Leistungserklärung / *Declaration of Performance*
16523_ETA-13/0763_2020

- **Eindeutiger Kenncode des Produkttyps** / ***Unique identification code of the product type***
  HVRS1140

- **Verwendungszweck(e)** / ***Usage(s)***
  Balkenschuhe für Holz-Holz-Verbindungen und Holz-Beton- oder Stahlverbindungen /
  Joist hanger for wood to wood connections and wood to concrete or steel connections

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- **Hersteller** / ***Manufacturer***
  Conmetall Meister GmbH
  Hafenstraße 26
  29223 Celle Germany

- **System(e) zur Bewertung und Überprüfung der Leistungsbeständigkeit /**
  System(s) for evaluating and verifying constancy of performance
  System 4

- **Europäisch Technische Bewertung** / ***European Technical Assessment***
  Europäisches Bewertungsdokument / *European evaluation document:*
  ETAG015 22.04.2013
  Europäisch technische Bewertung / *European technical evaluation:*
  ETA-13/0763 31.05.2018
  Technische Bewertungsstelle / *Technical Assessment Body:*
  ETA-Danmark A/S
  Notifizierte Stelle / *Notified body:*
  -

Wesentliche Merkmale und erklärte Leistung(en) / *Essential features and stated performance(s)*

Wesentliches Merkmal *Essential features*	Leistung *Performance*	Harmonisierte technische Spezifikation *Harmonized technical specification*
Charakteristische Tragfähigkeit *Characteristic load-carrying capacity*	Siehe Annex B *See Annex B*	ETA-13/0763; 3.1
Steifigkeit *Stiffness*	NPD	ETA-13/0763; 3.1
Duktilität beim zyklischen Testen *Ductility in cyclic testing*	NPD	ETA-13/0763; 3.1
Brandverhalten *Reaction to fire*	A1	ETA-13/0763; 3.2 EN 1350-1
Einfluss auf Luftqualität *Influence on air quality*	Keine gefährlichen Materialien *No dangerous materials*	ETA-13/0763; 3.3
Haltbarkeit *Durability*	Nutzungsklassen 1 und 2 bei Holzkonstruktionen unter Verwendung von Holzarten gem. Eurocode 5 *Service classes 1 and 2 for timber constructions using wood species acc. Eurocode 5*	ETA-13/0763; 3.7
Identifikation *Identification*	Tab 2	ETA-13/0763; 3.7

Tab.1 Wesentliche Merkmale / *essential features*

ETA-Artikel Nr. *ETA article number*	Typ *Type*	Breite *Width*	Höhe *Height*	Materialstärke *Material thickness*	Oberfläche *Surface*	Rohling-Größe *Blank size*	Material *Material*
2012041	A	80 mm	120 mm	2 mm	Rostfreier Stahl *Stainless steel*	320	1.4301 (EN10088) $R_p \geq 220$ N/mm² $R_m \geq 500$ N/mm²

Tab.2 Identifikation / *Identification*

Die Leistung des vorstehenden Produkts entspricht der erklärten Leistung/ den erklärten Leistungen. Für die Erstellung der Leistungserklärung im Einklang mit der Verordnung (EU) Nr. 305/2011 ist allein der obengenannte Hersteller verantwortlich.
Unterzeichnet für den Hersteller und im Namen des Herstellers von:

The performance of the above product is the declared performance. The above manufacturer is solely responsible for drawing up the declaration of performance in accordance with Regulation (EU) No 305/2011.
Signed for the manufacturer and on behalf of the manufacturer of:

Conmetall Meister GmbH
Celle, 24.07.2020

i. V. Andreas Schacht
Leitung Einkauf Eisenwaren
Head of purchasing ironmongery

i. A. Marcel Dartscht
Qualitätsmanagement
Quality management

Annex B
Characteristic values of load-carrying-capacities

Characteristic capacities of the joist hanger connections with nails 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 a distance $e_{J,90}$ above the center of gravity of the nails in the joist.

Two nails patterns are specified. A full nailing pattern, where there are nails in all the holes and 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. The nails in the header shall be put in the holes closest to the bend line.

For EUROKON joist hangers 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.

B.1 Joist hanger's types A and B fastened with nails

Force downward toward the bottom plate:

$$F_{Z,Rd} = \min \begin{cases} (n_J + 2) \cdot F_{v,J,Rd} \\ \dfrac{1}{\sqrt{\left(\dfrac{1}{n_H \cdot F_{v,H,Rd}}\right)^2 + \left(\dfrac{1}{k_{H,1} \cdot F_{ax,H,Rd}}\right)^2}} \end{cases} \qquad \text{(B.1.1.1)}$$

Force upward away from the bottom plate:

$$F_{Z,Rd} = \min \begin{cases} n_J \cdot F_{v,J,Rd} \\ \dfrac{1}{\sqrt{\left(\dfrac{1}{n_H \cdot F_{v,H,Rd}}\right)^2 + \left(\dfrac{1}{k_{H,2} \cdot F_{ax,H,Rd}}\right)^2}} \end{cases} \qquad \text{(B.1.1.2)}$$

Lateral force:

$$F_{Y,Rd} = \min \begin{cases} \dfrac{n_J \cdot F_{v,J,Rd}}{\sqrt{\left(\dfrac{2 \cdot \sqrt{e_{J,0}^2 + e_{J,90}^2}}{b_J}\right)^2 + \left(\dfrac{F_{v,J,Rd}}{F_{ax,J,Rd}}\right)^2}} \\ \dfrac{F_{v,H,Rd}}{\sqrt{\left(\dfrac{1}{n_H} + \dfrac{e_H}{e_1}\right)^2 + \left(\dfrac{e_H}{e_2}\right)^2}} \end{cases} \qquad \text{(B.1.1.3)}$$

n_J total number of nails in both sides of the joist

n_H total number of nails in the side of the header

$F_{v,Rd}$ Characteristic lateral load-carrying capacity of the fasteners in the joist or in the header indicated by the indices J or H

$F_{ax,Rd}$ Characteristic axial load-carrying capacity of the fasteners in the joist or in the header indicated by the indices J or H

b_J width of the joist hanger, see figure B1.

$e_{J,90}$ distance of the lateral force above the center of gravity of the nails in the joist, see figure B1.

$e_{J,0}$ distance from the nails in the joist to the surface of the header, see figure B1.

e_H distance of the lateral force above the center of gravity of the nails in the header.

e_1 joist hanger dimension, see Annex C

e_2 joist hanger dimension, see Annex C

$k_{H,1}$ form factor, see Annex C

$k_{H,2}$ form factor, see Annex C

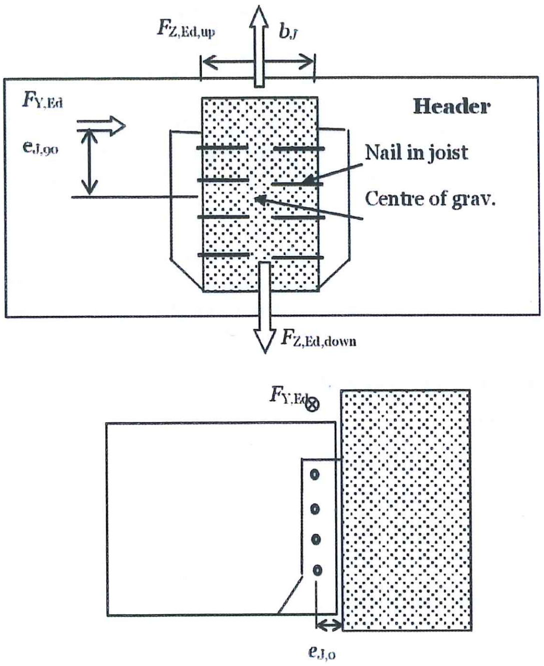

Figure B1: Definition of $e_{J,90}$ and $e_{J,0}$

B.1.2 Combined forces

In case of combined forces shall the following inequality be fulfilled:

$$\left(\frac{F_{Y,Ed}}{F_{Y,Rd}}\right)^2 + \left(\frac{F_{Z,Ed}}{F_{Z,Rd}}\right)^2 \leq 1$$

(B.1.2.1)

B.2 Joist hangers type split fastened with nails

Type	Force downward towards or upward away from the bottom plate $F_{Z,Rk}$ [kN]	Lateral Force $F_{Y,Rk}$ [kN]	
	Timber	Timber	Steel
30 x 100	6,31	12,9	5,20
25 x 140	13,2	20,5	7,15
24 x 148	12,3	17,2	6,11

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

$k_{dens} = \left(\frac{\rho_k}{350}\right)^2$ where ρ_k is he characteristic density of the timber in kg/m³.

B.2.2 Combined forces

If the forces $F_{Y,Ed}$ and $F_{Z,Ed}$ act at the same time or if $e_H \neq 0$, the following inequality shall be fulfilled:

$$\left(\frac{F_{Y,Ed}}{F_{Y,Rd}}\right)^2 + \left(\frac{F_{Z,Ed} + 2 \cdot \Delta F_{Z,Ed}}{F_{Z,Rd}}\right)^2 \leq 1$$

(B.2.1)

Where:

$$\Delta F_{Z,Ed} = F_{Y,Ed} \cdot \frac{e_H}{B}$$

(B.2.2)

B.3 Characteristic capacities of the joist hanger type A connections with bolts

For joist hangers type A 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, see clause B.1;
- The bolts shall always be positioned symmetrically about the vertical axis of the joist hanger;
- Washers according to EN ISO 7094 shall be installed at least under the upper 2 bolt heads or nuts.

Description of the static model

For a downward directed force toward the bottom plate the static behavior is basically the same as for a wood-wood connection with nails.

The nails in the joist are subjected to a lateral force, which is equally distributed over all nails in the joist.

Since the concrete and steel have a larger compressive strength than timber subjected perpendicular to the grain the rotation point may be assumed positioned at the top of the bottom plate.

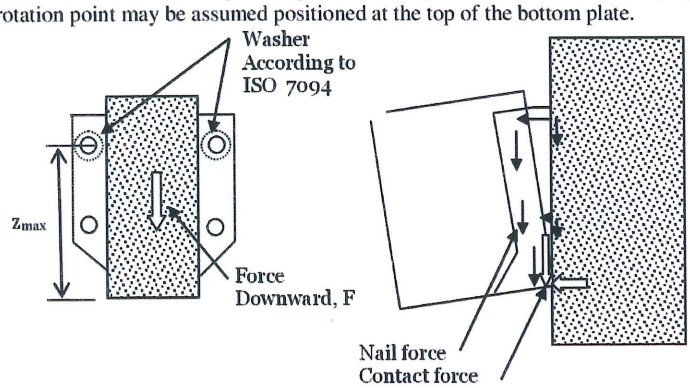

Figure B2 Left: Cross section in joist. Right: The joist will deflect and rotate, at the bottom a contact force will occur at the bottom plate, and the withdrawal forces in the bolts in the wall will vary linearly as assumed for nailed connections in the header.

The forces in the bolts will be partly lateral forces, partly withdrawal forces. The lateral forces are distributed evenly over all bolts. The withdrawal forces are on the safe side assumed to be taken by the 2 upper bolts with washers. The maximum withdrawal force in an upper bolt can be calculated from

$$F_{ax,bolt} = \frac{F \cdot e_{J,0}}{2 \cdot z_{max}} \quad \text{(B.3.1)}$$

Where

F downward directed force toward the bottom plate;

$e_{J,0}$ eccentricity = distance from the nail column in the joist to the surface of the header;

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

The upper 2 bolts are critical. They are subjected to a lateral force and a withdrawal force. The lateral force is determined assuming an even distribution of the downward force F.

$$F_{lat,bolt} = F / n_{bolt} \quad \text{(B.3.2)}$$

Characteristic capacities of a bolted joist hanger connection

The Characteristic capacity of the connection between the joist and the joist hanger may be calculated from the same assumptions and formulas as for joist hangers nailed to a wooden header beam.

$$F_{Z,Rk} = (n_J + 2) \cdot F_{vJ,Rk} \quad \text{for threaded nails}$$

(B.3.3)

The upper 2 bolts are critical. They are subjected to a lateral force calculated from formula (B.3.2).

The withdrawal force in an upper bolt is calculated from (B.3.1).

Where

F downward directed force toward the bottom plate

n_{bolt} total number of bolts in the joist hanger

$e_{J,0}$ eccentricity = distance from the nail column in the joist to the surface of the header

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

It shall be verified by the design of the bolted connection that the upper bolts have sufficient load-carrying capacity to carry the combined lateral and axial forces.

From the Characteristic load-carrying-capacity of the bearing resistance between the bolt and the plate of the joist hanger the following maximum characteristic capacity of the joist hanger connection can be determined.

$$F_{bear,Rk} = n_{bolt} \cdot f_{u,k} \cdot d \cdot t$$

(B.3.4)

where

n_{bolt} total number of bolts in the 2 flaps

$f_{u,k}$ characteristic ultimate tensile strength of the steel

d diameter of the bolt

t thickness of the steel plate of the joist hanger

The characteristic load-carrying capacity of the joist hanger connections is the minimum of:

- The capacity determined from (B.3.3) from the fasteners in the joist;
- The capacity determined from (B.3.4) from the embedding strength of the steel plate against the bolt;
- The capacity controlled by the bolt forces given by (B.3.1) and (B.3.2).