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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-09/0218 of 02/09/2014

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:	Drüeke & Springob cleats (type 90, 130, 170, 210)
Product family to which the above construction product belongs:	Three-dimensional nailing plate (Cleats for timber-to-timber connections)
Manufacturer:	Drüeke & Springob GmbH Bahnstrasse 19 57439 Attendorn - Kraghammer Tel. +49 02722 - 7771 Fax +49 02722 – 7922
Manufacturing plant:	Drüeke & Springob GmbH Bahnstrasse 19 57439 Attendorn - Kraghammer
This European Technical Assessment contains:	11 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 2009-09-09 and expiry on 2014-09-09

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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
Drüeke & Springob cleats are one-piece non-welded, face-fixed cleats to be used in timber-to-timber connections. They are connected to the timber elements by a range of profiled nails.

The cleats are made from pre-galvanized steel DX 51 D / Z 275 according to EN 10346:2009 with $R_e \geq 295$ N/mm², $R_m \leq 360$ N/mm² and $A_{80} \geq 22\%$. Dimensions and hole positions are shown in Annex A. Drüeke & Springob cleats are made from steel with tolerances according to EN 10143.

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

The cleats are intended for use in making connections in load bearing timber structures, as a connection between a beam and a purlin, where requirements for mechanical resistance and stability and safety in use in the sense of the Basic Work Requirements 1 and 4 of the Regulation 305/2011 (EU) shall be fulfilled.

The connection may be with a single cleat or with a cleat on each side of the fastened timber member.

The static and kinematical behaviour of the timber members or the supports shall be as described in Annex B.

The wood members may be of solid timber, glued laminated timber and similar glued members, or wood-based structural members with a characteristic density from 290 kg/m^3 to 460 kg/m^3. This requirement to the material of the wood members can be fulfilled by using the following materials:

- 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,
- Plywood according to EN 636

The calculation methods are only allowed for a characteristic wood density of up to 460 kg/m^3. 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.

The design of the connections shall be in accordance with Eurocode 5 or a similar national Timber Code. The wood members shall have a thickness which is larger than the penetration depth of the nails into the members.

The angle brackets are primarily for use in timber structures subject to the dry, internal conditions defined by service classes 1 and 2 of Eurocode 5 and for connections subject to static or quasi-static loading.

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

The scope of the connectors 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

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

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

3 Performance of the product and references to the methods used for its assessment

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability (BWR 1)*)	
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 (BWR 2)	
Reaction to fire	The cleats are made from steel classified as **Euroclass A1** in accordance with EN 13501-1:2007+A1:2009 and EC decision 96/603/EC, amended by EC Decision 2000/605/EC
3.3 Hygiene, health and the environment (BWR 3)	
Influence on air quality	The product does not contain/release dangerous substances specified in TR 034, dated March 2012)
3.7 Sustainable use of natural resources (BWR 7)	No Performance Determined
3.8 General aspects related to the performance of the product	The cleats 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 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

3.10 Mechanical resistance and stability
See annex B for characteristic load-carrying capacities of the cleats.

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

The design models allow the use of fasteners described in table A.3 in Annex A.

Threaded nails (ringed shank nails) in accordance to EN 14592
In the formulas in Annex B the capacities for threaded nails calculated from the formulas of Eurocode 5 are used assuming a thick steel plate when calculating the lateral nail load-carrying-capacity.

The load bearing capacities of the brackets has been determined based on the use of connector nails 4,0 x 40 mm in accordance with the German national approval for the nails.

The characteristic withdrawal capacity of the nails has to be determined by calculation in accordance with EN 1995-1-1: 2004, paragraph 8.3.2 (head pull-through is not relevant):

$F_{ax,Rk} = f_{ax,k} \times d \times t_{pen}$

Where:

$f_{ax,k}$ Characteristic value of the withdrawal parameter in N/mm^2
d Nail diameter in mm
t_{pen} Penetration depth of the profiled shank including the nail point in mm, $t_{pen} \geq 31$ mm

Based on tests by Versuchsanstalt für Stahl, Holz und Steine, University of Kalrsruhe, the characteristic value of the withdrawal resistance for the threaded nails used can be calculated as:

$f_{ax,k} = 50 \times 10^{-6} \times \sigma_k^2$

Where:

σ_k Characteristic density of the timber in kg/m^3

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

The design models allow the use of fasteners described in the table on page 9 in Annex A

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

3.11 Aspects related to the performance of the product
Corrosion protection in service class 1 and 2.
In accordance with ETAG 015 the cleats are made from pre-galvanized steel DX 51 D / Z 275 according to EN 10346:2009 with $R_e \geq 295$ N/mm², $R_m \leq 360$ N/mm² and $A_{80} \geq 22\%$

3.12 General aspects related to the use of the product
Drüeke & Springob cleats 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

Drüeke & Springob cleats
The nailing pattern used shall be either the maximum or the minimum pattern as defined in Annex A.

The following provisions concerning installation apply:

The structural members – the components 1 and 2 shown in the figure on page 11 - to which the brackets are fixed shall be:

- Strength class C14 or better, see section 1 of this ETA
- Free from wane under the bracket.
- The gap between the timber members does not exceed 3 mm.
- There are no specific requirements relating to preparation of the timber members.

The execution of the connection shall be in accordance with the approval holder's technical literature.

4 Assessment and verification of constancy of performance (AVCP)

4.1 AVCP system

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

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

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

Issued in Copenhagen on 2014-09-02 by

Thomas Bruun
Managing Director, ETA-Danmark

Annex A
Product details and definitions

Table A.1 Materials specification

Cleat number	Cleat type	Thickness (mm)	Steel specification	Coating specification
4210	90	2,0	DX 51 D	Z 275
4211	130	2,0	DX 51 D	Z 275
4212	170	2,0	DX 51 D	Z 275
4213	210	2,0	DX 51 D	Z 275

Table A.2 Range of sizes

Cleat number	Cleat type	Height (mm) vertical		Height (mm) horizontal		Width (mm)	
4210	90	89	91	89	91	37	39
4211	130	129	131	129	131	74	76
4212	170	154	156	154	156	84	86
4213	210	194	196	194	196	99	101

Table A.3 Fastener specification

Nail type	Nail size (mm)		Finish
According to EN 14592	Diameter	Length	
Threaded nail	4,0	40 - 60	Electroplated zinc

In the load-carrying-capacities of the nailed connection in Annex B the capacities for threaded nails calculated from the formulas of Eurocode 5 are used assuming a thick steel plate when calculating the lateral nail load-carrying-capacity. The load-carrying-capacities of the cleats have been determined based on the use of connector nails 4,0 x L mm in accordance with the German national approval for the nails. The characteristic withdrawal capacity of the nails has to be determined by calculation in accordance with EN 1995-1-1:2004, paragraph 8.3.2 (head pull-through is not relevant):

$F_{ax,Rk} = f_{ax,k} \times d \times t_{pen}$

Where:

$f_{ax,k}$ Characteristic value of the withdrawal parameter in N/mm^2

d Nail diameter in mm

t_{pen} Penetration depth of the profiled shank including the nail point in mm, $t_{pen} \geq 31$ mm

Based on tests by Versuchsanstalt für Stahl, Holz und Steine, University of Karlsruhe, the characteristic value of the withdrawal resistance for the threaded nails used can be calculated as:

$f_{ax,k} = 50 \times 10^{-6} \times \rho_k^2$

Where:

ρ_k Characteristic density of the timber in kg/m^3

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

Annex B
Characteristic values of load-carrying-capacities

Characteristic capacity of the cleat connection with nails

The forces are assumed to act parallel or perpendicular to the shear plane at a distance e_1 from the shear plane and at a distance e_{45} from the centre of gravity of the nails in the steel-to-timber connection.

Only one nail pattern is specified, where there are nails in all the holes.

For Drüeke & Springob cleats the width of the members shall be at least the penetration length of the nails.

$$F_{Rd} = \min \begin{cases} F_{1,Rd} \\ F_{45,Rd} \end{cases} \quad \text{(B.1.1)}$$

The load-carrying capacities $F_{1,Rd}$ and $F_{45,Rd}$ relate to the two different steel-to-timber connections of one cleat. For combined loading see equation B.1.4.

Where

$$F_{1,Rd} = \frac{1}{\sqrt{\left(\frac{1}{n \cdot F_{v,Rd}}\right)^2 + \left(\frac{e_1 \cdot z_{max}}{I_p \cdot F_{ax,Rd}}\right)^2}} \quad \text{(B.1.2)}$$

$$F_{45,Rd} = \frac{F_{ax,Rd}}{\frac{1}{n} + \frac{e_{45} \cdot z_{max}}{I_p}} \quad \text{(B.1.3)}$$

n Number of fasteners in one steel-to-timber connection, with full nailing, see Table B.1

$F_{v,Rd}$ Design lateral load-carrying capacity of the nails

$F_{ax,Rd}$ Design axial load-carrying capacity of the nails

e_1 Eccentricity of the load parallel to the shear plane with regard to the shear plane, see figure B.1

e_{45} Eccentricity of the load perpendicular to the shear plane with regard to the centroid of the connection, see figure B.1

I_p Polar moment of inertia of the nailed steel-to-timber connection, see Table B.1

z_{max} Distance of the centroid of the nailed steel-to-timber connection to the outermost nail, see Table B.1

Table B1: Numbers of fasteners n and polar moment of inertia I_p over z_{max} for Drüeke & Springob cleats

Type	n	I_p/z_{max} [mm]
90	8	129
130	10	193
170	12	271
210	16	464

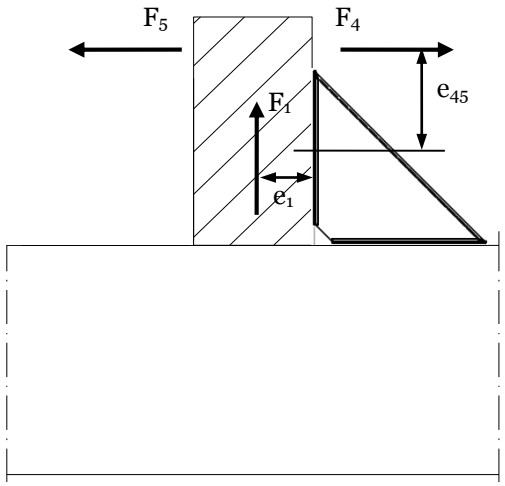

Figure B1: Definition of forces and eccentricities for the vertical connection. e_1 is the eccentricity with regard to the shear plane, e_{45} the eccentricity with regard to the centre of gravity of the vertical nailed steel-to-timber connection. For the horizontal connection, F_1 becomes F_{45} and vice-versa

Combined forces

In case of combined forces in the same steel-to-timber connection of one cleat shall the following inequality be fulfilled:

$$\left(\frac{F_{1,Ed}}{F_{1,Rd}}\right)^2 + \left(\frac{F_{45,Ed}}{F_{45,Rd}}\right)^2 \leq 1 \qquad \text{(B.1.4)}$$

Double cleats per connection

The cleats must be placed at each side opposite to each other, symmetrically to the component axis. The load-carrying capacity of a double cleat connection may be assumed as two times the load-carrying capacity of a single cleat connection.

Wane

Wane is not allowed, the timber has to be sharp-edged in the contact area of the cleats.

Timber splitting

It must be checked in accordance with Eurocode 5 or a similar national Timber Code that splitting will not occur.

Drüeke & Springob Cleats

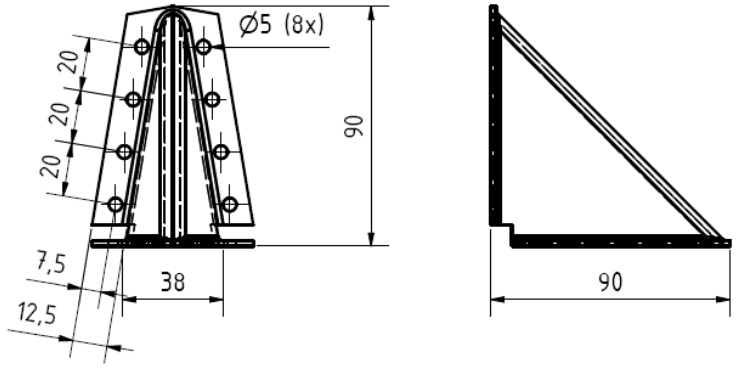

Figure B.1 Dimensions of Cleat 4210

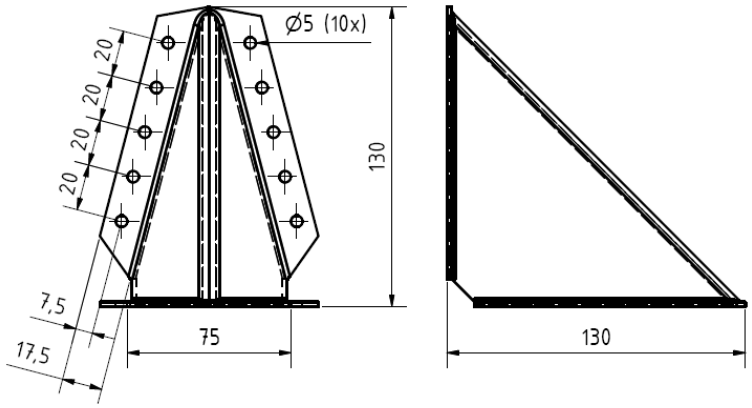

Figure B.2 Dimensions of Cleat 4211

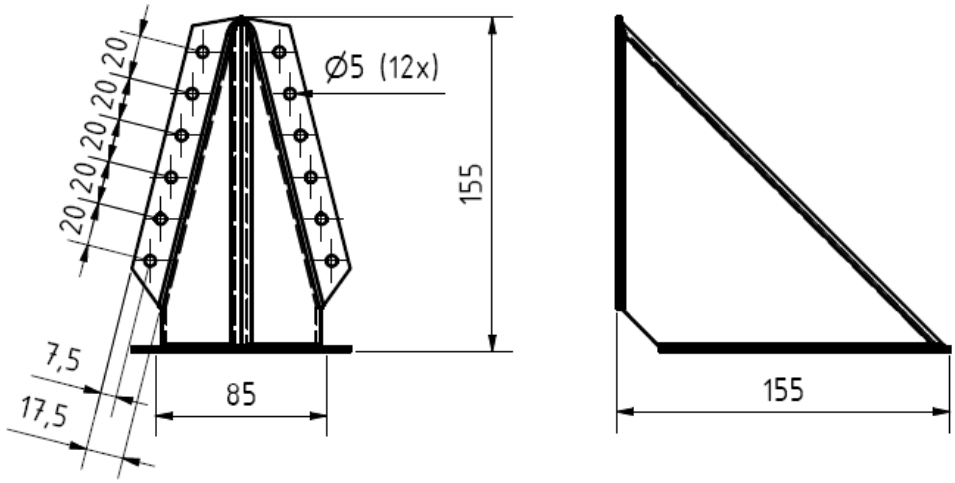

Figure B.3 Dimensions of Cleat 4212

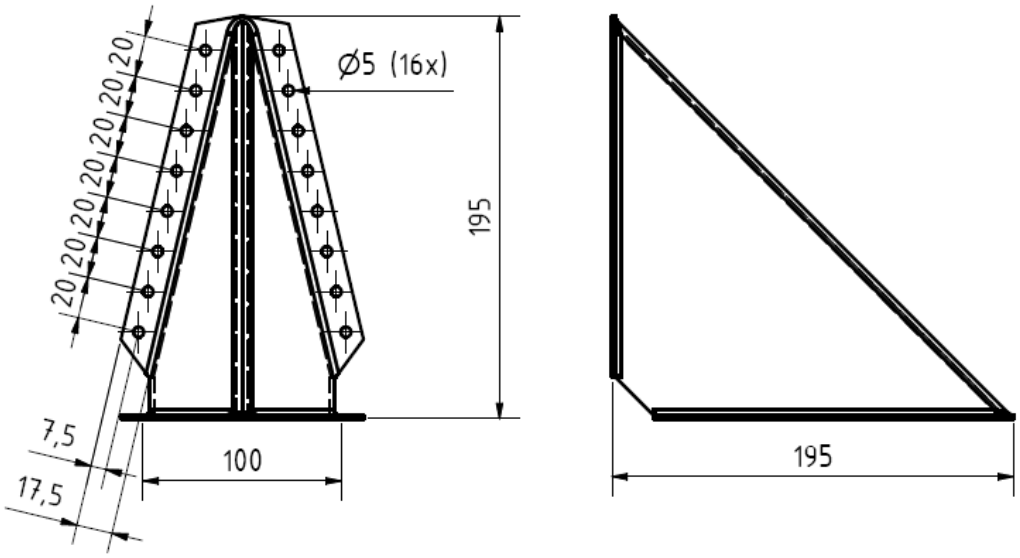

Figure B.4 Dimensions of Cleat 4213