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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-06/0270 of 02/09/2014

### 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 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 hanger for wood to wood connections and wood to concrete or steel connections)

**Manufacturer:**

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**Manufacturing plant:**

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**This European Technical Assessment contains:**

188 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 2013-06-19 and expiring on 2018-06-19

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

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## II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

### 1 Technical description of product and intended use

#### Technical description of the product

This ETA covers the following joist hangers types:

BSN, BSI, BSD, BSDI, SAE, SAEL, SAI, SAIL, SAIX, SBE, SBG, SLE, SDED, SDEG, GSE, GSI, GSE-AL, GSI-AL, GSEXL, GLE, GLI, MF, MH, LUP, BSIL, BSS, JHR, JHL, HGUS, HGUQ, JHA, THA, THAI, AG703, AG713, SAMI, ETC, ETCG and ETCD.

Simpson Strong-Tie joist hangers type SBE, SBG, BSN, BSD, SAE, SAEL, SAIX, GSE, GSE-AL, GSEXL, GLE, MF, MH, LUP, BSS, HGUS, HGUQ and ETC are one-piece non-welded, face-fixed external flanges joist hangers to be used in timber-to-timber connections as well as connections between a timber joist and a concrete structure or a steel member.

Simpson Strong-Tie joist hangers type BSI, BSDI, SAI, SAIL, SAIX, GSI, GSI-AL, GLI and BSIL are one-piece non-welded, face-fixed, internal flanges joist hangers to be used in timber-to-timber connections.

Simpson Strong-Tie joist hangers type JHR, JHL, ETCG and ETCD are one-piece non-welded, face-fixed, both external and internal flanges joist hangers to be used in timber-to-timber connections.

Simpson Strong-Tie joist hangers type SDED and SDEG are two-pieces non-welded, face-fixed external flanges joist hanger to be used in timber to timber connections as well as connection between a timber and a concrete structure or a steel member.

Simpson Strong-Tie JHA, THA, THAI, AG703 and AG713 joist hangers are one-piece, non-welded, face-fixed or wrapped-over timber-to-timber joist hangers. They are connected to a header to support a timber joist with a range of nails.

The materials for headers and joists can be of solid timber, glued laminated timber or engineered timber products such as LVL or I-joist (fitted with backer blocks if used for the header).

The joist hangers are made from pre-galvanized steel Grade S250GD + Z (min Z275) according to EN 10346 or pre-galvanized steel with a minimum characteristic 0.2% yield stress of 250MPa, a minimum

ultimate tensile strength of 330MPa and a minimum Elongation of 19%, with tolerances according to EN 10143 except if another material is precised. Material, dimensions and nails positions are detailed in Annex D and typical installations are detailed in Annex B.

All joist 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.

### 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, 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. They are also intended for use in making an end-grain connection between a timber joist and a concrete structure or a steel member.

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

- Structural solid timber classified to C14-C40 according to EN 338 / EN 14081,
- Glulam classified to GL24-GL36 according to EN 1194 / EN 14080,
- LVL according to EN 14374,
- Parallam PSL,
- Intrallam LSL,
- Duo- and Triobalken,
- Layered wood plates,
- Kreuzbalken with minimum thickness of 80 mm
- I-beams with backer blocks on both sides of the web in the header and web stiffeners in the joist
- Plywood according to EN 636

However, the calculation methods are only allowed for a characteristic wood density of up to 460 kg/m<sup>3</sup>. Even though the wood based material may have a larger density, this must not be used in the formulas for the load-carrying capacities of the fasteners.

Annex C defines the directions of forces and also states the formulas for the characteristic load-carrying capacities of the joist hanger connections. The design of the connections shall be in accordance with Eurocode 5 or a similar national Timber Code.

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 made from stainless steel are intended for use in outdoor conditions defined by the service classes 3 of EN 1995-1-1:2004, (Eurocode 5). The fasteners (nails, screws and bolts) to be used shall be made from suitable stainless material.

The scope of the hangers regarding resistance to corrosion shall be defined according to national provisions that apply at the installation site considering environmental conditions and in conjunction with the admissible service conditions according to EN 1995-1-1 and the admissible corrosivity category as described and defined in EN ISO 12944-2

The provisions made in this European Technical Assessment are based on an assumed intended working life of the post bases brackets of 50 years.

The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

### 3 Characteristics of product and assessment

Characteristic	Assessment of characteristic
<b>3.1 Mechanical resistance and stability*) (BWR1)</b>	
Characteristic load-carrying capacity	See Annex D
Stiffness	No performance determined
Ductility in cyclic testing	No performance determined
<b>3.2 Safety in case of fire (BWR2)</b>	
Reaction to fire	The joist 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
<b>3.3 Hygiene, health and the environment (BWR3)</b>	
Influence on air quality	The product does not contain/release dangerous substances specified in TR 034, dated March 2012
<b>3.7 Sustainable use of natural resources (BWR7)</b>	
<b>3.8 General aspects related to the performance of the product</b>	The joist 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 conditions defined by service class 1 and 2
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 are based on the characteristic values of the nail connections and the joist hangers. To obtain design values the capacities have to be divided by different partial factors for the material properties, the nail connection in addition multiplied with the coefficient  $k_{mod}$ .

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

Thus, the characteristic values of the load-carrying capacity are determined also for timber failure  $F_{Rk,H}$  (obtaining the embedment strength of nails subjected to shear or the withdrawal capacity of the most loaded nail, respectively) as well as for steel plate failure  $F_{Rk,S}$ . The design value of the load-carrying capacity is the smaller value of both load-carrying capacities.

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

Therefore, for timber failure the load duration class and the service class are included. The different partial factors  $\gamma_M$  for steel or timber, respectively, are also correctly taken into account.

#### 3.10 Mechanical resistance and stability

See annex C for characteristic load-carrying capacities of the joist hangers.

The characteristic capacities of the joist hangers are determined by calculation assisted by testing or only 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.

The design models allow the use of fasteners described in the table in Annex C3:

The characteristic load-carrying capacities of the products shall be calculated in accordance with the manufacturer's design code, extracts of which are given in Annex C4. The design code has been derived in accordance with ETAG 015 and Eurocode 5 (2008).

The calculated values should be used for designs in accordance with Eurocode 5 or a similar national Timber Code. These values are based on the assumption that there is a maximum gap of 3 mm between the timber members, the members are laterally restrained and wane is not present in the timber at the joint.

The hangers shall be used with the fasteners specified in Annex C3.

Furthermore, the Face mount hangers types BSN, BSI, BSD, SAE, SAEL, SAIX, SDED, SDEG, GSE, GSE-AL, GSEXL and GLE, ETC can be fastened to a concrete structure or steel member with 8 to 12 mm diameter bolts in holes with a diameter up to 2 mm larger than the bolt. In the same way, SAE, SAEL, SBE, SBG, SLE, MF, SAMI hangers can be fixed with 10 mm diameter bolts.

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

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

#### 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 the joist hanger have a zinc coating weight of min Z275. The steel employed is S250 GD with min Z275 according to EN 10346:2009.

##### 3.11.2 Corrosion protection in service class 3.

In accordance with Eurocode 5 the joist hangers are made 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. The nails or screws shall be produced from stainless steel.

#### 3.12 General aspects related to the use of the product

Simpson Strong-Tie joist hangers types BSN, BSI, BSD, BSDI, SAE, SAEL, SAI, SAIL, SAIX, SBE, SBG, SLE, SDED, SDEG, GSE, GSI, GSE-AL, GSI-AL, GSEXL, GLE, GLI, MF, MH, LUP, BSIL, BSS, JHR, JHL, HGUS, HGUQ, JHA, THA, THAI, AG703, AG713, ETC, ETG, ETCD 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.

#### Joist hanger connections

Joist hangers shall be installed on the basis of a specific structural design for each installation, using the load-bearing capacities derived from the formulas and specific factors  $k_{H1}$  and  $k_{H2}$  given in Annex D, applying the appropriate  $k_{mod}$  factor depending on the relevant service class / duration of load and the appropriate National partial safety factor for materials.



The fixing of Joist hangers to the support shall use the appropriate nails or screws in case of solid wood or wood-based support, appropriate CE marked metal anchors for use in concrete in case of concrete support. The load bearing capacities which can be derived from Annex C are given provided that the fixing device has been appropriately designed and installed.

Joist hangers shall be installed by appropriately qualified personnel, following an installation plan and relevant construction details worked out for each individual building project. The installation plan shall be based on the manufacturers general guide and provisions for installing SIMPSON Strong-Tie connections.

A joist hanger connection is deemed fit for its intended use provided:

### Header – support conditions

- The header shall be restrained against rotation and be free from wane under the joist hanger.

If the header carries joists only on one side the eccentricity moment from the joists  $M_{ec} = R_{joist} (b_{header}/2 + e_{nail})$  shall be considered at the strength verification of the header.

$R_{joist}$  Reaction force from the joists  
 $b_{header}$  Width of header  
 $e_{nail}$  Distance from nails in the joist to the of the header

- For a header with joists from both sides but with different reaction forces a similar consideration applies.

### Wood to wood connections

- Joist hangers can be fastened to wood-based members by nails or screws.
- There shall be nails or screws in all holes or a partial nailing pattern as prescribed in Annex B can be used.
- The characteristic capacity of the joist hanger connection is calculated according to the manufacturer's technical documentation.
- The joist hanger connection is designed in accordance with Eurocode 5 or an appropriate national code.
- The gap between the end of the joist and the surface, where contact stresses can occur during loading shall be limited. This means that for joist hangers with outward flaps shall the gap between the surface of the end of the joist and that of the header be maximum 3 mm.

Joist hangers with inward flaps shall the gap between the surface of the nail heads in the inward flaps and the end of the joist be maximum 8 mm.

- For joist hanger BSD, BSD, BSI, BSDI and SBG the width of the joist shall be at least  $l + 4d$ , where  $l$  is the length of the nails and  $d$  is the diameter of the nails in the joist, for full nailing and partial nailing without staggering the nails in the joist. For partial nailing with staggered nails in the joist the width shall be at least the penetration length of the nails. For joist hanger SAE, SAEL, SBE, SLE, SAIL SAIX and SDED/G the width of the joist shall be at least the penetration length of the nails.
- The cross section of the joist at the joist hanger connection shall have sharp edges at the lower side against the bottom plate, i.e. it shall be without wane.
- The cross section of the header shall have a plane surface against the whole joist hanger.
- The width  $B_j$  of the joist shall correspond to that of the joist hanger.  $B_j$  shall not be smaller than  $B - 3$  mm, where  $B$  is the inner width of the joist hanger.
- The depth of the joist shall be so large that the top of the joist is at least 20 mm above the upper nail in the joist.
- Joist hangers made from stainless steel should only be fastened with fasteners made from suitable stainless steel. Zinc-coated joist hangers shall not be fastened with fasteners of stainless steel.
- Nails or screws to be used shall have a diameter, which fits the holes of the joist hangers. Round nails shall have a diameter which is not smaller than the diameter of the hole minus 1 mm. Nails with square cross section shall have a side length not smaller than the hole diameter minus 1,25 mm.

Straps hangers shall be installed to meet the following requirements:

- The hanger is connected to header using the specified nails in Annex C3. The hanger side and back flanges may have a slight splay from nesting within the packing. It is essential to hold the hanger square to the header before nailing.
  - Where it is necessary to wrap the straps over the header, a minimum wrap over of 45 mm is required for the JHA and THA and 65 mm for the THAI, AG703 and AG713 to achieve the minimum nailing specification.
  - For I-joist headers backer blocks of softwood, OSB or plywood shall be installed (see Annex B).
  - The size, material and installation details of the backer blocks shall be in accordance to the joist manufacturer's specifications.

- The joist is installed in the hanger ensuring it is free from wane and the gap between the end of joist and header does not exceed 3 mm.
- The specified joist nails are installed. For instances where double shear nailing is specified, ensure that the correct nail is installed into the joist at an angle of 45°. For the THAI, the specified nail is to be driven downwards at an angle of 45°, into the joist.
- When the supported member is an I-joist it will be necessary to install web stiffeners to the end of the joist if the top flange is not laterally restrained by the hanger side flanges. Refer to joist manufacturer's literature for details of web stiffener installation.
- Header is restrained against rotation before application of full loading.

### **Wood to concrete or steel**

The above mentioned rules for wood-to-wood connections are applicable also for the connections between the joist and the joist hanger.

- The joist hanger shall be in close contact with the concrete or steel over the whole face. There shall be no intermediate layers in between.
- The gap between the end of the joist and the surface, where contact stresses can occur during loading shall be limited. This means that the gap between the surface of the end of the joist and that of the concrete or steel shall be maximum 3 mm.
- The bolt shall have a diameter not less than the hole diameter minus 2 mm.
- The bolts shall be placed symmetrically about the vertical symmetry line. There shall always be bolts in the 2 upper holes.
- For concrete, the bolts shall use washers recommended with the mechanical anchor delivery by the suppliers. For steel, the upper bolts shall have washer Ø18 mm minimum.

## **4 Assessment and verification of constancy of performance (AVCP)**

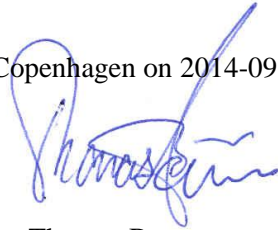
### **4.1 AVCP system**

According to the decision 97/638/EC of the European Commission<sup>1</sup>, as amended, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 2+.

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

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

Issued in Copenhagen on 2014-09-02 by



Thomas Bruun  
Manager, ETA-Danmark

## ANNEX A

### REVISION HISTORY

<i>Modifications and additions to the previous versions of ETA-06/0270</i>	
Issue No.	Update
1,0	First release
2,0	BSD – Modification of the drawing
	BSDI – Modification of the drawing
	SAE590, SAE620-a and SAE620-b have been added
	SDED/G have been added
	SDED/G – New formula for downward direction
	SDED/G – New formula for upward direction
	SDED/G – New formula for lateral direction
	SBE and SBG – Axial force has been added
	SBE – The model of calculation for the SBG is used.
	Square washer 30x30x3 has been deleted and replaced by standard washer Ø18 min
	AI and A joist hanger have been deleted
	New model of calculation for concrete application (excepted for SBE and SBG)
3,0	Modification of the text about material
	BSD/I – Insertion of new blank model in the first two tables
	BSD/I – Modification of the drawing
	SBG – Modification of the minimum width of SBG in both tables
	BSD/I – Modification of the four tables
	SBG – Correction of the value of kh,2 and insertion of a line for 38 mm (Full Nailing)
	SBG – Correction of the value of kh,2 and insertion of a line for 38 mm (Partial Nailing)
	BSD/I – Modification of the table
	BSD/I – Modification of the table
	Update following names: Standard to BSN, I to BSI
	Merging ETA-06/0270 with ETA-07/0150 and ETA-07/0043
4,0	Add SLE variant of SBG
	Correction of the SBG drawing
	Correction of some inversion of letter in the ETA
	Addition of stainless steel types
5.0	Add SAMI/4X
	Add fire resistance for GSE/4 and GLE/4
	Add new values for SAE with square twist nails
	Add HGUQ
	Other updates
	<ul style="list-style-type: none"> <li>- Standard correction</li> <li>- BNS2P</li> <li>- BSD drawing</li> <li>- BSN and BSI 440 blank model</li> </ul>

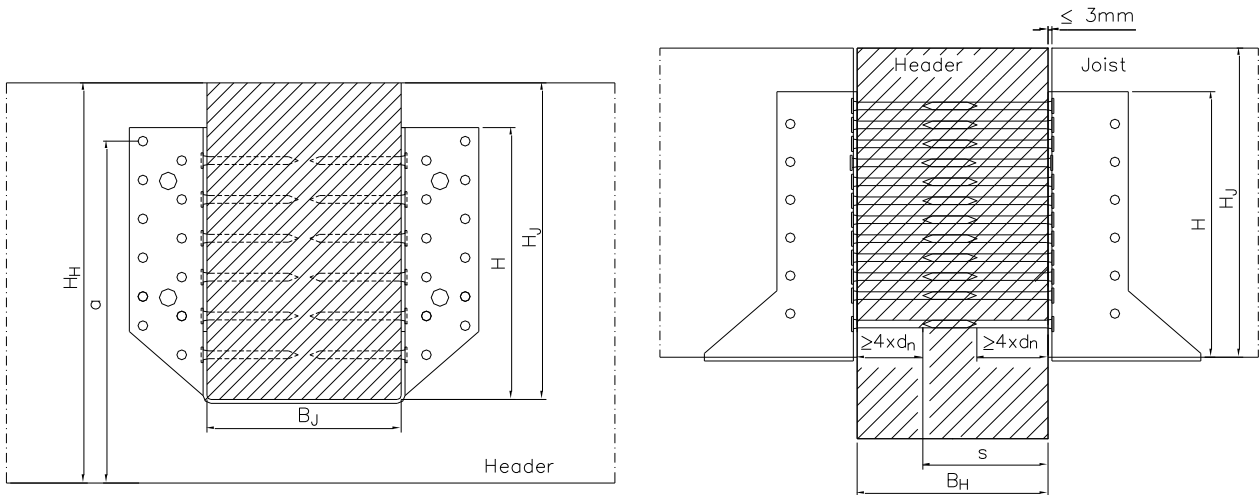
<b>Modifications and additions to the previous versions of ETA-07/0150</b>	
<b>Issue No.</b>	<b>Updates</b>
1,0	First release
2,0	GSE780/120 - New loads on concrete
	HGUS from UK - $k_{H1}$ and $k_{H2}$
	Calibration factors for GSE and GSI on wood/wood
	GSE/GSI - New model for wood/rigid support application (ID151)
	$k_{h1}$ and $k_{h2}$ are not given for JHL/R. Situation to be clarified. See project F1044
	Add HGUQ product range
	Change product type in HGUS table in annex 48 (currently refers to GSE)
	Change the identity of type IL from blank to width x height (annex 49)
	Add 4.0 nails for HGUS range
	Add widths up to 300mm for HGUS48
3,0	Add axial resistance of GSE/I timber and concrete
	Change the identity of type IL to BSIL and also from blank to width x height
	Add HGUQ product range
	Add widths up to 300mm for HGUS48 and add Spec HGUS
	Change product type in HGUS table in annex 48 (currently refers to GSE)
	Add 4.0 nails for HGUS range
	Calibration factors for GSE and GSI on wood/wood
	GSE/GSI - New model for wood/rigid support application (ID151)
	Add axial resistance of GSE/I on timber and concrete
Add ranges ETC – ETC G/D – GSEXL – GLE/GLI	
Update following names: IL to BSIL, S to BSS	

<b>Modifications and additions to the previous versions of ETA-07/0043</b>	
<b>Issue No.</b>	<b>Updates</b>
1.0	First Release
2.0	EN 1195-1-1:2004 changed to EN 1995-1-1:2004 + A1:2008
	JHA & THA minimum wrap over changed from 55mm to 45mm
	Figure 1 updated: Table 1 split into two tables: Material reference's updated
	Table A3 was table 2. Table updated - model number changed & material reference updated.
	Figure A3 updated.
	Table A4 was table 3. THAI322 added to table: Material reference updated.
	Table A5 was table 4.
	Table A6 was table 5. Table updated - additional installation configurations added for JHA270, JHA450 & THA
	Formula reference numbers added
	Formula (2) updated; Formula (3) added; Formula (4) updated
	Formula (14) updated; Formula (16) added; Formula (18) updated
	Figure A2.10.1 was Figure A1
	Definition of symbols table updated - $B_{eff}$ and $L_{eff}$ added
	Annex 3. Table 3.1 was table 8; Table 3.2 was table 7; Table 3.3 was table 6; Table 3.4 was table 9
	Annex 4. Table updated - $L_{eff}$ , $B_{eff}$ , $C_{Hor}$ & $K_{ef}$ added to table; $B_{min}^*$ removed from table.
Annex 5 added.	
3.0	Add AG703 & AG713
	Merging ETA-06/0270 with ETA-07/0150 and ETA-07/0043

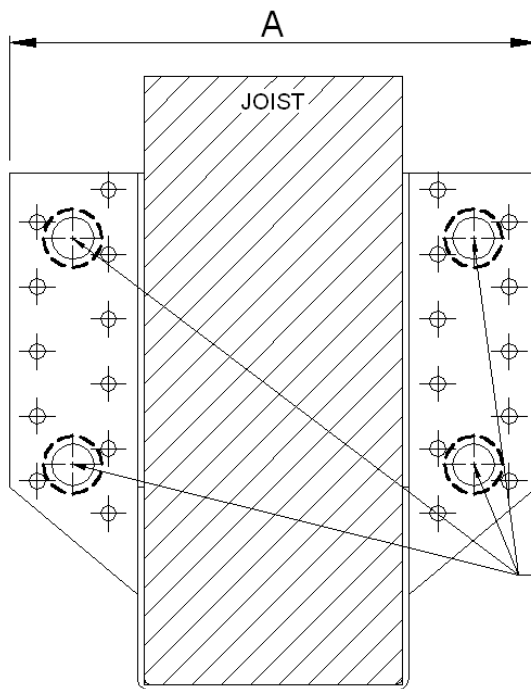
## ANNEX B

### TYPICAL INSTALLATIONS

#### Joist hanger in wood/wood connection



#### Joist hanger connected to concrete, lightweight concrete or a steel member by bolts

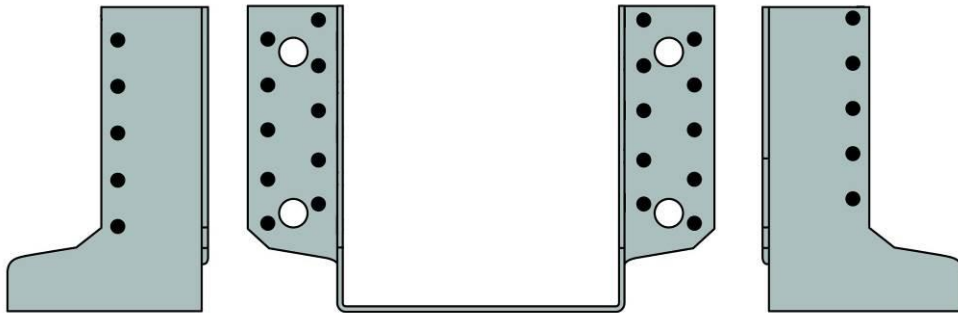


Washer min  $\varnothing 18$ .

The washer have to follow the requirement of the anchor suppliers.  
Always used the washer delivered with the anchor.

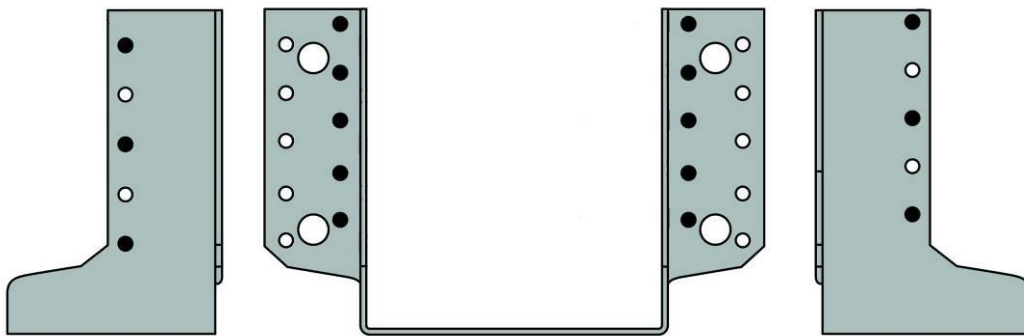
Holes for bolts  
The bolts shall always be positioned symmetrically about the vertical axis of the joist hanger

**Full nail fixing:**  
*General application*



Fill it in all the holes with nails, on the face and the side flanges.

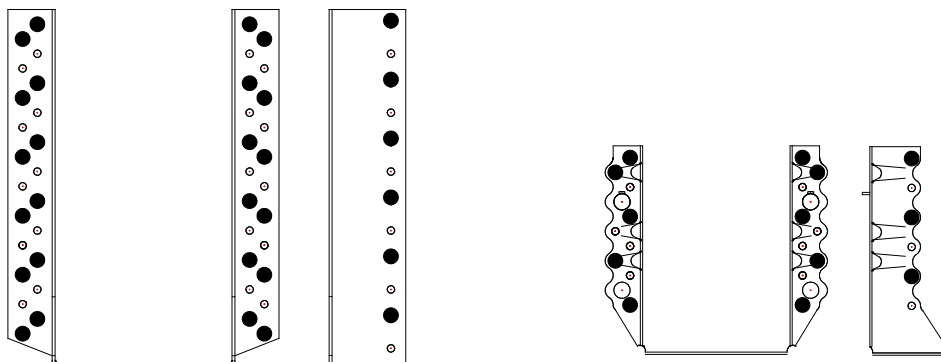
**Partial nail fixing:**  
*General application*



- *On the side flanges* : Place one nail out of two on each side flange, starting from the first hole on the top of the flange.
- *On the face flanges* : Place the nails on each face flange, on the vertical line next to the folding.

*Partial nailing for connection to column*

The distance between the nails in the direction of the fibre shall be at least 20 mm.

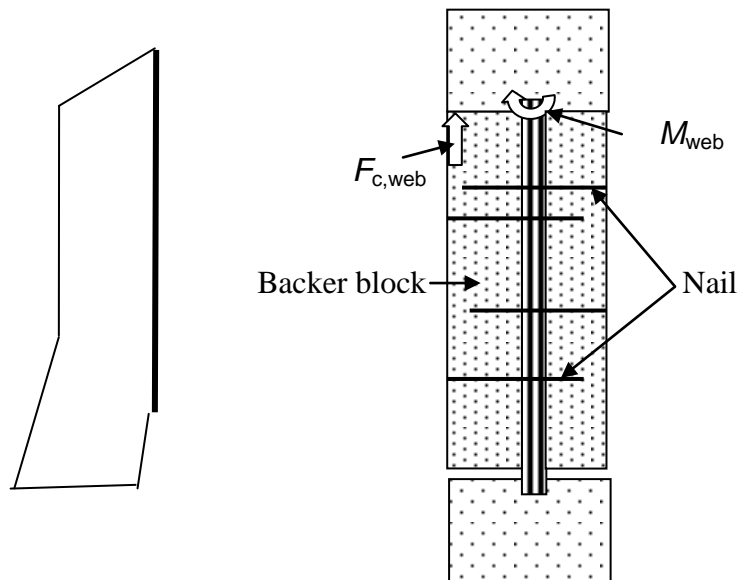


### Conditions for using I-beam headers

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 a 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:

$$n_{nail,backerblock} = 2 \cdot n_{header}$$

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.

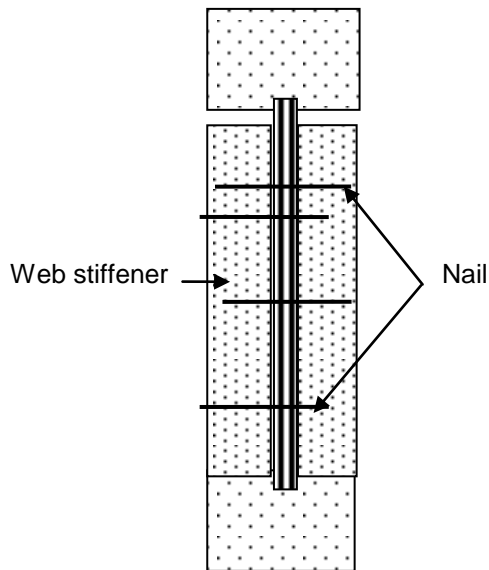
The nails in the backer block shall have a length so their tip will go through the web and at least 20 mm into the opposite backer block.

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.



### 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:

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

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

## ANNEX C

### BASIS OF DESIGN

#### C0 Symbols used in the ETA-06/0270

For the purpose of ETA-06/0270, the following symbols apply.

$a-0.5a_c$	Lever arm of the effective nails (face-fixed hangers)
$b$	Width of the joist hanger (mm)
$B_{eff}$	Effective Compressed depth (mm)
$Blank$	Blank length of the joist hanger
$C_{hor}$	Horizontal lever arm
$c_i$	Calibration coefficient
$d$	Divisor taking the inclination of the tilting force into account
$D$	Hanger seat depth (mm)
$e$	Eccentricity = distance from the nails in the joist to the surface of the header
$e_{center,x}$	Distance of topmost nails in the joist to the centre of nail group in the joist
$e_{J,F}$	Distance of the lateral force above the centre of gravity of the nails in the joist
$e_{J,nail}$	Distance from the nails in the joist to the surface of the header
	For the joist hangers: Standard, SBE, I, BSD, BSDI fastened with threaded nails it has been documented by tests that this eccentricity term can be disregarded.
$e_{H,F}$	Distance of the lateral force above the centre of gravity of the nails in the header
$F_{Ax,nail}$	Axial force of the nails per flange (N)
$F_{Ax,Rk,header}$	Characteristic withdrawal capacity of each nail in the header beam (N)
$f_{c,90,k}$	Characteristic compression strength perpendicular to the grain of joist or header material (MPa)
$f_{c,90,k*}$	Local compressive strength perpendicular to the grain of joist or header material (MPa)
$F_c$	Load contributions from contact pressure at top corner of header beam
$F_r$	Load contributions from rope effect
$F_{Hanger-Header}$	Load transfer from the joist hanger to the header beam per flange (N)
$F_{Joist-Hanger}$	Load transfer from the joist to hanger per flange (N)
$F_{Lat,nail}$	Lateral force of the nails per flange (N)
$F_{hanger,Tension}$	Tensile capacity of the lower part of the joist hanger per flange (N)
$f_u$	Tensile strength of hanger steel (MPa)
$F_{v,RK,header}$	Characteristic lateral load carrying capacity of each of the nails in the header beam (N)
$F_{v,Rk,joist}$	Characteristic lateral load-carrying capacity of each of the nails in the joist member (N)
$h$	Height of the joist

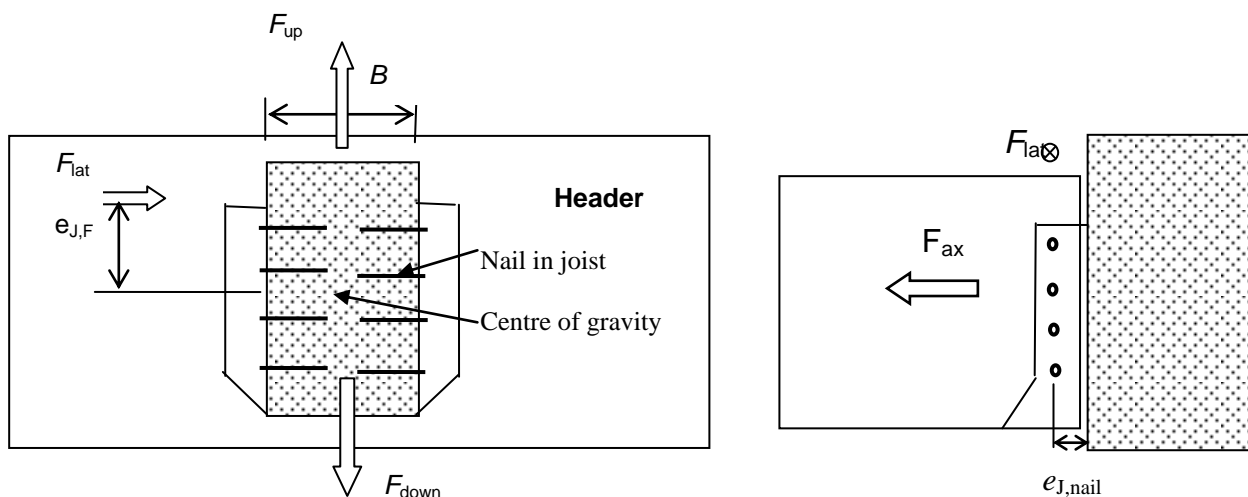
$H^*$	Maximum vertical distance between the nails in header
$h_e$	Effective height = distance from upper nail to the bottom plate
$I_{p,H}$	Polar moment of inertia of the whole nail group in the header
$I_{p,nail}$	Polar moment of inertia of the whole nail group in the joist
$I_{p,fl}$	Polar moment of inertia around the centre of gravity of the nail group in one header flange
$k_{c,90}$	Increase factor from EN 1995-1-1 = 2.5
$k_{ef}$	Rope effect efficiency factor $k_{ef} = 0.8$ if $b = 100$ mm for a larger width, $k_{ef}$ is linearly decreasing : $k_{ef} = 1 - 0.002 \cdot b$ with $b$ in mm
$k_{H,1}$	Form factor
$k_{H,2}$	Form factor
$l$	Top flap width (mm)
$l_{eff}$	Effective compressive width of top flap (mm)
$n_b$	Number of bolts for joist hangers SBG and SBE, use: $n_{ef,b}$
$n_J$	Total number of nails in both sides of the joist
$n_H$	Total number of nails in the side of the header
$n_{H,b}$	Number of nails in the header in the first row close to the bending line of the side flange.
$n_{ef,b}$	Effective number of bolts = 2,0 with 2 bolts in the SBG hanger = 3,2 with 4 bolts in the SBG hanger
$n_{J,eff}$	Effective number of nails in the joist $\left[ \text{round down} \left( \frac{n_J}{2} \right) \right] \times 2$
$n_{eff,ax}$	Number of effective nail per flange (face-fixed hangers)
$n_{h, side nail}$	Number of nails in the side of the header beam per flange
$n_{h, top nail}$	Number of nails in the top of the header beam per flange
$n_{j,side}$	Number of nails in the side of the joist per flange
$n_{nail,backer}$	Number of nails required for fixing backer blocks to the I-joist web
$n_{skew nail}$	Number of skew nails in double shear per flange
$n_{top flange}$	Number of nails in the header beam top into the top flange of an I-beam
$n_{web}$	Number of nails in the header beam side into the web of an I-beam
$R_{ax,k}$	Characteristic axial load-carrying capacity of the nails in the joist or in the header indicated by the indices J or H
$R_{lat,k}$	Characteristic lateral load-carrying capacity of the nails in the joist or in the header indicated by the indices J or H

$R_{\text{bolt,lat,k}}$	<p>Characteristic lateral capacity of the anchor bolt, however, for a thickness till 2,0 mm and an anchor size of:</p> <ul style="list-style-type: none"><li>- M10 maximum 11,0 kN</li><li>- M8 maximum 8,8 kN</li></ul> <p>For larger thicknesses, the capacity shall be the maximum of:</p> <ul style="list-style-type: none"><li>- 11,0 kN / 2,0 mm x thickness for an anchor size of M10 and accordingly</li><li>- 8,8 kN / 2,0 mm x thickness for an anchor size of M8</li></ul> <p>- divergent for type SBE, SBG and SLE: for downward and upward force: <math>R_{\text{bolt,lat,k}} \leq 7,1 \text{ kN}</math> for lateral force: <math>R_{\text{bolt,lat,k}} \leq 12,0 \text{ kN}</math></p> <p>- divergent for type SDED/G: for downward and upward force: <math>R_{\text{bolt,lat,k}} \leq 9,51 \text{ kN}</math></p> <p>- or the characteristic lateral load-carrying capacity of the anchor bolt in the material to which it is fastened</p>
$S$	Critical width (mm)
$SCL$	Structural composite timber i.e. LVL
$t_p$	Steel plate thickness (mm)
$W$	Width of the bottom of the joist hanger (mm)
$W^*$	Maximum horizontal distance between the nails in header
$y_{\text{max}}$	Maximum distance from a nail to the centre of gravity
$z_{\text{max}}$	Distance from upper bolts to bottom plate or by uplift force the distance from the lower bolt to the top of joist hanger
$\rho_k$	Characteristic density of header or joist material ( $\text{kg/m}^3$ )

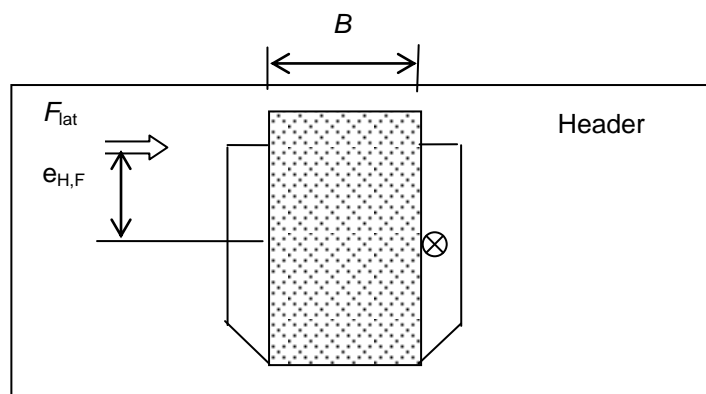
## C1 Definition of Force Directions and Eccentricity

It is assumed that the forces acting on the joist hanger connection are the following  $F_{down}$ ,  $F_{up}$ ,  $F_{lat}$  and  $F_{ax}$ , as shown in the figure below. The forces  $F_{up}$ ,  $F_{down}$  and  $F_{ax}$  shall act in the middle of the joist hanger. The force  $F_{lat}$  is assumed to act  $e_{j,F}$  above the centre of gravity of the nails in the joist. It is assumed that the forces are acting right at the end of the joist.

Illustrations showing the position of the centre of gravity:



**Figure 1:** Definition of  $F_{down}$ ,  $F_{up}$ ,  $F_{lat}$ ,  $F_{ax}$ ,  $e_{j,F}$  and  $e_{j,nail}$



**Figure 2:** The lateral force acts with an eccentricity  $e_{H,F}$  in relation to the centre of gravity of the header nails in one flange - marked by  $\otimes$  - in the compressed side.

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%.

## **C2 Characteristic Capacity Modification Methods**

Capacities expressed as numbers (not formulas) e.g. type SAMI and JHR/L are based on a characteristic density of 350 kg/m<sup>3</sup>. For timber or wood based material with a lower density than 350 kg/m<sup>3</sup> the load carrying capacities shall be reduced by the  $K_{\text{dens}}$  factor:

$$K_{\text{dens}} = (\rho_k / 350)^2$$

where  $\rho_k$  is the characteristic density of the timber

## C3 Fastener Specification and Capacities

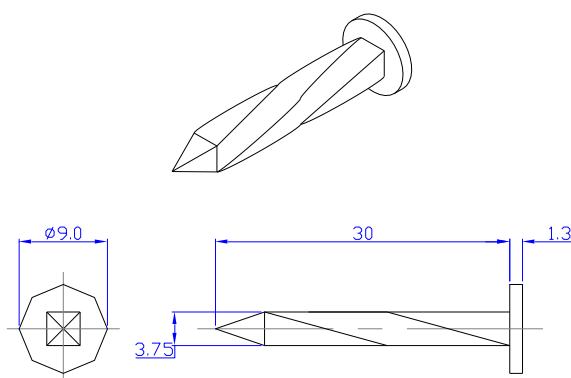
### Fastener types and sizes

NAILS diameter	Length Min – max	Nail type
4.0	35 - 100	Connector nails in accordance with ETA-04/0013
4.2	35 - 60	Connector nails in accordance with ETA-04/0013
3.1	35	Ring shank nails according to EN 14592
4.0	35 - 100	Ring shank nails according to EN 14592
3.75	30 - 32	SST Square Twist nails according to EN 14592
3.75	38 - 75	Round smooth nails according to EN 14592
4.0 – 4.5	35 - 100	Round smooth nails according to EN 14592

SCREW diameter	Length Min – max	Screw type
5.0	35 - 50	Connector screws in accordance with ETA-04/0013
¼	3 ½	Coach screws according to EN 14592
¼	2 ½	Coach screws according to EN 14592

BOLTS diameter	Correspondence Holes diameter	Bolts type
8.0	Max. 2 mm. larger than the bolt diameter	See specification of the manufacturer
10.0		
12.0		

### *SST Square Twist Nail*



#### UNLESS OTHERWISE NOTED:

1. NO BURRS GREATER THAN 0.3MM
2. ALL DIMENSIONS:  $\pm 1.0$ MM
3. ALL ANGLES:  $\pm 1^\circ$
4. ALL BEND RADII: 1T
5. MATERIAL MILD STEEL
6. FINISH: : HOT DIP GALVANISED

## Typical Hanger and Nail Type Combinations

Face Mount Hanger	Type	Nails diameter	Length Min - Max	Nailing	Bolt Possible
BSN, BSI, BSIL, BSS, JHL/JHR, GSE, GSE-AL, GSI, GSI-AL, GSEXL, MF, GLE, GLI, SBE, SBG, SDED/G, SLE, SAE, SAEL, SAI, SAIL, SAIX, BSD, BSDI	ARS*	4.0	35 - 100	Full / Partial	BSN, GSE, GSI, GSE-AL, GSI-AL, GSEXL, GLE, GLI, SBE, SBG, SDED/G, SLE, SAE, SAEL, SAIX, BSD, BSDI: M8- M12
	ARS*	4.2	35 - 60		
	ST**	3.75	30		
	SS***	4.0 - 4.5	35 - 100		
	Screw	5.0	35 - 50		
HGUS, Spec HGUS	SS***	3.75	75	Full	
	SS***	4.0	90 - 100		
	ARS*	4.0	60		
HGUQ	Screw	¼ (inch)	3 ½ (inch)	Full	
	Screw	¼ (inch)	2 ½ (inch)		
MH	ST**	3.75	30	Full	
MF	ARS*	4.0	35 - 100	Full	M10
	ARS*	4.2	35 - 60		
	Screw	5.0	35 - 50		
LUP	ST**	3.75	30	Full	
ETC, ETCG/D	ARS*	4.0	35 - 100	Other	M12
	Screw	5.0	35 - 50		
JHA270, JHA450, THA, THAI	ST**	3.75	30	Other	
	ARS*	4.0	60 - 100		
AG703	ARS*	3.1	35	Other	
	ST**	3.75	30		
AG713	ARS*	4.0	50	Other	

\*ARS: Annular Ring Shank nail

\*\*ST: Square Twist nail

\*\*\*SS: Smooth Shank nail

The general model is given here after. It shall be used with the relevant specific form factors  $k_{H,1}$  and  $k_{H,2}$  given in Annex D for each type of face mount hangers



Hanger Type	Installation Configuration		Supporting Timber Fasteners								Supported Timber Fasteners				
			3.75 x 30 ST		3.75 x 75 SS		3.1 x 35 ARS		4.0 x 50 ARS		3.75 x 30 ST	3.8 x 38 SS	3.75 x 75 SS	3.1 x 35 ARS	4.0 x 50 ARS
			Top	Face	Top	Face	Top	Face	Top	Face					
JHA270	Std	FF	-	20	-	-	-	-	-	-	4	-	-	-	-
		WO	4	8	-	-	-	-	-	-	4	-	-	-	-
	Std	FF	-	20	-	-	-	-	-	-	-	-	4	-	-
		WO	4	8	-	-	-	-	-	-	-	-	4	-	-
JHA450	Std	FF	-	20	-	-	-	-	-	-	6	-	-	-	-
		WO	4	8	-	-	-	-	-	-	6	-	-	-	-
	Std	FF	-	20	-	-	-	-	-	-	-	-	6	-	-
		WO	4	8	-	-	-	-	-	-	-	-	6	-	-
	Und	FF	-	20	-	-	-	-	-	-	6	-	-	-	-
		WO	4	4	-	-	-	-	-	-	6	-	-	-	-
THA	Std	FF	-	20	-	-	-	-	-	-	6	-	-	-	-
		WO	4	8	-	-	-	-	-	-	6	-	-	-	-
		FF	-	20	-	-	-	-	-	-	-	-	6	-	-
		WO	4	8	-	-	-	-	-	-	-	-	6	-	-
THAI	Std	FF	-	-	-	20	-	-	-	-	-	-	-	-	-
		WO	-	-	-	-	-	-	-	20	-	2	-	-	-
	Std	WO	-	-	4	2	-	-	-	-	2	-	-	-	-
		FF	-	-	-	-	-	-	4	2	-	2	-	-	-
THAI-2	Std	FF	-	-	-	20	-	-	-	-	2	-	-	-	-
		WO	-	-	-	-	-	-	-	20	-	2	-	-	-
	Std	WO	-	-	4	2	-	-	-	-	2	-	-	-	-
		FF	-	-	-	-	-	-	4	2	-	2	-	-	-
AG703	Std	FF	-	-	-	-	-	16	-	-	-	-	-	4	-
		WO	-	-	-	-	4	2	-	-	-	-	-	4	-
AG713	Std	FF	-	-	-	-	-	-	-	20	-	-	-	-	4
		WO	-	-	-	-	-	-	4	2	-	-	-	-	4

**Notes:**

- Std refers to a standard installation where the joist sits level with the header
- Und refers to a under slung installation where the joist sits lower than the header
- FF refers to a face fix installation
- WO refers to a wrap over installation
- 20 refers to the quantity of fasteners to be installed

The hanger and nail type combinations in the table are typical, but other combinations may also be proven suitable, subject to following the design model in Annex C4 of this document.

## Nail Capacity Tables

### Capacities of 3.75 x 30 mm Square Twist Nails

Nail Reference	Nail Shape	Side Length or Diameter (mm)	Nail Length (mm)	Wire Tensile Strength (Mpa)	Plate Thickness (mm)	Timber Grade	Timber Char. Density (kg/m <sup>3</sup> )	F <sub>ax,RK</sub> (N)	F <sub>v,RK</sub> (N)
3.75 x 30 ST	S	3.4	30	600	0.9	C16	310	190	882
						C18	320	203	907
						C20	330	215	931
						C22	340	229	956
						C24	350	242	981
						C27	370	271	1031
						C30	380	286	1056
SCL	420	349	1156						
3.75 x 30 ST	S	3.4	30	600	1.2	C16	310	188	876
						C18	320	201	900
						C20	330	213	925
						C22	340	226	949
						C24	350	240	974
						C27	370	268	1023
						C30	380	283	1048
SCL	420	345	1147						
3.75 x 30 ST	S	3.4	30	600	1.5	C16	310	186	870
						C18	320	198	894
						C20	330	211	918
						C22	340	224	942
						C24	350	237	967
						C27	370	265	1015
						C30	380	280	1040
SCL	420	342	1138						
3.75 x 30 ST	S	3.4	30	600	2.0	C16	310	183	860
						C18	320	195	883
						C20	330	207	907
						C22	340	220	931
						C24	350	233	955
						C27	370	261	1003
						C30	380	275	1027
SCL	420	336	1123						

*Capacities of 3.75 x 38 mm Round Wire Nails*

Nail Reference	Nail Shape	Side Length or Diameter (mm)	Nail Length (mm)	Wire Tensile Strength (Mpa)	Plate Thickness (mm)	Timber Grade	Timber Char. Density (kg/m <sup>3</sup> )	F <sub>ax,RK</sub> (N)	F <sub>v,RK</sub> (N)
3.75 x 38 SS	R	3.75	38	600	0.9	C16	310	267	1105
						C18	320	285	1139
						C20	330	303	1172
						C22	340	322	1206
						C24	350	341	1240
						C27	370	381	1307
						C30	380	402	1341
SCL	420	491	1461						
3.75 x 38 SS	R	3.75	38	600	1.2	C16	310	265	1098
						C18	320	283	1131
						C20	330	301	1165
						C22	340	319	1198
						C24	350	338	1231
						C27	370	378	1299
						C30	380	399	1332
SCL	420	487	1456						
3.75 x 38 SS	R	3.75	38	600	1.5	C16	310	263	1091
						C18	320	280	1124
						C20	330	298	1157
						C22	340	316	1190
						C24	350	335	1223
						C27	370	375	1290
						C30	380	395	1323
SCL	420	483	1450						
3.75 x 38 SS	R	3.75	38	600	2.0	C16	310	259	1079
						C18	320	276	1111
						C20	330	294	1144
						C22	340	312	1176
						C24	350	331	1209
						C27	370	370	1275
						C30	380	390	1308
SCL	420	476	1440						

**Capacities of 3.75 x 75 mm Round Wire Nails**

Nail Reference	Nail Shape	Side Length or Diameter (mm)	Nail Length (mm)	Wire Tensile Strength (Mpa)	Plate Thickness (mm)	Timber Grade	Timber Char. Density (kg/m <sup>3</sup> )	F <sub>ax,RK</sub> (N)	F <sub>v,RK</sub> (N)
3.75 x 75 SS	R	3.75	75	600	0.9	C16	310	534	1309
						C18	320	569	1337
						C20	330	605	1364
						C22	340	642	1392
						C24	350	681	1420
						C27	370	761	1475
						C30	380	803	1502
SCL	420	980	1614						
3.75 x 75 SS	R	3.75	75	600	1.2	C16	310	532	1309
						C18	320	567	1336
						C20	330	603	1364
						C22	340	640	1391
						C24	350	678	1419
						C27	370	758	1474
						C30	380	799	1502
SCL	420	976	1613						
3.75 x 75 SS	R	3.75	75	600	1.5	C16	310	530	1308
						C18	320	564	1336
						C20	330	600	1363
						C22	340	637	1391
						C24	350	675	1418
						C27	370	755	1473
						C30	380	796	1501
SCL	420	972	1612						
3.75 x 75 SS	R	3.75	75	600	2.0	C16	310	526	1307
						C18	320	561	1335
						C20	330	596	1362
						C22	340	633	1390
						C24	350	671	1417
						C27	370	750	1472
						C30	380	791	1499
SCL	420	966	1610						

**Capacities of 3.1 x 35 mm Ring Shank Nails according to Eurocode 5 for AG703 installation**

Nail reference	Nail shape	Side length or Diameter (mm)	Nail length h (mm)	Wire tensile Strength (Mpa)	Plate thickness (mm)	Timber Grade	Timber Char. Density (kg/m <sup>3</sup> )	F <sub>ax,RK</sub> (N)	F <sub>v,RK</sub> (N)
3.1 x 35 ARS	ARS	3,1	35	600	1,2	C16	310	473	1043
						C18	320	473	1069
						C20	330	473	1094
						C22	340	473	1119
						C24	350	473	1145
						C27	370	473	1196
						C30	380	473	1221
SCL	420	473	1290						

**Capacities of 4.00 x 50mm Annular Ring Shank Wire Nails**

Nail Reference	Nail Shape	Side Length or Diameter (mm)	Nail Length (mm)	Wire Tensile Strength (Mpa)	Plate Thickness (mm)	Timber Grade	Timber Char. Density (kg/m <sup>3</sup> )	F <sub>ax,RK</sub> (N)	F <sub>v,RK</sub> (N)
4.00 x 50 ARS	ARS	4.00	50	600	0.9	C16	310	924	1315
						C18	320	985	1347
						C20	330	1048	1380
						C22	340	1112	1413
						C24	350	1178	1446
						C27	370	1247	1479
						C30	380	1389	1547
4.00 x 50 ARS	ARS	4.00	50	600	1.2	C16	310	919	1309
						C18	320	979	1346
						C20	330	1041	1378
						C22	340	1105	1411
						C24	350	1171	1444
						C27	370	1239	1477
						C30	380	1381	1545
4.00 x 50 ARS	ARS	4.00	50	600	1.5	C16	310	913	1301
						C18	320	973	1343
						C20	330	1035	1377
						C22	340	1098	1409
						C24	350	1164	1442
						C27	370	1231	1475
						C30	380	1372	1543
4.00 x 50 ARS	ARS	4.00	50	600	2.0	C16	310	904	1288
						C18	320	963	1330
						C20	330	1024	1371
						C22	340	1087	1407
						C24	350	1152	1349
						C27	370	1219	1472
						C30	380	1358	1539
SCL	420	1659	1676						

**Capacities of 4.00 x 50mm Annular Ring Shank Nails according to ETA-04/0013 for AG713 installation**

Nail reference	Nail shape	Side length or Diameter (mm)	Nail length (mm)	Wire tensile Strength (Mpa)	Plate thickness (mm)	Timber Grade	Timber Char. Density (kg/m <sup>3</sup> )	F <sub>ax,RK</sub> (N)	F <sub>v,RK</sub> (N)
4.0 x 50 ARS	ARS	4,0	50	600	1,5	C16	310	1085	2183
						C18	320	1120	2229
						C20	330	1155	2274
						C22	340	1190	2319
						C24	350	1225	2363
						C27	370	1295	2451
						C30	380	1330	2495
SCL	420	1470	2666						

## **C4 Design Formula where appropriate**

### **C4.1 Joist hangers type BSN, BSD, BSI, BSDI, SAE, SAEL, SBE, SAI, SAIL, SAIX, SBG, SLE, SDED/G**

#### **Characteristic capacities of the joist hanger connections with nails or screws only.**

The downward and the upward directed forces are assumed to act in the middle of the joist. The lateral force is assumed to act at an distance  $e_{J,F}$  above the centre of gravity of the nails in the joist.

The connection is also allowed for connection to column, where the distance between nails perpendicular to grain is minimum 20mm.

Two nails patterns are specified. A full nailing pattern, where there are nails in all the holes. A partial nailing pattern, where the number of nails in the joist and the header are at least half the numbers specified for full nailing. The nails in the joist may be staggered and there shall always be a nail in the upper and the lower holes. The other nails are distributed evenly over the height. The nails in the header shall be put in the holes closest to the bend line.

For joist hanger BSN, BSD, BSI, SBG and BSDI the width of the joist shall be at least  $l+4d$ , where  $l$  is the length of the nails and  $d$  is the diameter of the nails in the joist, for full nailing and partial nailing without staggering the nails in the joist. For partial nailing with staggered nails in the joist the width shall be at least the penetration length of the nails.

For joist hanger SAE, SAEL, SBE, SAIL and SAIX the width of the joist shall be at least the penetration length of the nails.

The following Table summarizes the formulas to be used for the calculation of the various face mount hangers characteristic load-carrying capacities covered by the present ETA. Where no value is stated, no capacity is declared by formula. Some capacities are determined by tests only, see Annex D (marked in the table by <sup>1)</sup>)

Hanger type	Threaded nails, screws and smooth nails*				Bolts				Smooth and Square twist nails 3.75x30mm	
	Force direction				Force direction				Force direction	
	Downward	Upward	Lateral	Axial	Downward	Upward	Lateral	Axial	Downward	Upward
BSN	Eq1	Eq3	Eq6 & Eq7	-	Eq19	Eq23	Eq27 & Eq28 & Eq29	-	Eq13	Eq14
BSI	Eq1	Eq3	Eq6 & Eq7	-	Eq19	Eq23	Eq27 & Eq28 & Eq29	-	Eq13	Eq14
BSD	Eq1	Eq3	Eq6 & Eq7	-	Eq19	Eq23	Eq27 & Eq28 & Eq29	-	Eq13	Eq14
BSDI	Eq1	Eq3	Eq6 & Eq7	-	Eq19	Eq23	Eq27 & Eq28 & Eq29	-	Eq13	Eq14
SAE/SAEL	Eq1	Eq3	Eq6 & Eq7	Eq12	Eq19	Eq23	Eq27 & Eq28 & Eq29	Eq30	Eq13 <sup>1)</sup>	Eq14
SAI/SAIL	Eq1	Eq3	Eq6 & Eq7	Eq12	Eq19	Eq23	Eq27 & Eq28 & Eq29	Eq30	Eq13 <sup>1)</sup>	Eq14
SAIX	Eq1	Eq3	Eq6 & Eq7	Eq12	Eq19	Eq23	Eq27 & Eq28 & Eq29	Eq30	-	-
SBG	Eq1	Eq4	Eq8	Eq12	Eq19 & Eq21 & Eq22	Eq24 & Eq26	Eq27 & Eq28 & Eq29	Eq30	-	-
SBE	Eq1	Eq4	Eq8	Eq12	Eq19 & Eq21 & Eq22	Eq24 & Eq26	Eq27 & Eq28 & Eq29	Eq30	-	-
SLE	Eq1	Eq4	Eq8	Eq12	Eq19 & Eq21 & Eq22	Eq24 & Eq26	Eq27 & Eq28 & Eq29	Eq30	-	-
SDED/G	Eq2	Eq5	Eq11	-	Eq20	Eq26	-	-	-	-
BSN2P	Eq2	Eq5	Eq11	-	Eq20	Eq26	-	-	-	-

\* Smooth nails should be longer than 75 mm

<sup>1)</sup> Capacities determined by test only, see Annex D.

**C4.1.1 Joist hangers with outward or inward flaps and fastened with nails or screws****C4.1.1.1 Threaded nails or screws**

This clause covers both the use of threaded nails and screws.

**► DOWNWARD force toward the bottom plate:**

- For Joist Hangers type BSN, BSD, BSI, BSDI, SAE, SAEL, SBE, SAI, SAIL, SAIX, SBG, SLE

$$R_{Down,k} = \min \left\{ (n_J + 2) \cdot R_{lat,J,k}; \frac{1}{\sqrt{\left(\frac{1}{n_H R_{lat,H,k}}\right)^2 + \left(\frac{1}{k_{H,1} R_{ax,H,k}}\right)^2}} \right\} \quad \text{Eq 1.}$$

“SAE, SAEL and SAI download values with square twist nails can be found in annex D. When no value is given in this annex, values can be calculate using this equation”

- For SDED/G

$$R_{Down,k} = \min \left\{ (n_J) \cdot R_{lat,J,k}; \frac{1}{\sqrt{\left(\frac{1}{n_H R_{lat,H,k}}\right)^2 + \left(\frac{1}{k_{H,1} R_{ax,H,k}}\right)^2}} \right\} \quad \text{Eq 2.}$$

**► UPWARD force away from the bottom plate:**

- For the most joist hangers excepted for SBG, SLE, SBE and SDED/G

$$R_{Up,k} = \min \left\{ n_J \cdot R_{lat,J,k}; \frac{1}{\sqrt{\left(\frac{1}{n_H R_{lat,H,k}}\right)^2 + \left(\frac{1}{k_{H,2} R_{ax,H,k}}\right)^2}} \right\} \quad \text{Eq 3.}$$

- For SBG, SLE and SBE:

$$R_{up,k} = \min \left\{ n_J \cdot R_{lat,J,k}; \frac{1}{\sqrt{\left(\frac{1}{n_H R_{lat,H,k}}\right)^2 + \left(\frac{1}{k_{H,2} R_{ax,H,k}}\right)^2}}; 7B \sqrt{\frac{h_e}{1 - \frac{h_e}{h}}} \right\} \quad \text{Eq 4.}$$

- For SDED/G

$$R_{up,k} = \min \left\{ n_J \cdot R_{lat,J,k}; \frac{1}{\sqrt{\left(\frac{1}{n_H R_{lat,H,k}}\right)^2 + \left(\frac{1}{k_{H,2} R_{ax,H,k}}\right)^2}}; 14 \times 0,75 \times B \sqrt{\frac{h_e}{1 - \frac{h_e}{h}}} \right\} \quad \text{Eq 5.}$$



► **LATERAL force:**

- **For all joist hangers except SBG, SLE, SBE and SDED/G:**

The capacity from the nails in the joist

$$R_{lat,k} = \frac{n_J \cdot R_{lat,J,k}}{\sqrt{\left(\frac{2\sqrt{e_{J,F}^2 + e_{J,nail}^2}}{B}\right)^2 + \left(\frac{R_{lat,J,k}}{R_{ax,J,k}}\right)^2}} \quad \text{Eq 6.}$$

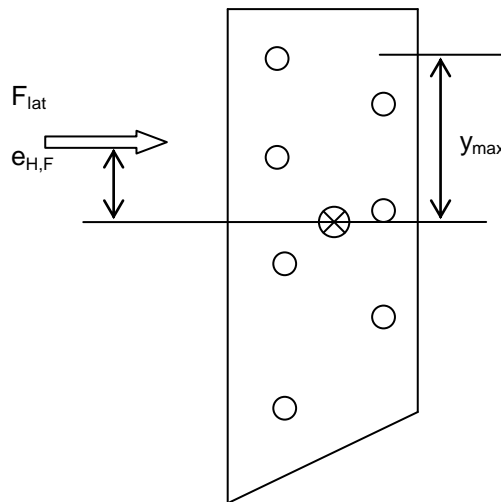
The capacity from the nails in the header

$$R_{lat,k} = \frac{R_{lat,H,k}}{\sqrt{\left(\frac{1}{n_H} + \frac{e_{H,F} \cdot H^*}{2I_{p,H}}\right)^2 + \left(\frac{e_{H,F} \cdot W^*}{2I_{p,H}}\right)^2}} \quad \text{Eq 7.}$$

The lateral capacity of the joist hanger is the minor of the capacity of the nails in the joist and the nails in the header.

- **For SBG, SLE and SBE:**

$$R_{lat} = \frac{1/2 n_H R_{lat,H,k}}{1 + \frac{n_H e_{H,F} y_{max}}{2I_{p,fl}}} = k_{lat} R_{lat,H,k} \quad \text{Eq 8.}$$



**Figure 3:** Vertical view of the compressed flange on the header

$$k_{lat} = \frac{n_H}{2 \times \left(1 + \frac{n_H \times e_{H,F} \times y_{max}}{2 \times I_{p,fl}}\right)} \quad \text{Eq 9.}$$

If full nailing of all holes in the header flange is applied a contribution from the nails in the other flange can be added to the value of the above formula. This term is:

$$R_{lat} = 1/2 n_J R_{ax,J,k} \quad \text{Eq 10.}$$

• For SDED/G

The capacity of the SDED/G is given by the formula:

$$R_{lat,K} = 1/2 \times (n_H \times R_{lat,H,K} + n_J \times R_{ax,H,K}) \times \left( -\frac{22}{9} \times 10^{-3} \times \text{Blank} + 1,636 \right) \times 0,65 \quad \text{Eq 11.}$$

► AXIAL force:

In some cases, a solicitation of the joist can be applied in the F3 direction. We can estimate the resistant capacity of the joist hanger by  $R_{ax}$ .

• For SAE, SAIX, SAI, SBE, SBG and SLE

$$R_{ax} = \min \begin{cases} n_{J,eff} \times R_{lat,J,k} \times "c" \\ n_{H,b} \times R_{ax,H} \end{cases} \quad \text{Eq 12.}$$

“c” = reducing factor for the nails in the joist is equal to 0,85.

All the models used are conservative and simple to use for other face fix hangers. Indeed the calibration of the model is made by changing the “c” factor value.

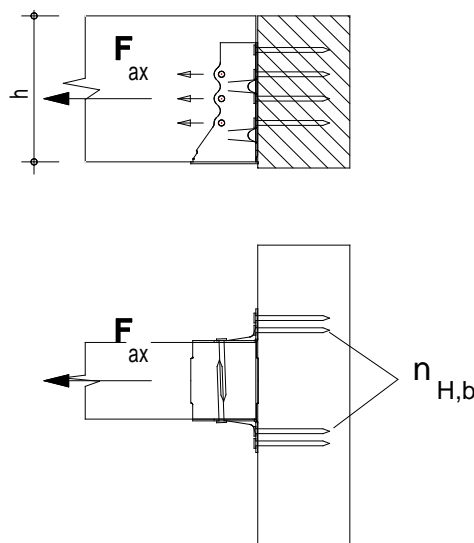


Figure 4: figure showing the axial solicitation in the F3 direction

**C4.1.1.2 Outward or inward flaps, Square twist nails or smooth round nails****► DOWNWARD force toward the bottom plate:**

$$R_{Down,k} = \min \left\{ n_{J,ef,1} \cdot R_{lat,J,k}; n_H \cdot R_{lat,H,k} \right\} \quad \text{Eq 13.}$$

where the following symbols, which have not been defined Annex C0 are:

$n_{J,ef,1}$  effective number of nails in the side of the joist

**► UPWARD force away from the bottom plate:**

$$R_{Down,k} = \min \left\{ n_{J,ef,2} \cdot R_{lat,J,k}; n_H \cdot R_{lat,H,k} \right\} \quad \text{Eq 14.}$$

where the following symbols, which have not been defined in Annex C0 are:

$n_{J,ef,2}$  effective number of nails in the side of the joist

**C4.1.1.3 Combined forces**

**C.4.1.1.3.1 - In case of combined forces shall the relevant of the following inequalities be fulfilled:**

$$\text{► DOWNWARD force:} \quad \left( \frac{F_{Down,d}}{R_{Down,d}} \right)^2 + \left( \frac{F_{lat,d}}{R_{lat,d}} \right)^2 \leq 1,0 \quad \text{Eq 15.}$$

$$\text{► UPWARD force:} \quad \left( \frac{F_{Up,d}}{R_{Up,d}} \right)^2 + \left( \frac{F_{lat,d}}{R_{lat,d}} \right)^2 \leq 1,0 \quad \text{Eq 16.}$$

**C.4.1.1.3.2 - In case of axial forces, , the relevant inequalities shall be fulfilled:**

$$\text{► DOWNWARD force:} \quad \left( \frac{F_{Down,d}}{R_{Down,d}} \right)^2 + \left( \frac{F_{lat,d}}{R_{lat,d}} \right)^2 + \left( \frac{F_{ax,d}}{R_{ax,d}} \right)^2 \leq 1,0 \quad \text{Eq 17.}$$

$$\text{► UPWARD force:} \quad \left( \frac{F_{Up,d}}{R_{Up,d}} \right)^2 + \left( \frac{F_{lat,d}}{R_{lat,d}} \right)^2 + \left( \frac{F_{ax,d}}{R_{ax,d}} \right)^2 \leq 1,0 \quad \text{Eq 18.}$$

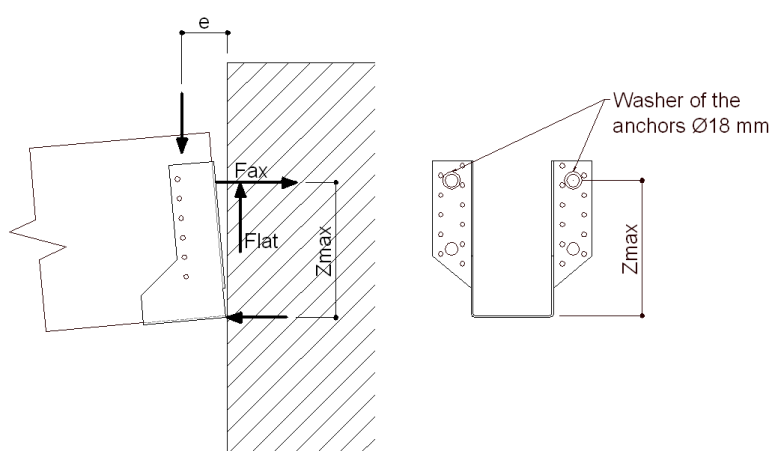
## C4.1.2 Characteristic capacities of the joist hanger connections with bolts

### C4.1.2.1 – General requirement

For joist hangers connected to a wall of concrete, lightweight concrete or to a steel member the assumptions for the calculation of the load-carrying capacity of the connection are:

- The Transfer of force from the joist to the joist hanger is as for a wood-wood connection.
- The bolts shall always be positioned symmetrically about the vertical axis of the joist hanger.
- For concrete, the bolts shall use washers recommended with the mechanical anchor delivery by the suppliers. Check it is a CE marked product with an ETA.
- For bolted application, washer  $\geq \text{Ø}18$  mm shall be installed under the upper bolt heads or nuts.

### C4.1.2.2 - Characteristic capacities of a bolted joist hanger connection



**Figure 5:** definition of  $Z_{\max}$  when a downward direction is applied on the concrete application

#### C4.1.2.2.1 – DOWNWARD force

For a **downward force** the formulas for the characteristic load-carrying capacity of the joist hanger connection are:

$$R_{Down,k} = \min \left[ (n_j + 2) \times R_{lat,j,k}; n_b \times R_{lat,b,k} \right] \quad \text{for all the joist hangers excepted SDED/G} \quad \text{Eq 19.}$$

$$R_{Down,k} = \min \left[ n_j \times R_{lat,j,k}, n_b \times R_{lat,b,k} \right] \quad \text{for SDED/G} \quad \text{Eq 20.}$$

For type SBE, SBG and SLE,  $n_b = n_{ef,b}$

It must be checked that the combination of lateral and axial forces in the anchor bolt can be carried by these forces.

$R_{lat,b,k}$  characteristic lateral load-carrying capacity of the anchor bolt.

$$R_{lat,b,d} = \frac{R_{down,d}}{n_b} \quad \text{Eq 21.}$$

$R_{ax,b,k}$  axial force in the anchor bolt

$$R_{ax,b,d} = \frac{F_{Down,d} \times e_{J,nail}}{2 \times Z_{max}} \quad \text{Eq 22.}$$

#### C4.1.2.2.2 – UPWARD force

For an **upward force**, the formula for the characteristic load-carrying capacity of the joist hanger connection is:

- for all the joist hangers excepted SDED/G, SBE, SBG and SLE

$$R_{up,k} = \min \left[ n_j \times R_{lat,j,k}; n_b \times R_{bolt,lat,k} \right] \quad \text{Eq 23.}$$

- for SBG, SBE and SLE  
the minimum of following formulas (Eq24 + Eq26):
- for SDED/G: Eq 26. must be used

If there is no reinforcing for splintering, the following formula is

$$\text{applied: } R_{up,k} = 7 \times B \times \sqrt{\frac{h_e}{1 - \frac{h_e}{h}}} \quad \text{Eq 24.}$$

For connection with 2 bolts for all joist hangers:

$$R_{Up,k} = \frac{1}{\sqrt{\left(\frac{1}{n_j}\right)^2 + \left(\frac{\frac{2}{3} e_{J,nail} \times e_{center,x}}{I_{p,nail}}\right)^2}} \times R_{lat,nail,k} \quad \text{Eq 25.}$$

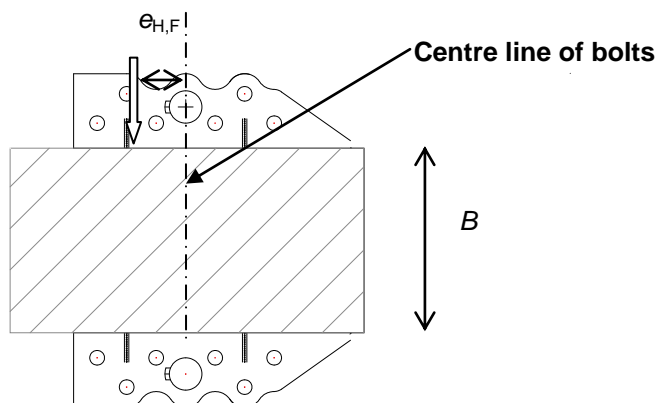
The force in the anchor bolts are calculated analogous from formula (**Eq 21.**) and (**Eq 22.**).

$$R_{Up,k} = \min \left\{ n_j \cdot R_{lat,J,k}; n_{ef,b} R_{bolt,lat,k} \right\} \quad \text{Eq 26.}$$

#### C4.1.2.2.3 – LATERAL capacity of the joist hanger with bolts

Different formulas are used for joist hangers with 2 or 4 anchor bolts into the supporting structure of for example concrete or steel.

► For connection timber to concrete with 2 bolts



**Figure 6.** Lateral force on a SBG joist hanger with 2 bolts.

The minimum value of the following formulas and also formula [Eq.6] for the characteristic lateral load-carrying capacity of the joist hanger connection applies to a joist hanger with 2 bolts.

For small eccentricities  $e_{H,F}$ :

$$R_{lat,k} = \frac{\frac{2R_{bolt,lat,k}}{R_{ax,J,k}^2} + \sqrt{\frac{4R_{bolt,lat,k}^2}{R_{ax,J,k}^4} - \left(4\frac{R_{bolt,lat,k}^2}{R_{ax,J,k}^2} - n_J^2\right) \left[\left(\frac{e_{H,F}}{BR_{lat,J,k}}\right)^2 + 1/R_{ax,J,k}^2\right]}}{2\left[\left(\frac{e_{H,F}}{BR_{lat,j,k}}\right)^2 + 1/R_{ax,J,k}^2\right]} \quad \text{Eq 27.}$$

For larger eccentricities  $e_{H,F}$ :

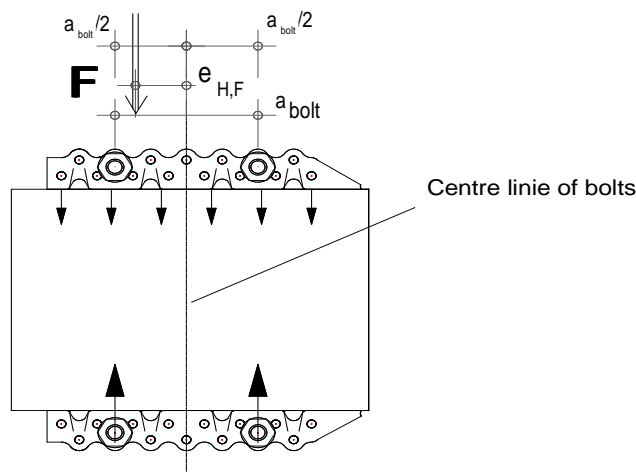
$$R_{lat,k} = \frac{1/2 B n_J R_{lat,J,k}}{e_{H,F}} \quad \text{Eq 28.}$$

where the symbols previously not defined are:

$e_{H,F}$  is the eccentricity of the lateral force in relation to the centre of the bolts in each flange. It shall be taken as the numerical value of the eccentricity

$R_{bolt,lat,k}$  characteristic lateral capacity of the anchor bolt - maximum 12,0 kN for SBG joist hanger. For the other joist hangers,  $R_{bolt,lat,k}$  is maximum 11,0 kN for an anchor size of M10 and for an anchor size of M8 it is maximum 8,8 kN. (See page 22)

► **For connection timber to concrete with 4 bolts**



**Figure 7:** Lateral force on a SBG joist hanger with 4 bolts.

For a lateral force the formula for the characteristic load-carrying capacity of the joist hanger connection with 4 Ø10 mm bolts is:

$$R_{lat,k} = \frac{a_{bolt} \times R_{bolt,lat,k}}{e_{H,F} + \frac{1}{2} a_{bolt}} + \frac{1}{2} n_J \times R_{ax,J,k} \quad \text{Eq 29.}$$

where the symbols are defined in the previous text, also the limitation on the characteristic lateral capacity of a 10 mm bolt.

**C4.1.2.2.4 – AXIAL capacity of the joist hanger with bolts**

In some cases, a solicitation of the joist can be applied in the F3 direction. We can estimate the resistant capacity of the joist hanger by  $R_{ax}$ .

- **For SAE, SAIX, SBE, SBG and SLE**

$$R_{ax} = \min \left\{ \begin{array}{l} n_J \times R_{lat,J,k} \times "c" \\ 2,5 \times n_{bolt} \end{array} \right. \quad \text{Eq 30.}$$

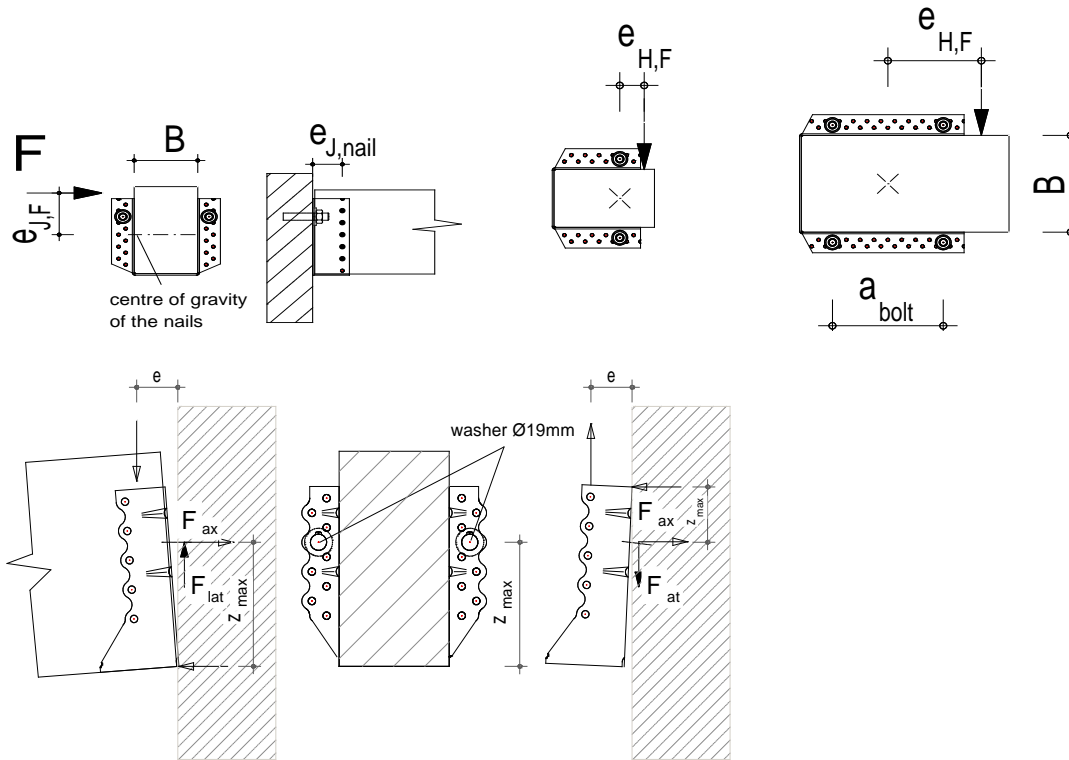
“c” = reducing factor for the nails in the joist is equal to 1.

For the type SBE and SBG and SLE:  $n_j = n_{J,ef}$

All the models used are conservative and simple to use for other face fix hangers. Indeed the calibration of the model is made by changing the “c” factor value.

It must be checked that the external diameter of the washer is at least twice the diameter of the anchor or the bolt.

► *Symbols used in this technical document*



**Figure 7**

**C4.1.2.4 Combination of forces**

For a combination of forces in the vertical direction and in the lateral direction the following inequalities shall be fulfilled.

Downward force  $F_{down}$  and lateral force  $F_{lat}$

$$\left( \frac{F_{down,d}}{R_{down,d}} \right)^2 + \left( \frac{F_{lat,d}}{R_{lat,d}} \right)^2 \leq 1,0 \quad \text{Eq 31.}$$

Upward force  $F_{up}$  and lateral force  $F_{lat}$

$$\left( \frac{F_{up,d}}{R_{up,d}} \right)^2 + \left( \frac{F_{lat,d}}{R_{lat,d}} \right)^2 \leq 1,0 \quad \text{Eq 32.}$$

**C4.1.2.5 - In case of axial forces, for SBE, SBG and SLE, the relevant inequalities shall be fulfilled:**

► **DOWNWARD force:** 
$$\left( \frac{F_{Down,d}}{R_{Down,d}} \right)^2 + \left( \frac{F_{lat,d}}{R_{lat,d}} \right)^2 + \left( \frac{F_{ax,d}}{R_{ax,d}} \right)^2 \leq 1,0 \quad \text{Eq 33.}$$

► **UPWARD force:** 
$$\left( \frac{F_{Up,d}}{R_{Up,d}} \right)^2 + \left( \frac{F_{lat,d}}{R_{lat,d}} \right)^2 + \left( \frac{F_{ax,d}}{R_{ax,d}} \right)^2 \leq 1,0 \quad \text{Eq 34.}$$



Factors  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  will be detailed in Annex D for each reference.

### **Form factor $k_{H,1}$ for downward force**

The form factor  $k_{H,1}$  is to be used for calculation of the load-carrying capacity of a wood-wood connection with threaded nails or screws subjected to a downward force towards the bottom plate.

Two nails patterns are specified. A full nailing pattern, where there are nails in all the holes. A partial nailing pattern, where the number of nails in the joist and the header are at least half the numbers specified for full nailing. The nails in the joist may be staggered and there shall always be a nail in the upper and the lower holes. The other nails are distributed evenly over the height. The nails in the header shall be put in the holes closest to the bend line or with a given nail pattern.

$n_H$ : total number of nails in the side of the header

$n_J$ : total number of nails in both sides of the joist

### **Form factor $k_{H,2}$ for upward force**

The form factor  $k_{H,2}$  is to be used for calculation of the load-carrying capacity of a wood-wood connection with threaded nails or screws subjected to an upward force away from the bottom plate.

Two nail patterns are specified:

- Full nailing pattern  
Nails in all holes in the joist hanger.
- Partial nailing pattern

The number of nails in the joist and the header has to be at least half the number specified for full nailing. In the header the nails shall be put into the holes closest to the bend line in the hanger or with a given nail pattern.. In the joist the nails may be staggered. The upper and lower holes always have to be nailed.

### **Effective number of nails $n_{J,ef,1}$ and $n_{J,ef,2}$ for joist hangers nailed with smooth round nails or square twist nails**

The effective number of nails  $n_{J,ef,1}$  and  $n_{J,ef,2}$  shall be used for calculation of the load-carrying capacity of a wood-wood connection with smooth round nails or square twist nails subjected to a downward force towards the bottom plate, respectively an upward force away from the bottom plate.

Two nail patterns are specified:

1. **Full nailing pattern:** Nails in all holes in the joist hanger.
2. **Partial nailing pattern:** The number of nails in the joist and the header has to be at least half the number specified for full nailing. In the header the nails shall be put into the holes closest to the bend line in the hanger. In the joist the nails may be staggered. The upper and lower holes always have to be nailed.

## C4.2 Joist hangers type BSIL, BSS, HGUS, GSE, GSE-AL, GSI, GSI-AL, GSEXL, MH, MF, LUP, GLE, GLI

### C4.2.1 Face mount hangers characteristic load-carrying capacities

The following Table summarizes the formulas to be used for the calculation of the various face mount hangers characteristic load-carrying capacities covered by the present ETA. Where no value is stated, no capacity is declared by formula. In this case, see Annex D for capacities determined by tests only.

Hanger type	Threaded nails, screws and smooth nails*				Bolts				Smooth and Square Twist nails 3,75 x 30 mm	
	Force direction				Force direction				Force direction	
	Downward	Upward	Lateral	Axial	Downward	Upward	Lateral	Axial	Downward	Upward
BSIL	Eq 35	Eq 36	Eq 37 & Eq 38	-	-	-	-	-	Eq 39	Eq 40
BSS	Eq 35	Eq 36	Eq 37 & Eq 38	-	Eq 48	-	-	-	Eq 39	Eq 40
HGUS	Eq 60	Eq 61	-	-	-	-	-	-	-	-
GSE GSE-AL	Eq 35	Eq 36	Eq 37 & Eq 38	Eq 43	Eq 48	Eq 49	Eq 50 & Eq 51 & Eq 52	Eq 53 & Eq 54	Eq 39	Eq 40
GSI GSI-AL	Eq 35	Eq 36	Eq 37 & Eq 38	Eq 43	-	-	-	-	Eq 39	Eq 40
GSEXL	-	-	-	-	Eq 48	Eq 49	Eq 51 & Eq 52	Eq 54	-	-
MH	-	-	-	-	-	-	-	-	5 kN	-
MF	Eq 62	Eq 63	-	-	Eq 48	-	-	-	-	-
LUP	Eq 35	Eq 36	Eq 37 & Eq 38	-	-	-	-	-	5,2 kN	-
GLE	Eq 55	Eq 56	Eq 37 & Eq 38	Eq 57	Eq 48	Eq 49	Eq 50 & Eq 51 & Eq 52	Eq 58 & Eq 59	-	-
GLI	Eq 55	Eq 56	Eq 37 & Eq 38	Eq 57	-	-	-	-	-	-

\* Smooth nails should be longer than 75 mm

### C4.2.2 Face mount hangers type BSIL, BSS, LUP, GSE, GSE-AL, GSI and GSI-AL fastened with nails or screws

#### C4.2.2.1 Case of threaded nails or screws

► DOWNWARD force toward the bottom plate:

$$R_{Down,k} = \min \left\{ c_1 \cdot (n_J + 2) \cdot R_{lat,J,k}; c_1 \cdot \frac{1}{\sqrt{\left(\frac{1}{n_H R_{lat,H,k}}\right)^2 + \left(\frac{1}{k_{H,1} R_{ax,H,k}}\right)^2}} \right\} \quad \text{Eq 35.}$$

For GSE, GSI, GSE-AL and GSI-AL :  $c_1 = 0.9$

For others:  $c_1 = 1$

► **UPWARD force toward the bottom plate:**

$$R_{Up,k} = \min \left\{ c_2 \cdot n_J \cdot R_{lat,J,k} ; c_2 \cdot \frac{1}{\sqrt{\left( \frac{1}{n_H R_{lat,H,k}} \right)^2 + \left( \frac{1}{k_{H,2} R_{ax,H,k}} \right)^2}} \right\} \quad \text{Eq 36.}$$

For GSE, GSI, GSE-AL and GSI-AL :  $c_2 = 0.8$

For others:  $c_2 = 1$

► **LATERAL force:**

The lateral capacity of the face mount hanger is the minor of the capacity of the nails in the joist and the nails in the header.

The capacity from the nails in the joist is :

$$R_{lat,k} = \frac{n_J \cdot R_{lat,J,k}}{\sqrt{\left( \frac{2\sqrt{e^2_{J,F} + e^2_{J,nail}}}{W} \right)^2 + \left( \frac{R_{lat,J,k}}{R_{ax,J,k}} \right)^2}} \quad \text{Eq 37.}$$

The capacity from the nails in the header is :

$$R_{lat,k} = \frac{R_{lat,H,k}}{\sqrt{\left( \frac{1}{n_H} + \frac{e_{H,F} \cdot H^*}{2 \cdot I_{p,H}} \right)^2 + \left( \frac{e_{H,F} \cdot W^*}{2 \cdot I_{p,H}} \right)^2}} \quad \text{Eq 38.}$$

**C4.2.2.2 Case of square twist nails or smooth round nails**

► **DOWNWARD force toward the bottom plate:**

$$R_{Down,k} = \min(n_{J,ef,1} \cdot R_{lat,J,k}; n_H \cdot R_{lat,H,k}) \quad \text{Eq 39.}$$

Where  $n_{J,ef,1}$  is the effective number of nails in the side of the joist.

► **UPWARD force toward the bottom plate:**

$$R_{Down,k} = \min(n_{J,ef,2} \cdot R_{lat,J,k}; n_H \cdot R_{lat,H,k}) \quad \text{Eq 40.}$$

Where  $n_{J,ef,2}$  is the effective number of nails in the side of the joist.

**C4.2.2.3 Case of combined forces (all screws and nails)**

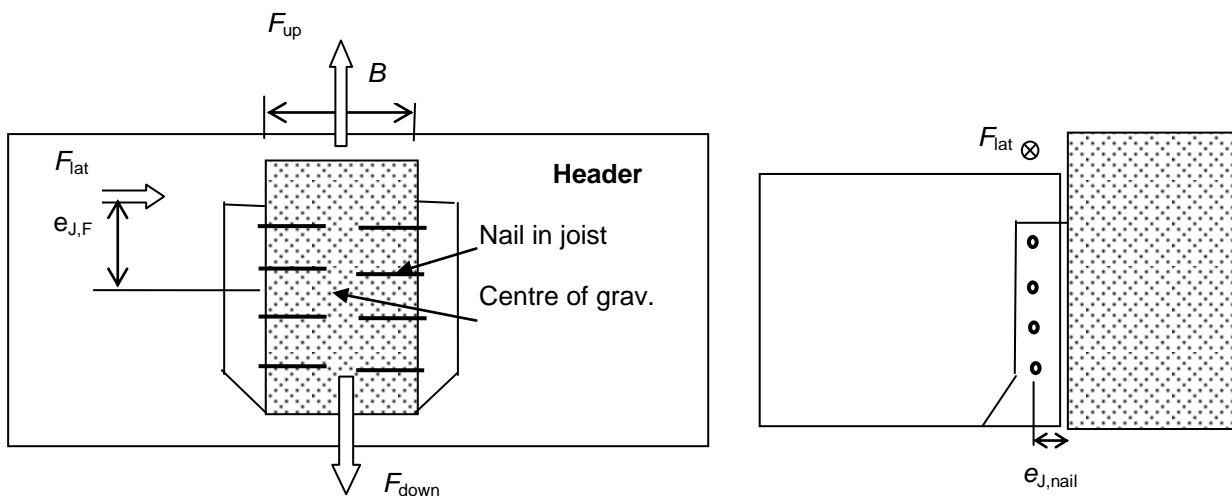
In case of combined forces, the relevant of the following inequalities shall be fulfilled:

► **DOWNWARD force toward the bottom plate:**

$$\left(\frac{F_{Down,d}}{R_{Down,d}}\right)^2 + \left(\frac{F_{lat,d}}{R_{lat,d}}\right)^2 \leq 1 \quad \text{Eq 41.}$$

► **UPWARD force toward the bottom plate:**

$$\left(\frac{F_{Up,d}}{R_{Up,d}}\right)^2 + \left(\frac{F_{lat,d}}{R_{lat,d}}\right)^2 \leq 1 \quad \text{Eq 42.}$$



**Figure 8**

### C4.2.3 Face mount hangers type GSE, GSE-AL, GSI and GSI-AL (all blank models) fastened with nails or screws

#### ► AXIAL force:

The tension resistance of the hangers is obtained comparing the resistance of the nails on the header with the nails on the joist.

$$F_{ax,k} = \min \{ n_{h,eff} \cdot R_{ax,k} ; n_j \cdot R_{lat,k} \} \quad \text{Eq 43.}$$

Where:

$n_{h,eff}$  is the number of efficient nails on the header

$R_{ax,k}$  is the axial resistance of the nail

$n_j$  is the number of nails on the header

$R_{lat,k}$  is the shear resistance of the nail

### C4.2.4 Face mount hangers type GSE, GSE-AL on concrete with bolts in the flap

#### C4.2.4.1 GSE or GSE-AL with blank model from 300 to 500

- This case is for face mount hangers connected to a wall of concrete or to a steel member.
- The bolts shall be positioned symmetrically about the vertical axis of the Face mount hanger.
- The nails in the joists are subjected to a lateral force, which is equally distributed over all nails or screws in the joist.
- The rotation point can be assumed to be positioned at the top of the bottom plate.
- The forces in the bolts are partly lateral forces, partly withdrawal forces.
- The lateral forces are distributed evenly over all bolts.
- The withdrawal forces are assumed to be taken by the 2 upper bolts with washers (30 x 30 x 3)
- The maximum withdrawal force in a upper bolt can be calculated as follows :

$$F_{ax,bolt} = \frac{F \cdot e}{2 \cdot z_{max}} \quad \text{Eq 44.}$$

Where:

F is the force directed downward toward the bottom plate.

E is the eccentricity: distance from the nail column in the joist to the surface of the header, concrete or steel.

$z_{max}$  is the maximum distance from upper bolt to the bottom plate (rotation point).

- The upper two bolts are subjected to a combination of lateral and withdrawal forces. The lateral force is determined assuming an even distribution of the downward force F:

$$F_{lat,bolt} = \frac{F}{n_{bolt}} \quad \text{Eq 45.}$$

Where:

F is the force directed downward toward the bottom plate.

$n_{bolt}$  is the total number of bolts in the joist face mount hanger.

- The characteristic capacity of the nail connection between the joist and the face mount hanger is calculated as follows:

$$R_{nail,k} = 0,9 \cdot (n_J + 2) \cdot R_{lat,J,k} \quad \text{for threaded nails and screws} \quad \text{Eq 46.}$$

The bearing resistance between the bolt and the plate of the face mount hanger is given by the following equation :

$$R_{bear,k} = n_{bolt} \cdot f_{u,k} \cdot d \cdot t \quad \text{Eq 47.}$$

Where:

- $n_{bolt}$  is the total number of bolts in the two flaps.
- $f_{u,k}$  is the characteristic ultimate tensile strength of the steel (330 N/mm<sup>2</sup>)
- $d$  is the diameter of the bolt
- $t$  is the thickness of the steel plate of the Face mount hanger

The characteristic load-carrying capacity of the face mount hanger connection is the minimum of :  
 The capacity determined from (Eq 46) for the nails in the joists.  
 The capacity determined from (Eq 47) for the embedding strength of the steel plate against the bolt.  
 The capacity controlled by the bolt forces given by (Eq 44) and (Eq 45).

#### C4.2.4.2 All GSEXL and GSE or GSE-AL with blank model from 540 to 1020

##### ► DOWNWARD force toward the bottom plate on concrete for all GSEXL and GSE or GSE-AL with blank model from 540 to 1020:

In order to calculate value of GSE and GSEXL on concrete we compared 4 failure modes and take the most disadvantageous one.

$$F_{down,Rk} = \min \{ F_{v,ST,Rk}; F_{Anet,Rk}; F_{v,sp,Rk}; F_{anchor,Rk} \} \quad \text{Eq 48.}$$

Where:

- $F_{v,ST,Rk}$  is the resistance of the steel to timber connection
- $F_{Anet,Rk}$  is the resistance of the cross section in tension.
- $F_{v,sp,Rk}$  is the resistance of the bolt to steel connection
- $F_{anchor,Rk}$  is the resistance of the anchor group

To find the design value,  $k_{mod}$  and  $\gamma_M$  must be applied on  $F_{down,Rk}$  even if the failure is due to a steel failure. Indeed, it will always be on the safe side.

#### **Failure mode: Steel to timber connection**

The support reaction of the joist causes lateral loading of the fasteners in the joist connection and compression perpendicular to the grain in the contact area between bottom plate and joist. By taking into account the contribution of the bottom plate and the plastic behaviour of the fasteners, the characteristic steel-to-timber load capacity is:

$$F_{v,ST,Rk} = n_f \cdot F_{v,f,Rk} + F_{c,Rk}$$

Where:

- $F_{v,f,Rk}$  is the characteristic load-carrying capacity of the fasteners in the joist
- $n_f$  is the number of fasteners in the joist
- $F_{c,Rk}$  is the load-carrying capacity of the bottom plate taking into account the compression of the timber perpendicular to the grain and expressed as follows:

$$F_{c,Rk} = 4 \sqrt{M_{y,Rk} \cdot b \cdot k_{c,90} \cdot f_{c,90,k}} \quad \text{with} \quad M_{y,Rk} = \frac{f_{u,k} \cdot b \cdot e^2}{4}$$

Where:

- $f_{u,k}$  is the characteristic tensile strength of the steel (N/mm<sup>2</sup>)

$b$  is the width of the plate (or the joist) (mm)

$k_{c,90}$  is a factor taking into account the concentrated load,  $k_{c,90} = 1,75$  (for GL24 and 1,5 for C24)

$e$  is the thickness of the steel (mm)

$f_{c,90}$  is the resistance in compression perpendicular to the grain of the joist (N/mm<sup>2</sup>)

### **Failure mode: Steel plate**

Depending on the thickness of the steel plate, the characteristic load capacity  $F_{v,sp,Rk}$  of the bolt-to-steel connection is designed according to EN 1993-1-8 (§3 table 3.4) for the 4 mm hanger and EN 1993-1-3 (§8.3 table 8.4) for the 2.5 mm hanger with the following modifications:

The tensile strength  $F_{Anet,Rk}$  of the area  $A_{net}$  is calculated assuming a contribution of an effective width which is the actual width + 60 mm for each side of the hanger. According to Eurocode 3, the total effective area is then:

$$A_{net,ef} = 2 \cdot (2 \cdot e_2 - d_0 + 60) \cdot t_{cor}$$

Then, the load bearing capacity of the joist hanger is then:

$$F_{v,Rk} = \min \{ F_{v,StT,Rk} ; F_{v,sp,Rk} \}$$

### **Failure mode: Anchor failure**

The last failure mode is the failure of anchor in shear. For this failure mode, it must be checked that the group of anchor can resist to the load. To check the group anchor, the ETAG001 Annex C must be used.

The forces in the anchors will be partly lateral forces, partly withdrawal forces. The lateral forces are distributed equally over all anchors:

$$F_{anchor,lat,Rk} = \frac{F_{v,Ed}}{n_{anchor}}$$

Where:

$F_{v,Ed}$  is downward directed force toward the bottom plate

$n_{anchor}$  is the number of anchors

The centre of rotation is assumed at the bottom plate of the joist hanger. The withdrawal forces are on the safe side assumed to be taken by the 2 upper anchors with washers. The maximum withdrawal force in an upper anchor can be calculated from:

$$F_{anchor,ax,Rk} = \frac{F_{v,Ed} \cdot e_{ecc}}{2 \cdot z_{max}}$$

Where:

$F_{v,Ed}$  is downward directed force toward the bottom plate

$e_{ecc}$  is the eccentricity defined as the distance from the nail column in the joist to the surface of the header

$z_{max}$  is the maximum distance from upper anchor to the bottom plate (rotation point)

### **► UPWARD force toward the bottom plate on concrete for all GSEXL and GSE or GSE-AL with blank model from 540 to 1020:**

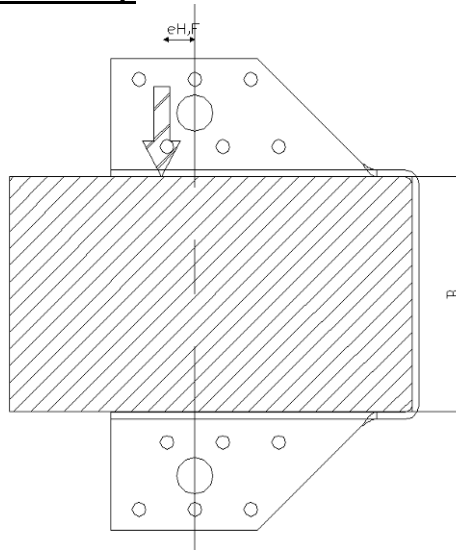
For uplift resistance, the same failure mode as in download are used, but without the resistance of the seat of the hangers. So the resistance of the hanger to an uplift force is calculated using the following formula:

$$F_{up,Rk} = \min \{ c \cdot F_{anchor,Rk} ; c \cdot n_f \cdot F_{v,f,Rk} ; c \cdot F_{v,Rk} ; F_{Anet,Rk} \} \quad c = 0.8 \quad \text{Eq 49.}$$

► **LATERAL force on concrete**  
**for all GSEXL, GSE and GSE-AL (all blank models):**

The characteristic values of the hanger in lateral cases are given by the following formula.

**GSE hanger with only one bolt hole in each flap:**



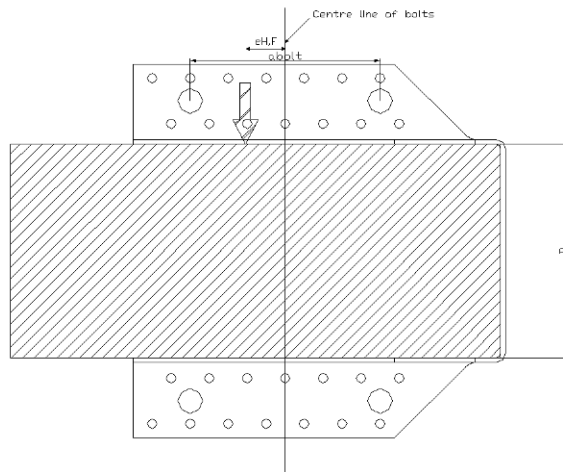
Provided the joist is prevented from rotation around its own axis, i.e. the force is acting right at the anchor bolts with  $e_{H,F} = 0$  mm the characteristic lateral load-carrying capacity of the joist hanger connection with 2 Ø12 mm bolts is:

$$R_{lat,k} = R_{bolt,lat,k}$$

**Eq 50.**

Where  $R_{bolt,lat,k}$  is the resistance of one anchor in shear

**GSE hanger with 2 x 2 holes:**



**Figure 9**

Provided the force is acting between the anchors bolts the characteristic lateral load-carrying capacity of the joist hanger connection with 4 Ø12 mm bolts is:

$$R_{lat,k} = \frac{a_{bolt}}{e_{H,F} + \frac{1}{2}a_{bolt}} R_{bolt,lat,k}$$

**Eq 51.**

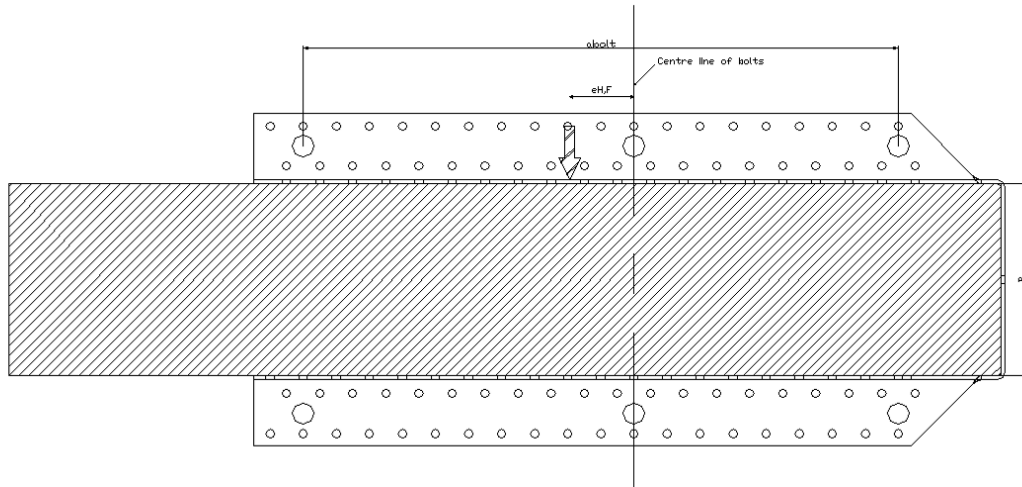
Where:

$a_{bolt}$  is the distance between the two extreme bolts

$e_{H,F}$  is the distance between application load and the centre line of the bolts



**GSE hanger with 2 x 3 holes:**



**Figure 10**

Provided the force is acting between the outer anchor bolts and the force is acting  $e_{H,F}$  from the middle anchor bolt the characteristic lateral load-carrying capacity of the joist hanger connection with 6 12 mm bolts is:

$$R_{lat,k} = \frac{R_{bolt,lat,k}}{1/3 + e_{H,F} / a_{bolt}} \quad \text{Eq 52.}$$

**C4.2.4.3 AXIAL force for GSEXL and GSE (all blank models) on concrete**

**2.5 mm thick joist hangers**

For 2.5mm thick GSE, the axial resistance is:

$$R_{ax,k} = \min \{ n_j \cdot R_{nail,lat,k}; 2,5 \cdot n_{bolt} \} \quad \text{Eq 53.}$$

Where:

$n_j$  is the number of nails in the joist

$R_{nail,lat,k}$  is the lateral capacity of the nails

$n_{bolt}$  is the number of bolt in the hanger

**4 mm thick joist hangers**

For 4 mm thick GSE, the axial resistance is:

$$R_{ax,k} = \min \{ n_j \cdot R_{nail,lat,k}; 6,5 \cdot n_{bolt} \cdot c \} \text{ with "c" = 0.8} \quad \text{Eq 54.}$$

## C4.2.5 GLE/GLI characteristic load-carrying capacities

### C4.2.5.1 GLE/GLI timber to timber

#### ► DOWNWARD force toward the bottom plate

$$R_{Down,k} = \min \left\{ n_j \cdot R_{lat,J,k}; \frac{1}{\sqrt{\left(\frac{1}{n_H R_{lat,H,k}}\right)^2 + \left(\frac{1}{k_{H,1} R_{ax,H,k}}\right)^2}} \right\} \quad \text{Eq 55.}$$

#### ► UPWARD force away from the bottom plate

$$R_{Down,k} = \min \left\{ c_1 \cdot n_j \cdot R_{lat,J,k}; \frac{1}{\sqrt{\left(\frac{1}{n_H R_{lat,H,k}}\right)^2 + \left(\frac{1}{k_{H,2} R_{ax,H,k}}\right)^2}} \right\} \quad \text{Eq 56.}$$

With:  $c_1 = 0.9$

#### ► LATERAL force

Same as GSE.- See Section C4.2.2.1

#### ► AXIAL force

$$R_k = \min \left\{ \begin{array}{l} n_{J,eff} \times R_{lat,J} \times "c" \\ n_{Hb} \times R_{ax,H} \end{array} \right. \quad "c" = 0,85 \text{ GLE2.5, GLI2.5, GLE4 and GLI4} \quad \text{Eq 57.}$$

### C4.2.5.2 GLE timber to concrete

#### GLE300-GLE340 - GLE380

Same as GSE – See section C4.2.4.1

#### Other GLE

Same as GSE – See section C4.2.4.2

► AXIAL force

**GLE2.5**

$$R_{ax,k} = \min \left\{ \begin{array}{l} n_j \times R_{lat,J} \\ 2,5 \times n_{bolt} \times "c" \end{array} \right. \quad "c" = 1 \quad \text{Eq 58.}$$

**GLE4**

$$R_{ax,k} = \min \left\{ \begin{array}{l} n_j \times R_{lat,J} \\ 6,5 \times n_{bolt} \times "c" \end{array} \right. \quad "c" = 0,8 \quad \text{Eq 59.}$$

**C4.2.6 HGUS characteristic load-carrying capacities****► DOWNWARD force toward the bottom plate**

$$R_{Down,k} = \min \left[ k_{ef} \cdot b \cdot D \cdot k_{c,90} \cdot f_{c,90,k} + n_J \cdot k_{J,ef} \cdot R_{lat,J,k}; \frac{1}{\sqrt{\left(\frac{1}{n_H \cdot R_{lat,H,k}}\right)^2 + \left(\frac{1}{k_{H1} \cdot R_{ax,H,k}}\right)^2}} \right] \quad \text{Eq 60.}$$

$k_{J,ef}$  are given in the following table:

Nail type and dimension	Reduction factor $k_{J,ef}$
Round smooth 3,75 x 75	0,6
Round smooth 4,0 x 90	0,6
ETA annular ring shank 4,0 x 60 according to ETA-04/0013	0,4

**► UPWARD force away from the bottom plate**

$$R_{Up,k} = \min \left[ n_J \cdot k_{J,ef} \cdot R_{lat,J,k}; \frac{1}{\sqrt{\left(\frac{1}{n_H \cdot R_{lat,H,k}}\right)^2 + \left(\frac{1}{k_{H2} \cdot R_{ax,H,k}}\right)^2}} \right] \quad \text{Eq 61.}$$

### C4.2.7 MF characteristic load-carrying capacities

► **DOWNWARD** force toward the bottom plate

$$R_{Down,k} = \min \left[ 4,2 \cdot R_{lat,J,k} ; \frac{1}{\sqrt{\left(\frac{1}{n_H \cdot R_{lat,H,k}}\right)^2 + \left(\frac{1}{k_{H1} \cdot R_{ax,H,k}}\right)^2}} \right] \quad \text{Eq 62.}$$

► **UPWARD** force away from the bottom plate

$$R_{Up,k} = \min \left[ 2,2 \cdot R_{lat,J,k} ; \frac{1}{\sqrt{\left(\frac{1}{n_H \cdot R_{lat,H,k}}\right)^2 + \left(\frac{1}{k_{H2} \cdot R_{ax,H,k}}\right)^2}} \right] \quad \text{Eq 63.}$$

## C4.3 Joist hangers type JHA, THA, THAI, AG703, AG713

### C4.3.1 Basis of Design

The design method detailed below for the JHA, THA, THAI, AG703 and AG713 joist hangers has been validated by calculation assisted by testing method as defined in ETAG 015 and substantiated by BM TRADA Certification as part of the ETA assessment process.

This method is applicable if the header beam is restrained from rotation.

The hanger characteristics needed to apply this method can be found in Annex D.

The designation of symbol is in Annex C0.

### C4.3.2 Nail Capacities

The nail capacities are given in Annex C3 and have been validated against hanger test data.

They have had an efficiency factor applied as part of the design method validation and are only for use in conjunction with this ETA and the hangers listed in it.

### C4.3.3 Hanger Characteristics

Hanger characteristics are given in Annex C4.

For hanger models not included in Annex C4, but within the scope of the ETA, reference should be made to the ETA holder for further information regarding the hanger characteristics.

### C4.3.4 Design – Vertical down load capacity

The load is transferred from the supported member (joist) to the supporting member (header) by:

- 1) Load transfer from the supported member to the hanger
- 2) Tension in the lower part of the hanger
- 3) Load transfer from the hanger to the supporting member.

Therefore, the capacity of the system is the minimum of the above three mechanisms:

$$F_{\text{tot}} = \text{Min} \begin{cases} F_{\text{Joist-Hanger}} \\ F_{\text{Hanger-Tension}} \\ F_{\text{Hanger-Header}} \end{cases} \quad \text{Eq 64.}$$

### C4.3.5 Load Transfer from Joist to Hanger (F<sub>Joist-Hanger</sub>)

The force between joist and hanger per flange ( $F_{\text{Joist-Hanger}}$ ) is:

$$F_{\text{Joist-Hanger}} = \frac{B_{\text{eff}} \times W \times f_{c,90,*}}{2} \quad \text{Eq 65.}$$

Where from Eurocode 5

$$f_{c,90,*} = k_{c,90,joist} \times f_{c,90,joist} \quad (k_{c,90,joist} = 1.5) \quad \text{Eq 66.}$$

When joists are installed with 75mm long skewed nails, a contribution from these nails can be added to  $F_{\text{Joist-Hanger}}$  to give:

$$F_{\text{Joist-Hanger}} = \frac{B_{\text{eff}} \times W \times f_{c,90,*}}{2} + \frac{n_{\text{skewnail}} \times F_{v,RK,joist}}{3} \quad \text{Eq 67.}$$

#### C4.3.6 Characteristic tensile capacity of the lower part of the joist hanger ( $F_{\text{Hanger,Tension}}$ )

The tensile capacity per flange  $F_{\text{Hanger,Tension}}$  is:

$$F_{\text{Hanger,Tension}} = \frac{S \times t_p \times f_u}{d} \quad \text{Eq 68.}$$

When joists are installed with 75mm long skewed nails, a contribution from the skewed nails can be added to  $F_{\text{Hanger,Tension}}$  to give:

$$F_{\text{Hanger,Tension}} = \frac{S \times t_p \times f_u}{d} + \frac{n_{\text{skewnail}} \times F_{v,RK,joist}}{3} \quad \text{Eq 69.}$$

$F_{\text{Hanger,Tension}}$  shall be reduced by 25% if the joist hanger is installed in an under slung installation.

#### C4.3.7 Load transfer from the hanger to the header – Face Fix Installation

When face-fixed, the force between header and hanger per flange is:

$$F_{\text{Hanger-Header}} = \text{Min} \left\{ \begin{array}{l} F_{\text{Lat,nail}} \\ F_{\text{Ax,nail}} \end{array} \right\} \quad \text{Eq 70.}$$

The vertical load is shared between the total numbers of nails per flange:

$$F_{\text{Lat,nail}} = n_{\text{h,sidenail}} \times F_{v,Rk,header} \quad \text{Eq 71.}$$

The axial force per flange in the nails is:

$$F_{\text{Ax,nail}} = \frac{F_{\text{Ax,Rk,header}} \times (a - 0.5a_c) \times n_{\text{eff,ax}}}{e} \quad \text{Eq 72.}$$

When joists are installed with 75mm long skewed nails, a contribution from the skewed nails can be added, hence  $F_{\text{hanger-Header}}$  becomes:

$$F_{\text{Header-Hanger}} = \text{Min} \left\{ \begin{array}{l} F_{\text{Lat,nail}} \\ F_{\text{Ax,nail}} \end{array} \right\} + \frac{n_{\text{skewnail}} \times F_{v,RK,joist}}{3} \quad \text{Eq 73.}$$

Smooth nails (round or square) shall fulfil the following criterion:

$$\left( \frac{F_{\text{Lat,nail}}}{F_{v,Rk,header}} \right) \leq 1 \quad \text{and} \quad \left( \frac{F_{\text{Ax,nail}}}{F_{\text{ax,Rk,header}}} \right) \leq 1 \quad \text{Eq 74.}$$

Ring shank nails shall fulfil the following criterion:

$$\left( \frac{F_{\text{Lat,nail}}}{F_{v,Rk,header}} \right)^2 + \left( \frac{F_{\text{Ax,nail}}}{F_{\text{ax,Rk,header}}} \right)^2 \leq 1 \quad \text{Eq 75.}$$

### C4.3.8 Load transfer from the hanger to the header – Wrap over Installation

When wrapped-over, the force between header and hanger per flange is:

$$F_{\text{Hanger-Header}} = k_{\text{ef}} (F_c + F_r) + n_{\text{h,sidenail}} \times F_{\text{v,Rk,header}} \quad \text{Eq 76.}$$

Where

$$F_c = t_p \sqrt{\frac{f_u \times f_{c,90,k^*} \times l \times l_{\text{eff}}}{3}} \quad \text{Eq 77.}$$

$$F_r = n_{\text{h,top nail}} \times F_{\text{v,Rk,header}} - \frac{f_u \times l \times t_p^2}{6 \times C_{\text{hor}}} \quad \text{Eq 78.}$$

From Eurocode 5

$$f_{c,90,*} = K_{c,90,header} \times f_{c,90,header} \quad (k_{c,90,header} = 1.0) \quad \text{Eq 79.}$$

For instance where 75mm joist nails are used, a contribution from the skewed nails can be added, hence,  $F_{\text{hanger-Header}}$  becomes:

$$F_{\text{Hanger-Header}} = k_{\text{ef}} (F_c + F_r) + n_{\text{h,sidenail}} \times F_{\text{v,Rk,header}} + \frac{n_{\text{skewnail}} \times F_{\text{v,Rk,joist}}}{3} \quad \text{Eq 80.}$$

### C4.3.9 Uplift Force

For uplift force, the load is transferred from the joist into the hanger by the nails in the side of the joist.

For skew nails with a length of 75 mm or greater, the load may also be transferred directly from the joist into the header.

For instances where nails with a length of 30 to 38 mm are inserted perpendicular to the joist the uplift capacity is:

$$F_{\text{uplift}} = 0,6 \times n_{\text{joist}} \times F_{\text{Lat,RK,Joist}} \quad \text{Eq 81.}$$

When nails with a length of 75 mm are inserted skew to the joist the uplift capacity is:

$$F_{\text{uplift}} = \frac{n_{\text{skewnail}} \times F_{\text{Lat,RK,Joist}}}{3} \quad \text{Eq 82.}$$

Where

$n_{\text{joist}}$  is the total number of nails in the joist

$F_{\text{Lat,RK,Joist}}$  is the characteristic lateral capacity of the nails in the joist

### C4.3.10 I-beam as headers

If an I-beam is used as a header, a backer block must be installed between the joist hanger and the web. The backer shall fulfill the following criteria:

- The block shall fit tight to the underside of the top flange (Figure A2.10)
- The surface of the block shall be flush with the side of the flange
- The nails in the backer block shall be of sufficient length so that they go through the web and clinched.
- It is required that the number of nails in the backer block shall be determined from:

$$n_{\text{nail,backer}} = 2(n_{\text{web}} \times 2n_{\text{topflange}})$$



## **ANNEX D**

### **PRODUCT DEFINITION AND CAPACITIES**

## D1 Joist hanger type BSN

Face mount hanger with external flanges

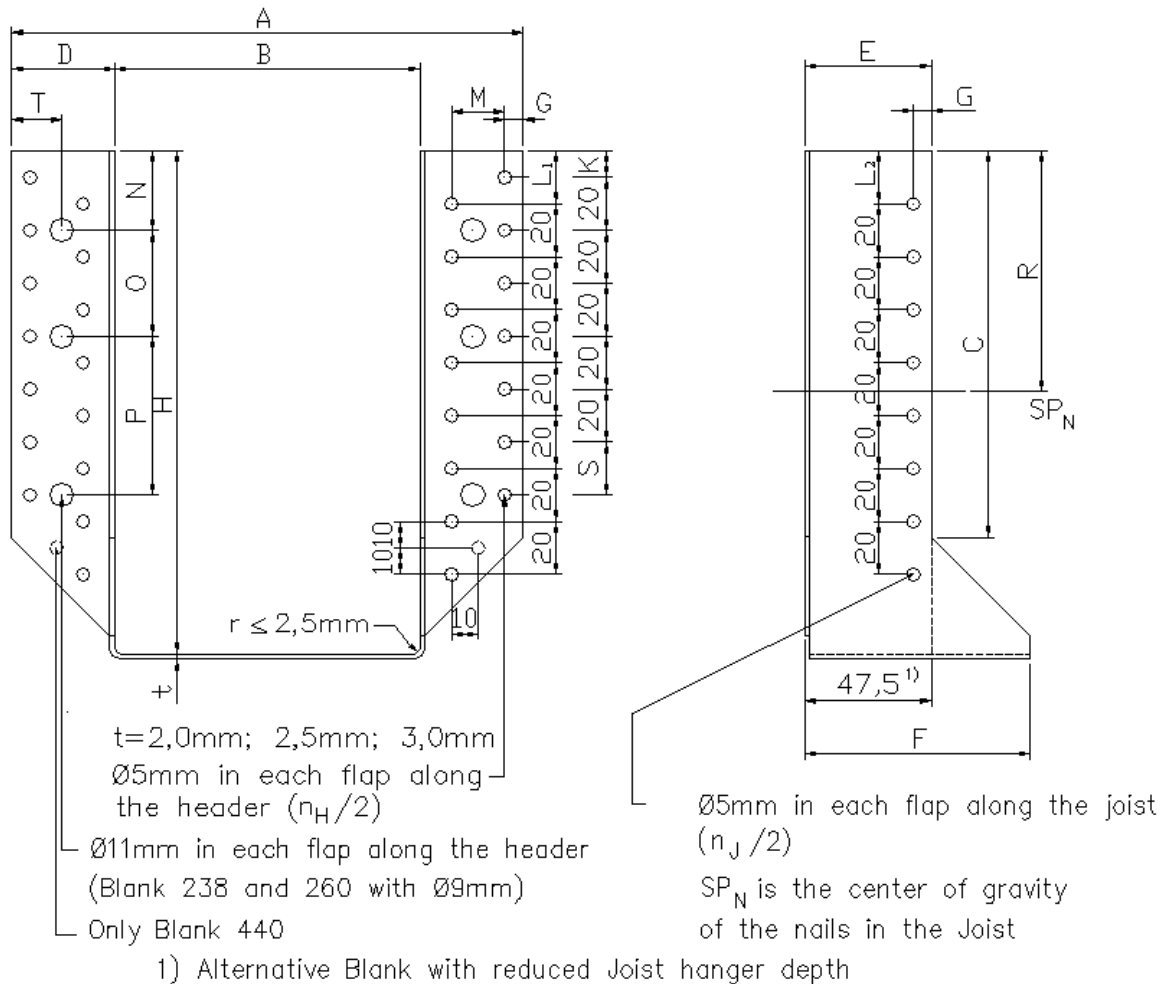
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
BSN	BSN	BSN	BSN	BSN

### Material Specification and Service Classes

2.0 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



## Blank form

Blank	B	C	D	E	F	G	K	L <sub>1</sub>	L <sub>2</sub>	M	N	O	P	T	S	R
238	34- 60	54	37.5	37	72.5	7.5	16.5	6.5	6.5	17.5	26.5			13.5	15	36.5
260	34- 64	65	37.5	37	72.5	7.5	7.5	17.5	17.5	17.5	27.5	40		20	15	57.5
280	100	55	40	42	80	7.5	17.5	7.5	7.5	20	37.5			20	15	37.5
320	34- 80	85.5	40	42	80	7.5	7.5	17.5	17.5	20	27.5	40		20	15	57.5
358	120	76.5	42	47	87	7.5	19	9	9	20	19	40		20	20	49
380	34-101	105	40	42	80	7.5	7.5	17.5	17.5	20	27.5	40		20	15	57.5
380	127	105	40	42	80	7.5	7.5	17.5	17.5	20	27.5	60		20	15	67.5
418	140	105.5	39	47.5	84.5	7.5	9	19	19	20	29	60		20	20	69
435	34-120	115	42	47	87	7.5	17.5	7.5	7.5	20	17.5	40	40	20	20	67.5
435	150	115	42	47	87	7.5	17.5	7.5	7.5	20	17.5	40	40	20	20	67.5
500	34-140	146.5	39	47.5	84.5	7.5	10	20	20	20	30	40	60	20	20	67.5
Permitted deviation		±2.0	±1.0	±1.0	±1.0	±1.0	±1.0	±1.0	±1.0	±0.2	±1.0	±0.2	±0.2	±1.0	±0.2	

Blank	Total n° of holes		Width		Height		A
	n <sub>H</sub>	n <sub>J</sub>	mm		mm		
238	14	8	34	60	89	102	= B + 75
260	16	8	34	64	98	113	= B + 75
280	14	8	100		90		180
320	20	10	34	80	120	143	= B + 80
358	18	10	120		119		204
380	24	12	34	101	139.5	173	= B + 80
380	22	6	127		126.5		207
418	22	12	140		139		218
435	26	14	34	120	157.5	200.5	= B + 84
435	26	14	150		145		234
500	30	16	34	140	180	233	= B + 78

Joist hanger's height = (blank – width)/2

### Table of parameters

Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C.

<b><math>k_{H,1}</math> for Joist Hangers type BSN and BSI</b>																							
<b>Full nailing - downward force</b>																							
Width B [mm]	<b>Blank</b>																						
	<b>238</b>		<b>260</b>		<b>280</b>		<b>320</b>		<b>358</b>		<b>380</b>		<b>380/127</b>		<b>418</b>		<b>435</b>		<b>435/150</b>		<b>500</b>		
	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	
Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$		
50	94	19.0	105	23.7				135	34.3			165	51.4					190.0	59.2			225	79.9
52	93	18.6	104	23.2				134	33.7			164	50.8					189.0	58.6			224	79.2
54	92	18.2	103	22.7				133	33.2			163	50.1					188.0	58.0			223	78.5
56	91	17.8	102	22.3				132	32.7			162	49.5					187.0	57.4			222	77.8
60	89	16.9	100	21.3				130	31.7			160	48.3					185.0	56.2			220	76.5
64	-	-	98	20.4				128	30.6			158	47.0					183.0	55.0			218	75.1
65	-	-	-	-				127.5	30.4			157.5	46.7					183	54.7			217.5	74.8
68	-	-	-	-				126	29.6			156	45.8					181.0	53.8			216	73.8
71	-	-	-	-				124.5	28.9			154.5	44.9					180	52.9			214.5	72.8
75	-	-	-	-				122.5	27.9			152.5	43.7					178	51.7			212.5	71.4
76	-	-	-	-				122	27.6			152	43.4					177.0	51.4			212	71.1
80	-	-	-	-				120	26.7			150	42.2					175.0	50.3			210	69.8
81	-	-	-	-				-	-			149.5	41.9					175	50.0			209.5	69.5
85	-	-	-	-				-	-			147.5	40.8					173	48.8			207.5	68.1
89	-	-	-	-				-	-			145.5	39.6					171	47.7			205.5	66.8
93	-	-	-	-				-	-			143.5	38.4					169	46.5			203.5	65.5
97	-	-	-	-				-	-			141.5	37.3					167	45.4			201.5	64.2
100	-	-	-	-	90	17.9		-	-			140	36.5					165.0	44.6			200	63.3
101	-	-	-	-				-	-			-	-					165	44.3			199.5	63.0
105	-	-	-	-				-	-			-	-					163	43.2			197.5	61.7
109	-	-	-	-				-	-			-	-					161	42.1			195.5	60.4
113	-	-	-	-				-	-			-	-					159	41.0			193.5	59.1
117	-	-	-	-				-	-			-	-					157	39.9			191.5	57.9
120	-	-	-	-				-	-	119	22.2	-	-					155.0	39.1			190	57.0
124	-	-	-	-				-	-			-	-					-	-			188	55.7
127														126.5	29.7							187	54.8
128	-	-	-	-				-	-			-	-					-	-			186	54.5
132	-	-	-	-				-	-			-	-					-	-			184	53.3
136	-	-	-	-				-	-			-	-					-	-			182	52.1
140	-	-	-	-				-	-			-	-			139	30.1	-	-			180	50.9
150																				140	24.2		

In the case of intermediate width,  $k_{H,1}$  can be calculated by linear interpolation.

<b><math>k_{H,1}</math> for Joist Hangers type BSN and BSI</b>																						
<b>Partial nailing - downward force</b>																						
<b>Blank</b>																						
Width B [mm]	<b>238</b>		<b>260</b>		<b>280</b>		<b>320</b>		<b>358</b>		<b>380</b>		<b>380/127</b>		<b>418</b>		<b>435</b>		<b>435/150</b>		<b>500</b>	
	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$
	8	4	8	4	8	4	10	6	10	6	12	6	10	6	12	6	14	8	12	6	16	8
Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	
34	102	14.6	113	14.6	-	-	143	21.4	-	-	173	29.9	-	-	-	-	198	38.9	-	-	233	45.9
36	101	14.3	112	14.3	-	-	142	21.1	-	-	172	29.6	-	-	-	-	197	38.6	-	-	232	45.5
40	99	13.7	110	13.7	-	-	140	20.4	-	-	170	28.9	-	-	-	-	195	37.8	-	-	230	44.7
44	97	13.2	108	13.2	-	-	138	19.8	-	-	168	28.2	-	-	-	-	193	37.1	-	-	228	43.9
48	95	12.6	106	12.6	-	-	136	19.2	-	-	166	27.5	-	-	-	-	191	36.4	-	-	226	43.2
52	93	12.1	104	12.1	-	-	134	18.6	-	-	164	26.8	-	-	-	-	189	35.7	-	-	224	42.4
56	91	11.6	102	11.6	-	-	132	18.0	-	-	162	26.1	-	-	-	-	187	34.9	-	-	222	41.6
60	89	11.1	100	11.1	-	-	130	17.4	-	-	160	25.4	-	-	-	-	185	34.2	-	-	220	40.9
64	-	-	98	10.56	-	-	128	16.9	-	-	158	24.8	-	-	-	-	183	33.5	-	-	218	40.1
65	-	-	-	-	-	-	127.5	16.7	-	-	157.5	24.62	-	-	-	-	182.5	33.3	-	-	217.5	39.9
68	-	-	-	-	-	-	126	16.3	-	-	156	24.1	-	-	-	-	181	32.8	-	-	216	39.4
71	-	-	-	-	-	-	124.5	15.9	-	-	154.5	23.6	-	-	-	-	179.5	32.3	-	-	214.5	38.8
75	-	-	-	-	-	-	122.5	15.3	-	-	152.5	23.0	-	-	-	-	177.5	31.6	-	-	212.5	38.0
76	-	-	-	-	-	-	122	15.2	-	-	152	22.8	-	-	-	-	177	31.4	-	-	212	37.9
80	-	-	-	-	-	-	120	14.6	-	-	150	22.2	-	-	-	-	175	30.7	-	-	210	37.1
81	-	-	-	-	-	-	-	-	-	-	149.5	22.0	-	-	-	-	174.5	30.6	-	-	209.5	36.9
85	-	-	-	-	-	-	-	-	-	-	147.5	21.4	-	-	-	-	172.5	29.9	-	-	207.5	36.2
89	-	-	-	-	-	-	-	-	-	-	145.5	20.8	-	-	-	-	170.5	29.2	-	-	205.5	35.5
93	-	-	-	-	-	-	-	-	-	-	143.5	20.1	-	-	-	-	168.5	28.5	-	-	203.5	34.8
97	-	-	-	-	-	-	-	-	-	-	141.5	19.5	-	-	-	-	166.5	27.8	-	-	201.5	34.0
100	-	-	-	-	90	9.7	-	-	-	-	140	19.1	-	-	-	-	165	27.3	-	-	200	33.5
101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	164.5	27.2	-	-	199.5	33.3
105	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	162.5	26.5	-	-	197.5	32.6
109	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	160.5	25.9	-	-	195.5	31.9
113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	158.5	25.2	-	-	193.5	31.2
117	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	156.5	24.6	-	-	191.5	30.5
120	-	-	-	-	-	-	-	-	119	13.7	-	-	-	-	-	-	155	24.1	-	-	190	30.0
124	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	188	29.32
127	-	-	-	-	-	-	-	-	-	-	-	-	126.5	15.2	-	-	-	-	-	-	186.5	28.81
128	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	186	28.65
132	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	184	27.98
136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	182	27.32
140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	139	18.8	-	-	-	-	180	26.67
150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	140	17.6	-	-

For a width between the in the table mentioned  $k_{H,1}$  can be calculated by linear interpolation.

Joist hanger	$k_{H,2}$				
	Full or partial nailing - upward force				
	Blank	Total number of nails in the header		$k_{H,2}$	
Full nailing		Partial nailing	Full nailing	Partial nailing	
BSN	238	14	8	17,2	10,2
	260	16	8	21,4	10,3
	280	14	8	14,9	8,7
	320	20	10	26,6	14,8
	358	18	10	19,4	11,1
	380	24	12	35,0	19,7
	380/127	22	10	31,4	13,8
	418	22	12	31,1	14,0
	435	26	14	36,7	20,3
	435/150	26	14	36,7	20,3
	500	30	16	46,7	25,5

Joist hanger	$n_{j,ef,1}$ and $n_{j,ef,2}$						
	Blank	Total number of nails in the joist		Force downward towards the bottom plate		Force upward away from the bottom plate	
		Full nailing	Partial nailing	Full nailing	Partial nailing	Full nailing	Partial nailing
				$n_{j,ef,1}$	$n_{j,ef,1}$	$n_{j,ef,2}$	$n_{j,ef,2}$
BSN	238	8	4	3,91	3,21	3,63	2,59
	260	8	4	3,91	3,21	3,63	2,59
	280	8	4	3,38	2,78	3,19	2,35
	320	10	6	5,45	4,01	5,02	3,47
	358	10	6	4,83	3,55	4,52	3,16
	380	12	6	8,04	5,43	7,19	4,27
	380/127	10	6	5,45	4,01	5,02	3,47
	418	12	6	7,12	4,21	6,51	3,6
	435	14	8	9,87	6,47	8,81	5,39
	435/150	12	6	7,19	4,26	6,57	3,63
	500	16	8	12,58	6,84	11,07	5,6

## D2 Joist hanger type BSI

Face mount hanger with interior flanges

Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
BSI	BSI	BSI	BSI	BSI

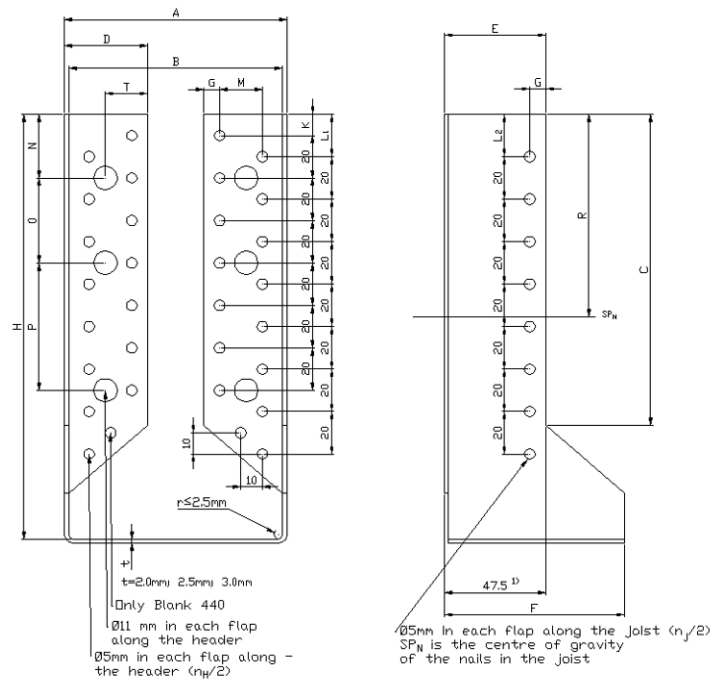
### Material Specification and Service Classes

2.0 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

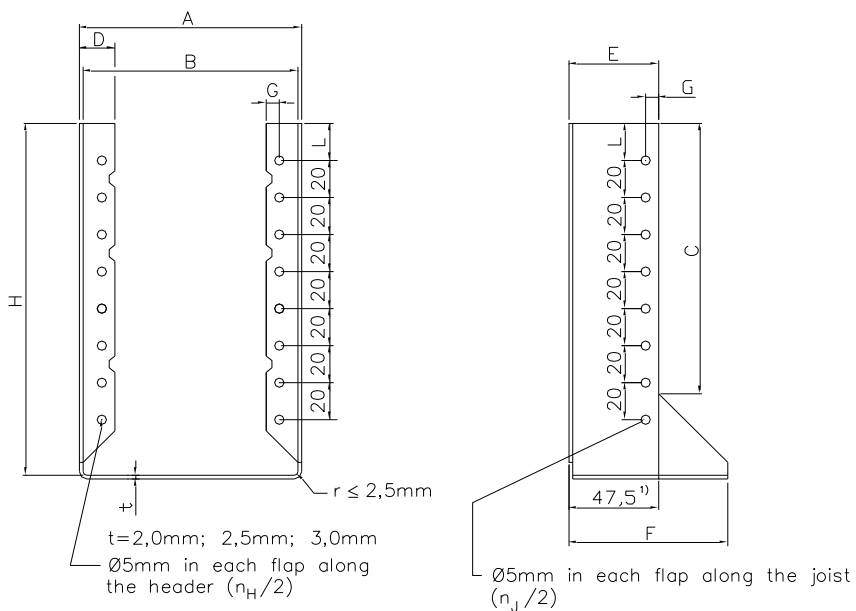
### Dimensions

1<sup>st</sup> blank form



1) Alternative Blank with reduced Joist hanger depth

2<sup>nd</sup> blank form



1) Alternative Blank with reduced Joist hanger depth



1<sup>st</sup> blank form

Blank	B Min - max	C	D	E	F	G	K	L <sub>1</sub>	L <sub>2</sub>	M	N	O	P	T	S
280	100	55	40	42.5	80	7.5	17.5	7.5	7.5	20	37.5	-	-	20	15
320	76 – 80	85.5	40	42	80	7.5	7.5	17.5	17.5	20	27.5	40	-	20	15
358	120	77	42	47	87	7.5	19	9	9	20	19	40	-	20	20
380	76 – 101	105	40	42	80	7.5	7.5	17.5	17.5	20	27.5	60	-	20	15
418	140	105	39	47.5	84.5	7.5	9	19	19	20	29	60	-	20	20
435	80 – 120	115	42	47	87	7.5	17.5	7.5	7.5	20	27.5	40	40	20	20
500	74 - 140	146.5	39	47.5	84.5	7.5	10	20	20	20	17.5	40	60	20	20
Permitted deviation		±2.0	±1.0	±1.0	±1.0	±1.0	±1.0	±1.0	±1.0	±0.2	±1.0	±0.2	±1.0	±0.2	

Blank	Total n° of nails		Width interval		Height interval		A
	n <sub>H</sub>	n <sub>J</sub>	min	max	min	max	
280	14	8	100		90		= B + 4
320	20	10	76	80	120	122	= B + 4
358	18	10	120		119		= B + 4
380	24	12	76	101	139.5	152	= B + 4
418	22	12	140		139		= B + 4
435	26	14	80	120	157.5	177.5	= B + 4
500	30	16	74	140	180	213	= B + 4

2<sup>nd</sup> blank form

Blank	B Min - max	C	D	E	F	G	L	T
238 BSI	38 – 60	71	20	37.5	55.5	7.5	7.5	20
260 BSI	38 – 64	82	20	37.5	55.5	7.5	18.5	20
320 BSI	38 – 81	102	20	42.5	60.5	7.5	17.5	20
380 BSI	38 – 101	122	20	42.5	60.5	7.5	17.5	20
435 BSI	38 – 120	115	22	47	87	7.5	7.5	20
500 BSI	38 – 140	146.5	19	47.5	84.5	7.5	20	20
Permitted deviation		±2.0	±1.0	±1.0	±1.0	±1.0	±1.0	±1.0

Blank	Total n° of nails		Width interval		Height interval		A
	n <sub>H</sub>	n <sub>J</sub>	min	max	min	max	
238 BSI	8	4	38	60	89	100	= B + 4
260 BSI	8	4	38	64	98	111	= B + 4
320 BSI	10	10	38	81	119.5	141	= B + 4
380 BSI	12	12	38	101	139.5	171	= B + 4
435 BSI	14	14	38	120	160	201	= B + 4
500 BSI	16	16	38	140	180	231	= B + 4

Joist hanger's height = (blank – width)/2

**Table of parameters**

Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C.

See Annex D1 - "Joist Hanger type BSN" section above for  $k_{H1}$  values.

Joist hanger	$k_{H,2}$				
	Full or partial nailing - upward force				
	Blank	Total number of nails in the header		$k_{H2}$	
		Full nailing	Partial nailing	Full nailing	Partial nailing
BSI model 1 Internal flanges	320	20	10	25,5	14,6
	380	24	12	35,0	19,7
	435	26	14	36,7	20,3
	500	30	16	44,9	25,0
BSI model 2 Internal flanges	238	8		10,0	
	260	8		10,0	
	320	10		12,8	
	380	12		17,6	
	435	14		20,3	
	500	16		25,5	

Joist hanger	$n_{j,ef,1}$ and $n_{j,ef,2}$						
	Blank	Total number of nails in the joist		Force downward towards the bottom plate		Force upward away from the bottom plate	
		Full nailing	Partial nailing	Full nailing $n_{j,ef,1}$	Partial nailing $n_{j,ef,1}$	Full nailing $n_{j,ef,2}$	Partial nailing $n_{j,ef,2}$
BSI model 1 Internal flanges	320	10	6	5,45	4,01	5,02	3,47
	380	12	6	8,04	5,43	7,19	4,27
	435	14	8	9,87	6,47	8,81	5,39
	500	16	8	12,58	6,84	11,07	5,6
BSI model 2 Internal flanges	238	8		3,91		3,63	
	260	8		3,91		3,63	
	320	10		5,45		5,02	
	380	12		8,04		7,19	
	435	14		9,87		8,81	
	500	16		12,58		11,07	

### D3 Joist hanger type BSD

Face mount hanger with external flanges

Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
BSD	BSD	BSD	BSD	BSD

#### Material Specification and Service Classes

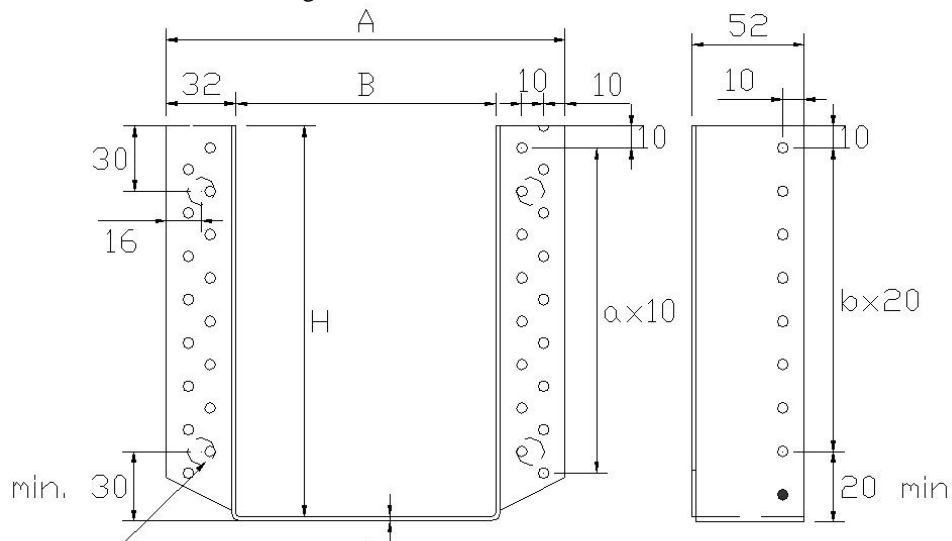
Pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

#### Dimensions

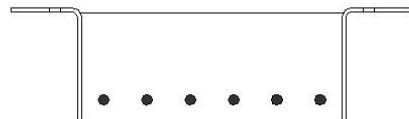
Optional bolt holes up to  $\varnothing 13$  are possible for bolts. It is allowed to remove all the  $\varnothing 5$  mm holes on the header flanges when bolt holes are added. More holes up to  $\varnothing 13$  are allowed between the 2 holes shown on each flange; the 16 mm edge distance can not be changed.

$50 \text{ mm} \leq \text{Width} \leq 250 \text{ mm}$  Height  $H \leq 320 \text{ mm}$



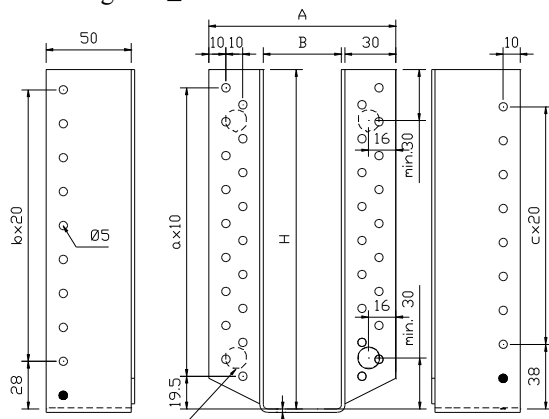
$t = 2,0 \text{ mm}; 2,5 \text{ mm}; 3,0 \text{ mm}$

Holes up to  $\varnothing 13$  are possible for bolts to fasten in concrete or steel, there is no maximum on the number of holes



• Marked holes are optional

$34 \text{ mm} \leq \text{Width} \leq 250 \text{ mm}$  Height  $H \leq 320 \text{ mm}$



+  $t=2,0 \text{ mm}; t=2,5 \text{ mm}; t=3,0 \text{ mm}$   
 Holes up to  $\varnothing 13$  is possible for bolts to fasten in concrete or steel, there are no maximum on the number of holes.



● Marked holes are optional

**Table of parameters**Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C.

<b><math>k_{H,1}</math> for Joist Hanger BSD and BSDI 80 mm ≤ Width (B) ≤ 250 mm Full nailing - downward force</b>				
Height H (mm)	$K_{h,1}$	Nails/screws		$R^{1)}$ (mm)
		$n_H$ (pcs.)	$n_J$ (pcs.)	
100	14,2	16	8	40
120	20,8	20	10	50
140	28,6	24	12	60
160	37,7	28	14	70
180	48,1	32	16	80
200	59,7	36	18	90
220	72,6	40	20	100
240	86,7	44	22	110
260	102,1	48	24	120
280	118,7	52	26	130
300	136,6	56	28	140
320	155,8	60	30	150

<b><math>k_{H,1}</math> for Joist Hanger BSD and BSDI 34 mm ≤ Width (B) ≤ 79 mm Full nailing - downward force</b>				
Height H (mm)	$K_{h,1}$	Nails/screws		$R^{1)}$ (mm)
		$n_H$ (pcs.)	$n_J$ (pcs.)	
100	14,5	16	7	40
120	21	20	9	50
140	28,9	24	11	60
160	38	28	13	70
180	48,3	32	15	80
200	60	36	17	90
220	72,8	40	19	100
240	87	44	21	110
260	102,3	48	23	120
280	119	52	25	130
300	136,9	56	27	140
320	156	60	29	150

<b><math>k_{H,1}</math> for Joist Hanger BSD and BSDI 80 mm ≤ Width (B) ≤ 250 mm Partial nailing - downward force</b>				
Height H (mm)	$K_{h,1}$	Nails/screws		$R^{1)}$ (mm)
		$n_H$ (pcs.)	$n_J$ (pcs.)	
100	9,5	8	4	30
120	12,8	10	6	50
140	17,6	12	6	50
160	22,2	14	8	70
180	28,3	16	8	70
200	34,2	18	10	90
220	41,5	20	10	90
240	48,6	22	12	110
260	57,2	24	12	110
280	65,6	26	14	130
300	75,4	28	14	130
320	85	30	16	150

<b><math>k_{H,1}</math> for Joist Hanger BSD and BSDI 34 mm ≤ Width (B) ≤ 79 mm Partial nailing - downward force</b>				
Height H (mm)	$K_{h,1}$	Nails/screws		$R^{1)}$ (mm)
		$n_H$ (pcs.)	$n_J$ (pcs.)	
100	6,6	8	4	35
120	9,9	10	5	46
140	13,9	12	6	55
160	18,4	14	7	66
180	23,6	16	8	75
200	29,4	18	9	86
220	35,9	20	10	95
240	42,9	22	11	105
260	50,6	24	12	115
280	59	26	13	125
300	67,9	28	14	135
320	77,5	30	15	145

Joist hanger	$k_{H,2}$				
	Full or partial nailing - upward force				
	Blank	Total number of nails in the header		$k_{H,2}$	
		Full nailing	Partial nailing	Full nailing	Partial nailing
BSD/BSDI External or internal flanges	H=100	16	8	14,8	7,1
	H=120	20	10	21,6	10,4
	H=140	24	12	29,6	14,3
	H=160	28	14	38,9	18,8
	H=180	32	16	49,4	24,0
	H=200	36	18	61,2	29,8
	H=220	40	20	74,2	36,2
	H=240	44	22	88,5	43,3
	H=260	48	24	104,0	51,0
	H=280	52	26	120,8	59,3
	H=300	56	28	138,8	68,2
	H=320	60	30	158,1	77,8

Joist hanger	$n_{j,ef,1}$ and $n_{j,ef,2}$						
	Blank	Total number of nails in the joist		Force downward towards the bottom plate		Force upward away from the bottom plate	
		Full nailing	Partial nailing	Full nailing	Partial nailing	Full nailing	Partial nailing
				$n_{j,ef,1}$	$n_{j,ef,1}$	$n_{j,ef,2}$	$n_{j,ef,2}$
BSD or BSDI external or internal flanges	H=100	7	4	2,8	0,95	2,69	0,93
	H=120	9	5	4,56	3,35	4,3	3,02
	H=140	11	6	6,83	4,04	6,29	3,49
	H=160	13	7	9,41	6,16	8,48	5,21
	H=180	15	8	12,17	6,58	10,79	5,46
	H=200	17	9	14,98	9,37	13,13	7,56
	H=220	19	10	17,79	9,55	15,47	7,66
	H=240	21	11	20,55	12,57	17,8	9,91
	H=260	23	12	23,24	12,59	20,1	9,92
	H=280	25	13	25,86	15,58	22,37	12,2
	H=300	27	14	28,4	15,52	24,62	12,17
	H=320	29	15	30,88	18,37	26,84	14,43

## D4 Joist hanger type BSDI

Face mount hanger with interior flanges.

Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
BSDI	BSDI	BSDI	BSDI	BSDI

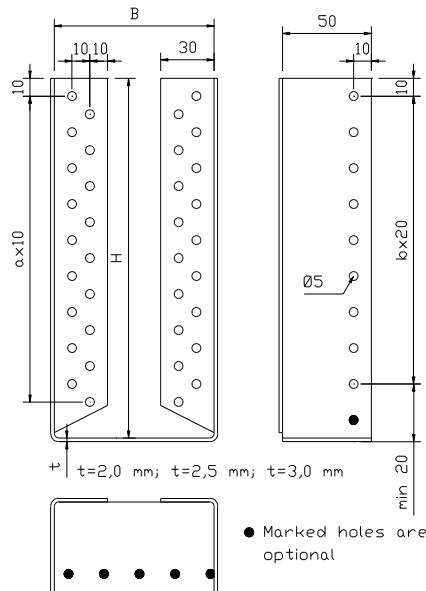
### Material Specification and Service Classes

Pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

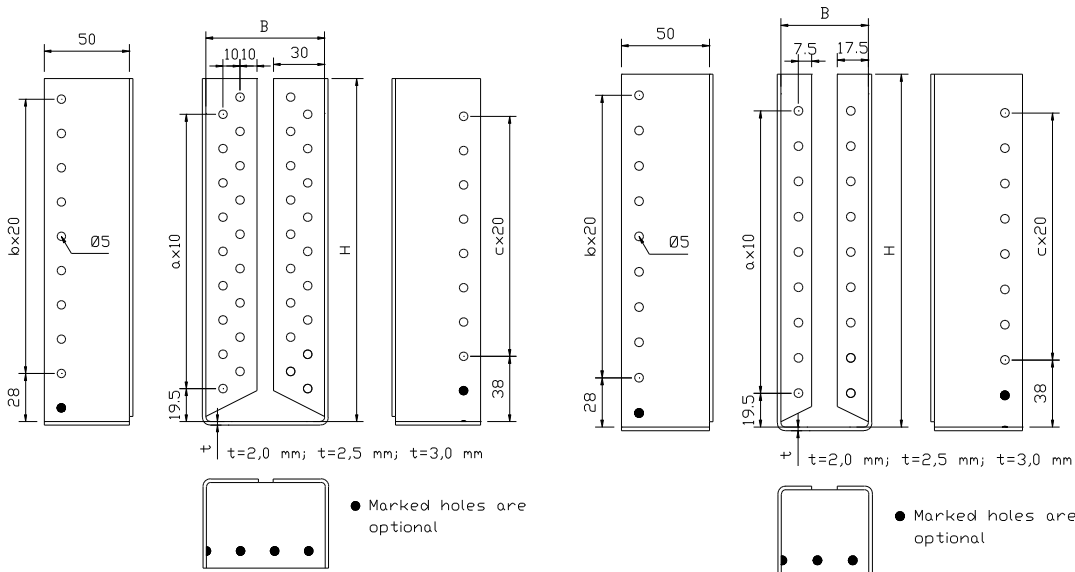
### Dimensions

$70 \text{ mm} \leq \text{width} \leq 250 \text{ mm}$  Height  $H \leq 320 \text{ mm}$



$60 \text{ mm} \leq \text{width} \leq 250 \text{ mm}$   
Height  $H \leq 320 \text{ mm}$

$34 \text{ mm} \leq \text{width} \leq 59 \text{ mm}$   
Height  $H \leq 320 \text{ mm}$



### Table of parameters

Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C.

See Annex D3 - “Joist Hanger type BSD” section above for  $k_{HI}$  values.



## D5 Joist hanger type SAE

Face mount hanger with external flanges.

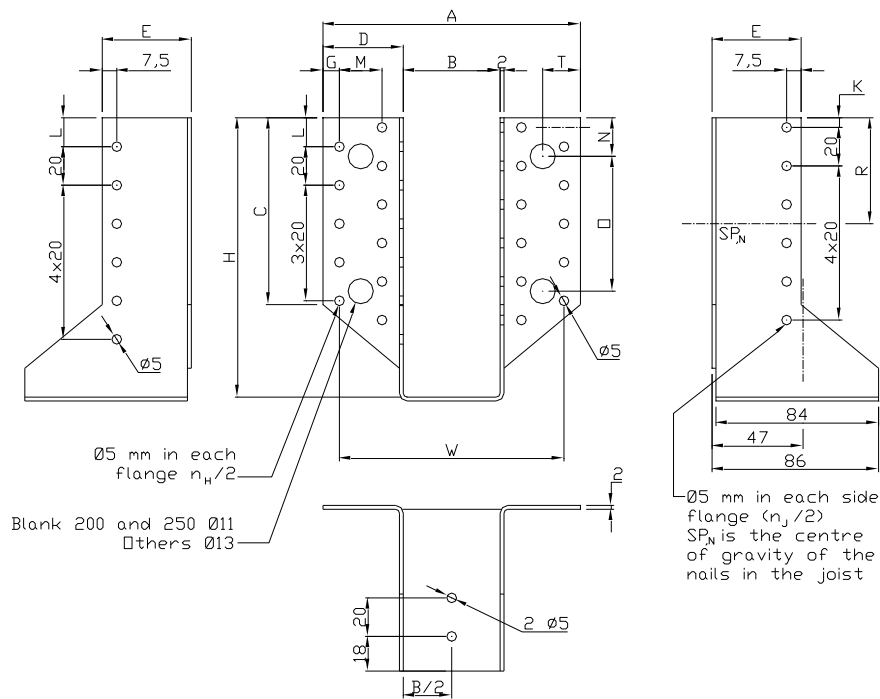
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
SAE	SAE	SAE	SAE	SAE

### Material Specification and Service Classes

2.0 mm thick pre-galvanized steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Blank	B min-max	C	D	E	G	K	L	M	N	O	R	T
200	24-80	27	41.5	46	8.5	5	15	22	20	--	20	19.5
250	24-80	52	41.5	46	8.5	10	20	22	25	--	35	19.5
300	24-70	77	41.5	46	8.5	5	15	22	20	50	45	19.5
340	24-70	97	41.5	46	8.5	5	15	22	20	70	55	19.5
380	24-110	97	41.5	46	8.5	5	15	22	20	70	55	19.5
440	24-110	127	41.5	46	8.5	5	15	22	20	100	70	19.5
500	24-110	157	41.5	46	8.5	5	15	22	20	60-70	85	19.5
Permitted deviation		+2 -0	±1.0	±1.0	±1.0	±1.0	±1.0	±0.2	±1.0-	±0.2	-	±1.0

Blank	Total n° of nails		Width interval		Height interval		A
	$n_H$	$n_T$	min	max	min	max	
200	8	5	24	80	60	88	= B + 83
250	12	7	24	80	85	113	= B + 83
300	18	10	24	70	115	138	= B + 83
340	22	12	24	70	135	158	= B + 83
380	22	12	24	110	135	178	= B + 83
440	28	15	24	110	165	208	= B + 83
500	34	18	24	110	195	238	= B + 83

*Table Notes:*

SAE200 to SAE500 are manufactured from a standard blank length, therefore the height will vary depending on hanger width.

**Joist hanger's height = (blank – width)/2**

**Table of parameters**Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C

		<b><math>k_{H,1}</math> for Joist Hanger SAE and SAIX</b>													
		<b>Full nailing - downward force</b>													
		<b>Blank</b>													
Width B [mm]	<b>200</b>		<b>250</b>		<b>300</b>		<b>340</b>		<b>380</b>		<b>440</b>		<b>500</b>		
	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	
	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]
32	84	11,6	109	18,4	134	31,0	154	41,0	174	51,8	204	71,7	234	94,6	
34	83	11,4	108	18,1	133	30,5	153	40,5	173	51,2	203	71,0	233	93,8	
36	82	11,1	107	17,7	132	30,1	152	40,0	172	50,7	202	70,3	232	93,0	
38	81	10,9	106	17,4	131	29,6	151	39,4	171	50,1	201	69,7	231	92,3	
40	80	10,6	105	17,1	130	29,2	150	38,9	170	49,6	200	69,0	230	91,5	
42	79	10,4	104	16,8	129	28,7	149	38,4	169	49,0	199	68,3	229	90,7	
44	78	10,2	103	16,4	128	28,3	148	37,9	168	48,5	198	67,7	228	89,9	
46	77	9,9	102	16,1	127	27,9	147	37,4	167	47,9	197	67,0	227	89,2	
48	76	9,7	101	15,8	126	27,4	146	36,9	166	47,4	196	66,4	226	88,4	
50	75	9,4	100	15,5	125	27,0	145	36,4	165	46,9	195	65,7	225	87,7	
52	74	9,2	99	15,1	124	26,6	144	35,9	164	46,3	194	65,1	224	86,9	
54	73	9,0	98	14,8	123	26,1	143	35,4	163	45,8	193	64,4	223	86,1	
56	72	8,7	97	14,5	122	25,7	142	34,9	162	45,2	192	63,8	222	85,4	
58	71	8,5	96	14,2	121	25,3	141	34,4	161	44,7	191	63,1	221	84,6	
60	70	8,3	95	13,9	120	24,8	140	33,9	160	44,2	190	62,5	220	83,9	
62	69	8,0	94	13,6	119	24,4	139	33,4	159	43,6	189	61,8	219	83,1	
64	68	7,8	93	13,3	118	24,0	138	32,9	158	43,1	188	61,2	218	82,4	
66	67	7,6	92	13,0	117	23,6	137	32,4	157	42,6	187	60,6	217	81,6	
68	66	7,3	91	12,7	116	23,2	136	31,9	156	42,1	186	59,9	216	80,9	
70	65	7,1	90	12,3	115	22,8	135	31,4	155	41,5	185	59,3	215	80,1	
72	64	6,9	89	12,0	-	-	-	-	154	41,0	184	58,6	214	79,4	
74	63	6,7	88	11,7	-	-	-	-	153	40,5	183	58,0	213	78,6	
76	62	6,4	87	11,4	-	-	-	-	152	40,0	182	57,4	212	77,9	
78	61	6,2	86	11,2	-	-	-	-	151	39,4	181	56,8	211	77,2	
80	60	6,0	85	10,9	-	-	-	-	150	38,9	180	56,1	210	76,4	
82	-	-	-	-	-	-	-	-	149	38,4	179	55,5	209	75,7	
84	-	-	-	-	-	-	-	-	148	37,9	178	54,9	208	75,0	
86	-	-	-	-	-	-	-	-	147	37,4	177	54,3	207	74,2	
88	-	-	-	-	-	-	-	-	146	36,9	176	53,6	206	73,5	
90	-	-	-	-	-	-	-	-	145	36,4	175	53,0	205	72,8	
92	-	-	-	-	-	-	-	-	144	35,9	174	52,4	204	72,1	
94	-	-	-	-	-	-	-	-	143	35,4	173	51,8	203	71,3	
96	-	-	-	-	-	-	-	-	142	34,9	172	51,2	202	70,6	
98	-	-	-	-	-	-	-	-	141	34,4	171	50,6	201	69,9	
100	-	-	-	-	-	-	-	-	140	33,9	170	50,0	200	69,2	
102	-	-	-	-	-	-	-	-	139	33,4	169	49,4	199	68,5	
104	-	-	-	-	-	-	-	-	138	32,9	168	48,8	198	67,8	
106	-	-	-	-	-	-	-	-	137	32,4	167	48,2	197	67,1	
108	-	-	-	-	-	-	-	-	136	31,9	166	47,6	196	66,4	
110	-	-	-	-	-	-	-	-	135	31,4	165	47,0	195	65,7	

For a width between in the table mentioned  $k_{H,1}$  can be calculated by linear interpolation.

66	67	5,3	92	8,5	117	17,4	137	19,9	157,0	25,9	187	35,1	217	50,9
68	66	5,2	91	8,4	116	17,2	136	19,6	156,0	25,6	186,0	34,7	216,0	50,5
70	65	5,0	90	8,2	115	16,9	135	19,3	155,0	25,3	185,0	34,4	215,0	50,0
72	64	4,9	89	8,0	-	-	-	-	154,0	25,0	184,0	34,0	214,0	49,6
74	63	4,7	88	7,8	-	-	-	-	153,0	24,7	183,0	33,7	213,0	49,2
76	62	4,6	87	7,6	-	-	-	-	152,0	24,4	182,0	33,4	212,0	48,7
78	61	4,5	86	7,5	-	-	-	-	151,0	24,1	181	33,0	211	48,3
80	60	4,3	85	7,3	-	-	-	-	150,0	23,8	180	32,7	210	47,8
82	-	-	-	-	-	-	-	-	149,0	23,5	179	32,3	209	47,4
84	-	-	-	-	-	-	-	-	148,0	23,2	178	32,0	208	47,0
86	-	-	-	-	-	-	-	-	147,0	22,9	177	31,6	207	46,5
88	-	-	-	-	-	-	-	-	146,0	22,6	176	31,3	206	46,1
90	-	-	-	-	-	-	-	-	145,0	22,3	175	30,9	205	45,7
92	-	-	-	-	-	-	-	-	144,0	22,0	174	30,6	204	45,2
94	-	-	-	-	-	-	-	-	143,0	21,7	173	30,3	203	44,8
96	-	-	-	-	-	-	-	-	142,0	21,4	172	29,9	202	44,4
98	-	-	-	-	-	-	-	-	141,0	21,1	171	29,6	201	43,9
100	-	-	-	-	-	-	-	-	140,0	20,8	170	29,3	200	43,5
102	-	-	-	-	-	-	-	-	139,0	20,5	169	28,9	199	43,1
104	-	-	-	-	-	-	-	-	138,0	20,2	168	28,6	198	42,7
106	-	-	-	-	-	-	-	-	137,0	19,9	167	28,3	197	42,2
108	-	-	-	-	-	-	-	-	136,0	19,6	166	27,9	196	41,8
110	-	-	-	-	-	-	-	-	135,0	19,3	165	27,6	195	41,4

For a width between in the table mentioned  $k_{H,1}$  can be calculated by linear interpolation.

## Compilation of effective nail numbers for SIMPSON SAE Joist hanger

### Partial nail fixing Effective nail numbers to be used for smooth or square twist nails

Independently of height or width of joist hanger.

Basic design							
Blank	200	250	300	340	380	440	500
Number of nails in joist	3	4	6	6	6	8	10
$n_{Nef\ down}$	0,9	1,7	4,2	4,2	4,2	7,4	10,7
$n_{Nef\ up}$	0,8	1,6	3,6	3,6	3,6	5,9	8,2

Joist hanger	$k_{H,2}$				
	Full or partial nailing - upward force				
	Blank	Total number of nails in the header		$k_{H,2}$	
		Full nailing	Partial nailing	Full nailing	Partial nailing
SAE	200	8	4	5,6	3,0
	250	12	6	10,3	4,2
	300	18	10	19,9	11,4
	340	22	12	28,1	15,8
	380	22	12	28,1	15,8
	440	28	14	42,9	20,4
	500	34	18	60,8	32,9
	590	30	16	81,5	40,9
	620-a	40	20	105,1	48,9
	620-b	40	22	114,7	61,3
	690	30	16	81,5	40,9

Joist hanger	$n_{j,ef,1}$ and $n_{j,ef,2}$						
	Blank	Total number of nails in the joist		Force downward towards the bottom plate		Force upward away from the bottom plate	
		Full nailing	Partial nailing	Full nailing	Partial nailing	Full nailing	Partial nailing
				$n_{j,ef,1}$	$n_{j,ef,1}$	$n_{j,ef,2}$	$n_{j,ef,2}$
SAE	200	5	4	1,29	1,29	1,26	1,24
	250	7	4	2,84	2,13	2,69	1,92
	300	10	6	6,15	3,9	5,54	3,4
	340	12	6	8,76	4,91	7,69	4
	380	12	6	8,76	4,91	7,69	4
	440	15	8	12,92	7,59	11,06	5,99
	500	18	10	17,08	10,69	14,46	8,21
	590	20	10	18,46	9,11	15,9	7,42
	620a	22	12	20,67	10,69	17,87	8,9
	620b	22	12	22,35	12	18,92	9,62
	690	20	10	18,46	9,11	15,9	7,42

### Characteristic capacities with Square Twist Nails

Art. No.	Dimensions <sup>1)</sup>		Total no. of square twist nails 3,75x30 mm		Characteristic capacity <sup>2)</sup> $R_{down,k}$
	B	H	$n_H$	$n_J$	
SAE250/50	50	100	12	7	13.5
SAE250/76	76	87	12	7	13.5
SAE380/38	38	171	22	12	22.3
SAE380/45	45	167.5	22	12	22.3
SAE380/50	50	165	22	12	22.3
SAE380/64	64	158	22	12	22.3
SAE380/66	66	157	22	12	22.3
SAE380/76	76	152	22	12	22.3
SAE380/90	90	145	22	12	22.3
SAE380/92	92	144	22	12	22.3
SAE380/100	100	140	22	12	22.3
SAE500/38	38	231	34	18	35.0
SAE500/46	46	227	34	18	35.0
SAE500/50	50	225	34	18	35.0

SAE500/64	64	218	34	18	35.0
SAE500/66	66	217	34	18	35.0
SAE500/76	76	212	34	18	35.0
SAE500/91	91	204.5	34	18	35.0
SAE500/100	100	200	34	18	35.0
SAE500/125	125	187.5	32	16	28.0

<sup>1)</sup>For further dimensions see the section Dimensions of this annex

<sup>2)</sup>The characteristic capacity is given for Timber Grade C24 (characteristic density of 350 kg/m<sup>3</sup>)

## D6 Joist hanger type SAE250/38/1,5

Face mount hanger with external flanges

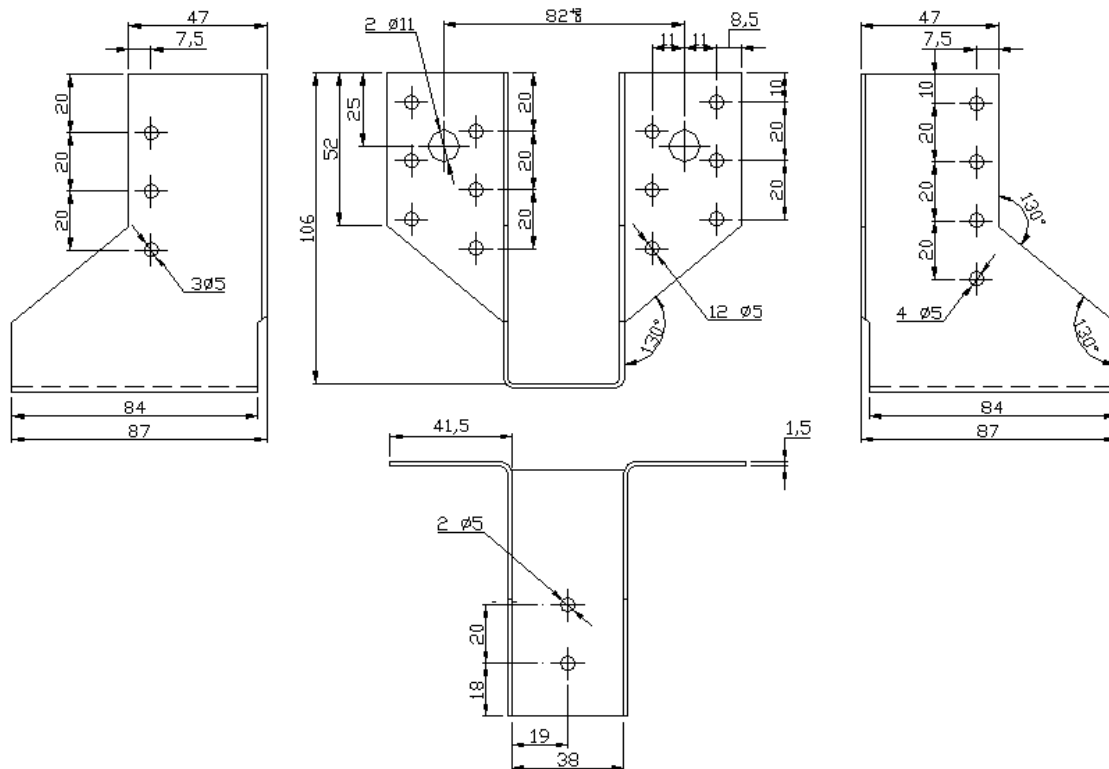
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
SAE	SAE	SAE	SAE	SAE

### Material Specification and Service Classes

1.5 mm thick pre-galvanized steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006

1.5 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Characteristic values for a connection timber/timber with fasteners in accordance with the ETA-04/0013.

Timber Grade		C14	C16	C18	C20	C22	C24	
Characteristic Density (kg/m <sup>3</sup> )		290	310	320	330	340	350	
SAE250/38/1,5	F <sub>k</sub> EN 14358	Downward	11,00	12,57	13,39	14,24	15,12	16,02
		Uplift	4,50	5,14	5,48	5,83	6,19	6,55
		Lateral	6,29	7,19	7,66	8,14	8,65	9,16

## D7 Joist hanger type SAE590, SAE620 and SAE690

Face mount hanger with external flanges

Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
SAE	SAE	SAE	SAE	SAE

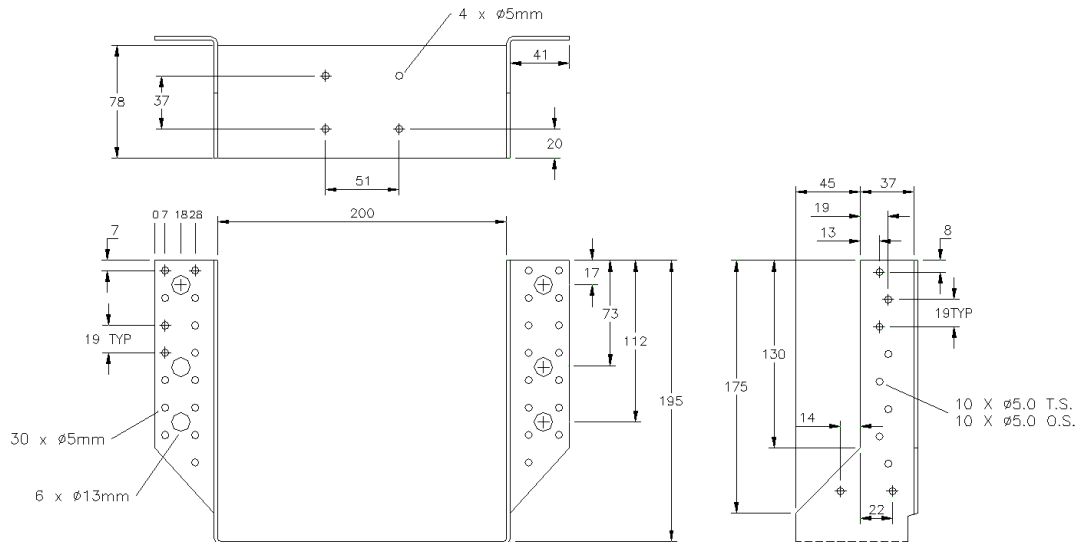
### Material Specification and Service Classes

1.5 and 2 mm thick pre-galvanized steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

1.5 and 2.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

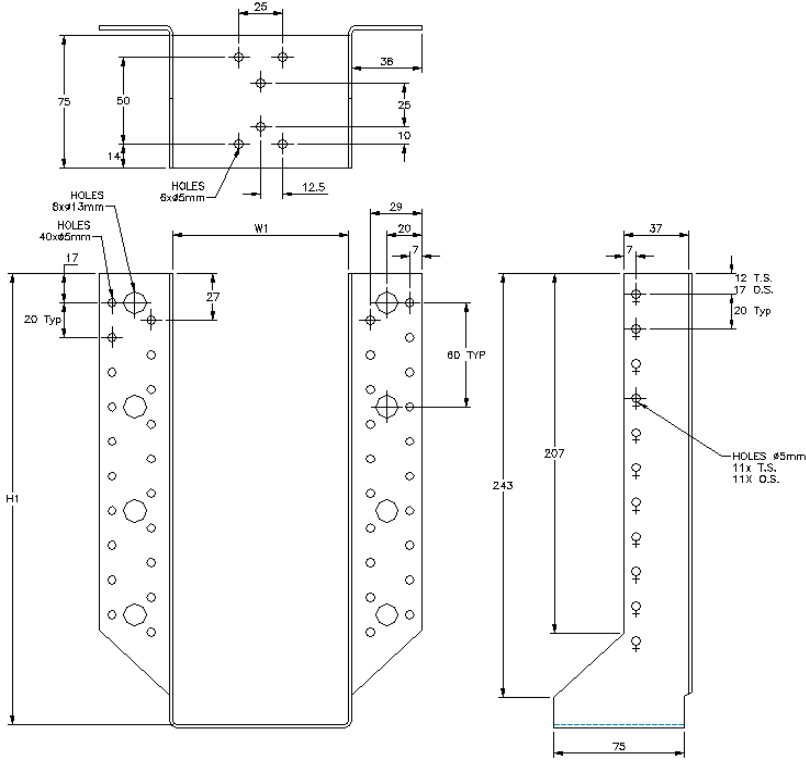
### Dimensions

#### SAE590

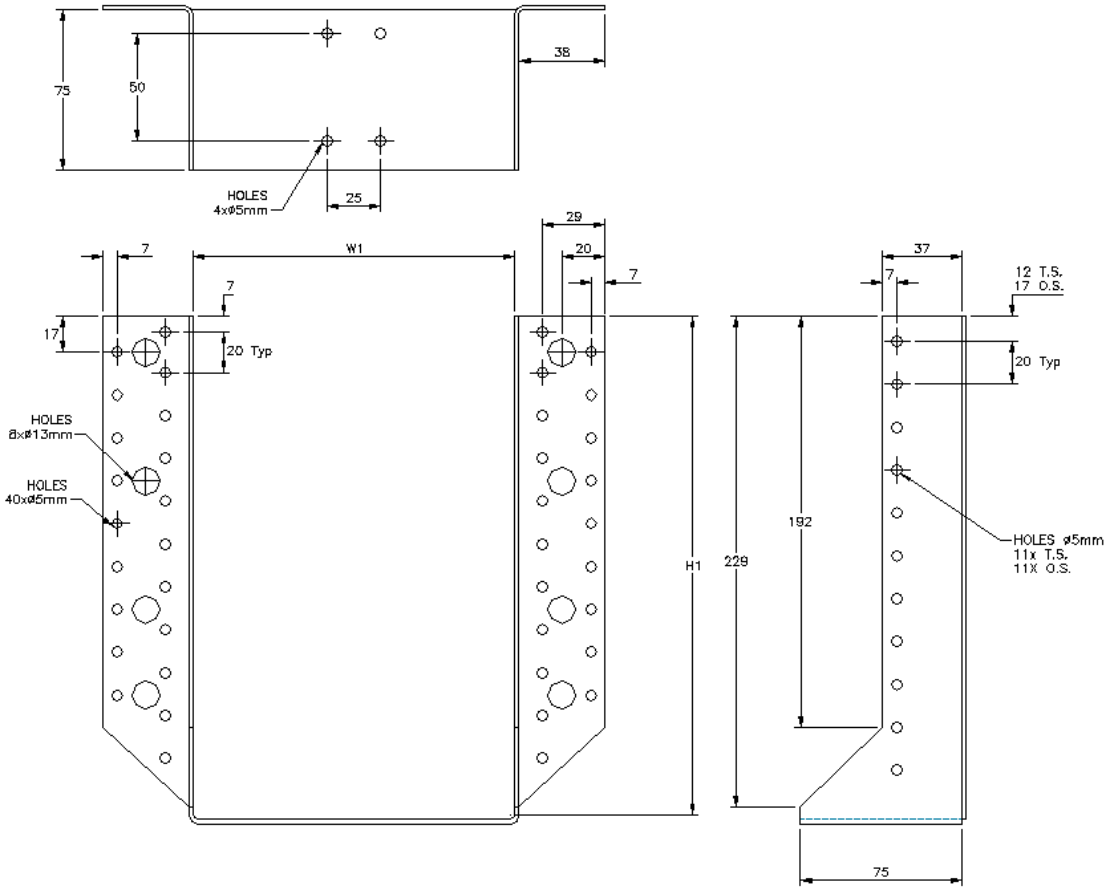


#### SAE620-a

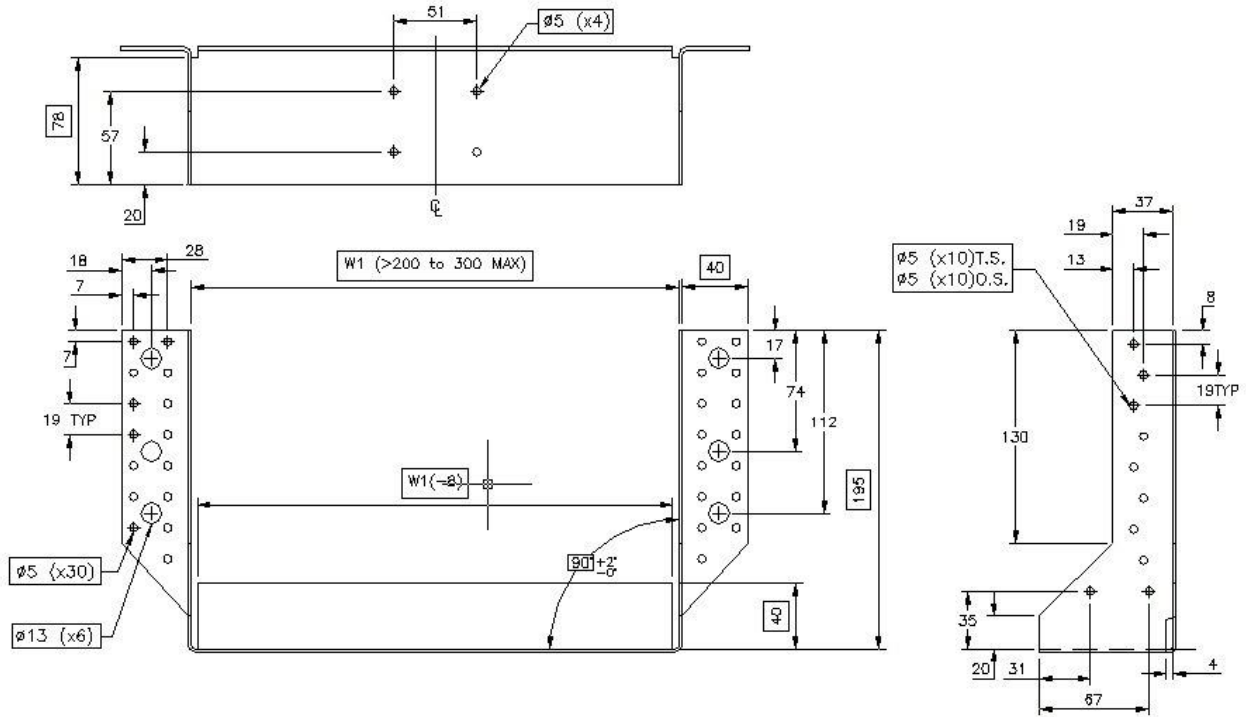




SAE620-b



SAE590



Blank	Total n° of nails		Width interval		Height interval		A
	$n_H$	$n_J$	min	max	min	max	
590	30	20	200	200	195	195	= B + 83
620-a	40	22	38	100	260	291	= B + 83
620-b	40	22	101	125	247.5	259.5	= B + 83
690	40	22	201	300	195	195	= B + 83

Table Notes:

SAE590 to SAE620 are manufactured from a standard blank length, therefore the height will vary depending on hanger width.

Joist hangers height = (blank – width)/2

Table of parameters

Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C.

See Annex D5 - “Joist Hanger type SAE” section above for  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  values.

Blank	$k_{H,1}$ – Values for Joist hanger SAE590, SAE620 and SAE690							
	FULL NAIL FIXING							
	Width	590		620		620		690
	Height [mm]	$k_{H,1}$	Height [mm]	$k_{H,1}$	Height [mm]	$k_{H,1}$	Height [mm]	$k_{H,1}$
38			291	170,5				
45			287,5	166,5				
50			285	163,6				
64			278	155,6				

76			272	148,8				
100			260	135,5				
125					247,5	132,6		
150					235	119,4		
200	195	105	210	85,4				
201-300							195	105

### Characteristic capacities with square twist nails

Art. No.	Dimensions <sup>1)</sup>		Total no. of square twist nails 3,75x30 mm		Characteristic capacity <sup>2)</sup>
	W1	H1	n <sub>H</sub>	n <sub>J</sub>	
SAE590/200	200	195	30	20	30.0
SAE620/38	38	291	40	22	50.0
SAE620/44	44	288	40	22	50.0
SAE620/50	50	285	40	22	50.0
SAE620/64	64	278	40	22	50.0
SAE620/76	76	272	40	22	50.0
SAE620/91	91	264.5	40	22	50.0
SAE620/100	100	260	40	22	50.0
SAE620/116	116	252	40	22	50.0
SAE620/125	125	247.5	40	22	50.0
SAE620/150	150	235	40	22	50.0
SAE690X	195	200-300	30	20	30.0

<sup>1)</sup>For further dimensions see the section Dimensions of this annex

<sup>2)</sup>The characteristic capacity is given for Timber Grade C24 (characteristic density of 350 kg/m<sup>3</sup>)

## D8 Joist hanger type SAIX

Face mount hanger with external or internal flanges

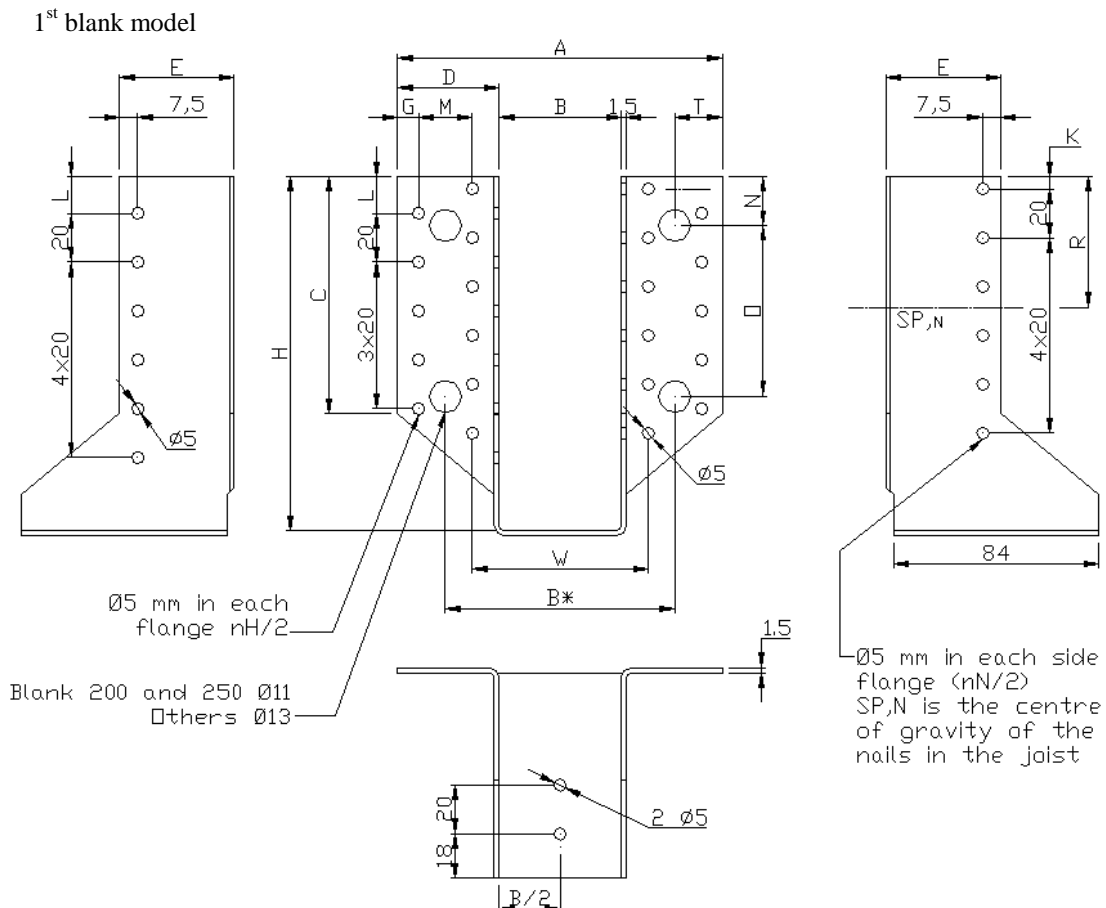
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
SAIX	SAIX	SAIX	SAIX	SAIX

### Material Specification and Service Classes

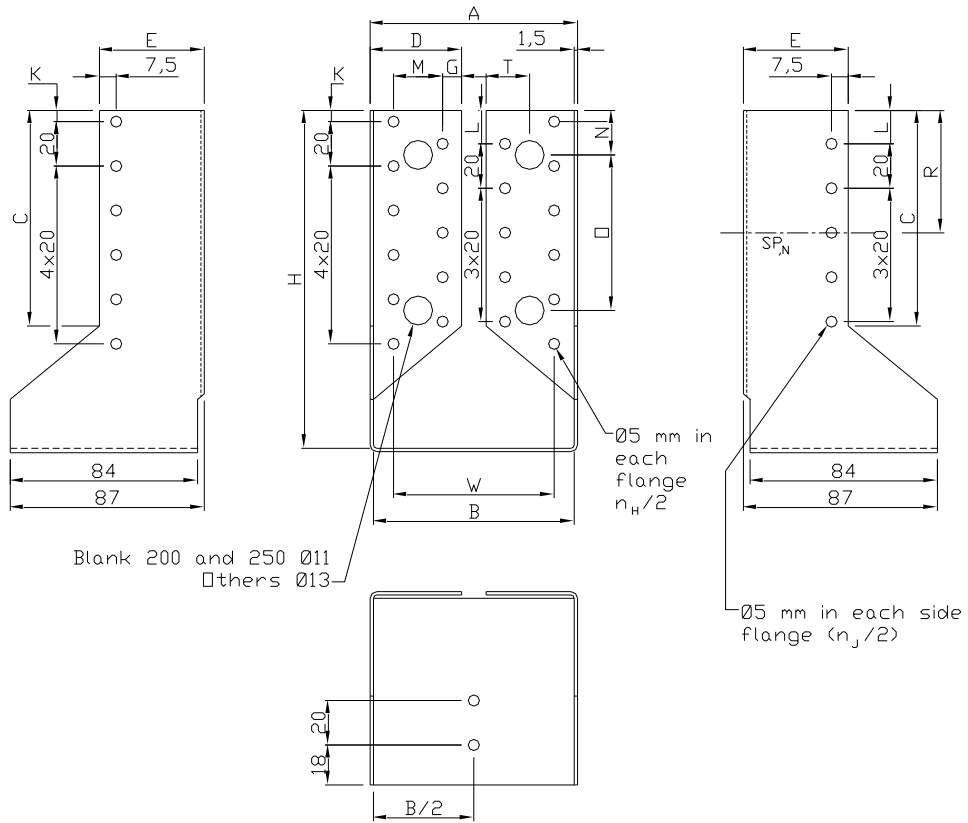
1.5 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

1.5 mm thick pre-galvanized steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

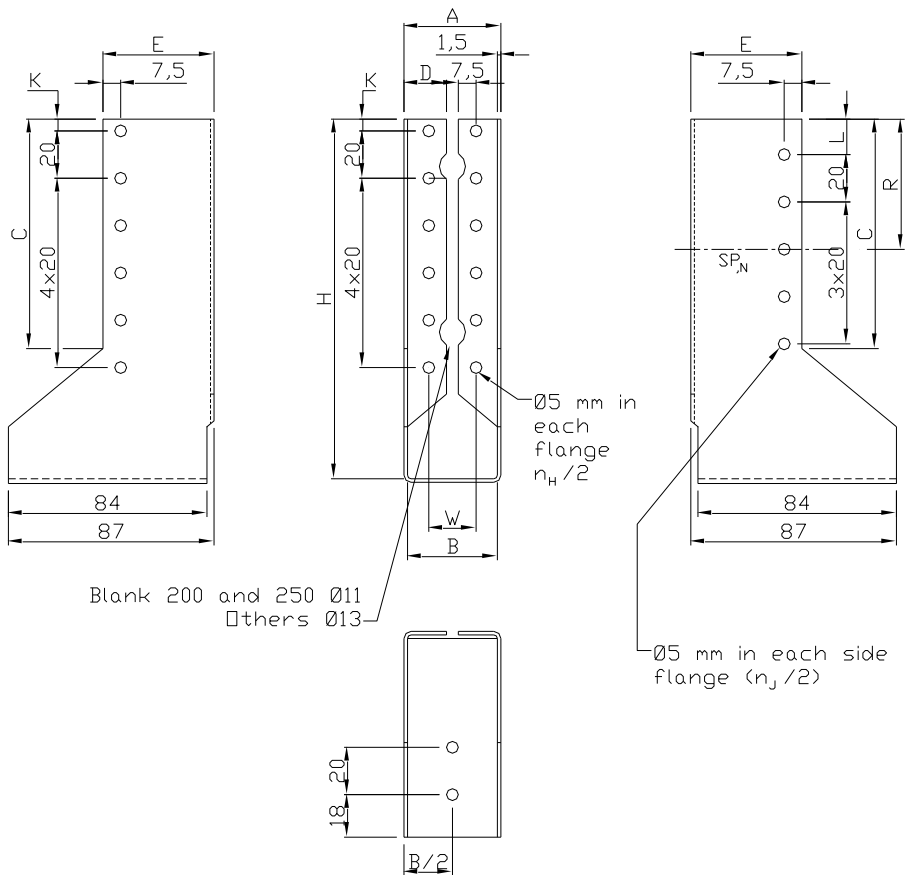
### Dimensions



2nd blank model



3rd blank model



## 1st blank model

Blank	B min-max	C	D	E	G	K	L	M	N	O	T
250	24-80	52	41.5	46	8.5	10	20	22	25	--	19.5
300	24-80	77	41.5	46	8.5	5	15	22	20	50	19.5
340	24-80	97	41.5	46	8.5	5	15	22	20	70	19.5
380	24-120	97	41.5	46	8.5	5	15	22	20	70	19.5
440	24-120	127	41.5	46	8.5	5	15	22	20	100	19.5
500	24-120	157	41.5	46	8.5	5	15	22	20	60-70	19.5
Permitted deviation		+2 -0	±1.0	±1.0	±1.0	±1.0	±1.0	±0.2	±1.0-	±0.2	±1.0

Blank	Total n° of nails		Width interval		Height interval		A
	n <sub>H</sub>	n <sub>J</sub>	min	max	min	max	
250	12	7	24	80	85	113	= B + 83
300	18	10	24	80	110	138	= B + 83
340	22	12	24	80	130	158	= B + 83
380	22	12	24	120	130	178	= B + 83
440	28	15	24	120	160	208	= B + 83
500	34	18	24	120	190	238	= B + 83

## 2nd blank model

Blank	B min-max	C	D	E	G	K	L	M	N	O	T
380	80-120	97	41.5	46	8.5	5	15	22	20	70	19.5
440	80-120	127	41.5	46	8.5	5	15	22	20	100	19.5
500	80-120	157	41.5	46	8.5	5	15	22	20	60-70	19.5
Permitted deviation		+2 -0	±1.0	±1.0	±1.0	±1.0	±1.0	±0.2	±1.0-	±0.2	±1.0

Blank	Total n° of nails		Width interval		Height interval		A
	n <sub>H</sub>	n <sub>J</sub>	min	max	min	max	
380	22	12	80	120	130	150	= B + 3
440	28	15	80	120	160	180	= B + 3
500	34	18	80	120	190	210	= B + 3

## 3rd blank model

Blank	B min-max	C	D	E	G	K	L
250	38-80	52	18.5	46	7.5	10	20
300	38-80	77	18.5	46	7.5	5	15
340	38-80	97	18.5	46	7.5	5	15
380	38-79	97	18.5	46	7.5	5	15
440	38-79	127	18.5	46	7.5	5	15
500	38-79	157	18.5	46	7.5	5	15
Permitted deviation		+2 -0	±1.0	±1.0	±1.0	±1.0	±1.0

Blank	Total n° of nails		Width interval		Height interval		A
	n <sub>H</sub>	n <sub>J</sub>	min	max	min	max	
250	6	7	38	79	85	106	= B + 3
300	10	9	38	79	110	131	= B + 3
340	12	11	38	79	130	151	= B + 3
380	12	11	38	79	150.5	171	= B + 3
440	14	15	38	79	180.5	201	= B + 3
500	18	18	38	79	210.5	231	= B + 3

## Table Notes:

SAIX250 to SAIX500 are manufactured from a standard blank length, therefore the height will vary depending on hanger width.

Joist hanger's height = (blank – width)/2

## Table of parameters

Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C.

See Annex D5 - "Joist Hanger type SAE" section above for  $k_{H1}$  values.

Joist hanger	$k_{H,2}$				
	Full or partial nailing - upward force				
	Blank	Total number of nails in the header		$k_{H,2}$	
Full nailing		Partial nailing	Full nailing	Partial nailing	
SAIX model 1	380	22	12	27,4	15,4
External or	440	28	14	41,8	19,9
internal flanges	500	34	18	59,3	32,1
	250	6		4,7	
SAIX model 2	300	10		11,1	
External or	340	12		15,4	
internal flanges	380	12		15,4	
	440	14		20,3	
	500	18		32,1	

Joist hanger	Blank	$n_{j,ef,1}$ and $n_{j,ef,2}$					
		Total number of nails in the joist		Force downward towards the bottom plate		Force upward away from the bottom plate	
		Full nailing	Partial nailing	Full nailing	Partial nailing	Full nailing	Partial nailing
				$n_{j,ef,1}$	$n_{j,ef,1}$	$n_{j,ef,2}$	$n_{j,ef,2}$
SAIX model 1	380	12	6	8,76	4,91	7,69	4
external or	440	15	8	12,92	7,59	11,06	5,99
internal flanges	500	18	10	17,08	10,69	14,46	8,21
	250	7	4	2,84	2,13	2,69	1,92
SAIX model 2	300	9	6	4,94	3,51	4,52	3,13
external or	340	11	6	7,43	5,12	6,6	4,12
internal flanges	380	11	6	7,43	4,56	6,6	3,81
	440	15	8	12,92	7,96	11,06	6,16
	500	18	10	17,08	10,69	14,46	8,21

## D9 Joist hanger type SAEL

Face mount hanger with external flanges

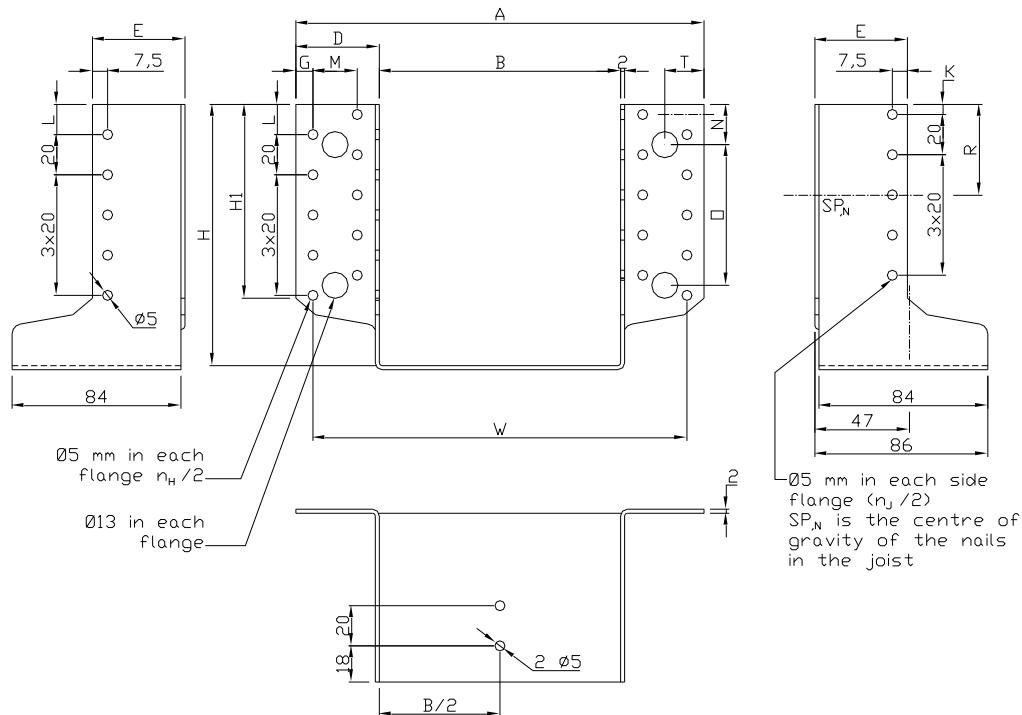
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
SAEL	SAEL	SAEL	SAEL	SAEL

### Material Specification and Service Classes

2.0 mm thick pre-galvanized steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Blank	B min-max	C	D	E	G	K	L	M	N	O	R	T
300	24-120	76.4	41.5	46	8.5	5	15	22	20	50	40	19.5
340	24-120	96.4	41.5	46	8.5	5	15	22	20	70	50	19.5
380	24-160	96.4	41.5	46	8.5	5	15	22	20	70	50	19.5
440	24-160	126.4	41.5	46	8.5	5	15	22	20	100	65	19.5
500	24-160	156.4	41.5	46	8.5	5	15	22	20	60-70	80	19.5
Permitted deviation		+2 -0	±1.0	±1.0	±1.0	±1.0	±1.0	±0.2	±1.0-	±0.2	-	±1.0

Blank	Total n° of nails		Width interval		Height interval		A
	$n_H$	$n_J$	min	max	min	max	
300	16	8	24	120	90	138	= B + 83
340	20	10	24	120	110	158	= B + 83
380	20	10	24	160	110	178	= B + 83
440	26	13	24	160	140	208	= B + 83
500	32	16	24	160	170	238	= B + 83

Table Notes:



SAE200 to SAE500 are manufactured from a standard blank length, therefore the height will vary depending on hanger width.

Joist hanger's height = (blank – width)/2

**Table of parameters**Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C.

		<b><math>k_{H,1}</math> for Joist Hanger SAEL</b>									
		<b>Full nailing - downward force</b>									
		<b>Blank</b>									
Width B [mm]	<b>300</b>		<b>340</b>		<b>380</b>		<b>440</b>		<b>500</b>		
	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	
	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	
32	134	31,1	154	41,2	174	51,5	204	71,5	234	94,5	
34	133	30,6	153	40,7	173	51,0	203	70,9	233	93,8	
36	132	30,2	152	40,2	172	50,5	202	70,2	232	93,0	
38	131	29,8	151	39,7	171	49,9	201	69,6	231	92,3	
40	130	29,4	150	39,2	170	49,4	200	69,0	230	91,5	
42	129	29,0	149	38,7	169	48,9	199	68,3	229	90,8	
44	128	28,5	148	38,2	168	48,4	198	67,7	228	90,0	
46	127	28,1	147	37,7	167	47,9	197	67,0	227	89,3	
48	126	27,7	146	37,2	166	47,3	196	66,4	226	88,5	
50	125	27,3	145	36,7	165	46,8	195	65,8	225	87,8	
52	124	26,9	144	36,2	164	46,3	194	65,1	224	87,0	
54	123	26,4	143	35,7	163	45,8	193	64,5	223	86,3	
56	122	26,0	142	35,2	162	45,3	192	63,9	222	85,5	
58	121	25,6	141	34,7	161	44,8	191	63,2	221	84,8	
60	120	25,2	140	34,3	160	44,2	190	62,6	220	84,0	
62	119	24,8	139	33,8	159	43,7	189	62,0	219	83,3	
64	118	24,4	138	33,3	158	43,2	188	61,4	218	82,6	
66	117	24,0	137	32,8	157	42,7	187	60,7	217	81,8	
68	116	23,6	136	32,3	156	42,2	186	60,1	216	81,1	
70	115	23,2	135	31,9	155	41,7	185	59,5	215	80,4	
72	114	22,8	134	31,4	154	41,2	184	58,9	214	79,6	
74	113	22,4	133	30,9	153	40,7	183	58,3	213	78,9	
76	112	22,0	132	30,4	152	40,2	182	57,6	212	78,2	
78	111	21,6	131	30,0	151	39,7	181	57,0	211	77,5	
80	110	21,2	130	29,5	150	39,2	180	56,4	210	76,7	
82	109	20,8	129	29,0	149	38,7	179	55,8	209	76,0	
84	108	20,4	128	28,6	148	38,2	178	55,2	208	75,3	
86	107	20,0	127	28,1	147	37,7	177	54,6	207	74,6	
88	106	19,6	126	27,7	146	37,2	176	54,0	206	73,9	
90	105	19,2	125	27,2	145	36,7	175	53,4	205	73,2	
92	104	18,9	124	26,8	144	36,2	174	52,8	204	72,5	
94	103	18,5	123	26,3	143	35,7	173	52,2	203	71,7	
96	102	18,1	122	25,9	142	35,2	172	51,6	202	71,0	
98	101	17,7	121	25,4	141	34,7	171	51,0	201	70,3	
100	100	17,4	120	25,0	140	34,3	170	50,4	200	69,6	

<b><math>k_{H,1}</math> for Joist Hanger SAEL</b>										
<b>Full nailing - downward force</b>										
Width B [mm]	<b>Blank</b>									
	<b>300</b>		<b>340</b>		<b>380</b>		<b>440</b>		<b>500</b>	
	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$
	16	8	20	10	20	10	26	13	32	16
Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	
102	99	17,0	119	24,5	139	33,8	169	49,8	199	68,9
104	98	16,6	118	24,1	138	33,3	168	49,2	198	68,2
106	97	16,3	117	23,7	137	32,8	167	48,6	197	67,5
108	96	15,9	116	23,2	136	32,3	166	48,0	196	66,9
110	95	15,5	115	22,8	135	31,9	165	47,5	195	66,2
112	94	15,2	114	22,4	134	31,4	164	46,9	194	65,5
114	93	14,8	113	22,0	133	30,9	163	46,3	193	64,8
116	92	14,5	112	21,6	132	30,4	162	45,7	192	64,1
118	91	14,2	111	21,1	131	30,0	161	45,1	191	63,4
120	90	13,8	110	20,7	130	29,5	160	44,6	190	62,7
122	-	-	-	-	129	29,0	159	44,0	189	62,1
124	-	-	-	-	128	28,6	158	43,4	188	61,4
126	-	-	-	-	127	28,1	157	42,9	187	60,7
128	-	-	-	-	126	27,7	156	42,3	186	60,1
130	-	-	-	-	125	27,2	155	41,7	185	59,4
132	-	-	-	-	124	26,8	154	41,2	184	58,7
134	-	-	-	-	123	26,3	153	40,6	183	58,1
136	-	-	-	-	122	25,9	152	40,1	182	57,4
138	-	-	-	-	121	25,4	151	39,5	181	56,8
140	-	-	-	-	120	25,0	150	39,0	180	56,1
142	-	-	-	-	119	24,5	149	38,4	179	55,5
144	-	-	-	-	118	24,1	148	37,9	178	54,8
146	-	-	-	-	117	23,7	147	37,4	177	54,2
148	-	-	-	-	116	23,2	146	36,8	176	53,6
150	-	-	-	-	115	22,8	145	36,3	175	52,9
152	-	-	-	-	114	22,4	144	35,8	174	52,3
154	-	-	-	-	113	22,0	143	35,3	173	51,7
156	-	-	-	-	112	21,6	142	34,7	172	51,0
158	-	-	-	-	111	21,1	141	34,2	171	50,4
160	-	-	-	-	110	20,7	140	33,7	170	49,8

In the case of intermediate width,  $k_{H,1}$  can be calculated by linear interpolation.

		<b>k<sub>H,1</sub> for Joist Hanger SAEL</b>									
		<b>Partial nailing - downward force</b>									
		<b>Blank</b>									
Width B [mm]	<b>300</b>		<b>340</b>		<b>380</b>		<b>440</b>		<b>500</b>		
	n <sub>H</sub>	n <sub>J</sub>	n <sub>H</sub>	n <sub>J</sub>	n <sub>H</sub>	n <sub>J</sub>	n <sub>H</sub>	n <sub>J</sub>	n <sub>H</sub>	n <sub>J</sub>	
	8	4	10	6	10	6	12	7	16	8	
	Height H [mm]	k <sub>H,1</sub>	Height H [mm]	k <sub>H,1</sub>	Height H [mm]	k <sub>H,1</sub>	Height H [mm]	k <sub>H,1</sub>	Height H [mm]	k <sub>H,1</sub>	
32	134	18,8	154	24,0	174	29,4	204	38,8	234	55,7	
34	133	18,6	153	23,8	173	29,1	203	38,5	233	55,3	
36	132	18,3	152	23,5	172	28,8	202	38,2	232	54,9	
38	131	18,1	151	23,3	171	28,5	201	37,9	231	54,5	
40	130	17,9	150	23,0	170	28,3	200	37,6	230	54,1	
42	129	17,6	149	22,8	169	28,0	199	37,3	229	53,7	
44	128	17,4	148	22,5	168	27,7	198	37,0	228	53,3	
46	127	17,2	147	22,3	167	27,5	197	36,7	227	53,0	
48	126	17,0	146	22,0	166	27,2	196	36,4	226	52,6	
50	125	16,7	145	21,8	165	26,9	195	36,1	225	52,2	
52	124	16,5	144	21,5	164	26,7	194	35,8	224	51,8	
54	123	16,3	143	21,3	163	26,4	193	35,5	223	51,5	
56	122	16,1	142	21,0	162	26,1	192	35,2	222	51,1	
58	121	15,9	141	20,8	161	25,9	191	35,0	221	50,7	
60	120	15,6	140	20,5	160	25,6	190	34,7	220	50,3	
62	119	15,4	139	20,3	159	25,3	189	34,4	219	50,0	
64	118	15,2	138	20,0	158	25,1	188	34,1	218	49,6	
66	117	15,0	137	19,8	157	24,8	187	33,8	217	49,2	
68	116	14,8	136	19,6	156	24,6	186	33,5	216	48,8	
70	115	14,6	135	19,3	155	24,3	185	33,2	215	48,5	
72	114	14,3	134	19,1	154	24,0	184	32,9	214	48,1	
74	113	14,1	133	18,9	153	23,8	183	32,6	213	47,7	
76	112	13,9	132	18,6	152	23,5	182	32,4	212	47,4	
78	111	13,7	131	18,4	151	23,3	181	32,1	211	47,0	
80	110	13,5	130	18,2	150	23,0	180	31,8	210	46,7	
82	109	13,3	129	17,9	149	22,8	179	31,5	209	46,3	
84	108	13,1	128	17,7	148	22,5	178	31,2	208	45,9	
86	107	12,9	127	17,5	147	22,3	177	30,9	207	45,6	
88	106	12,7	126	17,2	146	22,0	176	30,7	206	45,2	
90	105	12,5	125	17,0	145	21,8	175	30,4	205	44,9	
92	104	12,3	124	16,8	144	21,5	174	30,1	204	44,5	
94	103	12,1	123	16,6	143	21,3	173	29,8	203	44,2	
96	102	11,9	122	16,4	142	21,0	172	29,6	202	43,8	
98	101	11,7	121	16,1	141	20,8	171	29,3	201	43,5	
100	100	11,5	120	15,9	140	20,5	170	29,0	200	43,1	

		<b><math>k_{H,1}</math> for Joist Hanger SAEL</b>									
		<b>Partial nailing - downward force</b>									
Width B [mm]	<b>Blank</b>										
	<b>300</b>		<b>340</b>		<b>380</b>		<b>440</b>		<b>500</b>		
	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	
	8	4	10	6	10	6	12	7	16	8	
	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	
102	99	11,3	119	15,7	139	20,3	169	28,8	199	42,8	
104	98	11,1	118	15,5	138	20,0	168	28,5	198	42,4	
106	97	11,0	117	15,3	137	19,8	167	28,2	197	42,1	
108	96	10,8	116	15,1	136	19,6	166	28,0	196	41,7	
110	95	10,6	115	14,9	135	19,3	165	27,7	195	41,4	
112	94	10,4	114	14,7	134	19,1	164	27,4	194	41,1	
114	93	10,3	113	14,5	133	18,9	163	27,2	193	40,7	
116	92	10,1	112	14,3	132	18,6	162	26,9	192	40,4	
118	91	9,9	111	14,1	131	18,4	161	26,6	191	40,1	
120	90	9,7	110	13,9	130	18,2	160	26,4	190	39,7	
122	-	-	-	-	129	17,9	159	26,1	189	39,4	
124	-	-	-	-	128	17,7	158	25,9	188	39,1	
126	-	-	-	-	127	17,5	157	25,6	187	38,7	
128	-	-	-	-	126	17,2	156	25,4	186	38,4	
130	-	-	-	-	125	17,0	155	25,1	185	38,1	
132	-	-	-	-	124	16,8	154	24,9	184	37,8	
134	-	-	-	-	123	16,6	153	24,6	183	37,5	
136	-	-	-	-	122	16,4	152	24,4	182	37,1	
138	-	-	-	-	121	16,1	151	24,2	181	36,8	
140	-	-	-	-	120	15,9	150	23,9	180	36,5	
142	-	-	-	-	119	15,7	149	23,7	179	36,2	
144	-	-	-	-	118	15,5	148	23,5	178	35,9	
146	-	-	-	-	117	15,3	147	23,2	177	35,6	
148	-	-	-	-	116	15,1	146	23,0	176	35,3	
150	-	-	-	-	115	14,9	145	22,8	175	35,0	
152	-	-	-	-	114	14,7	144	22,5	174	34,7	
154	-	-	-	-	113	14,5	143	22,3	173	34,4	
156	-	-	-	-	112	14,3	142	22,1	172	34,1	
158	-	-	-	-	111	14,1	141	21,9	171	33,8	
160	-	-	-	-	110	13,9	140	21,7	170	33,5	

In the case of intermediate width,  $k_{H,1}$  can be calculated by linear interpolation.

		<b><math>k_{H,2}</math></b>			
		<b>Full or partial nailing - upward force</b>			
Joist hanger	Blank	Total number of nails in the header		<b><math>k_{H,2}</math></b>	
		Full nailing	Partial nailing	Full nailing	Partial nailing
SAEL	300	16	8	16,4	7,9
	340	20	10	23,8	11,4
	380	20	10	23,8	11,4
	440	26	12	37,6	21,9
	500	32	16	54,5	25,9

Joist hanger	Blank	Total number of nails in the joist		Force downward towards the bottom plate		Force upward away from the bottom plate	
		Full nailing	Partial nailing	Full nailing	Partial nailing	Full nailing	Partial nailing
SAEL	300	8	4	3,83	2,59	3,57	2,23
	340	10	6	6,15	4,22	5,54	3,61
	380	10	6	6,15	4,22	5,54	3,61
	440	13	8	10,13	6,45	8,81	5,38
	500	16	8	14,31	7,78	12,2	6,08

**Characteristic capacities with square twist nails**

Art. No.	Dimensions <sup>1)</sup>		Total no. of square twist nails 3,75x30 mm		Characteristic capacity <sup>2)</sup>
	B	H	n <sub>H</sub>	n <sub>J</sub>	
SAEL500/150	150	175	32	16	28.0

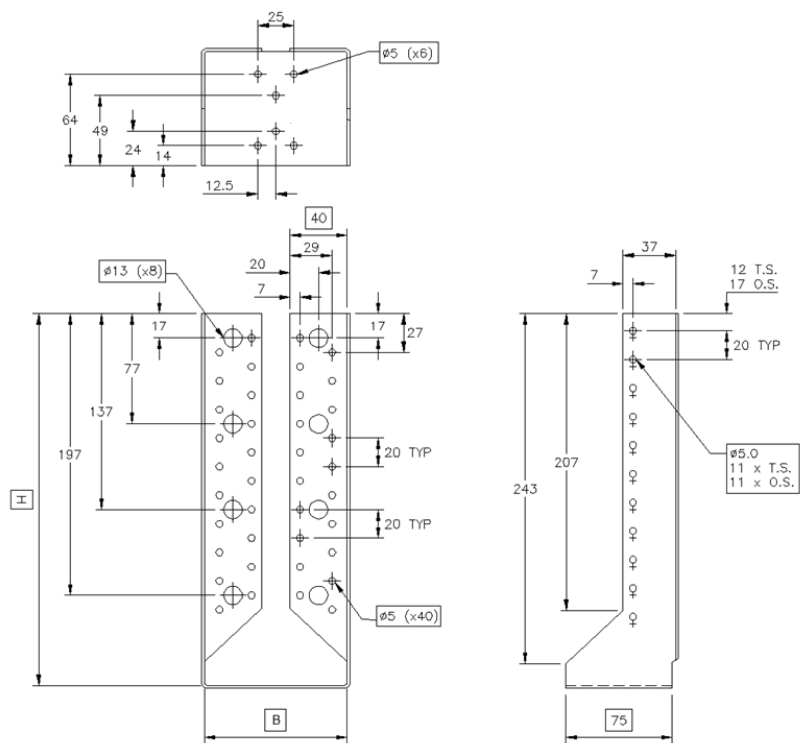
<sup>1)</sup>For further dimensions see the section Dimensions of this annex

<sup>2)</sup>The characteristic capacity is given for Timber Grade C24 (characteristic density of 350 kg/m<sup>3</sup>)

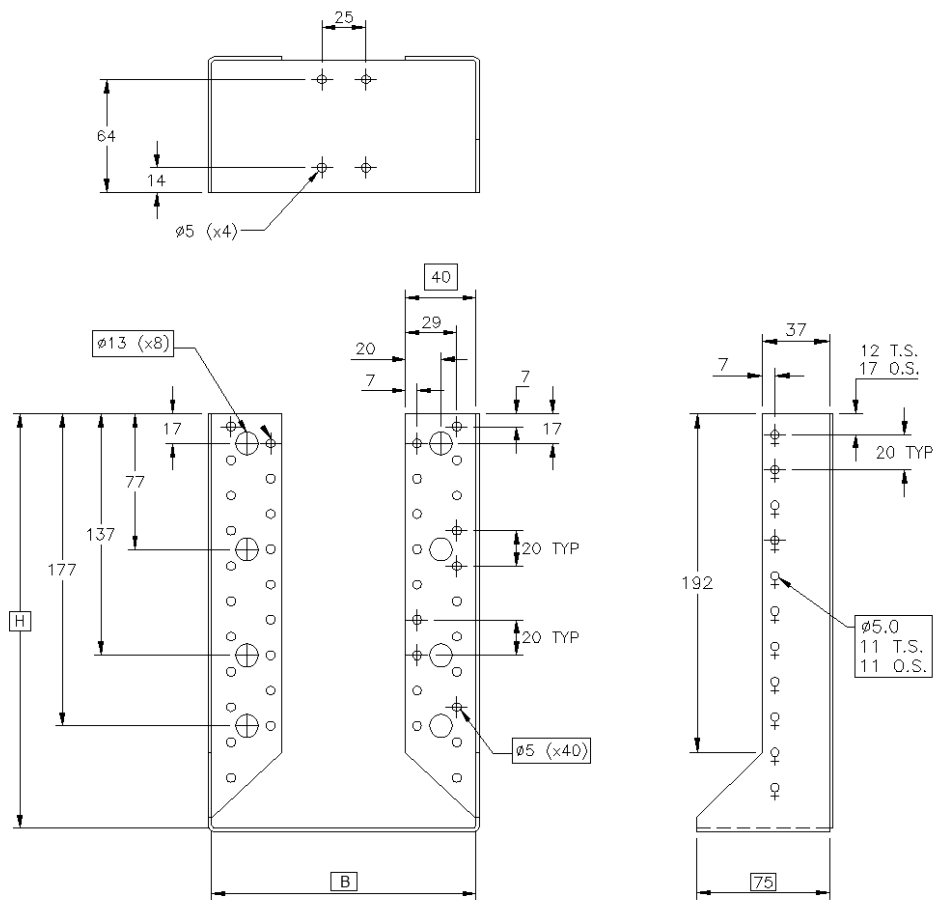








Blank model SAI620-b



1<sup>st</sup> blank model

Blank	B min-max	C	D	G	K	M	O
200	64-80	24	33,5	6	17.5	18	--
250	64-80	50	33,5	6	22.5	18	--
300	64-80	77	33,5	6	7.5	18	60
340	64-120	77	33,5	6	7.5	18	60
380	64-120	94	33,5	6	7.5	18	80
440	64-120	124	33,5	6	12.5	18	100
500	64-120	154	33,5	6	7.5	18	60-80
Permitted deviation	+2 -0	+/-1.5	+/-1,0	+/-1,0	+/-1,0		+/-0.2

Blank	Total n° of nails		Width interval		Height interval		A
	n <sub>H</sub>	n <sub>J</sub>	min	max	min	max	
200	6	4	64	80	60	68	= B + 4
250	10	6	64	80	85	93	= B + 4
300	16	9	64	80	110	118	= B + 4
340	16	10	64	120	110	138	= B + 4
380	20	12	64	120	130	158	= B + 4
440	26	15	64	120	160	188	= B + 4
500	32	18	64	120	190	218	= B + 4

2<sup>nd</sup> blank model

Blank	B min-max	C	D	K
200	38-63	40	17.5	17.5
250	38-63	66	17.5	22.5
Permitted deviation	+2 -0	+/-1.5	+/-1.0	+/-1,0

Blank	Total n° of holes		Width interval		Height interval		A
	n <sub>H</sub>	n <sub>J</sub>	min	max	Min	max	
200	4	4	38	63	68.5	81	= B + 4
250	6	6	38	63	93.5	106	= B + 4

## Table Notes:

- SAI200 to SAI500 are manufactured from a standard blank length, therefore the height will vary depending on hanger width.
- The range of the SAI offers a broad range of folding. But its installation depends on its width.
- Joist hanger's height = (blank – width)/2

Blank	Total n° of nails		Width interval		Height interval		A
	n <sub>H</sub>	n <sub>J</sub>	Min	Max	Min	Max	
590	30	20	200	200	195	195	=B+83
620-a	40	22	38	100	260	291	=B+83
620-b	40	22	101	125	247.5	259.5	=B+83

## Table Notes:

SAI590 to SAI620 are manufactured from a standard blank length, therefore the height will vary depending on hanger width.

Joist hangers height = (blank – width)/2

## Table of parameters

Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C.

<b><math>k_{H,1}</math> for Joist Hanger SAI 64-80</b>														
<b>Full nailing - DOWNWARD force</b>														
Width mm	Blank													
	200		250		300		340		380		440		500	
	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$
64	68	6,3	93	11,8	118,0	21,5	138	29,1	158	39,1	188	58,4	218	77,3
66	67	6,1	92	11,5	117,0	21,1	137	28,7	157	38,6	187	57,8	217	76,6
68	66	5,9	91	11,2	116,0	20,7	136	28,3	156	38,2	186	57,2	216	75,8
70	65	5,7	90	10,9	115,0	20,3	135	27,9	155	37,7	185	56,6	215	75,1
72	64	5,5	89	10,7	114,0	20,0	134	27,5	154	37,2	184	56,0	214	74,4
74	63	5,3	88	10,4	113,0	19,6	133	27,1	153	36,7	183	55,4	213	73,7
76	62	5,2	87	10,1	112,0	19,2	132,0	26,7	152,0	36,2	182,0	54,8	212,0	73,0
78	61	5,0	86	9,9	111,0	18,9	131	26,3	151	35,8	181	54,2	211	72,3
80	60	4,8	85	9,6	110,0	18,5	130,0	25,9	150,0	35,3	180,0	53,6	210,0	71,6
82	-	-	-	-	109,0	18,1	129,0	25,5	149,0	34,8	179,0	53,0	209,0	70,9
84	-	-	-	-	108,0	17,8	128	25,1	148	34,3	178	52,4	208	70,2
86	-	-	-	-	107,0	17,4	127	24,7	147	33,9	177	51,8	207	69,5
88	-	-	-	-	106,0	17,1	126,0	24,3	146,0	33,4	176,0	51,2	206,0	68,8
90	-	-	-	-	105,0	16,7	125,0	23,9	145,0	32,9	175,0	50,6	205,0	68,2
92	-	-	-	-	104,0	16,4	124,0	23,5	144,0	32,5	174,0	50,0	204,0	67,5
94	-	-	-	-	103,0	16,0	123,0	23,1	143,0	32,0	173,0	49,4	203,0	66,8
96	-	-	-	-	102,0	15,7	122,0	22,7	142,0	31,5	172,0	48,9	202,0	66,1
98	-	-	-	-	101,0	15,3	121	22,4	141	31,1	171	48,3	201	65,4
100	-	-	-	-	100,0	15,0	120,0	22,0	140,0	30,6	170,0	47,7	200,0	64,8
102	-	-	-	-	99,0	14,7	119,0	21,6	139,0	30,2	169,0	47,1	199,0	64,1
104	-	-	-	-	98,0	14,3	118,0	21,2	138,0	29,7	168,0	46,5	198,0	63,4
106	-	-	-	-	97,0	14,0	117,0	20,8	137,0	29,3	167,0	46,0	197,0	62,7
108	-	-	-	-	96,0	13,7	116,0	20,5	136,0	28,8	166,0	45,4	196,0	62,1
110	-	-	-	-	95,0	13,4	115	20,1	135	28,4	165	44,8	195	61,4
112	-	-	-	-	94,0	13,0	114	19,7	134	27,9	164	44,3	194	60,7
114	-	-	-	-	93,0	12,7	113	19,3	133	27,5	163	43,7	193	60,1
116	-	-	-	-	92,0	12,4	112	19,0	132	27,0	162	43,1	192	59,4
118	-	-	-	-	91,0	12,1	111	18,6	131	26,6	161	42,6	191	58,8
120	-	-	-	-	90,0	11,8	110	18,3	130	26,2	160	42,0	190	58,1

In the case of intermediate values, the height may be rectilinear interpolated

<b><math>k_{H,1}</math> for Joist Hanger SAI 64-80</b>												
<b>Partial nailing - downward force</b>												
Width mm	<b>Blank</b>											
	<b>250</b>		<b>300</b>		<b>340</b>		<b>380</b>		<b>440</b>		<b>500</b>	
	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$
64	93	6,5	118	14,1	138	19,3	158	25,5	188	31,1	218	45,7
66	92	6,4	117	13,9	137	19,0	157	25,2	187	30,8	217	45,3
68	91	6,2	116	13,7	136	18,7	156	24,9	186	30,4	216	44,9
70	90	6,0	115	13,4	135	18,5	155	24,5	185	30,1	215	44,5
72	89	5,9	114	13,2	134	18,2	154	24,2	184	29,8	214	44,1
74	88	5,7	113	13,0	133	17,9	153	23,9	183	29,4	213	43,7
76	87	5,5	112	12,7	132,0	17,7	152,0	23,6	182,0	29,1	212,0	43,3
78	86	5,4	111	12,5	131	17,4	151	23,3	181	28,8	211	42,9
80	85	5,2	110	12,3	130,0	17,2	150,0	23,0	180,0	28,4	210,0	42,5
82	-	-	109	12,0	129,0	16,9	149,0	22,7	179,0	28,1	209,0	42,1
84	-	-	108	11,8	128	16,6	148	22,4	178	27,8	208	41,7
86	-	-	107	11,6	127	16,4	147	22,1	177	27,4	207	41,3
88	-	-	106	11,4	126,0	16,1	146,0	21,8	176,0	27,1	206,0	40,9
90	-	-	105	11,1	125,0	15,9	145,0	21,5	175,0	26,8	205,0	40,5
92	-	-	104	10,9	124,0	15,6	144,0	21,2	174,0	26,5	204,0	40,1
94	-	-	103	10,7	123,0	15,4	143,0	20,9	173,0	26,1	203,0	39,7
96	-	-	102	10,5	122,0	15,1	142,0	20,6	172,0	25,8	202,0	39,3
98	-	-	101	10,3	121	14,9	141	20,3	171	25,5	201	38,9
100	-	-	100	10,1	120,0	14,6	140,0	20,1	170,0	25,2	200,0	38,5
102	-	-	99	9,9	119,0	14,4	139,0	19,8	169,0	24,9	199,0	38,1
104	-	-	98	9,7	118,0	14,1	138,0	19,5	168,0	24,5	198,0	37,7
106	-	-	97	9,5	117,0	13,9	137,0	19,2	167,0	24,2	197,0	37,3
108	-	-	96	9,3	116,0	13,7	136,0	18,9	166,0	23,9	196,0	37,0
110	-	-	95	9,1	115	13,4	135	18,6	165	23,6	195	36,6
112	-	-	94	8,9	114	13,2	134	18,3	164	23,3	194	36,2
114	-	-	93	8,7	113	13,0	133	18,1	163	23,0	193	35,8
116	-	-	92	8,5	112	12,7	132	17,8	162	22,7	192	35,4
118	-	-	91	8,3	111	12,5	131	17,5	161	22,4	191	35,1
120	-	-	90	8,2	110	12,3	130	17,2	160	22,1	190	34,7

In the case of intermediate width,  $k_{H,1}$  can be calculated by linear interpolation.

<b><math>k_{H,1}</math> for Joist Hanger SAI 38-63</b>				
<b>Full nailing - downward force</b>				
Width B [mm]	<b>Blank</b>			
	<b>200</b>		<b>250</b>	
	$n_H$	$n_J$	$n_H$	$n_J$
	4	4	6	6
Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	
38	81	5,2	106	8,1
40	80	5,0	105	7,9
42	79	4,9	104	7,8
44	78	4,8	103	7,6
46	77	4,7	102	7,5
48	76	4,5	101	7,3
50	75	4,4	100	7,1
52	74	4,3	99	7,0
54	73	4,2	98	6,8
56	72	4,0	97	6,7
58	71	3,9	96	6,5
60	70	3,8	95	6,4
62	69	3,7	94	6,2
63	69	3,6	94	6,1

In the case of intermediate width,  $k_{H,1}$  can be calculated by linear interpolation.

<b><math>k_{H,2}</math></b>					
<b>Full or partial nailing - upward force</b>					
Joist hanger	Blank	Total number of nails in the header		$k_{H2}$	
		Full nailing	Partial nailing	Full nailing	Partial nailing
SAI model 1	200	6	4	3,6	2,5
	250	10	4	7,5	2,4
	300	15	8	13,5	7,6
	340	15	8	13,5	7,6
	380	18	10	19,2	12,1
	440	23	12	28,2	15
	500	28	14	41,3	19,6
	590	30	16	81,5	40,9
	620-a	40	20	105,1	48,9
620-b	40	22	114,7	61,3	
SAI model 2	200	4		2,5	
	250	6		4,7	

Joist hanger	Blank	Total number of nails in the joist		Force downward towards the bottom plate		Force upward away from the bottom plate	
		Full nailing	Partial nailing	Full nailing	Partial nailing	Full nailing	Partial nailing
				$n_{J,ef,1}$	$n_{J,ef,1}$	$n_{J,ef,2}$	$n_{J,ef,2}$
SAI model 1	200	4	4	1,84	1,84	1,7	1,7
	250	6	4	1,91	1,6	1,84	1,51
	300	10	6	5,95	3,77	5,39	3,31
	340	10	6	5,95	5,69	5,39	4,4
	380	12	6	8,5	4,75	7,52	3,92
	440	14	8	11,22	7,21	9,74	5,8
	500	18	8	16,75	10,46	14,27	8,1
	590	20	10	18.46	9.11	15.90	7.42
	620-a	22	12	20.67	10.69	17.87	8.90
620-b	22	12	22.35	12.00	18.92	9.62	
SAI model 2	200	4		1,84		1,7	
	250	6		1,91		1,84	

### Characteristic capacities with square twist nails

Art. No.	Dimensions <sup>1)</sup>		Total no. of square twist nails 3,75x30 mm		Characteristic capacity <sup>2)</sup>
	B	H	$n_H$	$n_J$	
SAI380/90	90	145	20	12	20.3
SAI380/100	100	140	20	12	20.3
SAI500/91	91	204.5	32	18	28.0
SAI500/100	100	200	32	18	28.0
SAI500/125	125	187.5	32	16	28.0
SAI500/150	150	175	32	16	28.0
SAI590/200	200	195	30	20	30.0
SAI620/91	91	264.5	40	22	35.0
SAI620/100	100	260	40	22	35.0
SAI620/116	116	252	40	22	35.0
SAI620/125	125	247.5	40	22	35.0
SAI620/150	150	235	40	22	35.0

<sup>1)</sup>For further dimensions see the section Dimensions of this annex

<sup>2)</sup>The characteristic capacity is given for Timber Grade C24 (characteristic density of 350 kg/m<sup>3</sup>)

## D11 Joist hanger type SAIL

Face mount hanger with interior flanges

Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
SAIL	SAIL	SAIL	SAIL	SAIL

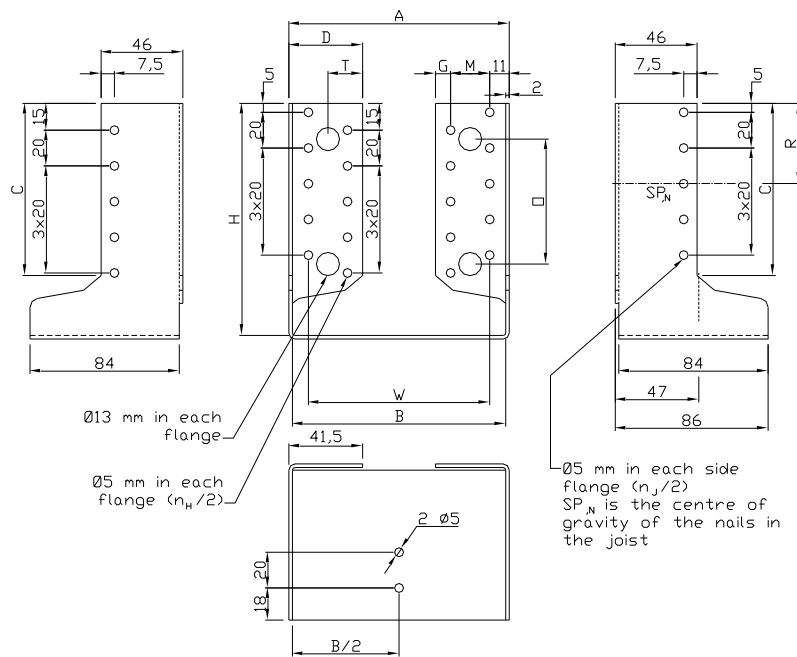
### Material Specification and Service Classes

2.0 mm thick pre-galvanized steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

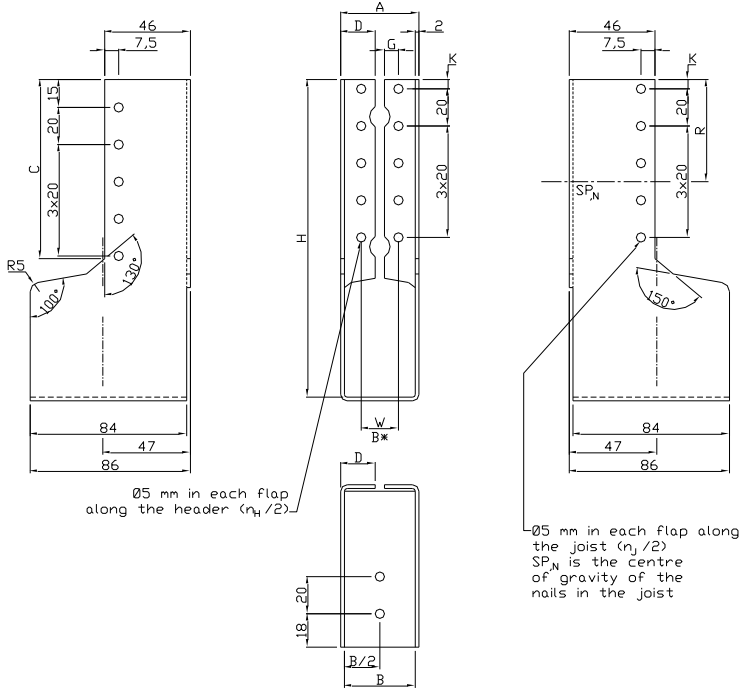
2.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions

1<sup>st</sup> blank model



2<sup>nd</sup> blank model





1<sup>st</sup> blank model

Blank	B min-max	C	D	G	K	M	O	T
300	80-120	76.4	41.5	8.5	5	22	50	19.5
340	80-120	96.4	41.5	8.5	5	22	70	19.5
380	80-160	96.4	41,5	8,5	5	22	70	19,5
440	80-160	126.4	41,5	8,5	5	22	100	19,5
500	80-160	156.4	41,5	8,5	5	22	60-70	19,5
Permitted deviation	+2 -0	+/-1.5	+/-1,0	+/-1,0	+/-1,0	+/-1,0	+/-0.2	+/-1,0

Blank	Total n° of nails		Width interval		Height interval		A
	n <sub>H</sub>	n <sub>J</sub>	min	max	min	max	
300	16	8	80	120	90	110	= B + 4
340	20	10	80	120	110	130	= B + 4
380	20	10	80	160	110	150	= B + 4
440	26	13	80	160	140	180	= B + 4
500	32	16	80	160	170	210	= B + 4

2<sup>nd</sup> blank model

Blank	B min-max	C	D	G	K
300	38-79	87	18.5	7.5	5
340	38-79	107	18.5	7.5	5
380	38-79	107	18.5	7,5	5
440	38-79	137	18.5	7,5	5
500	38-79	167	18.5	7,5	5
Permitted deviation	+2 -0	+/-1.5	+/-1.0	+1 -0	+/-1,0

Blank	Total n° of holes		Width interval		Height interval		A
	n <sub>H</sub>	n <sub>J</sub>	min	max	min	max	
300	8	10	38	79	110.5	131	= B + 4
340	10	10	38	79	130.5	151	= B + 4
380	10	12	38	79	150.5	171	= B + 4
440	12	14	38	79	180.5	201	= B + 4
500	16	18	38	79	210.5	231	= B + 4

## Table Notes:

- SAIL300 to SAIL500 are manufactured from a standard blank length, therefore the height will vary depending on hanger width.
- The range of the SAIL offers a broad range of folding. But its installation depends on its width.
- Joist hanger's height = (blank – width)/2

## Table of parameters

Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C

<b><math>k_{H,1}</math> for Joist Hanger SAIL 38-79</b>										
<b>Full nailing - downward force</b>										
Width B [mm]	<b>Blank</b>									
	<b>300</b>		<b>340</b>		<b>380</b>		<b>440</b>		<b>500</b>	
	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$
	8	8	10	10	10	10	12	13	16	16
Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	
38	131,0	16,6	151,0	21,8	171,0	27,1	201,0	36,6	231,0	49,1
40	130,0	16,4	150,0	21,6	170,0	26,8	200,0	36,2	230,0	48,7
42	129,0	16,2	149,0	21,3	169,0	26,5	199,0	35,9	229,0	48,3
44	128,0	15,9	148,0	21,1	168,0	26,3	198,0	35,6	228,0	47,9
46	127,0	15,7	147,0	20,8	167,0	26,0	197,0	35,3	227,0	47,6
48	126,0	15,5	146,0	20,5	166,0	25,7	196,0	35,0	226,0	47,2
50	125,0	15,3	145,0	20,3	165,0	25,5	195,0	34,7	225,0	46,8
52	124,0	15,1	144,0	20,0	164,0	25,2	194,0	34,4	224,0	46,4
54	123,0	14,9	143,0	19,8	163,0	25,0	193,0	34,1	223,0	46,0
56	122,0	14,7	142,0	19,5	162,0	24,7	192,0	33,8	222,0	45,7
58	121,0	14,4	141,0	19,3	161,0	24,4	191,0	33,5	221,0	45,3
60	120,0	14,2	140,0	19,0	160,0	24,2	190,0	33,2	220,0	44,9
62	119,0	14,0	139,0	18,8	159,0	23,9	189,0	32,9	219,0	44,5
64	118,0	13,8	138,0	18,5	158,0	23,6	188,0	32,6	218,0	44,1
66	117,0	13,6	137,0	18,3	157,0	23,4	187,0	32,3	217,0	43,8
68	116,0	13,4	136,0	18,0	156,0	23,1	186,0	32,0	216,0	43,4
70	115,0	13,2	135,0	17,8	155,0	22,9	185,0	31,7	215,0	43,0
72	114,0	13,0	134,0	17,5	154,0	22,6	184,0	31,4	214,0	42,6
74	113,0	12,8	133,0	17,3	153,0	22,3	183,0	31,1	213,0	42,3
76	112,0	12,5	132,0	17,0	152,0	22,1	182,0	30,8	212,0	41,9
78	111,0	12,3	131,0	16,8	151,0	21,8	181,0	30,5	211,0	41,5
80	110,0	12,1	130,0	16,6	150,0	21,6	180,0	30,2	210,0	41,2

In the case of intermediate width,  $k_{H,1}$  can be calculated by linear interpolation.

<b><math>k_{H,1}</math> for Joist Hanger SAIL 38-79</b>										
<b>Partial nailing - downward force</b>										
Width B [mm]	<b>Blank</b>									
	<b>300</b>		<b>340</b>		<b>380</b>		<b>440</b>		<b>500</b>	
	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$
	8	4	10	6	10	6	12	7	16	8
Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	
38	131	18,8	151	23,5	171	29,1	201	39,4	231	52,9
40	130	18,5	150	23,2	170	28,8	200	39,1	230	52,5
42	129	18,3	149	22,9	169	28,6	199	38,8	229	52,1
44	128	18,0	148	22,6	168	28,3	198	38,4	228	51,6
46	127	17,8	147	22,4	167	28,0	197	38,1	227	51,2
48	126	17,5	146	22,1	166	27,7	196	37,8	226	50,8
50	125	17,3	145	21,8	165	27,4	195	37,4	225	50,4
52	124	17,1	144	21,5	164	27,1	194	37,1	224	50,0
54	123	16,8	143	21,3	163	26,8	193	36,8	223	49,6
56	122	16,6	142	21,0	162	26,6	192	36,5	222	49,2
58	121	16,3	141	20,7	161	26,3	191	36,1	221	48,8
60	120	16,1	140	20,5	160	26,0	190	35,8	220	48,4
62	119	15,9	139	20,2	159	25,7	189	35,5	219	48,0
64	118	15,6	138	19,9	158	25,4	188	35,1	218	47,6
66	117	15,4	137	19,7	157	25,1	187	34,8	217	47,1
68	116	15,1	136	19,4	156	24,9	186	34,5	216	46,7
70	115	14,9	135	19,1	155	24,6	185	34,2	215	46,3
72	114	14,7	134	18,9	154	24,3	184	33,8	214	45,9
74	113	14,4	133	18,6	153	24,0	183	33,5	213	45,5
76	112	14,2	132	18,3	152	23,8	182	33,2	212	45,1
78	111	14,0	131	18,1	151	23,5	181	32,9	211	44,7
80	110	13,7	130	17,8	150	23,2	180	32,5	210	44,3

In the case of intermediate width,  $k_{H,1}$  can be calculated by linear interpolation.

		<b><math>k_{H,1}</math> for Joist Hanger SAIL 80-160</b>									
		<b>Full nailing - downward force</b>									
		<b>Blank</b>									
Width B [mm]	<b>300</b>		<b>340</b>		<b>380</b>		<b>440</b>		<b>500</b>		
	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	
	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	
80	110,0	21,2	130,0	29,5	150,0	39,2	180,0	56,4	210,0	76,7	
82	109,0	20,8	129,0	29,0	149,0	38,7	179,0	55,8	209,0	76,0	
84	108,0	20,4	128,0	28,6	148,0	38,2	178,0	55,2	208,0	75,3	
86	107,0	20,0	127,0	28,1	147,0	37,7	177,0	54,6	207,0	74,6	
88	106,0	19,6	126,0	27,7	146,0	37,2	176,0	54,0	206,0	73,9	
90	105,0	19,2	125,0	27,2	145,0	36,7	175,0	53,4	205,0	73,2	
92	104,0	18,9	124,0	26,8	144,0	36,2	174,0	52,8	204,0	72,5	
94	103,0	18,5	123,0	26,3	143,0	35,7	173,0	52,2	203,0	71,7	
96	102,0	18,1	122,0	25,9	142,0	35,2	172,0	51,6	202,0	71,0	
98	101,0	17,7	121,0	25,4	141,0	34,7	171,0	51,0	201,0	70,3	
100	100,0	17,4	120,0	25,0	140,0	34,3	170,0	50,4	200,0	69,6	
102	99,0	17,0	119,0	24,5	139,0	33,8	169,0	49,8	199,0	68,9	
104	98,0	16,6	118,0	24,1	138,0	33,3	168,0	49,2	198,0	68,2	
106	97,0	16,3	117,0	23,7	137,0	32,8	167,0	48,6	197,0	67,5	
108	96,0	15,9	116,0	23,2	136,0	32,3	166,0	48,0	196,0	66,9	
110	95,0	15,5	115,0	22,8	135,0	31,9	165,0	47,5	195,0	66,2	
112	-	-	-	-	134,0	31,4	164,0	46,9	194,0	65,5	
114	-	-	-	-	133,0	30,9	163,0	46,3	193,0	64,8	
116	-	-	-	-	132,0	30,4	162,0	45,7	192,0	64,1	
118	-	-	-	-	131,0	30,0	161,0	45,1	191,0	63,4	
120	-	-	-	-	130,0	29,5	160,0	44,6	190,0	62,7	
122	-	-	-	-	129,0	29,0	159,0	44,0	189,0	62,1	
124	-	-	-	-	128,0	28,6	158,0	43,4	188,0	61,4	
126	-	-	-	-	127,0	28,1	157,0	42,9	187,0	60,7	
128	-	-	-	-	126,0	27,7	156,0	42,3	186,0	60,1	
130	-	-	-	-	125,0	27,2	155,0	41,7	185,0	59,4	
132	-	-	-	-	124,0	26,8	154,0	41,2	184,0	58,7	
134	-	-	-	-	123,0	26,3	153,0	40,6	183,0	58,1	
136	-	-	-	-	122,0	25,9	152,0	40,1	182,0	57,4	
138	-	-	-	-	121,0	25,4	151,0	39,5	181,0	56,8	
140	-	-	-	-	120,0	25,0	150,0	39,0	180,0	56,1	
142	-	-	-	-	119,0	24,5	149,0	38,4	179,0	55,5	
144	-	-	-	-	118,0	24,1	148,0	37,9	178,0	54,8	
146	-	-	-	-	117,0	23,7	147,0	37,4	177,0	54,2	
148	-	-	-	-	116,0	23,2	146,0	36,8	176,0	53,6	
150	-	-	-	-	115,0	22,8	145,0	36,3	175,0	52,9	
152	-	-	-	-	114,0	22,4	144,0	35,8	174,0	52,3	
154	-	-	-	-	113,0	22,0	143,0	35,3	173,0	51,7	
156	-	-	-	-	112,0	21,6	142,0	34,7	172,0	51,0	
158	-	-	-	-	111,0	21,1	141,0	34,2	171,0	50,4	
160	-	-	-	-	110,0	20,7	140,0	33,7	170,0	49,8	

In the case of intermediate width,  $k_{H,1}$  can be calculated by linear interpolation.

		<b><math>k_{H,1}</math> for Joist Hanger SAIL 80-160</b>									
		<b>Partial nailing - downward force</b>									
		<b>Blank</b>									
Width B [mm]	<b>300</b>		<b>340</b>		<b>380</b>		<b>440</b>		<b>500</b>		
	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	
	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	
80	108	13,0	128	17,6	148	22,4	180,0	31,8	210,0	46,7	
82	107	12,8	127	17,4	147	22,1	179,0	31,5	209,0	46,3	
84	106	12,6	126	17,1	146	21,9	178,0	31,2	208,0	45,9	
86	104,5	12,4	124,5	16,9	144,5	21,6	177	30,9	207	45,6	
88	103,5	12,2	123,5	16,7	143,5	21,4	176	30,7	206	45,2	
90	102,5	12,0	122,5	16,5	142,5	21,1	175	30,4	205	44,9	
92	101,5	11,8	121,5	16,3	141,5	20,9	174	30,1	204	44,5	
94	100,5	11,6	120,5	16,0	140,5	20,6	173	29,8	203	44,2	
96	99,5	11,4	119,5	15,8	139,5	20,4	172	29,6	202	43,8	
98	98,5	11,2	118,5	15,6	138,5	20,2	171	29,3	201	43,5	
100	97,5	11,1	117,5	15,4	137,5	19,9	170	29,0	200	43,1	
102	96,5	10,9	116,5	15,2	136,5	19,7	169	28,8	199	42,8	
104	95,5	10,7	115,5	15,0	135,5	19,4	168	28,5	198	42,4	
106	94,5	10,5	114,5	14,8	134,5	19,2	167	28,2	197	42,1	
108	93,5	10,3	113,5	14,6	133,5	19,0	166	28,0	196	41,7	
110	92,5	10,2	112,5	14,4	132,5	18,7	165	27,7	195	41,4	
112	-	-	-	-	131,5	18,5	164	27,4	194	41,1	
114	-	-	-	-	130,5	18,3	163	27,2	193	40,7	
116	-	-	-	-	129,5	18,0	162	26,9	192	40,4	
118	-	-	-	-	128,5	17,8	161	26,6	191	40,1	
120	-	-	-	-	127,5	17,6	160	26,4	190	39,7	
122	-	-	-	-	126,5	17,4	159	26,1	189	39,4	
124	-	-	-	-	125,5	17,1	158	25,9	188	39,1	
126	-	-	-	-	124,5	16,9	157	25,6	187	38,7	
128	-	-	-	-	123,5	16,7	156	25,4	186	38,4	
130	-	-	-	-	122,5	16,5	155	25,1	185	38,1	
132	-	-	-	-	121,5	16,3	154	24,9	184	37,8	
134	-	-	-	-	120,5	16,0	153	24,6	183	37,5	
136	-	-	-	-	119,5	15,8	152	24,4	182	37,1	
138	-	-	-	-	118,5	15,6	151	24,2	181	36,8	
140	-	-	-	-	117,5	15,4	150	23,9	180	36,5	
142	-	-	-	-	116,5	15,2	149	23,7	179	36,2	
144	-	-	-	-	115,5	15,0	148	23,5	178	35,9	
146	-	-	-	-	114,5	14,8	147	23,2	177	35,6	
148	-	-	-	-	113,5	14,6	146	23,0	176	35,3	
150	-	-	-	-	112,5	14,4	145	22,8	175	35,0	
152	-	-	-	-	111,5	14,2	144	22,5	174	34,7	
154	-	-	-	-	110,5	14,0	143	22,3	173	34,4	
156	-	-	-	-	109,5	13,8	142	22,1	172	34,1	
158	-	-	-	-	108,5	13,6	141	21,9	171	33,8	
160	-	-	-	-	107,5	13,5	140	21,7	170	33,5	

In the case of intermediate width,  $k_{H,1}$  can be calculated by linear interpolation.

Joist hanger	$k_{H,2}$				
	Full or partial nailing - upward force				
	Blank	Total number of nails in the header		$k_{H,2}$	
Full nailing		Partial nailing	Full nailing	Partial nailing	
SAIL model 1	300	16	8	16,4	7,9
	340	20	10	23,8	11,4
	380	20	10	23,8	11,4
	440	26	14	37,6	21,9
	500	32	16	54,5	25,9
SAIL model 2	300	8		7,8	
	340	10		11,4	
	380	10		11,4	
	440	12		15,8	
	500	16		26,5	

Joist hanger	Blank	Total number of nails in the joist		Force downward towards the bottom plate		Force upward away from the bottom plate	
		Full nailing	Partial nailing	Full nailing	Partial nailing	Full nailing	Partial nailing
				$n_{J,ef,1}$	$n_{J,ef,1}$	$n_{J,ef,2}$	$n_{J,ef,2}$
SAIL model 1	300	8	4	3,83	2,59	3,57	2,23
	340	10	6	6,15	4,22	5,54	3,61
	380	10	6	6,15	4,22	5,54	3,61
	440	13	8	10,13	6,45	8,81	5,38
	500	16	8	14,31	7,78	12,2	6,08
SAIL model 2	300	10		6,15		5,54	
	340	10		6,15		5,54	
	380	12		8,76		7,69	
	440	14		11,52		9,93	
	500	18		17,08		14,46	

## D12 Joist hanger type SBE

Face mount hanger with external flanges

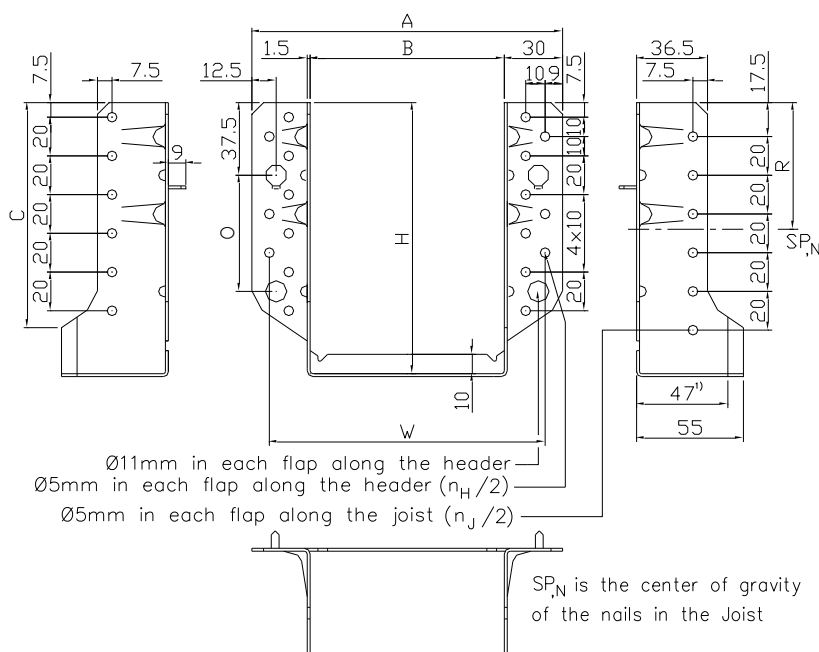
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
SBE	SBE	SBE	SBE	SBE

### Material Specification and Service Classes

1.5 mm thick pre-galvanized steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

1.5 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



1) Alternative Blank with reduced Joist hanger depth

Blank	B min-max	A	C	O	W	R	$I_{p,n}$ $\text{mm}^4$
230	32 – 65	B + 60	70.9	-	B + 42	32.5	2 352
260	32 – 71	B + 60	82.9	-	B + 42	42.5	2 800
320	32 – 81	B + 60	96.2	40	B + 42	52.5	4 943
380	32 – 101	B + 60	116.2	60	B + 42	65.5	8 956
440	32 – 121	B + 60	136.2	80	B + 42	72.5	14 764
500	32 - 141	B + 60	156.2	80	B + 42	82.5	24 800
Permitted deviation	+2 -0	+3 -1	$\pm 2.0$	$\pm 0.2$	+3 -1		

Blank	Total n° of nails		Width interval		Height interval	
	$n_H$	$n_J$	min	max	min	max
230	12	6	32	65	82.5	99
260	12	8	32	71	94.5	114
320	14	10	32	81	119.5	144
380	18	12	32	101	139.5	174
440	22	14	32	121	159.5	204
500	26	16	32	141	179.5	234

Joist hanger's height = (blank – width)/2

### **Table of parameters**

Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C



<b><math>k_{H,1}</math> for Joist Hanger SBE</b>												
<b>Full nailing - downward force</b>												
<b>Blank</b>												
Width B [mm]	<b>230</b>		<b>260</b>		<b>320</b>		<b>380</b>		<b>440</b>		<b>500</b>	
	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$
	12	6	12	8	14	10	18	12	22	14	26	16
	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$
32	99,0	19,4	114,0	24,1	144,0	37,2	174,0	56,1	204,0	78,9	234,0	104,4
36	97,0	18,6	112,0	23,3	142,0	36,3	172,0	54,9	202,0	77,5	232,0	102,7
40	95,0	17,8	110,0	22,5	140,0	35,4	170,0	53,7	200,0	76,1	230,0	101,1
44	93,0	17,0	108,0	21,7	138,0	34,4	168,0	52,5	198,0	74,6	228,0	99,4
48	91,0	16,3	106,0	20,9	136,0	33,5	166,0	51,4	196,0	73,2	226,0	97,8
52	89,0	15,5	104,0	20,1	134,0	32,6	164,0	50,2	194,0	71,8	224,0	96,2
56	87,0	14,8	102,0	19,4	132,0	31,7	162,0	49,0	192,0	70,4	222,0	94,6
60	85,0	14,0	100,0	18,6	130,0	30,8	160,0	47,9	190,0	69,0	220,0	92,9
64	83,0	13,3	98,0	17,8	128,0	29,9	158,0	46,8	188,0	67,6	218,0	91,3
65	82,5	13,1	97,5	17,7	127,5	29,6	157,5	46,5	187,5	67,3	217,5	90,9
68	-	-	96,0	17,1	126,0	29,0	156,0	45,6	186,0	66,3	216,0	89,7
71	-	-	94,5	16,5	124,5	28,3	154,5	44,8	184,5	65,2	214,5	88,5
75	-	-	-	-	122,5	27,4	152,5	43,6	182,5	63,9	212,5	86,9
76	-	-	-	-	122,0	27,2	152,0	43,4	182,0	63,5	212,0	86,5
80	-	-	-	-	120,0	26,3	150,0	42,2	180,0	62,2	210,0	85,0
81	-	-	-	-	119,5	26,1	149,5	42,0	179,5	61,8	209,5	84,6
85	-	-	-	-	-	-	147,5	40,9	177,5	60,5	207,5	83,0
89	-	-	-	-	-	-	145,5	39,8	175,5	59,1	205,5	81,4
93	-	-	-	-	-	-	143,5	38,7	173,5	57,8	203,5	79,9
97	-	-	-	-	-	-	141,5	37,6	171,5	56,5	201,5	78,3
100	-	-	-	-	-	-	140,0	36,8	170,0	55,5	200,0	77,2
101	-	-	-	-	-	-	139,5	36,5	169,5	55,1	199,5	76,8
105	-	-	-	-	-	-	-	-	167,5	53,8	197,5	75,2
109	-	-	-	-	-	-	-	-	165,5	52,5	195,5	73,7
113	-	-	-	-	-	-	-	-	163,5	51,2	193,5	72,2
117	-	-	-	-	-	-	-	-	161,5	50,0	191,5	70,7
121	-	-	-	-	-	-	-	-	159,5	48,7	189,5	69,2
125	-	-	-	-	-	-	-	-	-	-	187,5	67,7
129	-	-	-	-	-	-	-	-	-	-	185,5	66,3
133	-	-	-	-	-	-	-	-	-	-	183,5	64,8
137	-	-	-	-	-	-	-	-	-	-	181,5	63,3
141	-	-	-	-	-	-	-	-	-	-	179,5	61,9

In the case of intermediate width,  $k_{H,1}$  can be calculated by linear interpolation.

<b><math>k_{H,1}</math> for Joist Hanger SBE</b>												
<b>Partial nailing - downward force</b>												
Width B [mm]	<b>Blank</b>											
	230		260		320		380		440		500	
	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$	$n_H$	$n_J$
	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$	Height H [mm]	$k_{H,1}$
32	99,0	14,0	114,0	18,0	144,0	27,0	174,0	39,6	204,0	52,4	234,0	69,1
36	97,0	13,4	112,0	17,4	142,0	26,3	172,0	38,7	202,0	51,5	232,0	68,0
40	95,0	12,8	110,0	16,8	140,0	25,6	170,0	37,9	200,0	50,6	230,0	66,9
44	93,0	12,3	108,0	16,2	138,0	24,9	168,0	37,0	198,0	49,6	228,0	65,9
48	91,0	11,7	106,0	15,6	136,0	24,2	166,0	36,2	196,0	48,7	226,0	64,8
52	89,0	11,2	104,0	15,1	134,0	23,5	164,0	35,4	194,0	47,8	224,0	63,7
56	87,0	10,7	102,0	14,5	132,0	22,9	162,0	34,6	192,0	46,8	222,0	62,7
60	85,0	10,1	100,0	13,9	130,0	22,2	160,0	33,8	190,0	45,9	220,0	61,6
64	83,0	9,6	98,0	13,4	128,0	21,5	158,0	33,0	188,0	45,0	218,0	60,6
65	82,5	9,5	97,5	13,2	127,5	21,4	157,5	32,8	187,5	44,8	217,5	60,3
68	-	-	96,0	12,8	126,0	20,9	156,0	32,2	186,0	44,1	216,0	59,5
71	-	-	94,5	12,4	124,5	20,4	154,5	31,6	184,5	43,4	214,5	58,8
75	-	-	-	-	122,5	19,7	152,5	30,8	182,5	42,5	212,5	57,7
76	-	-	-	-	122,0	19,6	152,0	30,6	182,0	42,3	212,0	57,5
80	-	-	-	-	120,0	18,9	150,0	29,8	180,0	41,4	210,0	56,4
81	-	-	-	-	119,5	18,8	149,5	29,6	179,5	41,2	209,5	56,2
85	-	-	-	-	-	-	147,5	28,8	177,5	40,3	207,5	55,1
89	-	-	-	-	-	-	145,5	28,0	175,5	39,4	205,5	54,1
93	-	-	-	-	-	-	143,5	27,3	173,5	38,5	203,5	53,1
97	-	-	-	-	-	-	141,5	26,5	171,5	37,6	201,5	52,1
100	-	-	-	-	-	-	140,0	25,9	170,0	37,0	200,0	51,3
101	-	-	-	-	-	-	139,5	25,8	169,5	36,8	199,5	51,1
105	-	-	-	-	-	-	-	-	167,5	35,9	197,5	50,1
109	-	-	-	-	-	-	-	-	165,5	35,1	195,5	49,1
113	-	-	-	-	-	-	-	-	163,5	34,2	193,5	48,1
117	-	-	-	-	-	-	-	-	161,5	33,4	191,5	47,1
121	-	-	-	-	-	-	-	-	159,5	32,6	189,5	46,2
125	-	-	-	-	-	-	-	-	-	-	187,5	45,2
129	-	-	-	-	-	-	-	-	-	-	185,5	44,2
133	-	-	-	-	-	-	-	-	-	-	183,5	43,3
137	-	-	-	-	-	-	-	-	-	-	181,5	42,3
141	-	-	-	-	-	-	-	-	-	-	179,5	41,4

In the case of intermediate width,  $k_{H,1}$  can be calculated by linear interpolation.

<b><math>k_{H,2}</math></b>					
<b>Full or partial nailing - upward force</b>					
Joist hanger	Blank	Total number of nails in the header		$k_{H,2}$	
		Full nailing	Partial nailing	Full nailing	Partial nailing
SBE	230	12	8	15,3	10,3
	260	12	8	15,3	10,3
	320	14	10	19,2	15,2
	380	18	12	28,9	20,9
	440	22	14	40,4	27,6
	500	26	16	56,1	35,2

Joist hanger	Blank	Total number of nails in the joist		Force downward towards the bottom plate		Force upward away from the bottom plate	
		Full nailing	Partial nailing	Full nailing	Partial nailing	Full nailing	Partial nailing
SBE	230	6	4	2,71	2,66	2,44	2,22
	260	8	4	4,95	2,19	4,41	1,4
	320	10	6	7,74	5,36	6,62	4,04
	380	12	6	10,7	5,36	8,91	4,59
	440	14	8	13,7	8	11,21	6,59
	500	16	8	16	8	13,48	6,23

## D13 Joist hanger type SBE45/168/TF

Face mount hanger with external flanges

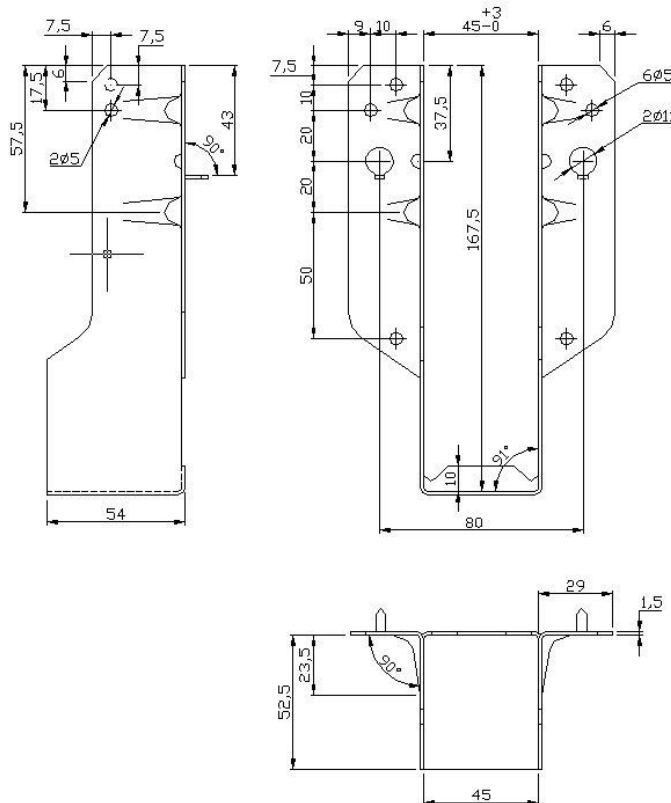
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
SBE	SBE	SBE	SBE	SBE

### Material Specification and Service Classes

1.5 mm thick pre-galvanized steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

1.5 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Characteristic values for a connection timber/timber with fasteners in accordance with the ETA-04/0013.

CHARACTERISTIC VALUES (kN) –Timber to timber							
Downward				Uplift			
C18	C20	C22	C24	C18	C20	C22	C24
5,00	5,32	5,64	5,98	2,24	2,38	2,52	2,67

## D14 Joist hanger type SBG/SLE

Face mount hanger with external flanges

Two variants of the same joist hanger exist: SBG and SLE

Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
SBG	SBG	SBG	SBG	SBG
SLE	SLE	SLE	SLE	SLE

### Material Specification and Service Classes

#### SBG

1.5 mm thick pre-galvanized steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

1.5 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

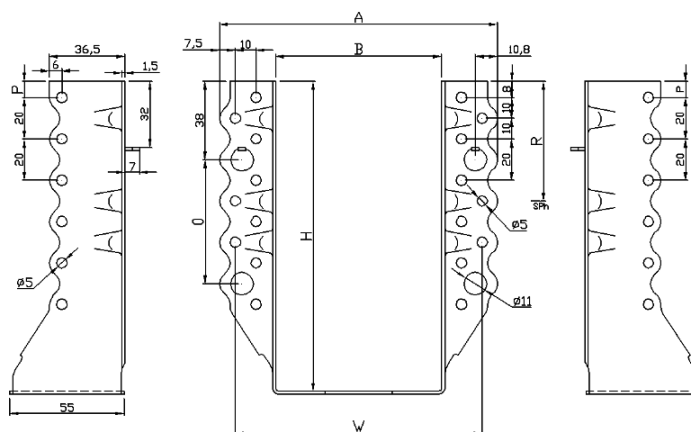
#### SLE

2 mm thick pre-galvanized steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions

#### SBG

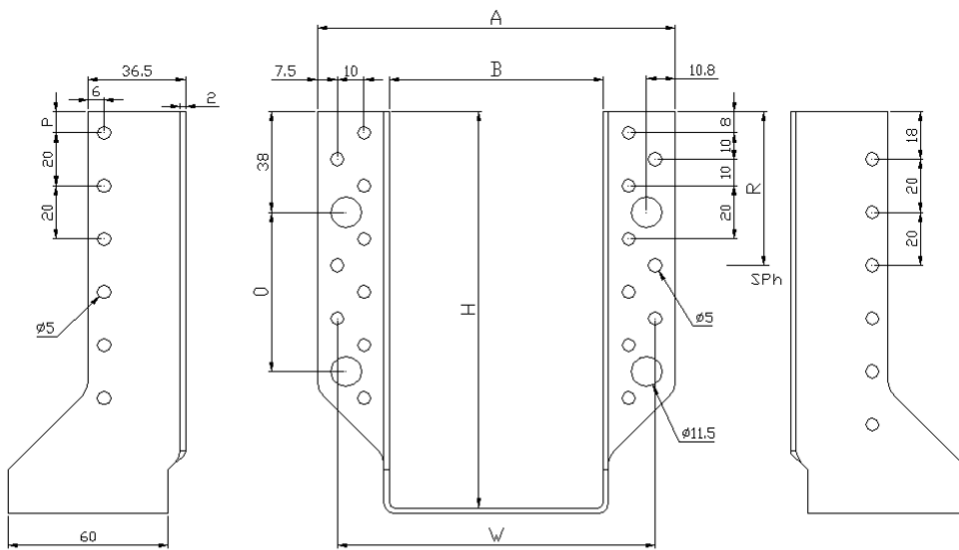


Blank	B min-max	A mm	O mm	P mm	W mm	R mm	$I_{p,fl}$ mm <sup>4</sup>
230	38-52	B + 54	-	28	B + 37.6	32	1 720
260	38-64	B + 54	-	28	B + 37.6	38	2 800
320	38-80	B + 54	-	8	B + 37.6	49	5 888
380	38-100	B + 54	60	8	B + 37.6	58	10 200
440	38-120	B + 54	60	8	B + 37.6	68	16 400
500	38-140	B + 54	80	8	B + 37.6	78	24 800
Permitted deviation	+2 -0	+3 -1	±2.0	±0.2	+3 -1		

Blank	Total n° of nails		Partial n° of nails		Width interval		Height interval	
	n <sub>H</sub>	n <sub>J</sub> *	n <sub>H</sub>	n <sub>J</sub> *	min	max	min	max
230	8	6	6	3	38	52	89	96
260	12	6	8	4	38	64	98	111
320	16	10	10	6	38	80	120	141
380	18	12	12	6	38	100	140	171
440	22	14	14	8	38	120	160	201
500	26	16	16	8	38	140	180	231

- \*: for  $t-t_2 < 4 \times d$ , don't use the holes in the joist, they are opposed. Then, the number of nails in the joist needs to be reduced in accordance with Eurocode 5, clause 8.3.1.1 (7)
- Joist hanger's height = (blank – width)/2

**SLE**



SLE can be with ribs or not.

Blank	B min-max	A mm	O mm	P mm	W mm	R mm	I <sub>p,fl</sub> mm <sup>4</sup>
230	38-76	B + 54	-	23	B + 37.6	32	1 720
260	38-76	B + 54	-	28	B + 37.6	38	2 800
320	38-76	B + 54	-	8	B + 37.6	49	5 888
380	38-106	B + 54	60	8	B + 37.6	58	10 200
440	38-106	B + 54	60	8	B + 37.6	68	16 400
500	38-106	B + 54	80	8	B + 37.6	78	24 800
Permitted deviation	+2 -0	+3 -1	±2.0	±0.2	+3 -1		

Blank	Total n° of nails		Partial n° of nails		Width interval		Height interval	
	n <sub>H</sub>	n <sub>J</sub> *	n <sub>H</sub>	n <sub>J</sub> *	min	max	min	max
230	8	6	6	3	38	52	89	96
260	12	6	8	4	38	76	92	111
320	16	10	10	6	38	76	122	141
380	18	12	12	6	38	106	137	171
440	22	14	14	8	38	106	167	201
500	26	16	16	8	38	106	197	231

- \*: for  $t-t_2 < 4 \times d$ , don't use the holes in the joist, they are opposed. Then, the number of nails in the joist needs to be reduced in accordance with Eurocode 5, clause 8.3.1.1 (7)
- Joist hanger's height = (blank – width)/2

**Table of parameters**Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C

<b>Table C18</b>		<b><math>k_{H,1}</math> – Values for Joist hanger SBG / SLE</b>										
		<b>Full nail fixing</b>										
		<b>Blank</b>										
Width B [mm]	<b>230</b>		<b>260</b>		<b>320</b>		<b>380</b>		<b>440</b>		<b>500</b>	
	Depth H [mm]	$k_{H,1}$	Depth H [mm]	$k_{H,1}$	Depth H [mm]	$k_{H,1}$	Depth H [mm]	$k_{H,1}$	Depth H [mm]	$k_{H,1}$	Depth H [mm]	$k_{H,1}$
36	97	15.7	112	24.8	142	39.1	172	56.4	202	78.3	232	105.8
40	95	15.1	110	23.9	140	38.1	170	55.2	200	76.9	230	104.1
44	93	14.4	108	23.1	138	37.0	168	54.0	198	75.4	228	102.4
48	91	13.8	106	22.2	136	35.9	166	52.8	196	74.0	226	100.7
52	89	13.2	104	21.4	134	34.9	164	51.6	194	72.6	224	99.0
56	87	12.5	102	20.6	132	33.8	162	50.4	192	71.1	222	97.4
60	85	11.9	100	19.7	130	32.8	160	49.2	190	69.7	220	95.7
64	83	11.3	98	18.9	128	31.8	158	48.0	188	68.3	218	94.0
68	81	10.7	96	18.1	126	30.8	156	46.9	186	66.9	216	92.4
72	79	10.1	94	17.4	124	29.8	154	45.7	184	65.5	214	90.7
76	77	9.6	92	16.6	122	28.8	152	44.5	182	64.1	212	89.1
80					120	27.8	150	43.4	180	62.7	210	87.5
90							145	40.5	175	59.3	205	83.4
100							140	37.7	170	56.0	200	79.4
110									165	52.7	195	75.5
120									160	49.4	190	71.6
130											185	67.8
140											180	64.0

<b>Table C19</b>		<b><math>k_{H,1}</math> – Values for Joist hanger SBG / SLE</b>										
		<b>Partial nail fixing</b>										
		<b>Blank</b>										
Width B [mm]	<b>230</b>		<b>260</b>		<b>320</b>		<b>380</b>		<b>440</b>		<b>500</b>	
	Depth H [mm]	$k_{H,1}$	Depth H [mm]	$k_{H,1}$	Depth H [mm]	$k_{H,1}$	Depth H [mm]	$k_{H,1}$	Depth H [mm]	$k_{H,1}$	Depth H [mm]	$k_{H,1}$
36	97	15.1	112	19.0	142	27.9	172	39.9	202	54.1	232	70.3
40	95	14.6	110	18.3	140	27.2	170	39.1	200	53.1	230	69.1
44	93	14.0	108	17.7	138	26.4	168	38.2	198	52.1	228	68.0
48	91	13.4	106	17.0	136	25.7	166	37.4	196	51.1	226	66.9
52	89	12.9	104	16.4	134	25.0	164	36.5	194	50.1	224	65.8
56	87	12.3	102	15.8	132	24.3	162	35.7	192	49.2	222	64.7
60	85	11.8	100	15.2	130	23.6	160	34.8	190	48.2	220	63.7
64	83	11.3	98	14.6	128	22.8	158	34.0	188	47.2	218	62.6
68	81	10.7	96.0	14.0	126	22.1	156	33.2	186	46.3	216	61.5
72	79	10.2	94.0	13.4	124	21.5	154	32.4	184	45.3	214	60.4
76	77	9.7	92.0	12.8	122	20.8	152	31.5	182	44.4	212	59.3
80					120	20.1	150	30.7	180	43.5	210	58.3
90							145	28.7	175	41.1	205	55.6
100							140	26.8	170	38.8	200	53.0
110									165	36.6	195	50.5
120									160	34.4	190	47.9
130											185	45.4
140											180	43.0

In the case of intermediate height  $k_{H,1}$  can be calculated by linear interpolation

<b><math>k_{H,2}</math> – Values for Joist hanger SBG /SLE</b>				
Blank	Total number of nails in the header		full - nailing	partial - nailing
	fullnailing	partialnailing		
230	8	6	9,6	6,7
260	12	8	15,9	10,7
320	16	10	25,6	15,7
380	18	12	29,9	21,7
440	22	14	44,3	28,6
500	26	16	58,1	36,4

## D15 Joist hanger type SDED/G and BNS2P

Face mount hanger 2 parts with external flanges

Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
SDED/G	SDED/G	SDED/G	SDED/G	SDED/G
BNS2P	BNS2P	BNS2P	BNS2P	BNS2P

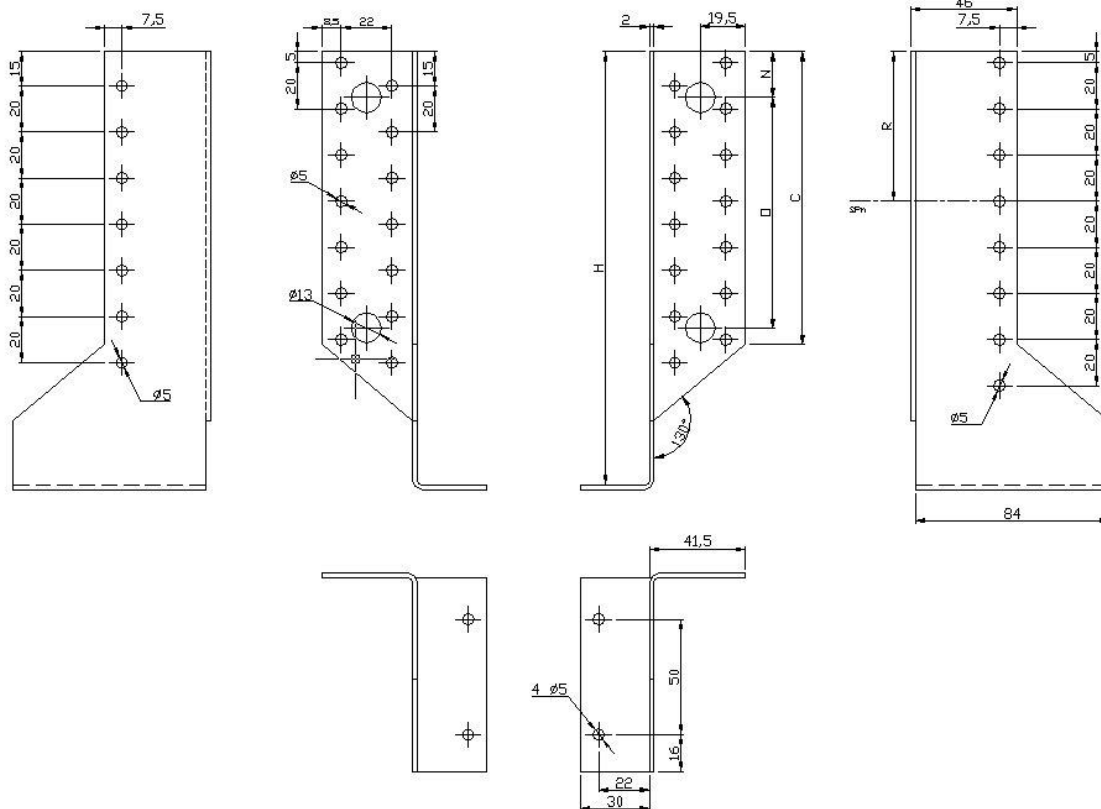
### Material Specification and Service Classes

2 mm thick pre-galvanized steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions

*SDED/G*

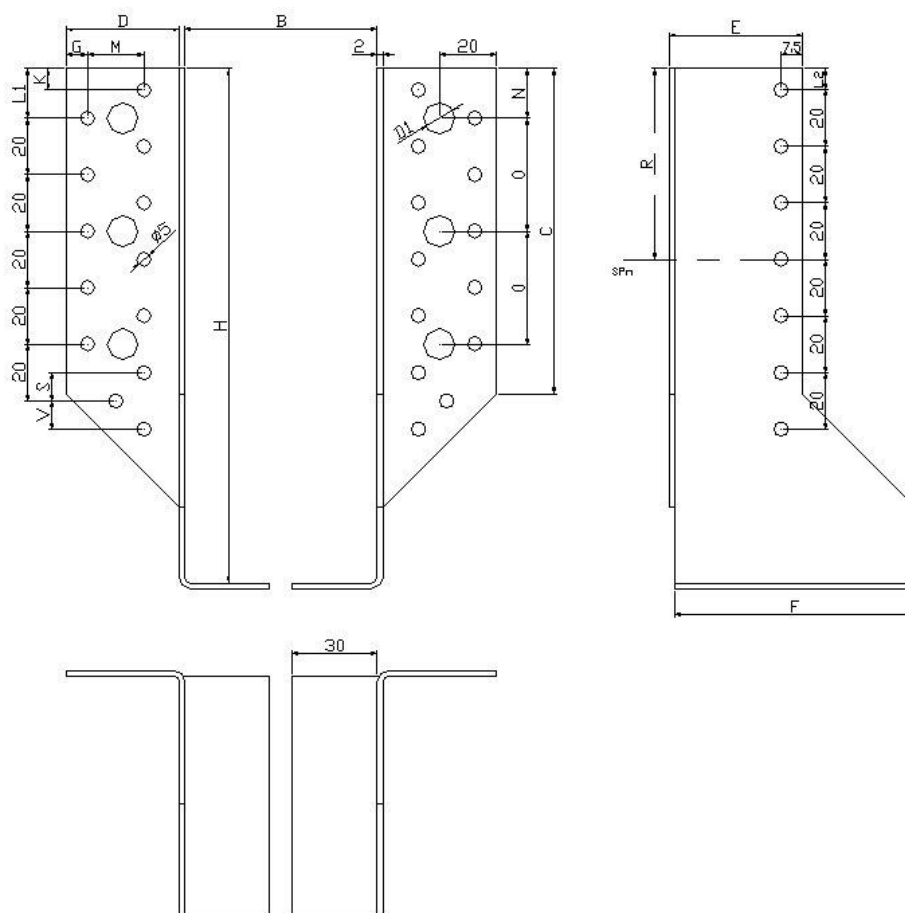


$SP_N$  is the centre of gravity of the nails in the joist.

Blank	B min-max	C	N	O	R
300	60-250	77	20	50	55
340	60-250	97	20	70	65
380	60-250	97	20	70	65
440	60-250	127	20	100	75
<b>Permitted deviation</b>		+2 -0	±1.0	±0.2	-



BSN2P30



$SP_N$  is the centre of gravity of the nails in the joist.

Blank	B min-max	C	D	E	F	G	K	L1	L2	M	N	O	R	S	T	V	D1
BSN2P30/98	60-200	65	37.5	37	70.5	7.5	17.5	7.5	17.5	17.5	17.5	37.5	47.5	5	13.5	15	9
BSN2P30/152	60-250	105	40	42	78	7.5	17.5	7.5	17.5	20	27.5	60	67.5	5	20	15	11
BSN2P30/182	60-250	115	42	47	85	7.5	7.5	17.5	7.5	20	17.5	40	67.5	10	20	10	11
Permitted deviation		+2 -0	±1.0	±1.0	±1.0	±1.0	±1.0	±1.0	±1.0	±0.2	±1.0	±0.2	-	±1.0	±1.0	±1.0	±0.2

Blank	Total n° of nails		Width interval		Height	Diameter	A
	$n_H$	$n_J$	min	max	Mm	mm	
BSN2P30/98	16	8	60	250	98	9	= B + 75
BSN2P30/152	12	7	60	250	152	11	= B + 80
BSN2P30/182	26	14	60	250	182	11	= B + 84
300	18	10	60	250	118	13	= B + 83
340	22	12	60	250	138	13	= B + 83
380	22	12	60	250	158	13	= B + 83
440	28	15	60	250	188	13	= B + 83

**Table of parameters**Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C

Table D20	$k_{H,1}$ and $k_{H,2}$ – Values for Joist hanger SDED/G FULL NAIL FIXING			
	References	Blank	Coefficients	
			$k_{H,1}$	$k_{H,2}$
BSN2P30/98	260	17.7	16.6	
BSN2P30/152	380	51.7	32.8	
BSN2P30/182	440	73.4	37.6	
SDED/G	300	24.0	19.9	
SDED/G	340	32.9	28.1	
SDED/G	380	38.6	28.1	
SDED/G	440	55.9	42.9	

Joist hanger	$k_{H,2}$				
	Full or partial nailing - Upward force				
	Blank	Total number of nails in the header		$k_{H,2}$	
Full nailing		Partial nailing	Full nailing	Partial nailing	
BSN2P30/98	260	16	8	16.58	--
BSN2P30/152	300	24	12	32.82	-
BSN2P30/182	440	26	14	37.63	-
SDED/G	300	18	10	19.95	-
SDED/G	340	22	12	28.10	-
SDED/G	380	22	12	28.10	-
SDED/G	440	28	14	42.91	-

## D16 Joist hanger type GSE

Face mount hanger with external flanges

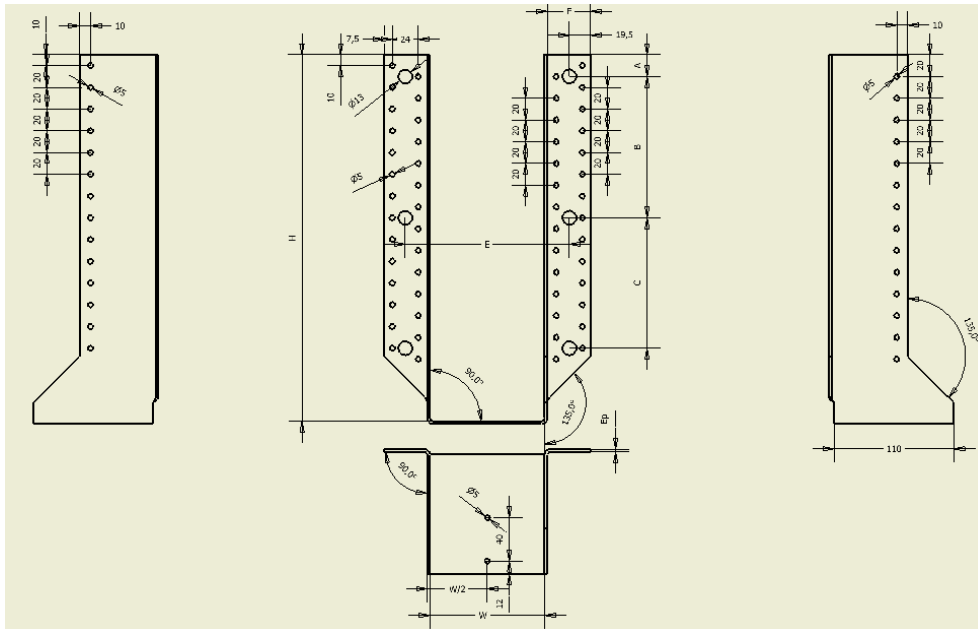
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
GSE	GSE	GSE	GSE	GSE

### Material Specification and Service Classes

2.5 and 4.0 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.5 and 4.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model	W (mm)	H (mm)	A (mm)	B (mm)	C (mm)	E(*) (mm)	F (mm)	Ep(*) (mm)	Holes number		
									Ø 5 (flanges)	Ø 5 (sides)	Ø 13 (flanges)
GSE300/2.5X	32-110	95-134	30	--	--	W + 42	40	2.5	12	6	2
GSE300/4X	32-110	95-134	30	--	--	W + 52	41.5	4	12	6	2
GSE340/2.5X	32-110	115-154	30	--	--	W + 42	40	2.5	16	8	2
GSE340/4X	32-110	115-154	30	--	--	W + 52	41.5	4	16	8	2
GSE380/2.5X	32-140	120-174	20	50	--	W + 42	40	2.5	16	8	4
GSE380/4X	32-140	120-174	20	50	--	W + 52	41.5	4	16	8	4
GSE440/2.5X	32-140	150-204	20	80	--	W + 42	40	2.5	22	12	4
GSE440/4X	32-140	150-204	20	80	--	W + 52	41.5	4	22	12	4
GSE500/2.5X	32-140	180-234	30	100	--	W + 42	40	2.5	28	14	4
GSE500/4X	32-140	180-234	30	100	--	W + 52	41.5	4	28	14	4
GSE540/2.5X	32-140	200-254	30	120	--	W + 42	40	2.5	32	16	4
GSE540/4X	32-140	200-254	30	120	--	W + 52	41.5	4	32	16	4
GSE600/2.5X	32-140	230-284	20	160	--	W + 42	40	2.5	38	20	4
GSE600/4X	32-140	230-284	20	160	--	W + 52	41.5	4	38	20	4
GSE660/2.5X	32-140	260-314	30	80	100	W + 42	40	2.5	44	22	6
GSE660/4X	32-140	260-314	30	80	100	W + 52	41.5	4	44	22	6
GSE720/2.5X	32-140	290-344	20	100	120	W + 42	40	2.5	50	26	6
GSE720/4X	32-140	290-344	20	100	120	W + 52	41.5	4	50	26	6
GSE780/2.5X	32-140	320-374	20	130	120	W + 42	40	2.5	56	28	6
GSE780/4X	32-140	320-374	20	130	120	W + 52	41.5	4	56	28	6
GSE840/2.5X	32-140	350-390	20	140	140	W + 42	40	2.5	62	32	6
GSE840/4X	32-140	350-390	20	140	140	W + 52	41.5	4	62	32	6
GSE900/2.5X	32-140	380-420	30	160	140	W + 42	40	2.5	68	38	6

GSE900/4X	32-140	380-420	30	160	140	W + 52	41.5	4	68	38	6
GSE960/2.5X	32-140	410-450	20	180	160	W + 42	40	2.5	74	38	6
GSE960/4X	32-140	410-450	20	180	160	W + 52	41.5	4	74	38	6
GSE1020/2.5X	32-140	440-480	30	200	160	W + 42	40	2.5	80	40	6
GSE1020/4X	32-140	440-480	30	200	160	W + 52	41.5	4	80	40	6

(\*) : Ep = Thickness of the steel

### Table of parameters

Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C

### Full nailing pattern

Width mm	GSE 300		GSE 340		GSE 380		GSE 440		GSE 500		GSE 540	
	Height mm	$K_{H,1}$	Height mm	$K_{H,1}$	Height mm	$K_{H,1}$	Height mm	$K_{H,1}$	Height mm	$K_{H,1}$	Height mm	$K_{H,1}$
32	134	17,5	154	21,0	174	25,4	204	41,2	234	55,7	254	66,1
34	133	17,3	153	20,8	173	25,2	203	40,8	233	55,3	253	65,6
36	132	17,1	152	20,5	172	24,9	202	40,5	232	54,8	252	65,1
38	131	16,8	151	20,3	171	24,7	201	40,1	231	54,4	251	64,6
40	130	16,6	150	20,1	170	24,5	200	39,8	230	54,0	250	64,2
42	129	16,4	149	19,9	169	24,3	199	39,4	229	53,5	249	63,7
44	128	16,2	148	19,7	168	24,1	198	39,1	228	53,1	248	63,2
46	127	15,9	147	19,4	167	23,8	197	38,7	227	52,7	247	62,7
48	126	15,7	146	19,2	166	23,6	196	38,3	226	52,2	246	62,2
50	125	15,5	145	19,0	165	23,4	195	38,0	225	51,8	245	61,7
52	124	15,3	144	18,8	164	23,2	194	37,6	224	51,4	244	61,3
54	123	15,1	143	18,6	163	22,9	193	37,3	223	50,9	243	60,8
56	122	14,8	142	18,4	162	22,7	192	36,9	222	50,5	242	60,3
58	121	14,6	141	18,1	161	22,5	191	36,6	221	50,1	241	59,8
60	120	14,4	140	17,9	160	22,3	190	36,2	220	49,6	240	59,4
62	119	14,2	139	17,7	159	22,1	189	35,9	219	49,2	239	58,9
64	118	13,9	138	17,5	158	21,8	188	35,5	218	48,8	238	58,4
66	117	13,7	137	17,3	157	21,6	187	35,2	217	48,4	237	57,9
68	116	13,5	136	17,1	156	21,4	186	34,8	216	47,9	236	57,5
70	115	13,3	135	16,8	155	21,2	185	34,5	215	47,5	235	57,0
72	114	13,1	134	16,6	154	21,0	184	34,1	214	47,1	234	56,5
74	113	12,9	133	16,4	153	20,8	183	33,8	213	46,7	233	56,1
76	112	12,6	132	16,2	152	20,5	182	33,4	212	46,2	232	55,6
78	111	12,4	131	16,0	151	20,3	181	33,1	211	45,8	231	55,1
80	110	12,2	130	15,8	150	20,1	180	32,7	210	45,4	230	54,7
82	109	12,0	129	15,6	149	19,9	179	32,4	209	45,0	229	54,2
84	108	11,8	128	15,4	148	19,7	178	32,0	208	44,6	228	53,7
86	107	11,6	127	15,1	147	19,4	177	31,7	207	44,2	227	53,3
88	106	11,4	126	14,9	146	19,2	176	31,4	206	43,7	226	52,8
90	105	11,1	125	14,7	145	19,0	175	31,0	205	43,3	225	52,3
92	104	10,9	124	14,5	144	18,8	174	30,7	204	42,9	224	51,9
94	103	10,7	123	14,3	143	18,6	173	30,3	203	42,5	223	51,4
96	102	10,5	122	14,1	142	18,4	172	30,0	202	42,1	222	51,0
98	101	10,3	121	13,9	141	18,1	171	29,7	201	41,7	221	50,5
100	100	10,1	120	13,7	140	17,9	170	29,3	200	41,3	220	50,1
102	99	9,9	119	13,5	139	17,7	169	29,0	199	40,8	219	49,6
104	98	9,7	118	13,2	138	17,5	168	28,6	198	40,4	218	49,1
106	97	9,5	117	13,0	137	17,3	167	28,3	197	40,0	217	48,7
108	96	9,3	116	12,8	136	17,1	166	28,0	196	39,6	216	48,2
110	95	9,1	115	12,6	135	16,8	165	27,6	195	39,2	215	47,8
112	--	--	--	--	134	16,6	164	27,3	194	38,8	214	47,3
114	--	--	--	--	133	16,4	163	27,0	193	38,4	213	46,9
116	--	--	--	--	132	16,2	162	26,6	192	38,0	212	46,4
118	--	--	--	--	131	16,0	161	26,3	191	37,6	211	46,0
120	--	--	--	--	130	15,8	160	26,0	190	37,2	210	45,6
122	--	--	--	--	129	15,6	159	25,7	189	36,8	209	45,1
124	--	--	--	--	128	15,4	158	25,3	188	36,4	208	44,7
126	--	--	--	--	127	15,1	157	25,0	187	36,0	207	44,2
128	--	--	--	--	126	14,9	156	24,7	186	35,6	206	43,8
130	--	--	--	--	125	14,7	155	24,4	185	35,2	205	43,4
132	--	--	--	--	124	14,5	154	24,0	184	34,8	204	42,9
134	--	--	--	--	123	14,3	153	23,7	183	34,4	203	42,5
136	--	--	--	--	122	14,1	152	23,4	182	34,0	202	42,1
138	--	--	--	--	121	13,9	151	23,1	181	33,7	201	41,6
140	--	--	--	--	120	13,7	150	22,8	180	33,3	200	41,2

Width mm	GSE 600		GSE 660		GSE 720		GSE 780	
	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>
32	284	82,9	314	102,2	344	122,8	374	145,9
34	283	82,3	313	101,6	343	122,1	373	145,1
36	282	81,8	312	101,0	342	121,4	372	144,3
38	281	81,2	311	100,3	341	120,7	371	143,6
40	280	80,7	310	99,7	340	120,0	370	142,8
42	279	80,1	309	99,1	339	119,4	369	142,1
44	278	79,6	308	98,5	338	118,7	368	141,3
46	277	79,0	307	97,9	337	118,0	367	140,6
48	276	78,5	306	97,2	336	117,3	366	139,8
50	275	77,9	305	96,6	335	116,6	365	139,0
52	274	77,4	304	96,0	334	115,9	364	138,3
54	273	76,8	303	95,4	333	115,2	363	137,5
56	272	76,3	302	94,8	332	114,6	362	136,8
58	271	75,8	301	94,2	331	113,9	361	136,0
60	270	75,2	300	93,5	330	113,2	360	135,3
62	269	74,7	299	92,9	329	112,5	359	134,6
64	268	74,1	298	92,3	328	111,9	358	133,8
66	267	73,6	297	91,7	327	111,2	357	133,1
68	266	73,1	296	91,1	326	110,5	356	132,3
70	265	72,5	295	90,5	325	109,8	355	131,6
72	264	72,0	294	89,9	324	109,2	354	130,8
74	263	71,4	293	89,3	323	108,5	353	130,1
76	262	70,9	292	88,7	322	107,8	352	129,4
78	261	70,4	291	88,1	321	107,2	351	128,6
80	260	69,8	290	87,5	320	106,5	350	127,9
82	259	69,3	289	86,9	319	105,8	349	127,2
84	258	68,8	288	86,3	318	105,2	348	126,4
86	257	68,3	287	85,7	317	104,5	347	125,7
88	256	67,7	286	85,1	316	103,8	346	125,0
90	255	67,2	285	84,5	315	103,2	345	124,2
92	254	66,7	284	83,9	314	102,5	344	123,5
94	253	66,2	283	83,3	313	101,9	343	122,8
96	252	65,6	282	82,7	312	101,2	342	122,1
98	251	65,1	281	82,1	311	100,5	341	121,3
100	250	64,6	280	81,5	310	99,9	340	120,6
102	249	64,1	279	80,9	309	99,2	339	119,9
104	248	63,5	278	80,4	308	98,6	338	119,2
106	247	63,0	277	79,8	307	97,9	337	118,5
108	246	62,5	276	79,2	306	97,3	336	117,8
110	245	62,0	275	78,6	305	96,6	335	117,0
112	244	61,5	274	78,0	304	96,0	334	116,3
114	243	61,0	273	77,4	303	95,3	333	115,6
116	242	60,5	272	76,9	302	94,7	332	114,9
118	241	60,0	271	76,3	301	94,1	331	114,2
120	240	59,4	270	75,7	300	93,4	330	113,5
122	239	58,9	269	75,1	299	92,8	329	112,8
124	238	58,4	268	74,6	298	92,1	328	112,1
126	237	57,9	267	74,0	297	91,5	327	111,4
128	236	57,4	266	73,4	296	90,9	326	110,7
130	235	56,9	265	72,8	295	90,2	325	110,0
132	234	56,4	264	72,3	294	89,6	324	109,3
134	233	55,9	263	71,7	293	89,0	323	108,6
136	232	55,4	262	71,2	292	88,4	322	107,9
138	231	54,9	261	70,6	291	87,7	321	107,2
140	230	54,4	260	70,0	290	87,1	320	106,5

Width mm	GSE 840		GSE 900		GSE 960		GSE 1020	
	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>
32	404	170,3	434	196,1	464	225,3	494	255,9
34	403	169,4	433	195,2	463	224,4	493	254,9
36	402	168,6	432	194,4	462	223,4	492	253,9
38	401	167,8	431	193,5	461	222,4	491	252,9
40	400	167,0	430	192,6	460	221,5	490	251,8
42	399	166,1	429	191,7	459	220,5	489	250,8
44	398	165,3	428	190,8	458	219,6	488	249,8
46	397	164,5	427	189,9	457	218,6	487	248,8
48	396	163,7	426	189,0	456	217,7	486	247,7
50	395	162,9	425	188,2	455	216,7	485	246,7
52	394	162,0	424	187,3	454	215,8	484	245,7
54	393	161,2	423	186,4	453	214,8	483	244,7
56	392	160,4	422	185,5	452	213,9	482	243,7
58	391	159,6	421	184,6	451	212,9	481	242,7
60	390	158,8	420	183,8	450	212,0	480	241,7
62	389	158,0	419	182,9	449	211,0	479	240,6
64	388	157,2	418	182,0	448	210,1	478	239,6
66	387	156,4	417	181,1	447	209,1	477	238,6
68	386	155,5	416	180,3	446	208,2	476	237,6
70	385	154,7	415	179,4	445	207,3	475	236,6
72	384	153,9	414	178,5	444	206,3	474	235,6
74	383	153,1	413	177,7	443	205,4	473	234,6
76	382	152,3	412	176,8	442	204,5	472	233,6
78	381	151,5	411	175,9	441	203,5	471	232,6
80	380	150,7	410	175,1	440	202,6	470	231,6
82	379	149,9	409	174,2	439	201,7	469	230,6
84	378	149,1	408	173,4	438	200,7	468	229,6
86	377	148,3	407	172,5	437	199,8	467	228,6
88	376	147,5	406	171,6	436	198,9	466	227,6
90	375	146,7	405	170,8	435	198,0	465	226,7
92	374	146,0	404	169,9	434	197,0	464	225,7
94	373	145,2	403	169,1	433	196,1	463	224,7
96	372	144,4	402	168,2	432	195,2	462	223,7
98	371	143,6	401	167,4	431	194,3	461	222,7
100	370	142,8	400	166,5	430	193,4	460	221,7
102	369	142,0	399	165,7	429	192,5	459	220,8
104	368	141,2	398	164,8	428	191,5	458	219,8
106	367	140,5	397	164,0	427	190,6	457	218,8
108	366	139,7	396	163,2	426	189,7	456	217,8
110	365	138,9	395	162,3	425	188,8	455	216,8
112	364	138,1	394	161,5	424	187,9	454	215,9
114	363	137,4	393	160,6	423	187,0	453	214,9
116	362	136,6	392	159,8	422	186,1	452	213,9
118	361	135,8	391	159,0	421	185,2	451	213,0
120	360	135,0	390	158,1	420	184,3	450	212,0
122	359	134,3	389	157,3	419	183,4	449	211,0
124	358	133,5	388	156,5	418	182,5	448	210,1
126	357	132,7	387	155,7	417	181,6	447	209,1
128	356	132,0	386	154,8	416	180,7	446	208,2
130	355	131,2	385	154,0	415	179,8	445	207,2
132	354	130,5	384	153,2	414	178,9	444	206,3
134	353	129,7	383	152,4	413	178,1	443	205,3
136	352	128,9	382	151,6	412	177,2	442	204,3
138	351	128,2	381	150,7	411	176,3	441	203,4
140	350	127,4	380	149,9	410	175,4	440	202,4

*Partial nailing pattern*

Width mm	GSE 300		GSE 340		GSE 380		GSE 440		GSE 500		GSE 540	
	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>
32	134	10,7	154	15,0	174	18,4	204	25,3	234	31,9	254	38,2
34	133	10,6	153	14,9	173	18,2	203	25,1	233	31,6	253	37,9
36	132	10,4	152	14,7	172	18,0	202	24,8	232	31,4	252	37,6
38	131	10,3	151	14,6	171	17,9	201	24,6	231	31,1	251	37,3
40	130	10,2	150	14,4	170	17,7	200	24,4	230	30,9	250	37,0
42	129	10,1	149	14,2	169	17,5	199	24,2	229	30,7	249	36,7
44	128	9,9	148	14,1	168	17,4	198	24,0	228	30,4	248	36,4
46	127	9,8	147	13,9	167	17,2	197	23,8	227	30,2	247	36,2
48	126	9,7	146	13,7	166	17,0	196	23,6	226	30,0	246	35,9
50	125	9,6	145	13,6	165	16,9	195	23,3	225	29,7	245	35,6
52	124	9,4	144	13,4	164	16,7	194	23,1	224	29,5	244	35,3
54	123	9,3	143	13,3	163	16,5	193	22,9	223	29,3	243	35,0
56	122	9,2	142	13,1	162	16,4	192	22,7	222	29,0	242	34,7
58	121	9,1	141	12,9	161	16,2	191	22,5	221	28,8	241	34,4
60	120	8,9	140	12,8	160	16,0	190	22,3	220	28,6	240	34,1
62	119	8,8	139	12,6	159	15,9	189	22,1	219	28,3	239	33,9
64	118	8,7	138	12,5	158	15,7	188	21,9	218	28,1	238	33,6
66	117	8,6	137	12,3	157	15,5	187	21,6	217	27,9	237	33,3
68	116	8,4	136	12,1	156	15,4	186	21,4	216	27,6	236	33,0
70	115	8,3	135	12,0	155	15,2	185	21,2	215	27,4	235	32,7
72	114	8,2	134	11,8	154	15,0	184	21,0	214	27,2	234	32,4
74	113	8,1	133	11,7	153	14,9	183	20,8	213	26,9	233	32,2
76	112	7,9	132	11,5	152	14,7	182	20,6	212	26,7	232	31,9
78	111	7,8	131	11,4	151	14,6	181	20,4	211	26,5	231	31,6
80	110	7,7	130	11,2	150	14,4	180	20,2	210	26,2	230	31,3
82	109	7,6	129	11,0	149	14,2	179	20,0	209	26,0	229	31,1
84	108	7,5	128	10,9	148	14,1	178	19,8	208	25,8	228	30,8
86	107	7,3	127	10,7	147	13,9	177	19,6	207	25,5	227	30,5
88	106	7,2	126	10,6	146	13,7	176	19,3	206	25,3	226	30,2
90	105	7,1	125	10,4	145	13,6	175	19,1	205	25,1	225	30,0
92	104	7,0	124	10,3	144	13,4	174	18,9	204	24,9	224	29,7
94	103	6,9	123	10,1	143	13,3	173	18,7	203	24,6	223	29,4
96	102	6,7	122	10,0	142	13,1	172	18,5	202	24,4	222	29,2
98	101	6,6	121	9,8	141	12,9	171	18,3	201	24,2	221	28,9
100	100	6,5	120	9,6	140	12,8	170	18,1	200	23,9	220	28,6
102	99	6,4	119	9,5	139	12,6	169	17,9	199	23,7	219	28,4
104	98	6,3	118	9,3	138	12,5	168	17,7	198	23,5	218	28,1
106	97	6,1	117	9,2	137	12,3	167	17,5	197	23,3	217	27,8
108	96	6,0	116	9,0	136	12,1	166	17,3	196	23,0	216	27,6
110	95	5,9	115	8,9	135	12,0	165	17,1	195	22,8	215	27,3
112	--	--	--	--	134	11,8	164	16,9	194	22,6	214	27,0
114	--	--	--	--	133	11,7	163	16,7	193	22,4	213	26,8
116	--	--	--	--	132	11,5	162	16,5	192	22,2	212	26,5
118	--	--	--	--	131	11,4	161	16,3	191	21,9	211	26,3
120	--	--	--	--	130	11,2	160	16,1	190	21,7	210	26,0
122	--	--	--	--	129	11,0	159	15,9	189	21,5	209	25,8
124	--	--	--	--	128	10,9	158	15,7	188	21,3	208	25,5
126	--	--	--	--	127	10,7	157	15,5	187	21,1	207	25,3
128	--	--	--	--	126	10,6	156	15,3	186	20,8	206	25,0
130	--	--	--	--	125	10,4	155	15,1	185	20,6	205	24,8
132	--	--	--	--	124	10,3	154	14,9	184	20,4	204	24,5
134	--	--	--	--	123	10,1	153	14,8	183	20,2	203	24,3
136	--	--	--	--	122	10,0	152	14,6	182	20,0	202	24,0
138	--	--	--	--	121	9,8	151	14,4	181	19,8	201	23,8
140	--	--	--	--	120	9,6	150	14,2	180	19,5	200	23,5

Width mm	GSE 600		GSE 660		GSE 720		GSE 780	
	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>
32	284	47,3	314	56,6	344	67,7	374	80,1
34	283	47,0	313	56,3	343	67,3	373	79,7
36	282	46,7	312	55,9	342	66,9	372	79,2
38	281	46,4	311	55,6	341	66,5	371	78,8
40	280	46,1	310	55,3	340	66,2	370	78,4
42	279	45,8	309	54,9	339	65,8	369	78,0
44	278	45,4	308	54,6	338	65,4	368	77,6
46	277	45,1	307	54,3	337	65,0	367	77,2
48	276	44,8	306	53,9	336	64,7	366	76,8
50	275	44,5	305	53,6	335	64,3	365	76,4
52	274	44,2	304	53,3	334	63,9	364	76,0
54	273	43,9	303	53,0	333	63,6	363	75,6
56	272	43,6	302	52,6	332	63,2	362	75,2
58	271	43,3	301	52,3	331	62,8	361	74,8
60	270	43,0	300	52,0	330	62,5	360	74,4
62	269	42,7	299	51,6	329	62,1	359	74,0
64	268	42,4	298	51,3	328	61,7	358	73,6
66	267	42,1	297	51,0	327	61,4	357	73,2
68	266	41,8	296	50,7	326	61,0	356	72,8
70	265	41,5	295	50,3	325	60,6	355	72,4
72	264	41,2	294	50,0	324	60,3	354	72,0
74	263	40,9	293	49,7	323	59,9	353	71,6
76	262	40,6	292	49,4	322	59,5	352	71,2
78	261	40,3	291	49,0	321	59,2	351	70,8
80	260	40,0	290	48,7	320	58,8	350	70,4
82	259	39,7	289	48,4	319	58,4	349	70,1
84	258	39,4	288	48,1	318	58,1	348	69,7
86	257	39,1	287	47,7	317	57,7	347	69,3
88	256	38,8	286	47,4	316	57,4	346	68,9
90	255	38,5	285	47,1	315	57,0	345	68,5
92	254	38,2	284	46,8	314	56,6	344	68,1
94	253	37,9	283	46,5	313	56,3	343	67,7
96	252	37,6	282	46,1	312	55,9	342	67,3
98	251	37,3	281	45,8	311	55,6	341	66,9
100	250	37,0	280	45,5	310	55,2	340	66,5
102	249	36,7	279	45,2	309	54,9	339	66,2
104	248	36,4	278	44,9	308	54,5	338	65,8
106	247	36,2	277	44,6	307	54,2	337	65,4
108	246	35,9	276	44,2	306	53,8	336	65,0
110	245	35,6	275	43,9	305	53,5	335	64,6
112	244	35,3	274	43,6	304	53,1	334	64,2
114	243	35,0	273	43,3	303	52,8	333	63,9
116	242	34,7	272	43,0	302	52,4	332	63,5
118	241	34,4	271	42,7	301	52,1	331	63,1
120	240	34,1	270	42,4	300	51,7	330	62,7
122	239	33,9	269	42,1	299	51,4	329	62,3
124	238	33,6	268	41,7	298	51,0	328	62,0
126	237	33,3	267	41,4	297	50,7	327	61,6
128	236	33,0	266	41,1	296	50,3	326	61,2
130	235	32,7	265	40,8	295	50,0	325	60,8
132	234	32,4	264	40,5	294	49,7	324	60,5
134	233	32,2	263	40,2	293	49,3	323	60,1
136	232	31,9	262	39,9	292	49,0	322	59,7
138	231	31,6	261	39,6	291	48,6	321	59,3
140	230	31,3	260	39,3	290	48,3	320	59,0



Width mm	GSE 840		GSE 900		GSE 960		GSE 1020	
	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>	Height mm	K <sub>H,1</sub>
32	404	92,9	434	106,2	464	120,9	494	137,1
34	403	92,5	433	105,7	463	120,4	493	136,6
36	402	92,0	432	105,2	462	119,9	492	136,0
38	401	91,6	431	104,8	461	119,4	491	135,5
40	400	91,1	430	104,3	460	118,9	490	135,0
42	399	90,7	429	103,8	459	118,4	489	134,4
44	398	90,2	428	103,4	458	117,9	488	133,9
46	397	89,8	427	102,9	457	117,4	487	133,4
48	396	89,3	426	102,4	456	116,9	486	132,8
50	395	88,9	425	101,9	455	116,4	485	132,3
52	394	88,5	424	101,5	454	115,9	484	131,7
54	393	88,0	423	101,0	453	115,3	483	131,2
56	392	87,6	422	100,6	452	114,8	482	130,7
58	391	87,1	421	100,1	451	114,3	481	130,1
60	390	86,7	420	99,6	450	113,8	480	129,6
62	389	86,3	419	99,2	449	113,3	479	129,1
64	388	85,8	418	98,7	448	112,8	478	128,6
66	387	85,4	417	98,2	447	112,3	477	128,0
68	386	85,0	416	97,8	446	111,8	476	127,5
70	385	84,5	415	97,3	445	111,3	475	127,0
72	384	84,1	414	96,9	444	110,9	474	126,4
74	383	83,7	413	96,4	443	110,4	473	125,9
76	382	83,2	412	95,9	442	109,9	472	125,4
78	381	82,8	411	95,5	441	109,4	471	124,9
80	380	82,4	410	95,0	440	108,9	470	124,3
82	379	81,9	409	94,6	439	108,4	469	123,8
84	378	81,5	408	94,1	438	107,9	468	123,3
86	377	81,1	407	93,7	437	107,4	467	122,8
88	376	80,7	406	93,2	436	106,9	466	122,2
90	375	80,2	405	92,7	435	106,4	465	121,7
92	374	79,8	404	92,3	434	105,9	464	121,2
94	373	79,4	403	91,8	433	105,4	463	120,7
96	372	79,0	402	91,4	432	105,0	462	120,2
98	371	78,5	401	90,9	431	104,5	461	119,6
100	370	78,1	400	90,5	430	104,0	460	119,1
102	369	77,7	399	90,0	429	103,5	459	118,6
104	368	77,3	398	89,6	428	103,0	458	118,1
106	367	76,9	397	89,1	427	102,5	457	117,6
108	366	76,4	396	88,7	426	102,0	456	117,1
110	365	76,0	395	88,2	425	101,6	455	116,6
112	364	75,6	394	87,8	424	101,1	454	116,0
114	363	75,2	393	87,4	423	100,6	453	115,5
116	362	74,8	392	86,9	422	100,1	452	115,0
118	361	74,3	391	86,5	421	99,7	451	114,5
120	360	73,9	390	86,0	420	99,2	450	114,0
122	359	73,5	389	85,6	419	98,7	449	113,5
124	358	73,1	388	85,1	418	98,2	448	113,0
126	357	72,7	387	84,7	417	97,8	447	112,5
128	356	72,3	386	84,3	416	97,3	446	112,0
130	355	71,9	385	83,8	415	96,8	445	111,5
132	354	71,5	384	83,4	414	96,3	444	111,0
134	353	71,1	383	83,0	413	95,9	443	110,5
136	352	70,7	382	82,5	412	95,4	442	110,0
138	351	70,2	381	82,1	411	94,9	441	109,5
140	350	69,8	380	81,7	410	94,5	440	109,0

***k<sub>h,2</sub>* factors for Full nailing pattern**

Type	Width GSE	Width GSI	Height	Factor	Number of nails	
GSE/GSI	B [mm]	B [mm]	H [mm]	k <sub>H,2</sub>	n <sub>H</sub>	n <sub>J</sub>
300	32 to 110	76 to 110	95	5,6	12	6
340	32 to 110	76 to 110	115	5,6	12	8
380	32 to 140	76 to 140	120	5,6	12	8
440	32 to 140	76 to 140	150	16,0	22	12
500	32 to 140	76 to 140	180	24,7	28	14
540	32 to 140	76 to 140	200	31,7	32	16
600	32 to 140	76 to 140	250	43,6	38	20
660	32 to 140	76 to 140	260	57,5	44	22
720	32 to 140	76 to 140	290	73,3	50	26
780	32 to 140	76 to 140	320	91,0	56	28
840	32 to 140	76 to 140	350	110,6	62	32
900	32 to 140	76 to 140	380	132,1	68	38
960	32 to 140	76 to 140	410	155,6	74	38
1020	32 to 140	76 to 140	440	180,9	80	40

**GSE/GSI and GLE/GLI fire resistance R30 to EN 13501-2**

**Performance declared:** 30 minutes resistance to Fire (R30) to EN 13501-2 with all faces of the hanger exposed to the fire (Table 3). The performance values were determined by a static model developed by SST validated and verified by testing to EN 1365-2 and ETAG 015 by the Assessment Report *BTC 18511FA* issued by the Building Test Centre (UKAS accredited No. 0296 and member of the Fire Test Study Group, FTSP).

**Scope of Certification:** This certification applies to the following products and sizes GSE/GSI and GLE/GLI range of 4mm thick (ETA-06/0270).

**Table 1: GSE/GSI (4mm thickness) Hanger Height (mm)**

		Seat Width (mm)					
		100	120	140	160	180	200
Blank Length (mm)	380	140	130	-	-	-	-
	440	170	160	-	-	-	-
	500	200	190	180	170	160	150
	540	220	210	200	190	180	170
	600	250	240	230	220	210	200
	660	280	270	260	250	240	230
	720	310	300	290	280	270	260
	780	340	330	320	310	300	290
	840	370	360	350	340	330	320
	900	400	390	380	370	360	350
	960	430	420	410	400	390	380
1020	460	450	440	430	420	410	

**Table 2: GLE/GLI (4mm thickness) Hanger Height (mm)**

		Seat Width (mm)					
		100	120	140	160	180	200
Blank Length (mm)	380	140	-	-	-	-	-
	440	170	160	150	140	-	-
	500	200	190	180	170	-	-
	540	220	210	200	190	-	-
	600	250	240	230	220	-	-
	660	280	270	260	250	-	-
	720	310	300	290	280	-	-
	780	-	-	-	-	-	-
	840	-	-	-	-	-	-
	900	-	-	-	-	-	-
	960	-	-	-	-	-	-
1020	-	-	-	-	-	-	

**Service Class:** 1 and 2 to Eurocode 5.

**Fasteners:** Fully nailed with CNA4,0x75mm (ETA-04/0013).

**Timber:** Untreated C24 strength class timber to EN338. The joist was exposed on 3 faces (sides and bottom) and the header on 2 faces (side and bottom).

**Boundary conditions:**

- Header height  $\geq$  Joist height  $\geq$  Hanger height + 10mm
- Joist end shall be within the header face edges
- Member width  $\geq$  100mm
- Gap between members  $\leq$  3mm

Any other relevant National minimum requirement shall be fulfilled.

**Table 3: Characteristic vertical load bearing capacity R30 to EN 13501-2,  $F_{v,Rk,fi}$ , in kN**

		Seat Width (mm)					
		100	120	140	160	180	200
<b>Blank Length (mm)</b>	<b>380</b>	1.00	1.00	-	-	-	-
	<b>440</b>	2.52	2.52	2.52	2.52	-	-
	<b>500</b>	3.55	3.55	2.52	2.52	2.52	2.52
	<b>540</b>	4.72	4.72	3.55	3.55	3.55	3.55
	<b>600</b>	7.30	7.30	5.98	5.98	5.98	5.98
	<b>660</b>	8.65	8.65	7.30	7.30	7.30	7.30
	<b>720</b>	11.40	11.40	10.03	10.03	10.03	10.03
	<b>780</b>	12.76	12.76	11.40	11.40	11.40	11.40
	<b>840</b>	15.44	15.44	14.11	14.11	14.11	14.11
	<b>900</b>	18.04	18.04	15.44	15.44	15.44	15.44
	<b>960</b>	19.32	19.32	16.75	16.75	16.75	16.75
	<b>1020</b>	20.57	20.57	19.32	19.32	19.32	19.32

$$E_{d,fi} \leq R_{d,30,fi}$$

$$R_{d,30,fi} = F_{v,Rk,fi} / \gamma_{M,fi}$$

where,

$E_{d,fi}$  is the design effect of actions for the fire situation, determined in accordance with EN 1995-1-2.

$R_{d,30,fi}$  is the design resistance in the fire situation.

$\gamma_{M,fi}$  is the material safety factor for the fire situation. The value is 1, unless otherwise specify in the National annex.

For hangers with widths between these specify in the table, the characteristic resistance is the minimum value of the adjacent hangers

### Simplified calculation of $E_{d,fi}$ according to Eurocode 5 part 1-2:

$$E_{d,fi} = \eta_{fi} E_d \quad (2.8)$$

where:

$E_d$  is the design effect of actions for normal temperature design for the fundamental combination of actions, see EN 1990:2002;

$\eta_{fi}$  is the reduction factor for the design load in the fire situation.

(3) The reduction factor  $\eta_{fi}$  for load combination (6.10) in EN 1990:2002 should be taken as

$$\eta_{fi} = \frac{G_k + \psi_{fi} Q_{k,1}}{\gamma_G G_k + \gamma_{Q,1} Q_{k,1}} \quad (2.9)$$

or, for load combinations (6.10a) and (6.10b) in EN 1990:2002, as the smallest value given by the following two expressions

$$\eta_{fi} = \frac{G_k + \psi_{fi} Q_{k,1}}{\gamma_G G_k + \gamma_{Q,1} Q_{k,1}} \quad (2.9a)$$

$$\eta_{fi} = \frac{G_k + \psi_{fi} Q_{k,1}}{\xi \gamma_G G_k + \gamma_{Q,1} Q_{k,1}} \quad (2.9b)$$

where:

$Q_{k,1}$  is the characteristic value of the leading variable action;

$G_k$  is the characteristic value of the permanent action;

$\gamma_G$  is the partial factor for permanent actions;

$\gamma_{Q,1}$  is the partial factor for variable action 1;

$\psi_{fi}$  is the combination factor for frequent values of variable actions in the fire situation, given either by  $\psi_{1,1}$  or  $\psi_{2,1}$ , see EN 1991-1-1;  $\xi$

$\xi$  is a reduction factor for unfavourable permanent actions G.

## D17 Joist hanger type GSI

Face mount hanger with internal flanges

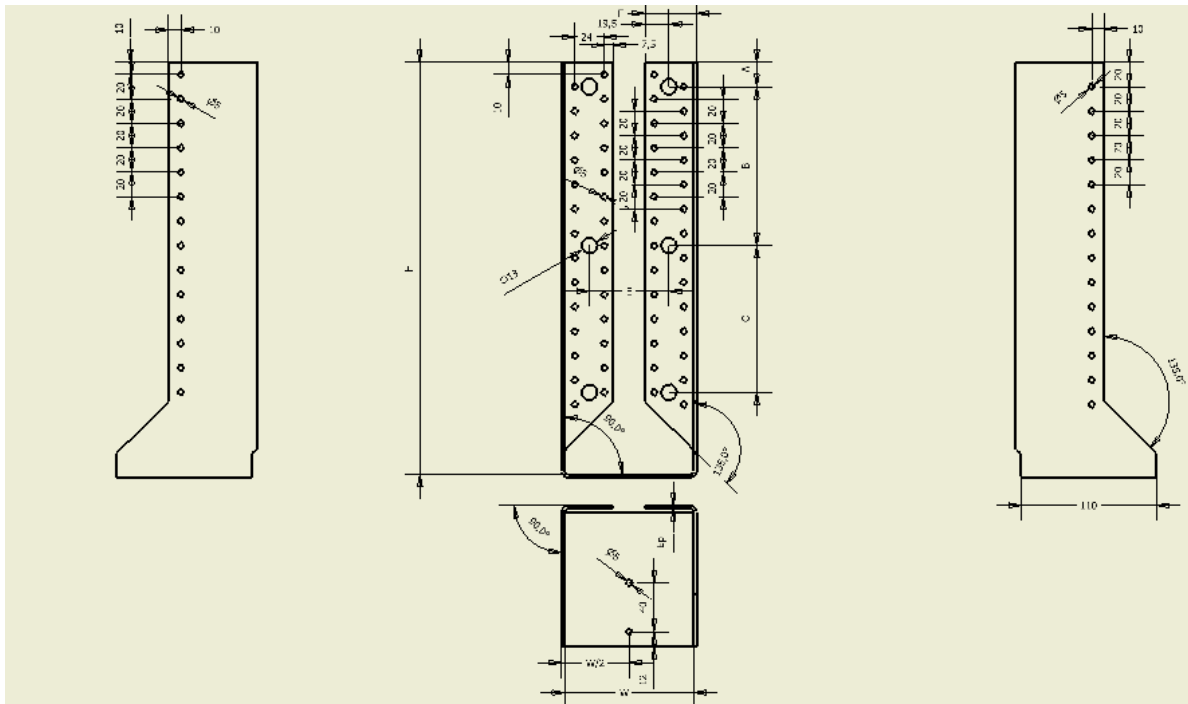
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
GSI	GSI	GSI	GSI	GSI

### Material Specification and Service Classes

2.5 and 4.0 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.5 and 4.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model	W (mm)	H (mm)	A mm	B mm	C mm	E <sup>(**)</sup> mm	F <sup>(*)</sup> mm	Ep <sup>(***)</sup> (mm)	Holes number		
									Ø 5 (flanges)	Ø 5 (sides)	Ø 13 (flanges)
GSI300/2.5X	76-110	95-112	30	--	--	W - 41	40	2.5	12	6	2
GSI300/4X	76-110	95-112	30	--	--	W - 44	41.5	4	12	6	2
GSI340/2.5X	76-110	115-132	30	--	--	W - 41	40	2.5	16	8	2
GSI340/4X	76-110	115-132	30	--	--	W - 44	41.5	4	16	8	2
GSI380/2.5X	76-140	120-152	20	50	--	W - 41	40	2.5	16	8	4
GSI380/4X	76-140	120-152	20	50	--	W - 44	41.5	4	16	8	4
GSI440/2.5X	76-140	150-182	20	80	--	W - 41	40	2.5	22	12	4
GSI440/4X	76-140	150-182	20	80	--	W - 44	41.5	4	22	12	4
GSI500/2.5X	76-140	180-212	30	100	--	W - 41	40	2.5	28	14	4
GSI500/4X	76-140	180-212	30	100	--	W - 44	41.5	4	28	14	4
GSI540/2.5X	76-140	200-232	30	120	--	W - 41	40	2.5	32	16	4
GSI540/4X	76-140	200-232	30	120	--	W - 44	41.5	4	32	16	4
GSI600/2.5X	76-140	230-262	20	160	--	W - 41	40	2.5	38	20	4
GSI600/4X	76-140	230-262	20	160	--	W - 44	41.5	4	38	20	4
GSI660/2.5X	76-140	260-292	30	80	100	W - 41	40	2.5	44	22	6
GSI660/4X	76-140	260-292	30	80	100	W - 44	41.5	4	44	22	6
GSI720/2.5X	76-140	290-322	20	100	120	W - 41	40	2.5	50	26	6
GSI720/4X	76-140	290-322	20	100	120	W - 44	41.5	4	50	26	6
GSI780/2.5X	76-140	320-352	20	130	120	W - 41	40	2.5	56	28	6
GSI780/4X	76-140	320-352	20	130	120	W - 44	41.5	4	56	28	6
GSI840/2.5X	76-140	350-382	20	140	140	W - 41	40	2.5	62	32	6
GSI840/4X	76-140	350-382	20	140	140	W - 44	41.5	4	62	32	6
GSI900/2.5X	76-140	380-412	30	160	140	W - 41	40	2.5	68	38	6
GSI900/4X	76-140	380-412	30	160	140	W - 44	41.5	4	68	38	6
GSI960/2.5X	76-140	410-442	20	180	160	W - 41	40	2.5	74	38	6
GSI960/4X	76-140	410-442	20	180	160	W - 44	41.5	4	74	38	6
GSI1020/2.5X	76-140	440-472	30	200	160	W - 41	40	2.5	80	40	6
GSI1020/4X	76-140	440-472	30	200	160	W - 44	41.5	4	80	40	6

(\*) : For width  $76 \leq W < 84$  mm, the F dimension is  $38^{0/-1}$  mm (\*\*\*) : Ep = Thickness of the steel

(\*\*) For width  $76 \leq W < 84$ ,  $E = W - 37$ ; tolerance is given at +0/+2 mm

## Table of parameters

See Annex D16 - “Joist Hanger type GSE” section above for  $k_{H1}$  values. They are the same as GSE for widths from 76 mm.

See Annex D16 - “Joist Hanger type GSE” section above for  $k_{H2}$  values.

## GSE/GSI and GLE/GLI fire resistance R30 to EN 13501-2

See annex D16 for the performance of GLE in case of fire

## D18 Joist hanger type GSE-AL

Face mount hanger with external flanges

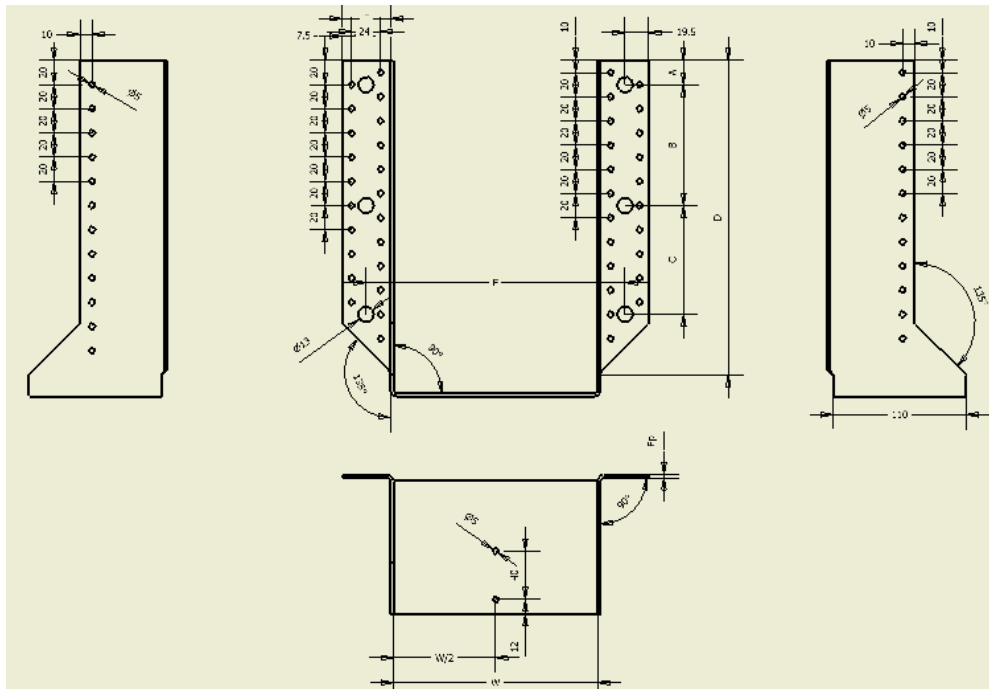
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
GSE-AL	GSE-AL	GSE-AL	GSE-AL	GSE-AL

### Material Specification and Service Classes

2.5 and 4.0 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.5 and 4.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model	W (mm)	H (mm)	A mm	B mm	C mm	E <sup>(*)</sup> (mm)	F (mm)	Ep (mm)	Holes number		
									Ø 5 (flanges)	Ø 5 (sides)	Ø 13 (flanges)
GSE500/2.5X-AL	135-200	150-182.5	50	--	--	W + 46	40	2.5	22	12	2
GSE500/4X-AL	135-200	150-182.5	50	--	--	W + 52	41.5	4	22	12	2
GSE540/2.5X-AL	135-200	170-202.5	30	80	--	W + 46	40	2.5	26	14	4
GSE540/4X-AL	135-200	170-202.5	30	80	--	W + 52	41.5	4	26	14	4
GSE600/2.5X-AL	135-200	200-232.5	20	120	--	W + 46	40	2.5	32	18	4
GSE600/4X-AL	135-200	200-232.5	20	120	--	W + 52	41.5	4	32	18	4
GSE660/2.5X-AL	135-200	230-262.5	30	120	--	W + 46	40	2.5	38	20	6
GSE660/4X-AL	135-200	230-262.5	30	120	--	W + 52	41.5	4	38	20	6
GSE720/2.5X-AL	135-200	260-292.5	20	100	90	W + 46	40	2.5	44	24	6
GSE720/4X-AL	135-200	260-292.5	20	100	90	W + 52	41.5	4	44	24	6
GSE780/2.5X-AL	135-200	290-322.5	20	110	110	W + 46	40	2.5	50	26	6
GSE780/4X-AL	135-200	290-322.5	20	110	110	W + 52	41.5	4	50	26	6
GSE840/2.5X-AL	135-200	320-352.5	20	120	120	W + 46	40	2.5	56	30	6
GSE840/4X-AL	135-200	320-352.5	20	120	120	W + 52	41.5	4	56	30	6
GSE900/2.5X-AL	135-200	350-382.5	30	130	130	W + 46	40	2.5	62	32	6
GSE900/4X-AL	135-200	350-382.5	30	130	130	W + 52	41.5	4	62	32	6
GSE960/2.5X-AL	135-200	380-412.5	20	140	140	W + 46	40	2.5	68	34	6
GSE960/4X-AL	135-200	380-412.5	20	140	140	W + 52	41.5	4	68	34	6
GSE1020/2.5X-AL	135-200	410-442.5	30	150	150	W + 46	40	2.5	74	38	6
GSE1020/4X-AL	135-200	410-442.5	30	150	150	W + 52	41.5	4	74	38	6

(\*) : Ep = Thickness of the steel

**Table of parameters**Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C**Full nailing pattern**

	GSE-AL 500		GSE-AL 540		GSE-AL 600		GSE-AL 660		GSE-AL 720		GSE-AL 780	
Width	Height	$K_{H,1}$	Height	$K_{H,1}$	Height	$K_{H,1}$	Height	$K_{H,1}$	Height	$K_{H,1}$	Height	$K_{H,1}$
mm	mm		mm		mm		mm		mm		mm	
136	182	33,4	202	41,6	232	55,0	262	70,9	292	88,2	322	107,8
138	181	33,1	201	41,2	231	54,6	261	70,4	291	87,6	321	107,2
140	180	32,7	200	40,8	230	54,1	260	69,8	290	87,0	320	106,5
142	179	32,4	199	40,4	229	53,6	259	69,3	289	86,4	319	105,8
144	178	32,0	198	40,0	228	53,2	258	68,8	288	85,8	318	105,2
146	177	31,7	197	39,6	227	52,7	257	68,3	287	85,2	317	104,5
148	176	31,4	196	39,2	226	52,3	256	67,7	286	84,6	316	103,8
150	175	31,0	195	38,8	225	51,8	255	67,2	285	84,0	315	103,2
152	174	30,7	194	38,4	224	51,4	254	66,7	284	83,4	314	102,5
154	173	30,3	193	38,0	223	50,9	253	66,2	283	82,8	313	101,9
156	172	30,0	192	37,7	222	50,5	252	65,6	282	82,2	312	101,2
158	171	29,7	191	37,3	221	50,0	251	65,1	281	81,6	311	100,5
160	170	29,3	190	36,9	220	49,5	250	64,6	280	81,1	310	99,9
162	169	29,0	189	36,5	219	49,1	249	64,1	279	80,5	309	99,2
164	168	28,6	188	36,1	218	48,6	248	63,5	278	79,9	308	98,6
166	167	28,3	187	35,7	217	48,2	247	63,0	277	79,3	307	97,9
168	166	28,0	186	35,3	216	47,8	246	62,5	276	78,7	306	97,3
170	165	27,6	185	35,0	215	47,3	245	62,0	275	78,1	305	96,6
172	164	27,3	184	34,6	214	46,9	244	61,5	274	77,6	304	96,0
174	163	27,0	183	34,2	213	46,4	243	61,0	273	77,0	303	95,3
176	162	26,6	182	33,8	212	46,0	242	60,5	272	76,4	302	94,7
178	161	26,3	181	33,5	211	45,5	241	60,0	271	75,8	301	94,1
180	160	26,0	180	33,1	210	45,1	240	59,4	270	75,3	300	93,4
182	159	25,7	179	32,7	209	44,7	239	58,9	269	74,7	299	92,8
184	158	25,3	178	32,3	208	44,2	238	58,4	268	74,1	298	92,1
186	157	25,0	177	32,0	207	43,8	237	57,9	267	73,6	297	91,5
188	156	24,7	176	31,6	206	43,3	236	57,4	266	73,0	296	90,9
190	155	24,4	175	31,2	205	42,9	235	56,9	265	72,4	295	90,2
192	154	24,0	174	30,9	204	42,5	234	56,4	264	71,9	294	89,6
194	153	23,7	173	30,5	203	42,1	233	55,9	263	71,3	293	89,0
196	152	23,4	172	30,1	202	41,6	232	55,4	262	70,7	292	88,4
198	151	23,1	171	29,8	201	41,2	231	54,9	261	70,2	291	87,7
200	150	22,8	170	29,4	200	40,8	230	54,4	260	69,6	290	87,1



Width	GSE-AL 840		GSE-AL900		GSE-AL 960		GSE-AL 1020	
	Height	K <sub>H,1</sub>	Height	K <sub>H,1</sub>	Height	K <sub>H,1</sub>	Height	K <sub>H,1</sub>
mm	mm		mm		mm		mm	
136	352	128,9	382	152,3	412	177,7	420	204,5
138	351	128,2	381	151,5	411	176,8	441	203,5
140	350	127,4	380	150,7	410	175,9	440	202,6
142	349	126,7	379	149,9	409	175,1	439	201,7
144	348	126,0	378	149,1	408	174,2	438	200,7
146	347	125,2	377	148,3	407	173,3	437	199,8
148	346	124,5	376	147,5	406	172,5	436	198,9
150	345	123,8	375	146,7	405	171,6	435	198,0
152	344	123,1	374	146,0	404	170,8	434	197,0
154	343	122,3	373	145,2	403	169,9	433	196,1
156	342	121,6	372	144,4	402	169,1	432	195,2
158	341	120,9	371	143,6	401	168,2	431	194,3
160	340	120,2	370	142,8	400	167,4	430	193,4
162	339	119,5	369	142,0	399	166,5	429	192,5
164	338	118,7	368	141,2	398	165,7	428	191,5
166	337	118,0	367	140,5	397	164,8	427	190,6
168	336	117,3	366	139,7	396	164,0	426	189,7
170	335	116,6	365	138,9	395	163,1	425	188,8
172	334	115,9	364	138,1	394	162,3	424	187,9
174	333	115,2	363	137,4	393	161,4	423	187,0
176	332	114,5	362	136,6	392	160,6	422	186,1
178	331	113,8	361	135,8	391	159,8	421	185,2
180	330	113,1	360	135,0	390	158,9	420	184,3
182	329	112,4	359	134,3	389	158,1	419	183,4
184	328	111,7	358	133,5	388	157,3	418	182,5
186	327	111,0	357	132,7	387	156,4	417	181,6
188	326	110,3	356	132,0	386	155,6	416	180,7
190	325	109,6	355	131,2	385	154,8	415	179,8
192	324	108,9	354	130,5	384	153,9	414	178,9
194	323	108,2	353	129,7	383	153,1	413	178,1
196	322	107,5	352	128,9	382	152,3	412	177,2
198	321	106,8	351	128,2	381	151,5	411	176,3
200	320	106,1	350	127,4	380	150,7	410	175,4

**Partial nailing pattern**

	GSE-AL 500		GSE-AL 540		GSE-AL 600		GSE-AL 660		GSE-AL 720		GSE-AL 780	
Width	Height	K <sub>H,1</sub>	Height	K <sub>H,1</sub>	Height	K <sub>H,1</sub>	Height	K <sub>H,1</sub>	Height	K <sub>H,1</sub>	Height	K <sub>H,1</sub>
mm	mm		mm		mm		mm		mm		mm	
136	182	20,6	202	24,4	232	31,7	262	40,6	292	49,7	322	59,5
138	181	20,4	201	24,2	231	31,5	261	40,3	291	49,4	321	59,2
140	180	20,2	200	23,9	230	31,2	260	40,0	290	49,0	320	58,8
142	179	20,0	199	23,7	229	31,5	259	39,7	289	48,7	319	58,4
144	178	19,8	198	23,5	228	31,3	258	39,4	288	48,4	318	58,1
146	177	19,6	197	23,3	227	31,0	257	39,1	287	48,0	317	57,7
148	176	19,3	196	23,0	226	30,8	256	38,8	286	47,7	316	57,4
150	175	19,1	195	22,8	225	30,5	255	38,5	285	47,4	315	57,0
152	174	18,9	194	22,6	224	30,3	254	38,2	284	47,0	314	56,6
154	173	18,7	193	22,4	223	30,0	253	37,9	283	46,7	313	56,3
156	172	18,5	192	22,2	222	29,7	252	37,6	282	46,4	312	55,9
158	171	18,3	191	21,9	221	29,5	251	37,3	281	46,0	311	55,6
160	170	18,1	190	21,7	220	29,2	250	37,0	280	45,7	310	55,2
162	169	17,9	189	21,5	219	29,0	249	36,7	279	45,4	309	54,9
164	168	17,7	188	21,3	218	28,7	248	36,4	278	45,1	308	54,5
166	167	17,5	187	21,1	217	28,5	247	36,2	277	44,7	307	54,2
168	166	17,3	186	20,8	216	28,2	246	35,9	276	44,4	306	53,8
170	165	17,1	185	20,6	215	28,0	245	35,6	275	44,1	305	53,5
172	164	16,9	184	20,4	214	27,7	244	35,3	274	43,8	304	53,1
174	163	16,7	183	20,2	213	27,5	243	35,0	273	43,4	303	52,8
176	162	16,5	182	20,0	212	27,2	242	34,7	272	43,1	302	52,4
178	161	16,3	181	19,8	211	27,0	241	34,4	271	42,8	301	52,1
180	160	16,1	180	19,5	210	26,7	240	34,1	270	42,5	300	51,7
182	159	15,9	179	19,3	209	26,5	239	33,9	269	42,2	299	51,4
184	158	15,7	178	19,1	208	26,2	238	33,6	268	41,8	298	51,0
186	157	15,5	177	18,9	207	26,0	237	33,3	267	41,5	297	50,7
188	156	15,3	176	18,7	206	25,7	236	33,0	266	41,2	296	50,3
190	155	15,1	175	18,5	205	25,5	235	32,7	265	40,9	295	50,0
192	154	14,9	174	18,3	204	25,2	234	32,4	264	40,6	294	49,7
194	153	14,8	173	18,1	203	25,0	233	32,2	263	40,3	293	49,3
196	152	14,6	172	17,8	202	24,8	232	31,9	262	40,0	292	49,0
198	151	14,4	171	17,6	201	24,5	231	31,6	261	39,6	291	48,6
200	150	14,2	170	17,4	200	24,3	230	31,3	260	39,3	290	48,3

	GSE-AL 840		GSE-AL900		GSE-AL 960		GSE-AL 1020	
Width	Height	$K_{H,1}$	Height	$K_{H,1}$	Height	$K_{H,1}$	Height	$K_{H,1}$
mm	mm		mm		mm		mm	
136	352	70,6	382	83,2	412	96,1	442	109,9
138	351	70,2	381	82,8	411	95,7	441	109,4
140	350	69,8	380	82,4	410	95,2	440	108,9
142	349	69,4	379	81,9	409	94,6	439	108,4
144	348	69,0	378	81,5	408	94,1	438	107,9
146	347	68,6	377	81,1	407	93,7	437	107,4
148	346	68,2	376	80,7	406	93,2	436	106,9
150	345	67,8	375	80,2	405	92,7	435	106,4
152	344	67,4	374	79,8	404	92,3	434	105,9
154	343	67,0	373	79,4	403	91,8	433	105,4
156	342	66,6	372	79,0	402	91,4	432	105,0
158	341	66,2	371	78,5	401	90,9	431	104,5
160	340	65,8	370	78,1	400	90,5	430	104,0
162	339	65,4	369	77,7	399	90,0	429	103,5
164	338	65,1	368	77,3	398	89,6	428	103,0
166	337	64,7	367	76,9	397	89,1	427	102,5
168	336	64,3	366	76,4	396	88,7	426	102,0
170	335	63,9	365	76,0	395	88,2	425	101,6
172	334	63,5	364	75,6	394	87,8	424	101,1
174	333	63,1	363	75,2	393	87,4	423	100,6
176	332	62,7	362	74,8	392	86,9	422	100,1
178	331	62,4	361	74,3	391	86,5	421	99,7
180	330	62,0	360	73,9	390	86,0	420	99,2
182	329	61,6	359	73,5	389	85,6	419	98,7
184	328	61,2	358	73,1	388	85,1	418	98,2
186	327	60,8	357	72,7	387	84,7	417	97,8
188	326	60,5	356	72,3	386	84,3	416	97,3
190	325	60,1	355	71,9	385	83,8	415	96,8
192	324	59,7	354	71,5	384	83,4	414	96,3
194	323	59,3	353	71,1	383	83,0	413	95,9
196	322	59,0	352	70,7	382	82,5	412	95,4
198	321	58,6	351	70,2	381	82,1	411	94,9
200	320	58,2	350	69,8	380	81,7	410	94,5

 ***$k_{h,2}$  factors for Full nailing pattern***

Type	Width GSE-AL	Width GSI-AL	Height	Factor	Number of nails	
GSE/GSI-AL	B mm	B mm	H mm	$k_{H,2}$ -	$n_H$ -	$n_I$ -
<b>500</b>	135 to 200	135 to 200	150	16,0	22	12
<b>540</b>	135 to 200	135 to 200	170	21,6	26	14
<b>600</b>	135 to 200	135 to 200	200	31,7	32	18
<b>660</b>	135 to 200	135 to 200	230	43,6	38	20
<b>720</b>	135 to 200	135 to 200	260	57,5	44	24
<b>780</b>	135 to 200	135 to 200	290	73,3	50	26
<b>840</b>	135 to 200	135 to 200	320	91,0	56	30
<b>900</b>	135 to 200	135 to 200	350	110,6	62	32
<b>960</b>	135 to 200	135 to 200	380	132,1	68	34
<b>1020</b>	135 to 200	135 to 200	410	155,6	74	38

**GSE/GSI and GLE/GLI fire resistance R30 to EN 13501-2**

See annex D16 for the performance of GLE in case of fire

## D19 Joist hanger type GSI-AL

Face mount hanger with internal flanges

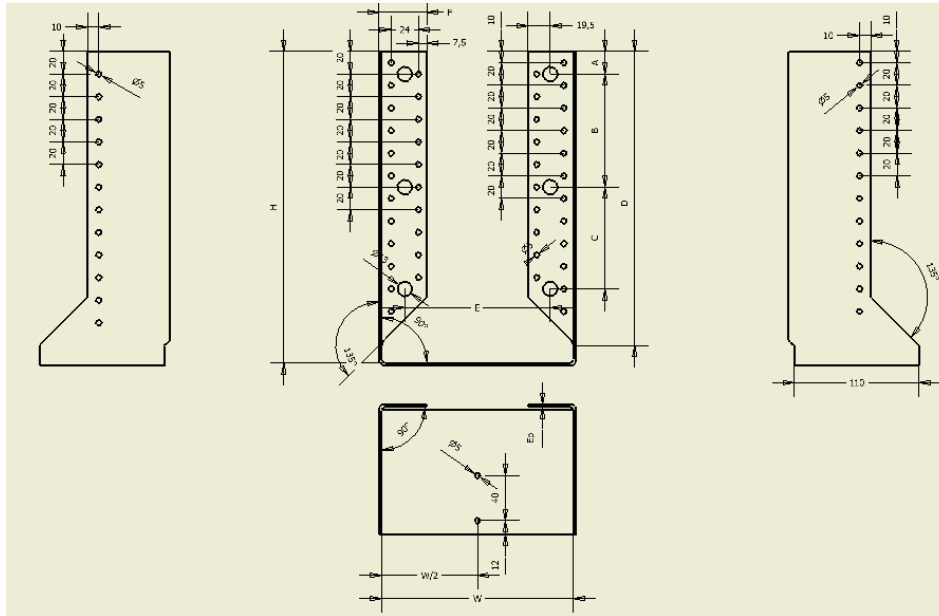
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
GSI-AL	GSI-AL	GSI-AL	GSI-AL	GSI-AL

### Material Specification and Service Classes

2.5 and 4.0 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.5 and 4.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model	W (mm)	H (mm)	A mm	B mm	C mm	E (mm)	F (mm)	Ep(**) mm	Ø 5 (flanges)	Ø 5 (sides)	Ø 13 (flanges)
GSI500/2.5X-AL	135-200	150-182.5	50	--	--	W - 41	40	2.5	22	12	2
GSI500/4X-AL	135-200	150-182.5	50	--	--	W - 44	41.5	4	22	12	2
GSI540/2.5X-AL	135-200	170-202.5	30	80	--	W - 41	40	2.5	26	14	4
GSI540/4X-AL	135-200	170-202.5	30	80	--	W - 44	41.5	4	26	14	4
GSI600/2.5X-AL	135-200	200-232.5	20	120	--	W - 41	40	2.5	32	18	4
GSI600/4X-AL	135-200	200-232.5	20	120	--	W - 44	41.5	4	32	18	4
GSI660/2.5X-AL	135-200	230-262.5	30	120	--	W - 41	40	2.5	38	20	6
GSI660/4X-AL	135-200	230-262.5	30	120	--	W - 44	41.5	4	38	20	6
GSI720/2.5X-AL	135-200	260-292.5	20	100	90	W - 41	40	2.5	44	24	6
GSI720/4X-AL	135-200	260-292.5	20	100	90	W - 44	41.5	4	44	24	6
GSI780/2.5X-AL	135-200	290-322.5	20	110	110	W - 41	40	2.5	50	26	6
GSI780/4X-AL	135-200	290-322.5	20	110	110	W - 44	41.5	4	50	26	6
GSI840/2.5X-AL	135-200	320-352.5	20	120	120	W - 41	40	2.5	56	30	6
GSI840/4X-AL	135-200	320-352.5	20	120	120	W - 44	41.5	4	56	30	6
GSI900/2.5X-AL	135-200	350-382.5	30	130	130	W - 41	40	2.5	62	32	6
GSI900/4X-AL	135-200	350-382.5	30	130	130	W - 44	41.5	4	62	32	6
GSI960/2.5X-AL	135-200	380-412.5	20	140	140	W - 41	40	2.5	68	34	6
GSI960/4X-AL	135-200	380-412.5	20	140	140	W - 44	41.5	4	68	34	6
GSI1020/2.5X-AL	135-200	410-442.5	30	150	150	W - 41	40	2.5	74	38	6
GSI1020/4X-AL	135-200	410-442.5	30	150	150	W - 44	41.5	4	74	38	6

(\*) : Tolerance is given at +0/+2 mm

(\*\*) : Ep = Thickness of the steel

**Table of parameters**

Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C

See Annex D18 - “Joist Hanger type GSE-AL” section above for  $k_{H1}$  and  $k_{H2}$  values.

**GSE/GSI and GLE/GLI fire resistance R30 to EN 13501-2**

See annex D16 for the performance of GLE in case of fire

## D20 Joist hanger type GSEXL

Face mount hanger with external flanges

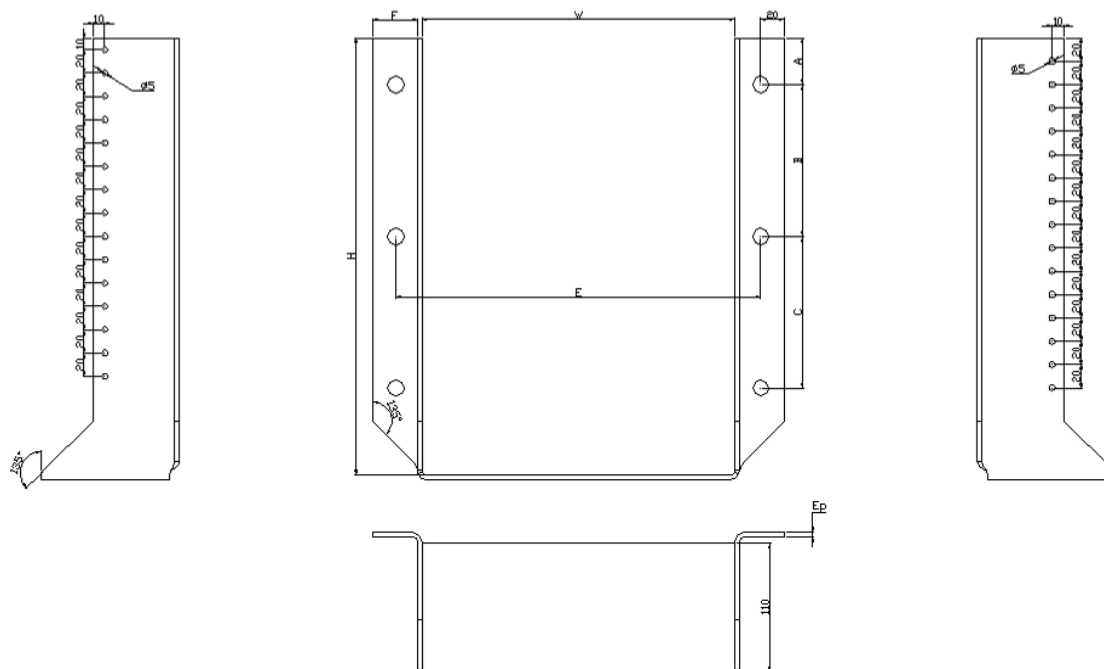
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
GSEXL	GSEXL	GSEXL	GSEXL	GSEXL

### Material Specification and Service Classes

4.0 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

4.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model	W (mm)	H (mm)	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	Thickness (mm)	Ø5 (sides)	Ø14 (flanges)
GSEXL720/4X	201-270	225-259.5	30	130	-	W+44	38.5	4	16	4
GSEXL1020/4X	201-270	375-409.5	40	130	130	W+44	38.5	4	30	6

See formulas from Annex C for characteristic values calculation.

## D21 Joist hanger type GLE

Face mount hanger with external flanges

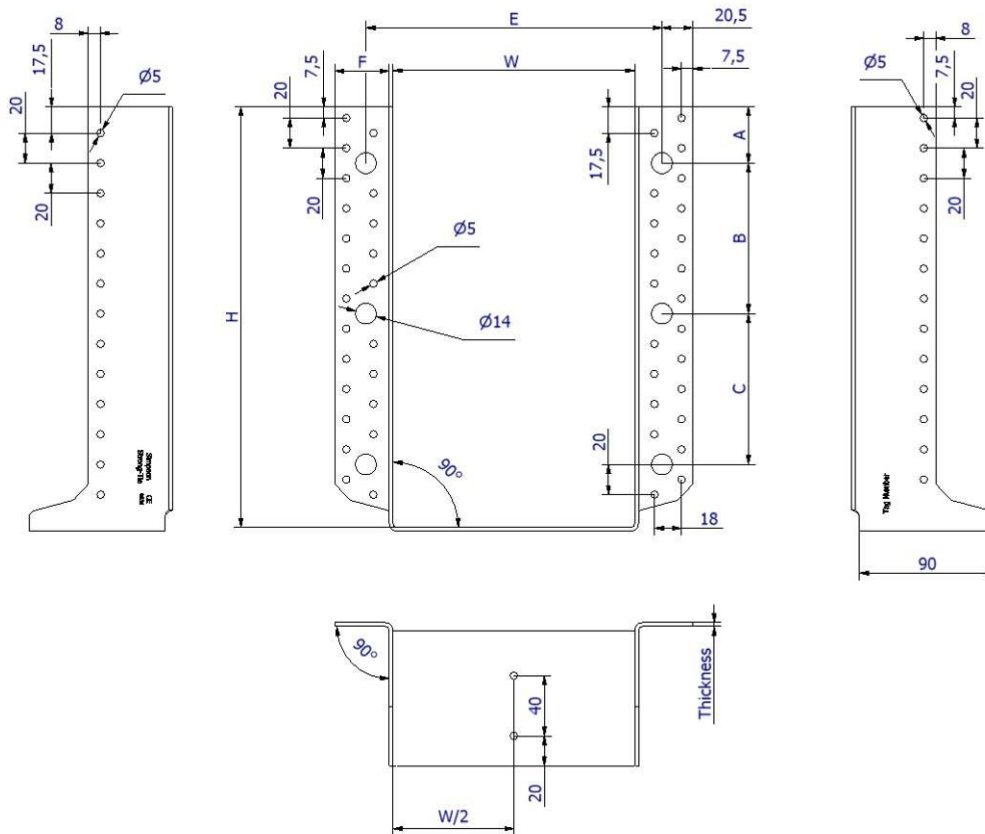
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
GLE	GLE	GLE	GLE	GLE

### Material Specification and Service Classes

2.5 and 4.0 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.5 and 4.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions





Model	W (mm)	H (mm)	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	Thickness (mm)	Number of holes		
									Ø5 (flange)	Ø5 (side)	Ø14 (flange)
GLE300/2,5	32-110	95-134	27,5	-	-	L+36	36	2,5	12	7	2
GLE300/4	32-110	95-134	27,5	-	-	L+39	36	4	12	7	2
GLE340/2,5	32-110	115-154	27,5	-	-	L+36	36	2,5	16	9	2
GLE340/4	32-110	115-154	27,5	-	-	L+39	36	4	16	9	2
GLE380/2,5	32-110	135-174	27,5	-	-	L+36	36	2,5	20	11	2
GLE380/4	32-110	135-174	27,5	-	-	L+39	36	4	20	11	2
GLE440/2,5	32-160	140-204	17,5	80	-	L+36	36	2,5	20	12	4
GLE440/4	32-160	140-204	17,5	80	-	L+39	36	4	20	12	4
GLE500/2,5	32-160	170-234	27,5	100	-	L+36	36	2,5	26	15	4
GLE500/4	32-160	170-234	27,5	100	-	L+39	36	4	26	15	4
GLE540/2,5	32-160	190-254	27,5	120	-	L+36	36	2,5	30	17	4
GLE540/4	32-160	190-254	27,5	120	-	L+39	36	4	30	17	4
GLE600/2,5	32-160	220-284	37,5	140	-	L+36	36	2,5	36	20	4
GLE600/4	32-160	220-284	37,5	140	-	L+39	36	4	36	20	4
GLE660/2,5	32-160	250-314	27,5	80	100	L+36	36	2,5	40	23	6
GLE660/4	32-160	250-314	27,5	80	100	L+39	36	4	40	23	6
GLE720/2,5	32-160	280-344	37,5	100	100	L+36	36	2,5	46	26	6
GLE720/4	32-160	280-344	37,5	100	100	L+39	36	4	46	26	6

Tolerance on all dimensions is +0/+2mm

### Table of parameters

Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C

Full nailing																		
Width	Blank Model																	
	300		340		380		440		500		540		600		660		720	
	kh,1	kh,2	kh,1	kh,2	kh,1	kh,2	kh,1	kh,2	kh,1	kh,2	kh,1	kh,2	kh,1	kh,2	kh,1	kh,2	kh,1	kh,2
32	24,2	10,1	33,1	15,8	43,3	22,7	55,8	22,8	78,4	34,5	94,3	43,9	121,7	59,9	142,9	76,3	176,8	97,0
34	23,9	10,1	32,7	15,8	42,9	22,7	55,3	22,8	77,8	34,5	93,6	43,9	120,8	59,9	142,0	76,3	175,8	97,0
36	23,5	10,1	32,3	15,8	42,4	22,7	54,8	22,8	77,1	34,5	92,9	43,9	120,0	59,9	141,1	76,3	174,8	97,0
38	23,2	10,1	31,9	15,8	41,9	22,7	54,3	22,8	76,5	34,5	92,2	43,9	119,2	59,9	140,2	76,3	173,8	97,0
40	22,9	10,1	31,5	15,8	41,4	22,7	53,8	22,8	75,9	34,5	91,5	43,9	118,4	59,9	139,3	76,3	172,8	97,0
42	22,5	10,1	31,1	15,8	40,9	22,7	53,3	22,8	75,3	34,5	90,8	43,9	117,6	59,9	138,4	76,3	171,9	97,0
44	22,2	10,1	30,7	15,8	40,4	22,7	52,8	22,8	74,7	34,5	90,1	43,9	116,8	59,9	137,6	76,3	170,9	97,0
46	21,9	10,1	30,3	15,8	39,9	22,7	52,3	22,8	74,0	34,5	89,4	43,9	115,9	59,9	136,7	76,3	169,9	97,0
48	21,6	10,1	29,9	15,8	39,5	22,7	51,8	22,8	73,4	34,5	88,7	43,9	115,1	59,9	135,8	76,3	168,9	97,0
50	21,3	10,1	29,5	15,8	39,0	22,7	51,3	22,8	72,8	34,5	88,0	43,9	114,3	59,9	134,9	76,3	167,9	97,0
52	20,9	10,1	29,1	15,8	38,5	22,7	50,8	22,8	72,2	34,5	87,3	43,9	113,5	59,9	134,1	76,3	166,9	97,0
54	20,6	10,1	28,7	15,8	38,0	22,7	50,3	22,8	71,6	34,5	86,6	43,9	112,7	59,9	133,2	76,3	165,9	97,0
56	20,3	10,1	28,3	15,8	37,6	22,7	49,8	22,8	70,9	34,5	85,9	43,9	111,9	59,9	132,3	76,3	164,9	97,0
58	20,0	10,1	27,9	15,8	37,1	22,7	49,3	22,8	70,3	34,5	85,3	43,9	111,1	59,9	131,5	76,3	164,0	97,0
60	19,7	10,1	27,5	15,8	36,6	22,7	48,8	22,8	69,7	34,5	84,6	43,9	110,3	59,9	130,6	76,3	163,0	97,0
62	19,3	10,1	27,1	15,8	36,1	22,7	48,3	22,8	69,1	34,5	83,9	43,9	109,5	59,9	129,7	76,3	162,0	97,0
64	19,0	10,1	26,7	15,8	35,7	22,7	47,8	22,8	68,5	34,5	83,2	43,9	108,7	59,9	128,9	76,3	161,0	97,0
66	18,7	10,1	26,3	15,8	35,2	22,7	47,3	22,8	67,9	34,5	82,5	43,9	107,9	59,9	128,0	76,3	160,0	97,0
68	18,4	10,1	25,9	15,8	34,7	22,7	46,9	22,8	67,3	34,5	81,8	43,9	107,1	59,9	127,1	76,3	159,1	97,0
70	18,1	10,1	25,5	15,8	34,3	22,7	46,4	22,8	66,7	34,5	81,1	43,9	106,3	59,9	126,3	76,3	158,1	97,0
72	17,8	10,1	25,1	15,8	33,8	22,7	45,9	22,8	66,1	34,5	80,5	43,9	105,5	59,9	125,4	76,3	157,1	97,0
74	17,5	10,1	24,7	15,8	33,4	22,7	45,4	22,8	65,5	34,5	79,8	43,9	104,7	59,9	124,6	76,3	156,2	97,0
76	17,1	10,1	24,4	15,8	32,9	22,7	44,9	22,8	64,9	34,5	79,1	43,9	103,9	59,9	123,7	76,3	155,2	97,0
78	16,8	10,1	24,0	15,8	32,5	22,7	44,4	22,8	64,3	34,5	78,4	43,9	103,1	59,9	122,9	76,3	154,2	97,0
80	16,5	10,1	23,6	15,8	32,0	22,7	43,9	22,8	63,7	34,5	77,7	43,9	102,3	59,9	122,0	76,3	153,3	97,0
82	16,2	10,1	23,2	15,8	31,5	22,7	43,5	22,8	63,1	34,5	77,1	43,9	101,6	59,9	121,2	76,3	152,3	97,0
84	15,9	10,1	22,8	15,8	31,1	22,7	43,0	22,8	62,5	34,5	76,4	43,9	100,8	59,9	120,3	76,3	151,4	97,0
86	15,6	10,1	22,5	15,8	30,6	22,7	42,5	22,8	61,9	34,5	75,7	43,9	100,0	59,9	119,5	76,3	150,4	97,0
88	15,3	10,1	22,1	15,8	30,2	22,7	42,0	22,8	61,3	34,5	75,1	43,9	99,2	59,9	118,6	76,3	149,5	97,0
90	15,0	10,1	21,7	15,8	29,8	22,7	41,6	22,8	60,7	34,5	74,4	43,9	98,4	59,9	117,8	76,3	148,5	97,0
92	14,7	10,1	21,3	15,8	29,3	22,7	41,1	22,8	60,1	34,5	73,7	43,9	97,6	59,9	117,0	76,3	147,6	97,0
94	14,4	10,1	21,0	15,8	28,9	22,7	40,6	22,8	59,5	34,5	73,1	43,9	96,9	59,9	116,1	76,3	146,6	97,0
96	14,1	10,1	20,6	15,8	28,4	22,7	40,1	22,8	58,9	34,5	72,4	43,9	96,1	59,9	115,3	76,3	145,7	97,0

98	13,8	10,1	20,2	15,8	28,0	22,7	39,7	22,8	58,3	34,5	71,7	43,9	95,3	59,9	114,4	76,3	144,7	97,0
100	13,5	10,1	19,9	15,8	27,6	22,7	39,2	22,8	57,7	34,5	71,1	43,9	94,6	59,9	113,6	76,3	143,8	97,0
102	13,3	10,1	19,5	15,8	27,1	22,7	38,7	22,8	57,2	34,5	70,4	43,9	93,8	59,9	112,8	76,3	142,8	97,0
104	13,0	10,1	19,2	15,8	26,7	22,7	38,3	22,8	56,6	34,5	69,8	43,9	93,0	59,9	112,0	76,3	141,9	97,0
106	12,7	10,1	18,8	15,8	26,3	22,7	37,8	22,8	56,0	34,5	69,1	43,9	92,3	59,9	111,1	76,3	141,0	97,0
108	12,4	10,1	18,4	15,8	25,9	22,7	37,3	22,8	55,4	34,5	68,5	43,9	91,5	59,9	110,3	76,3	140,0	97,0
110	12,1	10,1	18,1	15,8	25,4	22,7	36,9	22,8	54,8	34,5	67,8	43,9	90,7	59,9	109,5	76,3	139,1	97,0
112							36,4	22,8	54,3	34,5	67,2	43,9	90,0	59,9	108,7	76,3	138,2	97,0
114							35,9	22,8	53,7	34,5	66,5	43,9	89,2	59,9	107,9	76,3	137,2	97,0
116							35,5	22,8	53,1	34,5	65,9	43,9	88,5	59,9	107,0	76,3	136,3	97,0
118							35,0	22,8	52,6	34,5	65,2	43,9	87,7	59,9	106,2	76,3	135,4	97,0
120							34,6	22,8	52,0	34,5	64,6	43,9	87,0	59,9	105,4	76,3	134,5	97,0
122							34,1	22,8	51,4	34,5	63,9	43,9	86,2	59,9	104,6	76,3	133,6	97,0
124							33,7	22,8	50,9	34,5	63,3	43,9	85,5	59,9	103,8	76,3	132,6	97,0
126							33,2	22,8	50,3	34,5	62,7	43,9	84,7	59,9	103,0	76,3	131,7	97,0
128							32,8	22,8	49,7	34,5	62,0	43,9	84,0	59,9	102,2	76,3	130,8	97,0
130							32,3	22,8	49,2	34,5	61,4	43,9	83,2	59,9	101,4	76,3	129,9	97,0
132							31,9	22,8	48,6	34,5	60,8	43,9	82,5	59,9	100,6	76,3	129,0	97,0
134							31,4	22,8	48,1	34,5	60,2	43,9	81,8	59,9	99,8	76,3	128,1	97,0
136							31,0	22,8	47,5	34,5	59,5	43,9	81,0	59,9	99,0	76,3	127,2	97,0
138							30,6	22,8	47,0	34,5	58,9	43,9	80,3	59,9	98,2	76,3	126,3	97,0
140							30,1	22,8	46,4	34,5	58,3	43,9	79,6	59,9	97,4	76,3	125,4	97,0
142							29,7	22,8	45,9	34,5	57,7	43,9	78,9	59,9	96,7	76,3	124,5	97,0
144							29,3	22,8	45,3	34,5	57,1	43,9	78,1	59,9	95,9	76,3	123,6	97,0
146							28,8	22,8	44,8	34,5	56,4	43,9	77,4	59,9	95,1	76,3	122,7	97,0
148							28,4	22,8	44,3	34,5	55,8	43,9	76,7	59,9	94,3	76,3	121,9	97,0
150							28,0	22,8	43,7	34,5	55,2	43,9	76,0	59,9	93,5	76,3	121,0	97,0
152							27,6	22,8	43,2	34,5	54,6	43,9	75,3	59,9	92,8	76,3	120,1	97,0
154							27,1	22,8	42,7	34,5	54,0	43,9	74,6	59,9	92,0	76,3	119,2	97,0
156							26,7	22,8	42,1	34,5	53,4	43,9	73,9	59,9	91,2	76,3	118,3	97,0
158							26,3	22,8	41,6	34,5	52,8	43,9	73,2	59,9	90,5	76,3	117,5	97,0
160							25,9	22,8	41,1	34,5	52,2	43,9	72,5	59,9	89,7	76,3	116,6	97,0

Partial nailing																		
Width	Blank Model																	
	300		340		380		440		500		540		600		660		720	
	kh,1	kh,2	kh,1	kh,2	kh,1	kh,2	kh,1	kh,2	kh,1	kh,2	kh,1	kh,2	kh,1	kh,2	kh,1	kh,2	kh,1	kh,2
32	14,2	5,6	19,5	8,8	25,6	12,5	26,7	5,2	42,2	16,2	62,3	20,7	64,5	24,6	76,7	35,1	92,6	39,6
34	14,0	5,6	19,3	8,8	25,3	12,5	26,5	5,2	41,9	16,2	61,9	20,7	64,1	24,6	76,3	35,1	92,2	39,6
36	13,9	5,6	19,1	8,8	25,1	12,5	26,3	5,2	41,6	16,2	61,6	20,7	63,7	24,6	75,9	35,1	91,8	39,6
38	13,7	5,6	18,9	8,8	24,8	12,5	26,1	5,2	41,4	16,2	61,2	20,7	63,4	24,6	75,5	35,1	91,4	39,6
40	13,5	5,6	18,7	8,8	24,6	12,5	25,9	5,2	41,1	16,2	60,9	20,7	63,0	24,6	75,1	35,1	91,0	39,6
42	13,3	5,6	18,4	8,8	24,3	12,5	25,7	5,2	40,8	16,2	60,5	20,7	62,7	24,6	74,7	35,1	90,5	39,6
44	13,2	5,6	18,2	8,8	24,1	12,5	25,5	5,2	40,5	16,2	60,2	20,7	62,3	24,6	74,4	35,1	90,1	39,6
46	13,0	5,6	18,0	8,8	23,8	12,5	25,3	5,2	40,2	16,2	59,8	20,7	61,9	24,6	74,0	35,1	89,7	39,6
48	12,8	5,6	17,8	8,8	23,6	12,5	25,1	5,2	39,9	16,2	59,5	20,7	61,6	24,6	73,6	35,1	89,3	39,6
50	12,6	5,6	17,6	8,8	23,3	12,5	24,9	5,2	39,6	16,2	59,1	20,7	61,2	24,6	73,2	35,1	88,9	39,6
52	12,5	5,6	17,4	8,8	23,1	12,5	24,7	5,2	39,3	16,2	58,8	20,7	60,9	24,6	72,8	35,1	88,5	39,6
54	12,3	5,6	17,2	8,8	22,9	12,5	24,5	5,2	39,0	16,2	58,4	20,7	60,5	24,6	72,5	35,1	88,1	39,6
56	12,1	5,6	17,0	8,8	22,6	12,5	24,3	5,2	38,7	16,2	58,1	20,7	60,2	24,6	72,1	35,1	87,7	39,6
58	12,0	5,6	16,8	8,8	22,4	12,5	24,1	5,2	38,5	16,2	57,7	20,7	59,8	24,6	71,7	35,1	87,3	39,6
60	11,8	5,6	16,6	8,8	22,1	12,5	23,9	5,2	38,2	16,2	57,4	20,7	59,5	24,6	71,3	35,1	86,9	39,6
62	11,6	5,6	16,4	8,8	21,9	12,5	23,7	5,2	37,9	16,2	57,0	20,7	59,1	24,6	70,9	35,1	86,5	39,6
64	11,5	5,6	16,1	8,8	21,7	12,5	23,5	5,2	37,6	16,2	56,7	20,7	58,8	24,6	70,6	35,1	86,1	39,6
66	11,3	5,6	15,9	8,8	21,4	12,5	23,3	5,2	37,3	16,2	56,3	20,7	58,4	24,6	70,2	35,1	85,7	39,6
68	11,1	5,6	15,7	8,8	21,2	12,5	23,1	5,2	37,0	16,2	56,0	20,7	58,1	24,6	69,8	35,1	85,3	39,6
70	11,0	5,6	15,5	8,8	20,9	12,5	22,9	5,2	36,8	16,2	55,7	20,7	57,7	24,6	69,5	35,1	84,9	39,6
72	10,8	5,6	15,3	8,8	20,7	12,5	22,7	5,2	36,5	16,2	55,3	20,7	57,4	24,6	69,1	35,1	84,5	39,6
74	10,6	5,6	15,1	8,8	20,5	12,5	22,5	5,2	36,2	16,2	55,0	20,7	57,0	24,6	68,7	35,1	84,1	39,6
76	10,5	5,6	14,9	8,8	20,2	12,5	22,3	5,2	35,9	16,2	54,6	20,7	56,7	24,6	68,3	35,1	83,7	39,6
78	10,3	5,6	14,8	8,8	20,0	12,5	22,1	5,2	35,7	16,2	54,3	20,7	56,3	24,6	68,0	35,1	83,3	39,6
80	10,2	5,6	14,6	8,8	19,8	12,5	21,9	5,2	35,4	16,2	54,0	20,7	56,0	24,6	67,6	35,1	82,9	39,6
82	10,0	5,6	14,4	8,8	19,6	12,5	21,7	5,2	35,1	16,2	53,6	20,7	55,7	24,6	67,2	35,1	82,5	39,6
84	9,8	5,6	14,2	8,8	19,3	12,5	21,5	5,2	34,8	16,2	53,3	20,7	55,3	24,6	66,9	35,1	82,1	39,6
86	9,7	5,6	14,0	8,8	19,1	12,5	21,3	5,2	34,5	16,2	53,0	20,7	55,0	24,6	66,5	35,1	81,7	39,6
88	9,5	5,6	13,8	8,8	18,9	12,5	21,1	5,2	34,3	16,2	52,6	20,7	54,6	24,6	66,2	35,1	81,3	39,6
90	9,4	5,6	13,6	8,8	18,7	12,5	20,9	5,2	34,0	16,2	52,3	20,7	54,3	24,6	65,8	35,1	81,0	39,6
92	9,2	5,6	13,4	8,8	18,4	12,5	20,7	5,2	33,7	16,2	52,0	20,7	54,0	24,6	65,4	35,1	80,6	39,6
94	9,1	5,6	13,2	8,8	18,2	12,5	20,5	5,2	33,5	16,2	51,7	20,7	53,6	24,6	65,1	35,1	80,2	39,6
96	8,9	5,6	13,0	8,8	18,0	12,5	20,3	5,2	33,2	16,2	51,3	20,7	53,3	24,6	64,7	35,1	79,8	39,6

98	8,8	5,6	12,9	8,8	17,8	12,5	20,1	5,2	32,9	16,2	51,0	20,7	53,0	24,6	64,4	35,1	79,4	39,6
100	8,6	5,6	12,7	8,8	17,6	12,5	19,9	5,2	32,7	16,2	50,7	20,7	52,6	24,6	64,0	35,1	79,0	39,6
102	8,5	5,6	12,5	8,8	17,4	12,5	19,8	5,2	32,4	16,2	50,4	20,7	52,3	24,6	63,7	35,1	78,7	39,6
104	8,3	5,6	12,3	8,8	17,1	12,5	19,6	5,2	32,1	16,2	50,1	20,7	52,0	24,6	63,3	35,1	78,3	39,6
106	8,2	5,6	12,1	8,8	16,9	12,5	19,4	5,2	31,9	16,2	49,7	20,7	51,7	24,6	62,9	35,1	77,9	39,6
108	8,0	5,6	12,0	8,8	16,7	12,5	19,2	5,2	31,6	16,2	49,4	20,7	51,3	24,6	62,6	35,1	77,5	39,6
110	7,9	5,6	11,8	8,8	16,5	12,5	19,0	5,2	31,3	16,2	49,1	20,7	51,0	24,6	62,3	35,1	77,2	39,6
112							18,8	5,2	31,1	16,2	48,8	20,7	50,7	24,6	61,9	35,1	76,8	39,6
114							18,7	5,2	30,8	16,2	48,5	20,7	50,4	24,6	61,6	35,1	76,4	39,6
116							18,5	5,2	30,6	16,2	48,2	20,7	50,1	24,6	61,2	35,1	76,0	39,6
118							18,3	5,2	30,3	16,2	47,8	20,7	49,7	24,6	60,9	35,1	75,7	39,6
120							18,1	5,2	30,0	16,2	47,5	20,7	49,4	24,6	60,5	35,1	75,3	39,6
122							17,9	5,2	29,8	16,2	47,2	20,7	49,1	24,6	60,2	35,1	74,9	39,6
124							17,8	5,2	29,5	16,2	46,9	20,7	48,8	24,6	59,8	35,1	74,6	39,6
126							17,6	5,2	29,3	16,2	46,6	20,7	48,5	24,6	59,5	35,1	74,2	39,6
128							17,4	5,2	29,0	16,2	46,3	20,7	48,2	24,6	59,2	35,1	73,9	39,6
130							17,2	5,2	28,8	16,2	46,0	20,7	47,8	24,6	58,8	35,1	73,5	39,6
132							17,1	5,2	28,5	16,2	45,7	20,7	47,5	24,6	58,5	35,1	73,1	39,6
134							16,9	5,2	28,3	16,2	45,4	20,7	47,2	24,6	58,2	35,1	72,8	39,6
136							16,7	5,2	28,0	16,2	45,1	20,7	46,9	24,6	57,8	35,1	72,4	39,6
138							16,5	5,2	27,8	16,2	44,8	20,7	46,6	24,6	57,5	35,1	72,1	39,6
140							16,4	5,2	27,6	16,2	44,5	20,7	46,3	24,6	57,2	35,1	71,7	39,6
142							16,2	5,2	27,3	16,2	44,2	20,7	46,0	24,6	56,9	35,1	71,4	39,6
144							16,0	5,2	27,1	16,2	44,0	20,7	45,7	24,6	56,5	35,1	71,0	39,6
146							15,9	5,2	26,8	16,2	43,7	20,7	45,4	24,6	56,2	35,1	70,7	39,6
148							15,7	5,2	26,6	16,2	43,4	20,7	45,1	24,6	55,9	35,1	70,3	39,6
150							15,6	5,2	26,4	16,2	76,7	20,7	44,8	24,6	55,6	35,1	70,0	39,6
152							15,4	5,2	26,1	16,2	76,3	20,7	44,5	24,6	55,3	35,1	69,6	39,6
154							15,2	5,2	25,9	16,2	75,9	20,7	44,2	24,6	54,9	35,1	69,3	39,6
156							15,1	5,2	25,7	16,2	75,5	20,7	44,0	24,6	54,6	35,1	69,0	39,6
158							14,9	5,2	25,4	16,2	75,1	20,7	43,7	24,6	54,3	35,1	68,6	39,6
160							14,8	5,2	25,2	16,2	74,7	20,7	43,4	24,6	54,0	35,1	68,3	39,6

**GSE/GSI and GLE/GLI fire resistance R30 to EN 13501-2**

See annex D16 for the performance of GLE in case of fire

## D22 Joist hanger type GLI

Face mount hanger with external flanges

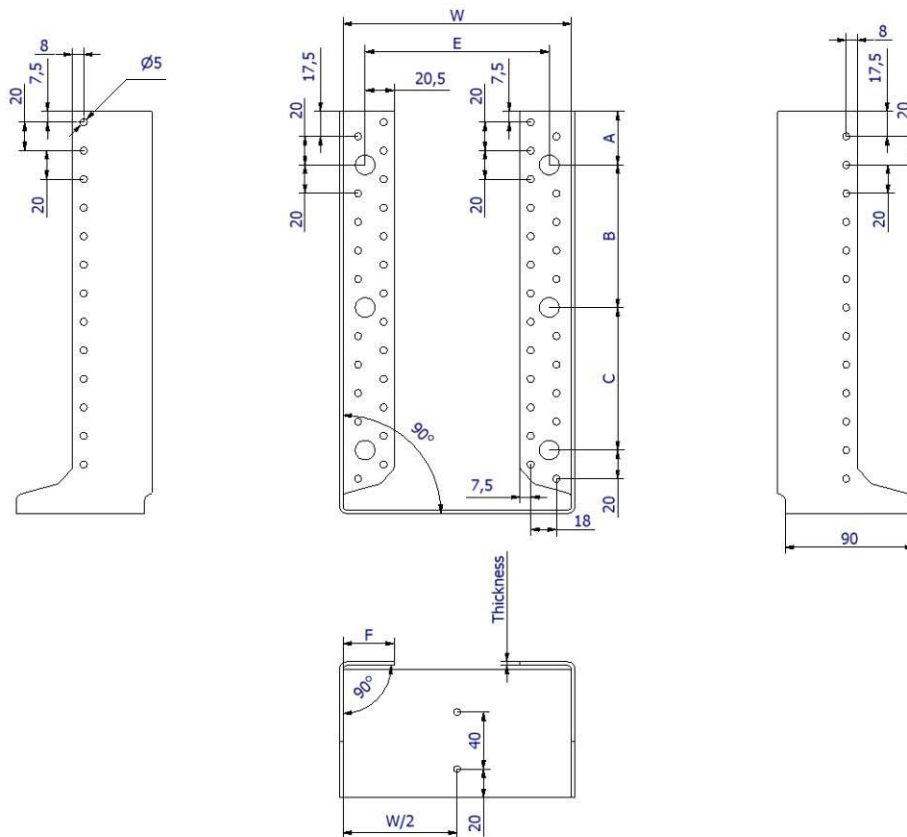
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
GLI	GLI	GLI	GLI	GLI

### Material Specification and Service Classes

2.5 and 4.0 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.5 and 4.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model	W (mm)	H (mm)	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	Thickness (mm)	Number of holes		
									Ø5 (flange)	Ø5 (side)	Ø14 (flange)
GLI300/2,5	76-110	95-112	27,5	-	-	L-31	36	2,5	12	7	2
GLI300/4	76-110	95-112	27,5	-	-	L-31	36	4	12	7	2
GLI340/2,5	76-110	115-132	27,5	-	-	L-31	36	2,5	16	9	2
GLI340/4	76-110	115-132	27,5	-	-	L-31	36	4	16	9	2
GLI380/2,5	76-110	135-152	27,5	-	-	L-31	36	2,5	20	11	2
GLI380/4	76-110	135-152	27,5	-	-	L-31	36	4	20	11	2
GLI440/2,5	76-160	140-182	17,5	80	-	L-31	36	2,5	20	12	4
GLI440/4	76-160	140-182	17,5	80	-	L-31	36	4	20	12	4
GLI500/2,5	76-160	170-212	27,5	100	-	L-31	36	2,5	26	15	4
GLI500/4	76-160	170-212	27,5	100	-	L-31	36	4	26	15	4
GLI540/2,5	76-160	190-232	27,5	120	-	L-31	36	2,5	30	17	4
GLI540/4	76-160	190-232	27,5	120	-	L-31	36	4	30	17	4
GLI600/2,5	76-160	220-262	37,5	140	-	L-31	36	2,5	36	20	4
GLI600/4	76-160	220-262	37,5	140	-	L-31	36	4	36	20	4
GLI660/2,5	76-160	250-292	27,5	80	100	L-31	36	2,5	40	23	6
GLI660/4	76-160	250-292	27,5	80	100	L-31	36	4	40	23	6
GLI720/2,5	76-160	280-322	37,5	100	100	L-31	36	2,5	46	26	6
GLI720/4	76-160	280-322	37,5	100	100	L-31	36	4	46	26	6

Tolerance on all dimensions is +0/+2mm

### Table of parameters

Parameters  $k_{H,1}$  and  $k_{H,2}$  to be used with formulas from Annex C

See Annex D21 - "Joist Hanger type GLE" section above for  $k_{H1}$  and  $k_{H2}$  values.

### GSE/GSI and GLE/GLI fire resistance R30 to EN 13501-2

See annex D16 for the performance of GLE in case of fire



## D23 Joist hanger type MF

Face mount hanger with external flanges

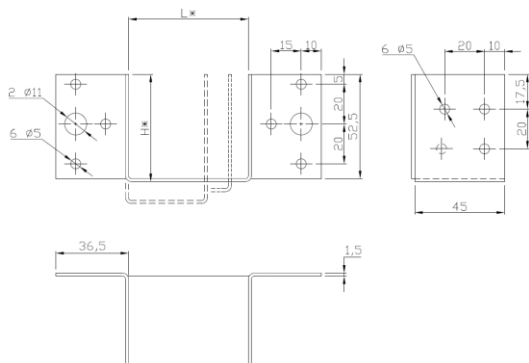
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
MF	MF	MF	MF	MF

### Material Specification and Service Classes

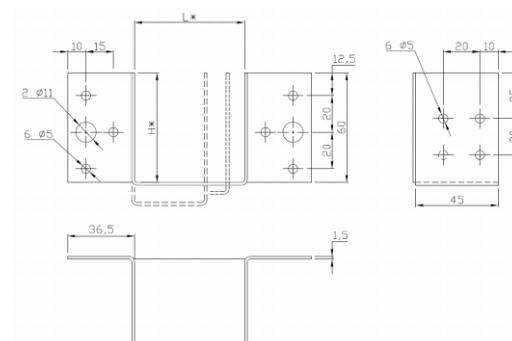
1.5 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

1.5 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

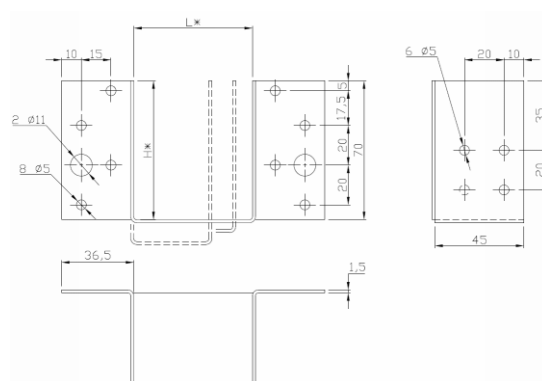
### Dimensions



**MF165**



**MF180**



**MF200**

Model	L* (mm)	H* (mm)	Nb of Holes Ø5
MF165	$32 \leq L^* \leq 60$	$52.5 \leq H^* \leq 66.5$	12
MF180	$32 \leq L^* \leq 60$	$60 \leq H^* \leq 74$	12
MF200	$32 \leq L^* \leq 60$	$70 \leq H^* \leq 84$	14

**Table of parameters**Parameters  $k_{H,1}$  and  $k_{H,2}$  to be used with formulas from Annex C ***$k_{h,1}$  factors for Full nailing pattern***

B mm	Basic design					
	165		180		200	
	Height mm	$k_{H,1}$ -	Height mm	$k_{H,1}$ -	Height mm	$k_{H,1}$ -
	Total number of nails in header and joist					
	3+3		3+3		4+4	
<b>38</b>	63,5	<b>10,3</b>	71	<b>10,3</b>	81	<b>15,4</b>
<b>50</b>	57,5	<b>8,5</b>	65	<b>8,5</b>	75	<b>13,2</b>
<b>60</b>	52,5	<b>7,1</b>	60	<b>7,1</b>	70	<b>11,4</b>

 ***$k_{h,2}$  factors for Full nailing pattern***

Type	Identity	Total number of nails	$k_{H,2}$
MF	165	12	8,68
	180	12	8,68
	200	14	13,93

## D24 Joist hanger type MH

Face mount hanger with external flanges

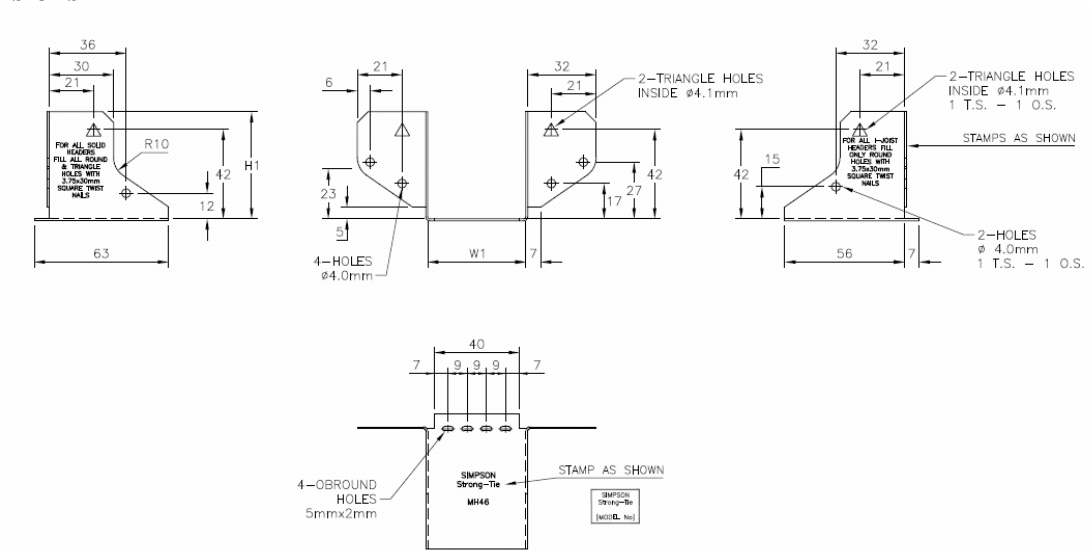
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
MH	MH	MH	MH	MH

### Material Specification and Service Classes

1.0 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

1.0 mm thick Stainless steel number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model	W1 (mm)	H1 (mm)	Number of holes
MH	$40 \leq W1 \leq 50$	$50 \leq H \leq 55$	10

Model	Fasteners	Load capacity (kN) – Downward
MH	N3.75x30	5.0

## D25 Joist hanger type LUP

Face mount hanger with external flanges

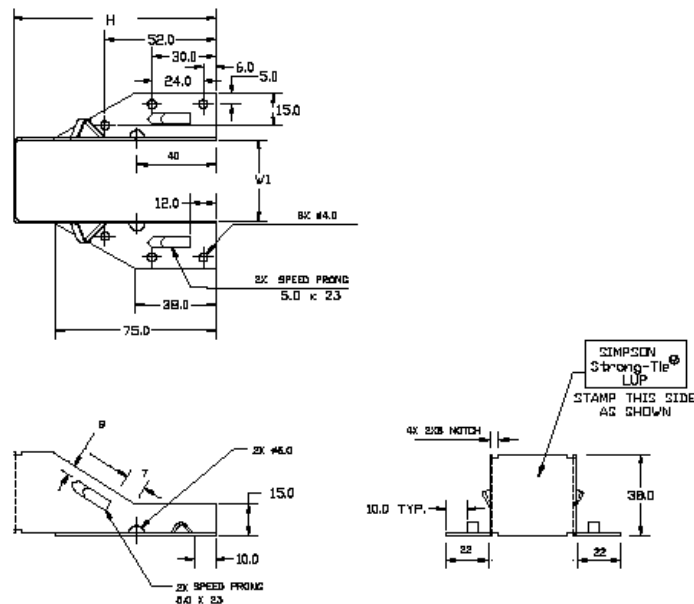
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
LUP	LUP	LUP	LUP	LUP

### Material Specification and Service Classes

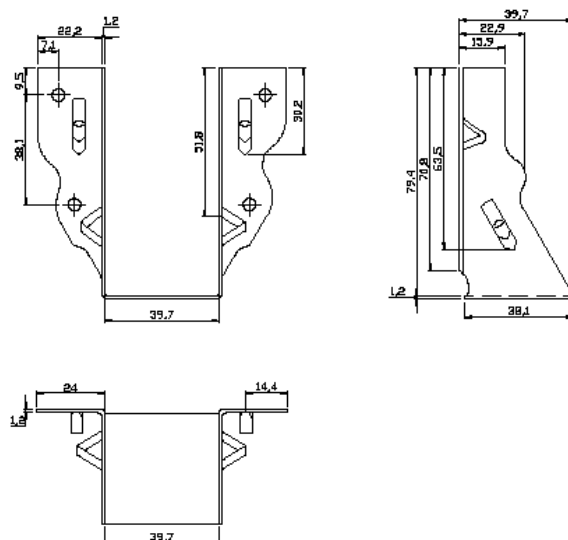
1.0 and 1.2 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

1.0 and 1.2 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model	W1 (mm)	H (mm)	Number of holes
LUP230	$38 \leq W1 \leq 50$	$90 \leq H \leq 96$	8



Model	W (mm)	H (mm)	Number of holes
LUP24	40	80	4

**Table of parameters**

Parameters  $k_{H,1}$  to be used with formulas from Annex C

*Full nailing pattern*

Basic design								
B m m	LUP 24		LUP230/38		LUP230/44		LUP230/50	
	Height mm	$k_{H,1}$ -	Height mm	$k_{H,1}$ -	Height mm	$k_{H,1}$ -	Height mm	$k_{H,1}$ --
<b>Total number of nails in header and joist</b>								
	2+2		3+3		3+3		3+3	
	79	7,0	96	13,7	93	12,9	93	12,9

## D26 Joist hanger type BSIL

Face mount hanger with internal flanges

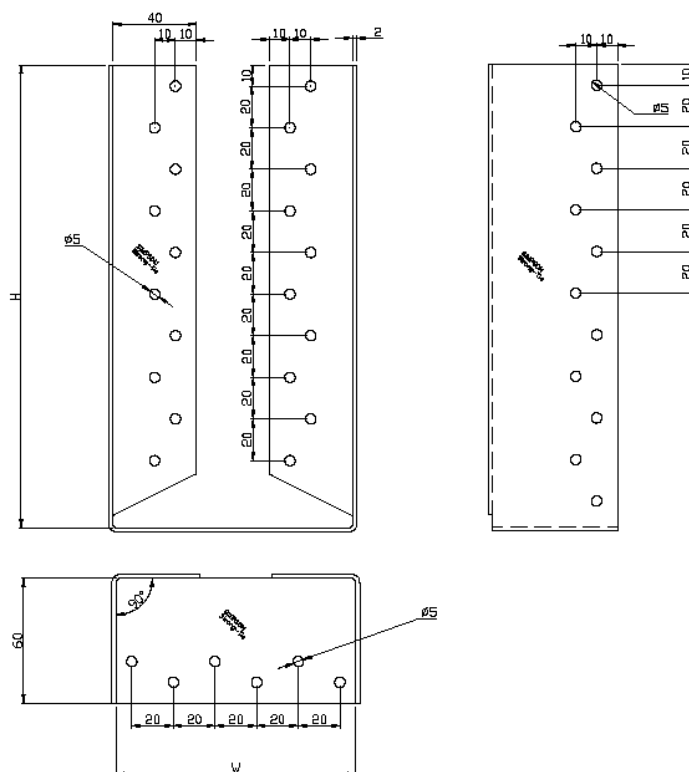
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
BSIL	BSIL	BSIL	BSIL	BSIL

### Material Specification and Service Classes

2.0 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model	W (mm)	H (mm)	Ep (mm)	Ø 5 (flanges)	Ø 5 (sides)	Ø 5 (bottom)
BSIL90/195	90	195	2	18	20	4
BSIL90/235	90	235	2	22	24	4
BSIL100/190	100	190	2	16	18	4
BSIL100/230	100	230	2	20	22	4
BSIL115/223	115	223	2	20	22	6
BSIL120/180	120	180	2	16	18	6
BSIL120/220	120	220	2	20	22	6

## Table of parameters

Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C.

### Full nailing pattern

Basic design														
B	480		560		480		560		560		480		560	
	Height	$k_{H,1}$	Height	$k_{H,1}$	Height	$k_{H,1}$	Height	$k_{H,1}$	Height	$k_{H,1}$	Height	$k_{H,1}$	Height	$k_{H,1}$
mm	mm	-	mm	-	mm	-	mm	--	mm	-	mm	-	mm	-
Total number of nails in header and joist														
	9+9	9+9	11+1 1	11+1 1	9+9	8+8	11+11	10+1 0	10+10	10+1 0	8+8	8+8	10+1 0	10+1 0
90	195	27,8	235	40,1	195	28,0	235	40,4	235	40,3	195	28,0	235	40,3
100	190	26,3	230	38,4	190	26,6	230	38,7	230	38,6	190	26,6	230	38,6
115	183	24,2	223	35,9	183	24,5	223	36,1	223	36,1	183	24,5	223	36,1
120	180	23,6	220	35,1	180	23,8	220	35,3	220	35,3	180	23,8	220	35,3

### Partial nailing pattern

Basic design														
B	480		560		480		560		560		480		560	
	Height	$k_{H,1}$	Height	$k_{H,1}$	Height	$k_{H,1}$	Height	$k_{H,1}$	Height	$k_{H,1}$	Height	$k_{H,1}$	Height	$k_{H,1}$
mm	mm	-	mm	-	mm	-	mm	--	mm	-	mm	-	mm	-
Total number of nails in header and joist														
	9		11	11	9	8	11	10	10	10	8	8	10	10
90	195	14,9	235	21,3	195	15,2	235	21,6	235	21,6	195	15,2	235	21,6
100	190	14,2	230	20,4	190	14,4	230	20,7	230	20,6	190	14,4	230	20,6
115	183	13,0	223	19,1	183	13,2	223	19,3	223	19,3	183	13,2	223	19,3
120	180	12,7	220	18,6	180	12,9	220	18,9	220	18,9	180	12,9	220	18,9

Type	Identity	Total number of nails		$k_{H,2}$	
		Full	Partial	Full	Partial
BSIL	90x195	18	9	27,0	13,48
	90x235	22	11	39,1	19,57
	100x190	18	9	27,0	13,48
	100x230	22	11	39,1	19,57
	115x223	20	10	32,8	16,38
	120x180	16	8	21,7	10,85
	120x220	20	10	32,8	16,38

## D27 Joist hanger type BSS

Face mount hanger with external flanges

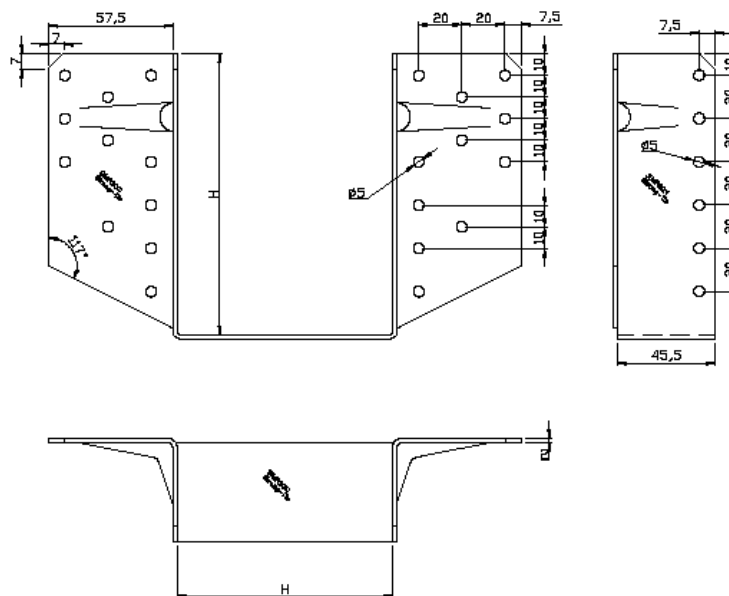
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
BSS	BSS	BSS	BSS	BSS

### Material Specification and Service Classes

2.0 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model	W (mm)	H (mm)	Ep (mm)	Ø 5 (flanges)	Ø 5 (sides)
0505000	60	90	2	16	8
0507000	60	110	2	20	10
0510000	80	110	2	20	10
0518000	80	130	2	22	12
0528000	80	150	2	26	14
0524000	100	130	2	22	12
0533000	100	150	2	26	14
0538000	100	170	2	28	16
0538500	100	190	2	32	18
0543000	120	170	2	28	16
0553000	120	190	2	32	20
0557000	120	210	2	34	20
0563000	120	230	2	38	22
0539000	140	150	2	26	16
0559000	160	190	2	32	20



**Table of parameters**Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C**Full nailing pattern** $k_{HI}$  factors to be used with threaded nails.

Nails	05050		05070		05100		05180		05240	
	8 + 8	4 + 4	10 + 10	5 + 5	10 + 10	5 + 5	11 + 11	6 + 6	11 + 11	6 + 6
Width B mm	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$	Height mm	$k_{H,1}$
40	100	14,4	120	22,5	130	26,4	150	34,0	160	37,5
42	99	14,1	119	22,1	129	26,0	149	33,5	159	37,0
44	98	13,8	118	21,7	128	25,6	148	33,1	158	36,6
46	97	13,5	117	21,3	127	25,2	147	32,7	157	36,1
48	96	13,2	116	20,9	126	24,8	146	32,2	156	35,7
50	95	12,9	115	20,5	125	24,4	145	31,8	155	35,2
52	94	12,6	114	20,2	124	24,0	144	31,4	154	34,7
54	93	12,3	113	19,8	123	23,6	143	30,9	153	34,3
56	92	12,1	112	19,4	122	23,2	142	30,5	152	33,8
58	91	11,8	111	19,0	121	22,8	141	30,1	151	33,4
60	90	11,5	110	18,7	120	22,5	140	29,7	150	32,9
62					119	22,1	139	29,3	149	32,5
64					118	21,7	138	28,8	148	32,0
66					117	21,3	137	28,4	147	31,6
68					116	20,9	136	28,0	146	31,2
70					115	20,5	135	27,6	145	30,7
72					114	20,2	134	27,2	144	30,3
74					113	19,8	133	26,8	143	29,9
76					112	19,4	132	26,3	142	29,4
78					111	19,0	131	25,9	141	29,0
80					110	18,7	130	25,5	140	28,6
82									139	28,2
84									138	27,8
86									137	27,3
88									136	26,9
90									135	26,5
92									134	26,1
94									133	25,7
96									132	25,3
98									131	24,9
100									130	24,6

	<b>05280</b>		<b>05330</b>		<b>05380</b>	
Nails	<b>13 + 13</b>	<b>7 + 7</b>	<b>13 + 13</b>	<b>7 + 7</b>	<b>14 + 14</b>	<b>8 + 8</b>
Width B	Height	k <sub>H,1</sub>	Height	k <sub>H,1</sub>	Height	k <sub>H,1</sub>
mm	mm		mm		mm	
40	170	42,3	180	47,2	200	56,8
42	169	41,8	179	46,7	199	56,3
44	168	41,3	178	46,2	198	55,8
46	167	40,8	177	45,7	197	55,2
48	166	40,4	176	45,3	196	54,7
50	165	39,9	175	44,8	195	54,2
52	164	39,4	174	44,3	194	53,6
54	163	38,9	173	43,8	193	53,1
56	162	38,5	172	43,3	192	52,6
58	161	38,0	171	42,8	191	52,1
60	160	37,5	170	42,3	190	51,5
62	159	37,0	169	41,8	189	51,0
64	158	36,6	168	41,3	188	50,5
66	157	36,1	167	40,8	187	50,0
68	156	35,7	166	40,4	186	49,5
70	155	35,2	165	39,9	185	49,0
72	154	34,7	164	39,4	184	48,4
74	153	34,3	163	38,9	183	47,9
76	152	33,8	162	38,5	182	47,4
78	151	33,4	161	38,0	181	46,9
80	150	32,9	160	37,5	180	46,4
82	149	32,5	159	37,0	179	45,9
84	148	32,0	158	36,6	178	45,4
86	147	31,6	157	36,1	177	44,9
88	146	31,2	156	35,7	176	44,4
90	145	30,7	155	35,2	175	43,9
92	144	30,3	154	34,7	174	43,4
94	143	29,9	153	34,3	173	42,9
96	142	29,4	152	33,8	172	42,4
98	141	29,0	151	33,4	171	41,9
100	140	28,6	150	32,9	170	41,5

Nails	05430		05385		05530		05570	
	14 + 14	8 + 8	16 + 16	9 + 9	16 + 16	9 + 9	17 + 17	10 + 10
Width B mm	Height mm	k <sub>H,1</sub>	Height mm	k <sub>H,1</sub>	Height mm	k <sub>H,1</sub>	Height mm	k <sub>H,1</sub>
40	210	62,2	220	67,3	230	73,2	250	84,8
42	209	61,7	219	66,7	229	72,6	249	84,2
44	208	61,1	218	66,1	228	72,0	248	83,6
46	207	60,6	217	65,5	227	71,4	247	83,0
48	206	60,1	216	65,0	226	70,8	246	82,3
50	205	59,5	215	64,4	225	70,2	245	81,7
52	204	59,0	214	63,8	224	69,6	244	81,1
54	203	58,4	213	63,2	223	69,0	243	80,4
56	202	57,9	212	62,7	222	68,5	242	79,8
58	201	57,4	211	62,1	221	67,9	241	79,2
60	200	56,8	210	61,5	220	67,3	240	78,6
62	199	56,3	209	60,9	219	66,7	239	78,0
64	198	55,8	208	60,4	218	66,1	238	77,3
66	197	55,2	207	59,8	217	65,5	237	76,7
68	196	54,7	206	59,2	216	65,0	236	76,1
70	195	54,2	205	58,7	215	64,4	235	75,5
72	194	53,6	204	58,1	214	63,8	234	74,9
74	193	53,1	203	57,6	213	63,2	233	74,3
76	192	52,6	202	57,0	212	62,7	232	73,7
78	191	52,1	201	56,5	211	62,1	231	73,1
80	190	51,5	200	55,9	210	61,5	230	72,5
82	189	51,0	199	55,4	209	60,9	229	71,9
84	188	50,5	198	54,8	208	60,4	228	71,2
86	187	50,0	197	54,3	207	59,8	227	70,6
88	186	49,5	196	53,7	206	59,2	226	70,0
90	185	49,0	195	53,2	205	58,7	225	69,5
92	184	48,4	194	52,6	204	58,1	224	68,9
94	183	47,9	193	52,1	203	57,6	223	68,3
96	182	47,4	192	51,6	202	57,0	222	67,7
98	181	46,9	191	51,0	201	56,5	221	67,1
100	180	46,4	190	50,5	200	55,9	220	66,5
102	179	45,9			199	55,4	219	65,9
104	178	45,4			198	54,8	218	65,3
106	177	44,9			197	54,3	217	64,7
108	176	44,4			196	53,7	216	64,2
110	175	43,9			195	53,2	215	63,6
112	174	43,4			194	52,6	214	63,0
114	173	42,9			193	52,1	213	62,4
116	172	42,4			192	51,6	212	61,8
118	171	41,9			191	51,0	211	61,3
120	170	41,5			190	50,5	210	60,7

Nails	05390		05590		05630	
	13 + 13	7 + 7	16 + 16	9 + 9	16 + 16	9 + 9
Width B mm	Height mm	k <sub>H,1</sub>	Height mm	k <sub>H,1</sub>	Height mm	k <sub>H,1</sub>
40	200	57,5	250	85,4	270	119,3
42	199	57,0	249	84,8	269	118,5
44	198	56,5	248	84,2	268	117,8
46	197	56,0	247	83,6	267	117,0
48	196	55,4	246	82,9	266	116,3
50	195	54,9	245	82,3	265	115,5
52	194	54,4	244	81,7	264	114,8
54	193	53,9	243	81,1	263	114,0
56	192	53,4	242	80,5	262	113,0
58	191	52,8	241	79,9	261	112,5
60	190	52,3	240	79,3	260	111,8
62	189	51,8	239	78,6	259	111,0
64	188	51,3	238	78,0	258	110,3
66	187	50,8	237	77,4	257	109,5
68	186	50,3	236	76,8	256	108,8
70	185	49,8	235	76,2	255	108,1
72	184	49,3	234	75,6	254	107,3
74	183	48,8	233	75,0	253	106,6
76	182	48,3	232	74,4	252	105,9
78	181	47,8	231	73,8	251	105,1
80	180	47,2	230	73,2	250	104,4
82	179	46,7	229	72,6	249	103,7
84	178	46,2	228	72,0	248	103,0
86	177	45,7	227	71,4	247	102,2
88	176	45,3	226	70,8	246	101,5
90	175	44,8	225	70,2	245	100,8
92	174	44,3	224	69,6	244	100,1
94	173	43,8	223	69	243	99,3
96	172	43,3	222	68,5	242	98,6
98	171	42,8	221	67,9	241	97,9
100	170	42,3	220	67,3	240	97,2
102	169	41,8	219	66,7	239	96,5
104	168	41,3	218	66,1	238	95,8
106	167	40,8	217	65,5	237	95,1
108	166	40,4	216	65,0	236	94,4
110	165	39,9	215	64,4	235	93,7
112	164	39,4	214	63,8	234	93,0
114	163	38,9	213	63,2	233	92,3
116	162	38,5	212	62,7	232	91,6
118	161	38	211	62,1	231	90,9
120	160	37,5	210	61,5	230	90,2
122	159	37,0	209	60,9		
124	158	36,6	208	60,4		
126	157	36,1	207	59,8		
128	156	35,7	206	59,2		
130	155	35,2	205	58,7		
132	154	34,7	204	58,1		
134	153	34,3	203	57,6		
136	152	33,8	202	57,0		
138	151	33,4	201	56,5		
140	150	32,9	200	55,9		
142			199	55,4		
144			198	54,8		
146			197	54,3		
148			196	53,7		
150			195	53,2		
152			194	52,6		
154			193	52,1		
156			192	51,6		
158			191	51,0		
160			190	50,5		

***$k_{h,2}$  factors for Full nailing pattern***

<b>Type</b>	<b>Identity</b>	<b>Total number of nails</b>	<b><math>k_{H,2}</math></b>
<b>BSS</b>	60x90	16	11,0
	60x110	20	18,2
	80x110	20	18,2
	80x130	22	21,4
	80x150	26	31,9
	100x130	22	21,4
	100x150	26	31,9
	100x170	28	36,2
	100x190	32	49,9
	120x170	28	36,2
	120x190	32	49,9
	120x210	34	57,1
	120x230	38	72,1
	140x150	26	31,9
160x190	32	49,9	

## D28 Joist hanger type JHR/L

Face mount hanger with external and internal flanges

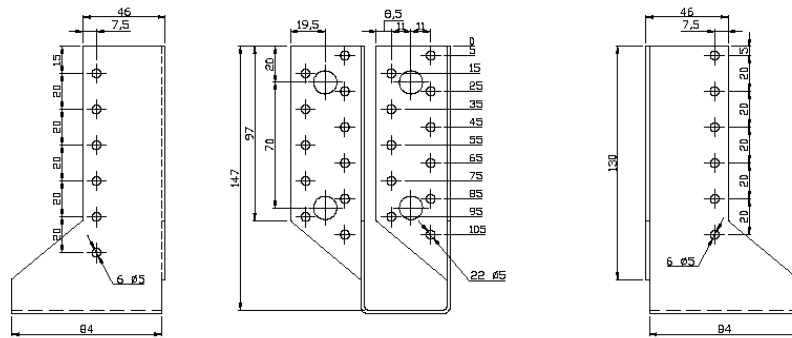
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
JHR/L	JHR/L	JHR/L	JHR/L	JHR/L

### Material Specification and Service Classes

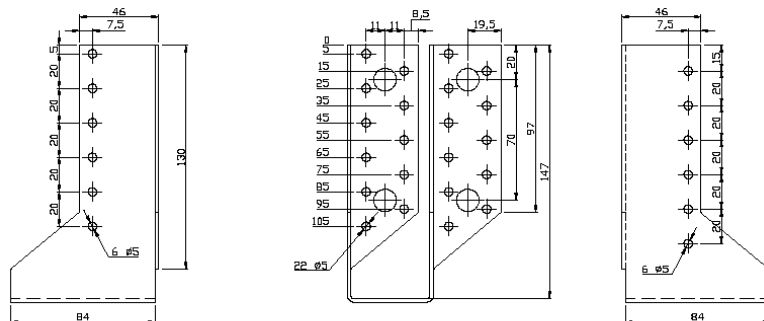
2.0 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.0 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



JHL 34462



JHR 34462

**JHR/L hangers Load carrying capacities**

Model	Number of fixation			Characteristic value	
	Rigid Support	Header Timber	Joist	DOWNWARD	UPWARD
<b>JHR34462</b>	4 Ø 12	22	12	17.77	9.7
<b>JHL34462</b>	4 Ø 12	22	12	17.77	9.7

## D29 Joist hanger type HGUS

Face mount hanger with external and internal flanges

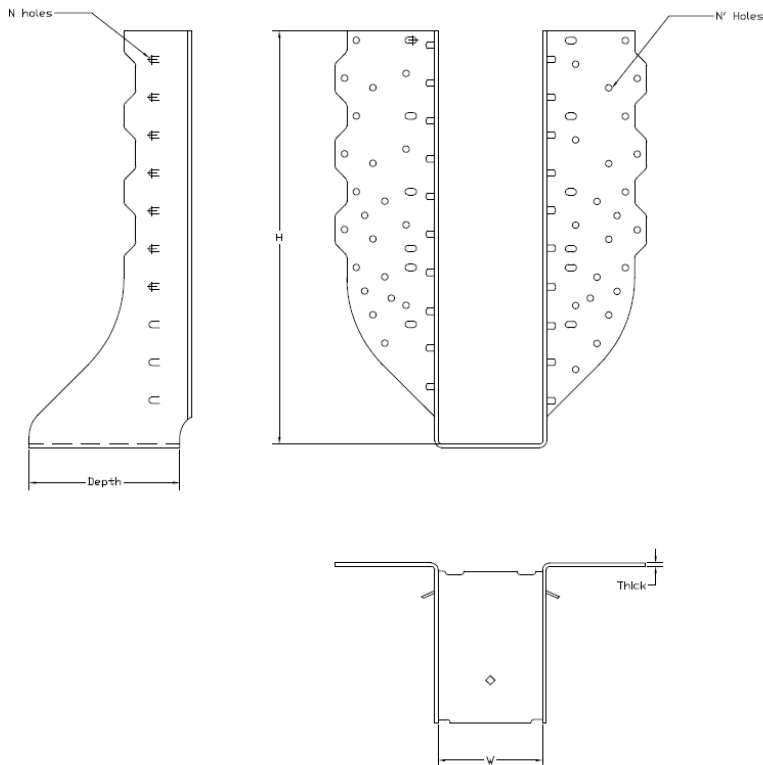
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
HGUS	HGUS	HGUS	HGUS	HGUS

### Material Specification and Service Classes

2.5 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.5 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions





Model	W (mm)	H (mm)	Depth (mm)	Thickness (mm)	N	N'
HGUS48	92	180	100	2,5	10	36
HGUS410	92	229	100	2,5	16	46
HGUS412	92	265	100	2,5	20	56
HGUS414	92	316	100	2,5	22	66
HGUS180/135	135	180	100	2,5	10	36
HGUS5.50/10	140	227	100	2,5	16	46
HGUS5.50/12	140	265	100	2,5	20	56
HGUS5.50/14	140	316	100	2,5	22	66
HGUS7.25/10	184	219	100	2,5	16	46
HGUS7.25/12	184	270	100	2,5	20	56
HGUS7.25/14	184	320	100	2,5	22	66
HGUS125/80	80	122	100	2,5	16	8
HGUS145/80	80	145	100	2,5	22	10
HGUS125/105	105	110	100	2,5	16	8
HGUS145/105	105	145	100	2,5	22	10
HGUS145/120	120	145	100	2,5	22	10
HGUS145/155	155	145	100	2,5	22	10

Model	W (mm)	H (mm)	Depth (mm)	Thickness (mm)	N	N'
Spec HGUS48	90-184	180	100	2,5	10	36
Spec HGUS48	185-200	180	100	2,5	10	36
Spec HGUS48	201-246	180	100	2,5	10	36
Spec HGUS48	247-300	180	100	2,5	10	36

### Table of parameters

Parameters  $k_{H,1}$ ,  $k_{H,2}$ ,  $n_{J,ef,1}$  and  $n_{J,ef,2}$  to be used with formulas from Annex C

#### *$k_{h,l}$ factors for Full nailing pattern*

Type	Height	Factor	Number of nails	
	H	$k_{H,1}$	$n_J$	$n_H$
	mm	-	-	-
HGUS 48	180	25,1	5+5	18+18
HGUS 410	229	31,9	8+8	23+23
HGUS 412	265	41,4	10+10	28+28
HGUS 414	316	54,5	11+11	33+33
HGUS 180/35	180	24,8	5+5	18+18
HGUS 5.5/10	227	32,2	8+8	23+23
HGUS 5.5/12	266	41,7	10+10	28+28
HGUS 5.5/14	317	54,9	11+11	33+33
HGUS 7.25/10	219	33,3	8+8	23+23
HGUS 7.25/12	270	43,2	10+10	28+28
HGUS 7.25/14	320	54,7	11+11	33+33

***k<sub>h,2</sub> factors for Full nailing pattern***

Type	<b>k<sub>H,2</sub></b>
	<b>Full</b>
<b>HGUS 48</b>	53,35
<b>HGUS 410</b>	95,93
<b>HGUS 412</b>	145,59
<b>HGUS 414</b>	206,72
<b>HGUS 180/35</b>	47,70
<b>HGUS 5.5/10</b>	94,39
<b>HGUS 5.5/12</b>	145,59
<b>HGUS 5.5/14</b>	227,17
<b>HGUS 7.25/10</b>	96,10
<b>HGUS 7.25/12</b>	145,59
<b>HGUS 7.25/14</b>	206,72

**Spec HGUS load carrying capacities**

Model	W (mm)	H (mm)	Characteristic capacity
			<b>DOWNWARD</b>
<b>Spec HGUS48</b>	90-184	180	as HGUS48
<b>Spec HGUS48</b>	185-200	180	49,0
<b>Spec HGUS48</b>	201-246	180	46,5
<b>Spec HGUS48</b>	247-300	180	43,7

## D30 Joist hanger type HGUQ

Face mount hanger with external and internal flanges

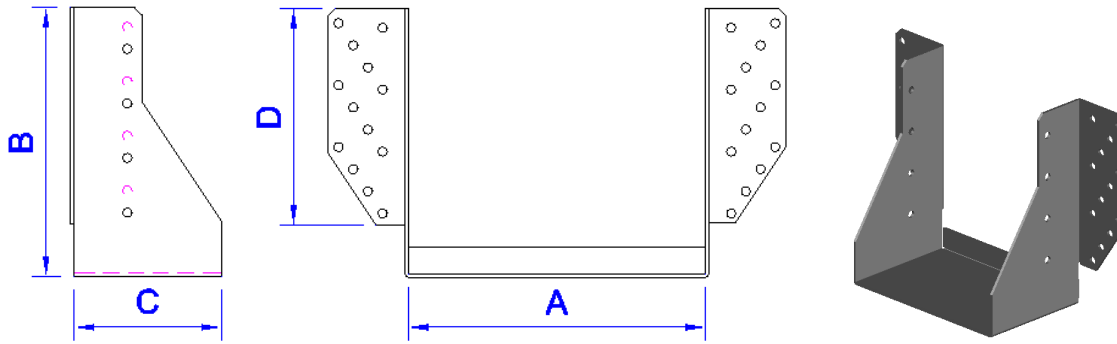
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
HGUQ	HGUQ	HGUQ	HGUQ	HGUQ

### Material Specification and Service Classes

2.5 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2.5 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Drawings



### Hanger range sizes

Min A	Max A	B	C	D
105	202	180	100	147

### Characteristic load carrying capacity

Fastener Specification				Hanger Width (mm)	Characteristic capacity of hanger <sup>1)</sup> (KN)	
Type	Size	Qty in Supporting member	Qty in Supported member		Download	Upward
SDS	6.35 x 63	26	8	105-202	45.5	20.7

<sup>1)</sup>Characteristic Capacities are based on Timber quality TR26/C27 or better.

## D31 Joist hanger type ETC

Face mount hanger with external flanges

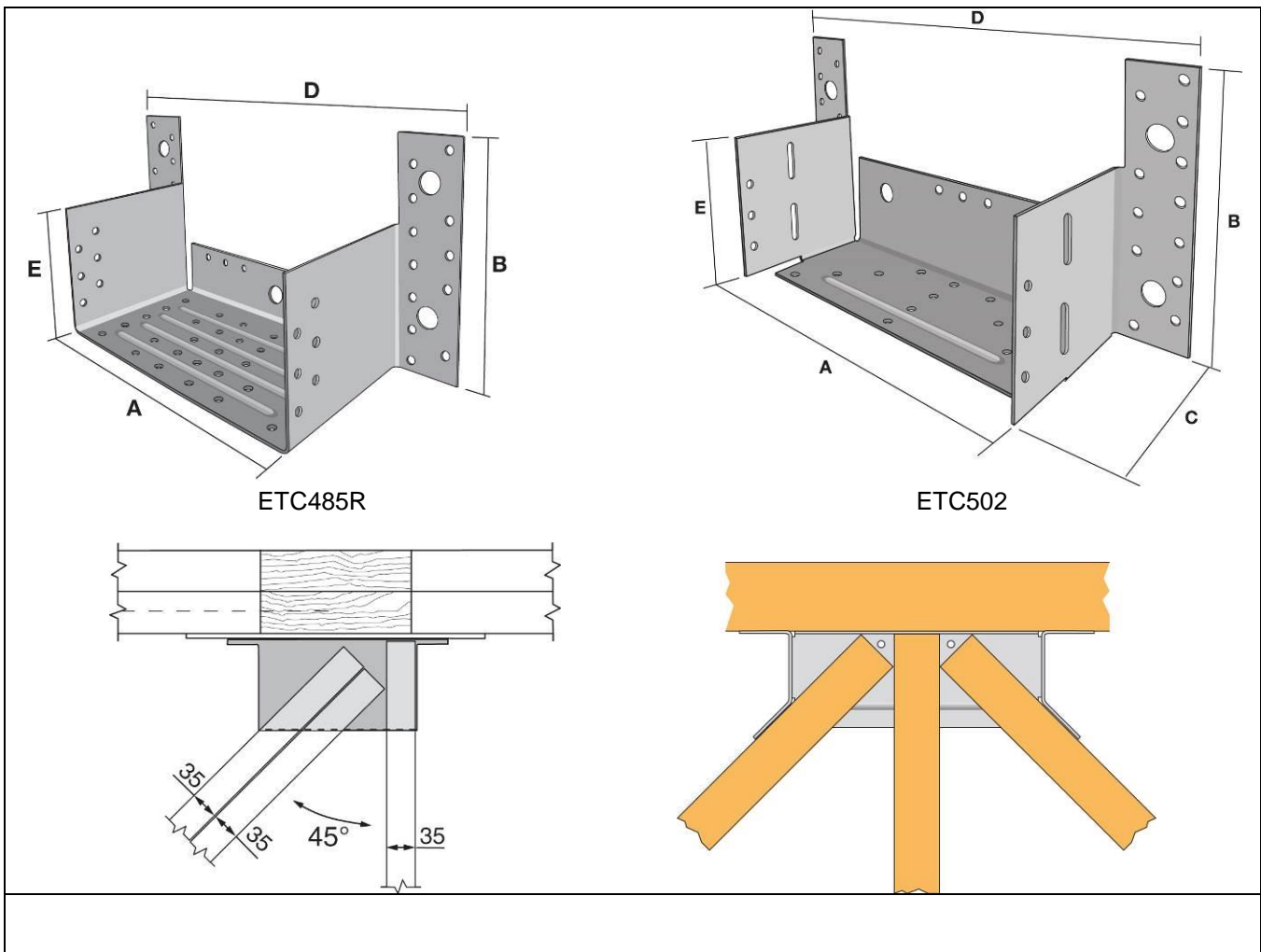
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
ETC	ETC	ETC	ETC	ETC

### Material Specification and Service Classes

2 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

2 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions

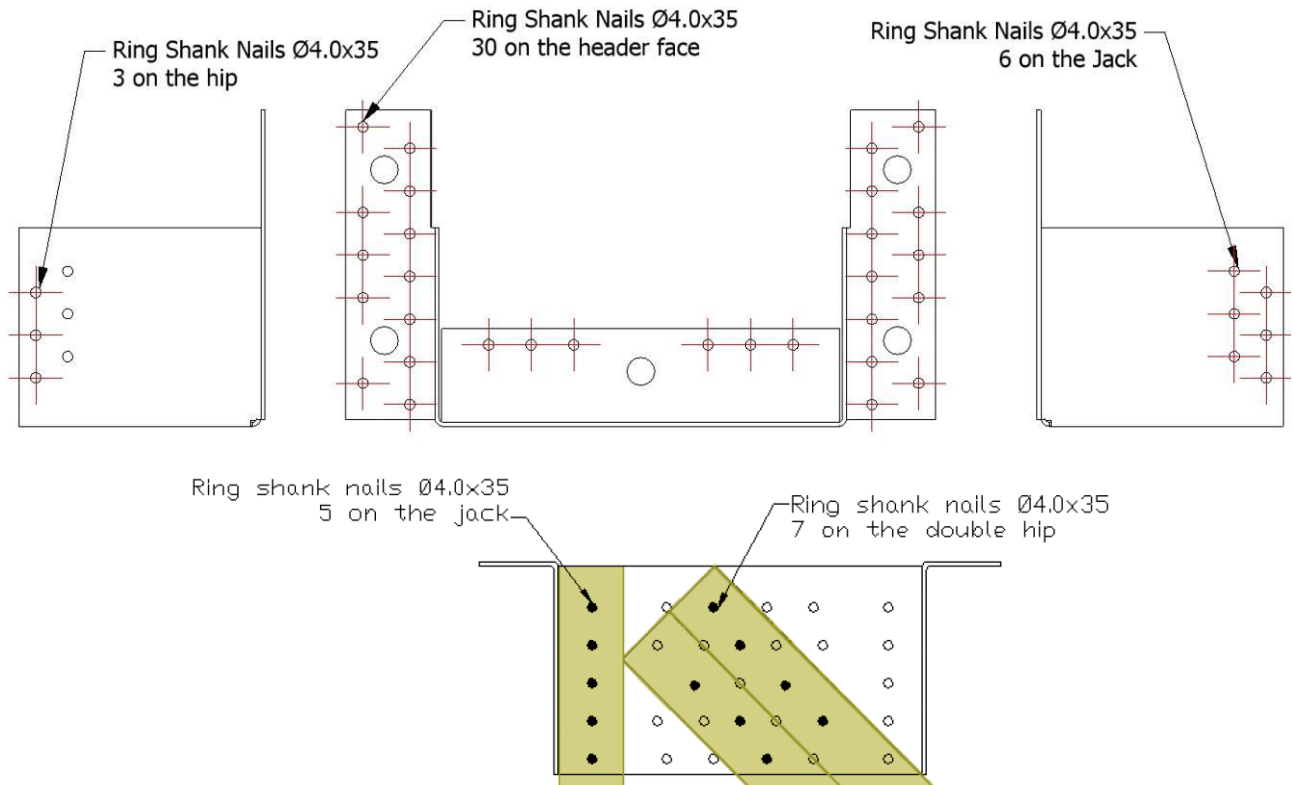


Model	Steel Thickness (mm)	Carried Member	Dimension (mm)				
			A	B	C	D	E
ETC485R	2	1 jack-rafter 38 1 hip-rafter 2x38	195	145	110	279	90
ETC502	2	1 jack-rafter 38 2 hip-rafter 38	206	145	78	291	89

Fasteners = Ring shank nails Ø4.0x35 mm

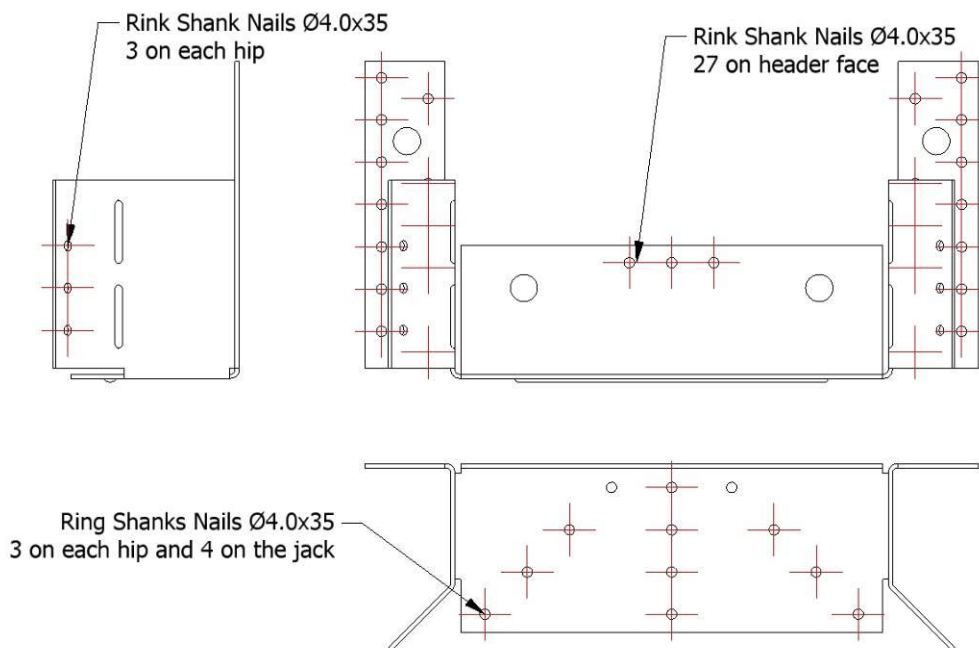
**ETC485R Hangers**

*Single Jack and double hips*



**ETC 502 Hanger**

*Single jack and double hip*



**ETC Hangers load carrying capacities**

<b>Hangers</b>	<b>Number of fasteners</b>							<b>Characteristic capacities (kN) DOWNWARD</b>
	<b>Header member</b>		<b>Carried Member</b>					
	<b>Concrete / Steel</b>	<b>Wood</b>	<b>Hip</b>			<b>Jack</b>		
			<b>Type</b>	<b>Side</b>	<b>Bottom</b>	<b>Side</b>	<b>Bottom</b>	
<b>ETC485R</b>	4 bolts Ø12	30	2 plys	3	7	6	5	22.4
<b>ETC502</b>	4 bolts Ø12	27	1 ply	3	3	0	4	23.2

*Fasteners = Ring shank nails Ø4.0x35 mm*

## D32 Joist hanger type ETC G/D

Face mount hanger with external flanges

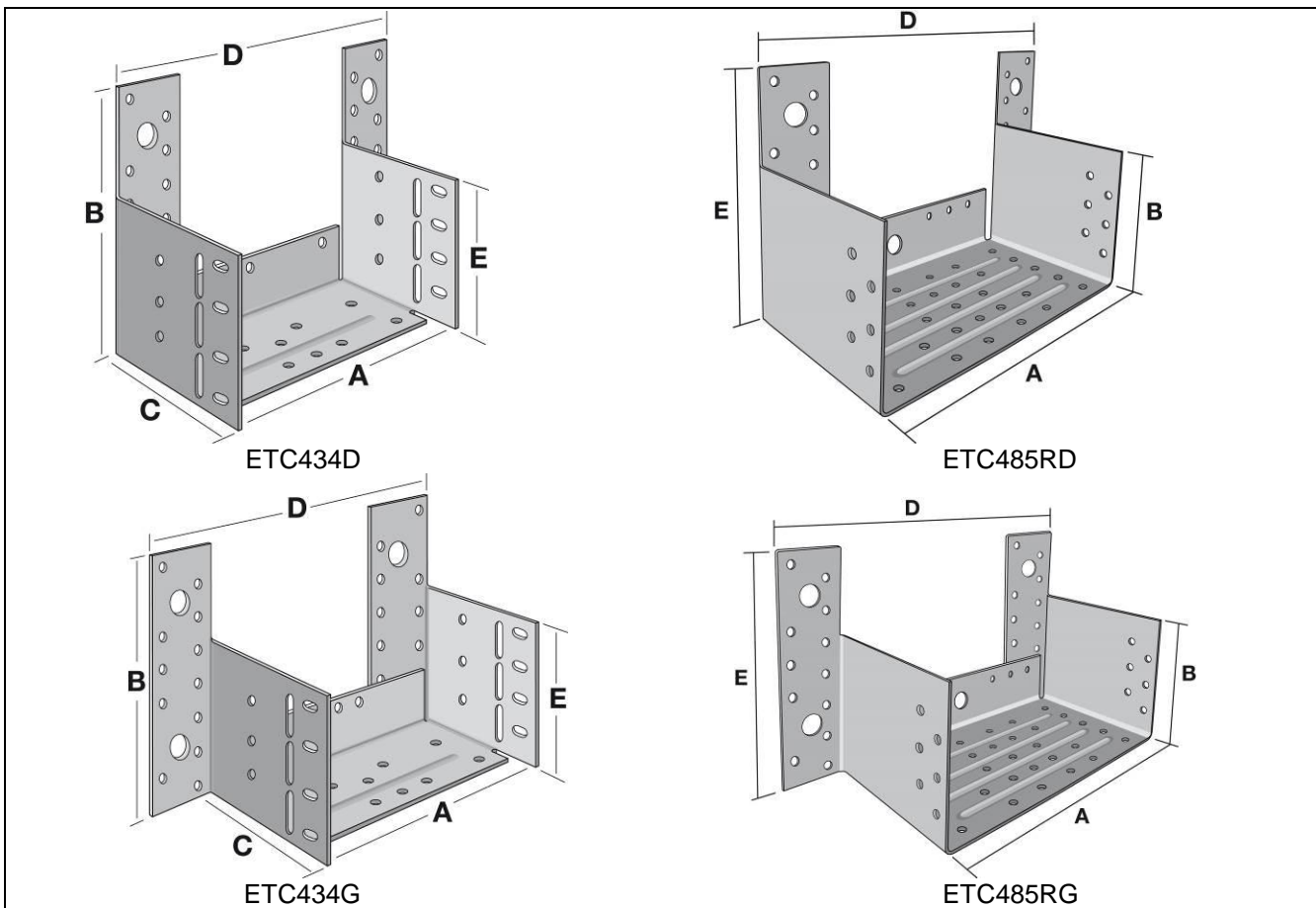
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
ETC G/D	ETC G/D	ETC G/D	ETC G/D	ETC G/D

### Material Specification and Service Classes

1.5 and 2 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

1.5 and 2 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

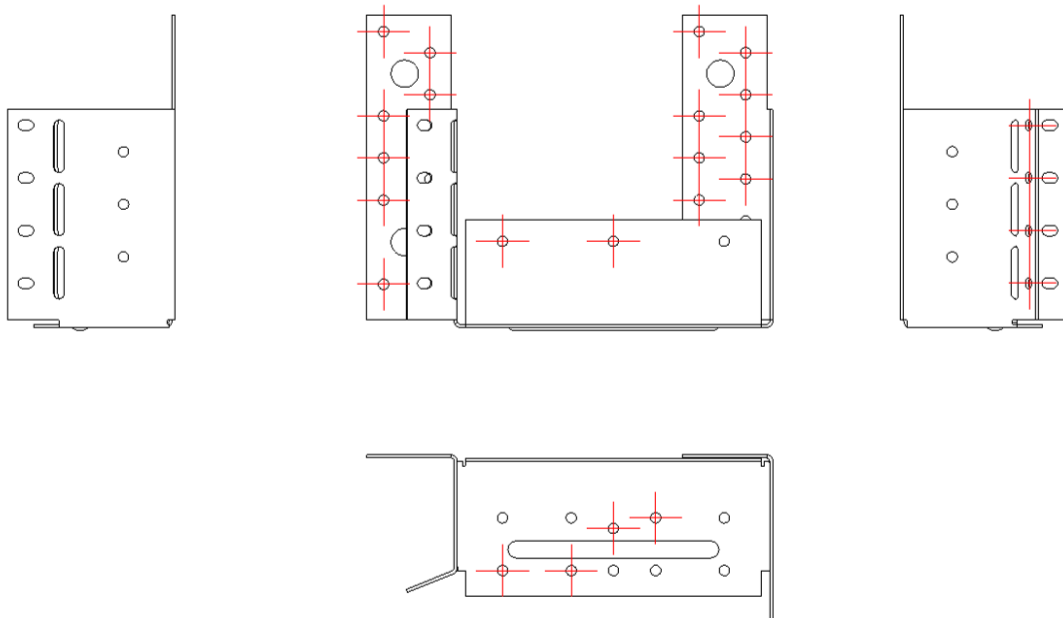
### Dimensions



	Steel Thickness (mm)	Dimension (mm)				
		A	B	C	D	E
ETC434D	1.5	140	145	80	185	100
ETC434G	1.5	140	145	80	185	100
ETC485RG	2	195	145	110	239	90
ETC485RD	2	195	145	110	239	90

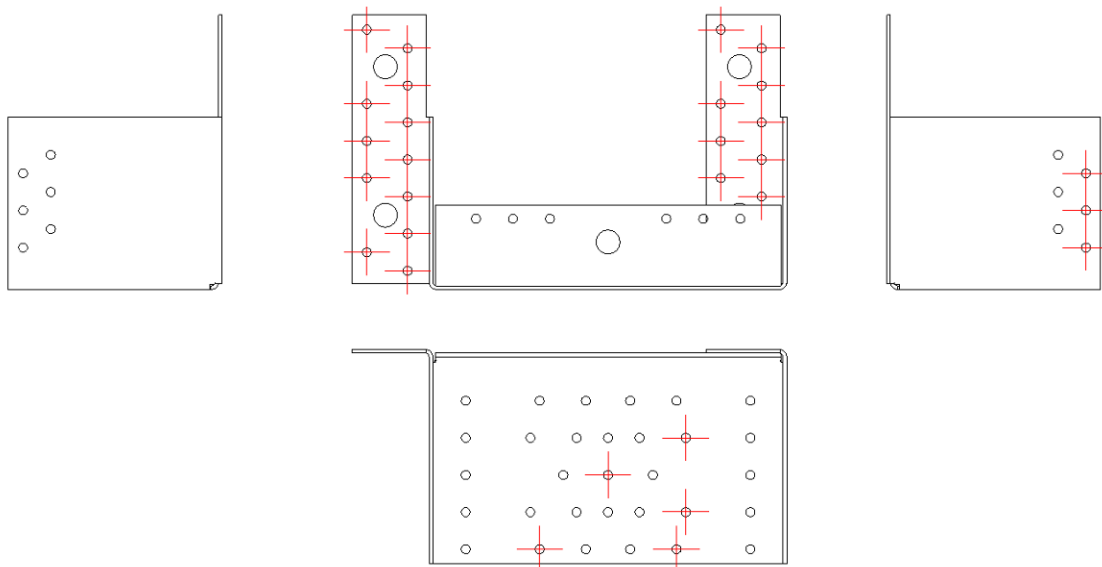
**ETC434G Hanger**  
*Single hip*

For ETC434D, it is a mirror of the nail pattern presented just below.



**ETC485RG Hangers**  
*Double Hips*

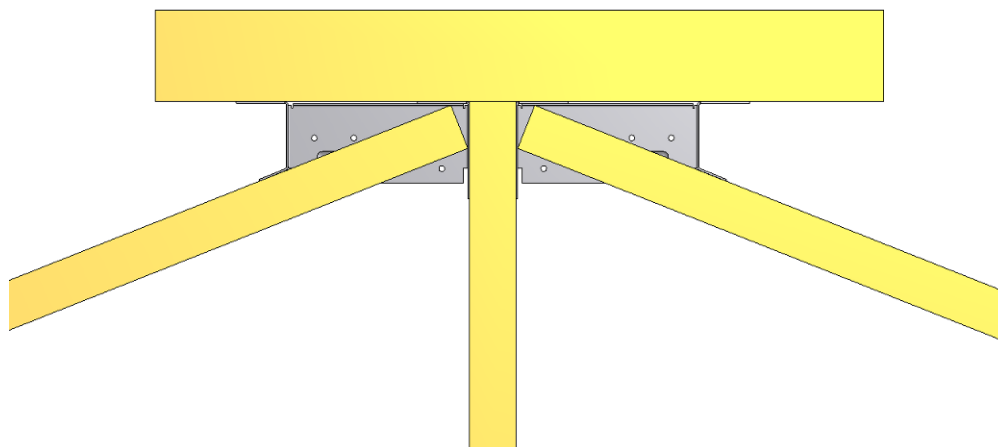
For ETC485RD it is a mirror of the nail pattern presented just below.





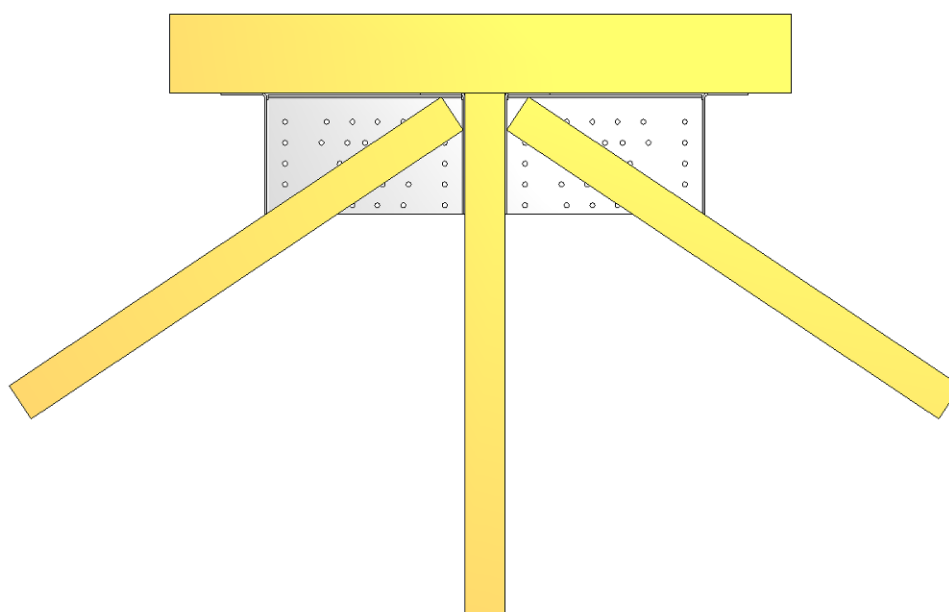
**ETC434G/D Hangers**

*Single Jack and two single hips*



**ETC485 RG/D Hangers**

*Single jack and two single hips*



**ETC Hangers load carrying capacities**

Hangers	Number of fasteners							Characteristic capacities (kN) DOWNWARD
	Header member		Carried Member					
	Concrete / Steel	Wood	Hip			Jack		
			Type	Side	Bottom	Side	Bottom	
ETC434G/D	6 bolts Ø12	40	1 ply	4	10	3	0	16.5
ETC485RG/D	6 bolts Ø12	42	1 ply	3	8	3	0	17.5

## D33 Straps hanger JHA270

Joist Hangers with Adjustable Height Strap

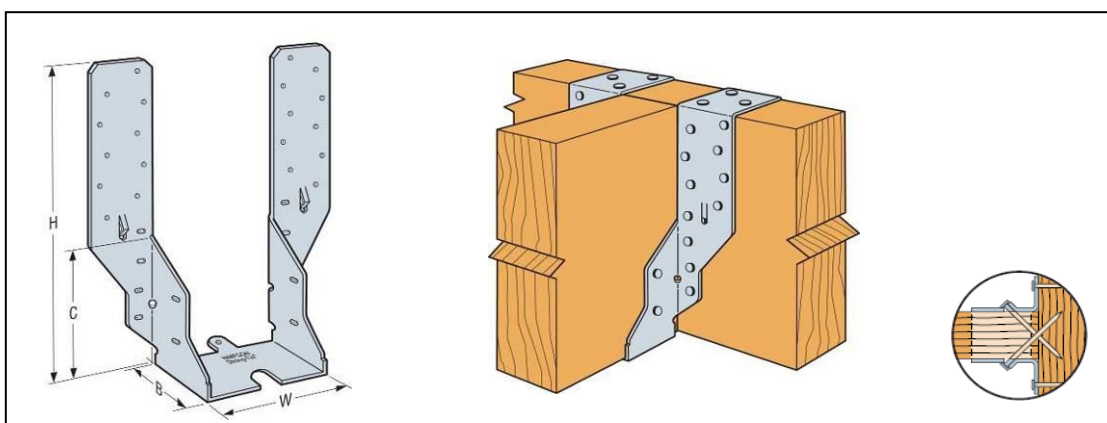
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
JHA270	JHA270	JHA270	JHA270	JHA270

### Material Specification and Service Classes

0.9 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

0.9 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model Number	Steel Thickness (mm)	Dimensions (mm)			
		W	H	B	C
JHA270/38	0.9	38	241.0	50	106.0
JHA270/44		44	238.0	50	103.0
JHA270/47		47	236.5	50	101.5
JHA270/50		50	235.0	50	100.0
JHA270/63		63	248.5	50	113.5
JHA270/75		75	242.5	50	107.5
JHA270/91		91	234.0	50	99.5
JHA270/100		100	230.0	50	95.0

### Table of parameters

Parameters to be used with formulas from Annex C.

Model No	W Width (mm)	H Height (mm)	B Seat Bearing (mm)	C (mm)	l (mm)	l <sub>eff</sub> (mm)	t (mm)	S (mm)	B <sub>eff</sub> (mm)	a-0.5a <sub>c</sub> (mm)	e (mm)	C <sub>hor</sub> (mm)	K <sub>ef</sub>	d	n <sub>eff</sub> (per flange) Round Wire	n <sub>eff</sub> (per flange) Ring Shank
JHA270/38	38	241.0	50.0	106.0	47.0	96	0.9	28.5	80	112	28.0	10	1.2	1.1	5	-
JHA270/44	44	238.0	50.0	103.0	47.0	99	0.9	28.5	80	112	28.0	10	1.2	1.1	5	-
JHA270/47	47	236.5	50.0	101.5	47.0	101	0.9	28.5	80	112	28.0	10	1.2	1.1	5	-
JHA270/50	50	235.0	50.0	100.0	47.0	102	0.9	28.5	80	112	28.0	10	1.2	1.1	5	-
JHA270/63	63	248.5	50.0	113.5	47.0	107	0.9	28.5	77	112	28.0	10	1.2	1.1	5	-
JHA270/75	75	242.5	50.0	107.5	47.0	107	0.9	28.5	74	112	28.0	10	1.2	1.1	5	-
JHA270/91	91	234.0	50.0	99.5	47.0	107	0.9	28.5	70	112	28.0	10	1.2	1.1	5	-
JHA270/100	100	230.0	50.0	95.0	47.0	107	0.9	28.5	68	112	28.0	10	1.2	1.1	5	-

JHA450/38	38	481.0	50.0	191.0	50.0	99	1.5	35.0	80	174	36.5	10	1.1	1.1	6	-
JHA450/44	44	478.0	50.0	188.0	50.0	102	1.5	35.0	80	174	36.5	10	1.1	1.1	6	-
JHA450/47	47	477.0	50.0	187.0	50.0	104	1.5	35.0	80	174	36.5	10	1.1	1.1	6	-
JHA450/50	50	475.0	50.0	185.0	50.0	105	1.5	35.0	80	174	36.5	10	1.1	1.1	6	-
JHA450/63	63	469.0	50.0	179.0	50.0	110	1.5	35.0	77	174	36.5	10	1.1	1.1	6	-
JHA450/75	75	463.0	50.0	173.0	50.0	110	1.5	35.0	74	174	36.5	10	1.1	1.1	6	-
JHA450/91	91	455.0	50.0	165.0	50.0	110	1.5	35.0	70	174	36.5	10	1.1	1.1	6	-
JHA450/100	100	450.0	50.0	160.0	50.0	110	1.5	35.0	68	174	36.5	10	1.1	1.1	6	-
JHA450/125	125	452.5	63.0	162.5	63.0	123	1.5	44.0	69	164	31.5	10	1.1	1.1	6	-
JHA450/137	137	446.5	63.0	156.5	63.0	123	1.5	44.0	66	164	31.5	10	1.1	1.1	6	-
JHA450/150	150	440.0	63.0	150.0	63.0	123	1.5	44.0	62	164	31.5	10	1.1	1.1	6	-

THA38	38	226.0	62.5	113.5	59.5	109	1.2	40.0	93	114	34.5	10	0.35	1.2	7	-
THA47	47	221.5	62.5	109.0	59.5	113	1.2	40.0	93	114	34.5	10	0.35	1.2	7	-
THA50	50	220.0	62.5	107.5	59.5	115	1.2	40.0	93	114	34.5	10	0.35	1.2	7	-
THA75	75	232.5	62.5	120.0	59.5	120	1.2	40.0	85	114	34.5	10	0.35	1.2	7	-
THA100	100	220.0	62.5	107.5	59.5	120	1.2	40.0	77	114	34.5	10	0.35	1.2	7	-

THAI222	40	580.0	57.0	238.0	57.0	107	1.2	39.0	87	200	37.0	15	1.0	1.1	5	2.5
THAI1.81/22	46	577.0	57.0	235.0	57.0	110	1.2	39.0	87	200	37.0	15	1.0	1.1	5	2.5
THAI3522	59	570.0	57.0	228.0	57.0	117	1.2	39.0	84	200	37.0	15	1.0	1.1	5	2.5
THAI322	65	568.0	57.0	225.0	57.0	117	1.2	39.0	83	200	37.0	15	1.0	1.1	5	2.5
THAI422	90	555.0	57.0	220.0	57.0	117	1.2	39.0	76	200	37.0	15	1.0	1.1	5	2.5
THAI-2	76	550.0	63.5	212.0	63.5	124	2.0	49.0	85	200	37.0	15	1.0	1.1	5	2.5

## D34 Straps hanger JHA450

Joist Hangers with Adjustable Height Strap

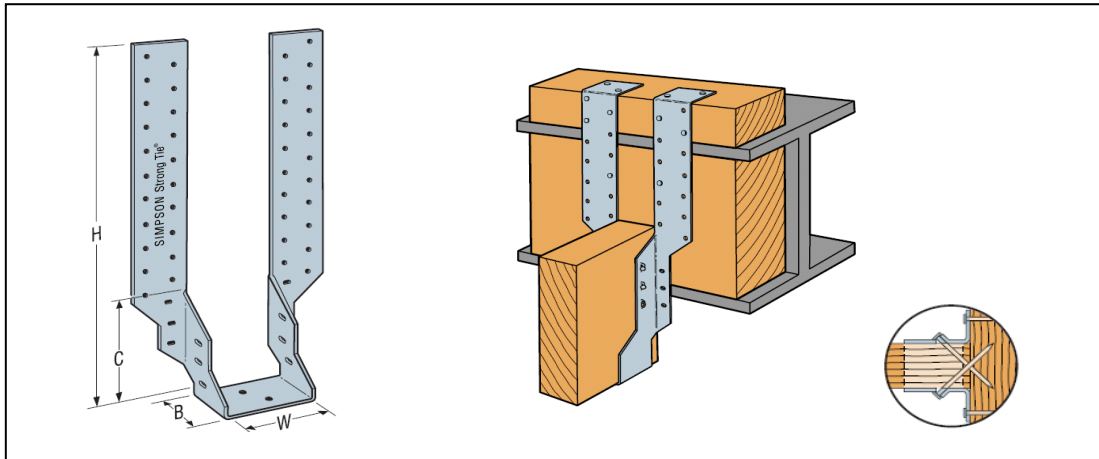
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
JHA450	JHA450	JHA450	JHA450	JHA450

### Material Specification and Service Classes

1.5 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

1.5 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model Number	Steel Thickness (mm)	Dimensions (mm)			
		W	H	B	C
JHA450/38	1.5	38	481.0	50	191.0
JHA450/44		44	478.0	50	188.0
JHA450/47		47	477.0	50	187.0
JHA450/50		50	475.0	50	185.0
JHA450/63		63	469.0	50	179.0
JHA450/75		75	463.0	50	173.0
JHA450/91		91	455.0	50	165.0
JHA450/100		100	450.0	50	160.0
JHA450/125		125	452.5	63	162.5
JHA450/137		137	446.5	63	156.5
JHA450/150		150	440.0	63	150.0

### Table of parameters

Parameters to be used with formulas from Annex C.

See Annex D33 - "JHA270" section above for parameters.

## D35 Straps hanger THA

Joist Hangers with Adjustable Height Strap

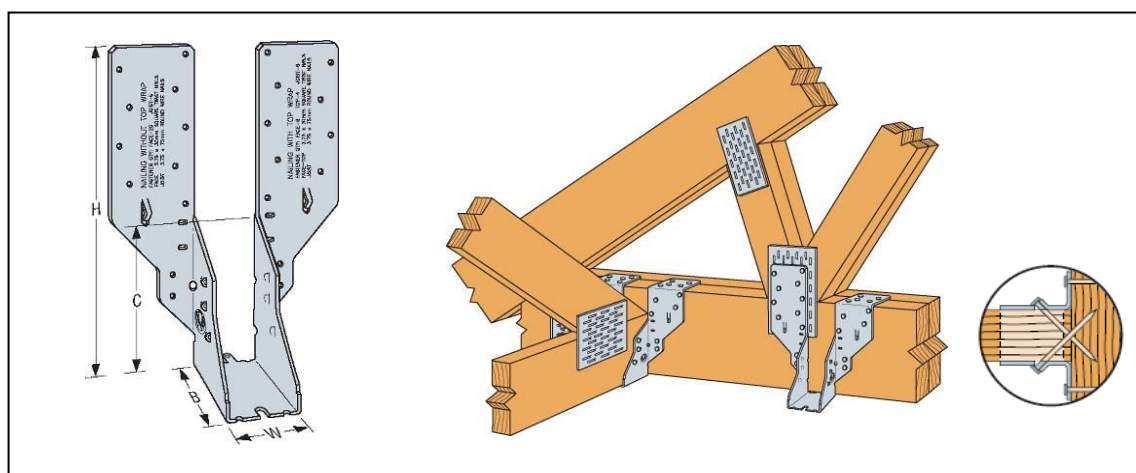
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
THA	THA	THA	THA	THA

### Material Specification and Service Classes

1.2 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

1.2 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model Number	Steel Thickness (mm)	Steel Specification & Grade	Dimensions (mm)			
			W	H	B	C
THA38	1.2	Pre-Galvanised S250GD+Z275 to EN 10346:2009	38	226.0	62.5	113.5
THA44			44	223.0	62.5	110.5
THA50			50	220.0	62.5	107.5
THA75			75	232.5	62.5	120.0
THA100			100	220.0	62.5	107.5

### Table of parameters

Parameters to be used with formulas from Annex C.

See Annex D33 - "JHA270" section above for parameters.

## D36 Straps hanger THAI

Joist Hangers with Adjustable Height Strap

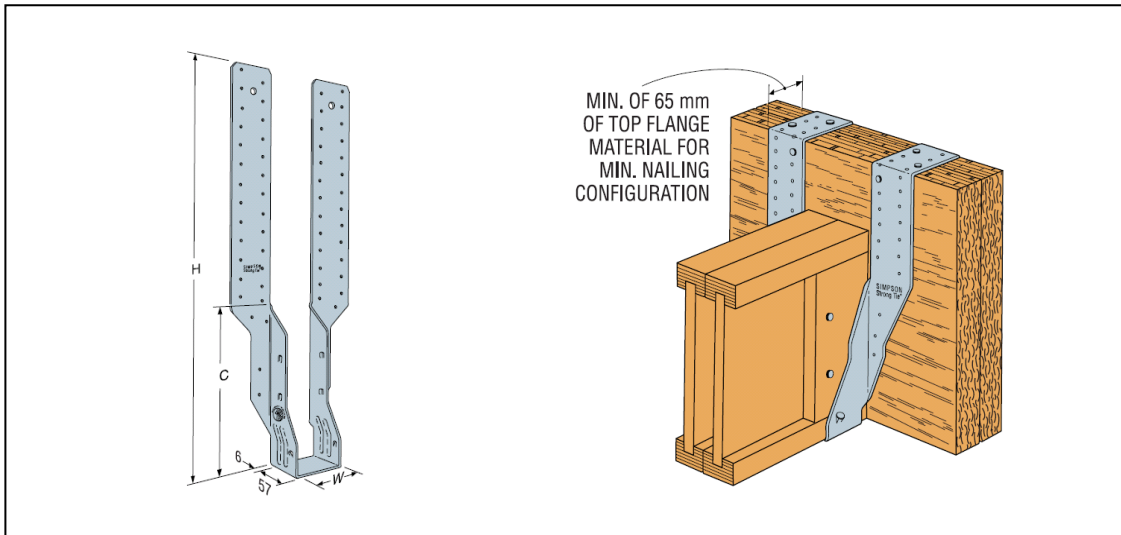
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
THAI	THAI	THAI	THAI	THAI

### Material Specification and Service Classes

1.2 and 2 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

1.2 and 2 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model Number	Steel Thickness (mm)	Steel Specification & Grade	Dimensions (mm)			
			W	H	B	C
THAI222	1.2	Pre-Galvanised S250GD+Z275 to EN 10346:2009 or G90, SS Grade 33 to ASTM A653	40	580.0	57	238.0
THAI1.81/22			46	577.0	57	235.0
THAI3522			59	570.0	57	228.0
THAI322			65	567.0	57	225.0
THAI422			90	555.0	57	220.0
THAI-2	2		45 - 150	550.0	63.5	224.0

### Table of parameters

Parameters to be used with formulas from Annex C.

See Annex D33 - "JHA270" section above for parameters.

## D37 Straps hanger AG703

Joist Hangers with Adjustable Height Strap

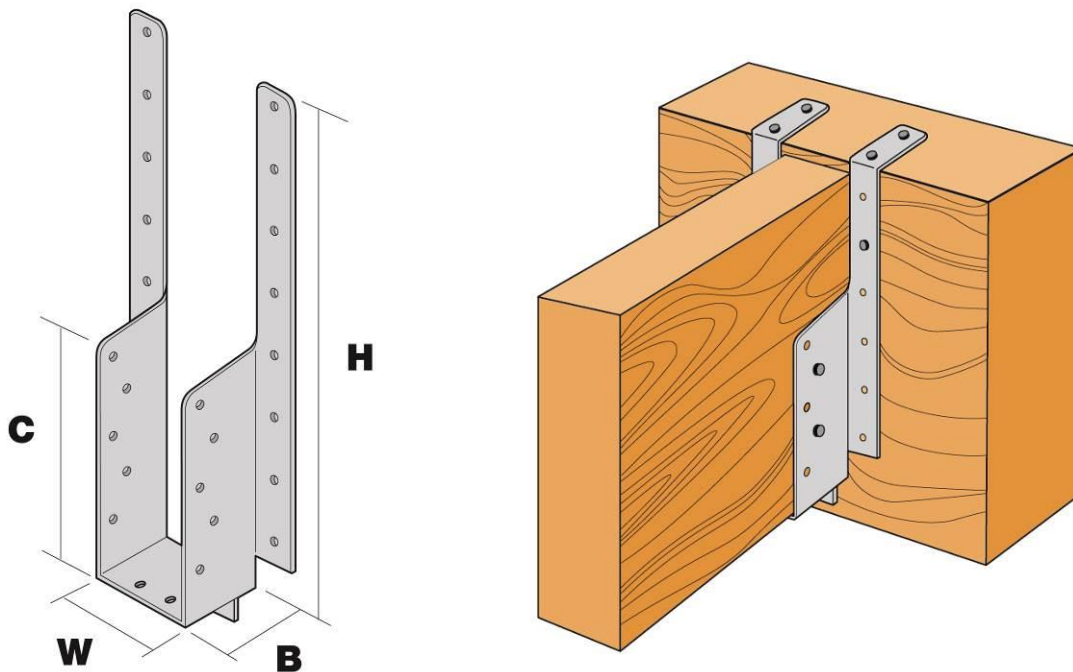
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
AG703	AG703	AG703	AG703	AG703

### Material Specification and Service Classes

1.2 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

1.2 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model Number	Steel Thickness (mm)	Steel Specification & Grade	Dimensions (mm)			
			W	H	B	C
AG703	1.2	Pre-galvanized S250GD+Z275 to EN 10346:2009	36 to 98	$(680-W)/2$	48	$(344-W)/2$

### Table of parameters

Parameters to be used with formulas from Annex C.



Model No	W Width (mm)	H Height (mm)	B Seat Bearing (mm)	C (mm)	I (mm)	$I_{ef}$ (mm)	t (mm)	S (mm)	$B_{ef}$ Seat Bearing (mm)	a-0.5a <sub>c</sub> (mm)	e (mm)	c <sub>hor</sub> (mm)	$K_{ef}$	d	$n_{eff}$
AG703/38	38	321.0	48	153.0	25	74	1.2	25	78.0	143	26.0	10	1.04	1.0	6
AG703/45	45	317.5	48	149.5	25	78	1.2	25	78.0	143	26.0	10	1.04	1.0	6
AG703/58	58	311.0	48	143.0	25	84	1.2	25	76.1	143	26.0	10	1.04	1.0	6
AG703/64	64	308.0	48	140.0	25	85	1.2	25	74.6	143	26.0	10	1.04	1.0	6
AG703/76	76	302.0	48	134.0	25	85	1.2	25	71.8	143	26.0	10	1.04	1.0	6
AG703/89	89	295.5	48	127.5	25	85	1.2	25	68.6	143	26.0	10	1.04	1.0	6
AG703/98	98	291.0	48	123.0	25	85	1.2	25	66.5	143	26.0	10	1.04	1.0	6
AG713/80	80	445.0	60	110.0	30	90	1.5	30	81.0	232.5	33.5	10	0.65	1.0	4
AG713/90	90	440.0	60	105.0	30	90	1.5	30	78.0	232.5	33.5	10	0.65	1.0	4
AG713/100	100	435.0	60	100.0	30	90	1.5	30	75.0	232.5	33.5	10	0.65	1.0	4

## D38 Straps hanger AG713

Joist Hangers with Adjustable Height Strap

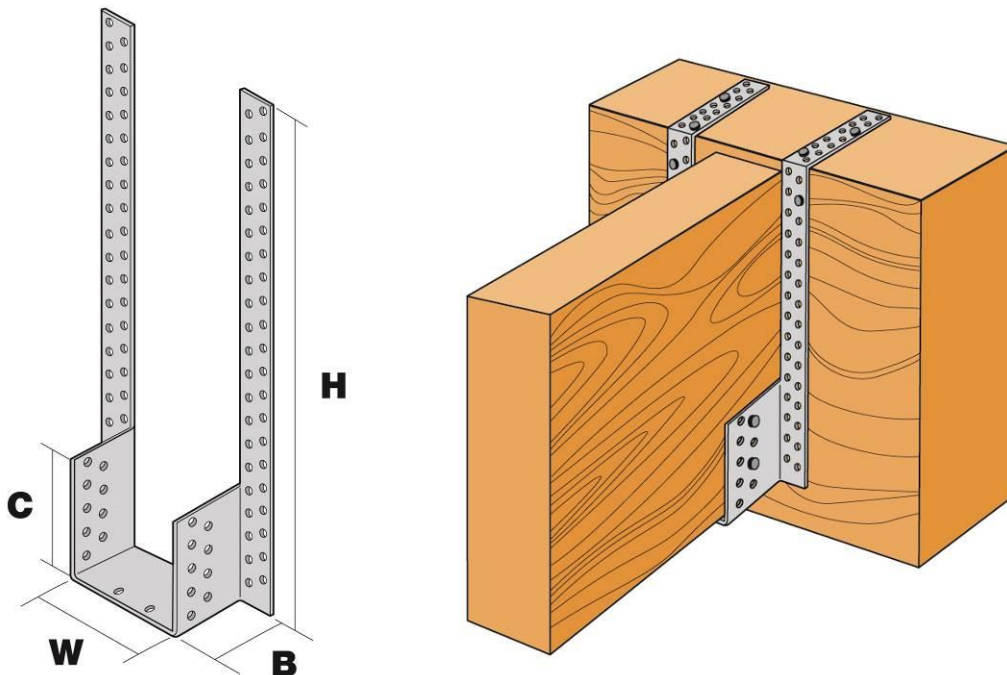
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
AG713	AG713	AG713	AG713	AG713

### Material Specification and Service Classes

1.5 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

1.5 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Dimensions



Model Number	Steel Thickness (mm)	Steel Specification & Grade	Dimensions (mm)			
			W	H	B	C
AG713	1.5	Pre-galvanized S250GD+Z275 to EN 10346:2009	80 to 100	$(970-W)/2$	60	$(300-W)/2$

### Table of parameters

Parameters to be used with formulas from Annex C.

See Annex D37 - "AG703" section above for parameters.

## D39 Joist hanger SAMI/4X

Joist Hanger for masonry hanger

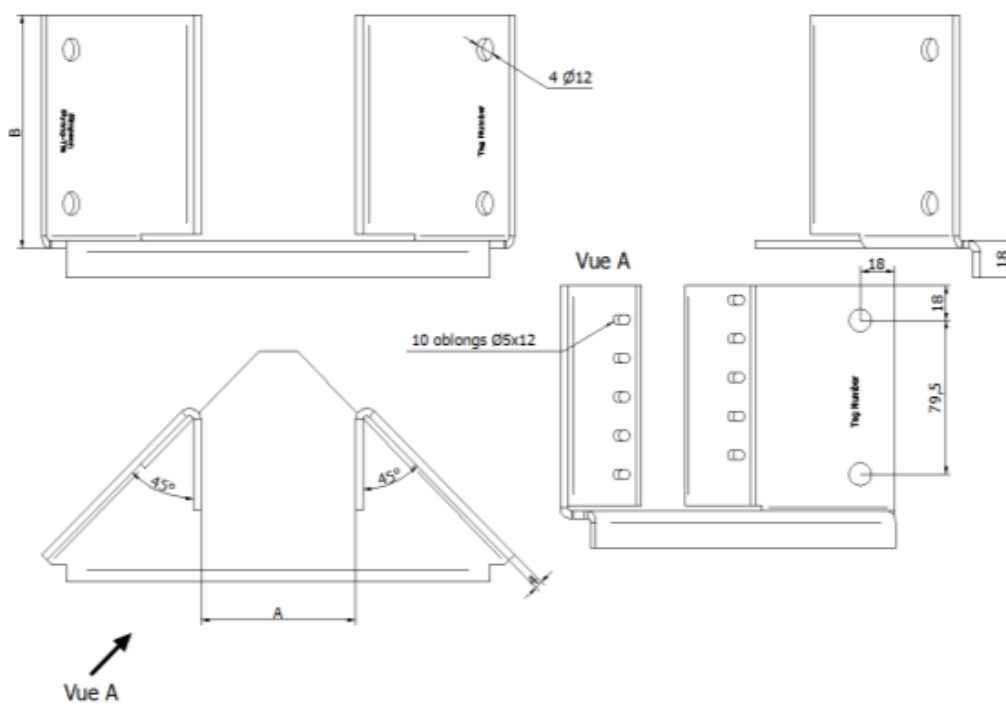
Product Name	Alternative Names			
	Branch 36	Branch 40	Branch 46	Branch 47
SAMI/4X	SAMI/4X	SAMI/4X	SAMI/4X	SAMI/4X

### Material Specification and Service Classes

1.5 mm thick pre-galvanised steel S250GD + Z (min Z275) according to EN 10346:2009 with tolerances according to EN 10143:2006.

1.5 mm thick Stainless steel: number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088:2005, or stainless steel as described before.

### Drawing



### Hanger Size Range

Min A	Max A	B
76	120	120

### Material Specification

Material Thickness	Material Grades	Coating Specification
4.0	S250GD to EN 10346:2009	Z275

**Characteristic Capacities under vertically downward load (F1)**

Fastener Specification				Hanger Width (mm)	Characteristic capacity of hanger (kN) Download
Type	Size	Qty in Supporting member	Qty in Supported member		
Bolt	Ø10	4	0	80-120	31.18
Nails	CNA4.0x35	0	10		