Centre Scientifique et
Technique du Bâtiment
84 avenue Jean Jaurès
CHAMPS-SUR-MARNE
F-77447 Marne-la-Vallée Cedex 2
Tél. : (33) 01 64 68 82 82
Fax : (33) 01 60 05 70 37

Autorisé et notifié conformément à l'article 10 de la directive 89/106/EEC du Conseil, du 21 décembre 1988, relative au rapprochement des dispositions législatives, réglementaires et administratives des Etats membres concernant les produits de construction.

CSTB
le futur en construction
MEMBRE DE L'EOTA

European Technical Approval ETA-07/0137

(English language translation, the original version is in French language)

Nom commercial : **Trade name:**	**Simpson Strong-Tie** **Universal brackets** **Purlin anchors** **Joist anchors**
Titulaire : **Holder of approval:**	**SIMPSON Strong-Tie** **ZAC des Quatre Chemins** **85400 SAINTE GEMME LA PLAINE**
Type générique et utilisation prévue du produit de construction : **Generic type and use of construction product:**	Equerres universelles et pattes de solivage pour accrochage d'éléments bois massif ou à base de bois sur des supports en bois massif ou à base de bois. **Universal brackets, purlin and joist anchors for connection of solid wood or wood based elements to solid wood or wood based support.**
Validité du : au : **Validity from / to:**	**01/01/2010** **31/12/2014**
Usine de fabrication : **Manufacturing plant:**	**Plant UK – Winchester Road, Tamworth, B78 3HG, UK** **Plant DK – Boulstrup, DK-8300 Odder, Denmark** **Plant F – ZAC des Quatre Chemins, 85400 Sainte Gemme la Plaine, France** **Plant US1 – NW USA Division, 5151 S Airport Way, Stockton, CA95206, USA** **Plant US2 – NE USA Division, 2600 International Street, Colombus, OH43228, USA**
Le présent Agrément technique européen contient : **This European Technical Approval contains:**	38 pages incluant 27 annexes faisant partie intégrante du document. **38 pages including 27 annexes which form an integral part of the document.**

I LEGAL BASES AND GENERAL CONDITIONS

1. This European Technical Approval is issued by the Centre Scientifique et Technique du Bâtiment in accordance with:

   - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1], modified by the Council Directive 93/68/EEC of 22 July 1993[2];
   - Décret n° 92-647 du 8 juillet 1992[3] concernant l'aptitude à l'usage des produits de construction;
   - Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex of Commission Decision 94/23/EC[4];
   - Guideline for European Technical Approval of « Three-Dimensional Nailing Plates » ETAG 015, edition September 2002,

2. The Centre Scientifique et Technique du Bâtiment is authorised to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant (for example concerning the fulfilment of assumptions made in this European Technical Approval with regard to manufacturing). Nevertheless, the responsibility for the conformity of the products with the European Technical Approval and for their fitness for the intended use remains with the holder of the European Technical Approval.

3. This European Technical Approval is not to be transferred to manufacturers or agents of manufacturer other than those indicated on page 1; or manufacturing plants other than those indicated on page 1 of this European Technical Approval.

4. This European Technical Approval may be withdrawn by the Centre Scientifique et Technique du Bâtiment pursuant to Article 5 (1) of the Council Directive 89/106/EEC.

5. Reproduction of this European Technical Approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of the Centre Scientifique et Technique du Bâtiment. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.

6. The European Technical Approval is issued by the approval body in its official language. This version corresponds to the version circulated within EOTA. Translations into other languages have to be designated as such.

---

1 Official Journal of the European Communities n° L 40, 11.2.1989, p. 12
2 Official Journal of the European Communities n° L 220, 30.8.1993, p. 1
3 Journal officiel de la République française du 14 juillet 1992
4 Official Journal of the European Communities n° L 17, 20.1.1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1. Definition of product

Simpson Strong-Tie Universal brackets, Purlin anchors and Joist anchors are three dimensional nailing plates made of pre-galvanized steel Grade S250GD+Z275 or S350GD+Z275 according to EN 10346:2004 of thickness 1.5 mm to 2.5 mm or 1.2-1.5 mm pre-galvanized mild steel or 1.5 mm G20 pre-galvanized steel Grade 33 according to ASTM A653. The range addressed by this Approval consists of : Universal brackets Micro 96, Mini 100, Midi 130, Maxi 190; Purlin anchors 170 to 370, Joist anchors 170E, 210E, UNI170, UNI210,UNI250, PSG/PSD, PSTG, PSTD, MTS, LTS, A and H. They are intended for connection of solid wood or wood based elements to solid wood or wood based support. The geometry and standard dimensions are given in Annexes 1 to 8.

All Strong-Tie Universal brackets, Purlin anchors and Joist anchors can also be produced from stainless steel number 1.4401 or number 1.4404 according to EN 10088-2:2005 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, or other grades of stainless steel with similar or increased characteristic yield and ultimate strengths.

1.2. Intended use

The SIMPSON Strong-Tie Universal brackets, Purlin anchors and Joist anchors are intended to be used for connections of joists with rectangular cross sections or I-joists to their support. The joist may be either of solid sawn or Engineering Wood Product listed in Annex 9. This support may be either a solid sawn element, or an Engineering Wood Product as listed in Annex 9. With regard to moisture behaviour of the support, the use is possible in service classes 1 and 2 defined in EN 1995-1-1:2004.

The SIMPSON Strong-Tie Universal brackets, Purlin anchors and Joist anchors can also be used in outdoor timber structures, service class 3, when stainless steel with similar or better characteristic yield and ultimate strength is employed.

They are not intended to be used in areas where they might support seismic actions.

They are supposed to be used with specified fasteners mentioned in Annex 10.

The provisions made in this European Technical Approval are based on an assumed intended working life of the three dimensional nailing plates of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

2 Characteristics of product and methods of verification

The SIMPSON Strong-Tie Universal brackets, Purlin anchors and Joist anchors in the range covered by this ETA corresponds to the drawings and provisions given in Annexes 1 to 8. The characteristic material values, dimensions and tolerances of the Universal brackets, Purlin anchors and Joist anchors not indicated in Annexes shall correspond to the respective values

laid down in the technical documentation[5] of this European Technical Approval. The mechanical properties of the SIMPSON Strong-Tie Universal brackets, Purlin anchors and Joist anchors are given in Annexes 11 to 19.

2.1. ER 1 Mechanical resistance and stability

The mechanical properties of the Simpson Strong-Tie Universal brackets, Purlin anchors and Joist anchors are given in Annexes 11 to 19.

The mechanical capacities are determined by calculation as described in the EOTA Guideline 015 Clause 5.1.2. They should be used for designs in accordance with Eurocode 5 or a similar national timber code.

No performance determined (NPD) towards seismic action.

Fasteners

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

The formulas for the load-carrying capacities of the connectors have been determined based on the use of connector nails or connector screws in accordance with ETA-04/0013.

The load-carrying capacities for Universal bracket Mini100, Midi130 and Maxi190 have been determined based on the use of connector nails with a diameter of 4.0 mm according to ETA-04/0013. To obtain these values it is also allowed to use connector nails with a diameter of 4.2 mm or connector screws with a diameter of 5 mm according to ETA-04/0013 with similar or better performance than connector nails with a diameter of 4.0 mm.

Threaded nails in accordance to EN 14592

The design models on which the formulas for load-carrying capacity for Universal bracket Micro 96, Purlin anchors and Joist anchors are based, also allows the use of threaded nails in accordance to EN 14592 with a diameter in the range 4,0 – 4,2 mm (Micro 96: 3.1 mm) and a minimum length of 35 mm, assuming a thick steel plate when calculating the lateral nail load-carrying capacity. For the load-carrying capacities for universal bracket Mini100, Midi 130 and Maxi190 a reduction factor equal to the ratio between the characteristic withdrawal capacity of the actual used threaded nail and the characteristic lateral capacity of the corresponding connector nail according to table B1 in ETA-04/0013 is applicable.

Square Twist nails in accordance to EN 14592

In the formulas given in relevant Annexes the capacities for square twist nails calculated from the formulas of EN 1995-1-1 (Eurocode 5) are used assuming a thick steel plate when calculating the lateral nail load bearing capacity.

Round smooth nails in accordance to EN 14592

In the formulas given in relevant Annexes, the capacities for round smooth nails calculated from the formulas of EN 1995-1-1 (Eurocode 5) are used assuming a thin steel plate when calculating the lateral nail load bearing capacity.

---

5 The technical documentation of this European Technical Approval is deposited at the Centre Scientifique et Technique du Bâtiment and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over to the approved bodies.

Stainless steel

For Universal brackets, Purlin anchors and Joist anchors produced from stainless steel number 1.4401 or number 1.4404 according to EN 10088-2:2005, or other grades of stainless steel with similar or increased characteristic yield and ultimate strengths, the characteristic load carrying capacities can be considered as the same as those published in this document subject to the use of stainless CNA connector nails covered by the ETA-04/0013 or stainless threaded nails in accordance to the standard EN 14592 respecting the rules given in the paragraph "fasteners" above. When using stainless screws, load carrying capacities can be considered as the same as those published in this document for connector nails covered by the ETA-04/0013 subject to the lateral and withdrawal capacities of the stainless screws are at least equal to those of CNA connector nails covered by the ETA-04/0013.

2.2. ER 2 Safety in case of fire

The SIMPSON Strong-Tie Universal brackets, Purlin anchors and Joist anchors are made of steel classified to have reaction to fire Class A1.

No performance determined (NPD) for resistance to fire.

2.3. ER 3 Hygiene, health and environment

Based on the declaration of the manufacturer, the SIMPSON Strong-Tie Universal brackets, Purlin anchors and Joist anchors do not contain harmful or dangerous substances as defined in the EU database.

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

2.4. ER 4 Safety in use

Not relevant

2.5. ER 5 Protection against noise

Not relevant

2.6. ER 6 Energy economy and heat retention

Not relevant.

2.7. Aspects of durability, serviceability and identification

2.7.1 Corrosion protection in service class 1 and 2.
In accordance with ETAG 015 shall the Universal brackets and Purlin anchors have a zinc coating weight of Z275. The steel employed is S250 GD with Z275 according to EN 10346.

2.7.2 Corrosion protection in service class 3.
In accordance with Eurocode 5, the Universal brackets and Purlin anchors shall be produced from stainless steel.

Serviceability of the Universal brackets, Purlin anchors and Joist anchors is understood as their ability to resist loads without unacceptable deformations.

3 Evaluation of Conformity and CE marking

3.1. Attestation of conformity system

The system of attestation of conformity 2 (i) (referred to as system 1) according to Council Directive 89/106/EEC Annex III laid down by the European Commission provides:

a) tasks for the manufacturer:

1. factory production control,
2. further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan.

b) tasks for the approved body:

3. initial type-testing of the product,
4. initial inspection of factory and of factory production control,
5. continuous surveillance, assessment and approval of factory production control.

3.2. Responsibilities

3.2.1. Tasks of the manufacturer, factory production control

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

The manufacturer shall only use steel material supplied with the relevant inspection documents as laid down in the prescribed control plan[6]. The incoming components shall be subject to controls and tests by the manufacturer before acceptance.

The Universal brackets, Purlin anchors and Joist anchors shall be subjected to the following tests and controls:

- Material properties of the steel : yield and ultimate tensile strengths, components.

[6] The prescribed control plan has been deposited at the Centre Scientifique et Technique du Bâtiment and is only made available to the approved bodies involved in the conformity attestation procedure.

- Thickness of galvanization
- Geometry:
  External dimensions including thicknesses
  Holes (place and diameter);
  Angles.

The frequency of controls and tests conducted during production and of the Universal brackets, Purlin anchors and Joist anchors is laid down in the prescribed control plan.

The results of factory production control are recorded and evaluated. The records include at least the following information:

- designation of the product, basic material and components;
- type of control or testing;
- date of manufacture of the product and date of testing of the product or basic material and components;
- result of control and testing and, if appropriate, comparison with requirements;
- signature of person responsible for factory production control.

The records shall be presented to the inspection body during the continuous surveillance. On request, they shall be presented to the Centre Scientifique et Technique du Bâtiment.

Details of the extent, nature and frequency of testing and controls to be performed within the factory production control shall correspond to the prescribed control plan which is part of the technical documentation of this European Technical Approval.

3.2.2. Tasks of notified bodies

3.2.2.1. Initial type-testing of the product

For initial type testing the results of the tests performed as part of the assessment for the European Technical Approval shall be used unless there are changes in the production line or plant. In such cases the necessary initial type testing has to be agreed between the Centre Scientifique et Technique du Bâtiment and the notified body involved.

3.2.2.2. Initial inspection of factory and of factory production control

The notified body shall ascertain that, in accordance with the prescribed control plan, the factory, in particular the staff and equipment, and the factory production control are suitable to ensure continuous and orderly manufacturing of the Universal brackets, Purlin anchors and Joist anchors according to the provisions mentioned in the ETA Guideline as well as in the present ETA.

3.2.2.3. Continuous surveillance

The notified body shall visit the factory at least twice a year for regular inspection. It has to be verified that the factory production control and the specified manufacturing process are performed and maintained according to the manufacturer's quality manual, including test of samples according to the prescribed test plan.

The results of product certification and continuous surveillance shall be made available on demand by the certification body or inspection body, respectively, to the Centre Scientifique et

Technique du Bâtiment. In cases where the provisions of the European Technical Approval and the prescribed test plan are no longer fulfilled the conformity certificate shall be withdrawn.

3.3. CE-Marking

The CE marking shall be affixed on each packaging. The CE-marking shall be accompanied by the following information:

- identification number of the certification body;
- name or identifying mark of the producer and manufacturing plant;
- the last two digits of the year in which the CE-marking was affixed;
- number of the EC certificate of conformity;
- number of the European Technical Approval;
- name and size of the product
- number of the ETA Guideline (ETAG015)

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1. Manufacturing

Simpson Strong-Tie Universal brackets, Purlin anchors and Joist anchors are manufactured in the factories in accordance with the provisions of the European Technical Approval as identified during inspection of the plant by the Centre Scientifique et Technique du Bâtiment and the notified body.

4.2. Installation

Simpson Strong-Tie Universal brackets, Purlin anchors and Joist anchors shall be installed on the basis of a specific structural design for each installation, using the load-bearing capacities derived from formulas given in Annexes 11 to 19, applying the appropriate k_{mod} factor depending on the relevant service class / load duration and the appropriate National partial safety factor for materials.

The fixing of the Universal brackets, Purlin anchors and Joist anchors to the support shall use the appropriate nails or screws in case of solid wood or wood-based support. The load bearing capacities indicated in the Annexes are given provided that the fixing device has been appropriately designed and installed.

The Universal brackets, Purlin anchors and Joist anchors 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.

4.3. Responsibility of the manufacturer

It is the manufacturer's responsibility to ensure that the information on the specific conditions according to 1 and 2 including Annexes is given to those who are concerned. This information may be made by reproduction of the respective parts of the European Technical Approval. In addition all installation data shall be shown clearly on the package and/or on an enclosed instruction sheet, preferably using illustration(s).

The minimum requirements are:

- Nails or screws specifications;
- information on the installation procedure, preferably by means of an illustration;
- minimum edge distances for fixing elements according to EN 1995-1-1 (Eurocode 5);
- identification of the manufacturing batch

All data shall be presented in a clear and explicit form.

5 Recommendations

5.1. Recommendations on packaging, transport and storage

The Universal brackets, Purlin anchors and Joist anchors shall be protected against harmful wetting during transport and storage. They also must be protected against deformations.

The manufacturer shall ensure that the information of these provisions is given to those concerned.

5.2. Recommendations on use

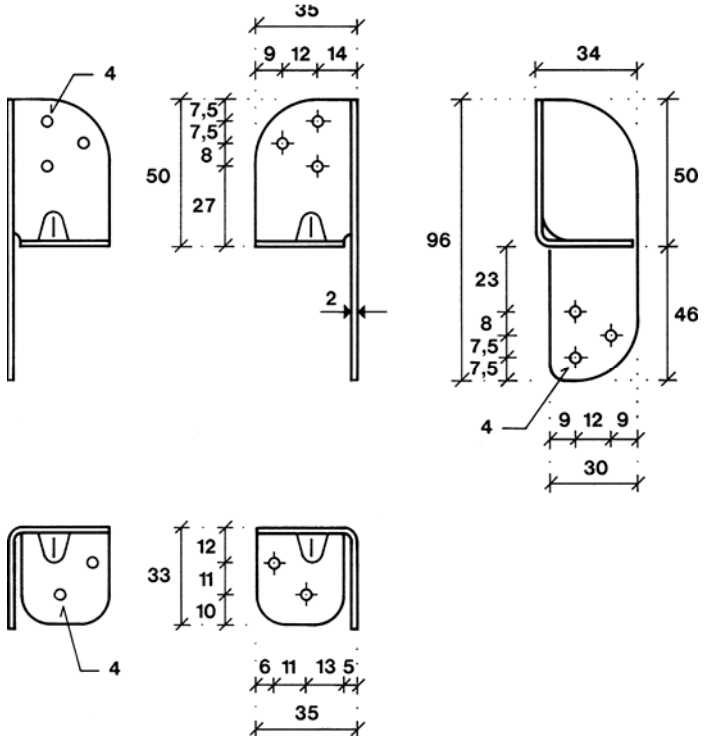
Before the installation, it shall be controlled that the Universal brackets, Purlin anchors and Joist anchors were not damaged during transport or storage.

It is not allowed to drill new holes in the Hangers or to modify their geometry in any way.

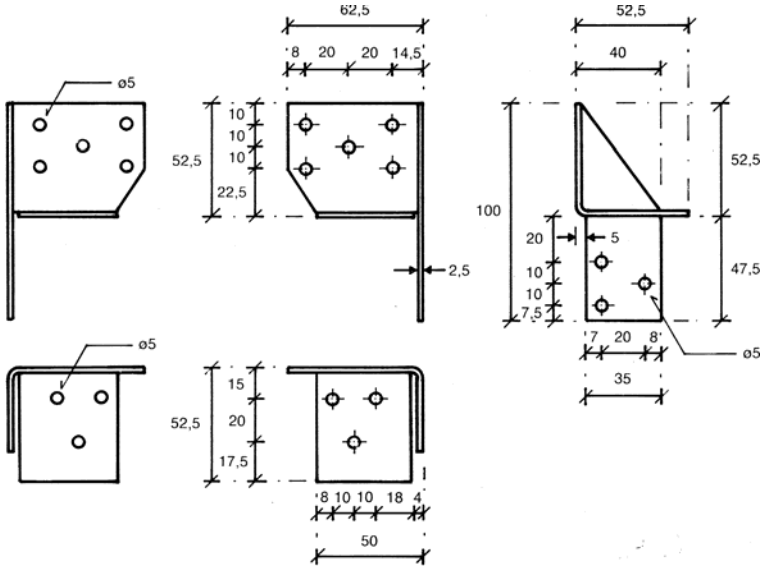
The original French version is signed by

Le Directeur Technique
H. BERRIER

Micro 96

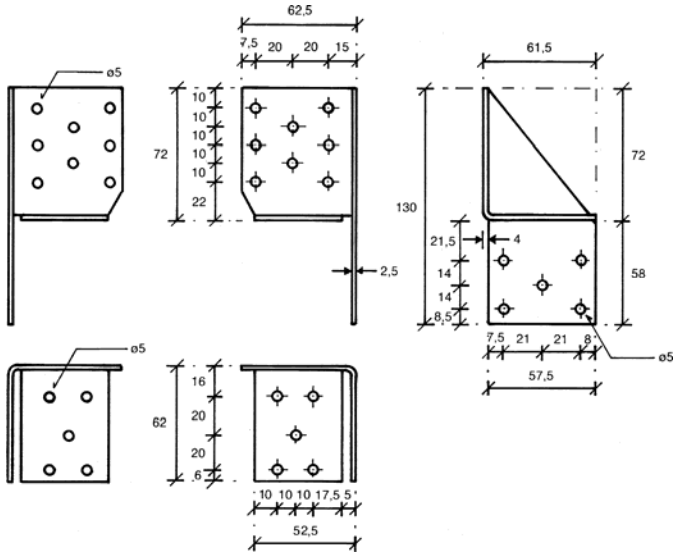


Mini 100

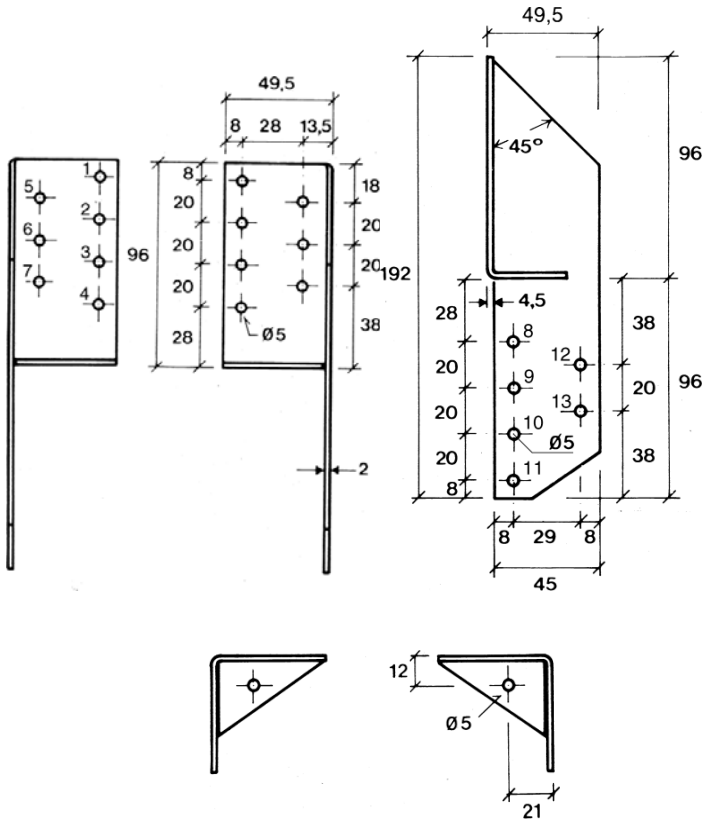


SIMPSON Strong Tie brackets, purlin and joist anchors	**Annex 1**
Universal brackets Micro 96 / Midi 100 **Geometry and drawings**	of European Technical Approval **ETA-07/0137**

Midi 130

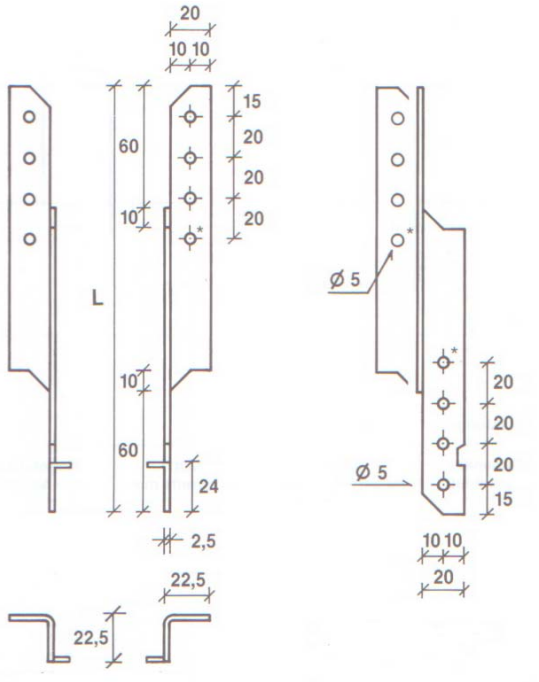


Maxi 190



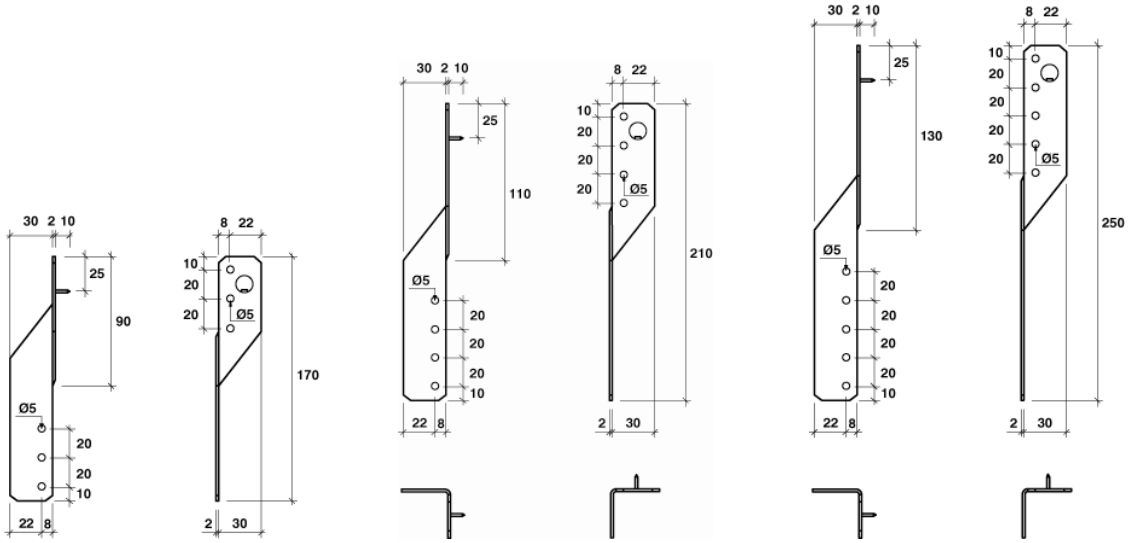
SIMPSON Strong Tie brackets, purlin and joist anchors	**Annex 2**
Universal brackets Midi 130 / Maxi 190 **Geometry and drawings**	of European Technical Approval **ETA-07/0137**

Joist anchors type E and UNI



Joists anchors type E

Model No (type E)	L (mm)	Thick (mm)	Number of holes ø5 mm
32170.00	170	2.5	6
32210.00	210	2.5	8



UNI 170 UNI 210 UNI 250

SIMPSON Strong Tie brackets, purlin and joist anchors	**Annex 3**
Universal brackets UNI **Geometry and drawings**	of European Technical Approval **ETA-07/0137**

Direction of forces nails patterns and other assumptions

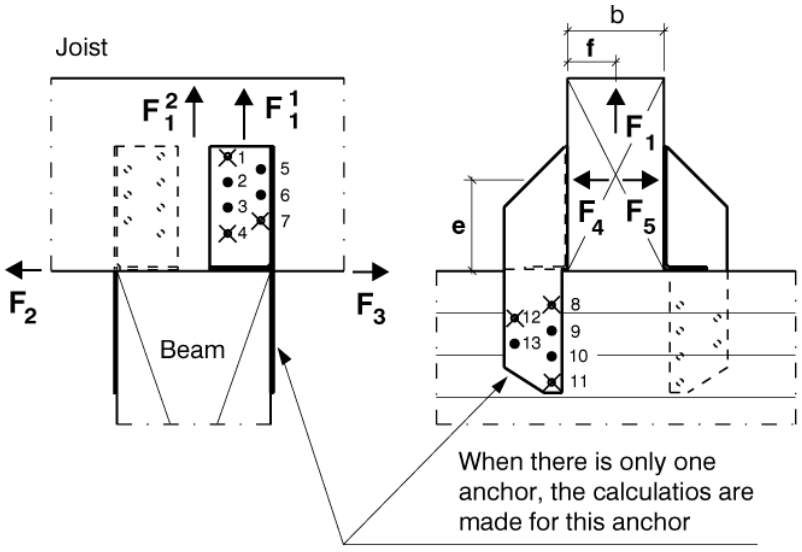
Universal brackets

For the brackets: Maxi 190, Midi 130, Mini 100 and Micro 96 the calculations cover the load-carrying capacities of the connections for nail patterns and forces in the directions shown in the figures below:

Maxi 190

Directions of forces, nail numbers and definition of forces on a single bracket. The 2 brackets are placed diagonally.

Nails pattern:

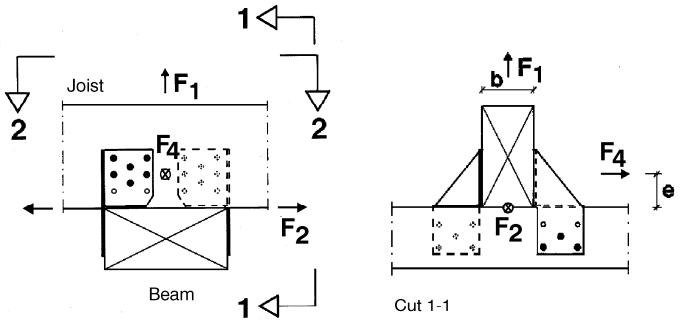


Nail pattern:

- ✕ 3 nails in each end of the bracket: nails in hole no 1, 4, 7 / 8, 11, 12
- • 6 nails in each end of the bracket: nails in hole no 1, 2, 3, 5, 6, 7 / 8, 9, 10, 11, 12, 13

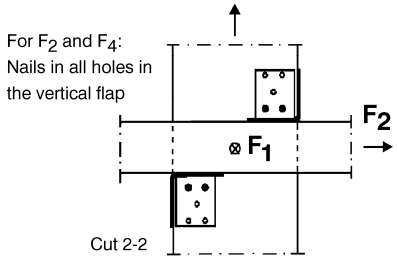
SIMPSON Strong Tie brackets, purlin and joist anchors	**Annex 4**
Universal brackets **Direction of forces**	of European Technical Approval **ETA-07/0137**

Midi 130



$F_2 = F_3$

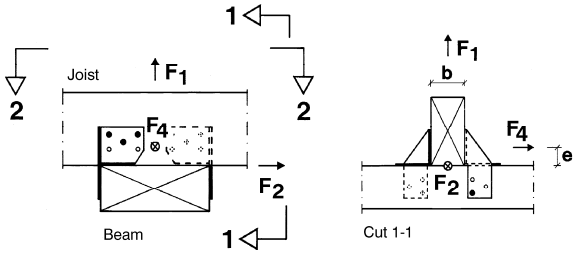
$F_4 = F_5$



○ holes

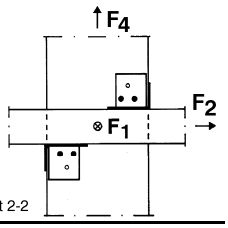
● nails

Mini 100



$F_2 = F_3$

$F_4 = F_5$

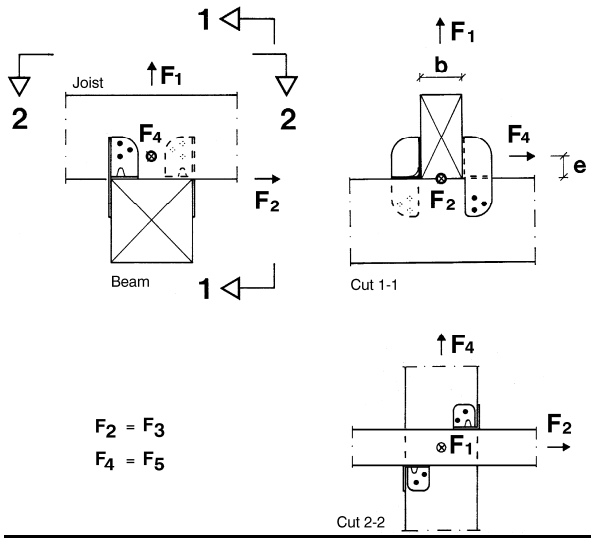


○ holes

● nails

SIMPSON Strong Tie brackets, purlin and joist anchors	**Annex 7**
Universal brackets **Combination of forces**	of European Technical Approval **ETA-07/0137**

Micro 96



Micro 96: direction of forces and nail pattern

It is assumed that forces are positioned in the following way in relation to the connection:

- F_1 - Lifting force
  Typically 2 brackets are used, one on each side of the joist. Therefore, it is assumed that the lifting force is acting at the bending line of the bracket.
  If there is only 1 bracket in the connection but it is secured by the static behaviour of the structure, that the force is acting in the bending line of the bracket then the lifting capacity is half that of a connection with 2 brackets. An example: A single bracket connecting a post to a sill.

- Maxi 190: F_1 - Lifting force acting with a horizontal eccentricity *f*.
  If the lifting force is acting on a single bracket, as assumed for Maxi 190, then the capacity depends on the eccentricity *f*.

- F_2 or F_3 - Axial force in the direction of the purlin.
  It is assumed that the purlin is supported at each end so the force will act at the bottom of the joist.

- F_4 or F_5 - Force perpendicular to the purlin.
  Typically 2 brackets are used, one on each side of the joist. But also only one bracket can be used. The capacity depends on the eccentricity *e*.
  For a single bracket it also depends on whether the force is compressed against the bracket (F_4) or if it results in tension in the nails (F_5). Capacities for a single bracket is stated for Maxi 190.

Combination of forces

When the bracket connection is subjected to more than one of the forces the strength verification can be made by verifying that the following inequalities are valid:

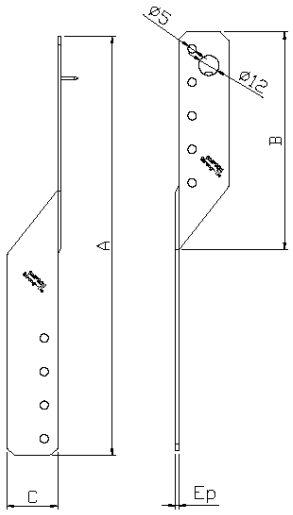
For Micro 96, Mini 100 and Midi 130 subjected to F_1 , F_2 or F_4:

$$\frac{F_{1,d}}{R_{1,d}} + \frac{F_{2,d}}{R_{2,d}} + \frac{F_{4,d}}{R_{4,d}} \leq 1{,}0$$

For Maxi 190:

$$\frac{F_{1,d}}{R_{1,d}} + \frac{F_{2,d}}{R_{2,d}} + \frac{F_{3,d}}{R_{3,d}} + \frac{F_{4,d}}{R_{4,d}} + \frac{F_{5,d}}{R_{5,d}} \leq 1{,}0$$

If F_{2d} has a value then $F_3 = 0$ and the other way around. Similary for F_4 and F_5.

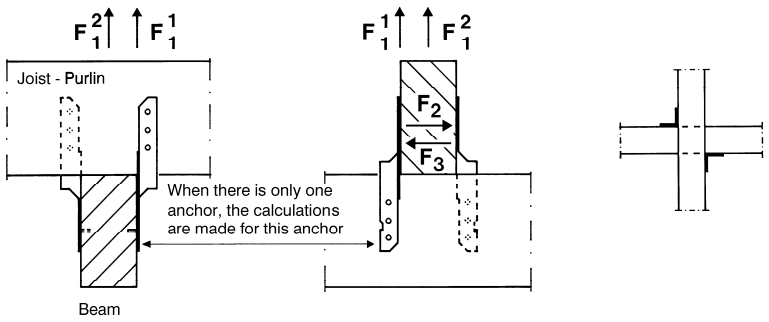


Joists anchors 170 to 250

Model No./Type	A (mm)	B (mm)	C (mm)	Ep (mm)
32170.00	170	100	20	2.5
32210.00	210	140	20	2.5
32570.00	170	90	30	2
32610.00	210	110	30	2
32650.00	250	130	30	2

Table 2 : Joists anchors 170 to 250
Dimensions A, B and C.

For the purlin and joist anchors the calculations cover the load-carrying capacities of the connections for forces in the directions shown in the figure below.



Purlin and joist anchors Direction and definition of forces on a single bracket. The 2 anchors a placed diagonally.

It is assumed that forces are positioned in the following way in relation to the connection:

- F_1 - Lifting force
  Typically 2 anchors are used, one on each side of the joist, placed diagonally. Therefore, it is assumed that the lifting force is acting at the bending line of the anchor.
  If there is only 1 anchor in the connection but it is secured by the static behaviour of the structure, that the force is acting in the bending line of the anchor then the lifting capacity is half that of a connection with 2 anchors. An example: A single anchor connecting a post to a sill.

- F_2 - Horizontal force perpendicular to the purlin toward the anchor

- F_3 - Horizontal force perpendicular to the purlin away from the anchor

- It is assumed that the purlin is supported at each end so the force will act at the bottom of the joist. It is assumed that the forces are acting not more than 20 mm above the surface of the beam member.

- Nail pattern: For a force F_1 the minimum nail distances to loaded and unloaded edge of the timber member shall be respected.

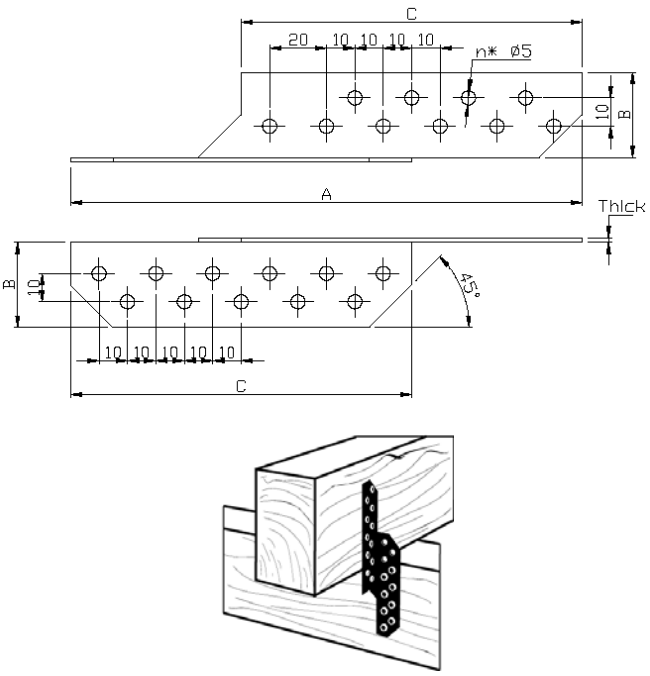
For a force F_2 or F_3 the nails shall be put as close to the joint as possible respecting the minimum nail distance to the edge, the beam and the joist.

Combination of forces

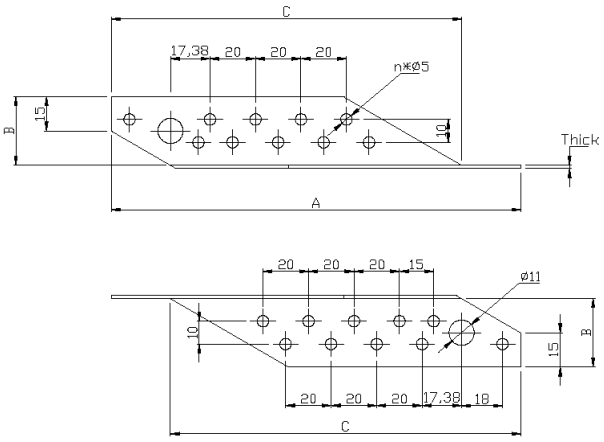
When the anchor connection is subjected to more than one of the forces the strength verification can be made by verifying that the following inequalities are valid:

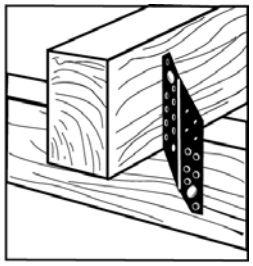
For all purlin and joist anchors: $\frac{F_{1,d}}{R_{1,d}} + \frac{F_{2,d}}{R_{2,d}} + \frac{F_{3,d}}{R_{3,d}} \leq 1{,}0$

SIMPSON Strong Tie brackets, purlin and joist anchors	**Annex 9**
Joist anchors 170 to 250 **Direction and combination of forces**	of European Technical Approval **ETA-07/0137**



Joist anchor PSG and PSD



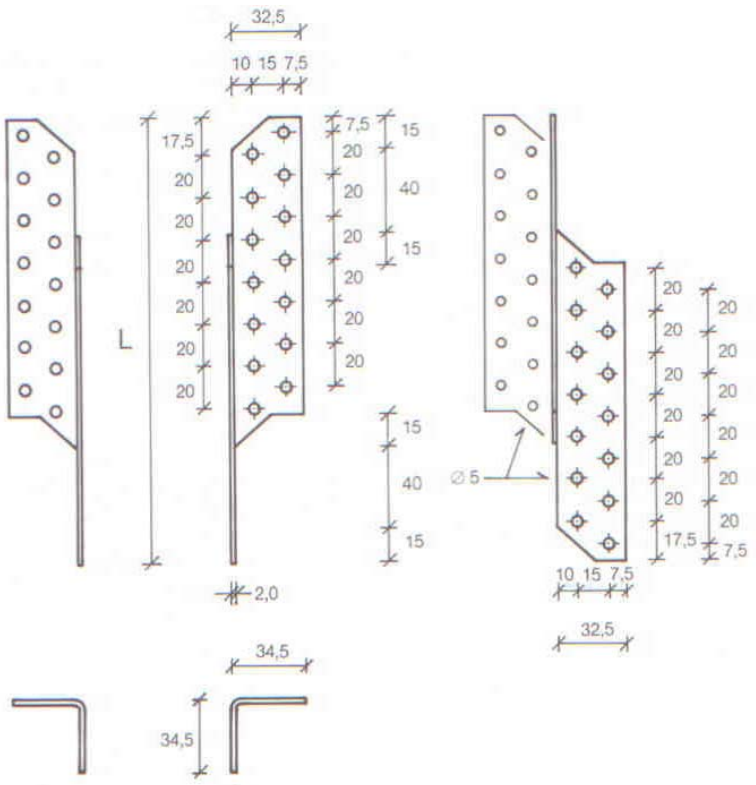


Joist anchor PSTG or PSTD 180/30/1.5

SIMPSON Strong Tie brackets, purlin and joist anchors	**Annex 11**
Joist anchors PSG / PSD / PSTG / PSTD Geometry	of European Technical Approval **ETA-07/0137**

Model No./Type	A (mm)	B (mm)	C (mm)	Thick (mm)	Number of holes ø5 mm
PSD200/30/1.5	200	30	140	1.5	26
PSG200/30/1.5	200	30	140	1.5	26
PSD200/45/2	200	45	140	2	39
PSG200/45/2	200	45	140	2	39
PSD200/30/2	200	30	140	2	26
PSG200/30/2	200	30	140	2	26
PSD220/45/2	220	45	160	2	45
PSG220/45/2	220	45	160	2	45
PSD180/30/1.5	180	30	120	1.5	22
PSG180/30/1.5	180	30	120	1.5	22
PSTD180/30/1.5	180	30	154	1.5	20
PSTG180/30/1.5	180	30	154	1.5	20

Table 3 : Joist anchors PSG / PSD / PSTG / PSTD – Dimensions A, B and C.

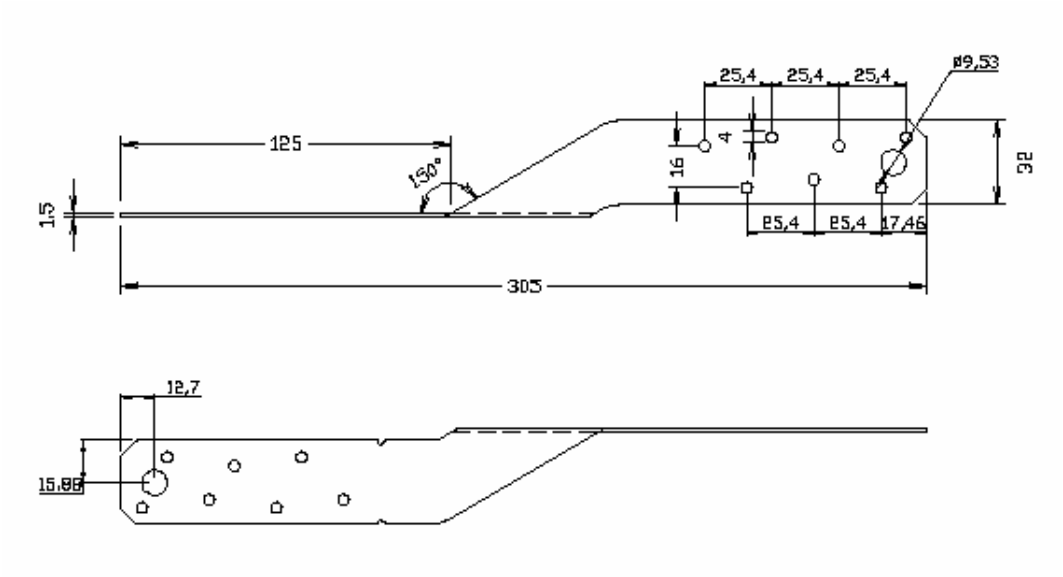


Purlin anchors 170 to 370

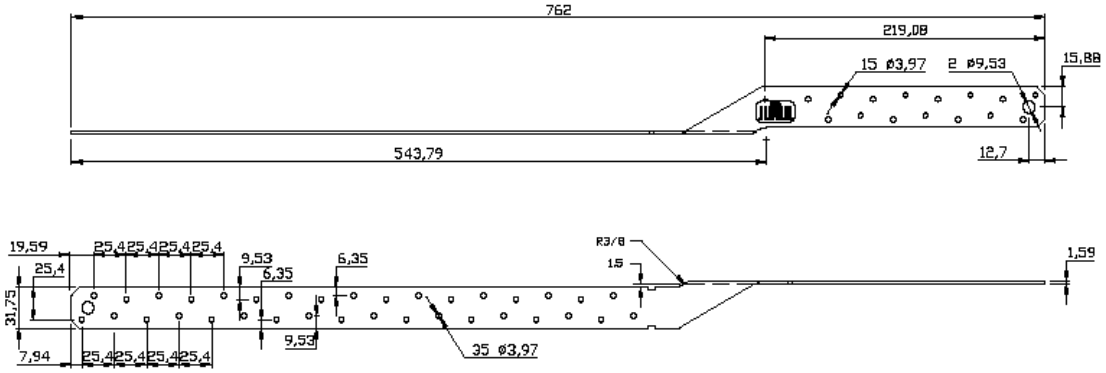
. Model N°	Type	L (mm)	Thickness (mm)	Number of holes ø5 mm
02170.00	Left	170	2	20
02171.00	Right	170	2	20
02210.00	Left	210	2	28
02211.00	Right	210	2	28
02250.00	Left	250	2	36
02251.00	Right	250	2	36
02290.00	Left	290	2	44
02291.00	Right	290	2	44
02330.00	Left	330	2	52
02331.00	Right	330	2	52
02370.00	Left	370	2	60
02371.00	Right	370	2	60

Table 4 : Purlin anchors 170 to 370 – Dimensions A, B and C

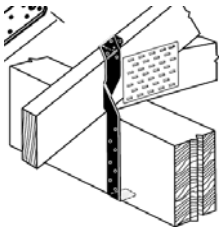
SIMPSON Strong Tie brackets, purlin and joist anchors	**Annex 12**
Purlin anchors 170 to 370 **Geometry and drawings**	of European Technical Approval **ETA-07/0137**



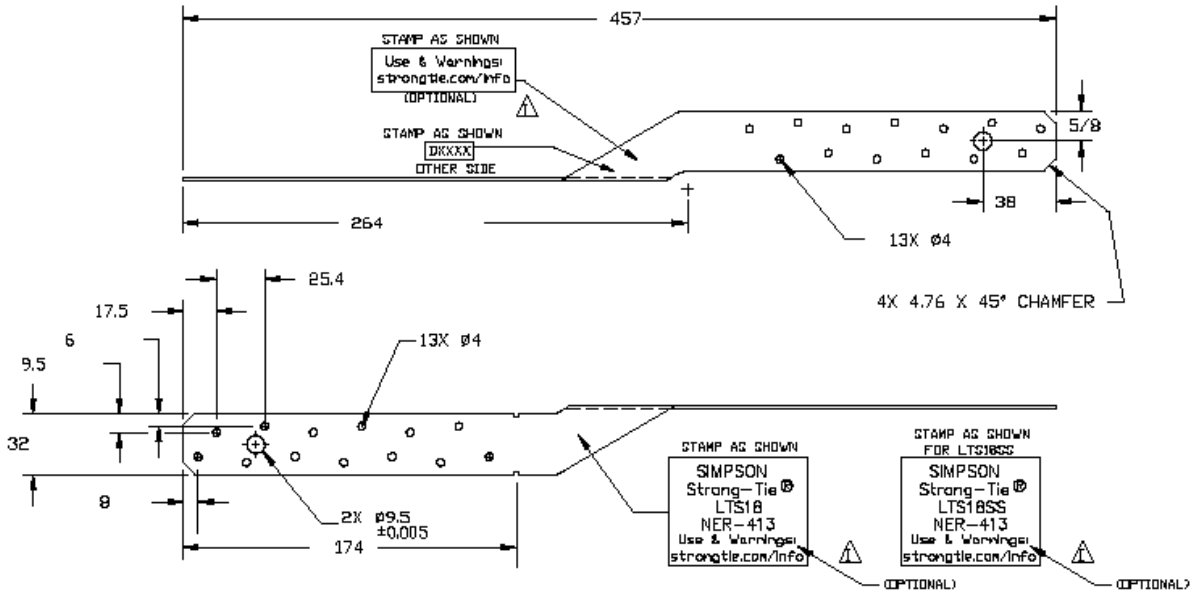
Joist anchor MTS 12



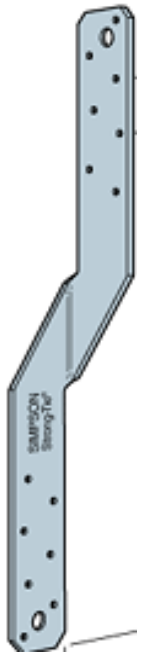
Joist anchor MTS 30



SIMPSON Strong Tie brackets, purlin and joist anchors	**Annex 13**
Joist anchors MTS **Geometry and drawings**	of European Technical Approval **ETA-07/0137**

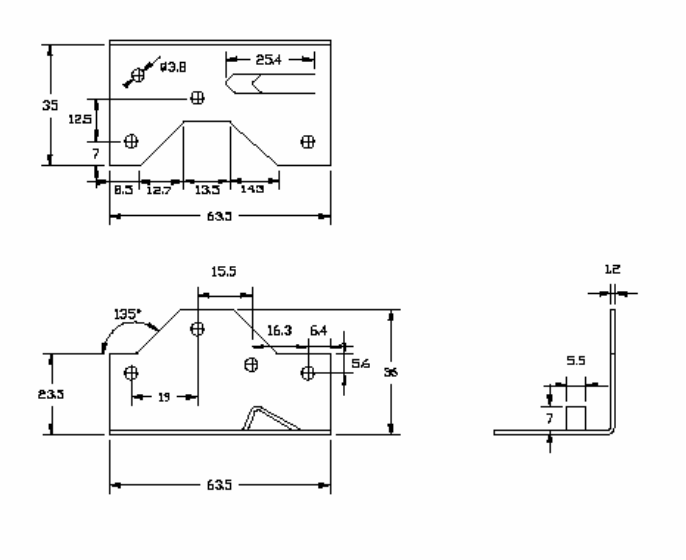


Joist anchor LTS 18

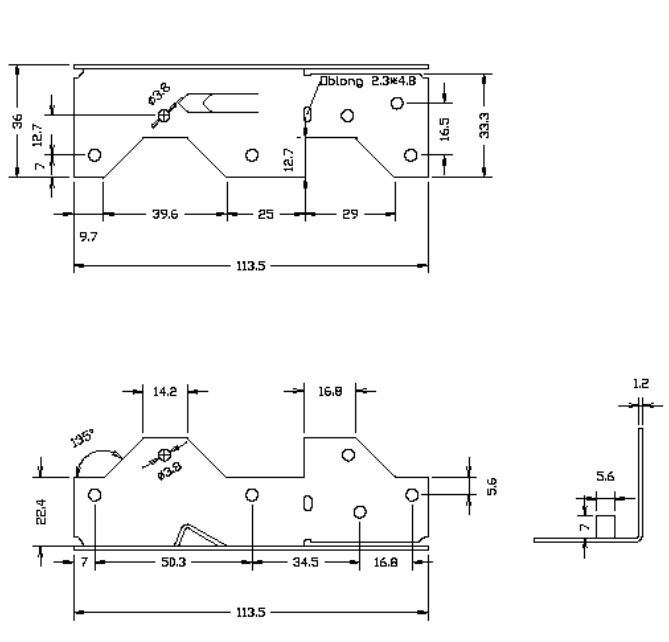


Joist LTS 18 – 3 dimensional view

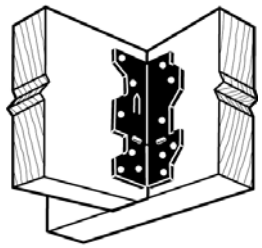
SIMPSON Strong Tie brackets, purlin and joist anchors	**Annex 14**
Joist anchors LTS **Geometry and drawings**	of European Technical Approval **ETA-07/0137**



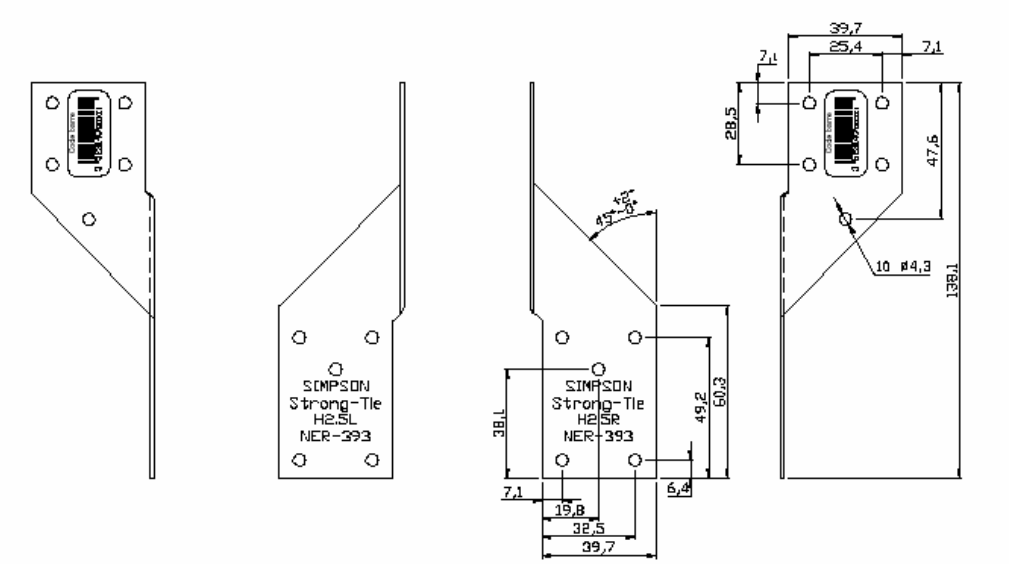
Joist anchor A34



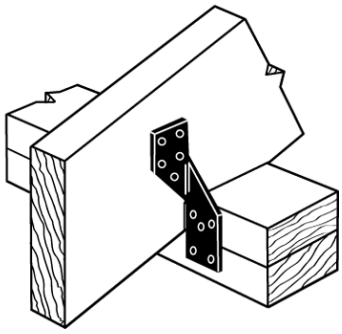
Joist anchor A35



SIMPSON Strong Tie brackets, purlin and joist anchors	**Annex 15**
Joist anchors A34 and A35 **Geometry and drawings**	of European Technical Approval **ETA-07/0137**



Joist anchor H 2.5L and H 2.5R



SIMPSON Strong Tie brackets, purlin and joist anchors	**Annex 16**
Joist anchors H2.5 L and H2.5 R **Geometry and drawings**	of European Technical Approval **ETA-07/0137**

Requirements for the wood members

The wood members can be of solid timber, glued laminated timber and similar glued members, or wood-based structural members with a minimum density of 290 kg/m3

These requirements to the material of the wood members can be fulfilled by using the following materials:

- Solid timber classified to C16-C40 or better according to EN 338
- Glued members of timber classified to C16-C40 or better according to EN 338/EN14081 when structural adhesives are used.
- Glued laminated timber classified to GL24c or better according to EN 1194/EN14080
- Laminated Veneer Lumber LVL according to EN 14374
- Other Engineering Wood products classified for their resistance and with certified mechanical performances for fasteners

Universal bracket Mini100, Midi130 and Maxi190 :

Characteristic capacities are based on a characteristic density of the wood members of 350 kg/m³. Lower densities are applicable but the load bearing capacities shall be reduced by the k_{dens} factor, given by

$$k_{dens} = \left(\frac{\rho_k}{350} \right)^2$$

Where ρ_k is the characteristic density of the timber in kg/m³.

Universal bracket Micro96, purlin anchors and joist anchors :

The calculation method for deciding characteristic capacities is only allowed for a characteristic wood density of up to 460 kg/m3. Even though the wood based material may have a greater density, this must not be used in the formulas for the load-carrying capacity of the connectors.

Applicable fasteners types and sizes in the cases where the load carrying capacities are expressed by a formula

Nails diameter	Length Min-Max	Correspondent Hole Diameter Min-Max	Nail Type
3.1	40 – 60	3.4 – 4.0	Connector nails in accordance with ETA 04/0013
4.0	35 – 100	4.4 – 5.0	Connector nails in accordance with ETA 04/0013
4.2	35 – 60	4.7 – 5.3	Connector nails in accordance with ETA 04/0013
3.1	35	3.4 – 4.0	Ring shank nails in accordance to EN 14592
4.0	35 – 100	4.4 – 5.0	Ring shank nails in accordance to EN 14592
3.75	30 – 32	3.8 – 5.0	Square twist nails in accordance to EN 14592
3.35	65	3.4 – 4.0	Ring shank nails in accordance to EN 14592

Screw diameter	Length Min-Max	Correspondent Hole Diameter Min-Max	Screw Type
5.0	35 - 50	5.0	Connector screws in accordance with ETA 04/0013

The applicable fastener types and sizes in the cases where the load carrying capacities are expressed by a number i.e Universal Bracket Mini 100, Midi 130 and Maxi 190 are stated together with the load carrying capacity of the connector.

$R_{1,k}$ is the characteristic lifting capacity for two brackets.
$R_{2,k}$ and $R_{3,k}$ are the characteristic axial capacities in the direction of the joist for two brackets.
$R_{4,k}$ and $R_{5,k}$ are the characteristic capacities in the direction perpendicular to the joist and for two brackets.

Micro 96 :

All capacities given in kN for a connection with two brackets, one on each side of the purlin.

$$R_{1,k} = 2{,}38 \bullet k_{mod} \bullet R_{lat,k}$$
$$R_{2,k} = R_{3,k} = 1{,}37 \bullet k_{mod} \bullet R_{lat,k}$$
$$R_{4,k} = R_{5,k} = \text{Min} \left(2{,}74 \bullet k_{mod} \bullet R_{lat,k} ; k_1 \bullet (b + k_2) / e \right)$$

With b the joist width, e the eccentricity of the horizontal load acting perpendicular to the joist and k_{mod} the appropriate modification factor.

With $k_1 = \text{Min} (2 \bullet k_{mod} \bullet R_{ax,k} ; 0{,}48) + 1{,}19 \bullet k_{mod} \bullet R_{lat,k}$
And with $k_2 = [\text{Min} (2 \bullet k_{mod} \bullet R_{ax,k} ; 0{,}48) \bullet 22.5 + 7.1 \bullet k_{mod} \bullet R_{lat,k}] / k_1$

Mini 100 :

All capacities are given in kN for a connection with two brackets, one on each side of the purlin and only for connector nails in accordance with ETA-04/0013 with the dimensions 4.0 x 40 and 4.0 x 50 mm or with the dimensions 4.2 x 40 and 4.2 x 50 mm.

$R_{1,k}$:

Load duration	Perm.	Long	Medium	Short	Inst.
Nail 4.0 x 40	3,7	4,3	4,9	5,4	6,3
Nail 4.0 x 50	4,6	5,3	5,7	6,2	7,3

$$R_{2,k} = R_{3,k} = 2{,}56 \bullet k_{mod} \bullet R_{lat,k}$$
$$R_{4,k} = R_{5,k} = \text{Min} \left(4 \bullet k_{mod} \bullet R_{lat,k} ; k_1 \bullet (b + k_2) / e \right)$$

With b the joist width, e the eccentricity of the horizontal load acting perpendicular to the joist and k_{mod} the appropriate modification factor.

With k_1 and k_2 resp. in kN and mm from the table below :

Load duration		Perm.	Long	Medium	Short	Inst.
With nail 4.0 x 40 : k_1	[kN]	1,7	2,0	2,3	2,6	3,5
With nail 4.0 x 50 : k_1	[kN]	1,9	2,2	2,6	3,0	3,8
With nail 4.0 x 40 : k_2	[mm]	16	16	16	16	16
With nail 4.0 x 50 : k_2	[mm]	16	16	16	16	16

Midi 130 :

All capacities are given in kN for a connection with two brackets, one on each side of the purlin and only for connector nails in accordance with ETA-04/0013 with the dimensions 4.0 x 40 and 4.0 x 50 mm or with the dimensions 4.2 x 40 and 4.2 x 50 mm.

$R_{1,k}$:

Load duration	Perm.	Long	Medium	Short	Inst.
Nail 4.0 x 40	6,7	7,8	8,9	9,9	11,8
Nail 4.0 x 50	8,8	10,3	11,5	12,7	15,3

$$R_{2,k} = R_{3,k} = 4{,}31 \bullet k_{mod} \bullet R_{lat,k}$$
$$R_{4,k} = R_{5,k} = \text{Min} \left(4{,}33 \bullet k_{mod} \bullet R_{lat,k} \; ; \; k_1 \bullet (b + k_2) / e \right)$$

With b the joist width, e the eccentricity of the horizontal load acting perpendicular to the joist and k_{mod} the appropriate modification factor.

With k_1 and k_2 resp. in kN and mm from the Table below :

Load duration		Perm.	Long	Medium	Short	Inst.
With nail 4.0 x 40 : k_1	[kN]	3,5	4,0	4,6	5,2	6,4
With nail 4.0 x 50 : k_1	[kN]	4,0	4,7	5,4	6,0	7,4
With nail 4.0 x 40 : k_2	[mm]	21	21	21	21	21
With nail 4.0 x 50 : k_2	[mm]	23	22	22	22	23

Maxi 190 (2 brackets per connection) :

All capacities are given in kN for a connection with two brackets, one on each side of the purlin and only for connector nails in accordance with ETA-04/0013 with the dimensions 4.0 x 40 and 4.0 x 50 mm or with the dimensions 4.2 x 40 and 4.2 x 50 mm.

$R_{1,k}$: values given for 3 nails (or 6 nails) in each end of the brackets + 1 nail in the horizontal flap

Load duration	Perm.	Long	Medium	Short	Inst.
Nail 4.0 x 40	4,8 (9,6)	5,6 (11,2)	6,4 (12,9)	7,2 (14,5)	8,8 (17,7)
Nail 4.0 x 50	5,9 (9,9)	6,8 (11,5)	7,8 (13,2)	8,8 (14,8)	10,7 (18,1)

$R_{2,k}$ and $R_{3,k}$: values given for 3 nails (or 6 nails) in each end of the bracket + 1 nail in the horizontal flap

Load duration	Perm.	Long	Medium	Short	Inst.
Nail 4.0 x 40	2,9 (3,4)	3,3 (4,0)	3,7 (4,5)	4,1 (5,0)	5,0 (6,0)
Nail 4.0 x 50	3,4 (4,1)	3,9 (4,7)	4,4 (5,3)	4,9 (5,9)	5,9 (7,2)

$R_{4,k} = R_{5,k}$ = Min (2,3 • k_{mod} • $R_{lat,k}$ if 3 nails ; 3,2 • k_{mod} • $R_{lat,k}$ if 6 nails ; k_1 • (b + k_2) / e)

With k_1 and k_2 resp. in kN and mm, given for 3 nails (or 6 nails) from the table below :

Load duration		Perm.	Long	Medium	Short	Inst.
With nail 4.0 x 40 : k_1	[kN]	2,5 (4,8)	2,9 (5,6)	3,3 (6,4)	3,7 (7,2)	4,5 (8,8)
With nail 4.0 x 50 : k_1	[kN]	3,0 (5,1)	3,5 (6,0)	4,0 (6,8)	4,5 (7,7)	5,5 (9,4)
With nail 4.0 x 40 : k_2	[mm]	7 (7)	7 (7)	7 (7)	7 (7)	7 (7)
With nail 4.0 x 50 : k_2	[mm]	7 (5)	7 (5)	7 (5)	7 (5)	7 (5)

Maxi 190 (1 bracket per connection) :

All capacities are given in kN for a connection one bracket and only for connector nails in accordance with ETA-04/0013 with the dimensions 4.0 x 40 and 4.0 x 50 mm or with the dimensions 4.2 x 40 and 4.2 x 50 mm.

$R_{1,k}$: values calculated as follows:

$$R_{1,k} = k_1 \bullet k_{mod} / (k_2 + f) \quad \text{for } f < f_{lim}$$

$$R_{1,k} = k_3 \bullet k_{mod} / f \quad \text{for } f > f_{lim}$$

With k_1, k_2, k_3 and f_{lim} given in the following table for 3 nails (or 6 nails) :

Load duration	k_1	k_2	k_3	f_{lim}
Unit	[kN]	[mm]	[kN]	[mm]
Nail 4.0 x 40	94 (89)	24 (13)	63 (66)	48 (37)
Nail 4.0 x 50	121 (118)	25 (14)	80 (86)	49 (38)

With f the horizontal eccentricity of the uplift load.

$R_{2,k}$ = 0,42 kN for all load durations

$$R_{3,k} = (1 + k_1) \bullet k_{mod} \bullet R_{lat,k}$$

With k_1 from the table below :

Load duration	k_1
3 nails	2,26
6 nails	2,76

$$R_{4,k} = k_1 \bullet k_{mod} / (k_2 + e)$$

With k_1 and k_2 for 3 nails (or 6 nails) from the table below and e the vertical eccentricity of the force ; except for 6 nails 4.0 x 50 and instantaneous load duration : $R_{4,k}$ = 257 / (47 + e)

	k_1	k_2
Unit	[kN]	[mm]
Nail 4.0 x 40	193 (264)	78 (65)
Nail 4.0 x 50	235 (321)	78 (65)

$$R_{5,k} = k_1 \bullet k_{mod} / (93 - e) \quad \text{for } e < e_{lim}$$

$$R_{5,k} = k_2 \bullet k_{mod} / f \quad \text{for } e > e_{lim}$$

With k_1, k_2 and e_{lim} for 3 nails (or 6 nails) from the Table below :

Load duration	k_1	k_2	e_{lim}
Unit	[kN]	[mm]	[mm]
Nail 4.0 x 40	63 (67)	41 (67)	56 (47)
Nail 4.0 x 50	83 (88)	54 (88)	56 (47)

$R_{1,k}$ is the characteristic lifting capacity for one purlin anchor with the assumption that two purlin anchors are placed diagonally.
$R_{2,k}$ is the horizontal characteristic capacity toward the purlin anchor for one purlin anchor.
$R_{3,k}$ is the horizontal characteristic capacity away from the purlin anchor, perpendicular to the purlin for one purlin anchor.

Purlin 170 to 370 :

All capacities given in kN for a connection with one purlin anchor.

$R_{1,k}$ = Min ($k_1 \bullet k_{mod} \bullet R_{lat,k}$; 6 kN in the flat cross section ; 13,4 kN in the folded cross section)

$R_{2,k}$ = Min ($k_2 \bullet k_{mod} \bullet R_{lat,k}$; 2,60 + 1,82 $\bullet$ k_{mod} $\bullet$ $R_{ax,k}$)

$R_{3,k}$ = Min ($k_3 \bullet k_{mod} \bullet R_{lat,k}$; 2 $\bullet$ k_{mod} $\bullet$ $R_{ax,k}$; 2,60 + 1,81 $\bullet$ k_{mod} $\bullet$ $R_{ax,k}$)

With k_1, k_2 and k_3 factors without dimensions depending on the type of purlin and the number of nail according to the following table:

Purlin anchor	Number of nails	k_1	k_2 and k_3
170	4	2,33	0,77
	5	3,13	1,19
210	6	4,30	1,32
	7	5,26	1,83
250	8	6,45	2,05
	9	7,45	2,53
290	10	8,63	2,62
	11	9,64	3,25
330	12	10,80	3,97
	13	11,81	4,00
370	14	12,82	4,07
	15	13,94	4,77

In the case where two purlin anchors (one on each side of the joist) are loaded with a horizontal force, the capacity is the sum of the above stated capacities $R_{2,k}$ and $R_{3,k}$.

$R_{1,k}$ is the characteristic lifting capacity for one joist anchor with the assumption that two joist anchors are placed diagonally.
$R_{2,k}$ is the horizontal characteristic capacity toward the joist anchor.
$R_{3,k}$ is the horizontal characteristic away from the joist anchor.

Joist anchors type 170E and 210E :

All capacities given in kN for a connection with one joist anchor.

$R_{1,k}$ = Min (k_1 • k_{mod} • $R_{lat,k}$; 4,53 kN)

With k_1 factor without dimension given in the table below.

$R_{2,k}$ = Min (k_2 • k_{mod} • $R_{lat,k}$; 81 / e)

With e the internal eccentricity (50 mm for the maximum number of nails and 70 mm for fewer) and k_2 factor without dimension given in the table below.

$R_{3,k}$ = Min (k_3 • k_{mod} • $R_{lat,k}$; 81 / e)

With e the internal eccentricity (60 mm for the maximum number of nails and 80 mm for fewer) and k_3 factor without dimension given in the table below.

Joist anchor	Number of nails	k_1	k_2	k_3
170	2	1,35	0,22	0,2
	3	2,49	0,57	0,5
210	3	2,47	0,44	0,4
	4	3,58	0,89	0,8

In the case where two joists anchors (one on each side of the joist) are loaded with a horizontal force, the capacity is the sum of the above stated capacities $R_{2,k}$ and $R_{3,k}$

$R_{1,k}$ is the characteristic lifting capacity for one joist anchor with the assumption that two joist anchors are placed diagonally.
$R_{2,k}$ is the horizontal characteristic capacity with two joist anchors (one on each side).

Joist anchors type PS 180 to PS 220 and PST :

All capacities given in kN for a connection with one joist anchor for uplift characteristics ($R_{k,1}$) and two joist anchors for horizontal characteristics ($R_{k,2}$).

$$R_{1,k} = \text{Min} (k_1 \bullet k_{mod} \bullet R_{lat,k} ; R_{steel})$$

With k_1 factor without dimension and R_{steel} given in the table below.

$$R_{2,k} = \text{Min} (k_2 \bullet k_{mod} \bullet R_{lat,k} ; [(55 \bullet k_{mod} \bullet R_{ax,k}) + M_y] / e) + \text{Min} (k_2 \bullet k_{mod} \bullet R_{lat,k} ; 2 \bullet k_{mod} \bullet R_{ax,k} ; M_y / 60)$$

With k_2 factor without dimension given in the table below.

Joist anchor	k_1	k_2	R_{steel}	M_y
Unit	-	-	[kN]	[kN.mm]
PS180 / 30 / 1,5	4,21	1,57	4,92	92,0
PS200 / 30 / 1,5	5,36	1,91	4,92	92,0
PS200 / 30 / 2,0	5,32	1,91	6,54	122
PS200 / 45 / 2,0	6,40	2,97	9,97	205
PS220 / 45 / 2,0	8,32	3,82	9,97	205
PST	3,63	1,53	4,79	94,4

The values given for PS are valid for PSG and PSD joist anchors.
The values given for PST are valid for PSTG and PSDG joist anchors.

$R_{1,k}$ is the characteristic lifting capacity for one joist anchor with the assumption that two joist anchors are placed diagonally.
$R_{2,k}$ is the horizontal characteristic capacity with two joist anchors (one on each side).

Joist anchors type H2.5 :

All capacities given in kN for a connection with one joist anchor for uplift characteristics ($R_{1,k}$) and two joist anchors for horizontal characteristics ($R_{2,k}$).

$$R_{1,k} = \text{Min}\ (1{,}61 \bullet k_{mod} \bullet R_{lat,k}\ ;\ 8{,}07\ \text{kN})$$

$$R_{2,k} = \text{Min}\ (0{,}96 \bullet k_{mod} \bullet R_{lat,k}\ ;\ 2{,}9\ \text{kN})$$

Joist anchors type MTS and LTS :

Capacity given in kN for a connection with one joist anchor for uplift characteristics ($R_{1,k}$)

$$R_{1,k} = \text{Min}\ (k_1 \bullet k_{mod} \bullet R_{lat,k}\ ;\ R_{steel})$$

With k_1 factor without dimension and steel capacity R_{steel} given in the following table

Joist anchor	Number of nails	k_1	R_{steel}
Unit	-	-	[kN]
MTS 12 and MTS 30	4	3,10	4,02
	5	3,54	
	6	4,68	
	7	5,64	
LTS 18	4	2,43	2,89
	5	3,25	
	6	4,30	
	7	5,42	

$R_{1,k}$ is the characteristic lifting capacity for one joist anchor with the assumption that two joist anchors are placed diagonally.
$R_{2,k}$ is the horizontal characteristic capacity for one joist anchors.

Joist anchors type A34 :

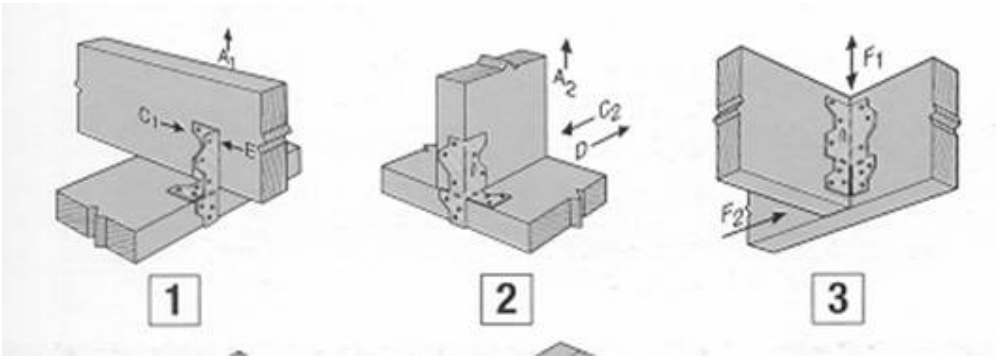
All capacities given in kN for a connection with one joist anchor for uplift characteristics ($R_{1,k}$) and for horizontal characteristics ($R_{2,k}$).

$$R_{1,k} = 2{,}04 \bullet k_{mod} \bullet R_{lat,k}$$

$$R_{2,k} = \text{Min} (3 \bullet k_{mod} \bullet R_{lat,k} ; 3{,}4 \bullet k_{mod})$$

Joist anchors type A35 :

All capacities given in kN for a connection with two joist anchors one on each side of the joist



Uplift : A_1 joist-joist or A_2 column-joist

$$R_{A1,k} = R_{A2,k} = 2{,}81 \bullet k_{mod} \bullet R_{lat,k} + \text{Min} (2 \bullet k_{mod} \bullet R_{ax,k} ; 0{,}78 \text{ kN})$$

Horizontal load : C_1 joist-joist or D column-joist or E joist-joist

$$R_{C1,k} = R_{D2,k} = R_{E,k} = 2{,}21 \bullet k_{mod} \bullet R_{lat,k}$$

Horizontal load : C_2 column-joist

$$R_{C2,k} = 2{,}21 \bullet k_{mod} \bullet R_{lat,k} + 0{,}24 \text{ kN}$$

Shear load : F_1 joist-header

$$R_{F1,k} = 10{,}5 \bullet k_{mod} \bullet R_{lat,k}$$

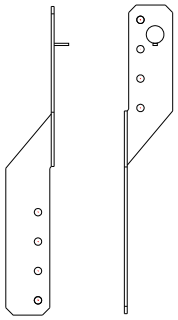
Horizontal load: F2 joist-header

$$R_{F2,k} = \text{Min} (9{,}2 \bullet k_{mod} ; 23 \bullet k_{mod} \bullet R_{ax,k} ; 8 \bullet k_{mod} \bullet R_{lat,k})$$

SIMPSON Strong Tie brackets, purlin and joist anchors	**Annex 27**
Joist anchors capacities **Joist anchors A34 and A35**	of European Technical Approval **ETA-07/0137**

Addition for ETA 07/0137 / version 05-03-2010

Joist anchors type PFU170, PFU210 and PFU250:



All capacities given in kN for a connection with one joist anchor.

$R_{1,k}$ = Min ($k_1 \cdot k_{mod} \cdot R_{lat,k}$; 5,2 kN) PFU170

$R_{1,k}$ = Min ($k_1 \cdot k_{mod} \cdot R_{lat,k}$; 7,3 kN) PFU210 and PFU250

$R_{2,k}$ = Min ($k_2 \cdot k_{mod} \cdot R_{lat,k}$; A / e)

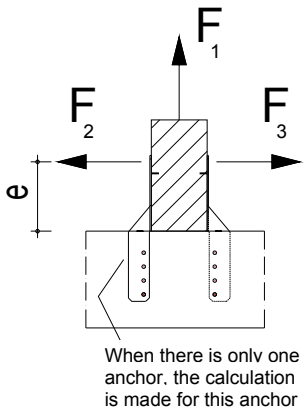
$R_{3,k}$ = Min ($k_3 \cdot k_{mod} \cdot R_{lat,k}$; A / e)

With:
e = the distance from the action force to the contact surface.

$R_{lat,k}$ = the characteristic lateral capacity of the CNA-Nail / CSA-Screw in [kN]

k_1 , k_2 , k_3 factor and A without dimension given in the table below

joist anchor	number of nails	k_1	k_2	k_3	A
170	2	1,49	0,22	0,20	174
	3	2,62	0,57	0,50	
210	3	2,62	0,44	0,40	244
	4	3,70	0,89	0,80	
250	4	3,70	0,73	0,67	
	5	4,76	1,27	1,17	



In the case where two joist anchors (one on each side of the joist) are loaded with a horizontal force, the capacity is the sum of the above stated capacities $R_{2,k}$ and $R_{3,k}$