

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-15/0860
of 4 January 2018

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

BeA / KMR Staples d=1,55mm; d=1,8mm; d=2,02mm

Product family
to which the construction product belongs

Dowel-type fasteners with resin coating

Manufacturer

Joh. Friedrich Behrens AG
BeA Deutschland Befestigungstechnik
Bogenstraße 43-45
22926 Ahrensburg
DEUTSCHLAND

Manufacturing plant

Joh. Friedrich Behrens AG

This European Technical Assessment
contains

15 pages including 3 annexes which form an integral part
of this assessment

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

EAD 130019-00-0603

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Specific Part

1 Technical description of the product

BeA/KMR Staples $d=1,55\text{mm}$, $d=1,8\text{mm}$ and $d=2,02\text{mm}$ are dowel type fasteners made of non-alloy steel rods according to EN ISO 16120 or made of stainless steel C 20 drawn from austenitic steel rods in accordance with EN 10088-1 for timber constructions. The staples have a special resin coating with a minimum length of 50 % of the legs.

The diameters of the staple legs are $d=1,55\text{mm} +0/- 0,02\text{mm}$, $d=1,8\text{mm} +0/- 0,02\text{mm}$ or $d=2,02\text{mm} +0.02/- 0,01\text{mm}$. Further dimensions are shown in Annex 1.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the BeA/KMR Staples $d=1,55\text{mm}$, $d=1,8\text{mm}$ and $d=2,02\text{mm}$ are used in compliance with the specifications and conditions given in Annex 1 to 3.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of staples of at least 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.

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

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Dimensions	See Annex 1
Characteristic yield moment	See Annex 3
Withdrawal capacity for short-term and medium-term loads	See Annex 3
Withdrawal capacity for long term and permanent loads	See Annex 3
Characteristic head pull-through parameter	See Annex 3
Minimum tensile strength of the wire	See Annex 3
Minimum and maximum thickness of the connected material	See Annex 3
Durability against corrosion	See Annex 2
Durability of the resin coating	See Annex 2

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Euroclass A1

3.3 Safety and accessibility in use (BWR 4)

The essential characteristics of BWR 4 have been covered by BWR 1.

English translation prepared by DIBt

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with EAD No.130019-00-0603, the applicable European legal act is: [1997/176/EC(EU)].

The system to be applied is: 3

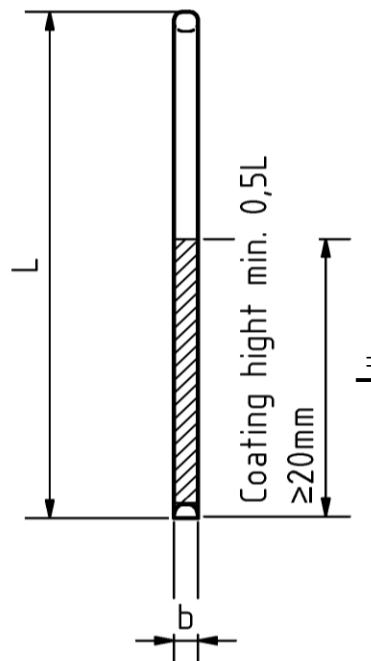
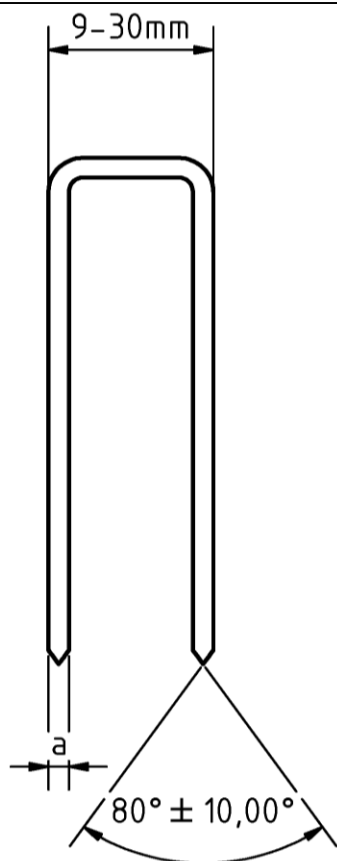
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 4 January 2018 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Baumann



	Size	Tolerance
Raw-wire	1,55	+0/-0,02
flattened wire	a	±0,03
	b	±0,02

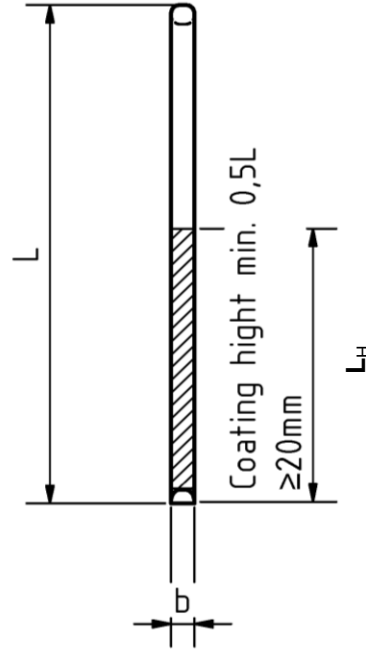
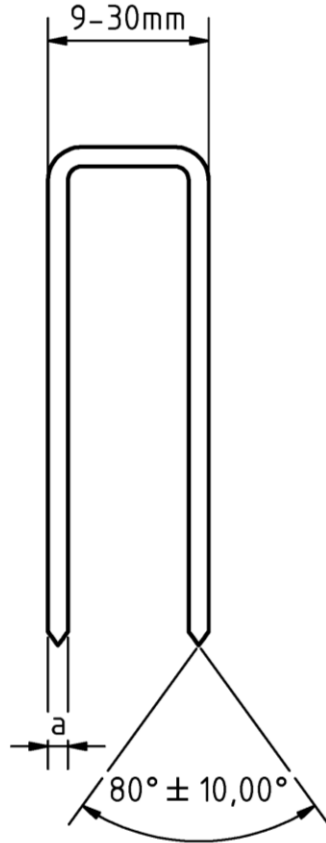
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mm	inch	mm	mm
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32	1 1/4	31,7	±0,3
35	1 3/8	34,6	±0,4
38	1 1/2	37,6	±0,4
40	1 5/8	39,6	±0,4
45	1 3/4	44,5	±0,5
50	2	49,5	±0,5
55	2 5/32	54,4	±0,6
56	2 5/32	55,4	±0,6
60	2 3/8	59,4	±0,6
65	2 5/8	64,3	±0,7
70	2 3/4	69,3	±0,7
75	3	74,3	±0,7
80	3 1/6	79,3	±0,7
85	3 1/3	84,3	±0,7
90	3 9/16	89,3	±0,7

Non-alloy steel rod in accordance with EN ISO 16120
Tensile-strength min. 900N/mm²
Resin coating Typ 3 (DIN EN 14592:2008+A1:2012)
Galvanized with a zinc-thickness of 12μ

BeA / KMR Staples d=1,55mm; d=1,8mm; d=2,02mm

Technical description of the product;
BeA Staples: 155 VZHZ, 146 VZHZ galvanised
KMR Staples: KG700 Galv, G Galv galvanised

Annex 1.1



	Size	Tolerance
Raw-wire	1,55	+0/-0,02
flattened wire	a	±0,03
	b	±0,02

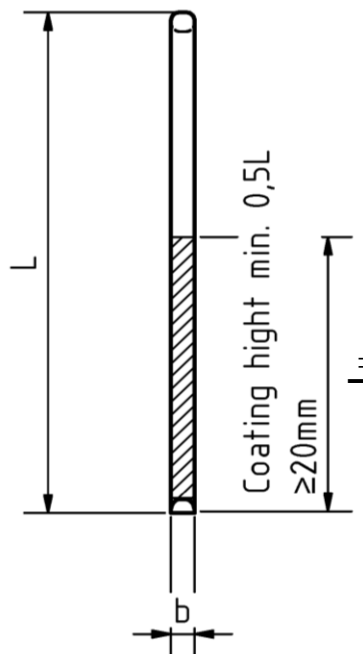
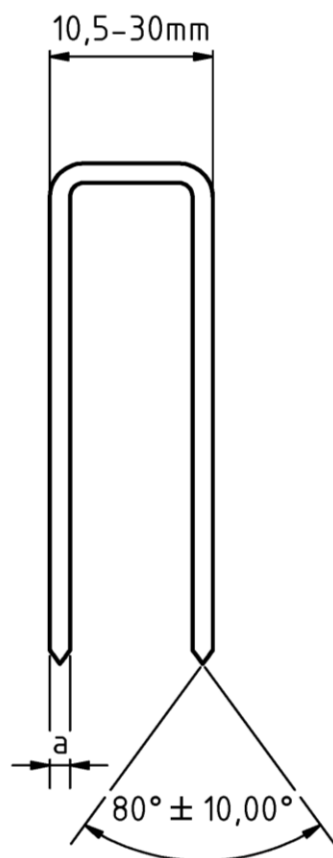
Length		basic size	tolerance
Nominal size	approx.	S	total
mm	inch	mm	mm
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32	1 1/4	31,7	±0,3
35	1 3/8	34,6	±0,4
38	1 1/2	37,6	±0,4
40	1 5/8	39,6	±0,4
45	1 3/4	44,5	±0,5
50	2	49,5	±0,5
55	2 5/32	54,4	±0,6
56	2 5/32	55,4	±0,6
60	2 3/8	59,4	±0,6
65	2 5/8	64,3	±0,7
70	2 3/4	69,3	±0,7
75	3	74,3	±0,7
80	3 1/6	79,3	±0,7
85	3 1/3	84,3	±0,7
90	3 9/16	89,3	±0,7

Stainless-steel rod in accordance with EN 10088-1
Tensile-strength min. 900N/mm²
Quality 1.4401
Resin coating Typ 3 (DIN EN 14592:2008+A1:2012)

BeA / KMR Staples d=1,55mm; d=1,8mm; d=2,02mm

Technical description of the product;
BeA Staples: 155 NRHZ, 146 NRHZ stainless steel
KMR Staples: KG700 A4, G A4 stainless steel

Annex 1.2



	Size	Tolerance
Raw-wire	1,8	+0/-0,02
flattened wire	a	±0,03
	b	±0,02

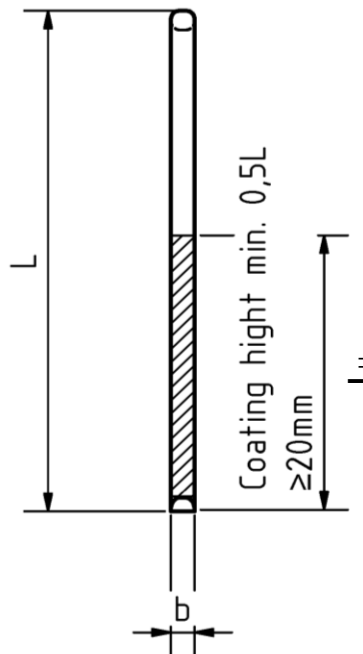
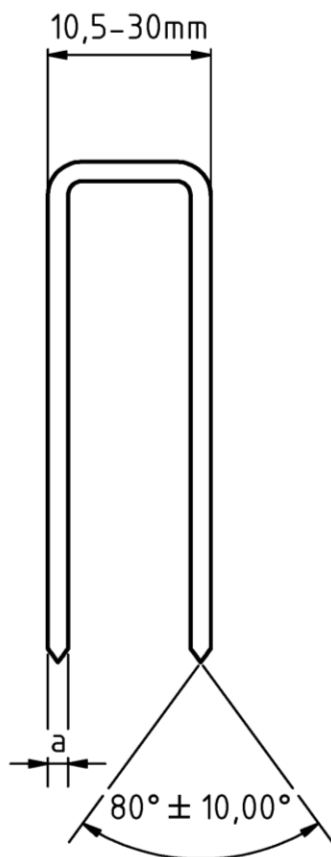
Length		basic size	tolerance
Nominal size	approx.	S	total
mm	inch	mm	mm
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32	1 1/4	31,7	±0,3
35	1 3/8	34,6	±0,4
38	1 1/2	37,6	±0,4
40	1 5/8	39,6	±0,4
45	1 3/4	44,5	±0,5
50	2	49,5	±0,5
55	2 5/32	54,4	±0,6
56	2 5/32	55,4	±0,6
60	2 3/8	59,4	±0,6
65	2 5/8	64,3	±0,7
70	2 3/4	69,3	±0,7
75	3	74,3	±0,7
80	3 1/6	79,3	±0,7
85	3 1/3	84,3	±0,7
90	3 9/16	89,3	±0,7

Non-alloy steel rod in accordance with EN ISO 16120
Tensile-strength min. 900N/mm²
Resin coating Typ 3 (DIN EN 14592:2008+A1:2012)
Galvanized with a zinc-thickness of 12μ

BeA / KMR Staples d=1,55mm; d=1,8mm; d=2,02mm

Technical description of the product;
BeA Staples: 180 VZHZ galvanised
KMR Staples: Q Galv galvanised

Annex 1.3



	Size	Tolerance
Raw-wire	1,8	+0/-0,02
flattened wire	a	$\pm 0,03$
	b	$\pm 0,02$

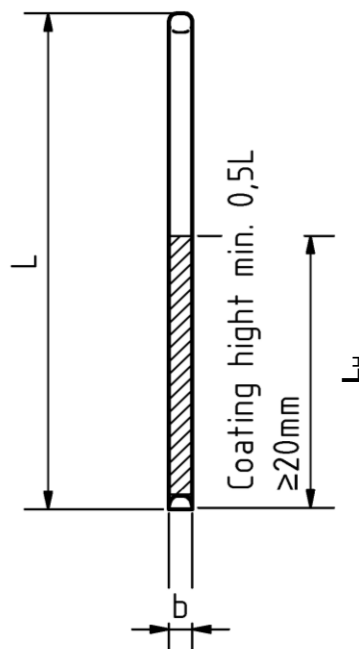
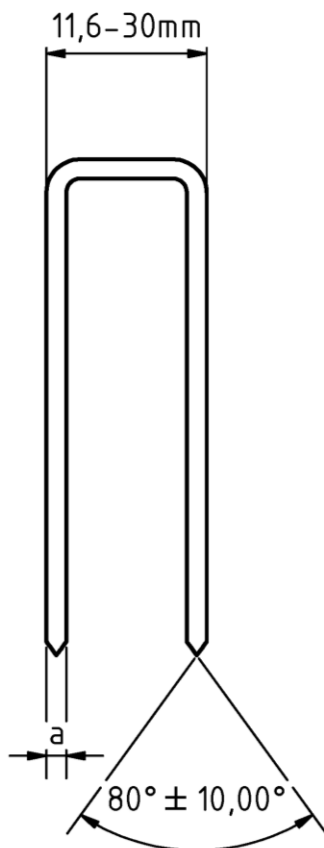
Length		basic size	tolerance
Nominal size	approx.	S	total
mm	inch	mm	mm
30	1 3/16	29,7	$\pm 0,3$
32	1 1/4	31,7	$\pm 0,3$
35	1 3/8	34,6	$\pm 0,4$
38	1 1/2	37,6	$\pm 0,4$
40	1 5/8	39,6	$\pm 0,4$
45	1 3/4	44,5	$\pm 0,5$
50	2	49,5	$\pm 0,5$
55	2 5/32	54,4	$\pm 0,6$
56	2 5/32	55,4	$\pm 0,6$
60	2 3/8	59,4	$\pm 0,6$
65	2 5/8	64,3	$\pm 0,7$
70	2 3/4	69,3	$\pm 0,7$
75	3	74,3	$\pm 0,7$
80	3 1/6	79,3	$\pm 0,7$
85	3 1/3	84,3	$\pm 0,7$
90	3 9/16	89,3	$\pm 0,7$

Stainless-steel rod in accordance with EN 10088-1
Tensile-strength min. 900N/mm^2
Quality 1.4401
Resin coating Typ 3 (DIN EN 14592:2008+A1:2012)

BeA / KMR Staples d=1,55mm; d=1,8mm; d=2,02mm

Technical description of the product;
BeA Staples: 180 NRHZ stainless steel
KMR Staples: Q A4 stainless steel

Annex 1.4



	Size	Tolerance
Raw-wire	2,02	+0,02/-0,01
flattened wire	a	±0,03
	b	±0,02

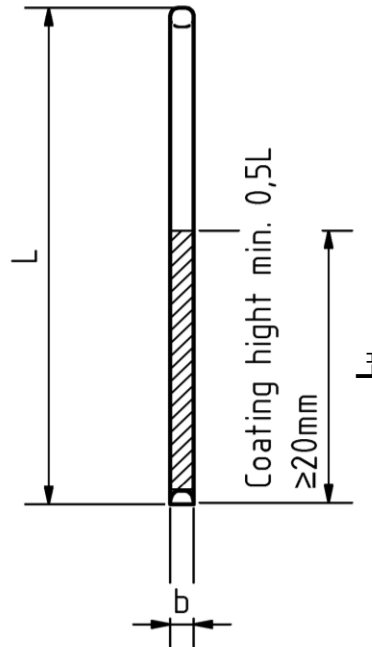
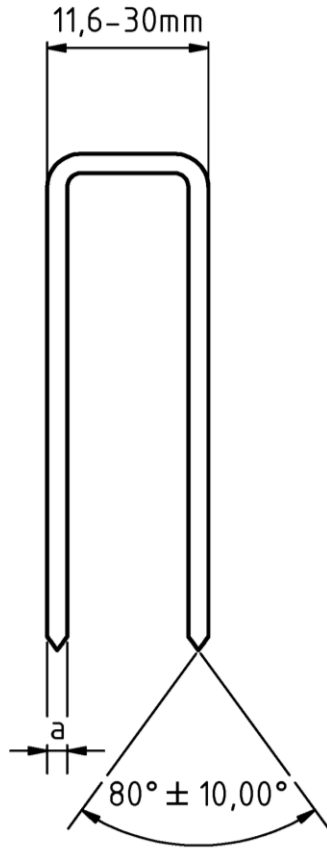
Nominal size	Length		basic size	tolerance
	mm	approx. inch	S	total
40	1 5/8	39,5	±0,5	
45	1 3/4	44,5	±0,5	
50	2	49,5	±0,5	
55	2 5/32	54,5	±0,5	
60	2 3/8	59,5	±0,5	
63	2 7/16	62,5	±0,5	
65	2 5/8	64,5	±0,5	
70	2 3/4	69,5	±0,5	
75	3	74,5	±0,5	
80	3 1/6	79,5	±0,5	
85	3 1/3	84,5	±0,5	
90	3 9/16	89,5	±0,5	
100	4	99,5	±0,5	
105	4 2/15	104,5	±0,5	
110	4 3/8	109,5	±0,5	
120	4 3/4	119,5	±0,5	
130	5 1/8	129,5	±0,5	
150	5 9/10	149,5	±0,5	
160	6 1/3	159,5	±0,5	
170	6 7/10	169,5	±0,5	

Non-alloy steel rod in accordance with EN ISO 16120
Tensile-strength min. 900N/mm²
Resin coating Typ 3 (DIN EN 14592:2008+A1:2012)
Galvanized with a zinc-thickness of 12μ

BeA / KMR Staples d=1,55mm; d=1,8mm; d=2,02mm

Technical description of the product;
BeA Staples: 200 VZHZ, 246 VZHZ galvanised
KMR Staples: SD Galv, BS Galv galvanised

Annex 1.5



	Size	Tolerance
Raw-wire	2,02	+0,02/-0,01
flattened wire	a	±0,03
	b	±0,02

Nominal size	Length		basic size S	tolerance total
	mm	approx. inch		
40	40	1 5/8	39,5	±0,5
45	45	1 3/4	44,5	±0,5
50	50	2	49,5	±0,5
55	55	2 5/32	54,5	±0,5
60	60	2 3/8	59,5	±0,5
63	63	2 7/16	62,5	±0,5
65	65	2 5/8	64,5	±0,5
70	70	2 3/4	69,5	±0,5
75	75	3	74,5	±0,5
80	80	3 1/6	79,5	±0,5
85	85	3 1/3	84,5	±0,5
90	90	3 9/16	89,5	±0,5
100	100	4	99,5	±0,5
105	105	4 2/15	104,5	±0,5
110	110	4 3/8	109,5	±0,5
120	120	4 3/4	119,5	±0,5
130	130	5 1/8	129,5	±0,5
150	150	5 9/10	149,5	±0,5
160	160	6 1/3	159,5	±0,5
170	170	6 7/10	169,5	±0,5

Stainless-steel rod in accordance with EN 10088-1
Tensile-strength min. 900N/mm²
Quality 1.4401 (A2/RF=1.4301)
Resin coating Typ 3 (DIN EN 14592:2008+A1:2012)

BeA / KMR Staples d=1,55mm; d=1,8mm; d=2,02mm

Technical description of the product;
BeA Staples: 200 NRHZ, 246 NRHZ stainless steel
KMR Staples: SD A4, BS A4, BS A2 stainless steel

Annex 1.6

Annex 2 Specifications of intended use

A.2.1 Loading

- Static and quasi-static loads (not relevant to fatigue)
- Short-, medium-, longterm and permanent load duration withdrawal as well as shear

A.2.2 Connection material

BeA/KMR Staples Type d=1,55mm, d=1,8mm, d=2,02mm are used for load bearing connections of the following material.

Material for base building components

- Solid timber (softwood) according to EN 338¹/ EN 14081-1²,
- Glued laminated timber (softwood) according to EN 14080³,
- Glued solid timber according to EN 14080,
- Laminated veneer lumber LVL according to EN 14374⁴,
- Cross-laminated timber according to European technical approvals/assessments or national provisions that apply at the installation site.

Material for connected building components

- Oriented Strand Board (OSB) according to EN 300⁵ and EN 13986⁶,
- Plywood according to EN 636⁷ and EN 13986,
- Cement-bonded particle boards according to EN 634-2⁸ and EN 13986,
- Fibreboards according to EN 622-2⁹, EN 622-3¹⁰ and EN 13986,
- Laminated veneer lumber LVL according to EN 13986 in connection with EN 14279¹¹,
- Solid-wood panels according to EN 13353¹² and EN 13986,
- Gypsum boards according to EN 520¹³, density $\rho \geq 680 \text{ kg/m}^3$ but without Typ D,
Gypsum boards Typ D with a density of $\rho \geq 800 \text{ kg/m}^3$
- Gypsum boards with mat reinforcement according to EN 15283-1¹⁴ and Gypsum fibre boards according to EN 15283-2¹⁵
- Fibre-cement flat sheets – Product specification and test methods according to EN 12467¹⁶
- Thermal insulation products for buildings – Factory made wood fibre (WF) products – Specification according to EN 13171¹⁷

1	EN 338:2016	Timber structures - Strength classes
2	EN 14081-1:2016	Timber structures – Strength graded structural timber with rectangular cross section – Part 1: General requirements
3	EN 14080:2013	Timber structures - Glued laminated timber and glued solid timber - Requirements
4	EN 14374:2004	Timber structures - Structural laminated veneer lumber - Requirements
5	EN 300:2006	Oriented strand boards (OSB) – Definition, classification and specifications
6	EN 13986:2004+A1:2015	Wood-based panels for use in construction - Characteristics, evaluation of conformity and marking
7	EN 636:2012+A1:2015	Plywood - Specifications
8	EN 634-2:2007	Cement-bonded particleboards – Specifications – Part 2: Requirements for OPC bonded particleboards for use in dry, humid and external conditions
9	EN 622-2:2004	Fibreboards - Specifications - Part 2: Requirements for hardboards
10	EN 622-3:2004	Fibreboards - Specifications - Part 3: Requirements for medium boards
11	EN 14279:2009	Laminated Veneer Lumber (LVL) – Definitions, classification and specifications
12	EN 13353:2008+A1:2011	Solid wood panels (SWP) – Requirements
13	EN 520:2004+A1:2009	Gypsum plasterboards – Definitions, requirements and test methods
14	EN 15283-1:2008+A1:2009	Gypsum boards with fibrous reinforcement – Definitions, requirements and test methods – Part 1: Gypsum boards with mat reinforcement
		Part 2: Gypsum fibre boards
15	EN 15283-2:2008+A1:2009	Gypsum boards with fibrous reinforcement – Definitions, requirements and test methods – Part 2: Gypsum fibre boards
16	EN 12467:2012+A1:2016	Fibre-cement flat sheets – Product specification and test methods
17	EN 13171:2012	Thermal insulation products for buildings – Factory made wood fibre (WF) products – Specification

A.2.3 Use conditions (environmental conditions)

A.2.3.1 Durability against corrosion

BeA/KMR Staples $d=1,55\text{mm}$, $d=1,8\text{mm}$, $d=2,02\text{mm}$ made of non-alloy steel rods are galvanized. The mean thickness of the zinc coating is $12\ \mu\text{m}$. Steel no. 1.4401 (A4) is used for BeA/KMR Staples $d=1,55\text{mm}$, $d=1,8\text{mm}$ and $d=2,02\text{mm}$ made of stainless steel.

A.2.3.2 Durability of the resin coating

The resin coating l_H of BeA/KMR Staples $d=1,55\text{mm}$, $d=1,8\text{mm}$, $d=2,02\text{mm}$ has a minimum length of 50 % of the legs according to Annex 1. The following kinds of resin are used:

Harz 975229.5.K180 Nr. 5229 Blau.

Data sheets of chemical compositions (as well as the process of application and drying for resin coatings) are deposited at Deutsches Institut für Bautechnik.

The resin coating fulfills the requirements of the EAD 130019-00-0603, clause 2.2.9 "durability of the resin coating".

A.2.3.3 Installation

EN 1995-1-1¹⁸ in conjunction with the respective national annex applies for the installation.

The pointside penetration length t_2 of the staples has to be at least $14 \cdot d$.

For connections of wood fibre insulation material the maximum length of the leg is $l = 85 \cdot d$, the minimum width is $b=20\text{mm}$ and the maximum thickness of the insulation is $70 \cdot d$.

¹⁸ EN 1995-1-1:2004+A1:2008+A2:2014

Annex 3 Specifications of essential characteristics

A.3.1 Characteristic yield moment according to EN 14592

Table A.3.1 Characteristic yield moment $M_{y,k}$ [Nm] of one leg of BeA/KMR staples $d=1,55\text{mm}$, $d=1,8\text{mm}$, $d=2,02\text{mm}$

Type	Nominal diameter d in mm	Characteristic yield moment $M_{y,k}$ in Nm	
		galvanised	stainless steel
155 VZHZ, 146 VZHZ, KG700 Galv, G Galv	1,55	0,64	-
155 NRHZ, 146 NRHZ, KG700 A4, G A4		-	0,71
180 VZHZ, Q Galv	1,80	0,97	-
180 NRHZ, Q A4		-	1,02
200 VZHZ, 246 VZHZ, SD Galv, BS Galv	2,02	1,28	-
200 NRHZ, 246 NRHZ, SD A4, BS A2, BS A4		-	1,37

A.3.2 Withdrawal capacity for short-term and medium-term loads

The characteristic withdrawal parameter $f_{ax,k}$ of one leg (at an angle of at least 30° between the width of staple crown and the direction of the grain) for material with a characteristic density $\rho_k \geq 350 \text{ kg/m}^3$ as well as for short-term and medium-term withdrawal loads can be taken from Table A.3.2.

Tabelle A.3.2 Charakteristic withdrawal parameter $f_{ax,k}$ of one leg of BeA/KMR staples $d=1,55\text{mm}$, $d=1,8\text{mm}$, $d=2,02\text{mm}$

Type	Nominal diameter d in mm	Withdrawal parameter short- and medium-term load $f_{ax,k}$ in N/mm ²	
		galvanised	stainless steel
155 VZHZ, 146 VZHZ, KG700 Galv, G Galv	1,55	7,8	-
155 NRHZ, 146 NRHZ, KG700 A4, G A4		-	6,9
180 VZHZ, Q Galv	1,80	6,7	-
180 NRHZ, Q A4		-	5,9
200 VZHZ, 246 VZHZ, SD Galv, BS Galv	2,02	6,3	-
200 NRHZ, 246 NRHZ, SD A4, BS A2, BS A4		-	7,4

The withdrawal parameter according to Table A.3.2 have been determined for a maximum length of staples in the base building components of $14 \cdot d \leq t_2 \leq 20 \cdot d$.

A.3.3 Design value of withdrawal capacity for long-term and permanent loads

The design value of withdrawal capacity for long-term and permanent loads for service class 1 and 2 for one staple may be taken to:

$$R_{ax,d} = 70 \text{ N, mit } \gamma_M = 1,3.$$

The design value of withdrawal capacity applies for a characteristic density of $\rho_k \geq 350 \text{ kg/m}^3$.

A.3.4 Maximum thickness of base building components

The maximum thickness t_1 according to Table A.3.3 applies for base building components (made of material according to chapter A.2.2) depending on the density of base building components.

Table A.3.3 Maximum thickness of connected material

Maximum thickness t_1 [mm]	Range of density ρ_k [kg/m ³]	Material of connected components Examples
80	$\rho_k \leq 400$	Solid timber of softwood
60	$400 < \rho_k \leq 650$	Wood-based panels and solid timber of hard- and softwood
40	$650 < \rho_k \leq 900$	Wood-based panels and gypsum boards
25	$900 < \rho_k \leq 1200$	Hardboards, gypsum fibreboards, cement-bonded particleboards
20	$1200 < \rho_k \leq 1600$	Highly compressed gypsum fibreboards

The maximum thickness of wood fibre insulation material is $t_1 \leq 70 \cdot d$.

A.3.5 Head pull-through capacity of wood and wood-based panels

The characteristic head pull-through parameters $f_{head,k}$ for one staple of BeA/KMR Staples $d=1,55\text{mm}$, $d=1,8\text{mm}$, $d=2,02\text{mm}$ for a minimum thickness of material according to Table A.3.4 (for material with a characteristic density of $\rho_k \geq 350 \text{ kg/m}^3$) shall be taken from Table A.3.5:

Table A.3.4 Minimum thickness of wood and wood-based panels

Wood or wood-based panels	Minimum thickness t_1 [mm]
Solid timber (softwood)	24
Solid wood panels	$7d^*$
Plywood	6^*
Oriented Strand Boards OSB	8^*
Resin-bonded particleboards	8^*
Cement-bonded particleboards	8^*

* if staple crown is countersunk it has to be increased by 2 mm

The characteristic head pull-through capacity may be calculated according to equation (1)

$$R_{ax,2,k} = f_{head,k} \cdot b \cdot d \quad \text{N} \quad (1)$$

with:

- $f_{head,k}$: characteristic head pull-through parameter in N/mm²
- b : width of staple crown [mm], $b \leq 27 \text{ mm}$
- d : nominal diameter of raw staple wire in mm

Table A.3.5 Characteristic head pull-through parameter $f_{head,k}$ for material $\rho_k \geq 350 \text{ kg/m}^3$, $b \leq 27 \text{ mm}$

Type	Nominal diameter d in mm	Width of staple crown b in mm	Head pull-through parameter $f_{head,k}$ in N/mm ²
155 VZHZ, KG700 Galv, G Galv	1,55	10,6	37
155 NRHZ, KG700 A4, G A4		10,5	
146 VZHZ, 146 NRHZ,	1,80	25,9	39
180 VZHZ, Q Galv, 180 NRHZ, Q A4		11,0	33
200 VZHZ, SD Galv, 200 NRHZ, SD A4	2,02	11,5	30
246 VZHZ, BS Galv, 246 NRHZ, BS A2, BS A4		27,0	36

A.3.6 Head pull-through capacity of wood fibre insulation material

The characteristic head pull-through parameter $f_{\text{head,k}}$ for one staple of BeA/KMR Staples $d=2,02\text{mm}$ (depending on the density) for wood fibre insulation material with a minimum thickness of 60 mm shall be taken from Table A.3.6. The width of the staple crown has to be at least 20 mm.

Tabelle A.3.6 Characteristic head pull-through parameter $f_{\text{head,k}}$ for wood fibre insulation material

Type	Nominal diameter d in mm	Minimum density ρ in kg/m^3	Width of staple crown b in mm	Head pull-through parameter $f_{\text{head,k}}$ in N/mm^2
246 VZHZ, BS Galv, 246 NRHZ, BS A2, BS A4	2,02	≥ 110	27,3	1,61
		≥ 140		8,59

A.3.7 Minimum tensile strength of the wire

Table A.3.7 Minimum tensile strength f_u [N/mm^2] of the raw wire of BeA/KMR staples
 $d=1,55\text{mm}$, $d=1,8\text{mm}$, $d=2,02\text{mm}$

Nominal diameter d in mm	1,55	1,80	2,02
Galvanised	900		
Stainless steel	900		