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to Article 29 of the Regulation (EU)
No 305/2011 of the European
Parliament and of the Council of 9
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MEMBER OF EOTA



European Technical Assessment ETA-12/0237 of 05/07/2017

I General Part

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

Trade name of the construction product:

Tecfi Joist hangers type KT and KW

Product family to which the above construction product belongs:

Three-dimensional nailing plate (Joist hanger for wood to wood connections)

Manufacturer:

Tecfi SpA
Strada Statale Appia, Km. 193
IT-81050 Pastorano (CE)
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Fax +39 0823 88 32 60
Internet www.tecfi.it

Manufacturing plant:

Tecfi SpA
Strada Statale Appia, Km. 193
IT-81050 Pastorano (CE)

This European Technical Assessment contains:

20 pages including 2 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 2012-07-05 and expiry on 2017-07-05

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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

Tecfi Joist hangers type KT and KW are one-piece, non-welded joist hangers. They are face mounted timber-to-timber joist hangers connected to the header beam and the joist with a range of screws.

The joist hangers are made from pre-galvanized steel Grade DX51D + Z275 according to EN 10327:2004. Dimensions, hole positions, steel type and typical installations are shown in Annex A.

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.

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 400 kg/m³. 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.

For timber or wood based material with a lower characteristic density than 400 kg/m³ the load carrying capacities shall be reduced by the k_{dens} factor, given by

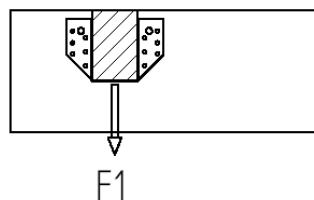
$$k_{dens} = \left(\frac{\rho_k}{400} \right)^{0,5}$$

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

Annex B gives the tables 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.

It is assumed that the force acting on the joist hanger connection is F_1 as shown in the figure below. The force shall act in the middle of the joist hanger.



It is assumed that the header is prevented from rotating. Similar it is assumed that the concrete structure or the steel member to which the joist hanger is bolted does not rotate.

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 scope of the angle brackets 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 angle 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 Performance of the product and references to the methods used for its assessment

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability*) (BWR1)	
Characteristic load-carrying capacity	See Annex B
Stiffness	No performance determined
Ductility in cyclic testing	No performance determined
3.2 Safety in case of fire (BWR2)	
Reaction to fire	The joist hangers are made from steel classified as Euroclass A1 in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364
3.3 Hygiene, health and the environment (BWR3)	
Influence on air quality	No dangerous materials
3.7 Sustainable use of natural resources (BWR7)	No performance determined
3.8 General aspects related to the performance of the product	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, 2 and 3
Identification	See Annex A

*) See additional information in section 3.9 – 3.12.

In addition to the specific clauses relating to dangerous substances contained in this European technical Assessment, 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 Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

3.9 Methods of verification

Safety principles and partial factors

The characteristic load-carrying capacities have been determined on the basis of testing without considering different ratios between the partial factors for timber connections and steel cross sections. Therefore, in the end use calculation based on this ETA, this shall be considered.

The values in annex B have been determined by multiplying the calculated resistance of the connection by k_{mod} to consider load duration and service classes in accordance with EC 5.

3.10 Mechanical resistance and stability

See annex B for characteristic load-carrying capacity in the directions F_1 .

The characteristic capacities of the joist hangers 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.

The design models allow the use of fasteners described in the table on page 15 in Annex A

Screws in accordance with EN 14592

In Annex B the capacities for screws calculated from the formulas of Eurocode 5 are used assuming a thick steel plate when calculating the lateral screw load-carrying-capacity.

The load bearing capacities of the brackets has been determined based on the use of connector screws 5,0 mm (outer thread diameter) x 40mm or 30mm (thread length) in accordance with the EN 14592.

The shape of the screw directly under the head shall be in the form of a truncated cone with a diameter under the screw head which exceeds the hole diameter.

5,0 mm threaded screws with a truncated cone below the head are used as fasteners, which are particularly suitable for screwed steel-to-timber connections. The specific shape below the head causes a clamping of screws in the steel plate.

The joist hangers are mounted using either full or half screw pattern.

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, 2 and 3. In accordance with ETAG 015 the joist hanger has a zinc coating weight of min Z275. The steel employed is DX51D + Z275 according to EN 10346.

3.12 General aspects related to the use of the product

Tecfi joist hangers type KT and KW are manufactured in accordance with the provisions of this European Technical Approval 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

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.

Wood to wood connections

- Joist hangers can be fastened to wood-based members by screws.
- There shall be screws in all holes or a partial screw pattern as prescribed in Annex A 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.
- The width of the joist shall be at least the penetration length of the screws, for full screw pattern and partial screw pattern without staggering the screws in the joist. For partial screw pattern with staggered screws in the joist the width shall be at least the penetration length of the screws.

- 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 screw in the joist.
- Screws to be used shall have a diameter, which fits the holes of the joist hangers.

In addition, the following requirements apply to the joist hanger type KW:

- The number of screws in the joist shall be at least twice the number of screws in the header
- The screws in the joist shall be evenly distributed over the screwing plate
- The screws nearest top the joist is utilized first
- The requirements for the screw distance in direction of the fibres shall be fulfilled

4 Attestation and verification of constancy of performance (AVCP)

4.1 AVCP system

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

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

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

Issued in Copenhagen on 2017-07-05 by



Thomas Bruun
Manager, ETA-Danmark

Annex A
Product details and dimensions

Fastener specification

Screw type	Nail and screw size (mm)		Finish
	Diameter	Length	
Tecfi TM Connector screw according to EN 14592	5,0	30 and 40	Electroplated zinc

Joist hanger specification

Figure 1 - Joist Hanger – Type KT specification

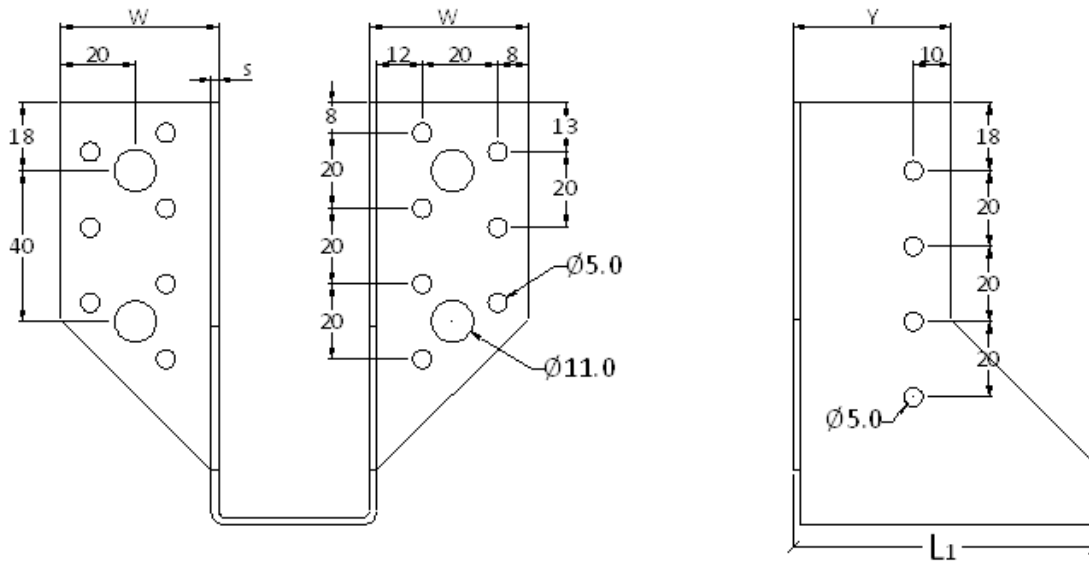


Figure 2 - Joist Hanger – Type KW specification

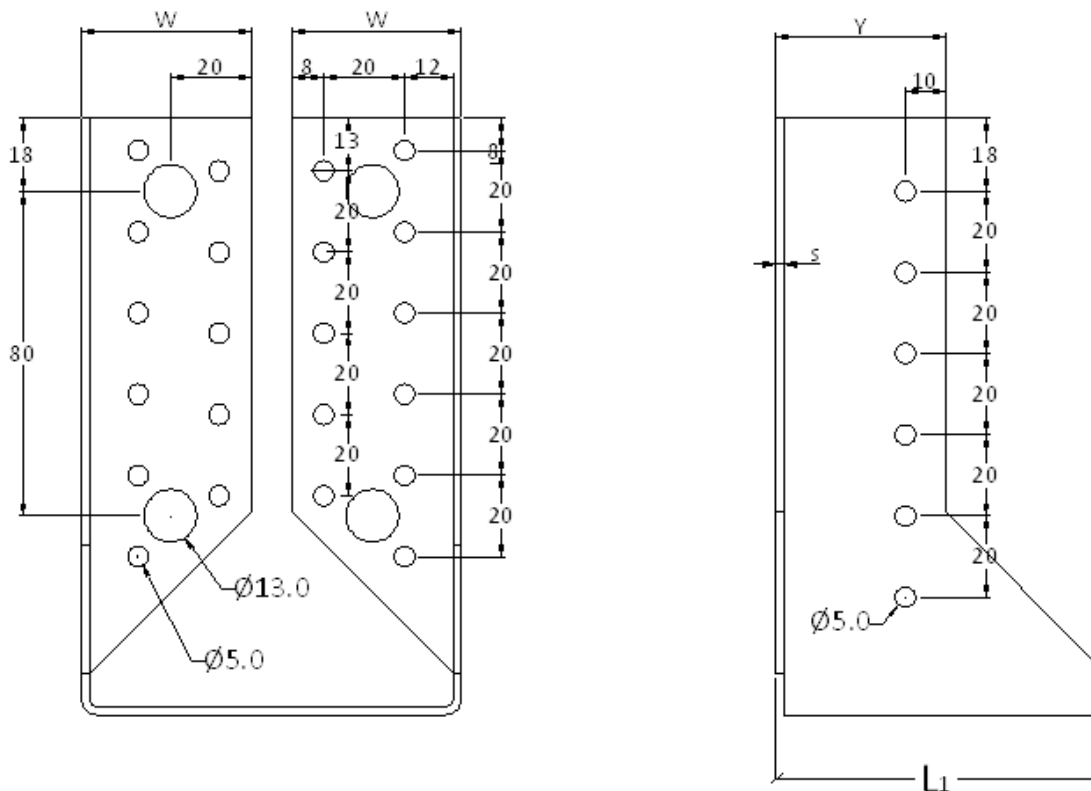


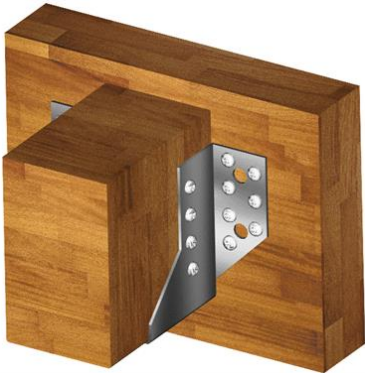
Table 1: Dimensions (in mm) for the different joist hanger types – Type KT

Configuration	Size				Number of holes	
	L ₁	W	Y	s	Frontal Wing	Lateral Wing
1	80	42	42	2	7	4
2	80	42	42	2	9	5
3	80	42	42	2	11	6
4	80	42	42	2	13	7
5	80	42	42	2	15	8

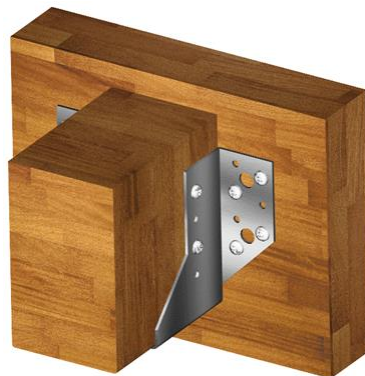
Table 2: Dimensions (in mm) for the different joist hanger types – Type KW

Configuration	Size				Number of holes	
	L ₁	W	Y	s	Frontal Wing	Lateral Wing
1	80	42	42	2	9	5
2	80	42	42	2	11	6
3	80	42	42	2	13	7
4	80	42	42	2	15	8

Screw patterns



KT Full screw pattern



KT Partial screw pattern



KW Full screw pattern



KW Partial screw pattern

Characteristic capacities of the joist hanger connections with screws.

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

Two nails patterns are specified. A full screw pattern, where there are nails in all the holes. A partial screw pattern, where the number of nails in the joist and the header are at least half the numbers specified for full screw pattern. The nails are distributed evenly over the height. The nails in the header shall be put in the holes closest to the bend line.

The width of the joist shall be at least the penetration length of the screws, for full Body n and partial screw pattern without staggering the nails in the joist. For partial screw pattern with staggered nails in the joist the width shall be at least the penetration length of the nails.

Joist hangers with outward flaps and fastened with screws

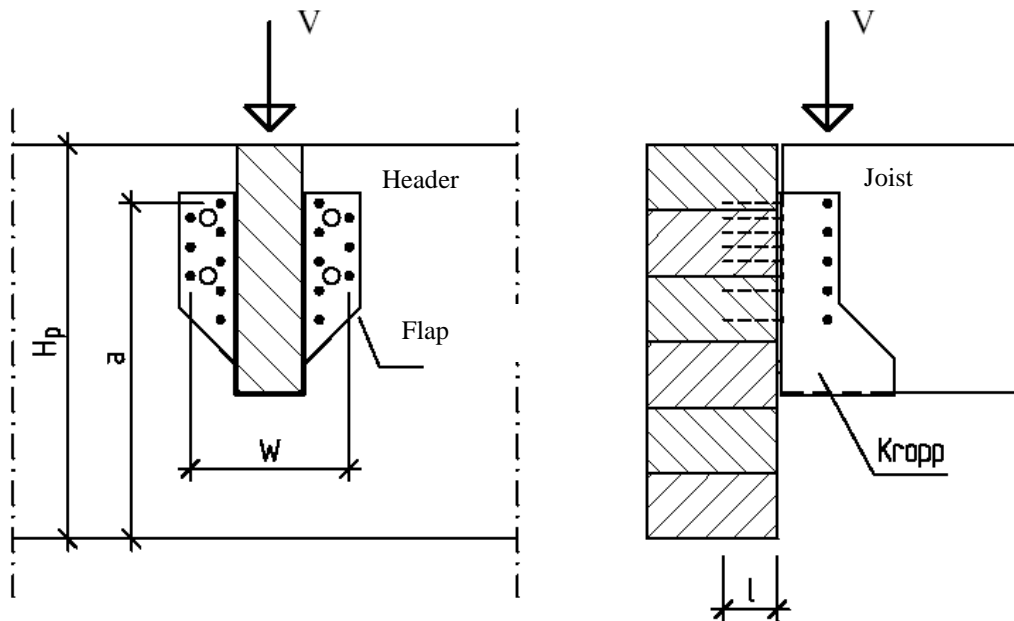


Figure 3

- H_p = Height of header
- a = distance from upper screw to bottom edge of header in mm
- W = distance between outer rows of screws in header in mm
- d = diameter of screw
- l = embedment depth including screw tip, maximum $12d$, in mm
- n_s = number screws in purlin
- n_p = number of screws in header

Joist hangers with inward flaps and fastened with screws

Not all holes can be utilized due to the requirements on the screw distances in the direction of the fibres, and therefore joist hangers type I are only partially screwed

The following requirements apply to the joist hanger type KW:

- The number of screws in the joist shall be at least twice the number of screws in the header
- The screws in the joist shall be evenly distributed over the nailing plate
- The screws nearest top the joist is utilized first
- The requirements for the screw distance in direction of the fibres shall be fulfilled

Annex B.1
Characteristic capacities for joist hanger type KT

Joist Hanger Type KT – configuration 1			
TM connector screws 5,0 x 30	N° pr connector	Load duration	F [kN]
Full screw pattern	22	P	10.2
		L	11.9
		M	13.6
		S	15.3
		I	18.7
Characteristic values			
The characteristic values found by testing			17
The values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KT– configuration 1			
TM connector screws 5,0 x 30	N° pr connector	Load duration	F [kN]
Partial screw pattern	12	P	5.8
		L	6.8
		M	7.7
		S	8.7
		I	10.6
Characteristic values			
The characteristic values found by testing			9.7
The values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KT– configuration 2			
TM connector screws 5,0 x 40	n° pr connector	Load duration	F [kN]
Full screw pattern	28	P	12.0
		L	14.0
		M	16.0
		S	18.0
		I	22.0
Characteristic values			
The characteristic values found by testing			20.0
Tha values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KT– configuration 2			
TM connector screws 5,0 x 40	n° pr connector	Load duration	F [kN]
Partial screw pattern	16	P	7.5
		L	8.7
		M	10.0
		S	11.2
		I	13.7
Characteristic values			
The characteristic values found by testing			12.5
Tha values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KT– configuration 3			
TM connector screws 5,0 x 40	n° pr connector	Load duration	F [kN]
Full screw pattern	34	P	13.3
		L	15.5
		M	17.7
		S	19.9
		I	24.3
Characteristic values			
The characteristic values found by testing			22.1
Tha values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KT – configuration 3			
TM connector screws 5,0 x 40	n° pr connector	Load duration	F [kN]
Partial screw pattern	18	P	8.0
		L	9.4
		M	10.7
		S	12.0
		I	14.7
Characteristic values			
The characteristic values found by testing			13.4
Tha values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KT – configuration 4			
TM connector screws 5,0 x 40	n° pr connector	Load duration	F [kN]
Full screw pattern	40	P	16.5
		L	19.2
		M	21.9
		S	24.7
		I	30.2
Characteristic values			
The characteristic values found by testing			27.4
Tha values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KT – configuration 4			
TM connector screws 5,0 x 40	n° pr connector	Load duration	F [kN]
Partial screw pattern	22	P	10.4
		L	12.2
		M	13.9
		S	15.6
		I	19.1
Characteristic values			
The characteristic values found by testing			17.4
Tha values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KT – configuration 5			
TM connector screws 5,0 x 40	n° pr connector	Load duration	F [kN]
Full screw pattern	46	P	17.1
		L	19.9
		M	22.8
		S	25.6
		I	31.3
Characteristic values			
The characteristic values found by testing			28.4
The values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KT – configuration 5			
TM connector screws 5,0 x 40	n° pr connector	Load duration	F [kN]
Partial screw pattern	24	P	11.6
		L	13.5
		M	15.5
		S	17.4
		I	21.3
Characteristic values			
The characteristic values found by testing			19.3
The values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Annex B.2
Characteristic capacities for joist hanger type KW

Joist Hanger Type KW – configuration 1			
TM connector screws 5,0 x 40	N° pr connector	Load duration	F [kN]
Full screw pattern	28	P	12.4
		L	14.5
		M	16.6
		S	18.7
		I	22.8
Characteristic values			
The characteristic values found by testing			20.7
The values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KW – configuration 1			
TM connector screws 5,0 x 40	N° pr connector	Load duration	F [kN]
Partial screw pattern	16	P	7.2
		L	8.5
		M	9.7
		S	10.9
		I	13.3
Characteristic values			
The characteristic values found by testing			12.1
The values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KW – configuration 2			
TM connector screws 5,0 x 40	n° pr connector	Load duration	F [kN]
Full screw pattern	34	P	15.0
		L	17.5
		M	20.0
		S	22.5
		I	27.5
Characteristic values			
The characteristic values found by testing			25.0
Tha values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KW – configuration 2			
TM connector screws 5,0 x 40	n° pr connector	Load duration	F [kN]
Partial screw pattern	18	P	8.0
		L	9.4
		M	10.7
		S	12.0
		I	14.7
Characteristic values			
The characteristic values found by testing			13.4
Tha values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KW – configuration 3			
TM connector screws 5,0 x 40	n° pr connector	Load duration	F [kN]
Full screw pattern	40	P	16.3
		L	19.0
		M	21.7
		S	24.4
		I	29.9
Characteristic values			
The characteristic values found by testing			27.1
Tha values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KW – configuration 3			
TM connector screws 5,0 x 40	n° pr connector	Load duration	F [kN]
Partial screw pattern	22	P	9.9
		L	11.6
		M	13.2
		S	14.9
		I	18.2
Characteristic values			
The characteristic values found by testing			16.5
Tha values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KW – configuration 4			
TM connector screws 5,0 x 40	n° pr connector	Load duration	F [kN]
Full screw pattern	46	P	17.1
		L	19.9
		M	22.8
		S	25.6
		I	31.3
Characteristic values			
The characteristic values found by testing			28.4
Tha values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			

Joist Hanger Type KW – configuration 4			
TM connector screws 5,0 x 40	n° pr connector	Load duration	F [kN]
Partial screw pattern	24	P	10.6
		L	12.4
		M	14.1
		S	15.9
		I	19.4
Characteristic values			
The characteristic values found by testing			17.7
Tha values have been assessed in accordance with EC 5 Table 3.1 - "Values of k_{mod} "			