against noise | | |
| Not relevant | | |
| BWR 6: Energy economy and heat retention | | |
| Not relevant | | |
| BWR 7: Sustainable use of natural resources | | |
| Not relevant | | |

3.1 Mechanical resistance and stability (BWR 1)

3.1.1 Joint strength

The characteristic load-carrying capacities of joints loaded according to static diagrams (shown in Annex 2), determined by tests carried out according to ETAG 015, clause 5.1.3, are given in Annex 3. The characteristic load-carrying capacities of joints for other load direction 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 the manufacture, 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 at Technický a zkušební ústav stavební Praha, s.p. were used a timber specimens with characteristic density 350 kg/m³.

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 Joint stiffness

No performance assessed.

3.1.3 Joint ductility in cyclic testing

No performance assessed.

3.2 Safety in case of fire (BWR 2)

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 Hygiene, health and the environment (BWR 3)

3.3.1 Content, emission and/or release of dangerous substances

The manufacturer submit a written declaration whether or not and in which concentrations the three dimensional nailing plates contain substances which are classified as dangerous according to Directive 67/548/EEC and European Commission Regulation No 1272/2008.

In addition to the specific clauses relating to dangerous substances, 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 Safety and accessibility in use (BWR 4)

Not relevant.

3.5 Protection against noise (BWR 5)

Not relevant.

3.6 Energy economy and heat retention (BWR 6)

Not relevant.

3.7 Sustainable use of natural resources (BWR 7)

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

3.8 Aspects of durability, serviceability and identification

3.8.1 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).

3.8.2 Identification

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

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

According to the decision 1997/638/EC¹, of the European Commission the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011 and Commission delegated Regulation (EU) No 568/2014) given in the following table applies:

| Product(s) | Intended use(s) | Level(s) or class(es) | Attestation of conformity system(s) |
|--|--------------------------------|-----------------------|-------------------------------------|
| Shear plates, toothed-plate connectors, punched nail plates, nailing plates | For structural timber products | | 2+ |

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

Issued in Prague on 28.04.2020

By
Mária Schaan
Head of the TAB

Annexes:

- Annex 1 Product details and definitions
- Annex 2 Loading and calculations according to static diagrams
- Annex 3 The characteristic load carrying capacities of connectors
- Annex 4 Nailing patterns
- Annex 5 Specification of connection elements
- Annex 6 Reference documents

¹ Official Journal of the European Communities L 268/36 of 19.9.1997

ANNEX 1

PRODUCT DETAILS AND DEFINITIONS

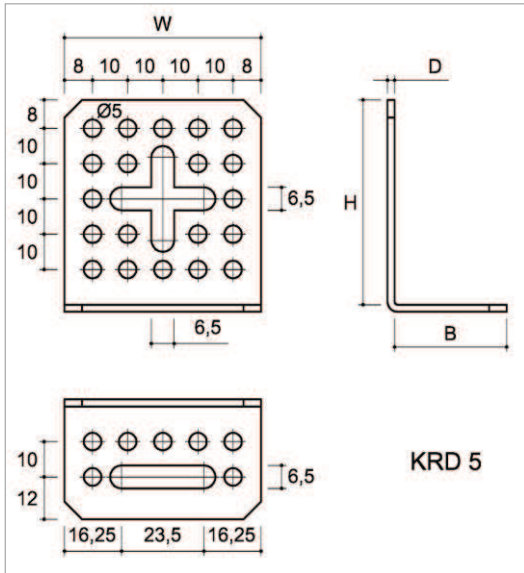


Figure 1 Type KRD 5

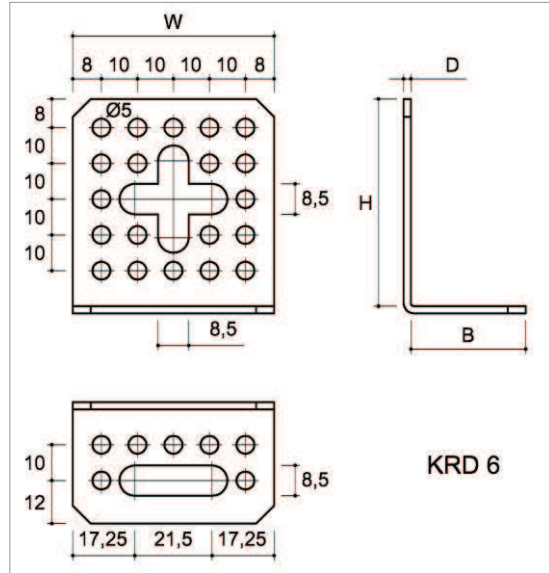


Figure 2 Type KRD 6

Table 2 KRD three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Number of holes |
|--------|----------------|----|----|---|-----------------|
| | W | H | B | D | |
| KRD 5 | 56 | 58 | 32 | 2 | 27 |
| KRD 6 | 56 | 58 | 32 | 2 | 27 |

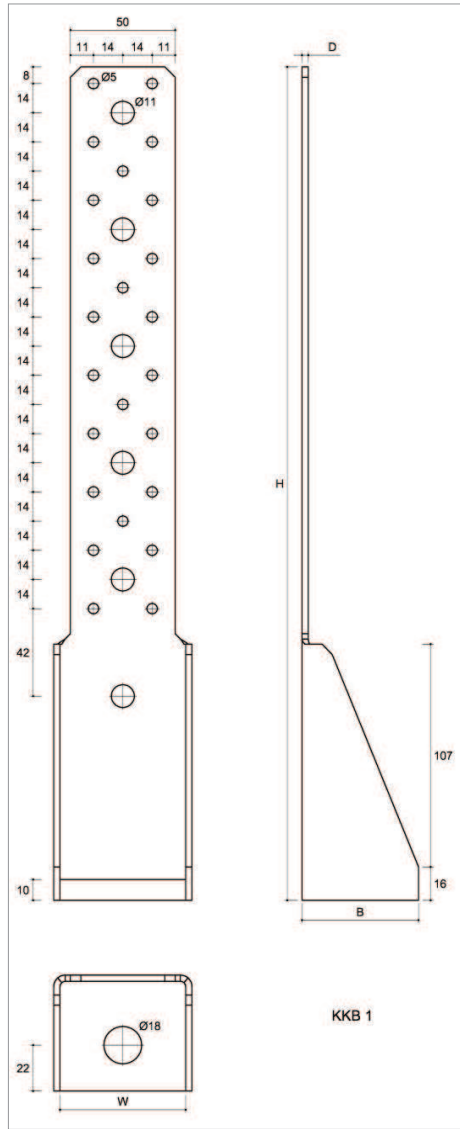


Figure 3 Type KKB 1

Table 3 KKB three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | | |
|--------|----------------|-----|----|---|----------------------|------|------|
| | W | H | B | D | ø 5 | ø 11 | ø 18 |
| KKB 1 | 60 | 400 | 56 | 3 | 24 | 6 | 1 |

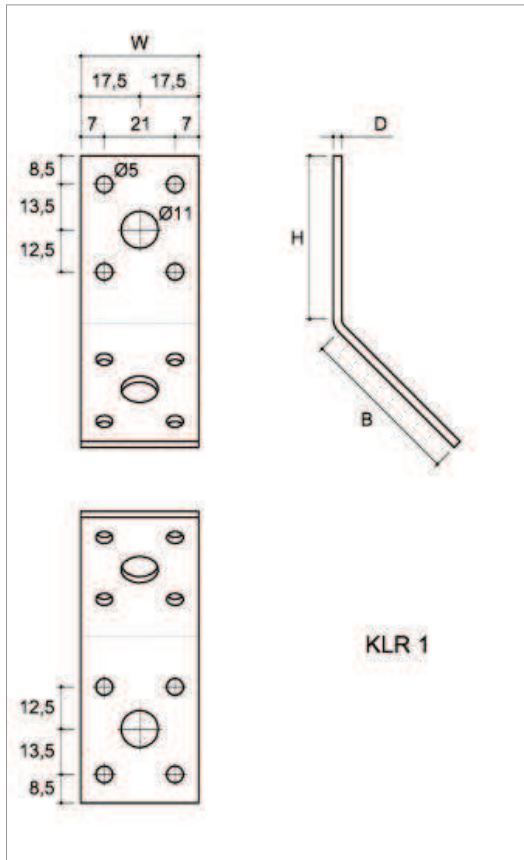


Figure 4 Type KLR 1

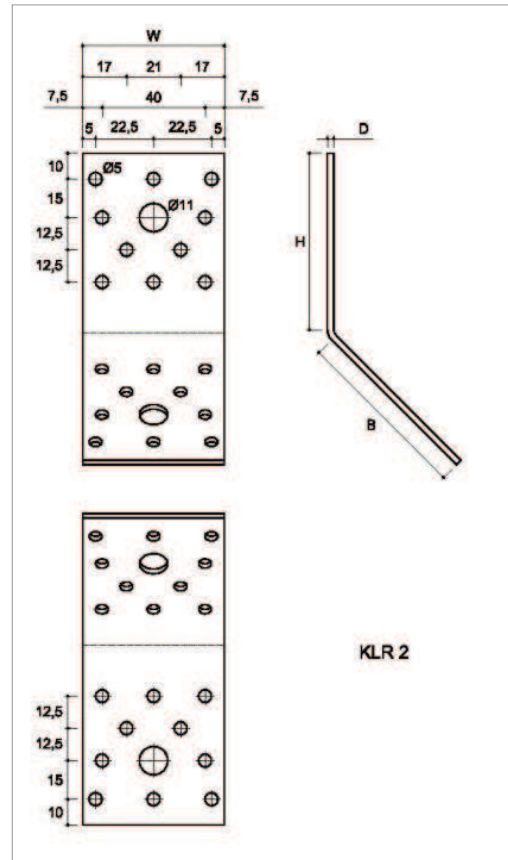


Figure 5 Type KLR 2

Table 4 KLR three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | |
|--------|----------------|----|----|-----|----------------------|------|
| | W | H | B | D | ø 5 | ø 11 |
| KLR 1 | 35 | 50 | 50 | 2.5 | 8 | 2 |
| KLR 2 | 55 | 70 | 70 | 2.5 | 20 | 2 |

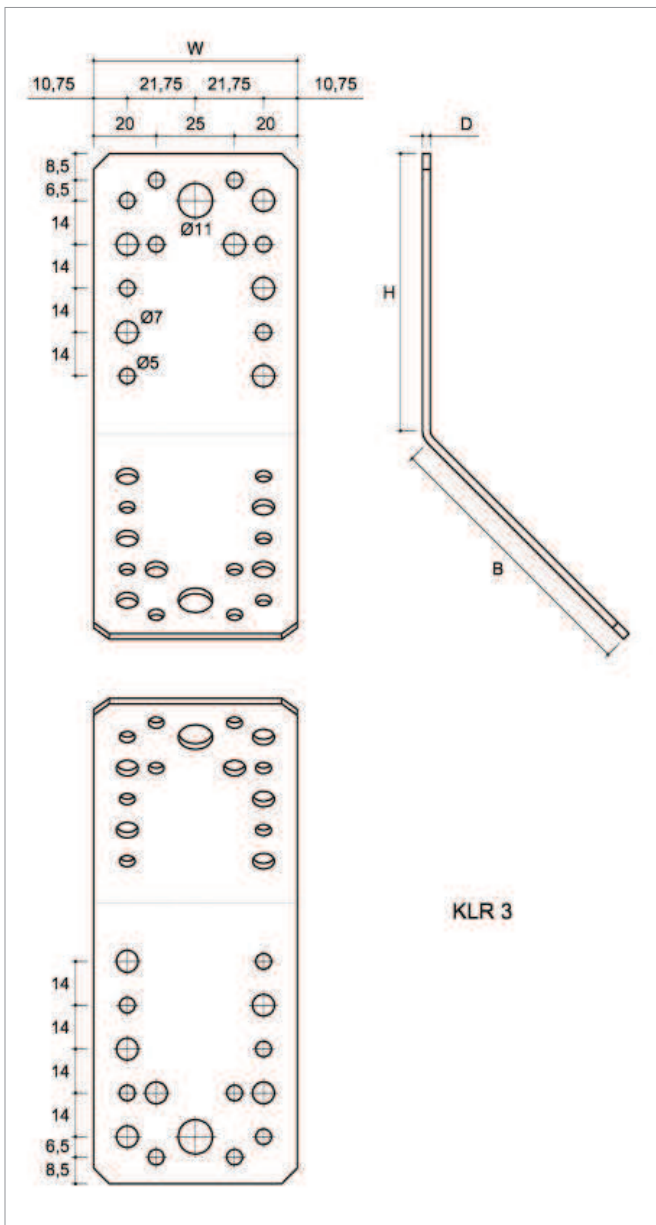


Figure 6 Type KLR 3

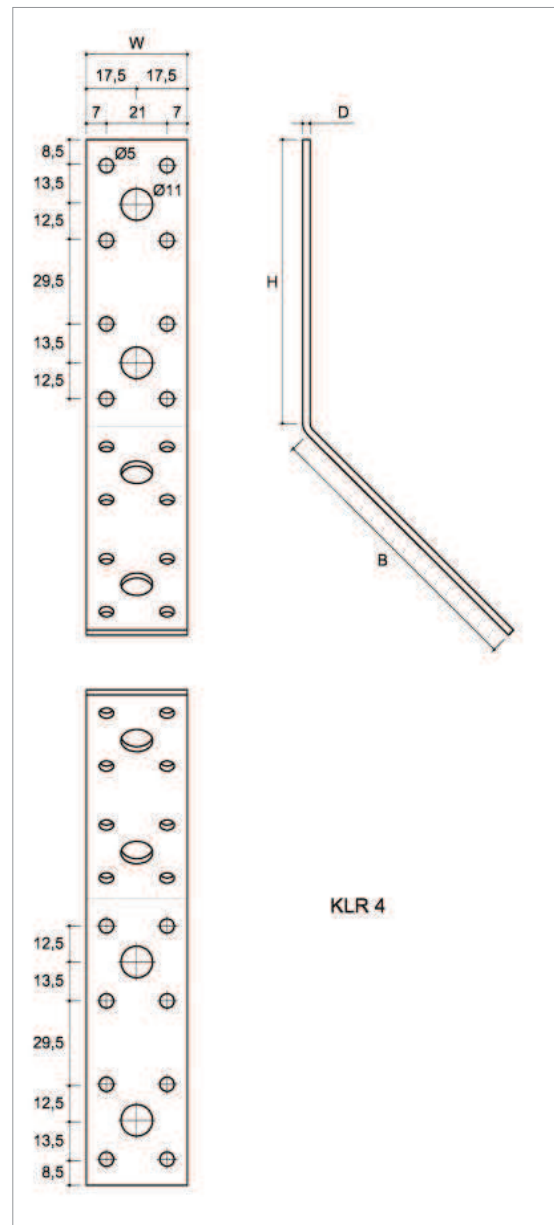


Figure 7 Type KLR 4

Table 5 KLR three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | | |
|--------|----------------|-----|-----|-----|----------------------|-----|------|
| | W | H | B | D | ø 5 | ø 7 | ø 11 |
| KLR 3 | 65 | 90 | 90 | 2.5 | 16 | 12 | 2 |
| KLR 4 | 35 | 100 | 100 | 2.5 | 16 | - | 4 |

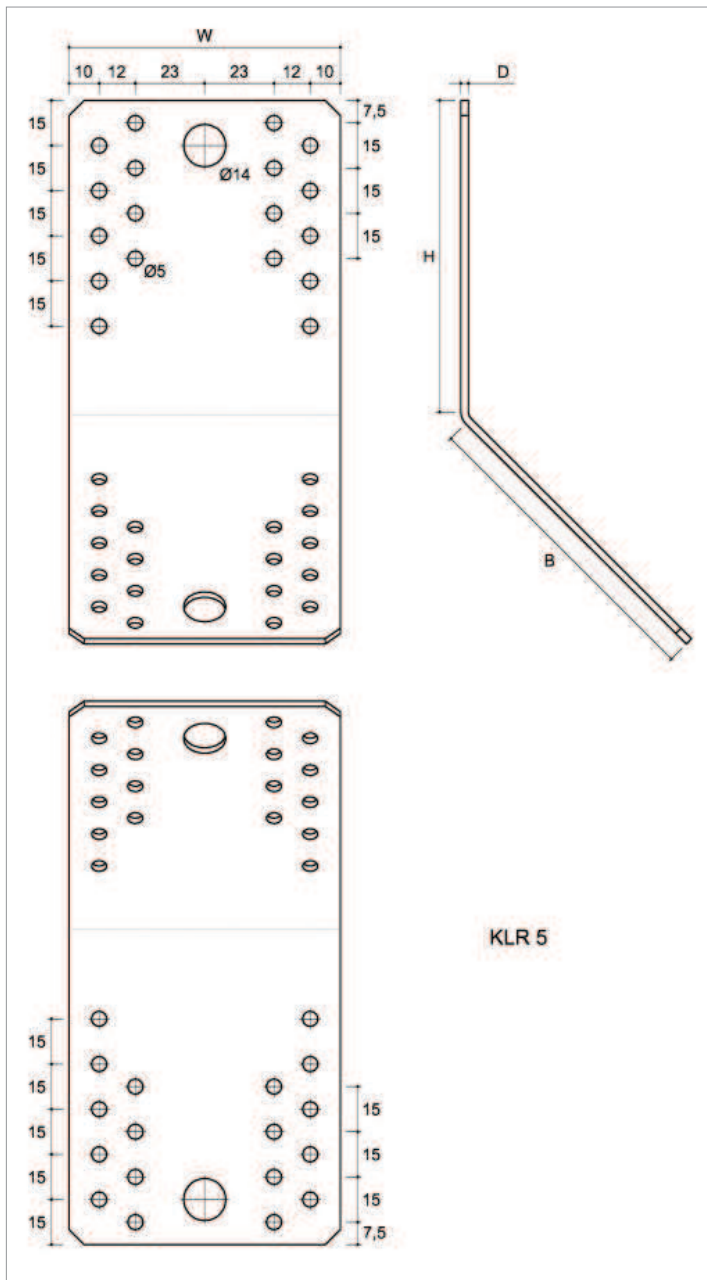


Figure 8 Type KLR 5

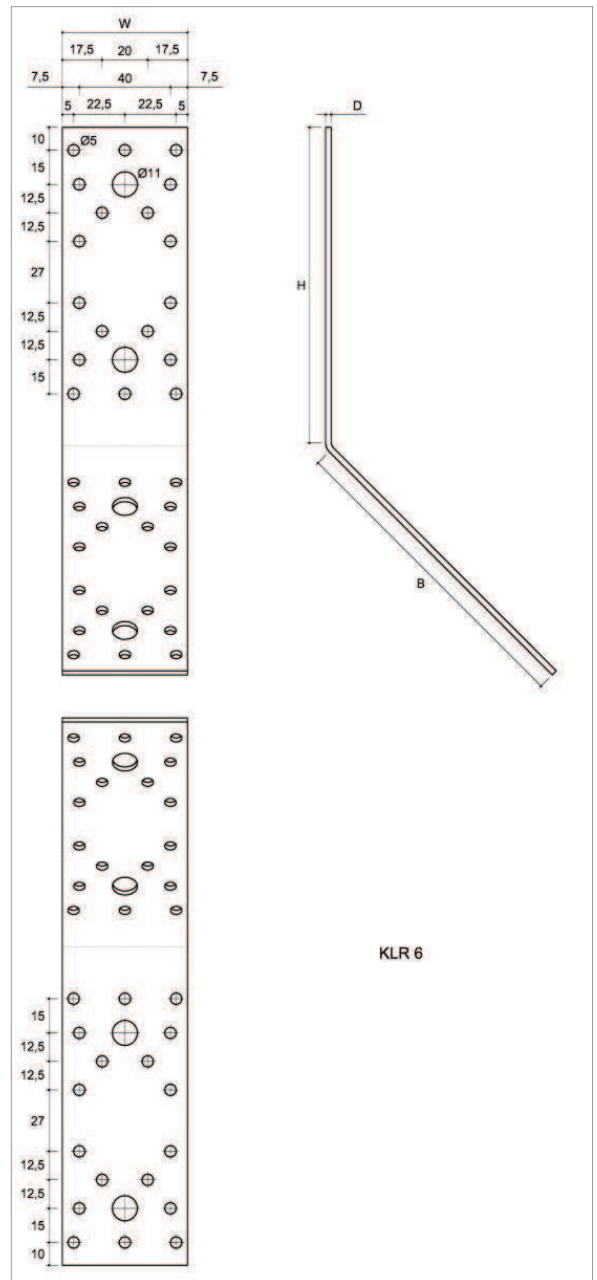


Figure 9 Type KLR 6

Table 6 KLR three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | | |
|--------|----------------|-----|-----|-----|----------------------|------|------|
| | W | H | B | D | ø 5 | ø 11 | ø 14 |
| KLR 5 | 90 | 105 | 105 | 2.5 | 36 | - | 2 |
| KLR 6 | 55 | 140 | 140 | 2.5 | 36 | 4 | - |

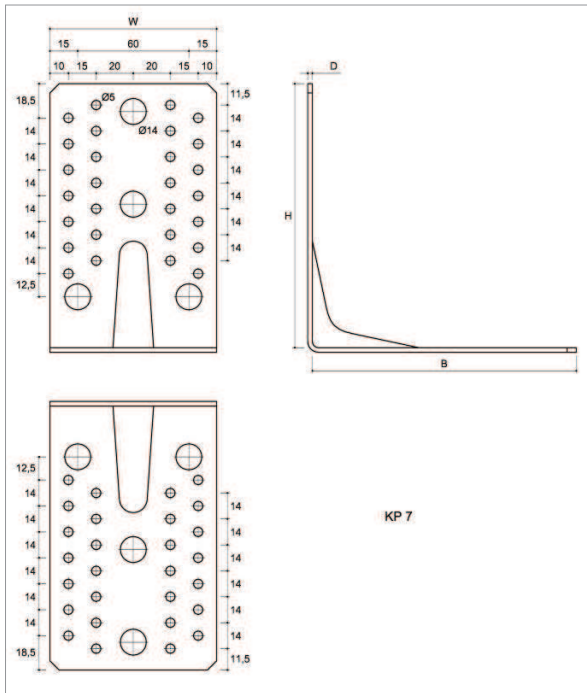


Figure 10 Type KP 7

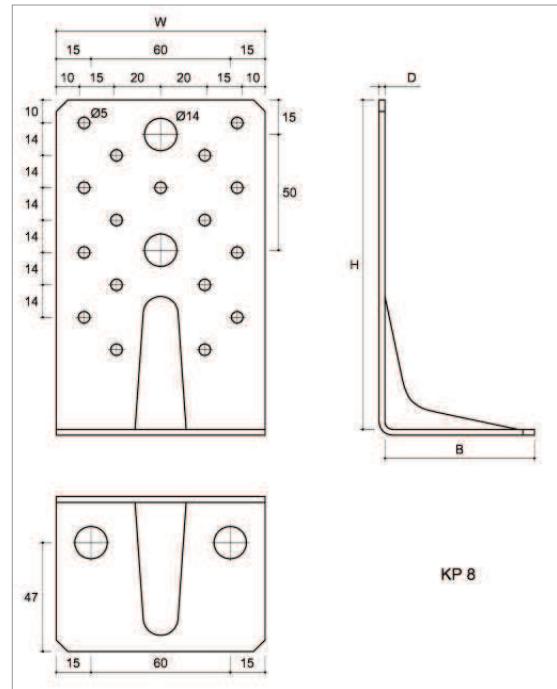


Figure 11 Type KP 8

Table 7 KP three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | |
|--------|----------------|-----|-----|-----|----------------------|------|
| | W | H | B | D | ø 5 | ø 14 |
| KP 7 | 90 | 143 | 143 | 2.5 | 56 | 8 |
| KP 8 | 90 | 143 | 65 | 2.5 | 17 | 4 |

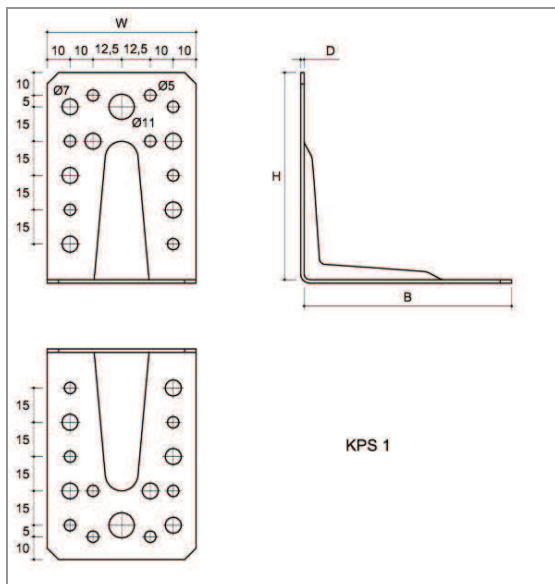


Figure 12 Type KPS 1

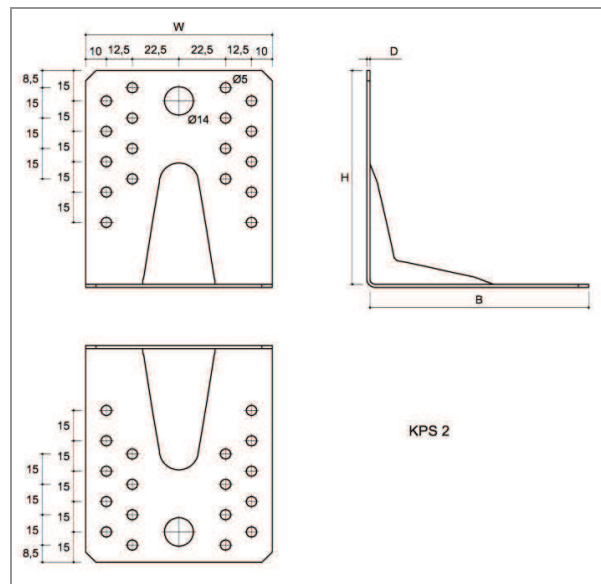


Figure 13 Type KPS 2

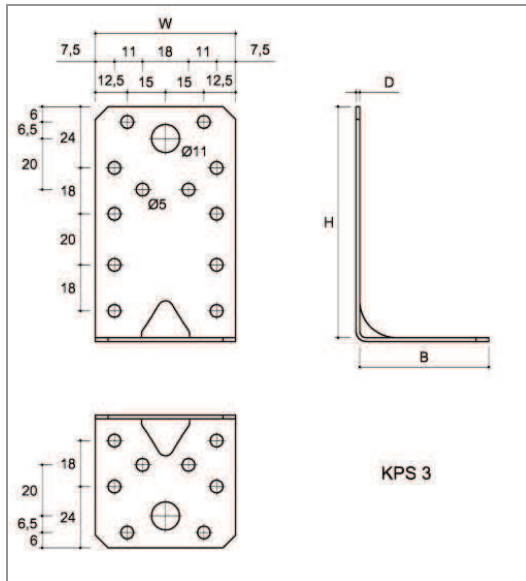


Figure 14 Type KPS 3

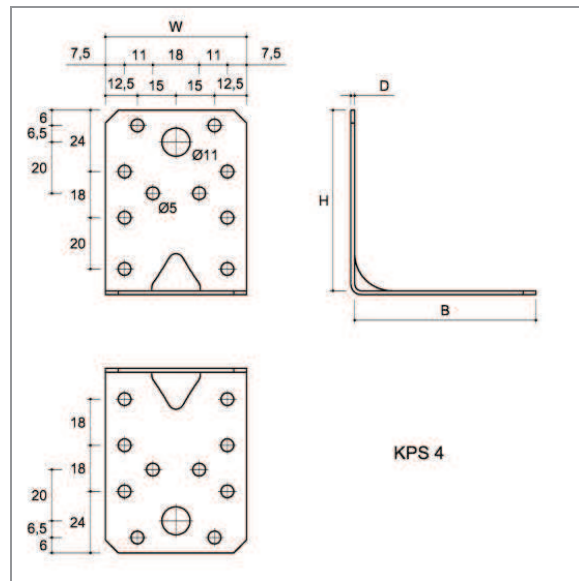


Figure 15 Type KPS 4

Table 8 KPS three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | | | |
|--------|----------------|-----|-----|-----|----------------------|-----|------|------|
| | W | H | B | D | Ø 5 | Ø 7 | Ø 11 | Ø 14 |
| KPS 1 | 65 | 90 | 90 | 1,5 | 16 | 12 | 2 | - |
| KPS 2 | 90 | 105 | 105 | 1,5 | 36 | - | - | 2 |
| KPS 3 | 55 | 90 | 50 | 1,5 | 20 | - | 2 | - |
| KPS 4 | 55 | 70 | 70 | 1,5 | 20 | - | 2 | - |

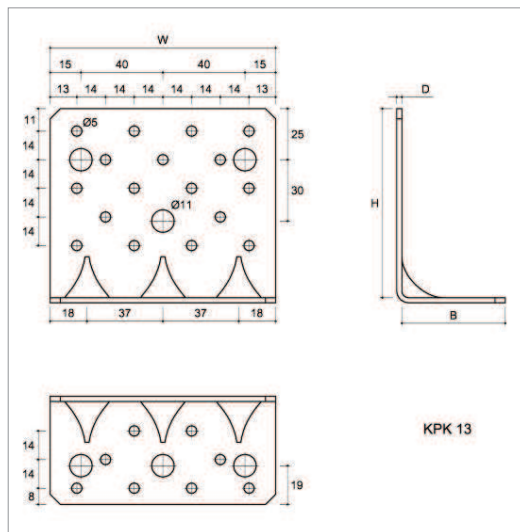


Figure 16 Type KPK 13

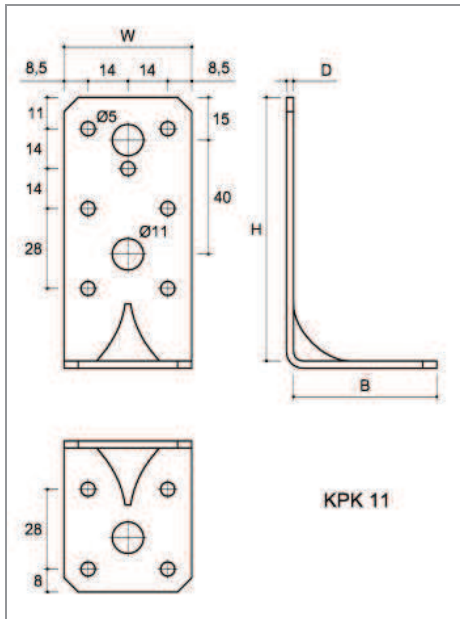


Figure 17 Type KPK 11

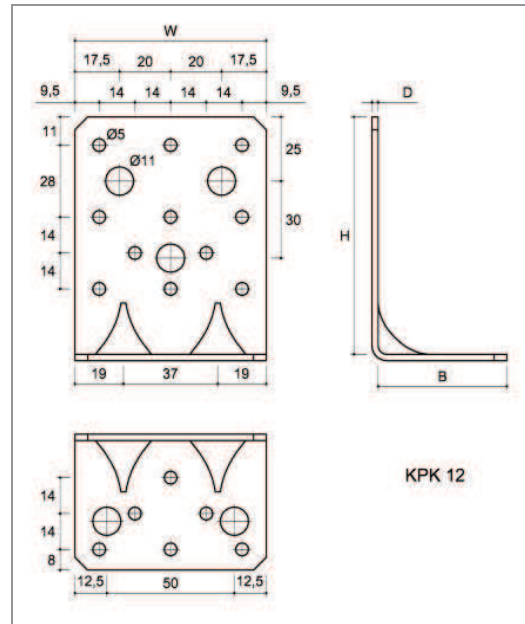


Figure 18 Type KPK 12

Table 9 KPK three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | |
|--------|----------------|----|----|-----|----------------------|------|
| | W | H | B | D | Ø 5 | Ø 11 |
| KPK 11 | 45 | 93 | 50 | 2.5 | 11 | 3 |
| KPK 12 | 75 | 93 | 50 | 2.5 | 17 | 5 |
| KPK 13 | 110 | 93 | 50 | 2.5 | 25 | 6 |

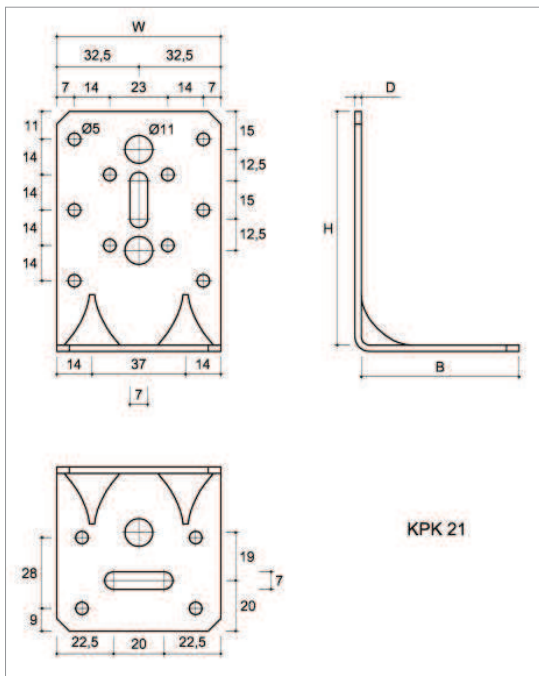


Figure 19 Type KPK 21

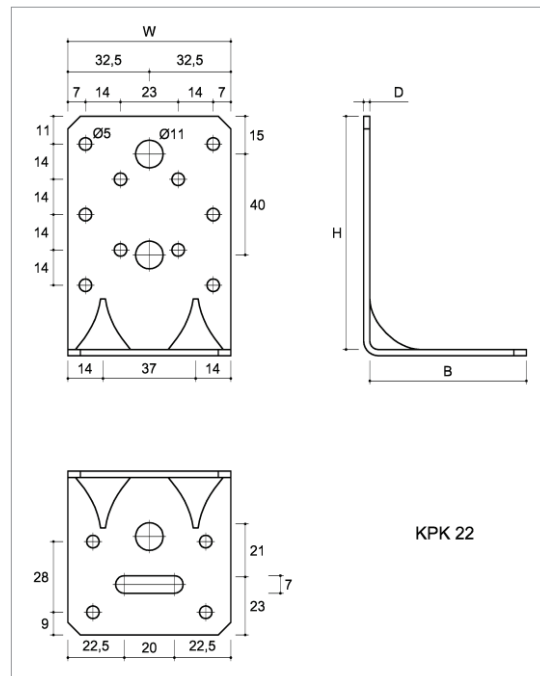


Figure 20 Type KPK 22

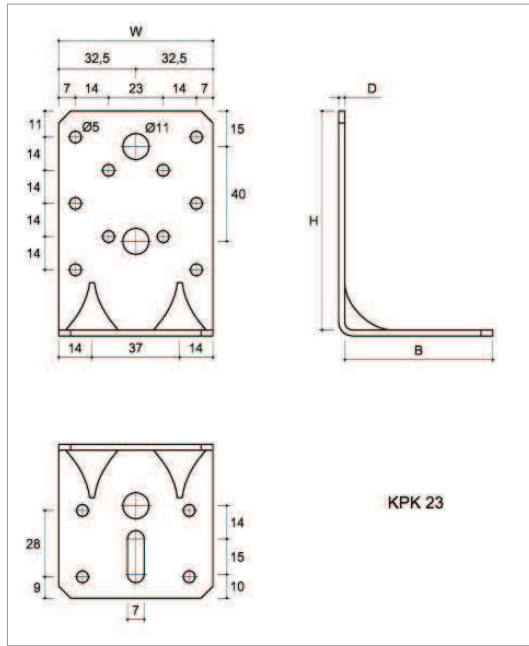


Figure 21 Type KPK 23

Table 10 KPK three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | |
|--------|----------------|----|----|-----|----------------------|------|
| | W | H | B | D | Ø 5 | Ø 11 |
| KPK 21 | 65 | 93 | 63 | 2.5 | 14 | 3 |
| KPK 22 | 65 | 93 | 63 | 2.5 | 14 | 3 |
| KPK 23 | 65 | 93 | 63 | 2.5 | 14 | 3 |

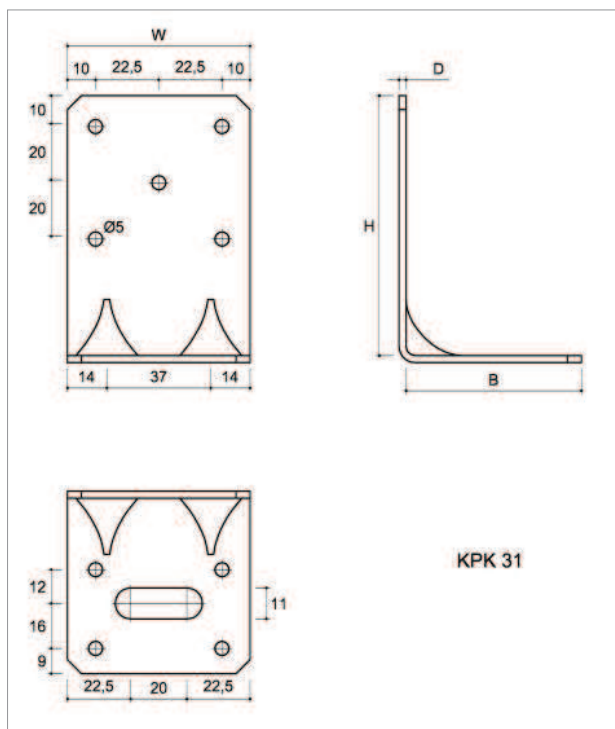


Figure 22 Type KPK 31

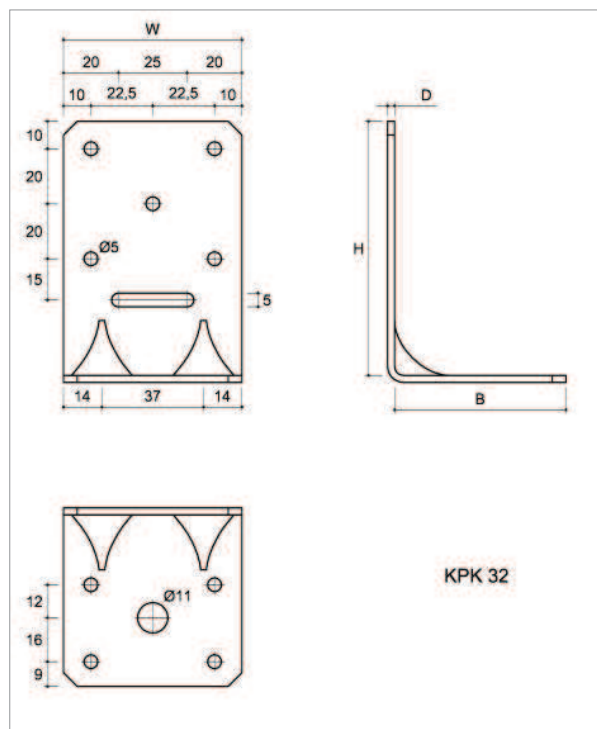


Figure 23 Type KPK 32

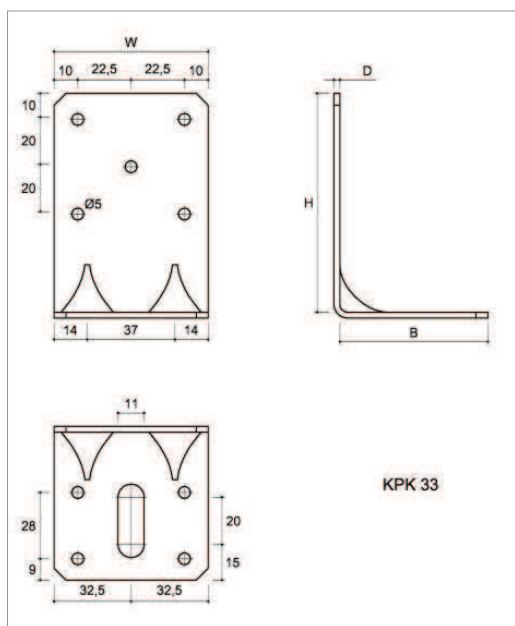


Figure 24 Type KPK 33

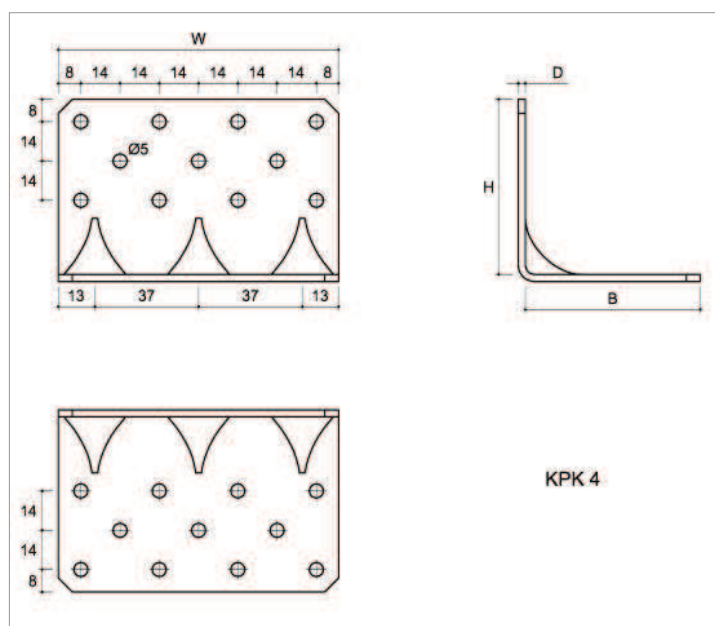


Figure 25 Type KPK 4

Table 11 KPK three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | |
|--------|----------------|----|----|-----|----------------------|------|
| | W | H | B | D | ø 5 | ø 11 |
| KPK 31 | 65 | 93 | 63 | 2.5 | 9 | - |
| KPK 32 | 65 | 93 | 63 | 2.5 | 9 | 1 |
| KPK 33 | 65 | 93 | 63 | 2.5 | 9 | - |
| KPK 4 | 100 | 63 | 63 | 2.5 | 22 | - |

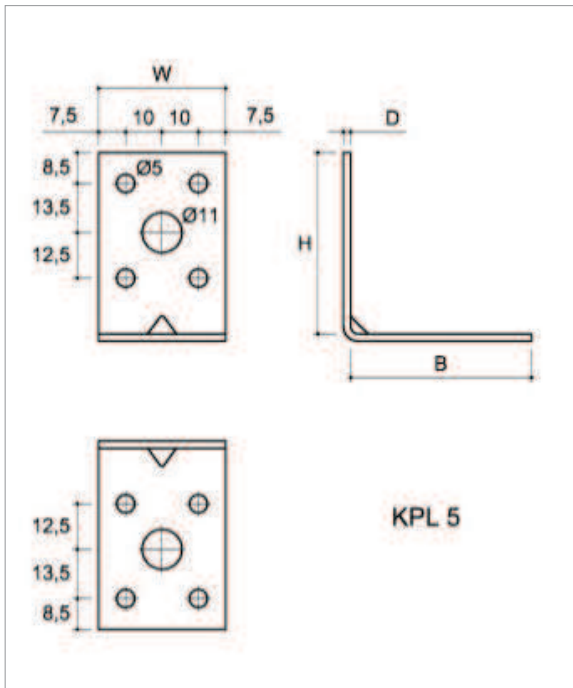


Figure 26 Type KPL 5

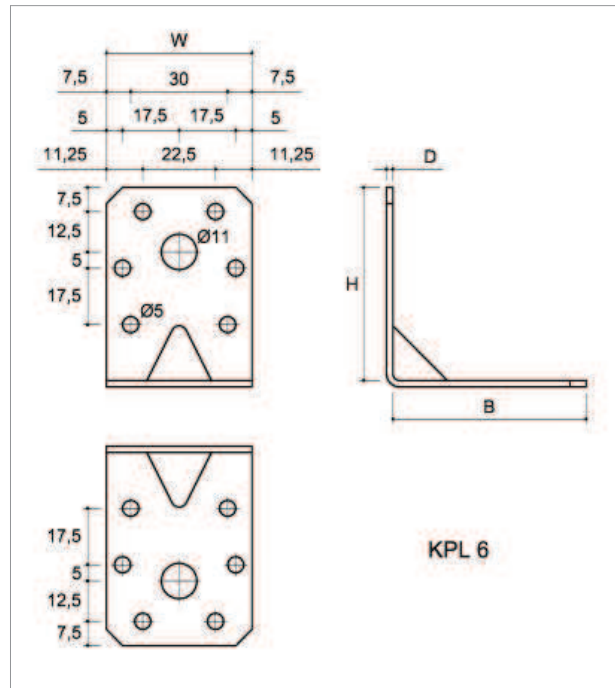


Figure 27 Type KPL 6

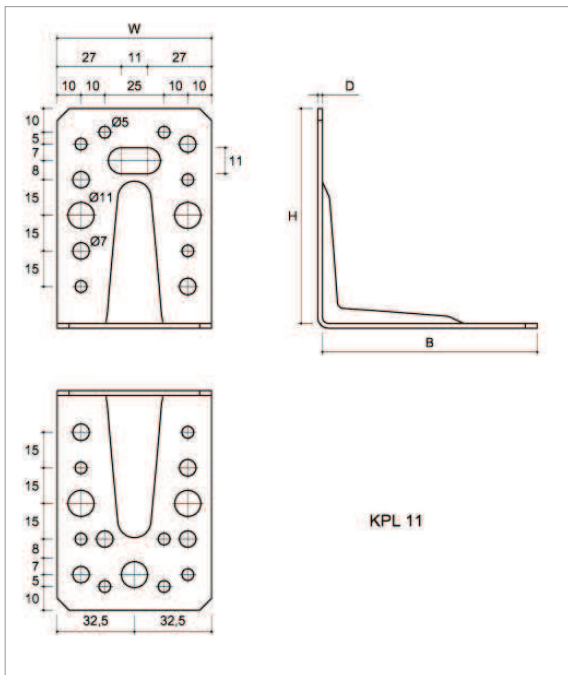


Figure 28 Type KPL 11

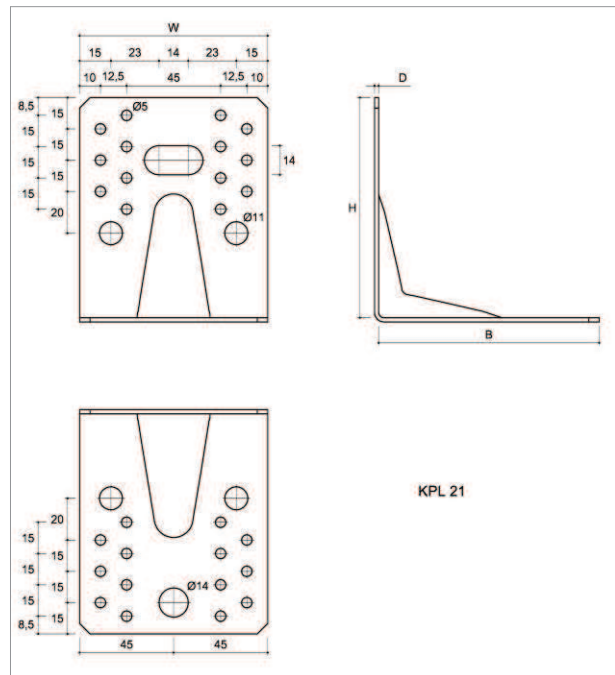


Figure 29 Type KPL 21

Table 12 KPL three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | | | |
|--------|----------------|-----|-----|---|----------------------|-----|------|------|
| | W | H | B | D | Ø 5 | Ø 7 | Ø 11 | Ø 14 |
| KPL 5 | 35 | 50 | 50 | 2 | 8 | - | 2 | - |
| KPL 6 | 45 | 60 | 60 | 2 | 12 | - | 2 | - |
| KPL 11 | 65 | 90 | 90 | 2 | 13 | 9 | 5 | - |
| KPL 21 | 90 | 105 | 105 | 2 | 28 | - | 4 | 1 |

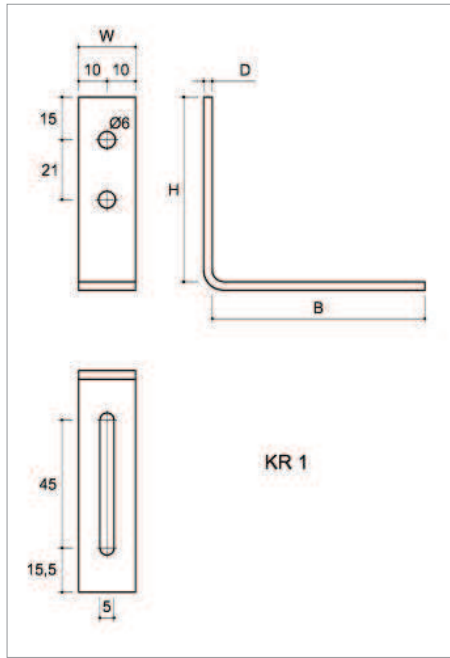


Figure 30 Type KR 1

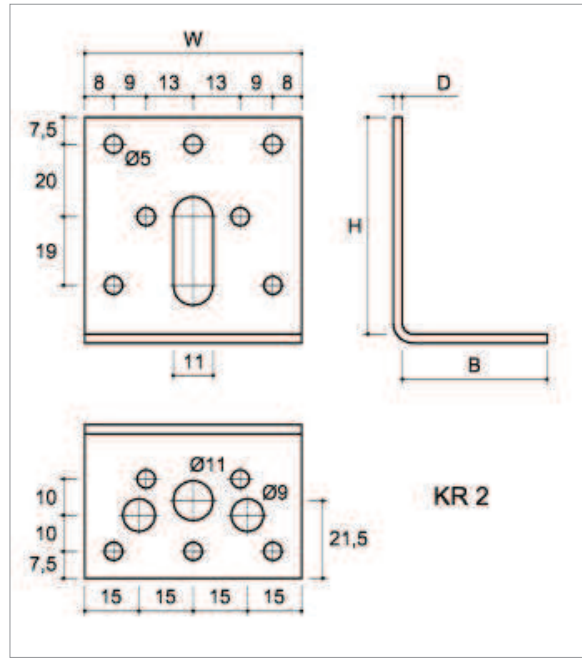


Figure 31 Type KR 2

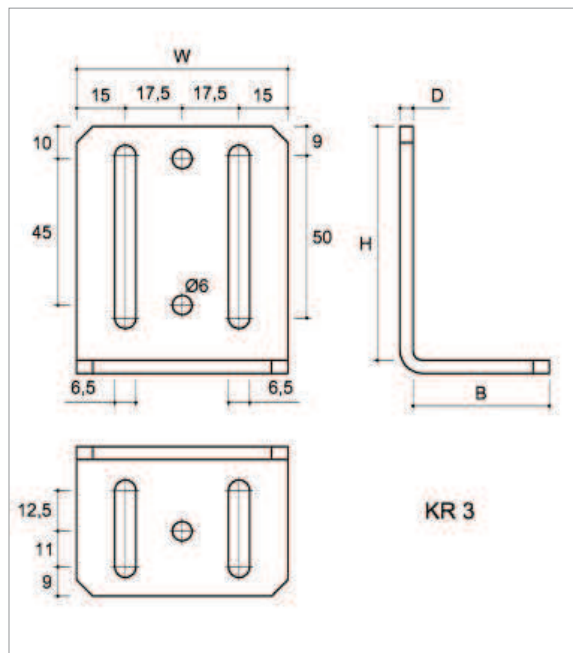


Figure 32 Type KR 3

Table 13 KR three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | | | |
|--------|----------------|----|----|-----|----------------------|-----|-----|------|
| | W | H | B | D | Ø 5 | Ø 6 | Ø 9 | Ø 11 |
| KR 1 | 20 | 65 | 75 | 3 | - | 2 | - | - |
| KR 2 | 60 | 60 | 40 | 2.5 | 12 | - | 2 | 1 |
| KR 3 | 65 | 72 | 42 | 4 | - | 3 | - | - |

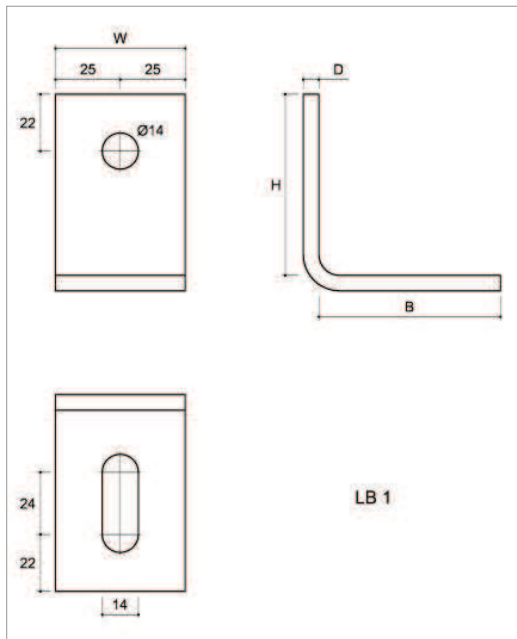


Figure 33 Type LB 1

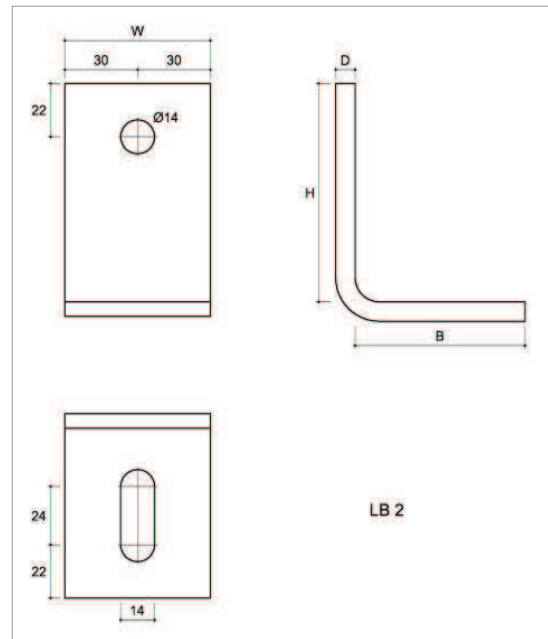


Figure 34 Type LB 2

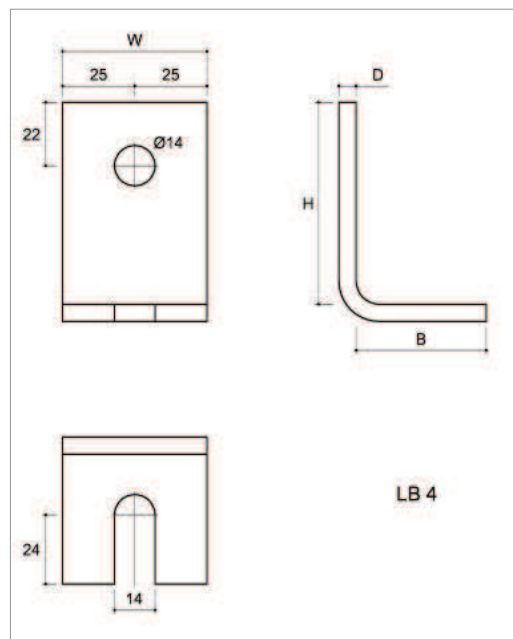


Figure 35 Type LB 4

Table 14 LB three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings |
|--------|----------------|----|----|---|----------------------|
| | W | H | B | D | Ø 14 |
| LB 1 | 50 | 70 | 70 | 6 | 1 |
| LB 2 | 60 | 90 | 70 | 8 | 1 |
| LB 4 | 50 | 70 | 45 | 6 | 1 |

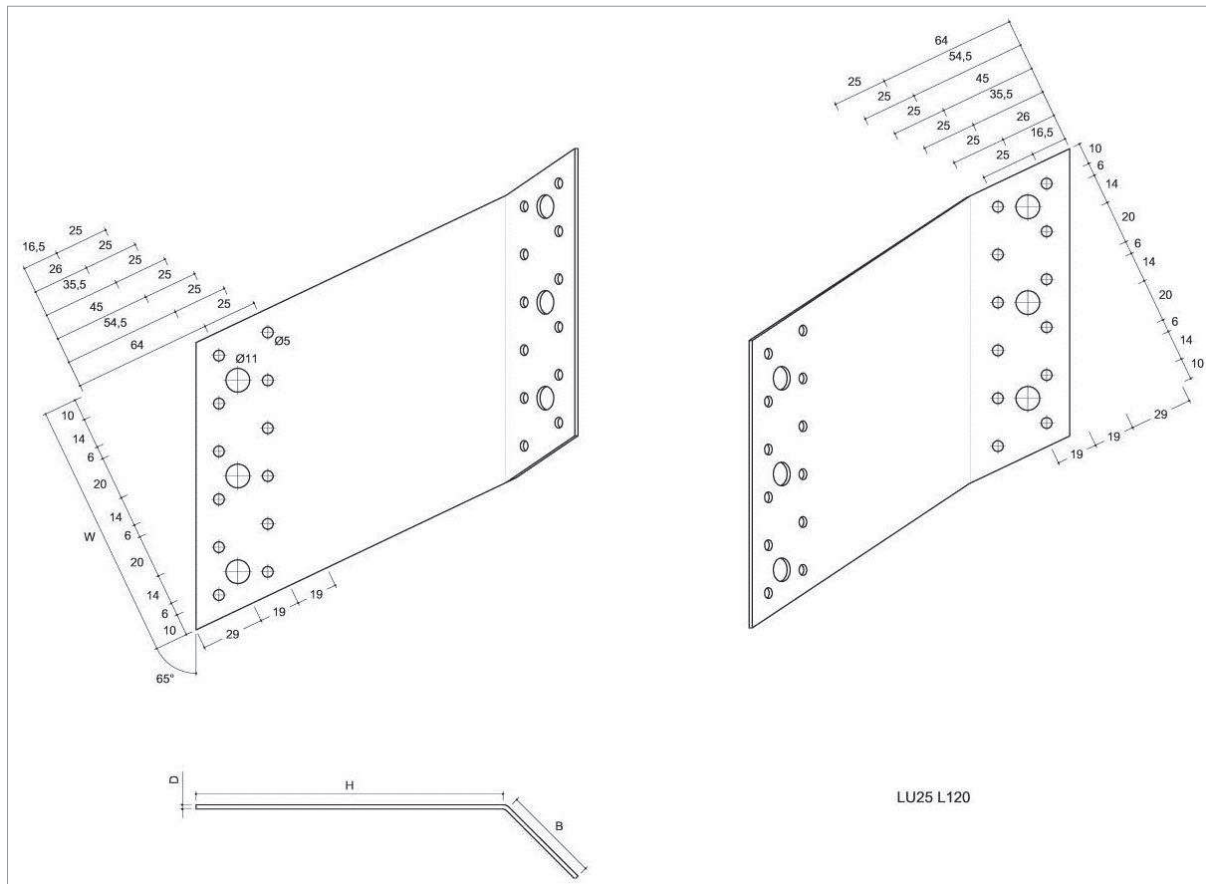


Figure 36 Type LU25 L120

Table 15 LU25 three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | |
|-----------|----------------|-----|----|---|----------------------|------|
| | W | H | B | D | ø 5 | ø 11 |
| LU25 L80 | 80 | 142 | 45 | 2 | 16 | 4 |
| LU25 R80 | 80 | 142 | 45 | 2 | 16 | 4 |
| LU25 L120 | 120 | 142 | 45 | 2 | 24 | 6 |
| LU25 R120 | 120 | 142 | 45 | 2 | 24 | 6 |

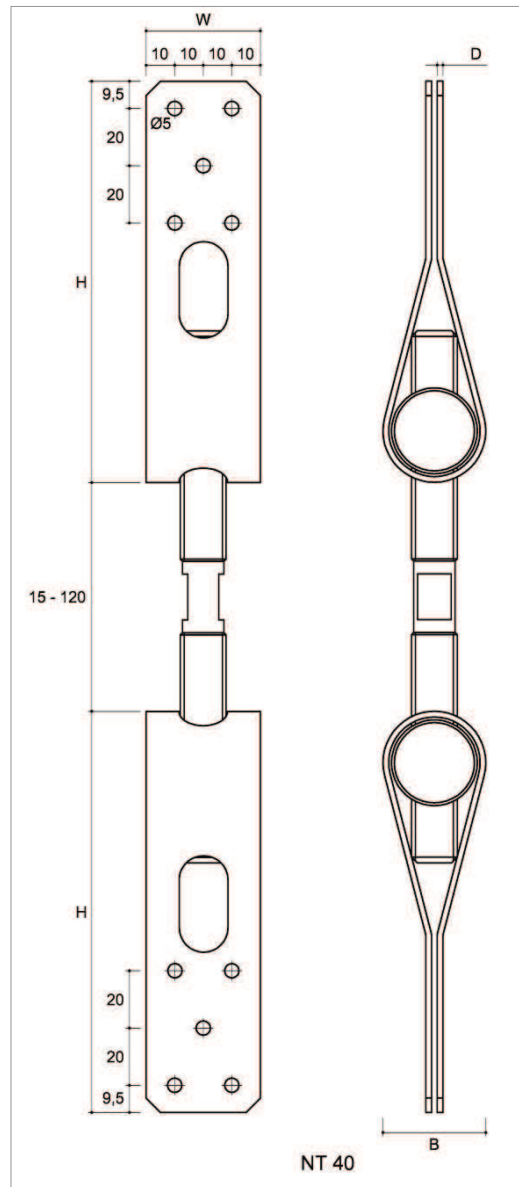


Figure 37 Type NT 40

Table 16 NT three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings |
|--------|----------------|-----|----|-----|----------------------|
| | W | H | B | D | Ø 5 |
| NT 25 | 30 | 137 | 25 | 1.5 | 12 |
| NT 40 | 40 | 140 | 36 | 2 | 10 |
| NT 60 | 60 | 140 | 36 | 2 | 14 |

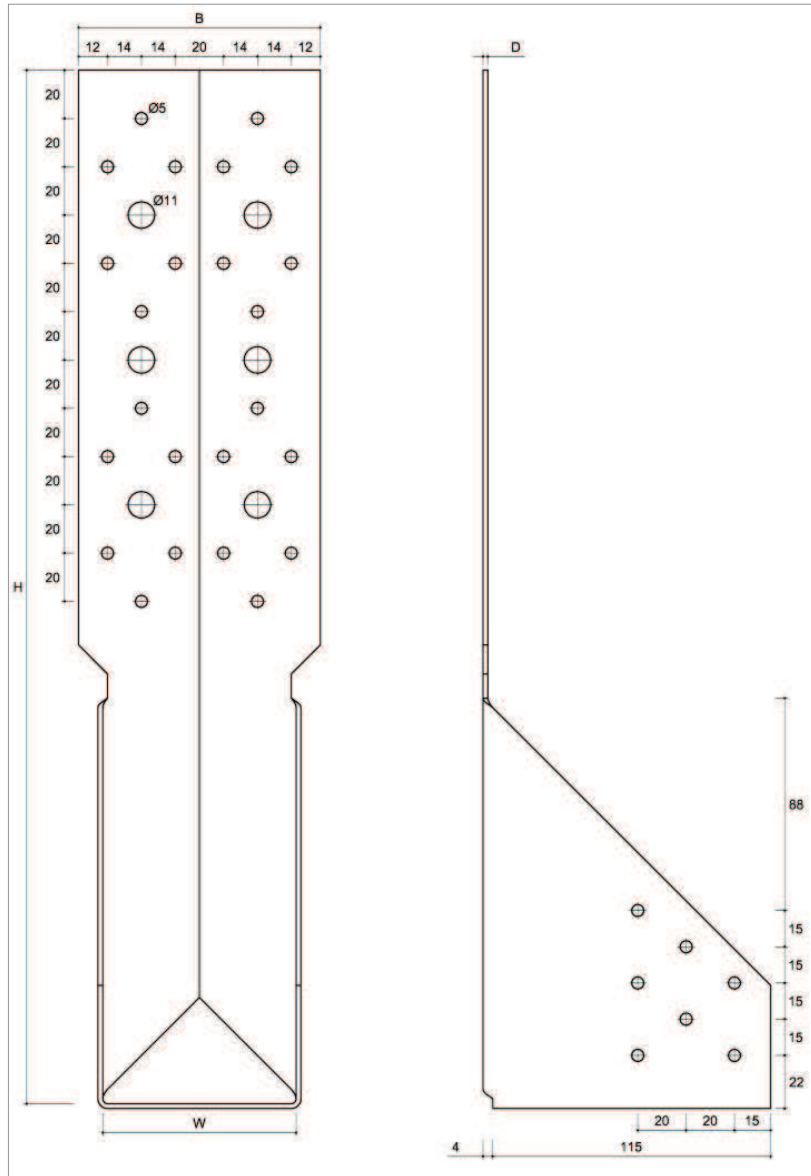


Figure 38 Type WBC 80

Table 17 WBC three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | |
|---------|----------------|-----|-----|---|----------------------|------|
| | W | H | B | D | Ø 5 | Ø 11 |
| WBC 80 | 80 | 428 | 100 | 2 | 38 | 6 |
| WBC 92 | 92 | 443 | 114 | 2 | 42 | 8 |
| WBC 100 | 100 | 443 | 120 | 2 | 42 | 8 |
| WBC 120 | 120 | 505 | 148 | 2 | 48 | 10 |
| WBC 137 | 137 | 515 | 160 | 2 | 52 | 12 |

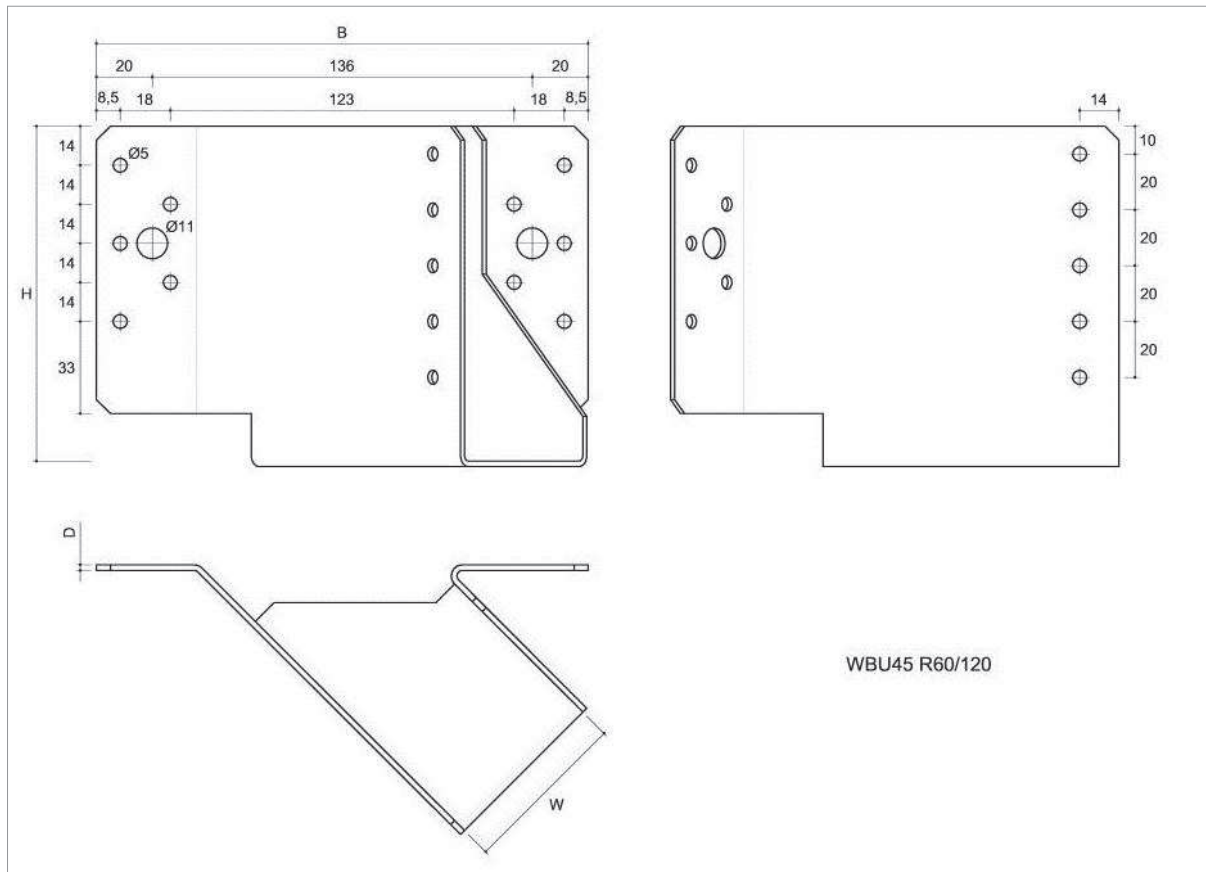


Figure 39 Type WB� 45 R60/120

Table 18 WB� 45 three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | |
|--------------------------------|----------------|-----|-----|---|----------------------|------|
| | W | H | B | D | Ø 5 | Ø 11 |
| WB�45 R45/105 WB�45 L45/105 | 45 | 105 | 155 | 2 | 12 | 2 |
| WB�45 R50/105 WB�45 L50/105 | 50 | 105 | 162 | 2 | 12 | 2 |
| WB�45 R60/120 WB�45 L60/120 | 60 | 120 | 176 | 2 | 15 | 2 |

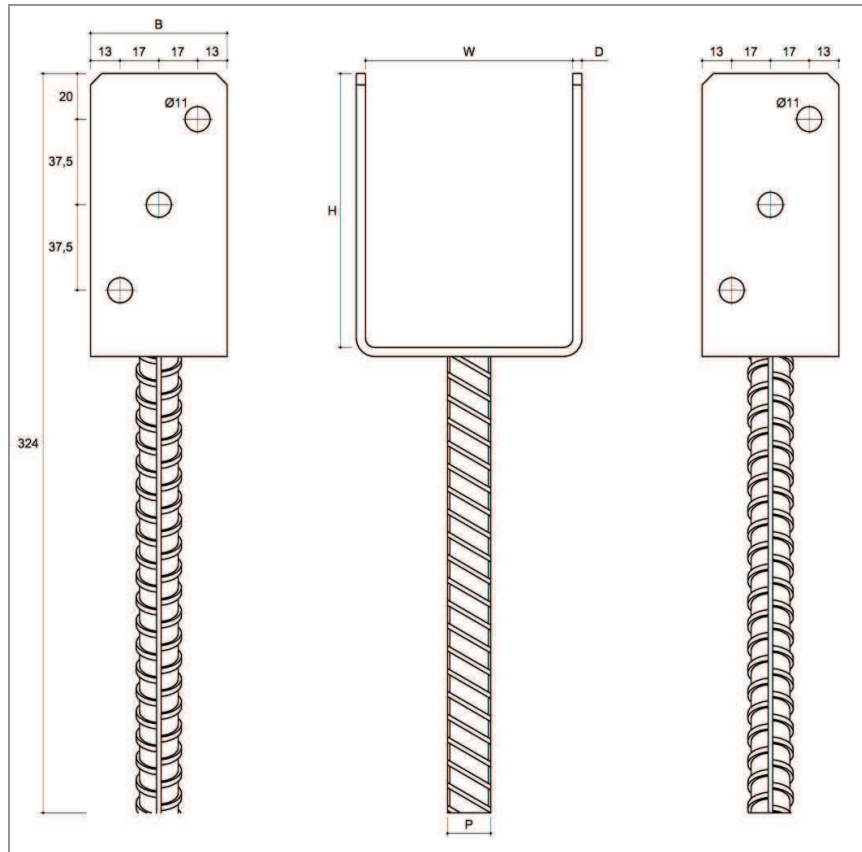


Figure 40 Type PS 90

Table 19 PS three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | | Quantity of openings |
|--------|----------------|-----|----|---|------|----------------------|
| | W | H | B | D | P | Ø 11 |
| PS 60 | 61 | 120 | 60 | 4 | Ø 16 | 6 |
| PS 70 | 71 | 120 | 60 | 4 | Ø 16 | 6 |
| PS 80 | 81 | 120 | 60 | 4 | Ø 18 | 6 |
| PS 90 | 91 | 120 | 60 | 4 | Ø 18 | 6 |
| PS 100 | 101 | 120 | 60 | 4 | Ø 18 | 6 |
| PS 120 | 121 | 120 | 60 | 4 | Ø 18 | 6 |
| PS 140 | 141 | 120 | 60 | 4 | Ø 18 | 6 |

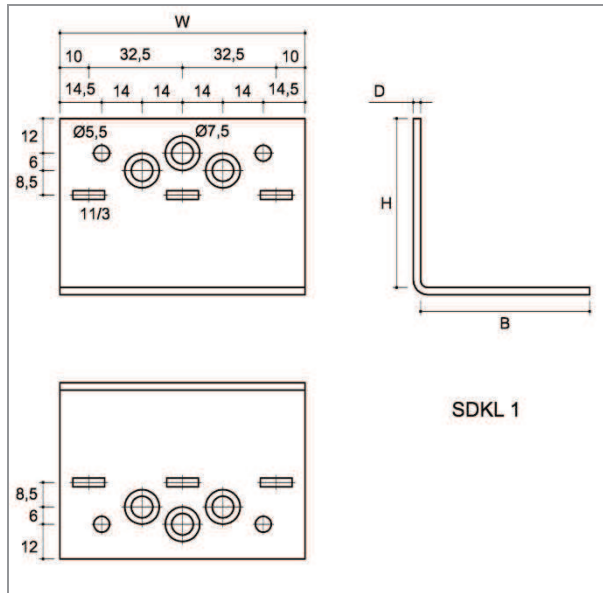


Figure 41 Type SDKL 1

Table 20 SDKL three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | | |
|--------|----------------|----|----|-----|----------------------|-------|------|
| | W | H | B | D | Ø 5.5 | Ø 7.5 | 11/3 |
| SDKL 1 | 85 | 58 | 58 | 2,5 | 4 | 6 | 6 |

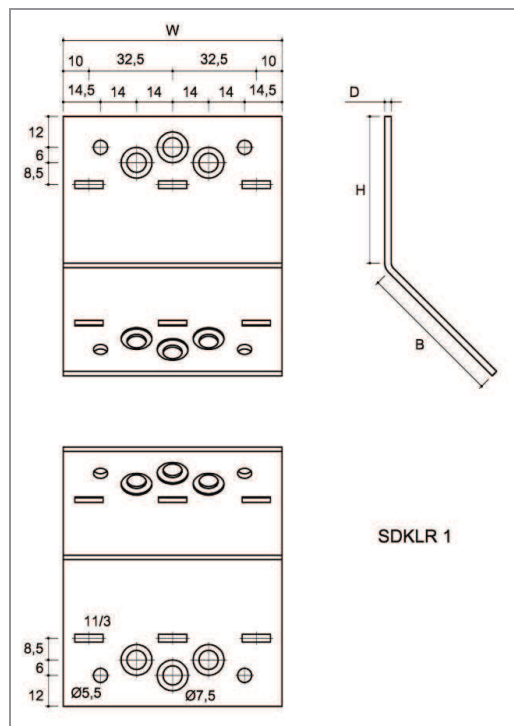


Figure 42 Type SDKLR 1

Table 21 SDKLR three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | | |
|---------|----------------|----|----|-----|----------------------|-------|------|
| | W | H | B | D | Ø 5.5 | Ø 7.5 | 11/3 |
| SDKLR 1 | 85 | 57 | 57 | 2,5 | 4 | 6 | 6 |

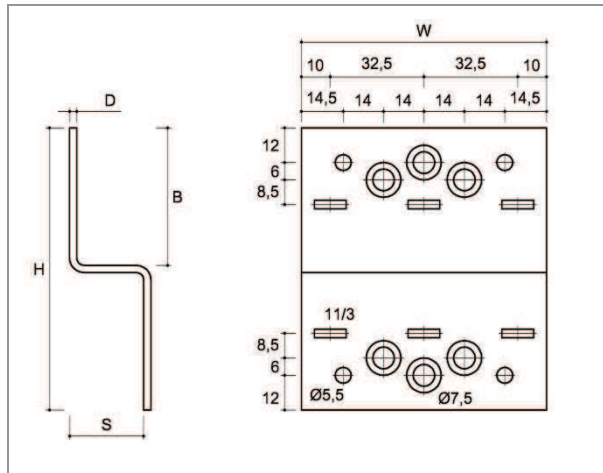


Figure 43 Type SDLZ 1

Table 22 SDLZ 1 three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | | Quantity of openings | | |
|--------|----------------|------|----|----|-----|----------------------|-------|------|
| | W | H | B | S | D | ∅ 5.5 | ∅ 7.5 | 11/3 |
| SDLZ 1 | 85 | 96,5 | 47 | 24 | 2,5 | 4 | 6 | 6 |

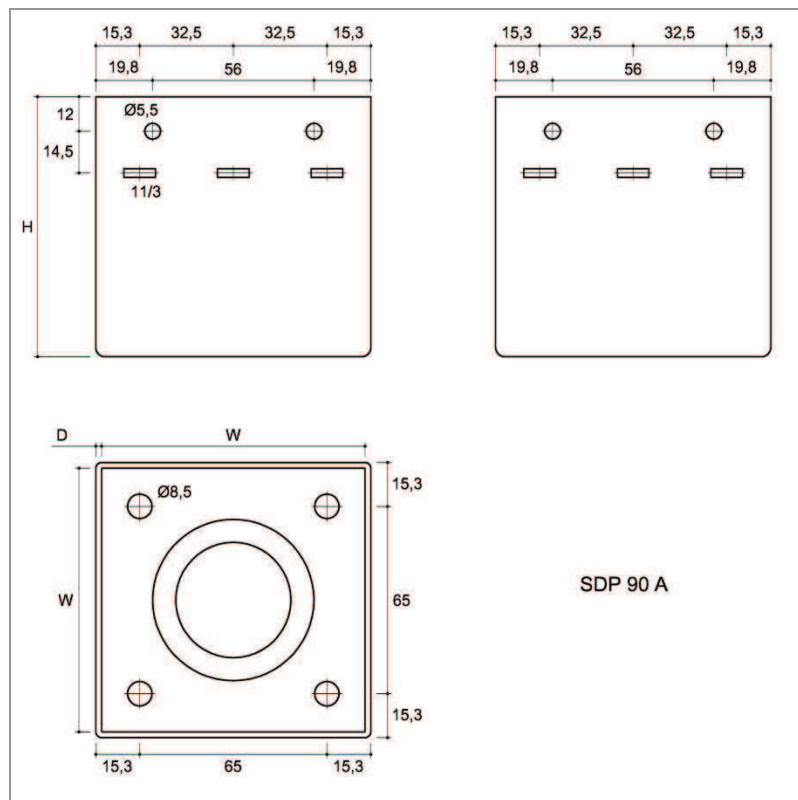


Figure 44 Type SDP 90 A

Table 23 SDP 90 A three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | Quantity of openings | | |
|-----------|----------------|----|---|----------------------|-------|------|
| | W | H | D | ∅ 5.5 | ∅ 8.5 | 11/3 |
| SDP 90 A | 91 | 90 | 2 | 8 | 4 | 12 |
| SDP 100 A | 101 | 90 | 2 | 8 | 4 | 12 |
| SDP 120 A | 121 | 90 | 2 | 8 | 4 | 12 |

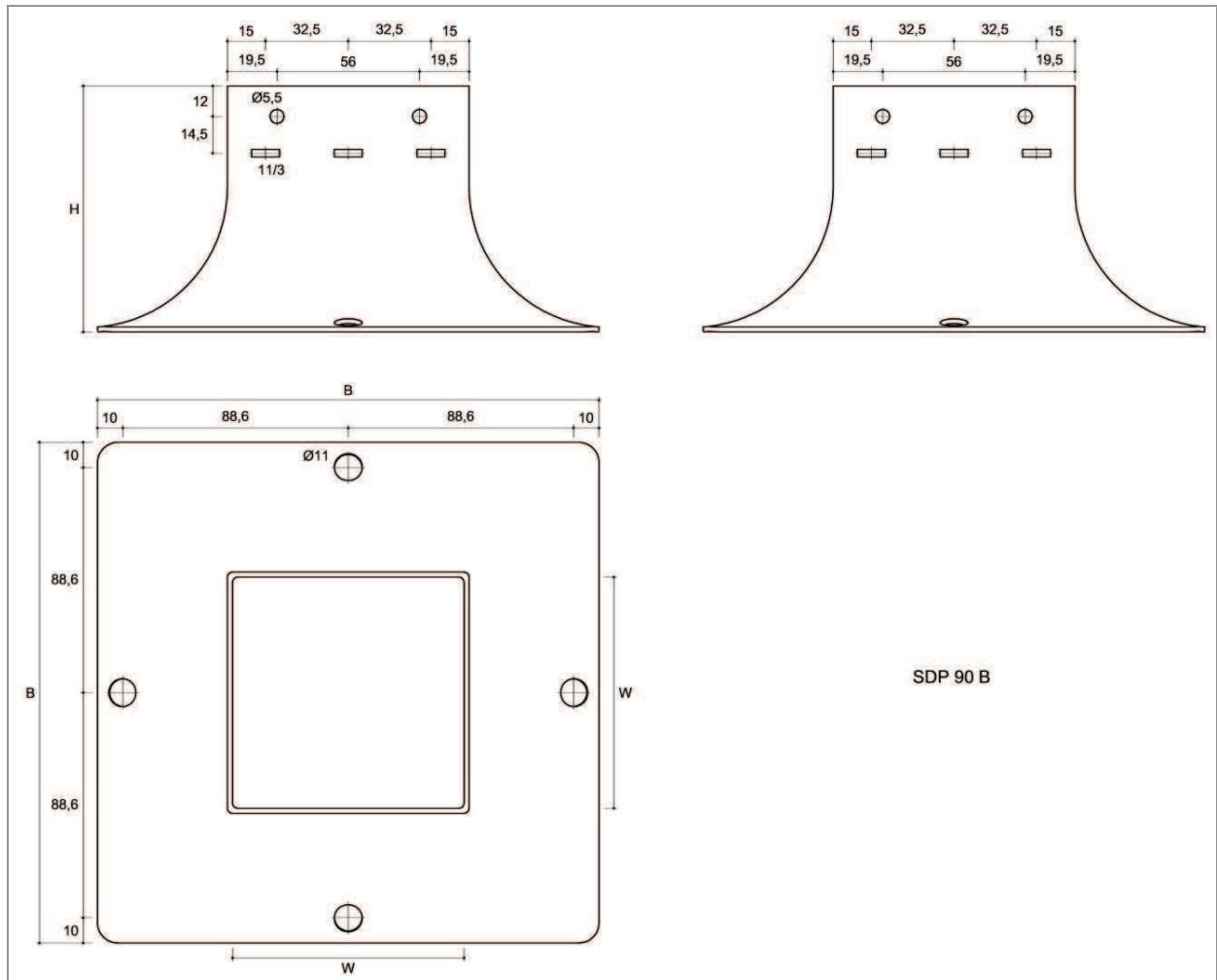


Figure 45 Type SDP 90 B

Table 24 SDP 90 B three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | | |
|-----------|----------------|----|---|-----|----------------------|------|------|
| | W | H | D | B | ∅ 5.5 | ∅ 11 | 11/3 |
| SDP 90 B | 91 | 97 | 2 | 197 | 8 | 4 | 12 |
| SDP 100 B | 101 | 97 | 2 | 207 | 8 | 4 | 12 |
| SDP 120 B | 121 | 97 | 2 | 227 | 8 | 4 | 12 |

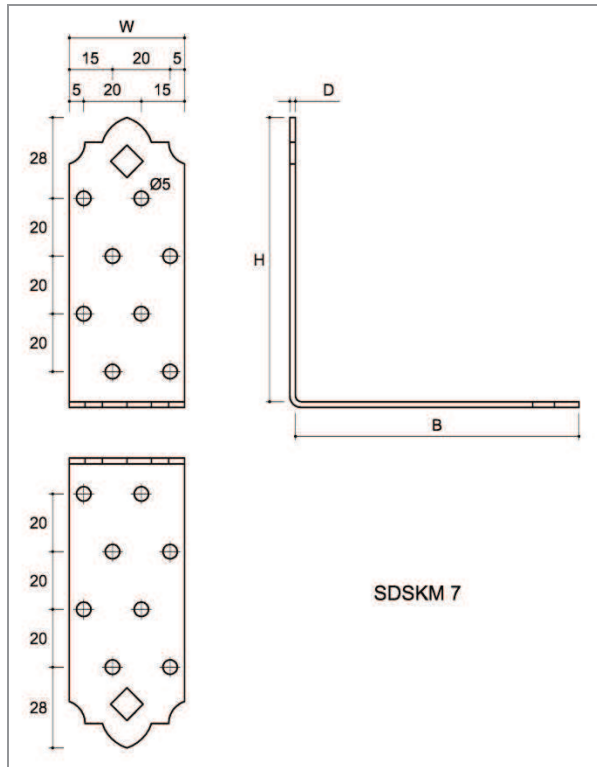


Figure 46 Type SDSKM 7

Table 25 SDSKM three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings |
|---------|----------------|----|----|---|----------------------|
| | W | H | B | D | ∅ 5 |
| SDSKM 7 | 40 | 98 | 98 | 2 | 16 |

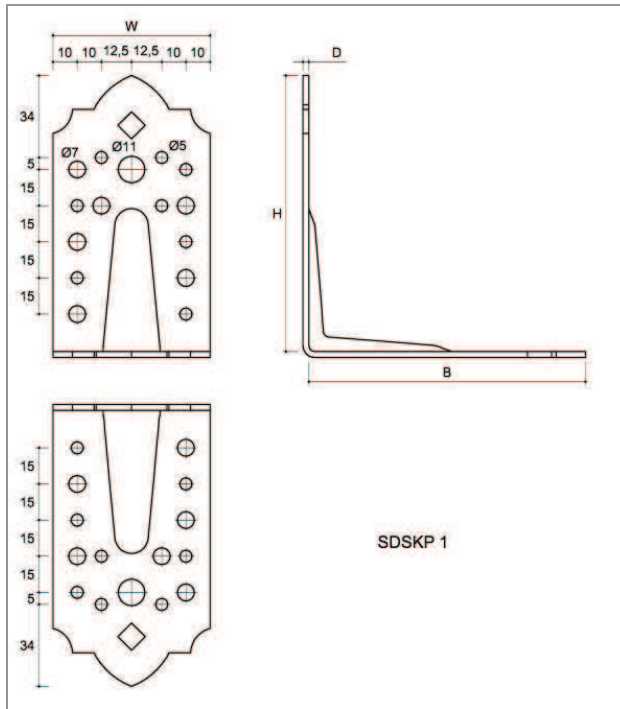


Figure 47 Type SDSKP 1

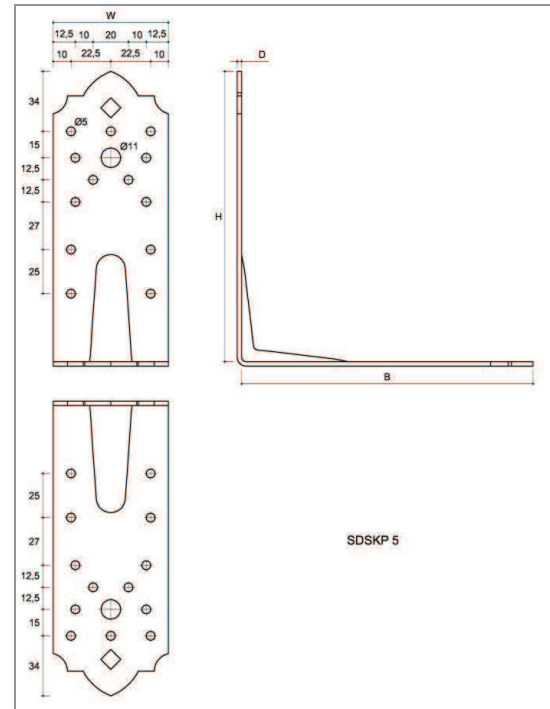


Figure 48 Type SDSKP 5

Table 26 SDSKP three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | | |
|---------|----------------|-----|-----|-----|----------------------|-----|------|
| | W | H | B | D | ø 5 | ø 7 | ø 11 |
| SDSKP 1 | 65 | 115 | 115 | 2,5 | 16 | 12 | 2 |
| SDSKP 5 | 65 | 165 | 165 | 2,5 | 26 | - | 2 |

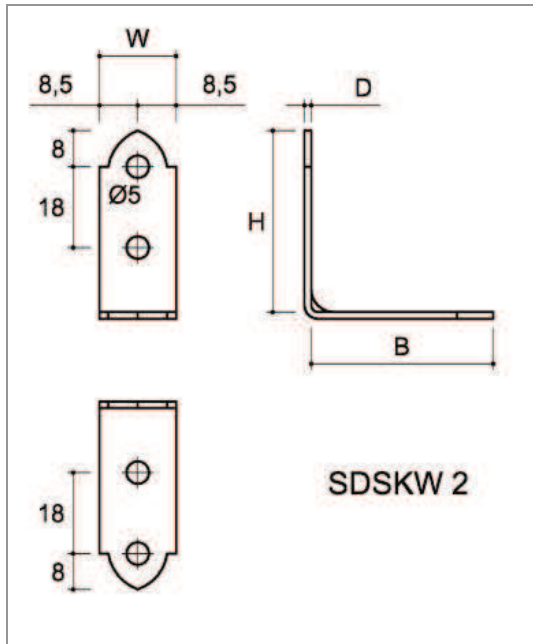


Figure 49 Type SDSKW 2

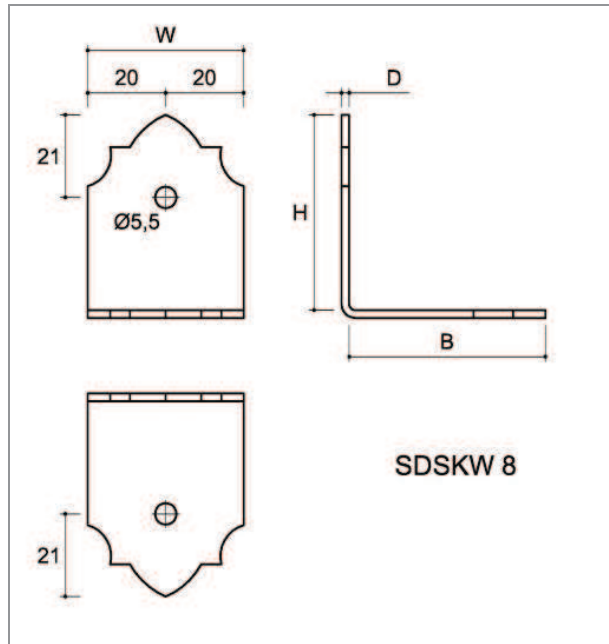


Figure 50 Type SDSKW 8

Table 27 SDSKW three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | |
|---------|----------------|----|----|-----|----------------------|-------|
| | W | H | B | D | Ø 5 | Ø 5.5 |
| SDSKW 2 | 17 | 40 | 40 | 1,5 | 4 | - |
| SDSKW 8 | 40 | 50 | 50 | 2 | - | 2 |

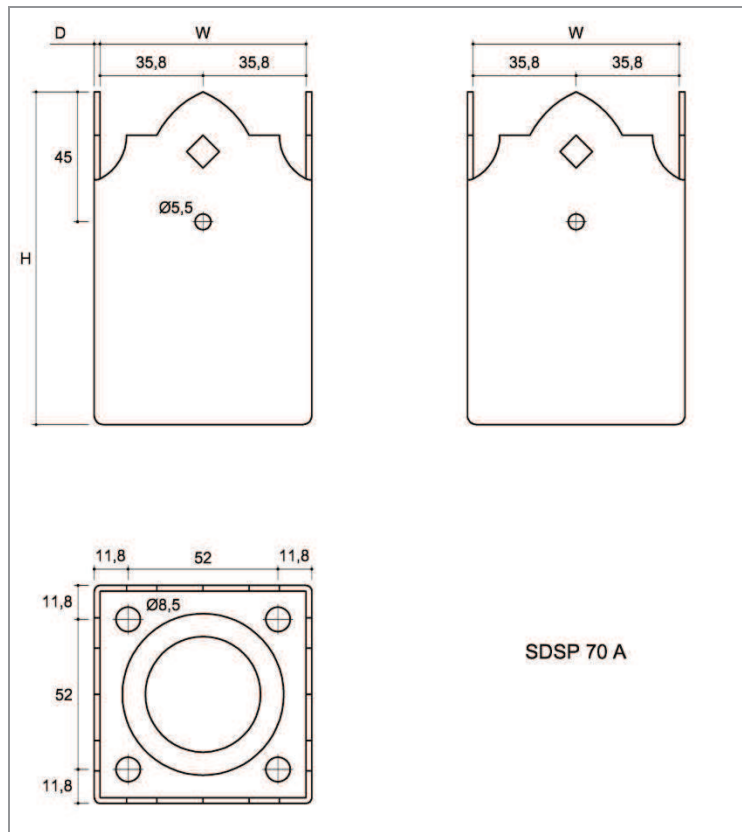


Figure 51 Type SDSP 70 A

Table 28 SDSP three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | Quantity of openings | |
|-----------|----------------|-----|---|----------------------|-------------------|
| | W | H | D | $\varnothing 5.5$ | $\varnothing 8.5$ |
| SDSP 70 A | 71 | 115 | 2 | 4 | 4 |

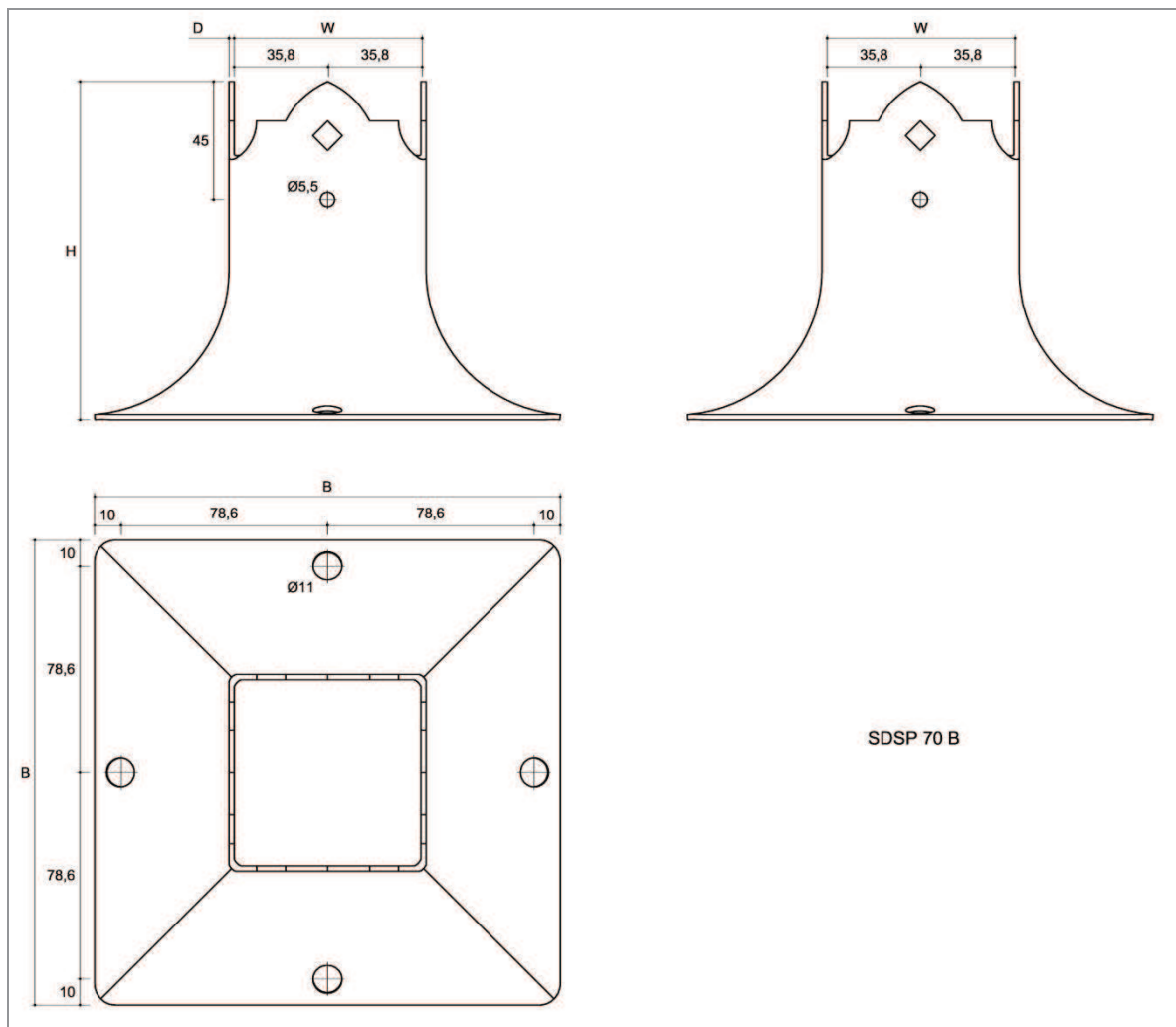


Figure 52 Type SDSP 70B

Table 29 SDSP three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | | Quantity of openings | |
|-----------|----------------|-----|---|-----|----------------------|------------------|
| | W | H | D | B | $\varnothing 5.5$ | $\varnothing 11$ |
| SDSP 70 B | 71 | 129 | 2 | 177 | 4 | 4 |

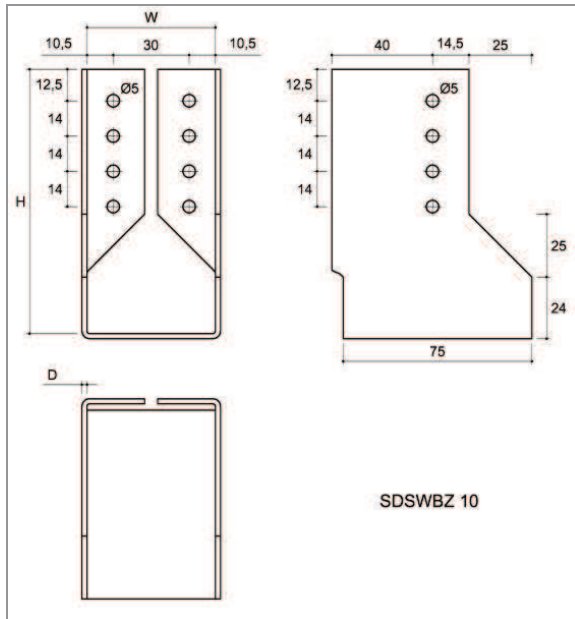


Figure 53 Type SDSWBZ 10

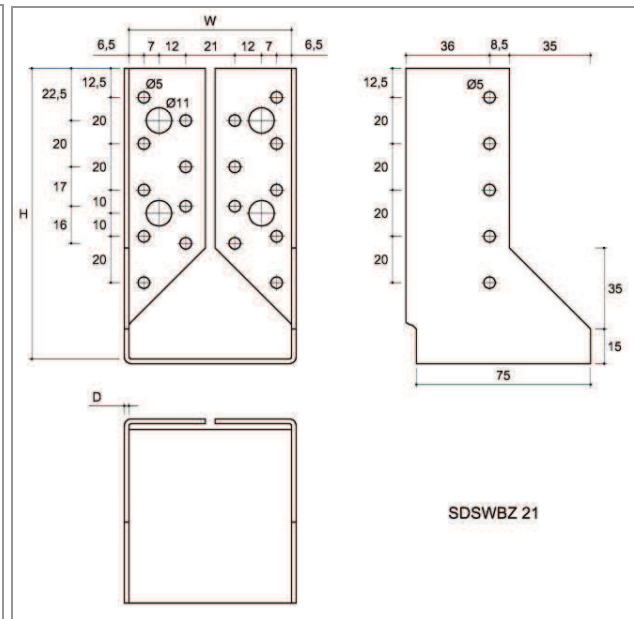


Figure 54 Type SDSWBZ 21

Table 30 SDSWBZ three-dimensional nailing plate symbols and dimensions

| Symbol | Dimensions, mm | | | Quantity of openings | |
|-----------|----------------|-----|---|----------------------|------|
| | W | H | D | Ø 5 | Ø 11 |
| SDSWBZ 10 | 51 | 105 | 2 | 16 | - |
| SDSWBZ 11 | 51 | 135 | 2 | 24 | - |
| SDSWBZ 14 | 60 | 100 | 2 | 16 | - |
| SDSWBZ 21 | 70 | 125 | 2 | 28 | 4 |
| SDSWBZ 26 | 80 | 120 | 2 | 28 | 4 |
| SDSWBZ 30 | 100 | 140 | 2 | 34 | 4 |

MASKING ELEMENTS

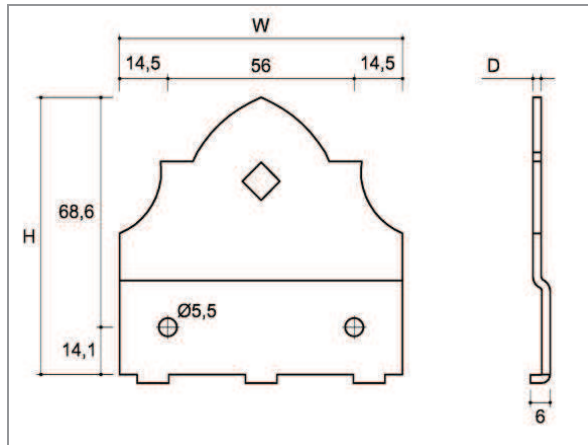


Figure 55 Type SDD 85 A

Table 31 SDD masking elements symbols and dimensions

| Symbol | Dimensions, mm | | | Quantity of openings |
|----------|----------------|----|-----|----------------------|
| | W | H | D | Ø 5.5 |
| SDD 85 A | 85 | 83 | 2,5 | 2 |
| SDD 85 B | 85 | 83 | 2,5 | 2 |

CONNECTION ELEMENTS

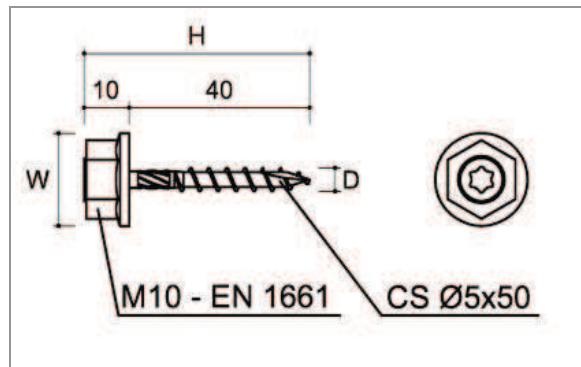


Figure 56 Type SDCS 50

Table 32 SDCS dowel type connector symbols and dimensions

| Symbol | Dimensions, mm | | |
|---------|----------------|----|-----|
| | W | H | D |
| SDCS 50 | 20.5 | 50 | 5.2 |

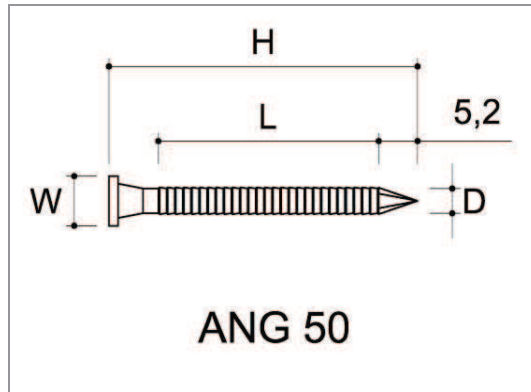


Figure 57 Type ANG 50

Table 33 Anchor dowel type connector symbols and dimensions

| Symbol | Dimensions, mm | | | |
|--------|----------------|----|------|---|
| | D | H | L | W |
| ANG 40 | 4 | 40 | 26.8 | 8 |
| ANG 50 | 4 | 50 | 36.8 | 8 |

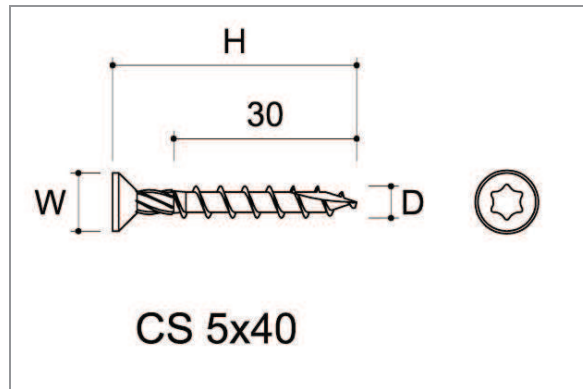


Figure 58 Type CS 5x40

Table 34 CS dowel type connector symbols and dimensions

| Symbol | Dimensions, mm | | |
|---------|----------------|----|-----|
| | D | H | W |
| CS 5x40 | 5 | 40 | 9.5 |
| CS 5x50 | 5 | 50 | 9.5 |

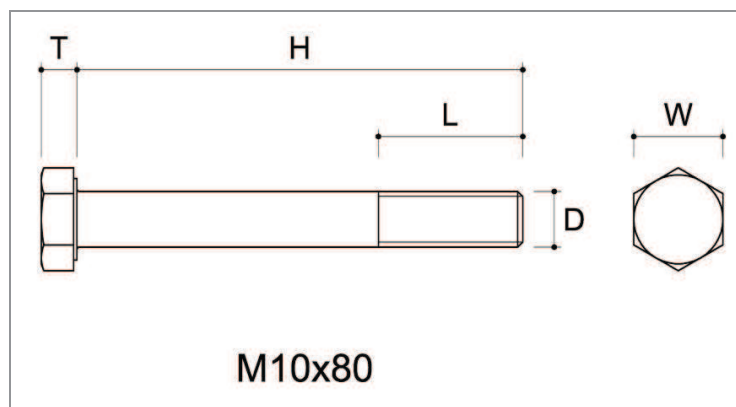


Figure 59 Type M10x80

Table 35 M bolt type connector symbols and dimensions

| Symbol | Dimensions, mm | | | | | Standard |
|---------|----------------|-----|----|----|-----|----------|
| | D | H | L | W | T | |
| M5x16 | M5 | 16 | 16 | 8 | 3.5 | ISO 4017 |
| M10x80 | M10 | 80 | 26 | 16 | 6.4 | ISO 4014 |
| M12x90 | M12 | 90 | 30 | 18 | 7.5 | ISO 4014 |
| M16x160 | M16 | 160 | 44 | 24 | 10 | ISO 4014 |

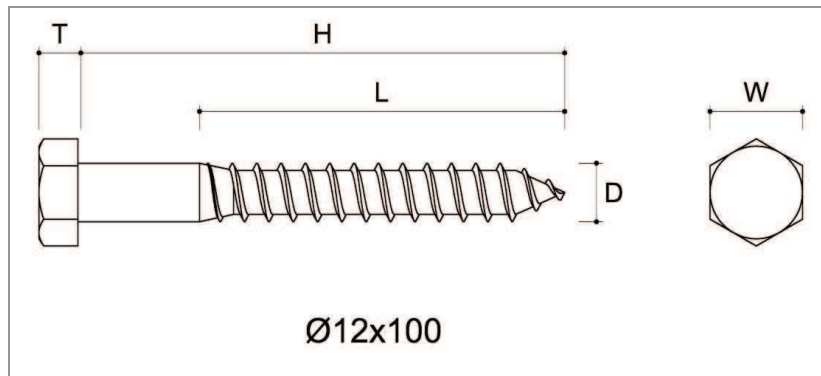


Figure 60 Type Ø12x100

Table 36 Ø12x100 type connector symbols and dimensions

| Symbol | Dimensions, mm | | | | | Standard |
|---------|----------------|-----|----|----|---|----------|
| | D | H | L | W | T | |
| Ø12x100 | 12 | 100 | 75 | 19 | 8 | DIN 571 |

ANNEX 2

LOADING ACCORDING TO STATIC DIAGRAMS (for selected elements)

| No. | Scheme | Connector types |
|-----|--------|---|
| 1 | | <p>KPK 11, 12, 13, 21, 22, 23</p> <p>KPL 5, 6, 11, 21</p> <p>KR 1, 2, 3</p> <p>KRD 5, 6</p> |

Figure 61 Scheme 1

| No. | Scheme | Connector types |
|-----|--------|---|
| 2 | | <p>KPK 31</p> <p>KPK 32</p> <p>KPK 33</p> |

Figure 62 Scheme 2

| No. | Scheme | Connector types |
|-----|--------|-------------------------|
| 3 | | <p>KP 7</p> <p>KP 8</p> |

Figure 63 Scheme 3


| No. | Scheme | Connector types |
|-----|---|-----------------|
| 4 |  | KPK 4 |

Figure 64 Scheme 4


| No. | Scheme | Connector types |
|-----|--|--|
| 5 |  | KLR 1 KLR 2 KLR 3 KLR 4 KLR 5 KLR 6 |

Figure 65 Scheme 5


| No. | Scheme | Connector types |
|-----|---|---|
| 6 |  | WBC 80 WBC 92 WBC 100 WBC 120 WBC 137 |

Figure 66 Scheme 6

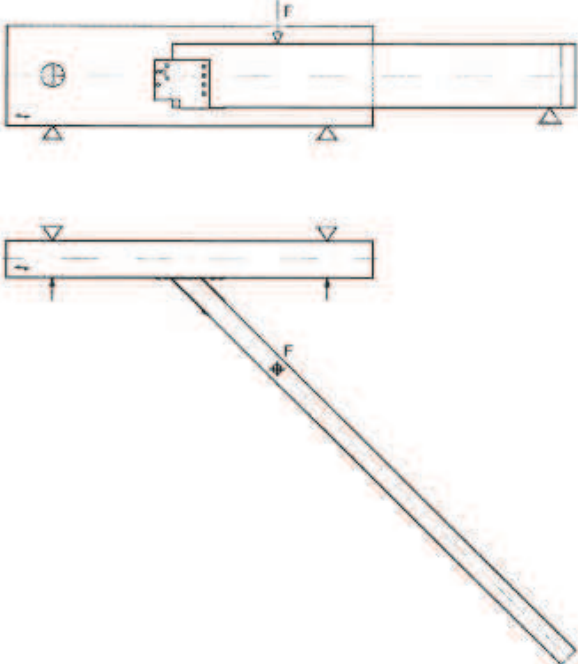
| No. | Scheme | Connector types |
|-----|--|---|
| 7 |  | <p>WBU 45 R45-105; L45-105 R50-105; L50-105 R60-120; L60-120</p> |

Figure 67 Scheme 7

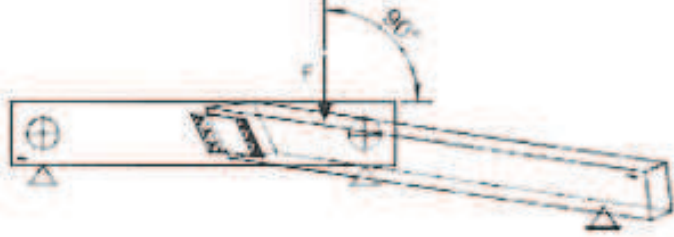
| No. | Scheme | Connector types |
|-----|--|--|
| 8 |  | <p>LU 25 R80; L80 R120; L120</p> |

Figure 68 Scheme 8

CALCULATIONS ACCORDING TO STATIC DIAGRAMS
(for selected elements)

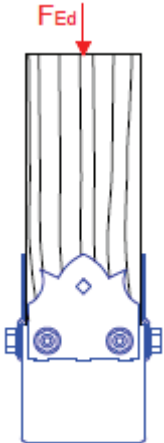
| No. | Scheme | Connector types |
|-----|---|--|
| 9 |  | <p align="center">SDP 90 A SDP 100 A SDP 120 A</p> |

Figure 69 Scheme 9

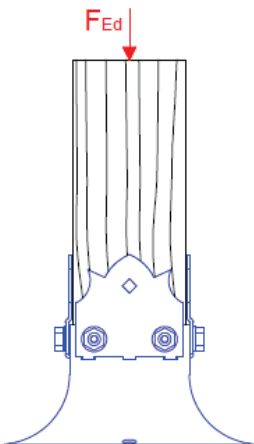
| No. | Scheme | Connector types |
|-----|--|--|
| 10 |  | <p align="center">SDP 90 B SDP 100 B SDP 120 B</p> |

Figure 70 Scheme 10

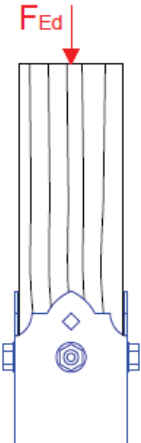
| No. | Scheme | Connector types |
|-----|---|---------------------------------|
| 11 |  | <p align="center">SDSP 70 A</p> |

Figure 71 Scheme 11

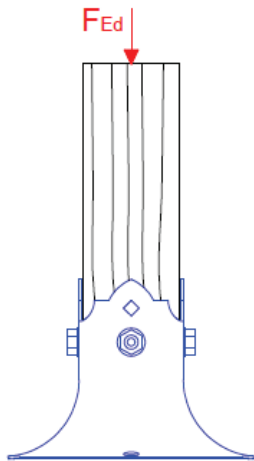
| No. | Scheme | Connector types |
|-----|---|-----------------|
| 12 |  | SDSP 70 B |

Figure 72 Scheme 12

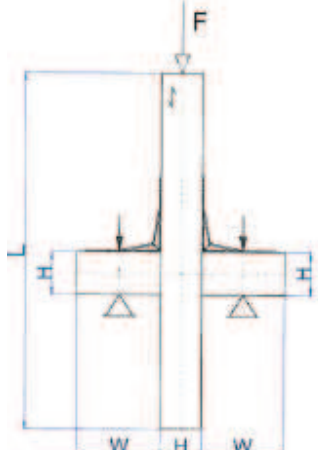
| No. | Scheme | Connector types |
|-----|--|----------------------------------|
| 13 |  | KPS 1 KPS 2 KPS 3 KPS 4 |

Figure 73 Scheme 13

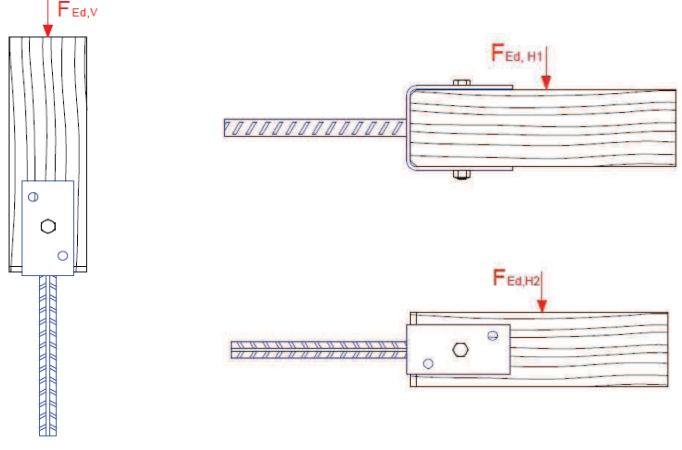
| No. | Scheme | Connector types |
|-----|---|--|
| 14 |  | PS 60 PS 70 PS 80 PS 90 PS 100 PS 120 PS 140 |

Figure 74 Scheme 14

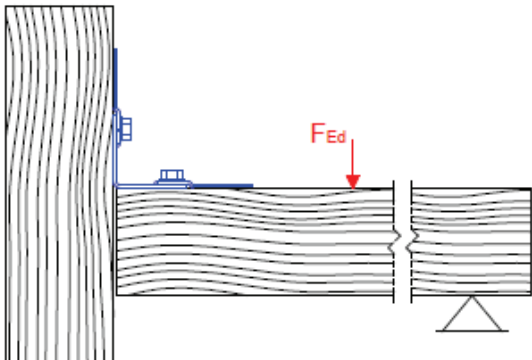
| No. | Scheme | Connector types |
|-----|---|--------------------|
| 15 |  | SDKL 1 pull out |

Figure 75 Scheme 15

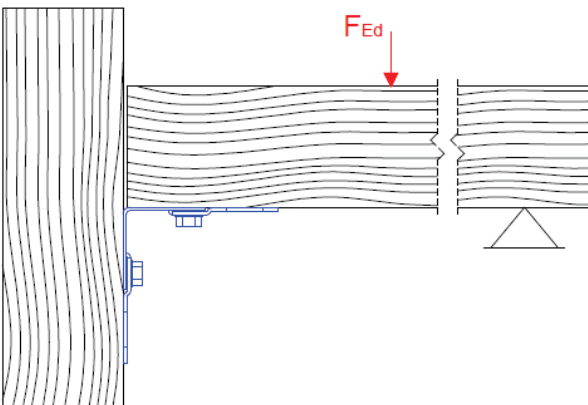
| No. | Scheme | Connector types |
|-----|---|--------------------|
| 16 |  | SDKL 1 pressure |

Figure 76 Scheme 16

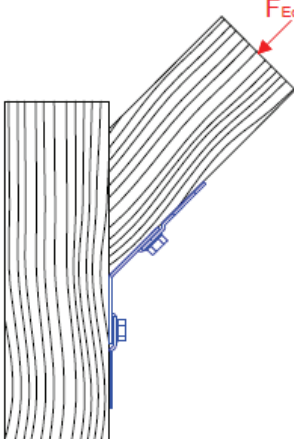
| No. | Scheme | Connector types |
|-----|---|-----------------|
| 17 |  | SDKLR 1 |

Figure 77 Scheme 17

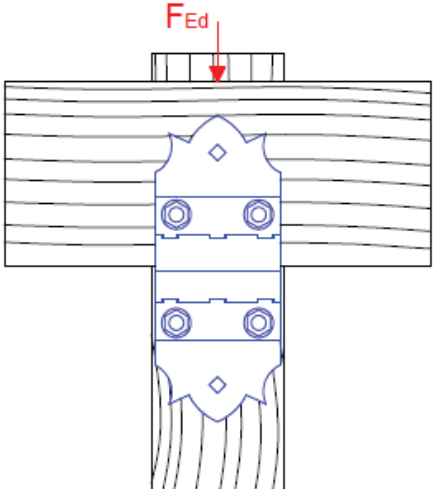
| No. | Scheme | Connector types |
|-----|---|-----------------|
| 18 |  | SDLZ 1 |

Figure 78 Scheme 18

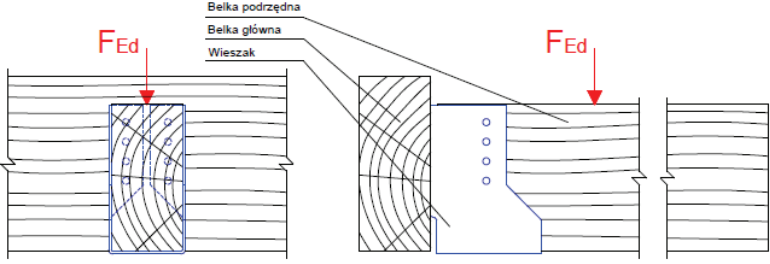
| No. | Scheme | Connector types |
|-----|---|--|
| 19 |  | SDSWBZ 10 SDSWBZ 11 SDSWBZ 14 SDSWBZ 21 SDSWBZ 26 SDSWBZ 30 |

Figure 79 Scheme 19

ANNEX 3

THE CHARACTERISTIC LOAD-CARRYING CAPACITIES OF CONNECTORS

Table 37

| Type group | Type | Timber Moisture [%] | Density $\rho_{mean, 12\%}$ [kg·m ⁻³] | $P_{max, mean}$ [kN] | $P_{max, k}$ [kN] | Note No. |
|------------|----------------|---------------------|---|----------------------|-------------------|----------|
| KP | KP 7 | 16.9 | 428.2 | 18.34 | 12.5 | 1 |
| | KP 8 | 23.0 | 411.7 | 20.62 | 12.9 | 1 |
| KPL | KPL 5 | 15.2 | 421.2 | 8.09 | 6.8 | 2 |
| | KPL 6 | 12.9 | 422.8 | 9.49 | 6.2 | 2 |
| | KPL 11 | 14.9 | 452.1 | 18.43 | 13.0 | 2 |
| | KPL 21 | 15.6 | 472.7 | 21.23 | 17.1 | 2 |
| KPK | KPK 4 | 14.3 | 416.8 | 15.85 | 12.7 | 2 |
| | KPK 11 | 17.7 | 460.8 | 13.00 | 10.4 | 2 |
| | KPK 12 | 14.3 | 460.9 | 17.32 | 13.5 | 2 |
| | KPK 13 | 13.4 | 398.2 | 22.13 | 16.7 | 2 |
| | KPK 21 | 12.3 | 468.5 | 13.53 | 10.8 | 2 |
| | KPK 22 | 11.3 | 407.5 | 13.14 | 10.6 | 2 |
| | KPK 23 | 11.3 | 460.9 | 12.79 | 9.0 | 2 |
| | KPK 31 | 13.6 | 436.6 | 12.44 | 9.3 | 3 |
| | KPK 32 | 12.2 | 424.8 | 12.62 | 10.5 | 3 |
| KPK 33 | 15.4 | 415.4 | 13.66 | 10.5 | 3 | |
| KLR | KLR 1 | 13.8 | 422.2 | 5.71 | 4.2 | 2 |
| | KLR 2 | 15.5 | 429.7 | 10.95 | 7.9 | 2 |
| | KLR 3 | 15.5 | 407.1 | 10.59 | 8.3 | 2 |
| | KLR 4 | 15.7 | 468.1 | 6.35 | 5.1 | 2 |
| | KLR 5 | 15.3 | 410.8 | 15.41 | 13.6 | 2 |
| | KLR 6 | 16.0 | 497.6 | 9.98 | 7.2 | 2 |
| KR | KR 1 | 13.4 | 438.8 | 6.74 | 5.1 | 2 |
| | KR 2 | 14.6 | 396.2 | 12.29 | 6.7 | 2 |
| | KR 3 | 14.7 | 408.7 | 7.53 | 6.3 | 2 |
| WBC | WBC 80 | 14.7 | 423.2 | 42.06 | 34.9 | 2 |
| | WBC 92 | 16.8 | 424.0 | 42.79 | 36.1 | 2 |
| | WBC 100 | 14.9 | 423.6 | 42.71 | 26.8 | 2 |
| | WBC 120 | 16.7 | 414.3 | 47.22 | 29.2 | 2 |
| | WBC 137 | 14.9 | 428.4 | 52.44 | 42.1 | 2 |
| WBU | WBU 45 R45-105 | 15.6 | 385.4 | 16.96 | 11.0 | 2 |
| | WBU 45 R50-105 | 14.5 | 387.0 | 16.43 | 12.4 | 2 |
| | WBU 45 R60-120 | 14.9 | 423.8 | 21.47 | 16.5 | 2 |
| KRD | KRD 5 | 16.1 | 453.8 | 9.65 | 6.1 | 2 |
| | KRD 6 | 16.1 | 430.8 | 8.74 | 6.1 | 2 |
| LU | LU 25 R80 | 14.7 | 436.5 | 9.07 | 6.1 | 2 |
| | LU 25 R120 | 14.6 | 414.5 | 14.76 | 12.3 | 2 |

Notes:

1 Given forces are per one connector (one angle bracket), the test connections consisted of two connectors, forces for the complete connections are twice as high

2 One connector

3 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

THE CHARACTERISTIC LOAD-CARRYING CAPACITIES OF JOINTS (LOADING)

Table 38

| Type group | Type | Timber Moisture [%] | Density $\rho_{mean, 12\%}$ [kg·m ⁻³] | $P_{max, mean}$ [kN] | $P_{max, k}$ [kN] | Note No. |
|------------|-------|---------------------|---|----------------------|-------------------|----------|
| ŁB | ŁB 1 | 12.0 | 400.1 | 13.41 | 9.9 | 1 |
| | ŁB 2 | 12.0 | 400.1 | 15.27 | 10.4 | 1 |
| | ŁB 4 | 12.0 | 400.1 | 12.73 | 9.4 | 1 |
| NT | NT 25 | | | 25.26 | 15.7 | 2 |
| | NT 40 | | | 37.14 | 32.8 | 2 |
| | NT 60 | | | 67.62 | 59.8 | 2 |
| KKB | KKB 1 | 12.0 | 400.0 | 81.14 | 57.6 | 3 |

Notes:

1 Given forces are for one connector, the test connections consisted of two connectors, hence the force for the complete connection is twice the given

2 One connector loaded in tension

3 Given forces are for the complete connection, the test connections consisted of two connectors, hence force for one connector is half of the given

THE CHARACTERISTIC LOAD-CARRYING CAPACITIES OF JOINTS (CALCULATIONS)

Table 39

| Type of connector | Load | Bearing Capacity [kN] | | Method of determination | Document No. |
|-------------------|----------|-----------------------|-------|-------------------------|--------------|
| | | Timber | Steel | | |
| SDLZ 1 | shear | 3.6 | | calculation | KAO-O-SOD-13 |
| SDKLR 1 | oblique | 3.3 | | calculation | KAO-O-SOD-12 |
| SDKL 1 | pull out | | 1.1 | calculation | KAO-O-SOD-10 |
| | pressure | 3.3 | | calculation | KAO-O-SOD-11 |
| SDSP 70 A | pressure | 34.8 | | calculation | KAO-O-SOD-23 |
| SDSP 70 B | pressure | 108.6 | | calculation | KAO-O-SOD-24 |
| SDP 90 A | pressure | 39.6 | | calculation | KAO-O-SOD-15 |
| SDP 90 B | pressure | 180.6 | | calculation | KAO-O-SOD-17 |
| SDP 100 A | pressure | 39.6 | | calculation | KAO-O-SOD-15 |
| SDP 100 B | pressure | 220.5 | | calculation | KAO-O-SOD-17 |
| SDP 120 A | pressure | 39.6 | | calculation | KAO-O-SOD-15 |
| SDP 120 B | pressure | 312.9 | | calculation | KAO-O-SOD-17 |
| SDSKW 2 | pressure | 3.3 | | testing | KAO-O-SOD-21 |
| SDSKW 8 | pressure | 3.5 | | testing | KAO-O-SOD-22 |
| SDSKP 1 | pressure | 17.8 | | testing | KAO-O-SOD-21 |
| SDSKP 5 | pressure | 10.9 | | testing | KAO-O-SOD-21 |
| SDSKM 7 | pressure | 5.8 | | testing | KAO-O-SOD-21 |
| SDSWBZ 10 | pressure | 9.6 | | calculation | KAO-O-SOD-18 |
| SDSWBZ 11 | pressure | 12.3 | | calculation | KAO-O-SOD-19 |
| SDSWBZ 14 | pressure | 9.3 | | calculation | KAO-O-SOD-20 |
| SDSWBZ 21 | pressure | 17.2 | | testing | KAO-O-SOD-21 |
| SDSWBZ 26 | pressure | 17.2 | | testing | KAO-O-SOD-21 |
| SDSWBZ 30 | pressure | 22.4 | | testing | KAO-O-SOD-21 |

THE CHARACTERISTIC LOAD-CARRYING CAPACITIES OF JOINTS (CALCULATIONS)

Table 40

| Type of connector | Characteristic bearing capacity [kN] | | Document No. |
|-------------------|--------------------------------------|--|--------------|
| | Timber | | |
| PS 60 | 4.1 | | BPS-0001/13 |
| PS 70 | 4.3 | | BPS-0002/13 |
| PS 80 | 6.9 | | BPS-0003/13 |
| PS 90 | 6.2 | | BPS-0004/13 |
| PS 100 | 6.7 | | BPS-0005/13 |
| PS 120 | 8.2 | | BPS-0006/13 |
| PS 140 | 7.5 | | BPS-0007/13 |
| KPS 1 | 16.3 | | KE1-0009/14 |
| KPS 2 | 18.7 | | KE1-0010/14 |
| KPS 3 | 12.6 | | KE1-0011/14 |
| KPS 4 | 11.6 | | KE1-0012/14 |

Table 41 Overview of bearing capacities of connector type PS [kN]

| Type of connector | Bearing capacity $N_{Rd,V}$ [kN] (calculation) | | Bearing capacity $N_{Rd,H1}$ [kN] (calculation) | | Bearing capacity $N_{Rd,H2}$ [kN] (testing) |
|-------------------|---|---------------------------|--|---------------------------|---|
| | Bearing capacity of timber | Bearing capacity of steel | Bearing capacity of timber | Bearing capacity of steel | |
| PS 60 | 61.7 | 51.7 | 12.2 | 6.9 | 4.7 |
| PS 70 | 86.6 | 51.7 | 12.2 | 6.9 | 4.4 |
| PS 80 | 99.2 | 57.3 | 12.2 | 9.6 | 7.7 |
| PS 90 | 111.8 | 57.3 | 12.2 | 9.6 | 6.8 |
| PS 100 | 124.4 | 57.3 | 12.2 | 9.6 | 7 |
| PS 120 | 149.6 | 57.3 | 12.2 | 9.6 | 9.1 |
| PS 140 | 174.8 | 57.3 | 12.2 | 9.6 | 7.8 |

$N_{Rd,V}$ - Vertical load force, $N_{Rd,H1}$ - Horizontal load force, $N_{Rd,H2}$ - Vertical load force parallel to the side of base
Document No.: KAO-L-PS-01

For combinations of loads ($F_{Ed,V}$, $F_{Ed,H1}$, $F_{Ed,H2}$) a linear summation of the utilization ratios may be used. This method may be applied by using a following criteria:

$$\frac{F_{Ed,V}}{N_{Rd,V}} + \frac{F_{Ed,H1}}{N_{Rd,H1}} + \frac{F_{Ed,H2}}{N_{Rd,H2}} \leq 1$$

ANNEX 4

NAILING PATTERNS

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).

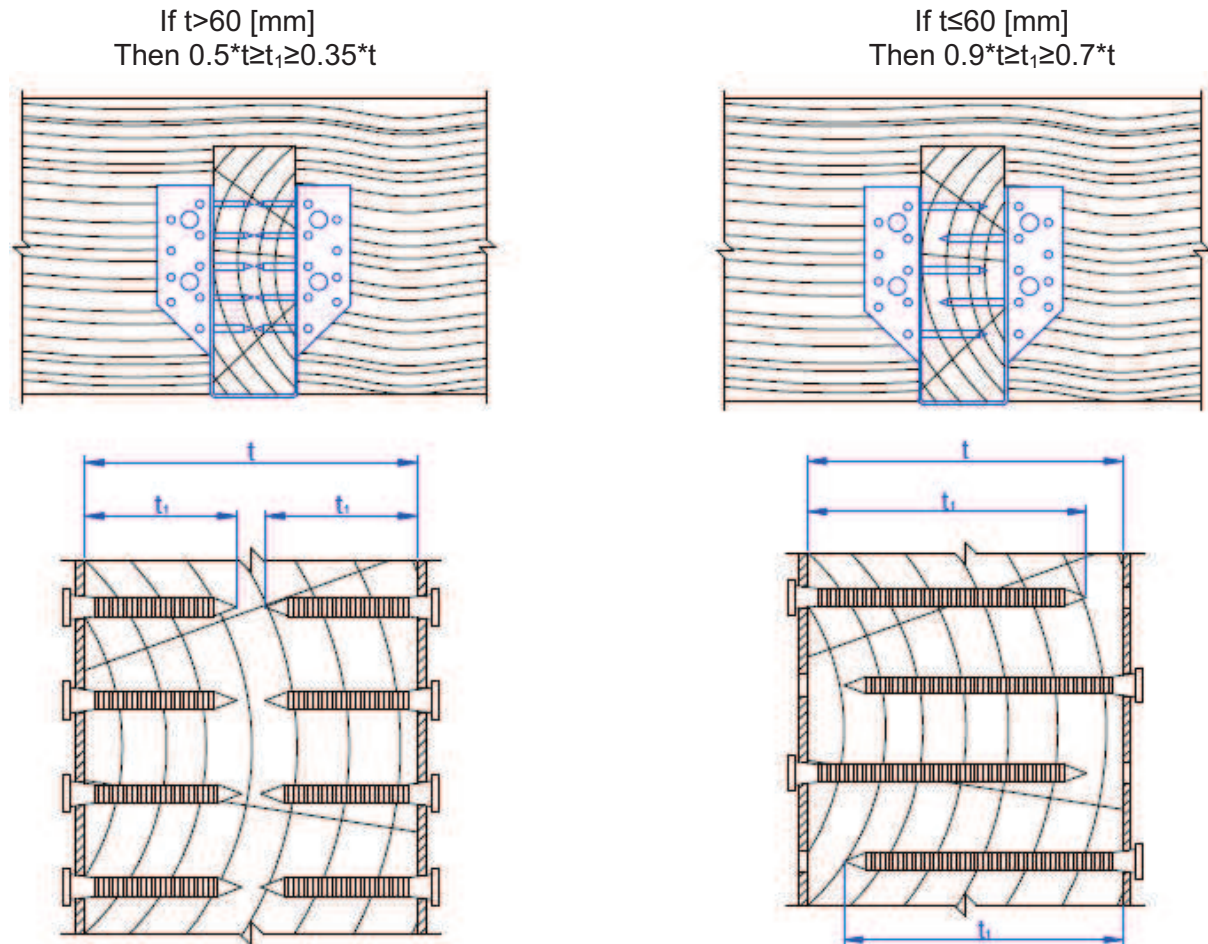


Figure 80 Rule for placement nails

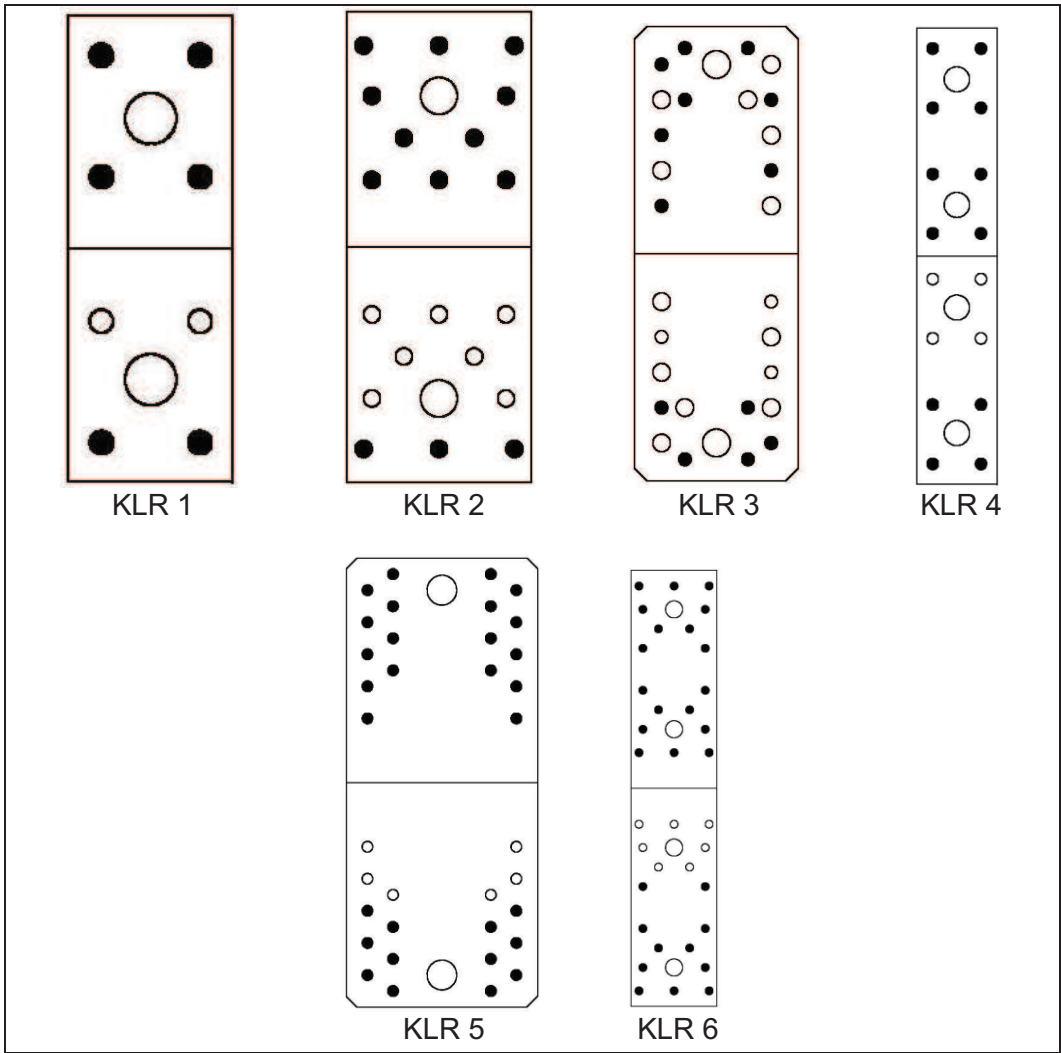


Figure 81 Type KLR

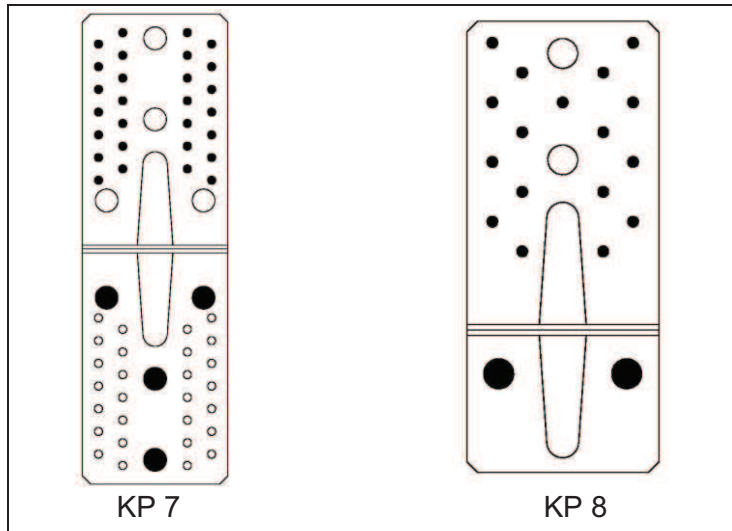


Figure 82 Type KP

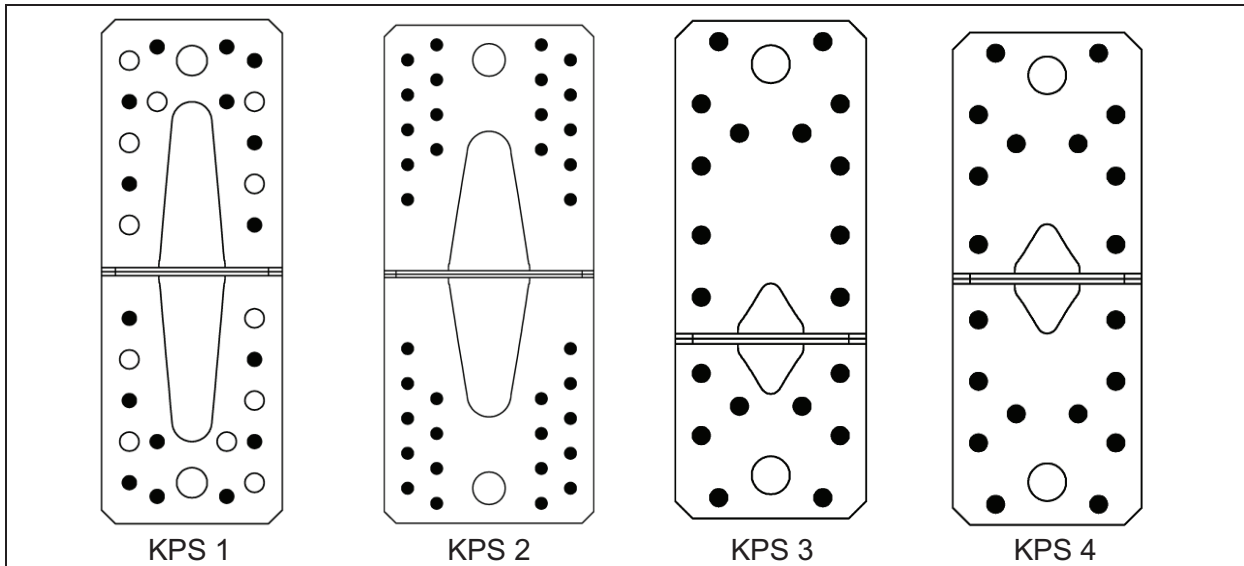


Figure 83 Type KPS

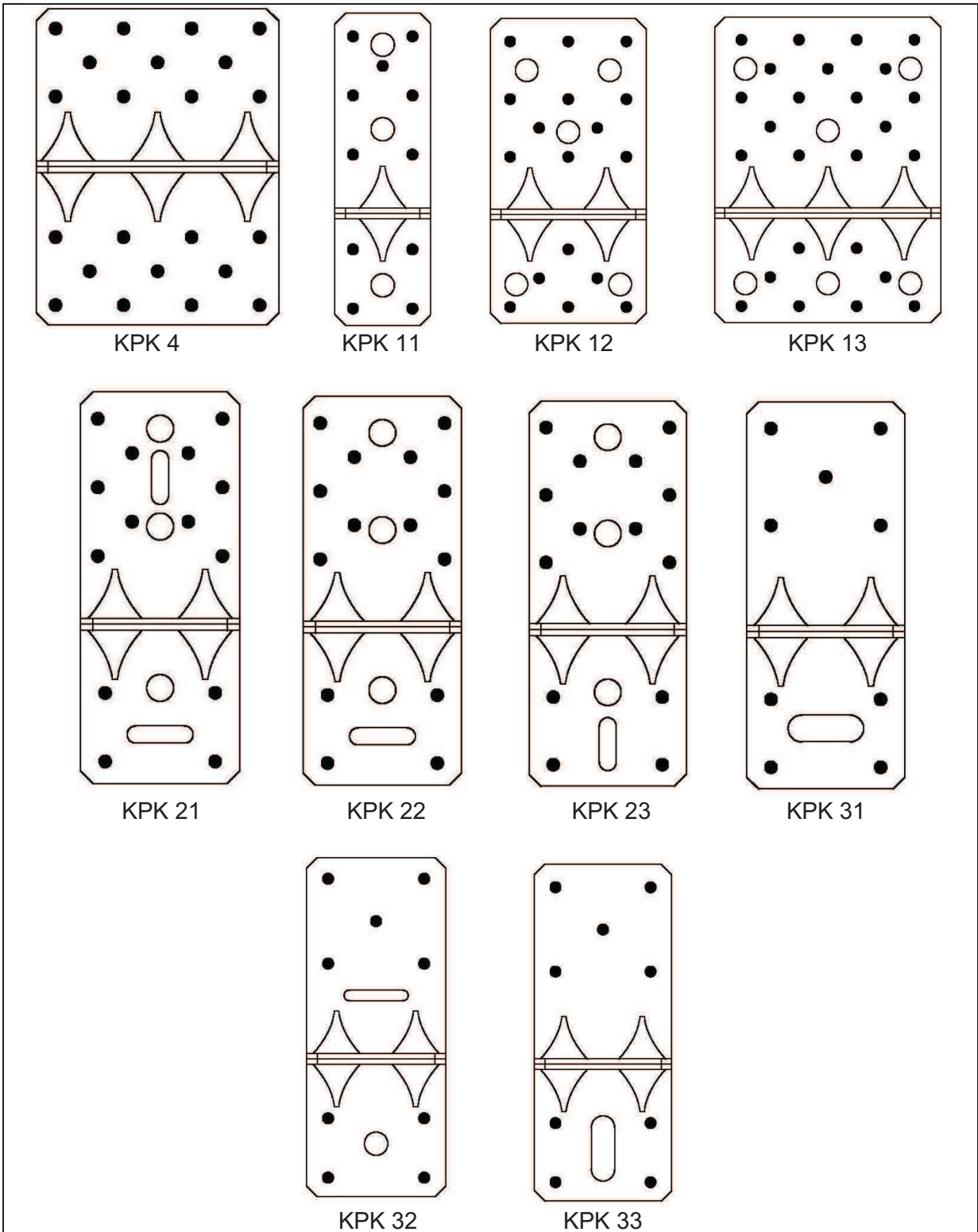


Figure 84 Type KPK

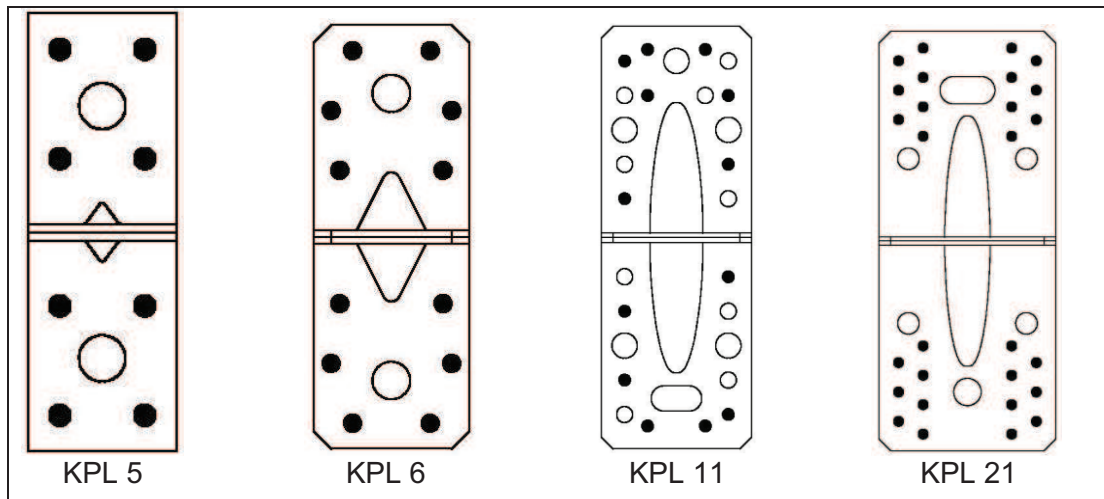


Figure 85 Type KPL

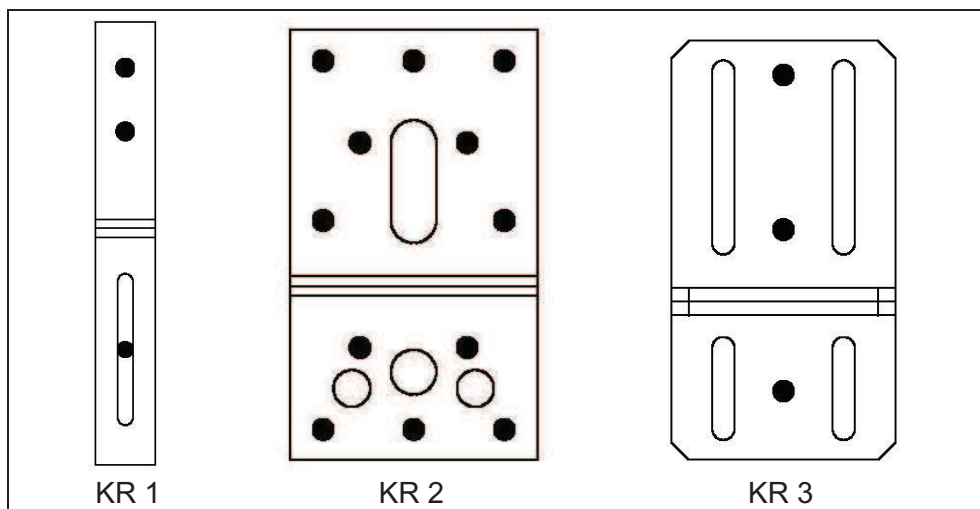


Figure 86 Type KR

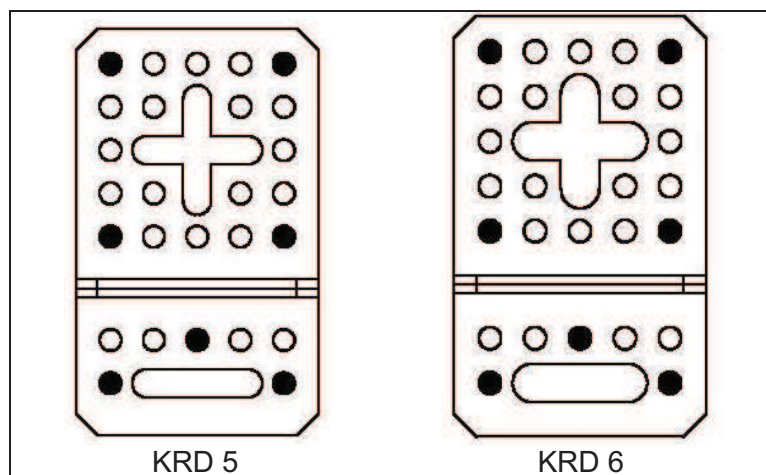


Figure 87 Type KRD

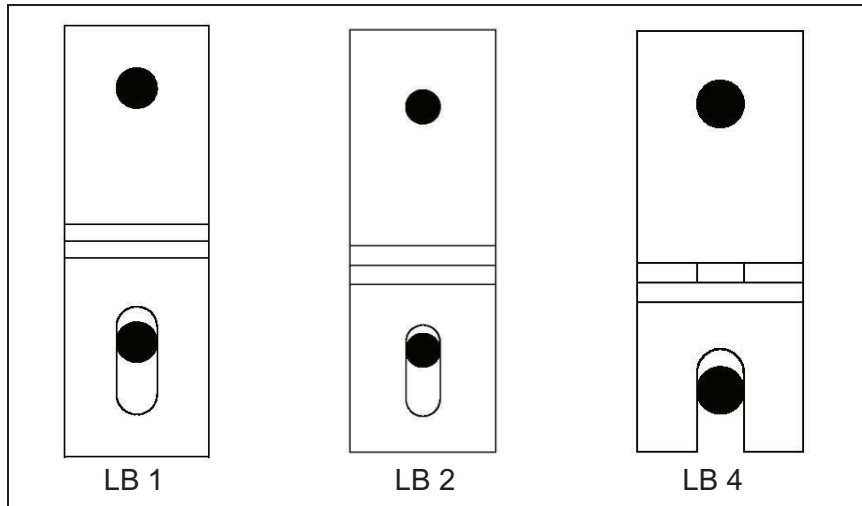


Figure 88 Type LB

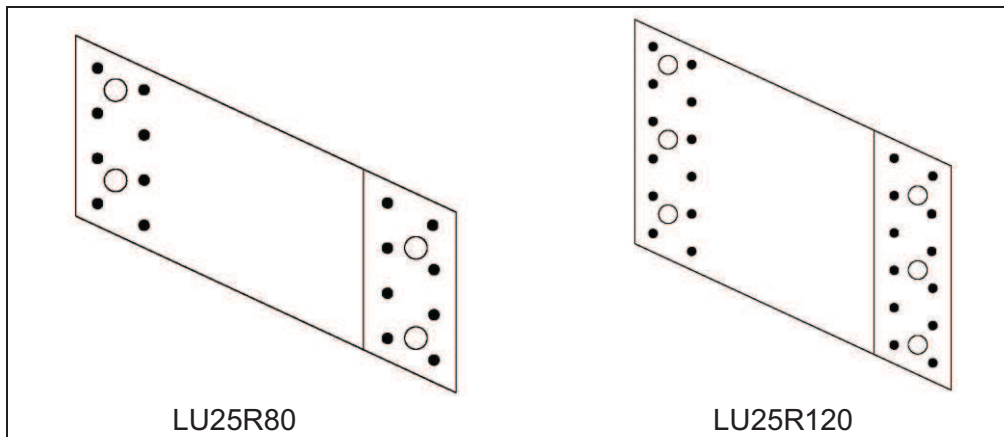


Figure 89 Type LU

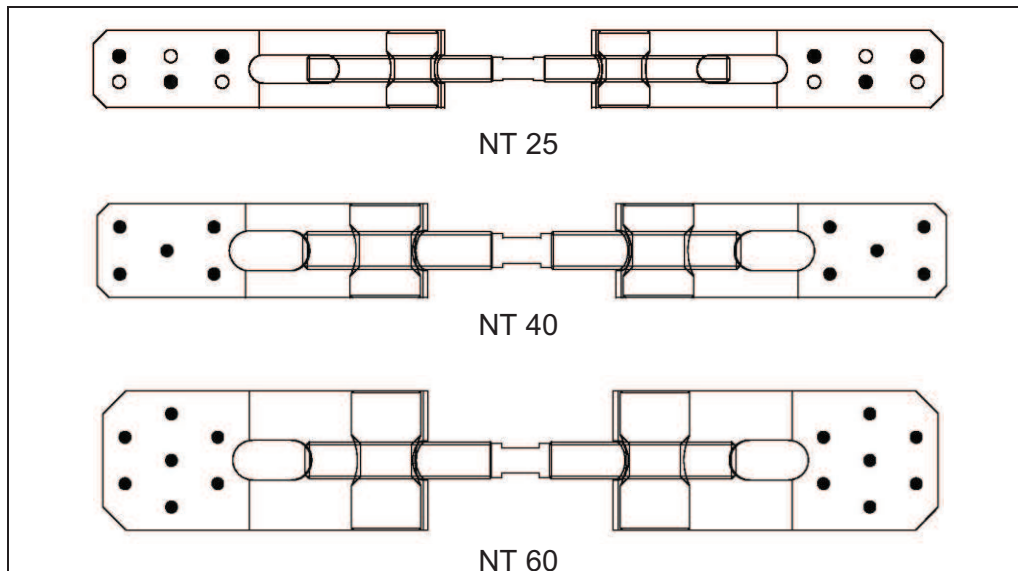


Figure 90 Type NT

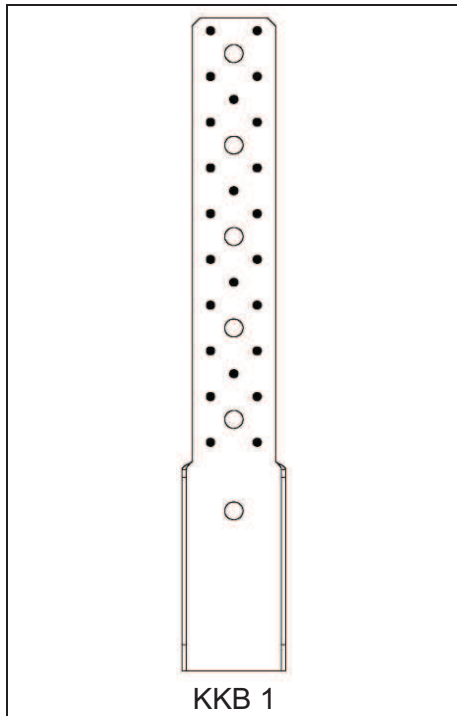


Figure 91 Type KKB

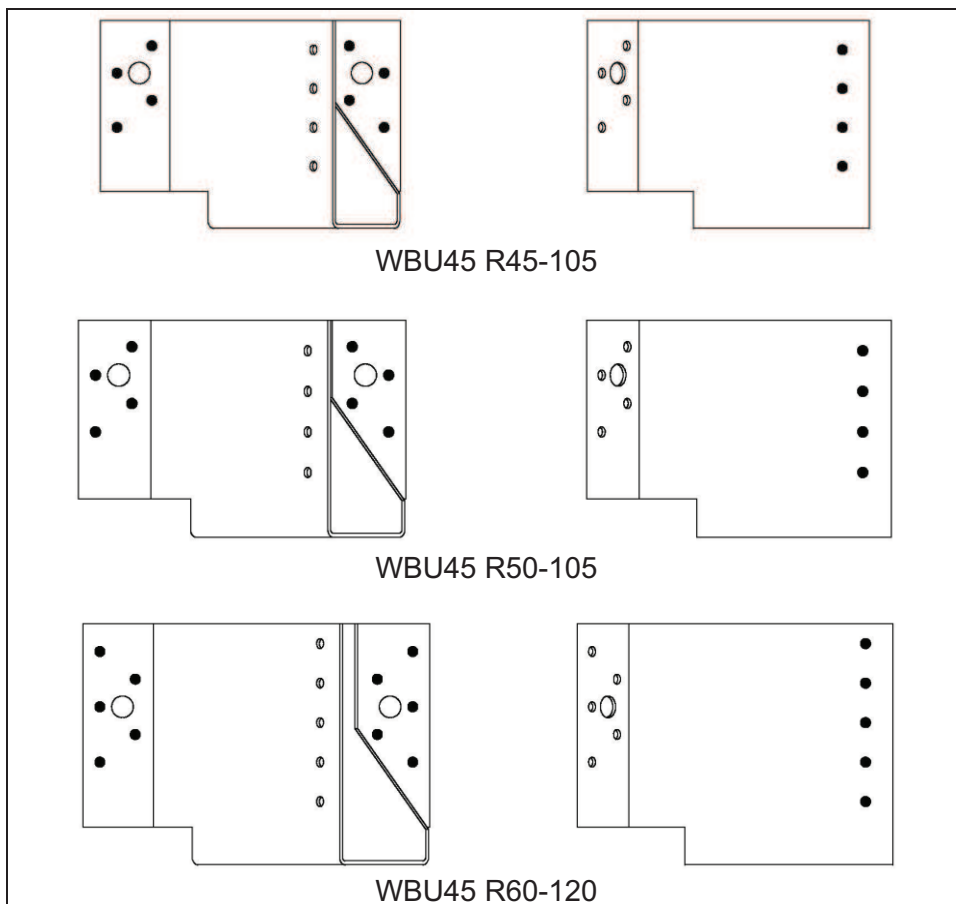


Figure 92 Type WBU

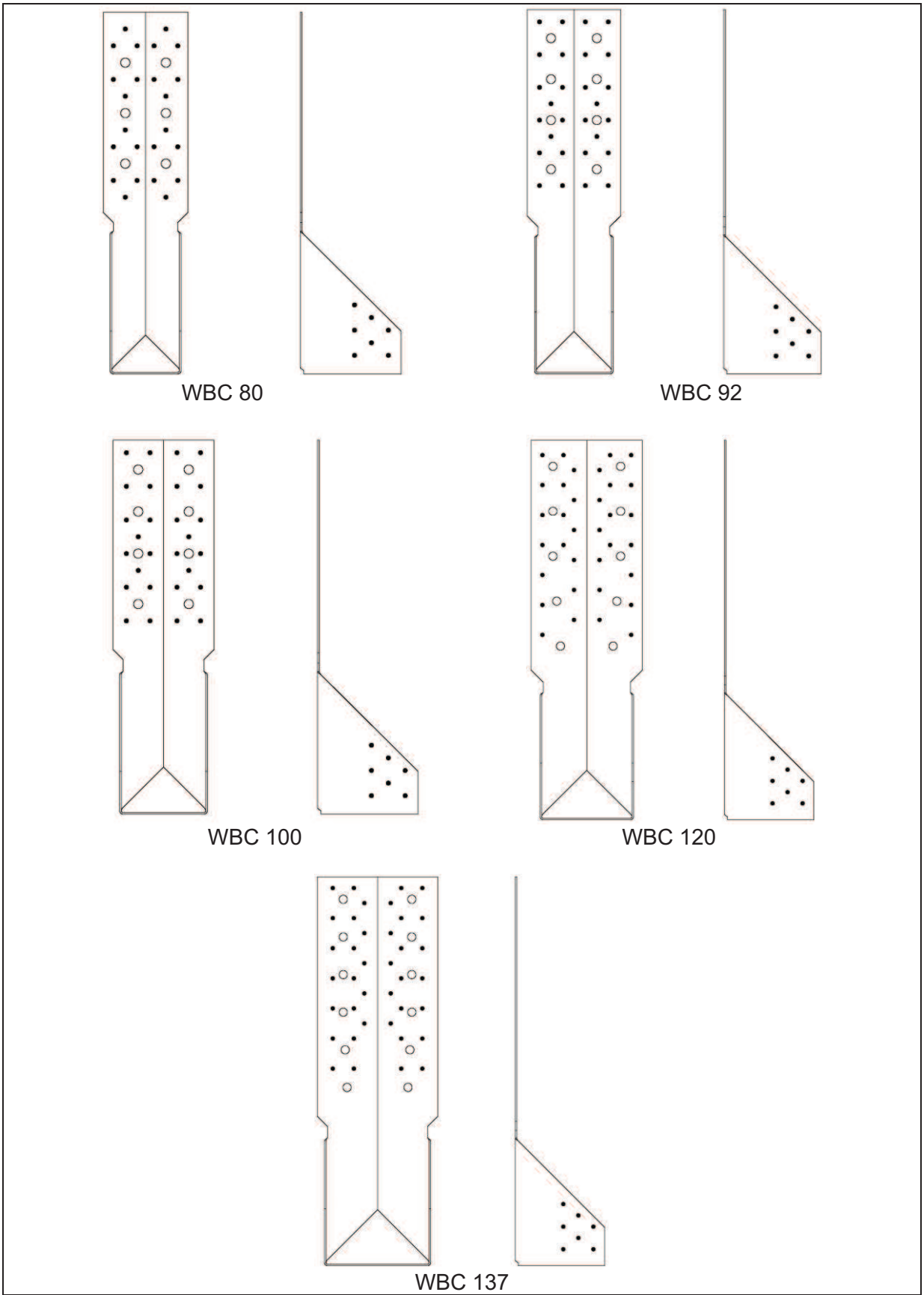


Figure 93 Type WBC

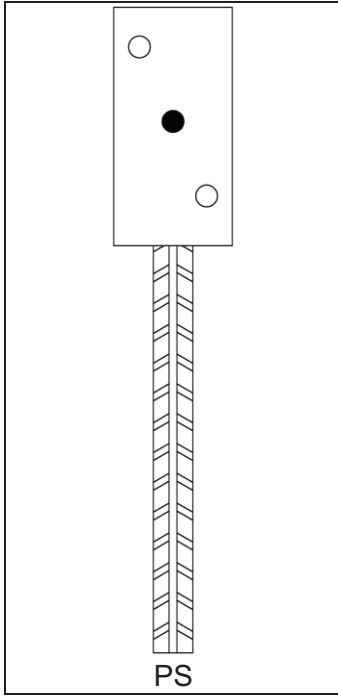
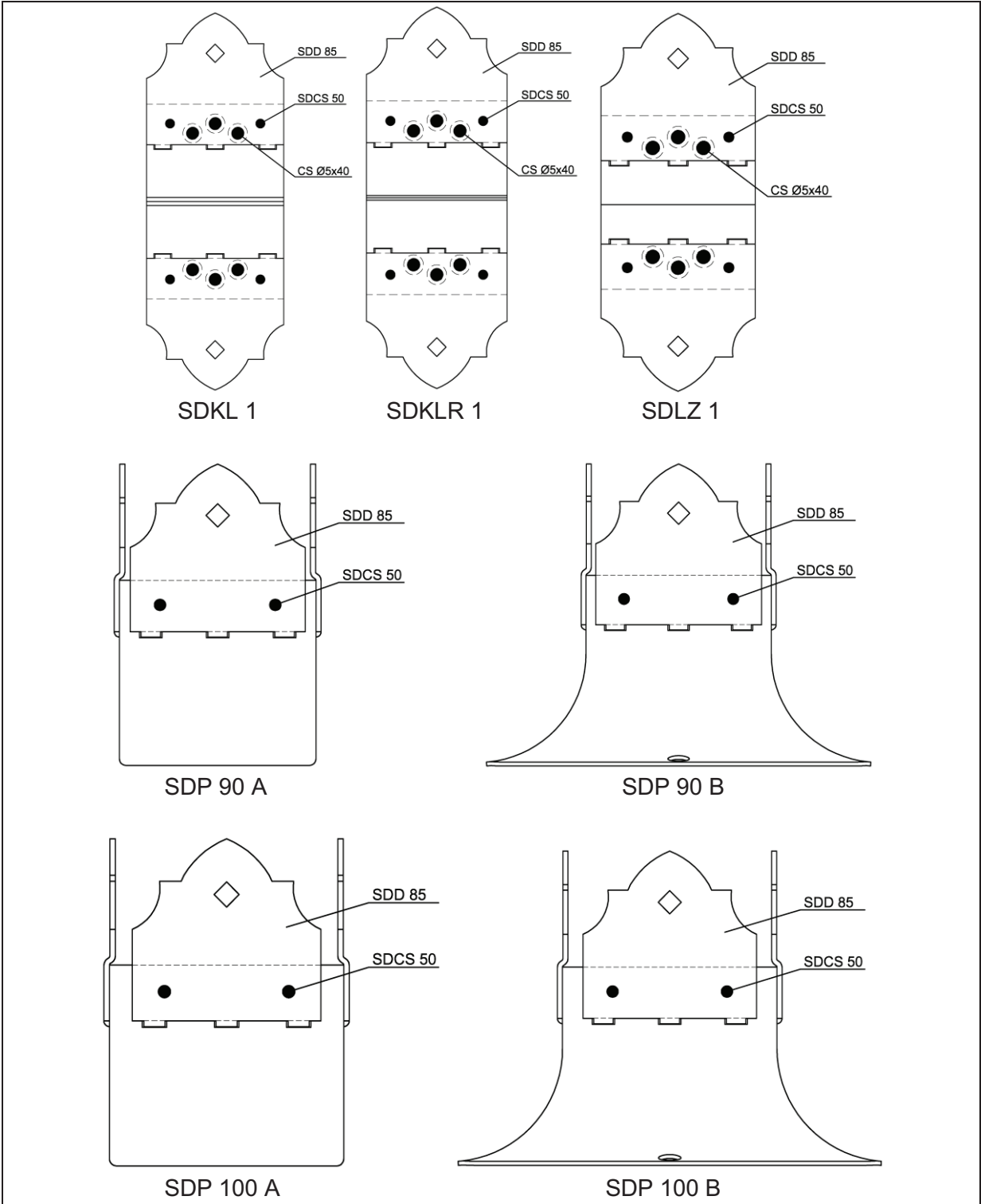


Figure 94 Type PS



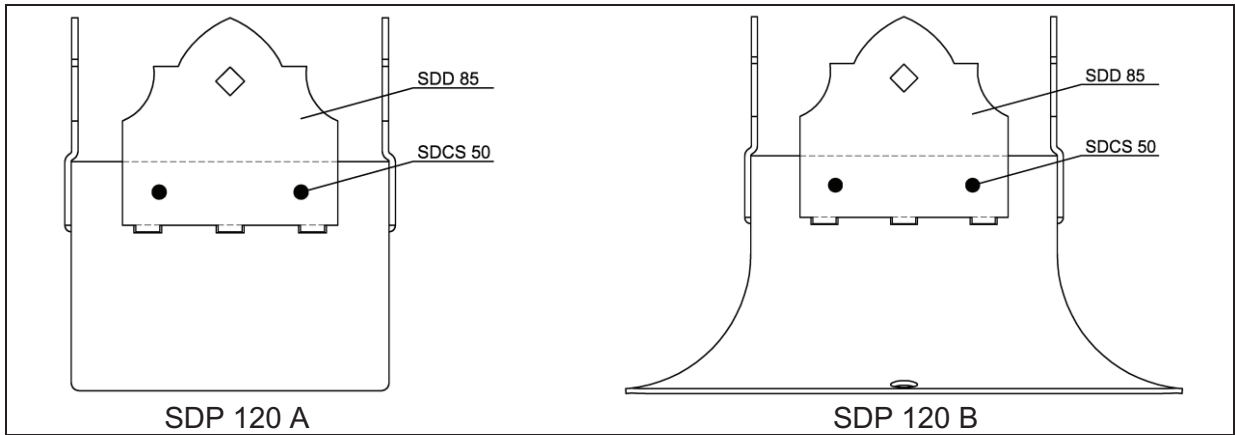
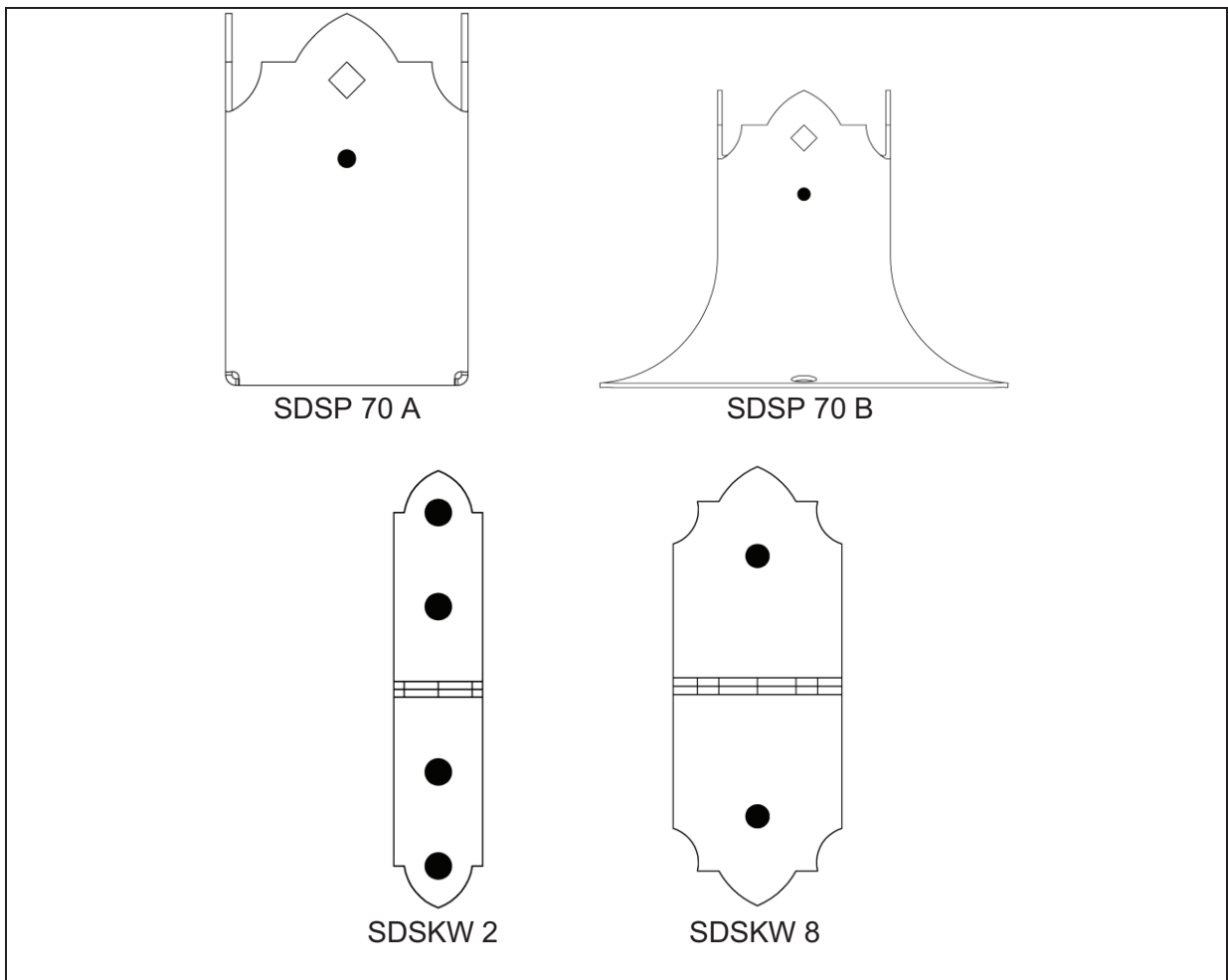
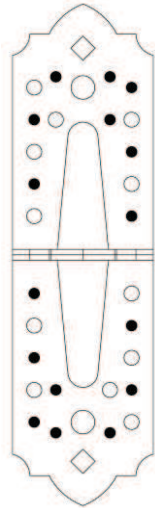


Figure 95 Type SD

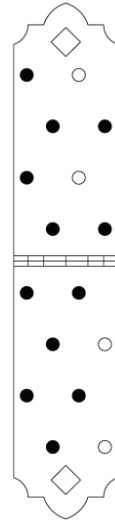




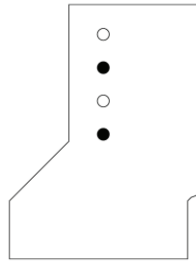
SDSKP 1



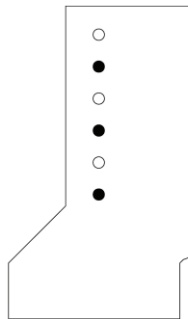
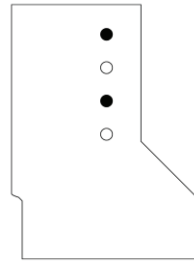
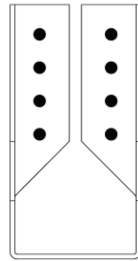
SDSKP 5



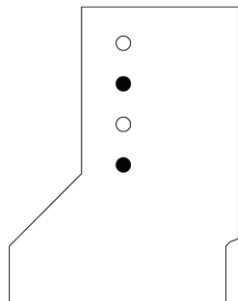
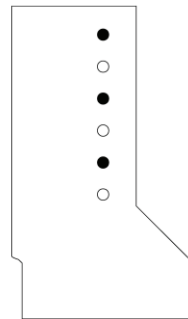
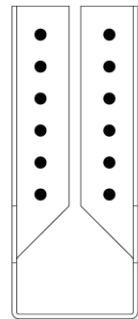
SDSKM 7



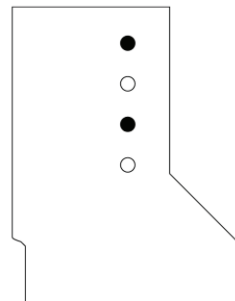
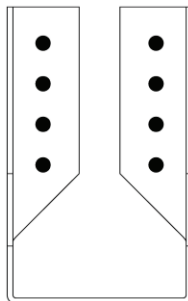
SDSWBZ 10



SDSWBZ 11



SDSWBZ 14



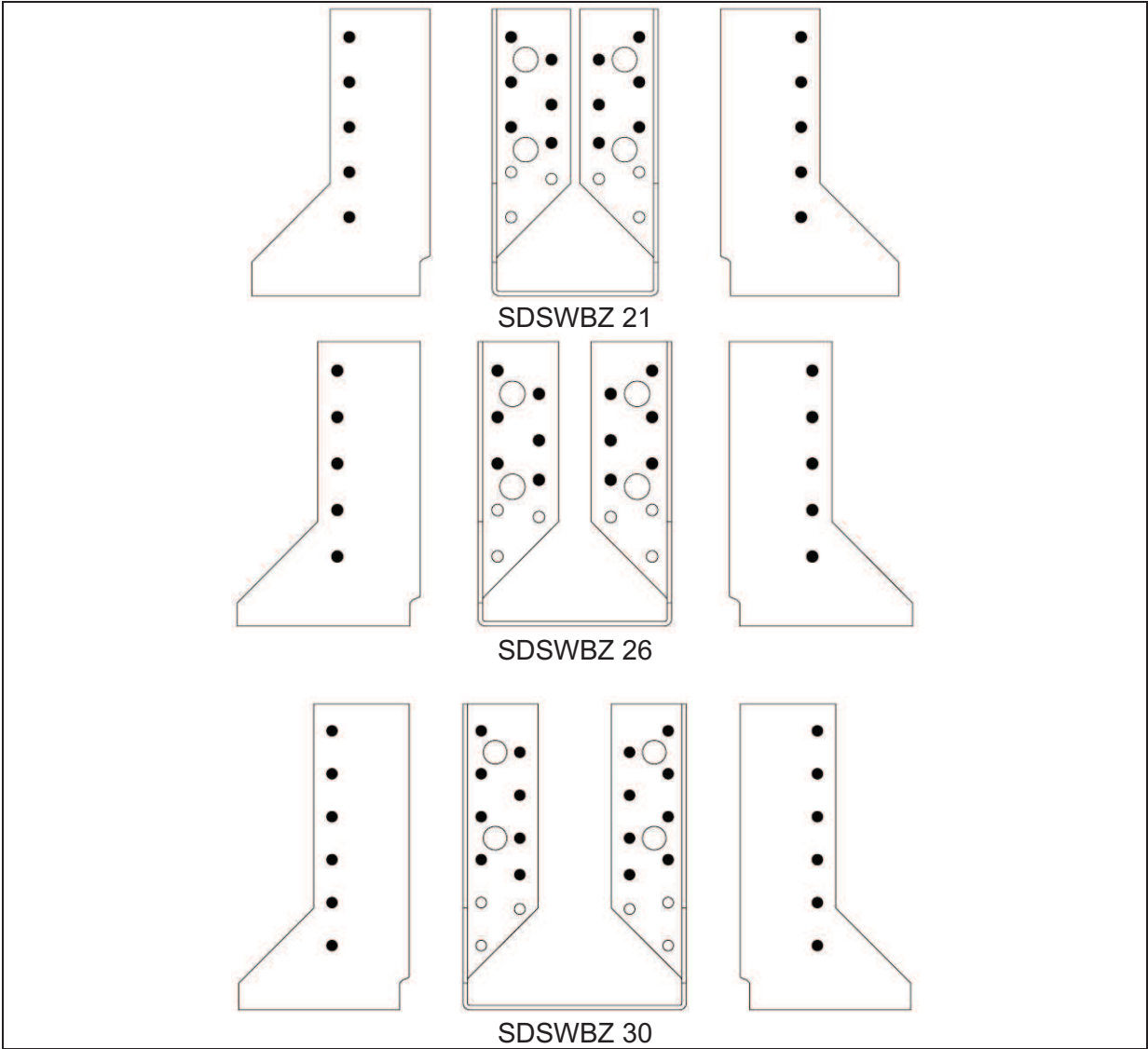


Figure 96 Type SDS

ANNEX 5

SPECIFICATION OF CONNECTION ELEMENTS

Table 42

| Detail | Dowel type connectors | Connectors/Detail [pc.] | Connectors/Connection [pc.] |
|-----------|--|----------------------------|--------------------------------|
| KLR 1 | ANCHOR \emptyset 4x50 | 6 | 6 |
| KLR 2 | ANCHOR \emptyset 4x50 | 13 | 13 |
| KLR 3 | ANCHOR \emptyset 4x50 | 13 | 13 |
| KLR 4 | ANCHOR \emptyset 4x50 | 12 | 12 |
| KLR 5 | ANCHOR \emptyset 4x50 | 30 | 30 |
| KLR 6 | ANCHOR \emptyset 4x50 | 29 | 29 |
| KP 7 | ANCHOR \emptyset 4x50 / DIN 571 \emptyset 12x100 | 28 / 4 | 56 / 8 |
| KP 8 | ANCHOR \emptyset 4x50 / DIN 571 \emptyset 12x100 | 17 / 2 | 34 / 4 |
| KPK 4 | ANCHOR \emptyset 4x50 | 22 | 22 |
| KPK 11 | ANCHOR \emptyset 4x50 | 11 | 11 |
| KPK 12 | ANCHOR \emptyset 4x50 | 17 | 17 |
| KPK 13 | ANCHOR \emptyset 4x50 | 25 | 25 |
| KPK 21 | ANCHOR \emptyset 4x50 | 14 | 14 |
| KPK 22 | ANCHOR \emptyset 4x50 | 14 | 14 |
| KPK 23 | ANCHOR \emptyset 4x50 | 14 | 14 |
| KPK 31 | ANCHOR \emptyset 4x50 | 9 | 18 |
| KPK 32 | ANCHOR \emptyset 4x50 | 9 | 18 |
| KPK 33 | ANCHOR \emptyset 4x50 | 9 | 18 |
| KPL 5 | ANCHOR \emptyset 4x50 | 8 | 8 |
| KPL 6 | ANCHOR \emptyset 4x50 | 12 | 12 |
| KPL 11 | ANCHOR \emptyset 4x50 | 13 | 13 |
| KPL 21 | ANCHOR \emptyset 4x50 | 28 | 28 |
| KR 1 | ANCHOR \emptyset 4x50 | 3 | 3 |
| KR 2 | ANCHOR \emptyset 4x50 | 12 | 12 |
| KP 3 | ANCHOR \emptyset 4x50 | 3 | 3 |
| KRD 5 | ANCHOR \emptyset 4x50 | 7 | 7 |
| KRD 6 | ANCHOR \emptyset 4x50 | 7 | 7 |
| SDLZ 1 | SDCS 50 / CS \emptyset 5x40 | 4 / 6 | 4 / 6 |
| SDKLR 1 | SDCS 50 / CS \emptyset 5x40 | 4 / 6 | 4 / 6 |
| SDKL 1 | SDCS 50 / CS \emptyset 5x40 | 4 / 6 | 4 / 6 |
| SDSP 70 A | SDCS 50 | 4 | 4 |
| SDSP 70 B | SDCS 50 | 4 | 4 |
| SDP 90 A | SDCS 50 | 8 | 8 |
| SDP 90 B | SDCS 50 | 8 | 8 |
| SDP 100 A | SDCS 50 | 8 | 8 |
| SDP 100 B | SDCS 50 | 8 | 8 |
| SDP 120 A | SDCS 50 | 8 | 8 |
| SDP 120 B | SDCS 50 | 8 | 8 |

| Detail | Dowel type connectors | Connectors/Detail [pc.] | Connectors/Connection [pc.] |
|-------------------------|--|-------------------------|-----------------------------|
| SDSKW 2 | ANCHOR ø 4x50 | 4 | 8 |
| SDSKW 8 | SDCS 50 | 2 | 4 |
| SDSKP 1 | ANCHOR ø 4x50 | 16 | 32 |
| SDSKP 5 | ANCHOR ø 4x50 | 18 | 36 |
| SDSKM 7 | ANCHOR ø 4x50 | 12 | 24 |
| SDSWBZ 10 | ANCHOR ø 4x50 / ANCHOR ø 4x40 | 8 / 4 | 8 / 4 |
| SDSWBZ 11 | ANCHOR ø 4x50 / ANCHOR ø 4x40 | 12 / 6 | 12 / 6 |
| SDSWBZ 14 | ANCHOR ø 4x50 / ANCHOR ø 4x40 | 8 / 4 | 8 / 4 |
| SDSWBZ 21 | ANCHOR ø 4x50 / ANCHOR ø 4x40 | 12 / 10 | 12 / 10 |
| SDSWBZ 26 | ANCHOR ø 4x50 / ANCHOR ø 4x40 | 12 / 10 | 12 / 10 |
| SDSWBZ 30 | ANCHOR ø 4x50 / ANCHOR ø 4x40 | 16 / 12 | 16 / 12 |
| PS 60 | ISO 4014 M10x80-5.8 | 1 | 1 |
| PS 70 | ISO 4014 M10x90-5.8 | 1 | 1 |
| PS 80 | ISO 4014 M10x100-5.8 | 1 | 1 |
| PS 90 | ISO 4014 M10x110-5.8 | 1 | 1 |
| PS 100 | ISO 4014 M10x120-5.8 | 1 | 1 |
| PS 120 | ISO 4014 M10x140-5.8 | 1 | 1 |
| PS 140 | ISO 4014 M10x160-5.8 | 1 | 1 |
| LU25 R80 (L80) | ANCHOR ø 4x50 | 16 | 16 |
| LU25 R120 (L120) | ANCHOR ø 4x50 | 24 | 24 |
| WBC 80 | ANCHOR ø 4x50 / ANCHOR ø 4x40 | 24 / 14 | 24 / 14 |
| WBC 92 | ANCHOR ø 4x50 / ANCHOR ø 4x40 | 28 / 14 | 28 / 14 |
| WBC 100 | ANCHOR ø 4x50 / ANCHOR ø 4x40 | 28 / 14 | 28 / 14 |
| WBC 120 | ANCHOR ø 4x50 / ANCHOR ø 4x40 | 34 / 14 | 34 / 14 |
| WBC 137 | ANCHOR ø 4x50 / ANCHOR ø 4x40 | 38 / 14 | 38 / 14 |
| WBU45 R45-105 (L45-105) | ANCHOR ø 4x50 / ANCHOR ø 4x40 | 8 / 4 | 8 / 4 |
| WBU45 R50-105 (L50-105) | ANCHOR ø 4x50 / ANCHOR ø 4x40 | 8 / 4 | 8 / 4 |
| WBU45 R60-120 (L60-120) | ANCHOR ø 4x50 / ANCHOR ø 4x40 | 10 / 5 | 10 / 5 |
| KKB 1 | ANCHOR ø 4x50 / ISO 4014 M16x160-5.8 | 24 / 1 | 48 / 2 |
| LB 1 | ISO 4014 M12x120-5.8 / ISO 4014 M12x90-5.8 | 1 / 1 | 1 / 2 |
| LB 2 | ISO 4014 M12x120-5.8 / ISO 4014 M12x90-5.8 | 1 / 1 | 1 / 2 |
| LB 4 | ISO 4014 M12x120-5.8 / ISO 4014 M12x90-5.8 | 1 / 1 | 1 / 2 |
| NT 25 | ISO 4017 M5x16-8.8 | 6 | 6 |
| NT 40 | ISO 4017 M5x16-8.8 | 10 | 10 |
| NT 60 | ISO 4017 M5x16-8.8 | 14 | 14 |
| KPS 1 | ANCHOR ø 4x50 | 16 | 32 |
| KPS 2 | ANCHOR ø 4x50 | 36 | 72 |
| KPS 3 | ANCHOR ø 4x50 | 20 | 40 |

| Detail | Dowel type connectors | Connectors/Detail [pc.] | Connectors/Connection [pc.] |
|--------|-------------------------|----------------------------|--------------------------------|
| KPS 4 | ANCHOR \emptyset 4x50 | 20 | 40 |

ANNEX 6

REFERENCE DOCUMENTS

- [1] Guideline for European Technical Approval of Three-dimensional nailing plates ETAG 015 (edition November 2012)
- [2] Declaration about dangerous substances issued by DOMAX sp. z o.o.
- [3] EN 26891:1991 Timber structures – Joints made with mechanical fasteners – General principles for the determination of strength and deformation characteristics
- [4] EN ISO 8970:2010 Timber structures – Testing of joints made with mechanical fasteners – Requirements for wood density
- [5] EN 384+A1:2019 Structural timber – Determination of characteristic values of mechanical properties and density
- [6] EN 13183-2:2002 Moisture content of a piece of sawn timber - Part 2: Estimation by electrical resistance method
- [7] EN 1309-1:1997 Round and sawn timber - Method of measurement of dimensions - Part 1: Sawn timber
- [8] EN 14358:2006 Timber structures – Calculation and verification of characteristic values
- [9] EOTA TR 016 “*Method of testing Three-Dimensional Nailing Plates with examples*”, version February 2002

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

According to the decision 1997/638/EC¹, of the European Commission the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011 and Commission delegated Regulation (EU) No 568/2014) given in the following table applies:

| Product(s) | Intended use(s) | Level(s) or class(es) | Attestation of conformity system(s) |
|---|--------------------------------|-----------------------|-------------------------------------|
| Shear plates, toothed-plate connectors, punched nail plates, nailing plates | For structural timber products | | 2+ |

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

Issued in Prague on 28.04.2020

By
Mária Schaan
Head of the TAB



Annexes:

- Annex 1 Product details and definitions
- Annex 2 Loading and calculations according to static diagrams
- Annex 3 The characteristic load carrying capacities of connectors
- Annex 4 Nailing patterns
- Annex 5 Specification of connection elements
- Annex 6 Reference documents

¹ Official Journal of the European Communities L 268/36 of 19.9.1997