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

MEMBER OF EOTA



European Technical Assessment ETA-08/0053 of 22/09/2017

I General Part

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

Trade name of the construction product:

Simpson Strong-Tie Skewed and Sloped joist hangers
See type numbers in section II.1 of the ETA

Product family to which the above construction product belongs:

Three-dimensional nailing plate (joist hangers for timber-to-timber connections/ timber-to-rigid support connections)

Manufacturer:

Simpson Strong-Tie Int. Ltd
For local branch addresses refer to www.strongtie.eu

Manufacturing plant:

SIMPSON STRONG-TIE Manufacturing facilities

This European Technical Assessment contains:

55 pages including 4 annexes which form an integral part of the document

This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:

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

This version replaces:

The ETA with the same number issued on 2013-03-21 and expiry on 2018-03-21

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II SPECIAL CONDITIONS OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product and intended use

Technical description of the product

This ETA covers the following hanger types: S45, S1530, SUL, SUR, HSUL, HSUR, LSSU, SPR, RR, HRC, ACI, SDEA and VPA.

The hangers are one piece, non-welded, skewed joist hangers. They are intended for timber-to-timber, timber-to-concrete or timber-to-steel connections fastened by a range of nails, screws or bolts.

The joist hangers are made from pre-galvanized steel Grade S 250 GD + min. Z275 according to EN 10346:2009 and EN 10143: 1993, or Grade G90 galv. Steel SS Grade 33 to ASTM A653, Min. yield strength 227 MPa and Min. ultimate strength 310 MPa. Dimensions, hole positions and typical installations are shown in Annex B and D.

All the hangers can also be produced from stainless steel number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088-2 or a stainless steel with a minimum characteristic 0.2% yield stress of 240 MPa, a minimum 1.0% yield stress of 270 MPa and a minimum ultimate tensile strength of 530 MPa. In the rest of this document, the steel types will be named as:

Steel ref. 1: S250GD + Z275

Steel ref. 2: Stainless Steel 1.4401, 1.4404, 1.4521

Steel ref. 3: Stainless Steel 1.4301, 1.4509

Steel ref. 4: SS Grade 33 + G90 (~Z275) or G185 (~Z600)

Steel ref. 5: Stainless Steel 1.4259

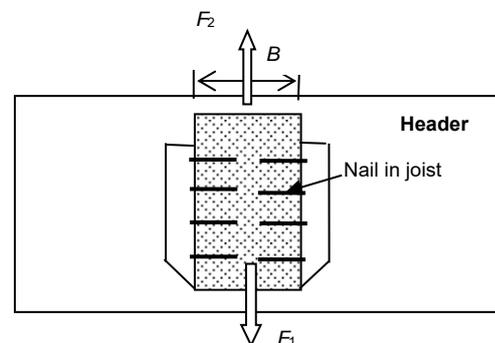
2 Specification of the intended use in accordance with the applicable EAD

The joist hangers are intended for use in making end-grain to side-grain connections in load bearing timber structures, as a connection between a wood based joist and a solid timber or wood based header, they are also intended for use in making an end-grain connection between a timber joist and a concrete structure or a steel member, where requirements for mechanical resistance and stability and safety in use in the sense of the Basic Works Requirements 1 and 4 of Regulation (EU) 305/2011 shall be fulfilled.

The joist hangers can be installed as connections between wood based members such as:

- Solid timber classified to C14-C40 according to EN 338 / EN 14081.
- Glued members of timber classified to C14 – C40 according to EN338 / EN14081 when structural adhesives are used.
- Glued laminated timber classified to GL24c or better according to EN 1194 / EN 14080.
- Solid Wood Panels, SWP according to EN 13353.
- Laminated Veneer Lumber LVL according to EN 14374.
- Plywood according to EN 636
- Oriented Strand Board, OSB according to EN 300
- I-beams with backer blocks on both side of the web in the header and web stiffeners in the joist.
- Cross Laminated Timber (CLT) acc. to EN 16351 or ETA

Annex D states the characteristic load-carrying capacities of the joist hanger connections.



It is assumed that the forces acting on the joist hanger connection are the following F_1 and F_2 as shown in the figure below. The forces F_1 and F_2 shall act in the middle of the joist hanger.

It is assumed that the header is prevented from rotating. Similar it is assumed that the concrete structure or the steel member to which the joist hanger is bolted does not rotate. If the header beam only has installed a joist hanger on one side the eccentricity moment $M_v = F_d \cdot (B_H / 2 + 30mm)$ shall be considered. The same applies when the header has joist hanger connections on both sides, but with vertical forces which differ more than 20%.

The loads acting on the VPA hangers are described in the figure on page 20.

The joist hangers are intended for use for connections subject to static or quasi static loading.

The zinc-coated hangers are for use in timber structures subject to dry, internal conditions defined by the service classes 1 and 2 of EN 1995-1-1:2004, (Eurocode 5).

The joist hangers can also be used in outdoor timber structures, service class 3, when a corrosion protection in accordance with Eurocode 5 is applied, or when stainless steel with similar or better characteristic yield and ultimate strength is employed

For timber or wood based material with a lower characteristic density than 350 kg/m^3 the load-carrying capacities shall be reduced by the K_{dens} factor (see Annex C4-2)

For timber or wood based material with a higher characteristic density than 350 kg/m^3 the load-carrying capacities shall be taken as that for 350 kg/m^3 .

The wood members shall have a thickness which is larger than the penetration depth of the nails into the members.

Assumed working life

The assumed intended working life of the joist hangers for the intended use is 50 years, provided that they are subject to appropriate use and maintenance.

The information on the working life should not be regarded as a guarantee provided by the manufacturer or ETA-Danmark A/S. An "assumed intended working life" means that it is expected that, when this working life has elapsed, the real working life may be, in normal use conditions, considerably longer without major degradation affecting the essential requirements.

3 Characteristics of product and assessment

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability*) (BWR1)	
Characteristic load-carrying capacity	See Annex D
Stiffness	No performance determined
Ductility in cyclic testing	No performance determined
3.2 Safety in case of fire (BWR2)	
Reaction to fire	The hangers are made from steel classified as Euroclass A1 in accordance with EN 13501-1 and EC decision 96/603/EC, amended by EC Decision 2000/605/EC
3.3 Hygiene, health and the environment (BWR3)	
Influence on air quality	The product does not contain/release dangerous substances specified in TR 034, dated March 2012
3.7 Sustainable use of natural resources (BWR7)	
3.8 General aspects related to the performance of the product	The hangers have been assessed as having satisfactory durability and serviceability when used in timber structures using the timber species described in Eurocode 5 and subject to the dry internal conditions defined by service class 1, 2 and 3
Identification	See Annex D

*) See additional information in section 3.9 – 3.12.

3.9 Methods of verification

Safety principles and partial factors

The characteristic load-carrying capacities have been calculated considering different ratios between the partial factors for timber connections and steel cross sections.

According to clause 6.3.5 of EN 1990 (Eurocode – Basis of structural design) the characteristic resistance for structural members that comprise more than one material acting in association should be calculated as

$$R_d = \frac{1}{\gamma_{M,1}} R \left\{ \eta_1 X_{k,1}; \eta_i X_{k,i(i>1)} \frac{\gamma_{m,1}}{\gamma_{m,i}}; a_d \right\}$$

where $\gamma_{M,1}$ is the global partial factor for material 1 (in this case wood), $\gamma_{m,1}$ is the partial factor on the material and $\gamma_{m,i}$ are material partial factors for the other materials, i.e. the calculations are made with material parameters modified by multiplication by

$$k_{modi} = \gamma_{m,1} / \gamma_{m,i}$$

The characteristic load-carrying capacities have been calculated considering a ratio between the partial factor for timber connections and steel cross sections

$$k_{modi} = 1,18 \quad (EC5: k_{modi} = \frac{1,30}{1,10} = 1,18)$$

For $k_{modi} > 1,18$ the load-carrying capacities stated in Annex D are valid (on the safe side).

For $k_{modi} < 1,18$ the load-carrying capacities stated in Annex D have to be multiplied by a factor

$$f = \frac{k_{modi}}{1,18}$$

3.10 Mechanical resistance and stability

See annex D for characteristic load-carrying capacity in the different directions.

The characteristic capacities of the hangers are determined by calculation assisted by testing as described in the EOTA Guideline 015 clause 5.1.2. They should be used for designs in accordance with Eurocode 5 or a similar national Timber Code.

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

Fasteners

Connector nails and screws in accordance to ETA-04/0013

In the formulas in Annex C the capacities for connector nails and connector screws in accordance to ETA-04/0013 are used.

Square Twist nails in accordance to EN 14592

The capacities of square twist nails have been calculated from the formulas of Eurocode 5 assuming a thick steel plate when calculating the lateral nail load bearing capacity.

Round smooth nails in accordance to EN 14592

The capacities of round smooth nails have been calculated from the formulas of Eurocode 5 assuming a thin steel plate when calculating the lateral load bearing capacity.

Threaded nails in accordance with EN 14592

The design model also allows the use of threaded nails in accordance with EN 14592 with a diameter in the range 4,0 – 4,2 mm and a minimum length of 35 mm, assuming a thick steel plate when calculating the lateral nail load-carrying capacity. If no calculations are made a reduction factor equal to the ratio between the characteristic withdrawal capacity of the actual used threaded nail and the characteristic withdrawal capacity of the corresponding connector nail according to table in annex B in ETA-04/0013 is applicable for all load-carrying capacities of the connection.

For any other information about fasteners or characteristic capacity modification method for different fasteners, please see Annex C4-1.

The hangers can be mounted using different nail/screw patterns. The nail/screw patterns for each hanger and different connection type is described and shown in annex D.

Stainless steel

All the hangers can also be produced from stainless steel number 1.4401, 1.4404, 1.4521 (Steel ref. 2) and 1.4301, 1.4509 (Steel ref. 3) according to EN 10088-2 or a stainless steel with a minimum characteristic 0.2% yield stress of 240 MPa, a minimum 1.0% yield stress of 270 MPa and a minimum ultimate tensile strength of 530 MPa. The characteristic load carrying capacities can be considered as the same as those published in this document subject to the use of stainless CNA connector nails or CSA connector screws covered by the ETA-04/0013 or stainless threaded nails or screws in accordance to the standard EN 14592

respecting the rules given in the paragraph "fasteners" above.

3.11 Aspects related to the performance of the product

3.11.1 Corrosion protection in service class 1 and 2.

In accordance with ETAG 015 shall the hangers have a zinc coating weight of Z275. The steel employed is S250 GD with Z275 (Steel ref. 1 or 4) according to EN 10346.

3.11.2 Corrosion protection in service class 3.

In accordance with Eurocode 5 the joist hangers shall be produced from stainless steel (Steel ref. 2 or 3 or 5).

3.12 General aspects related to the use of the product

Simpson Strong-Tie hanger types S45, S1530, SUL, SUR, HSUL, HSUR, LSSU, SPR, RR, HRC, ACI, SDEA and VPA are manufactured in accordance with the provisions of this European Technical Assessment using the manufacturing processes as identified in the inspection of the plant by the notified inspection body and laid down in the technical documentation.

4 Assessment and verification of constancy of performance (AVCP)

4.1 AVCP system

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

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

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

Issued in Copenhagen on 2017-09-22 by



Thomas Bruun

Managing Director, ETA-Danmark A/S

Annex A - Revision History

Modifications and additions to the previous versions of ETA-08/0053	
Issue No.	Update
0	First release
1.0	Adding of new hangers type LSSU and VPA
	Adding material properties and drawings for hangers type LSSU and VPA
	Revision of tables of fasteners
	Adding of characteristic resistance capacities for new hangers type LSSU and VPA
2.0	Modification of download values of S1530/38/1.5 (New tests)
	New S1530/80/2
	Add SDEA
	Add ACI
	Add ABF
	Merging with ETA-09/0122
	Precision about nails for LSSU and VPA
	Add American manufacturing plant
Remove laminated strand lumber (Not sell anymore in Europe)	
3.0	SDEA150 – update of values
	SPR - new range of sizes, additional capacities for square twist nails
	S1530 - additional applications and uplift capacities
	S45D/G250/38 - additional applications and uplift capacities
	RR47 replace RR50 (modification of width)

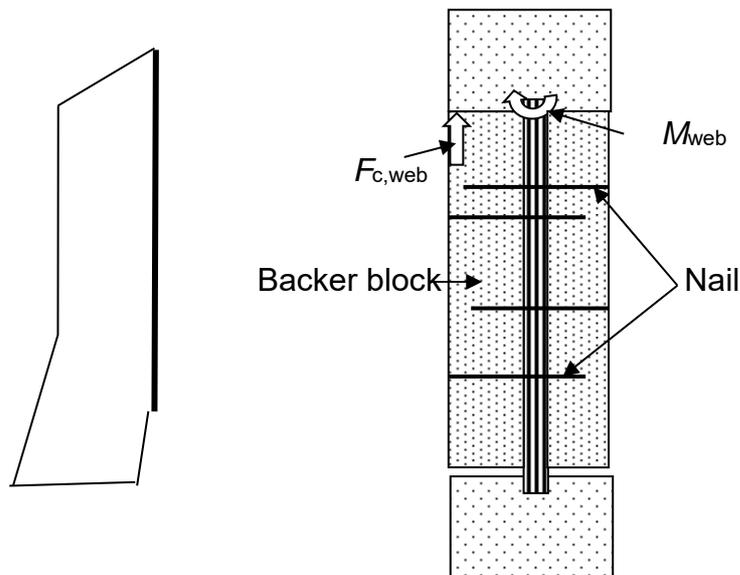
Annex B - Typical Installation

B1 Conditions for using I-beam headers

When an I-beam is used as header beam it is a condition for the load-carrying capacity, that 2 backer blocks are installed, because it prevents a bending failure of the web in the I-beam as explained in the following. Further, the nails, which normally are nailed in the side of the solid header beam, can instead be nailed into the backer blocks. Therefore, the sum of the thicknesses of the backer blocks and the web shall at least be equal to the length of the nails in the header

For both reasons it is important that the backer block supports the underside of the top flange of the header I-beam and is sufficiently connected to the web of the head I-beam.

The rope effect results in a tensile force F_t directed toward the edge of the flange. If there are no backer blocks installed, there exists a risk for a bending failure by M_{web} at the neck of the web due to the torsion. With at backer block installed the torsional moment will be taken by a compression force $F_{c,web}$ between the backer block and the underside of the flange and tensile force in the web.



Static model for a vertical force downward. The header beam has been drawn a little away to the right to show the forces acting. The header is shown with the forces and moment acting on it.

The surface of the backer block shall be flush with the side of the flange and shall fit tight to the underside of the flange and shall be nailed with sufficient nails to secure, that the backer blocks and the web functions as one piece of solid timber. It is required that the number of nails in the backer block shall be determined from:

$$n_{nail,backer\ block} = 2 \cdot n_{header}$$

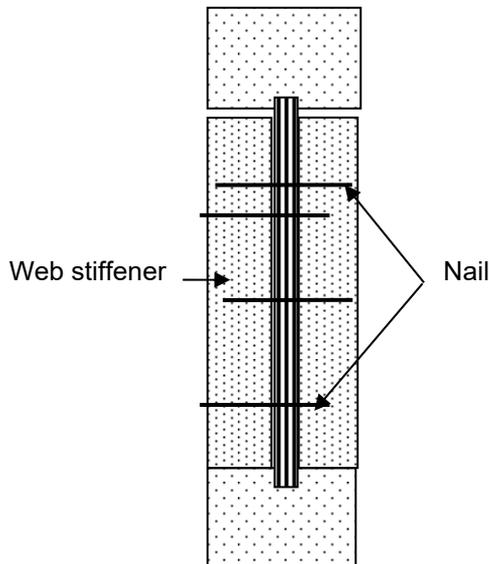
Where: n_{header} is the total number of nails from the joist hanger into the header. If the header has a joist hanger on each side, the number of nails shall be doubled.

The nails in the backer block shall have a length so their tip will go through the web and at least 20 mm into the opposite backer block.

The I-beam can be prevented from rotation by several means. For example can the wood based panel normally nailed to the top flange and the boards typically nailed to the bottom flange prevent the I-beam from rotating.

B2 Conditions for using I-beam joists

When an I-beam is used as a joist it is a condition for the load-carrying capacity, that 2 web stiffeners are nailed to the web of the joist, one on each side.



Web stiffeners on the joist at the joist hanger. The web stiffener shall fit to the bottom flange and have a width of 2/3 of the height between the inner sides of the flanges.

The surface of the web stiffeners shall be flush with the side of the flange of the joist and shall fit tight to the lower flange and shall be nailed with sufficient nails to secure, that the web stiffeners and the web functions as one piece of solid timber. So, the number of nails in each web stiffener shall be:

$$n_{\text{nail,web-stif}} = n_{\text{joist}}$$

Where: n_{joist} is the total number of nails from the joist hanger into the joist.

B3 S1530 – Typical installation

See C3, table 4 , for nails and screws that can be used with the S1530

The S1530 product family can be used to make angle between 15° and 30°. See the following drawings for the installation.

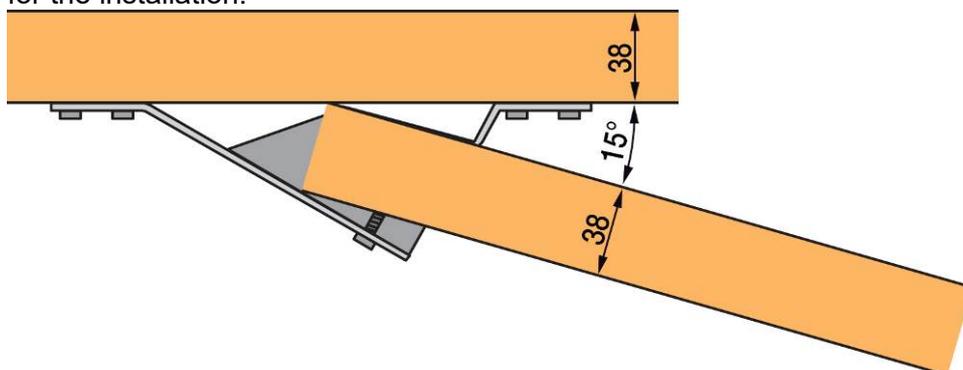


Figure 1: S1530D/38/1.5 at 15°

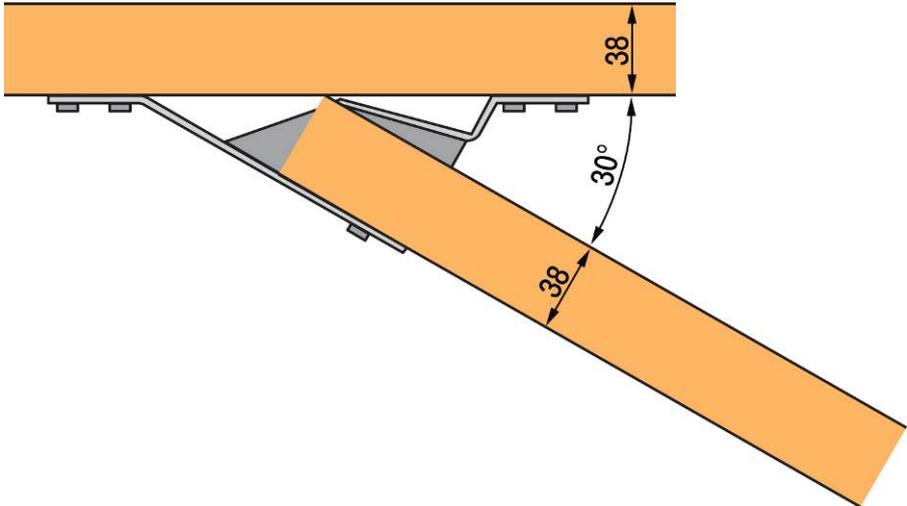


Figure 2: S1530D/38/1.5 at 30°

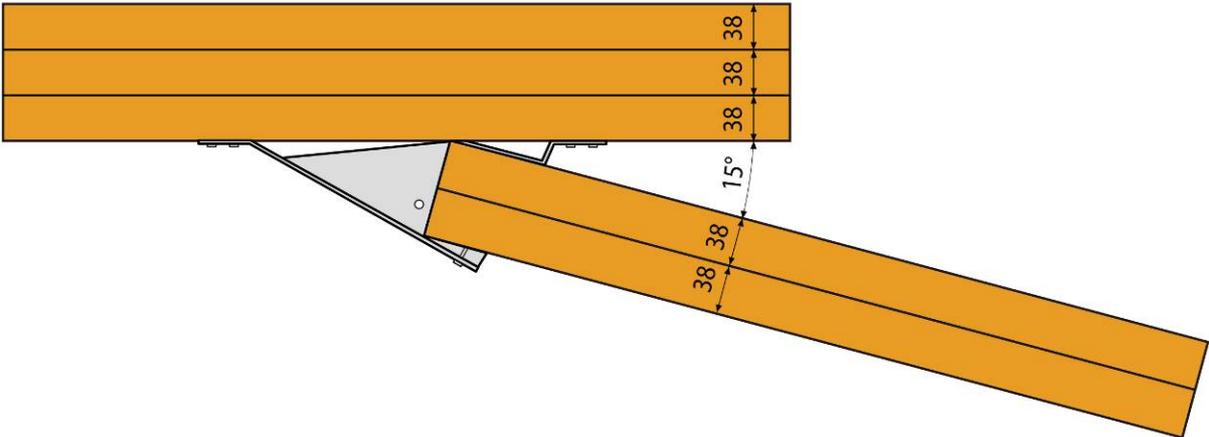


Figure 3: S1530D/80/2 at 15°

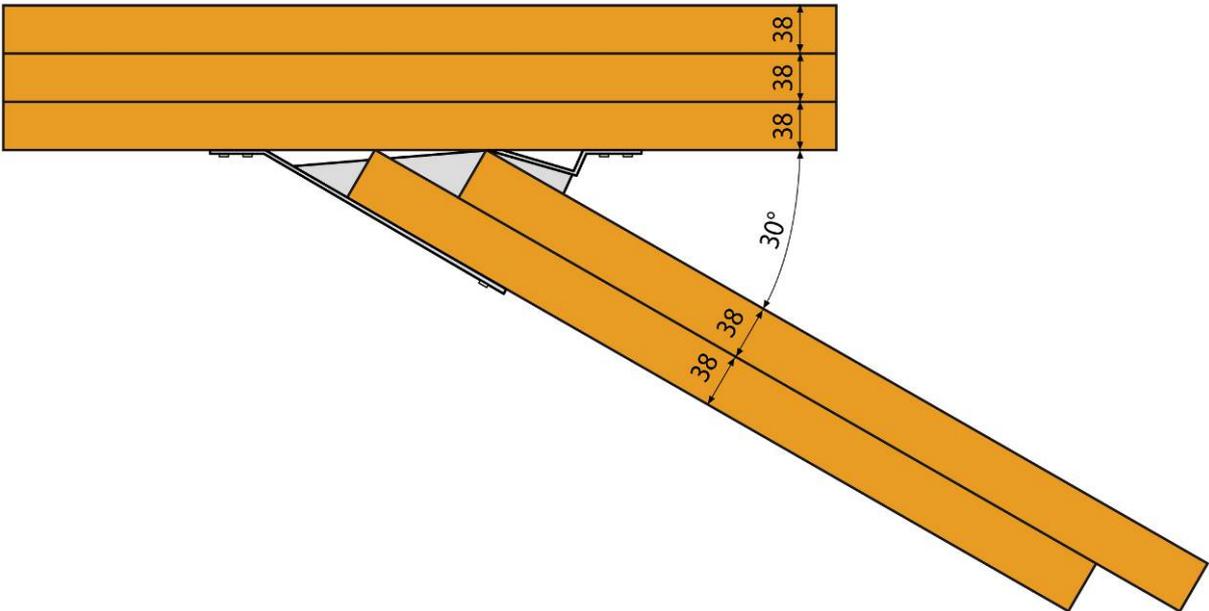


Figure 4: S1530D/80/2 at 30°

B4 LSSU – Typical installation

LSSU can be used either with only a slope (Figure 5) either with a slope and a skew (Figure 6)

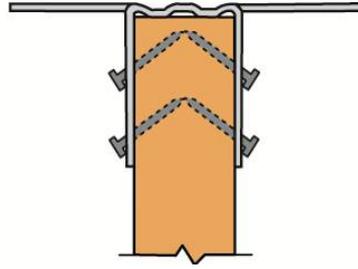


Figure 5 : LSSU with only a slope

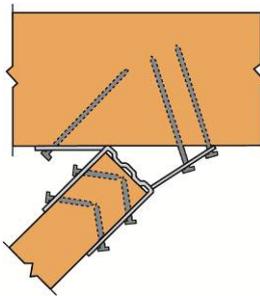


Figure 6: LSSU with a slope and a skew

To install LSSU with slope and skew please use the installation sequence that follows.

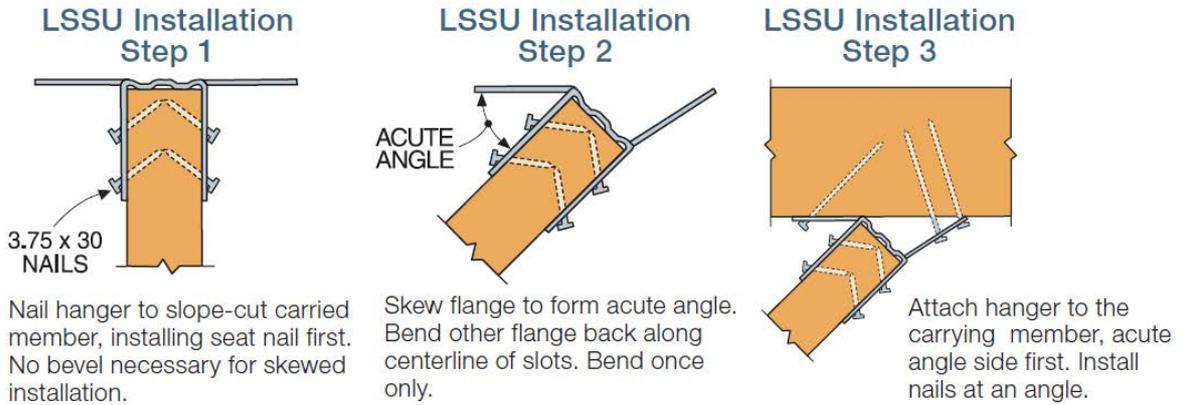


Figure 7: Installation sequence of LSSU

B5 VPA – Typical installation

To install VPA please use the following installation sequence.

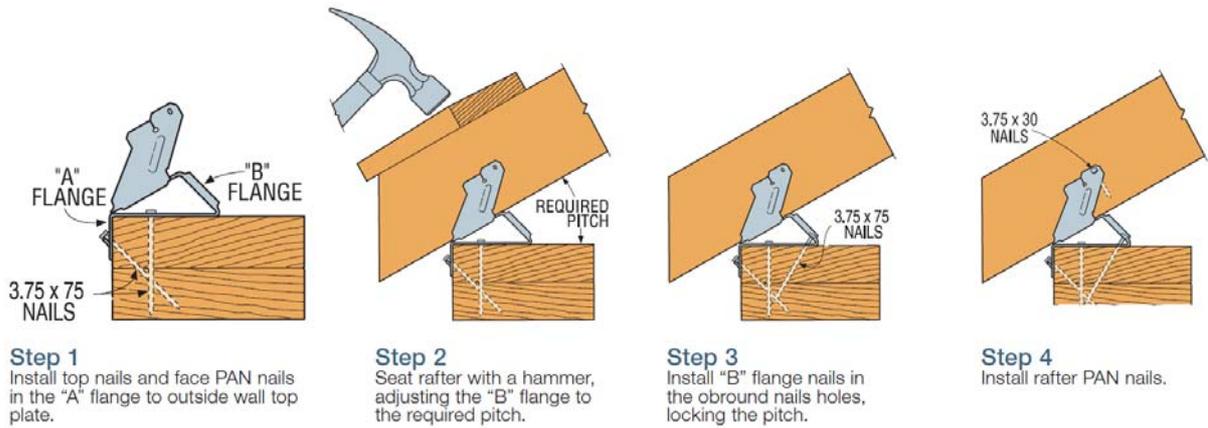
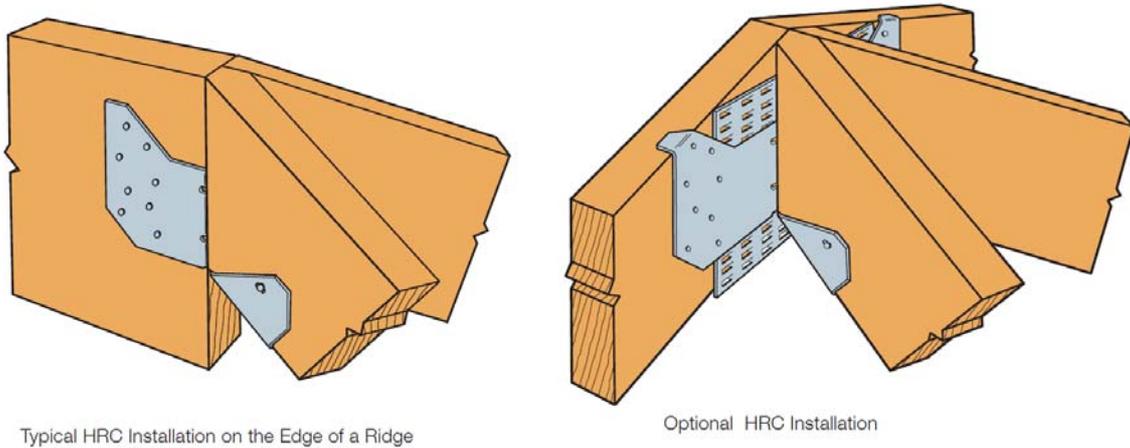


Figure 8: Installation sequence of VPA

B6 HRC – Typical installation

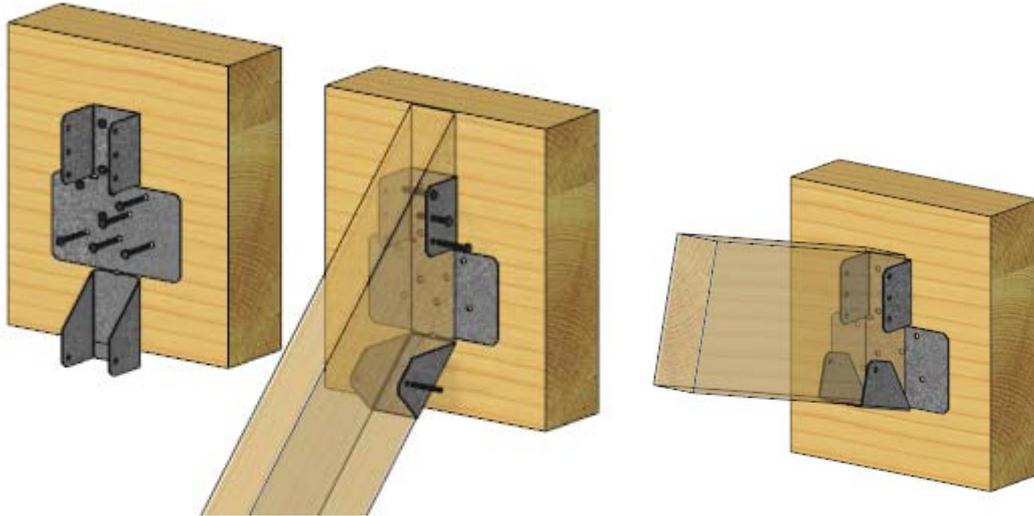
HRC can be installed in two different ways. See below the possible installation



B7 SPR – Typical installation

SPR has to be installed, allowing the bottom part to be only bent once to match the slope of the beam.

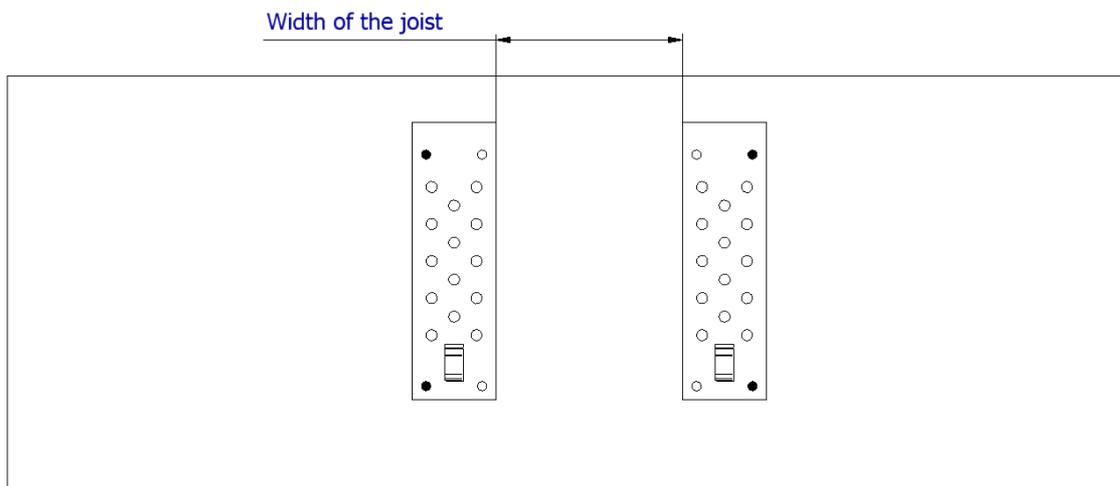
The bending can be made up or down.



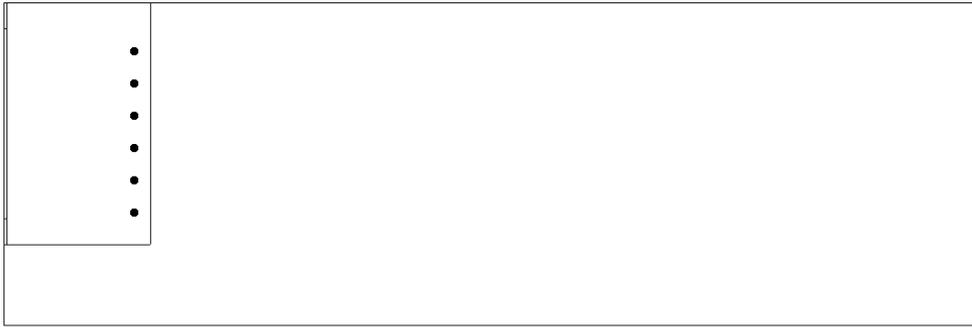
B8 SDEA – Typical installation

SEE C3, table 4 , for nails and screws that can be used with SDEA.

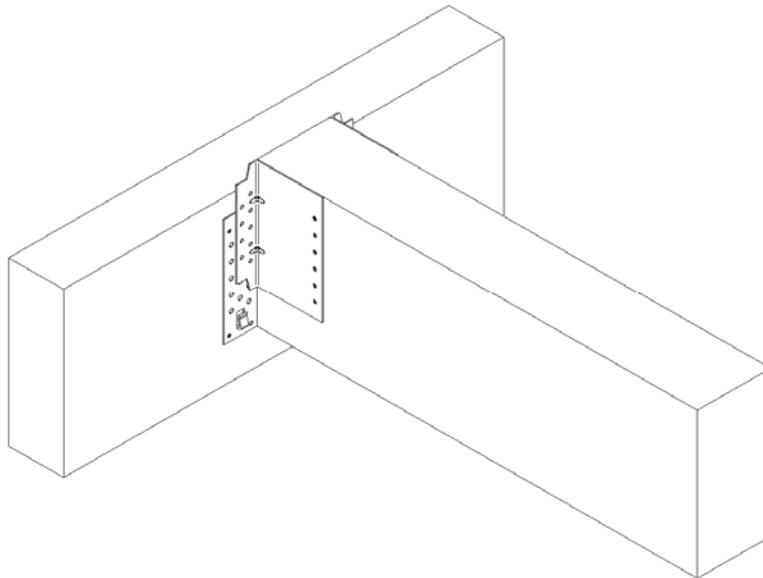
1°- Put the two parts 1, on the header, at a distance corresponding to the width of the joist. Put nails in the holes colored in black



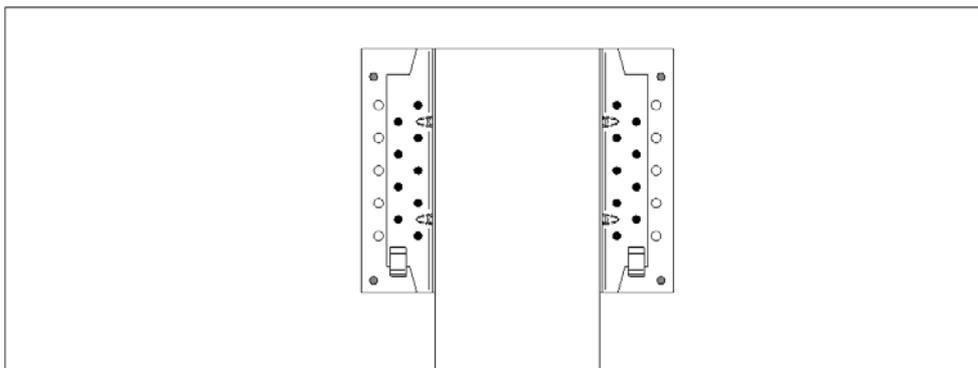
2°- Put the Part2 flush to the end of the joist and add the nails in the holes colored in black. One part 2 must be installed on each side of the joist.



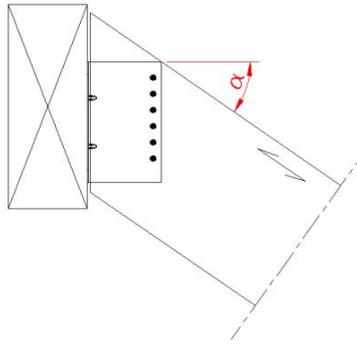
3°- Slip the joist in the header



4°- Add the missing nails represented by the holes colored in black

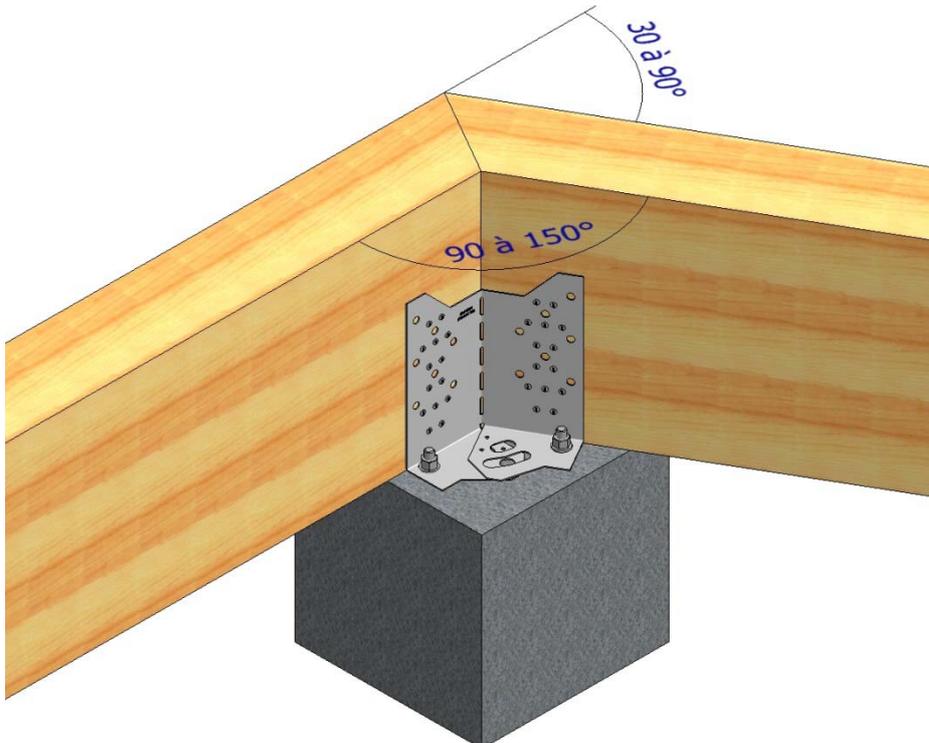


Slope of the joist: $\alpha = +45^\circ$ to -45°



B9 ABF230 – Typical installation

ABF230 must be installed and adjusted / folded on site to the correct angle according to the image below.



Annex C - Basis of design

Annex C1 – Basis of Design

All the general basis of design are given here. These rules applied to all products listed in this ETA except if something else is stated in Annex D for a particular product.

All of the capacities stated in the Annex D tables are **characteristic capacities** R_k . Therefore, the design capacities are obtained according to the following formula:

$$R_d = \frac{R_k \times k_{\text{mod}}}{\gamma_M}$$

Combined forces

For practical purposes, the strength verification is always carried out for design forces and design capacities.

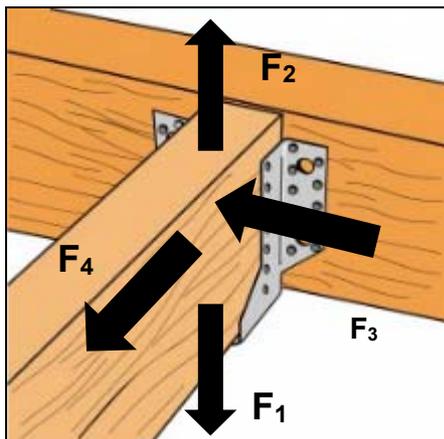
For all hangers included in this ETA, the following inequalities shall be fulfilled:

$$\left(\frac{F_{1,d}}{R_{1,d}}\right)^2 + \left(\frac{F_{2,d}}{R_{2,d}}\right)^2 + \left(\frac{F_{3,d}}{R_{3,d}}\right)^2 \leq 1$$

Timber splitting

For forces acting perpendicular to the grain in the timber it must be checked that splitting will not occur in accordance with Eurocode 5 or a similar national Timber Code.

Annex C2 – Definition of forces direction



Annex C3 – Fasteners specification and capacities

Table 1: Nail and screw specification for timber to timber connections with fasteners in accordance with ETA-04/0013

Nail and screw type According to ETA-04/0013	Nail and screw size (mm)		Finish
	Diameter	Length	
Connector nail	3.7	50	Electroplated zinc
Connector nail	4.0	35	Electroplated zinc
Connector nail	4.0	40	Electroplated zinc
Connector nail	4.0	50	Electroplated zinc
Connector nail	4.0	60	Electroplated zinc
Connector nail	4.2	35	Electroplated zinc
Connector nail	4.2	50	Electroplated zinc
Connector screw	5.0	35	Electroplated zinc
Connector screw	5.0	50	Electroplated zinc

Table 2: Nail specifications for timber to timber connections with nails in accordance with EN 14592

Nail and screw type	Nail and screw size (mm)		Finish
	Diameter	Length	
Square Twist nail	3.75	30	Galvanized
Smooth Shank Nail	3.75	75	Galvanized
Smooth Shank nail	4.0	90	Galvanized
Smooth Shank Nail	4.0	100	Galvanized

Table 3: Bolt specification

Bolt type	Bolt size (mm)		Capacities
	Diameter	Length	
Bolt M10/12/16 Quality 4.6 or higher	10 / 12 / 16	-	For relevant joist hangers see the assumed characteristic capacities of the bolt connection and compare with the specification of the manufacturer

The downward and the upward directed forces are assumed to act in the middle of the joist.

- There shall be nails or screws in the holes as described in the tables of this annex. Typically there shall be nails in all holes.
- The type and size of the fasteners shall be those stated in the tables.
- Connector nails are Simpson connector nails
Smooth nails and square twist nails are in accordance with EN 14592
- The thickness of the joist shall be at least $B - 3$ mm, where B is the width of the joist hanger.

The characteristic load-carrying capacities of the skew joist hanger connections for timber to timber connections are stated in the following tables.

For timber to timber connections the following tables state the type of nails and their sizes.

For joist hanger type S45 it is possible to fasten the joist hanger to a member made from concrete or similar material by using 12 mm anchor bolts. This is not an option for the other joist hanger types.

The following fasteners are used for connections to wood:

Table 4: Hanger capacities are to be determined for the following range of fastener types (in accordance with ETA-04/0013 and EN14592)

Nail size and type	Hanger type										
	S45	S1530	HSUR/H/SUL	SUR/SUL	LSSU	VPA	SDEA	ACI	HRC	SPR	RR
CNA3.7 x 50					X	X					
CNA4.0 x 35	X	X						X		X	
CNA4,0 x 50	X	X					X			X	
CNA4.0 x 60			X	X		X					
CNA4.2 x 35	X	X						X			
CNA4.2 x 50	X	X					X				
3.75 x 30 ST			X	X	X	X			X	X	X
3.75 x 75 SS					X	X					
4.0 x 90 SS			X	X					X		
4.0 x 100 SS					X						
CSA5.0 x 35	X	X						X		X	
CSA5.0 x 50	X	X					X			X	

CNA = Connector Nail ST = Square Twist SS = Smooth Shank CSA= Connector Screw

Annex C4 – Characteristic capacity modification methods for timber types

C4 –1: Characteristic capacity modification method for different timber types

Annex D states the load-carrying capacities of the hanger connections for a characteristic density of 350 kg/m³.

For timber or wood-based material with a lower characteristic density than 350 kg/m³ the load-carrying capacities shall be reduced by the k_{dens} factor:

$$k_{dens} = \left(\frac{\rho_k}{350} \right)^2 \text{ Where } \rho_k \text{ is the characteristic density of the timber in kg/m}^3.$$

Annex D - Product definition and capacities

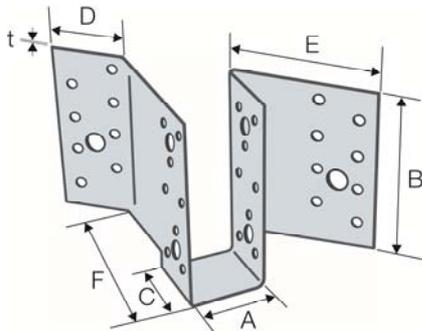
D1 – S45**Product Name:**

Product Name	Material reference acc. to clause II-1
S45D[size]	Steel ref. 1
S45G[size]	Steel ref. 1

[size] : blank / width / thickness

Table D1-1: Geometrical data for S45 Right

Item	Dimensions (mm)							Nail holes, no and size			Bolt holes, no and size	
	A	B	C	D	E	F	t	header	Joist (open side)	Joist (closed side)	header	Joist
S45D250/38/1,5	38	105	38	36	80	80	1,5	16 - $\emptyset 5$	8 - $\emptyset 5$	8 - $\emptyset 5$	2 - $\emptyset 11$	4 - $\emptyset 9$
S45D320/64/2	64	128	70	40	102	144	2	18 - $\emptyset 5$	5 - $\emptyset 5$	5 - $\emptyset 5 \times 7,5$	4 - $\emptyset 13$	--
S45D380/76/2	76	152	70	40	102	156	2	26 - $\emptyset 5$	6 - $\emptyset 5 + 1$ opt	6 - $\emptyset 5 \times 7,5 + 1$ opt	4 - $\emptyset 13$	--
S45D440/80/2	80	180	70	40	102	160	2	28 - $\emptyset 5$	7 - $\emptyset 5 + 1$ opt	7 - $\emptyset 5 \times 7,5 + 1$ opt	4 - $\emptyset 13$	--
S45D500/100/2	100	200	70	40	102	102	2	34 - $\emptyset 5$	9 - $\emptyset 5 + 1$ opt	9 - $\emptyset 5 \times 7,5 + 1$ opt	4 - $\emptyset 13$	--

Figure D1-1: Dimensioned drawing of right skewed hangers S45**Table D1-2-: Geometrical data for S45 Left**

Item	Dimensions (mm)							Nail holes, no and size			Bolt holes	
	A	B	C	D	E	F	t	header	Joist (open side)	Joist (closed side)	header	Joist
S45G250/38/1,5	38	105	38	36	80	80	01.Jan	16 - $\emptyset 5$	8 - $\emptyset 5$	8 - $\emptyset 5$	2 - $\emptyset 11$	4 - $\emptyset 9$
S45G320/64/2	64	128	70	40	102	144	2	18 - $\emptyset 5$	5 - $\emptyset 5$	5 - $\emptyset 5 \times 7,5$	4 - $\emptyset 13$	--
S45G380/76/2	76	152	70	40	102	156	2	26 - $\emptyset 5$	6 - $\emptyset 5 + 1$ opt	6 - $\emptyset 5 \times 7,5 + 1$ opt	4 - $\emptyset 13$	--
S45G440/80/2	80	180	70	40	102	160	2	28 - $\emptyset 5$	7 - $\emptyset 5 + 1$ opt	7 - $\emptyset 5 \times 7,5 + 1$ opt	4 - $\emptyset 13$	--
S45G500/100/2	100	200	70	40	102	102	2	34 - $\emptyset 5$	9 - $\emptyset 5 + 1$ opt	9 - $\emptyset 5 \times 7,5 + 1$ opt	4 - $\emptyset 13$	--

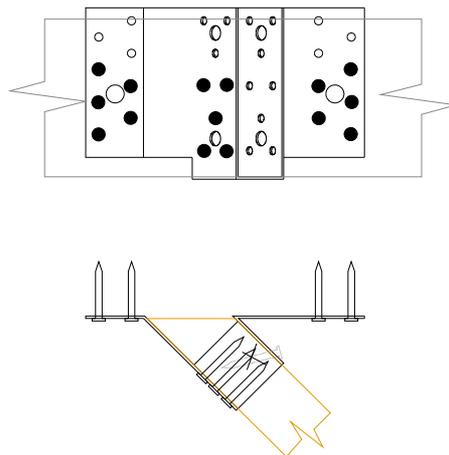
The "Left" version is mirror-image to the "Right" version.

For timber to concrete connection the number and size of the nails in the joist shall be those stated in the table. The anchor bolts into the concrete or similar type of structural member shall have a characteristic lateral capacity as stated in the table. The quality of the bolt material shall be at least 4.6.

Table D1-3: Characteristic load-carrying capacities of type S45, number and size of Simpson connector nails, 12 mm bolts 4.6.

Joist hanger size	Timber to timber connections				Joist hanger on a concrete wall		
	Connector nails, Nail types and sizes		Characteristic capacities		12 mm bolts in the wall		
	Number of nails and size				Characteristic capacities		Provided minimum
	Header	Joist	R _{1,k}	R _{2,k}	R _{1,k}	R _{2,k}	charac. Lateral capacity of each bolt
		kN	kN	kN	kN	kN	
S45 250/38	2x8x 4.0x50	8x 4.0x35	4.99	4.95	0	0	0
S45 250/38*	2x5x 4.0x50	5x 4.0x35	2.57	2.5	0	0	0
S45 320/38	2x9x 4.0x50	2x5x 4.0x35	14.0	3.2	14.0	3.2	7.4
S45 320/64	2x9x 4.0x50	2x5x 4.0x35	14.0	3.2	14.0	3.2	7.4
S45 380/76	2x13x 4.0x50	2x6x 4.0x50	16.2	4.2	16.2	4.2	8.8
S45 440/80	2x14x 4.0x50	2x7x 4.0x50	18.5	5.6	18.5	5.6	9.3
S45 500/100	2x17x 4.0x50	2x9x 4.0x50	23.4	8.3	23.0	8.3	12.0

*For connection with timber elements with a height of 97mm



Partial nailing for timber element with a height 97mm

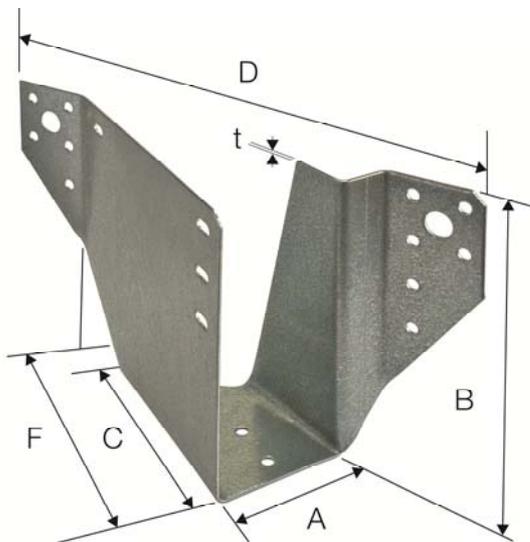
D2 S1530

Product Name:

Product Name	Material reference acc. to clause II-1
S1530D/38/1.5	Steel ref. 1
S1530G/38/1.5	Steel ref. 1
S1530D/80/2.0	Steel ref. 1
S1530G/80/2.0	Steel ref. 1

Dimension

Type	Dimensions [mm]						Holes			
							joist		header	
	A	B	C	D	F	t	Qty	size	Qty	size
S1530D/38/1.5	52	125	85	220	124	1,5	3/2	5x7.5/Ø5	11/2	Ø5/Ø11
S1530G/38/1.5	52	125	85	220	124	1,5	3/2	5x7.5/Ø5	11/2	Ø5/Ø11
S1530D/80/2.0	95	125	154	310	200	2	5	5x7.5	18/4	Ø5/Ø11
S1530G/80/2.0	95	125	154	310	200	2	5	5x7.5	18/4	Ø5/Ø11



The picture show the model D, the model G is mirror-image

For timber to timber connections the number and size of the nails in the joist and the header shall be those stated in the table. There shall be nails in all holes. In the bottom plate there shall be 2 nails from below.

The width of the joist shall be 38 mm for S1530/38/1.5 and 80mm for S1530/80/2.

Table D2-1: Characteristic load-carrying capacities of type S1530 for joist and header with height of ≥ 140 mm and full nailing, number and size of Simpson connector nails and depending on the angle between the header and the joist, which can be either 15° or 30°

Type / angle	Nails in joist	Nails in header	Characteristic capacities	
	4.0x35	4.0x35	$R_{1,k}$	$R_{2,k}$
	Number	Number	kN	kN
S1530/38//1.5 15°	3 + 2	5 + 6	7.5	1,2
S1530/38/1.5 30°	3 + 2	5 + 6	7.7	1,2
S1530/80/2 15°	5	18	8.2	1.2
S1530/80/2 30°	5	18	12.8	1.2

Table D2-2: Characteristic load-carrying capacities of type S1530 for joist and header with height of $\geq 97\text{mm}$ and partial nailing, number and size of Simpson connector nails and depending on the angle between the header and the joist, which can be either 15° or 30°

Type / angle	Nails in joist	Nails in header	Characteristic capacities.	
	4.0x35	4.0x35	$R_{1,k}$	$R_{2,k}$
	Number	Number	kN	kN
S1530/38/1.5 15°	2	3	1.6	0.45
S1530/38/1.5 30°	1+2	3	1.6	0.85
S1530/80/2 15°	2	10	5.4	1.22
S1530/80/2 30°	3+3	10	5.4	4.3

For connection with an angle between 15° and 30° are to use the values for 15° .

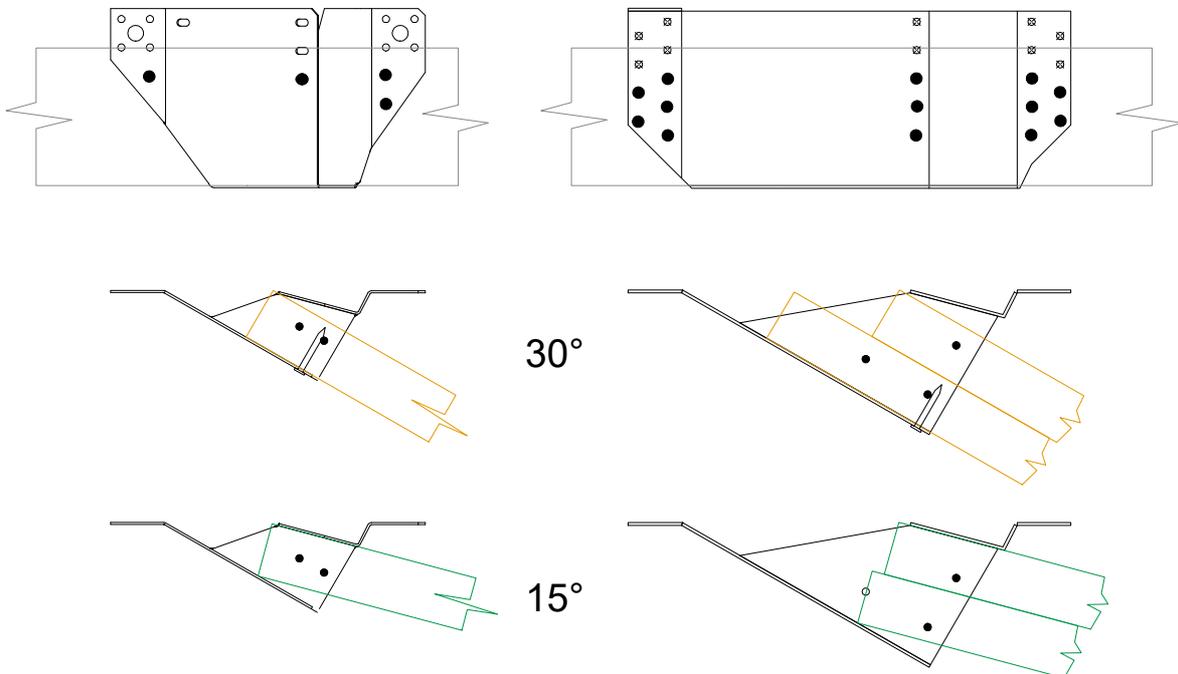


Figure D2-4: Partial nailing S1530/38/1,5

S1530/80/2

D3. SUL/R hangers

Product Name:

Product Name	Material reference acc. to clause II-1
SUL [type digits]	Steel ref. 1
SUR [type digits]	Steel ref. 1

SUL hangers

Table D3-1: Geometrical data for SUL

Item	Dimensions (mm)						Nail holes, no and size			
	A	B	C	D	E	Thick	n _h header (open flange)	n' _h header (closed flange)	n _j Joist (open side)	n' _j Joist (closed side)
SUL24	40	80	50	35	25	1,5	2 - ø4	2 - ø4x6	2 - ø4	2 - ø4x6
SUL26	40	127	50	35	25	1,5	3 - ø4	3 - ø4x6	3 - ø4	3 - ø4x6
SUL90/50	50	90	84	40	30	1,5	4 - ø4	4 - ø4x6	2 - ø4	2 - ø4x6
SUL135/50	50	135	84	40	30	1,5	6 - ø4	6 - ø4x6	3 - ø4	3 - ø4x6
SUL210/50	50	210	84	40	30	1,5	10 - ø4	10 - ø4x6	4 - ø4	4 - ø4x6
SUL210	40	206	50	35	25	1,5	5 - ø4	5 - ø4x6	5 - ø4	5 - ø4x6
SUL214	40	254	50	35	25	1,5	6 - ø4	6 - ø4x6	6 - ø4	6 - ø4x6
SUL1.81/9	46	233	50	35	19	1,5	6 - ø4	6 - ø4x6	4 - ø4	--
SUL.1.81/11	46	254	50	35	19	1,5	8 - ø4	8 - ø4x6	5 - ø4	--
SULI3510/12	58	228	73	44	43	1,5	7 - ø4	7 - ø4x6	3 - ø4	3 - ø4x6
SULI3514/20	58	330	73	44	43	1,5	9 - ø4	9 - ø4x6	4 - ø4	4 - ø4x6
SUL210-2	80	220	62	56	32	1,5	7 - ø4	7 - ø4x6	3 - ø4	3 - ø4x6
SUL410	90	216	62	56	25	1,5	7 - ø4	7 - ø4x6	3 - ø4	3 - ø4x6
SUL414	90	317	62	56	25	1,5	9 - ø4	9 - ø4x6	4 - ø4	4 - ø4x6
SUL310	65	227	67	51	38	1,5	7 - ø4	7 - ø4x6	3 - ø4	3 - ø4x6
SUL314	65	330	67	51	38	1,5	9 - ø4	9 - ø4x6	4 - ø4	4 - ø4x6
SUL2.06/9	52	231	81	54	41	1,6	7 - ø4	7 - ø4x6	4 - ø4	--
SUL2.1/9	53	230	81	54	40	1,6	7 - ø4	7 - ø4x6	4 - ø4	--
SUL2.37/9	60	227	81	54	33	1,6	7 - ø4	7 - ø4x6	4 - ø4	--
SUL2.56/9	65	225	81	54	28	1,6	7 - ø4	7 - ø4x6	4 - ø4	--
SUL2.06/11	52	285	81	54	41	1,6	8 - ø4	8 - ø4x6	4 - ø4	--
SUL2.1/11	53	284	81	54	40	1,6	8 - ø4	8 - ø4x6	4 - ø4	--
SUL2.37/11	60	284	81	54	33	1,6	8 - ø4	8 - ø4x6	4 - ø4	--
SUL2.56/11	65	284	81	54	28	1,6	8 - ø4	8 - ø4x6	4 - ø4	--
SUL2.06/14	52	345	81	54	41	1,6	9 - ø4	9 - ø4x6	4 - ø4	--
SUL2.1/14	53	344	81	54	40	1,6	9 - ø4	9 - ø4x6	4 - ø4	--
SUL2.37/14	60	341	81	54	33	1,6	9 - ø4	9 - ø4x6	4 - ø4	--
SUL2.56/14	65	339	81	54	28	1,6	9 - ø4	9 - ø4x6	4 - ø4	--

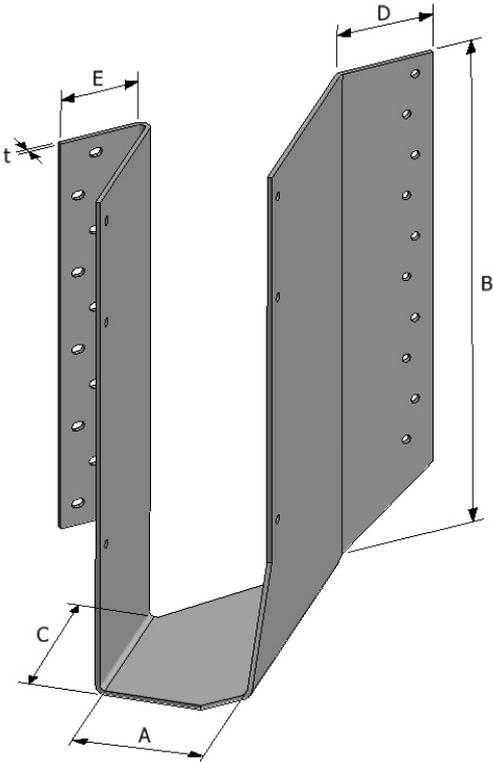


Figure D3-1: Dimensioned drawing of SUL hangers

SUR hangers

Table D3-2: Geometrical data for SUR

Item	Dimensions (mm)						Nail holes, no and size			
	A	B	C	D	E	Thick	n _h header (open flange)	n' _h header (closed flange)	n _j Joist (open side)	n' _j Joist (closed side)
SUR24	40	80	50	35	25	1,5	2 - ø4	2 - ø4x6	2 - ø4	2 - ø4x6
SUR26	40	127	50	35	25	1,5	3 - ø4	3 - ø4x6	3 - ø4	3 - ø4x6
SUR90/50	50	90	84	40	30	1,5	4 - ø4	4 - ø4x6	2 - ø4	2 - ø4x6
SUR135/50	50	135	84	40	30	1,5	6 - ø4	6 - ø4x6	3 - ø4	3 - ø4x6
SUR210/50	50	210	84	40	30	1,5	10 - ø4	10 - ø4x6	4 - ø4	4 - ø4x6
SUR210	40	206	50	35	25	1,5	5 - ø4	5 - ø4x6	5 - ø4	5 - ø4x6
SUR214	40	254	50	35	25	1,5	6 - ø4	6 - ø4x6	6 - ø4	6 - ø4x6
SUR1.81/9	46	233	50	35	19	1,5	6 - ø4	6 - ø4x6	4 - ø4	--
SUR.1.81/11	46	254	50	35	19	1,5	8 - ø4	8 - ø4x6	5 - ø4	--
SURI3510/12	58	228	73	44	43	1,5	7 - ø4	7 - ø4x6	3 - ø4	3 - ø4x6
SURI3514/20	58	330	73	44	43	1,5	9 - ø4	9 - ø4x6	4 - ø4	4 - ø4x6
SUR210-2	80	220	62	56	32	1,5	7 - ø4	7 - ø4x6	3 - ø4	3 - ø4x6
SUR410	90	216	62	56	25	1,5	7 - ø4	7 - ø4x6	3 - ø4	3 - ø4x6
SUR414	90	317	62	56	25	1,5	9 - ø4	9 - ø4x6	4 - ø4	4 - ø4x6
SUR310	65	227	67	51	38	1,5	7 - ø4	7 - ø4x6	3 - ø4	3 - ø4x6
SUR314	65	330	67	51	38	1,5	9 - ø4	9 - ø4x6	4 - ø4	4 - ø4x6
SUR2.06/9	52	231	81	54	41	1,6	7 - ø4	7 - ø4x6	4 - ø4	--
SUR2.1/9	53	230	81	54	40	1,6	7 - ø4	7 - ø4x6	4 - ø4	--
SUR2.37/9	60	227	81	54	33	1,6	7 - ø4	7 - ø4x6	4 - ø4	--
SUR2.56/9	65	225	81	54	28	1,6	7 - ø4	7 - ø4x6	4 - ø4	--
SUR2.06/11	52	285	81	54	41	1,6	8 - ø4	8 - ø4x6	4 - ø4	--
SUR2.1/11	53	284	81	54	40	1,6	8 - ø4	8 - ø4x6	4 - ø4	--
SUR2.37/11	60	284	81	54	33	1,6	8 - ø4	8 - ø4x6	4 - ø4	--
SUR2.56/11	65	284	81	54	28	1,6	8 - ø4	8 - ø4x6	4 - ø4	--
SUR2.06/14	52	345	81	54	41	1,6	9 - ø4	9 - ø4x6	4 - ø4	--
SUR2.1/14	53	344	81	54	40	1,6	9 - ø4	9 - ø4x6	4 - ø4	--
SUR2.37/14	60	341	81	54	33	1,6	9 - ø4	9 - ø4x6	4 - ø4	--
SUR2.56/14	65	339	81	54	28	1,6	9 - ø4	9 - ø4x6	4 - ø4	--

The “Right” version is mirror-image to the “Left” version.

For timber to timber connections the number and size of the nails in the joist and the header shall be those stated in the table.

Table D3-3: Characteristic load-carrying capacities of type SUL / SUR, type, number and size of SS Smooth Shank round nails and ST Square Twist nails

Joist Hanger Type	Header	Joist	Characteristic capacities	
	Nail types and sizes			
	SS	ST	R _{1,k}	R _{2,k}
	4.0 x 90	3.75 X 30		
Number of nails				
SUL / SUR				
210	2x5	2x5	11.38	10.83
214	2x6	2x6	13.24	11.49
1.81/9	2x6	4	4.19	0
1.81/11	2x8	4	4.28	0
3510/12	2x7	2x3	14.59	5.59
3514/20	2x9	2x4	20.02	9.35
310	2x7	2x3	14.48	5.78
314	2x9	2x4	19.86	9.57
210-2	2x7	2x3	13.18	5.69
410	2x7	2x3	14.14	5.34
414	2x9	2x4	18.80	8.96
24	2x2	2x2	3.48	2.75
26	2x3	2x3	6.13	8.38
90/50	2x4	2x2	4.55	1.46
135/50	2x6	2x3	8.44	2.86
210/50	2x10	2x4	15.66	6.11
2.06/9	2x7	4	4.55	0
2.1/9	2x7	4	4.64	0
2.37/9	2x7	4	4.88	0
2.56/9	2x7	4	5.08	0
2.06/11	2x8	4	4.66	0
2.1/11	2x8	4	4.75	0
2.37/11	2x8	4	5.00	0
2.56/11	2x8	4	5.21	0
2.06/14	2x9	6	6.48	0
2.1/14	2x9	6	6.55	0
2.37/14	2x9	6	6.97	0
2.56/14	2x9	6	7.18	0

Instead of the connector nails mentioned in D3-3 the connector nails can be substituted by the nails or screws mentioned in D3-4. These fasteners have larger characteristic capacities than the mentioned connector nails according to the ETA 04/0013.

Table D3-4: Substitution possibilities of fasteners. The smooth round nails may be substituted by the connector nail

Smooth round nail which may be substituted by the other connector nail	Other connector nails
4.0x90 mm	4.0x60 mm

D4 HSUR/L hangers**Product Name :**

Product Name	Material reference acc. to clause II-1
HSUR <i>[type digits]</i>	Steel ref. 1
HSUL <i>[type digits]</i>	Steel ref. 1

HSUR hangers**TableD4-1: Geometrical data for HSUR**

Item	Dimensions (mm)						Nail holes, no and size			
	A	B	C	D	E	Thick	n _h header (open flange)	n' _h header (closed flange)	n _j Joist (open side)	n' _j Joist (closed side)
HSUR26-2	80	125	62	56	32	2	6 - ø4	6 - ø4x6	2 - ø4	2 - ø4x6
HSUR410	90	216	62	56	25	2	10 - ø4	10 - ø4x6	3 - ø4	3 - ø4x6
HSUR414	90	317	62	56	25	2	13 - ø4	13 - ø4x6	4 - ø4	4 - ø4x6

No individual drawing: The “Right” version is mirror-image to the “Left” version HSUL.

Figure D4-1: Dimensioned drawing of HSUR hangers

HSUL hangers

Table D4-2: Geometrical data for HSUL

Item	Dimensions (mm)						Nail holes, no and size			
	A	B	C	D	E	Thick	n _h header (open flange)	n' _h header (closed flange)	n _j Joist (open side)	n' _j Joist (closed side)
HSUL26-2	80	125	62	56	32	2	6 - ø4	6 - ø4x6	2 - ø4	2 - ø4x6
HSUL410	90	216	62	56	25	2	10 - ø4	10 - ø4x6	3 - ø4	3 - ø4x6
HSUL414	90	317	62	56	25	2	13 - ø4	13 - ø4x6	4 - ø4	4 - ø4x6

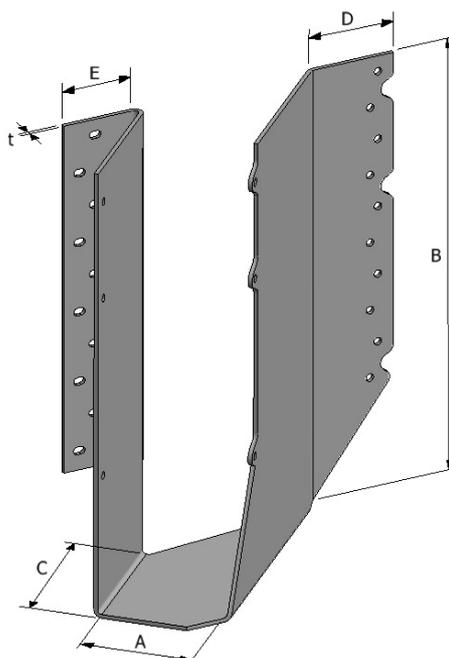


Figure D4-2: Dimensioned drawing of HSUL hangers

For timber to timber connections the number and size of the nails in the joist and the header shall be those stated in the table.

Table D4-3: Characteristic load-carrying capacities of type SUL / SUR, type, number and size of SS Smooth Shank round nails and ST Square Twist nails

Joist Hanger Type	Header	Joist	Characteristic capacities	
	Nail types and sizes			
	SS	ST	R _{1,k}	R _{2,k}
	4.0 x 90	3.75 X 30	kN	kN
Number of nails				
HSUL / HSUR				
HSUL26-2	2x6	2x2	8.57	2.40
HSUL410	2x10	2x3	17.35	5.57
HSUL414	2x13	2x4	29.78	9.23

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Instead of the connector nails mentioned in Table the connector nails can be substituted by the nails or screws mentioned in Table 4 . These fasteners have larger characteristic capacities than the mentioned connector nails according to the ETA 04/0013.

Table D4-4: Substitution possibilities of fasteners. The smooth round nails may be substituted by the connector nail

Smooth round nail which may be substituted by the other connector nail	Other connector nails
4.0x90 mm	4.0x60 mm

D5 LSSU Hangers

Product Name :

Product Name	Material reference acc. to clause II-1
LSSU [type digits]	Steel ref. 1
LSU [type digits]	Steel ref. 1

Figure D5-1: Drawings of LSSU hangers

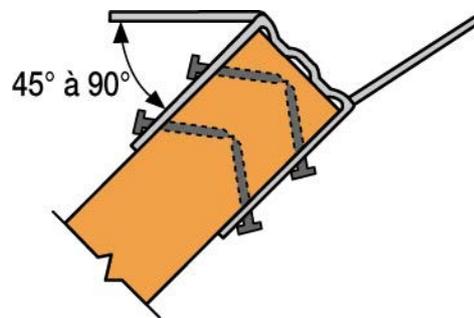


Table D5-1: Geometrical data for LSSU

Item	Dimensions (mm)					Nail number	
	A	B	C	D	t	Supporting Member (1)	Supported Member (2)
LSU26	38	124	75	38	1.2	6	5
LSSU28	38	181	90	44	1.2	10	5
LSSU210	38	216	90	44	1.2	10	7
LSSUI25	45	216	90	44	1.2	10	7
LSSU170/50	50	170	90	58	1.2	10	11
LSSU275/50	50	275	90	58	1.2	18	11
LSSUI2.06	52	216	90	47	1.2	10	7
LSSU170/58	58	170	90	58	1.2	10	11
LSSU275/58	58	275	90	58	1.2	18	11
LSSUI35	60	216	90	50	1.2	10	7
LSSU170/66	66	170	90	58	1.2	10	11
LSSU275/66	66	275	90	58	1.2	18	11
LSSU170/71	71	170	90	65	1.2	10	11
LSSU275/71	71	275	90	65	1.2	18	11
LSSU170/75	75	170	90	65	1.2	14	12
LSSU275/75	75	275	90	65	1.2	18	12
LSSU210-2	78	216	90	75	1.2	18	12
LSSU410	90	216	90	69	1.5	18	12
LSSU170/96	96	170	90	80	1.2	10	11
LSSU275/96	96	275	90	80	1.2	18	11
LSSU170/100	100	170	90	80	1.2	14	12
LSSU275/100	100	275	90	80	1.2	18	12
LSU4.12	105	228	90	59	1.2	24	12
LSU3510-2	120	228	90	89	1.5	24	16

(1) Can be installed with either of the following types: 3.75 x 75 Smooth Shank Nail, 3.7 x 50 Annular Ring Shank Nail or 4.0 x 100 Smooth Shank Nail

(2) Can be installed with SST Square Twist Nail 3.75 x 30

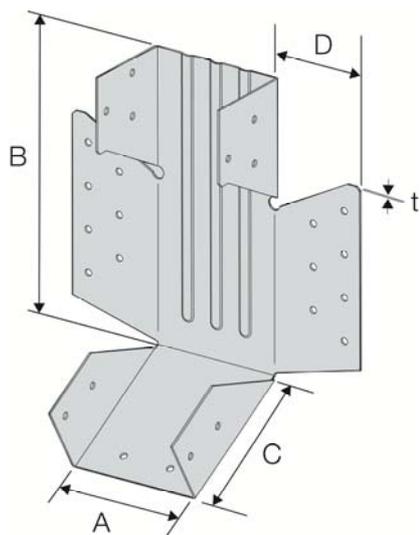


Table D5-2: characteristic values for LSSU

Joist Size	Item Code	Characteristic Load Capacities (kN) – full nailing					
		I-Joists				Solid Section	
		LVL Flanges		Solid Flanges		C24	
		R _{1,k}	R _{2,k}	R _{1,k}	R _{2,k}	R _{1,k}	R _{2,k}
Sloped Hangers Only							
38 x 150	LSU26	6.81	2.55	7.26	2.55	7.26	2.55
38 x 241	LSSU28	5.13	2.38	7.26	2.38	7.26	2.38
38 x 302	LSSU210	5.13	2.38	7.26	2.38	7.26	2.38
45 x 241 to 356	LSSUI25	5.13	2.38	9.93	3.98	9.93	3.98
47 x 195 to 245	LSSU170/50	-	-	11.35	5.71	11.35	5.71
47 x 300 to 450	LSSU275/50	-	-	10.59	5.71	10.59	5.71
51 x 241 to 356	LSSUI2.06	5.13	2.38	-	-	-	-
55 x 195 to 245	LSSU170/58	5.13	2.38	11.35	5.71	11.35	5.71
55 x 300 to 450	LSSU275/58	5.13	2.38	10.59	5.71	10.59	5.71
58 x 241 to 356	LSSUI35	9.14	2.38	9.93	3.98	9.93	3.98
63 x 195 to 245	LSSU170/66	-	-	11.35	5.71	11.35	5.71
63 x 300 to 450	LSSU275/66	-	-	10.59	5.71	10.59	5.71
68 x 195 to 245	LSSU170/71	9.14	2.38	11.35	5.71	11.35	5.71
68 x 300 to 450	LSSU275/71	9.14	2.38	10.59	5.71	10.59	5.71
72 x 195 to 300	LSSU170/75	-	-	11.35	5.71	11.35	5.71
72 x 300 to 400	LSSU275/75	-	-	10.59	5.71	10.59	5.71
(2) 38 x 241	LSSU210-2	9.14	2.38	-	-	-	-
89 x 241 to 356	LSSU410	11.17	2.99	12.45	2.26	12.45	2.26
(2) 47 x 195 to 245	LSSU170/96	-	-	11.35	5.71	11.35	5.71
(2) 47 x 300 to 450	LSSU275/96	-	-	10.59	5.71	10.59	5.71
97 x 195 to 300	LSSU170/100	-	-	13.11	5.71	13.11	5.71
97 x 300 to 400	LSSU275/100	-	-	14.29	5.71	14.29	5.71
(2) 51 x 241 to 356	LSU4.12	11.17	2.99	-	-	-	-
(2) 58 x 241 to 356	LSU3510-2	15.19	3.66	12.55	4.55	12.55	4.55
Skewed Hangers or Sloped and Skewed							
38 x 150	LSU26	4.16	2.55	3.24	2.55	3.24	2.55
38 x 241	LSSU28	3.45	1.47	3.24	1.47	3.24	1.47
38 x 302	LSSU210	3.45	1.47	3.24	1.47	3.24	1.47
41 x 195 to 245	LSSU170/44	3.45	1.47	-	-	-	-
41 x 300 to 450	LSSU275/44	3.45	1.47	-	-	-	-
45 x 241 to 356	LSSUI25	3.45	1.47	8.10	3.98	8.10	3.98
47 x 195 to 245	LSSU170/50	-	-	6.34	5.71	6.34	5.71
47 x 300 to 450	LSSU275/50	-	-	10.78	5.71	10.78	5.71
51 x 241 to 356	LSSUI2.06	3.45	1.47	-	-	-	-
55 x 195 to 245	LSSU170/58	3.45	1.47	6.34	5.71	6.34	5.71
55 x 300 to 450	LSSU275/58	3.45	1.47	10.78	5.71	10.78	5.71
58 x 241 to 356	LSSUI35	6.81	6.63	8.10	3.98	8.10	3.98
63 x 195 to 245	LSSU170/66	-	-	6.34	5.71	6.34	5.71
63 x 300 to 450	LSSU275/66	-	-	10.78	5.71	10.78	5.71
68 x 195 to 245	LSSU170/71	6.81	2.38	6.34	5.71	6.34	5.71
68 x 300 to 450	LSSU275/71	6.81	2.38	10.78	5.71	10.78	5.71
72 x 195 to 300	LSU170/75	-	-	6.34	5.71	6.34	5.71
72 x 300 to 400	LSU275/75	-	-	10.78	5.71	10.78	5.71
(2) 38 x 241	LSSU210-2	6.81	2.38	-	-	-	-
89 x 241 to 356	LSSU410	7.20	2.99	7.12	2.26	7.12	2.26
(2) 47 x 195 to 245	LSSU170/96	-	-	6.34	5.71	6.34	5.71
(2) 47 x 300 to 450	LSSU275/96	-	-	10.78	5.71	10.78	5.71
97 x 195 to 300	LSU170/100	-	-	4.69	5.71	4.69	5.71
97 x 300 to 400	LSU275/100	-	-	8.16	5.71	8.16	5.71
(2) 51 x 241 to 356	LSU4.12	7.20	2.99	-	-	-	-
(2) 58 x 241 to 356	LSU3510-2	11.14	3.66	11.89	4.55	11.89	4.55

Note: The connectors should be bent once only

D6 VPA – Hangers

Product Name :

Product Name	Material reference acc. to clause II-1
VPA [type digits]	Steel ref. 1

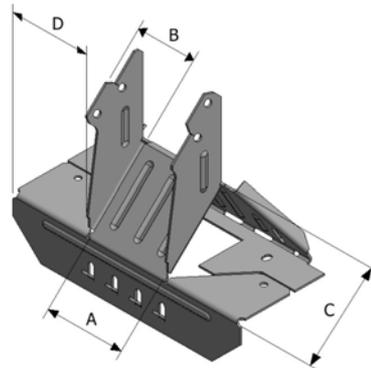


Figure D6-1: Dimensioned drawings of VPA hangers

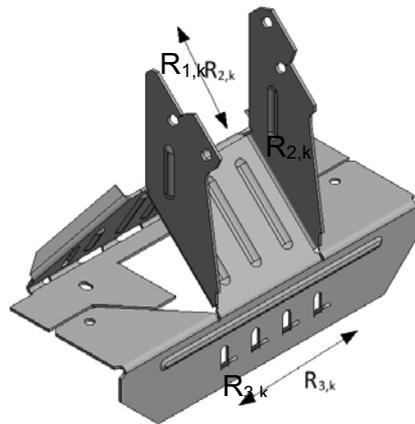


Figure D6-2: Load directions for VPA hangers

Table D6-1: Geometrical data for VPA

Item	Dimensions (mm)					Nail number	
	A	B	C	D	Thickness	Supporting Member (1)	Supported Member (2)
VPA2	40			46	1.2	8	2
VPA25	46			42	1.2	8	2
VPA50	50	45	57	36	1.2	9	2
VPA2.06	52			50	1.2	9	2
VPA58	58	45	57	32	1.2	9	2
VPA35	59			46	1.2	9	2
VPA66	66	45	57	32	1.2	9	2
VPA71	71	45	57	32	1.2	9	2
VPA75	75	52	57	34	1.2	11	2
VPA4	90			45	1.2	11	2
VPA96	96	52	57	34	1.2	11	2
VPA100	100	52	57	34	1.2	11	2

(1) Can be installed with either of the following types: 3.75 x 75 Smooth Shank Nail. 3.7 x 50 Annular Ring Shank Nail or 4.0 x 60 Annular Ring Shank Nail

(2) Can be installed with SST Square Twist Nail 3.75 x 30

Table D6-2: Characteristic values for VPA used in conjunction with corresponding LSSU

Joist Width	Item Codes		Characteristic Load Capacity (kN) – full nailing								
			I-Joists						Solid Section		
			LVL Flanges			Solid Flanges			C24		
			R _{1,k}	R _{2,k}	R _{3,k}	R _{1,k}	R _{2,k}	R _{3,k}	R _{1,k}	R _{2,k}	R _{3,k}
38	VPA2	LSSU28	4.76	3.69	3.04	-	-	-	-	-	-
45	VPA25	LSSUI25	4.76	3.69	3.04	5.31	1.94	2.17	5.31	1.94	2.17
47	VPA50	LSSU***/50	-	-	-	5.31	1.78	2.17	5.31	1.78	2.17
51	VPA2.06	LSSUI2.06	6.79	3.69	2.37	-	-	-	-	-	-
55	VPA58	LSSU***/58	6.79	3.69	2.37	-	-	-	-	-	-
58 / 60	VPA35	LSSUI35	6.79	3.69	2.37	6.19	1.94	2.17	6.19	1.94	2.17
63	VPA66	LSSU***/66	-	-	-	8.19	1.78	2.17	8.19	1.78	2.17
68	VPA71	LSSU***/71	6.79	3.69	2.37	-	-	-	-	-	-
70 / 72	VPA75	LSSU***/75	-	-	-	8.19	1.78	2.17	8.19	1.78	2.17
89 / 90	VPA4	LSSU410	14.16	3.69	2.96	7.94	1.94	2.17	7.94	1.94	2.17
(2) 47	VPA96	LSSU***/96	-	-	-	8.19	1.78	2.17	8.19	1.78	2.17
100	VPA100	LSSU***/100	-	-	-	8.19	1.78	2.17	8.19	1.78	2.17

Capacities are when VPA's are used in conjunction with corresponding LSSU connector

D7 HRC

Product Name :

Product Name	Material reference acc. to clause II-1
HRC [type digits]	Steel ref. 1

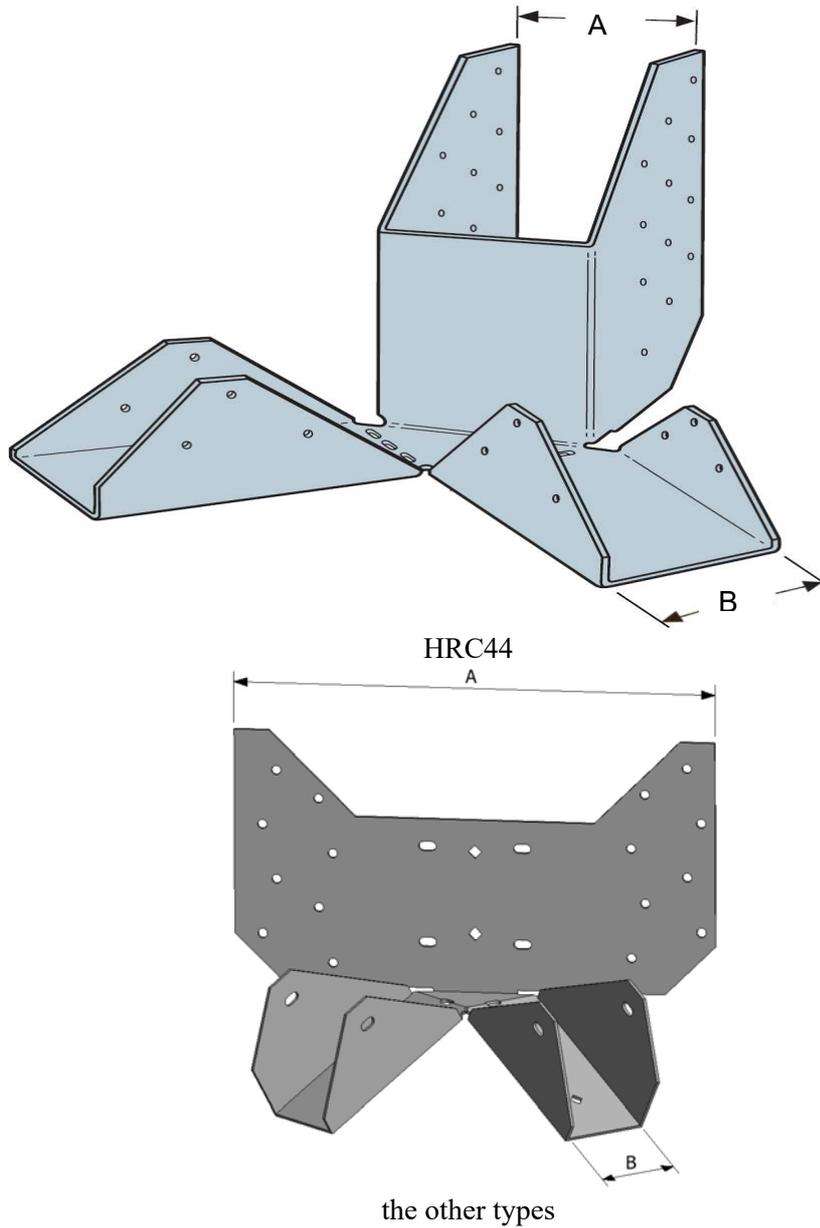


Figure D7-1: Dimensioned drawing of HRC

Table D7-1: Geometrical data for HRC connector

Model	Dimension (mm)		header holes			joist holes		
	A	B	Ø4.3	square 4.3	4.4x7.9	Ø4.3	square 4.3	4.4x7.9
HRC22	218	40	16	2	4		2	6
HRC1.81	218	46	16	2	4		2	6
HRC50	218	50	16		4			6
HRC44	90	90	24			12	4	

Table D7-2: Characteristic values for HRC connector

Model	No. Fasteners (3.75x30mm ST)		Characteristic capacity C24 [kN]	
	Header	Each Hip	R _{1,k}	R _{2,k}
HRC22	16	2	2.82	0.94
HRC1.81	16	2	2.82	0.94
HRC50	16	2	2.82	0.94
HRC44	24*	6*	8.90	3.52

*use 4.0x90mm nails with HRC44

Notes

- On the end of the ridge. use optional slots to secure the HRC22. HRC50 and HRC1.81. Bend face flanges back flush with the ridge and complete nailing
- On face of ridge. adjust to correct height and install nails
- Oblong nails holes ease rafter installation
- Optional diamond holes on the HRC range (except HRC44) are for installation convenience.
- Double bevel cut hip members to achieve full bearing capacity
- May be sloped to 45° with no reduction in loads

D8 SPR

Product Name :

Product Name	Material reference acc. to clause II-1
SPRxx	Steel ref. 1
SPR-xx/yyy	Steel ref. 1
SPR-Bxx/yyy	Steel ref. 1

xx= width ; yyy = height in [mm]

Drawing:

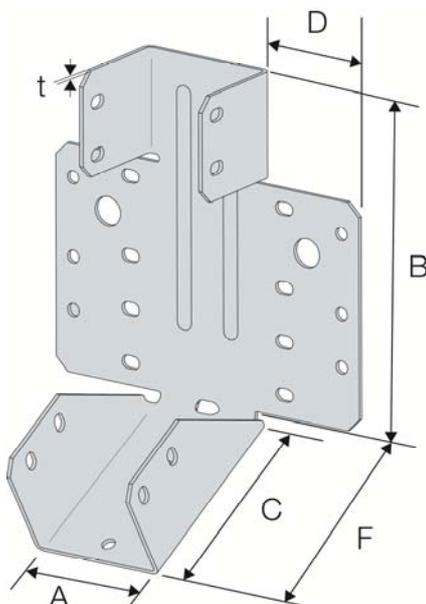


Figure D8-1: Dimensioned drawings of SPR type 38 / 50 / 64 / 76

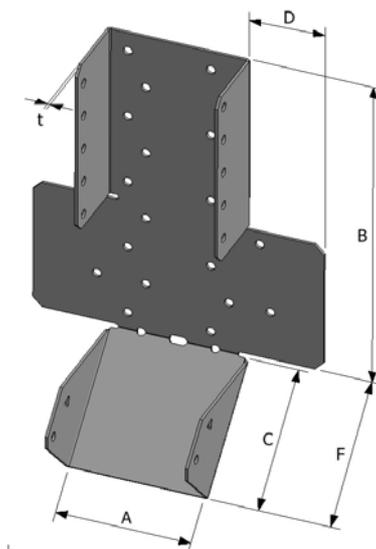


Figure D8-2: Dimensioned drawings of SPR xx/yyy

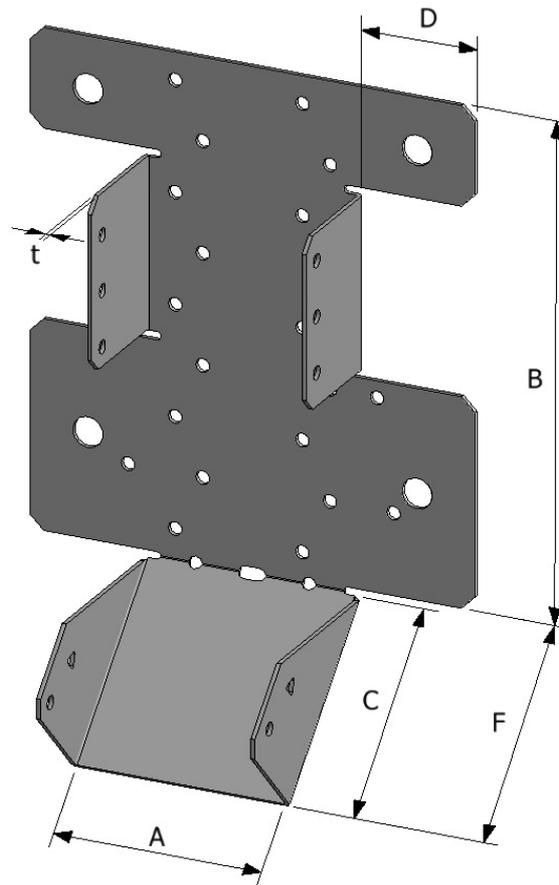


Figure D8-3: Dimensioned drawings for optional version SPR-Bxx/yyy

Table D8-1: Geometrical data and characteristic values for SPR connector

Model	Dimensions [mm]					Number of holes Ø5mm	
	A	B	C	D	F	Header	Joist
SPR38	38	110	59	40	61	12	5
SPR50	50	132	74	40	77	14	10
SPR64	64	152	74	40	77	16	10
SPR76	76	174	74	40	77	20	12
SPR47/140	47	140	75	41	76	13	10
SPR47/160	47	160	75	41	76	14	12
SPR47/180	47	180	75	41	76	16	14
SPR47/200	47	200	75	41	76	17	16
SPR91/140	91	140	75	41	76	18	10
SPR91/160	91	160	75	41	76	20	12
SPR91/180	91	180	75	41	76	22	14
SPR91/200	91	200	75	41	76	24	16
SPRxx/yyy	38 to 140	100 to 400	75	41	76	≤44	≤ 32 + 2
SPR-Bxx/yyy	38 to 140	220 to 400	75	41	76	≤44	≤ 28 + 2

xx = the size A . yyy = the size B by step of 20mm

Note:

- A readjustment may be permitted in order to finalize the slope
- The connectors should be bent once only
- If several bends are performed. the connector must be replaced

nail pattern

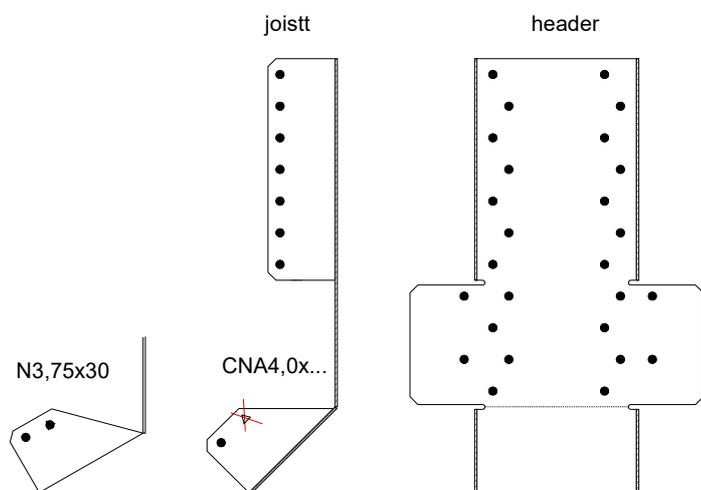


Table D8-2: The capacities for the SPRxx/yyy

Model	Number of Fasteners		Type of fastener	Characteristic capacities - timber C24 [kN]	
	Header	Joist		Direction	
				R _{1,k}	R _{2,k}
SPR38	12	5	CNA4.0x35	5.94	2.68
SPR50	14	10	CNA4.0x35	13.20	3.21
	14	10	N3.75x30	6.75	3.81
SPR64	16	10	CNA4.0x50	13.2	3.21
SPR76	20	12	CNA4.0x50	10.88	6.7
SPR47/140	13	10	N3.75x30	6.0	6.0
SPR47/160	14	12	N3.75x30	8.1	8.1
SPR47/180	16	14	N3.75x30	10.1	10.1
SPR47/200	17	16	N3.75x30	12.2	12.2
SPR91/140	18	10	N3.75x30	8.3	8.3
SPR91/160	20	12	N3.75x30	10.4	10.4
SPR91/180	22	14	N3.75x30	12.4	12.4
SPR91/200	24	16	N3.75x30	14.5	14.5
SPRxx/yyy	≤44	≤ 32 + 2	CNA4.0x L	R _{1,k.side} + R _{1,k.bottom}	R _{1,k.side}
SPR-Bxx/yyy	≤44	≤ 28 + 2	CNA4.00x L	see table 3+4	see table 3

Table D8-3: The capacities for the SPRxx/yyy and SPR-Bxx/yyy

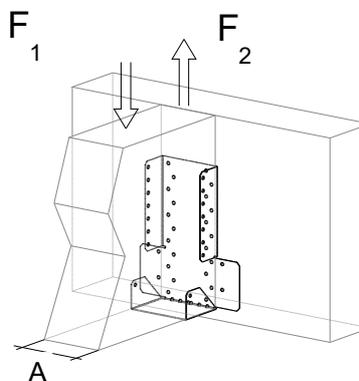
SPR B [mm]	SPR-B B [mm]	number of nails in the joist n_j	number of nails in the header		$R_{1,k}$ sides [kN]			
			for A<50 n_H	for A≥50 n_H	CNA nail:			
					4.0x35	4.0x40	4.0x50	4.0x60
100		6	8	12	1.7	2.2	2.8	3.20
120		6	9	14	2.9	3.3	4.2	4.90
140		8	13	18	4.0	4.5	5.8	6.60
160		10	14	20	6.3	7.2	9.1	10.50
180	220	12	16	22	9.0	10.2	12.8	14.60
200	240	14	17	24	11.8	13.3	16.7	19.00
220	260	16	19	26	14.7	16.5	20.9	23.40
240	280	18	20	28	17.7	20.0	24.9	28.00
260	300	20	22	30	20.7	23.5	28.9	32.50
280	320	22	23	32	23.8	26.8	33.4	37.10
300	340	24	25	34	27.0	30.1	37.2	42.60
320	360	26	26	36	30.2	33.4	41.6	48.10
340	380	28	28	38	33.2	37.2	46.7	53.60
360	400	30	29	40	36.2	40.8	51.8	59.10
380		32	31	42	39.2	45.0	56.9	64.60
400		34	32	44	43.1	49.3	62.00	70.00
A [mm] ≥					38	55	65	75

For a down load ($R_{1,k}$) the capacity ($R_{1,k side}$) shall be increased by the bottom part ($R_{1,k bottom}$), based on the width. for intermediate values a linear interpolation can be made.

Table D8-4: The capacities (with CNA-nails) for the SPRxx/yyy and SPR-Bxx/yyy bottom plate

The capacities are given only for connection timber to timber connection with nails.

A [mm]	$R_{1,k bottom}$ [kN]
40	2.1
50	2.6
60	3.1
70	3.6
80	4.1
100	5.2
140	7.2



$$R_{1,k} = R_{1,k side} + R_{1,k bottom}$$

$$R_{2,k} = R_{1,k side}$$

D9 RR

Product Name :

Product Name	Material reference acc. to clause II-1
RR	Steel ref. 1
RR47	Steel ref. 1

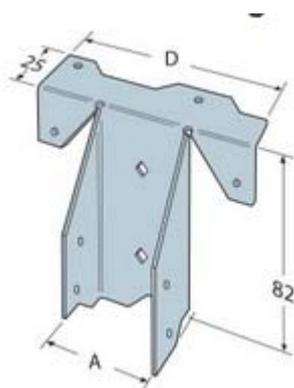


Figure D9-3: Dimensioned drawings of RR

Table D9-1: Product dimensions

Model	Minimum joist size	Dimensions (mm)				header holes		joist holes
		A	B	D	t	Ø4	square 5	Ø4
RR	35x100	38	82.5	102	1.2	4	2	4
RR47	44x100	47	82.5	113.5	1.2	4	2	4

Table D9-2 : Characteristic capacities

Model	No. Fasteners (3.75x30mm)		Characteristic Capacities (kN)
	Header	Joist	$R_{1,k}$
RR	4	4	0.62
RR47	4	4	0.62

D10 ACI

Product Name :

Product Name	Material reference acc. to clause II-1
ACI 100/80	Steel ref. 1
ACI 140/80	Steel ref. 1

ACI

Angle Connector for I joist

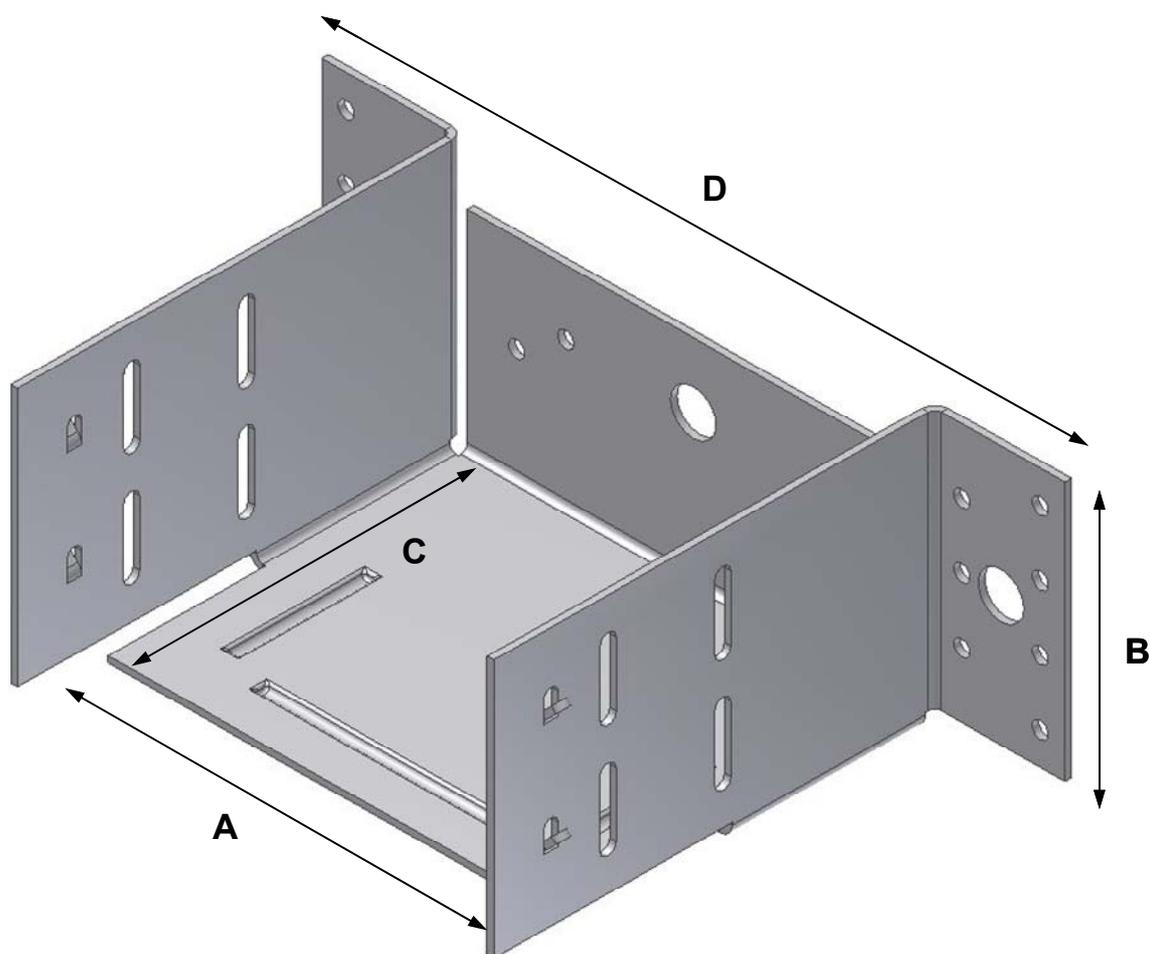


Table D10-1 : Product dimensions

Model number	Dimensions (mm)					Holes		
						Support		Supported beam
	A	B	C	D	t	Rigid	Beam	
ACI 100/80	98	80	112	270	2.0	2 - Ø14	14 - Ø5	4 Ø4x5
ACI 140/80	138	80	112	270	2.0	2 - Ø14	14 - Ø5	4 Ø4x5

Table D10-2 : Fasteners

Model number	Fasteners		
	Support		Supported beam
	Rigid	Beam	
ACI 100/80	2 - Ø12	14 – CNA4.0x35	2 or 4 CNA4.0x35
ACI 140/80	2 - Ø12	14 - CNA4.0x35	2 or 4 CNA4.0x35

Table D10-3 : Correspondence with I joists

Model number	I joists	
	Width	Height
ACI 100/80	45-69	200-400
ACI 140/80	70-100	200-400

Table D10-4 : Characteristic capacities

Model number	Characteristic values $R_{1,k}$ (kN)			
	Beam support		Rigid support	
	30° to 59°	60° to 90°	30° to 59°	60° to 90°
ACI 100/80	6.06	8.30	7.87	10.69
ACI 140/80	6.91	8.25	7.60	9.51

D11 SDEA

Product Name:

Product Name	Material reference acc. to clause II-1
SDEA 150-part1	Steel ref. 1
SDEA 150-part2	Steel ref. 1

Table D11-1: Geometrical data for SDEA150

Type	Dimensions [mm]					Holes			
						joist		header	
	A	B	C	D	t	Qty	size	Qty	size
SDEA150	29.5	150	90	45	1,5	12	Ø5	28/26	Ø6/Ø5

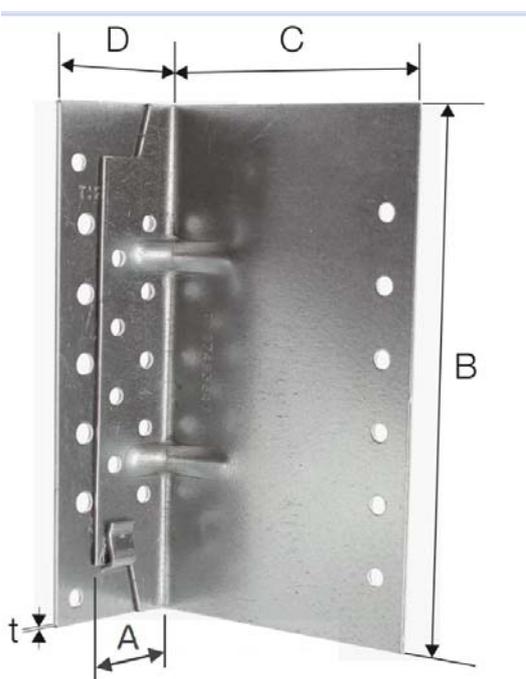


Figure D11-1: Dimensioned drawings of SDEA150-

Characteristic values

Table D11-2: Characteristic capacities for SDEA150

Model	Number of nails on the header	Number of nails on the joist	Characteristic values $R_{1,k}$ (kN)
SDEA150	22 – Ø4.0x50	12 – Ø4.0x50	12.7

D12 ABF230

Product Name:

Product Name	Material reference acc. to clause II-1
ABF230	Steel ref. 1

Angle bracket for floors

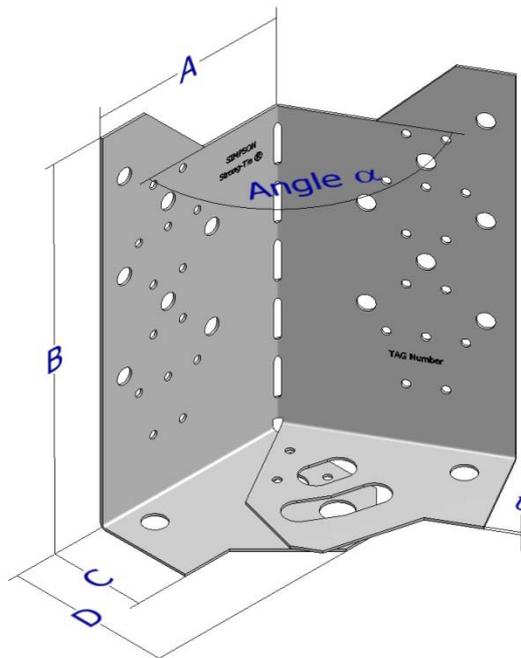


Table D12-1: Geometrical data for ABF230

Model	Dimension [mm]					Number and diameter of holes	
	A	B	C	D	t	Flange B	Flange C
ABF230	120	230	60	100	1.5	28 – Ø5 + 14 – Ø10	2 Ø14 + 2 Ø18 + 2 oblong Ø18 + 4 Ø5

The ABF230 must be fold / adjusted on site. The angle α can vary from 90 to 150 °. The fasteners to be used on flange C to connect the ABF to the concrete support are depending from the angle α according to the table below. Edge distance for the anchors should be respected.

Table D12-2: Folding angle range for ABF230

Angle α range	Fasteners to use on flange C to connect ABF to concrete
From 90 to 134°	2 Ø12 anchors
From 135 to 150°	2 Ø12 anchors - or – 1 Ø16 anchor

Characteristic capacities

Table D12-3: Characteristic capacities for ABF230

Model	Fasteners on rigid support	Number of nails on the joists	Characteristic values [kN]	
			R _{2,k}	R _{3,k}
ABF 230	1 Ø16	28– CNA4.0x50	1.63	2
	2 Ø12		13.35	2