

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-21/0657
of 3 November 2021

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 = 1.55 mm; d = 1.8 mm;
d = 2.02 mm - with bright yellow coating for long-term and
permanent load duration withdrawal capacity

Product family
to which the construction product belongs

Dowel-type fasteners with resin coating

Manufacturer

BeA Deutschland
Befestigungstechnik GmbH
Bogenstraße 43-45
22926 Ahrensburg
DEUTSCHLAND

Manufacturing plant

BeA 24; BeA 6

This European Technical Assessment
contains

13 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 $d = 1.55$ mm, $d = 1.8$ mm and $d = 2.02$ mm with bright yellow coating are dowel-type fasteners made from non-alloy steel rods in accordance with EN ISO 16120¹ or made of stainless steel drawn from austenitic steel rods in accordance with EN 10088-1² for timber constructions. The staples have a special resin coating over their entire length.

The diameters of the staple legs are $d = 1.55$ mm $+0/-0.02$ mm, $d = 1.8$ mm $+0/-0.02$ mm or $d = 2.02$ mm $+0.02/-0.01$ 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 $d = 1.55$ mm, $d = 1.8$ mm and $d = 2.02$ mm with bright yellow coating are used in compliance with the specifications and conditions given in Annex 2 and 3.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of BeA/KMR staples $d = 1.55$ mm, $d = 1.8$ mm and $d = 2.02$ mm with bright yellow coating 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 materials	See Annex 3
Durability against corrosion	See Annex 2
Durability of the resin coating	See Annex 2

¹ EN ISO 16120:2017

² EN 10088-1:2014

Non-alloy steel wire rod for conversion to wire (all parts)

Stainless steel – Part 1: List of stainless steels

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1

3.3 Safety and accessibility in use (BWR 4)

The essential characteristics of BWR 4 are covered by BWR 1.

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: 97/176/EC.
The system to be applied is: 3

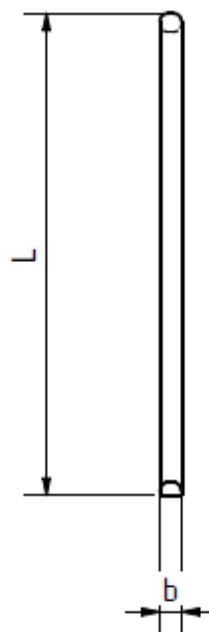
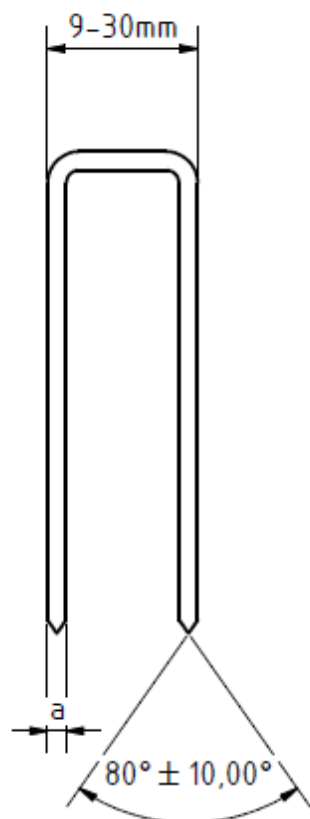
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

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 3 November 2021 by Deutsches Institut für Bautechnik

Anja Dewitt
Head of Section

beglaubigt:
Blümel



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

Length L		min	tolerance
Nominal size	approx.	L	total
mm	inch	mm	mm
30	1 3/16	29,7	±0,3
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

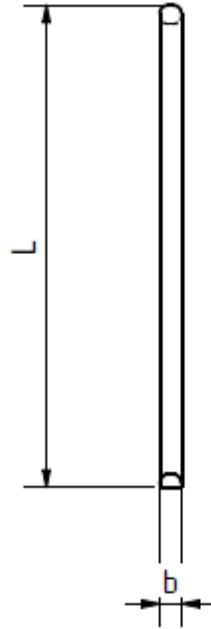
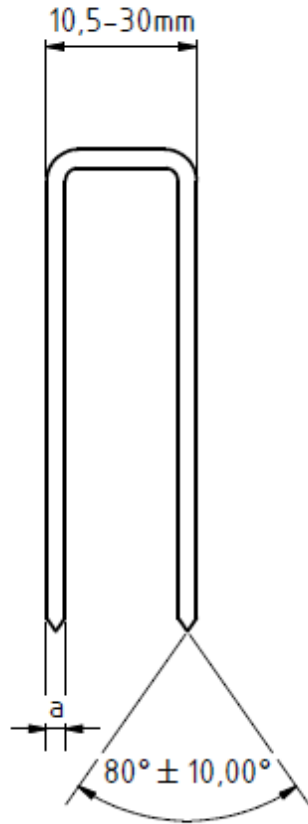
Coating over the entire length

BeA / KMR staples d = 1.55 mm; d = 1.8 mm; d = 2.02 mm - with bright yellow coating for long-term and permanent load duration withdrawal capacity

Product description:
BeA: 155 VZHZ, 145 VZHZ, 146 VZHZ with bright yellow coating
KMR: KG700 Galv, G Galv with bright yellow coating

Annex 1.1

English translation prepared by DIBt



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

Length L		min	tolerance total
Nominal size	approx.	L	
mm	inch	mm	mm
30	1 3/16	29,7	±0,3
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 1/8	79,3	±0,7
85	3 1/3	84,3	±0,7
90	3 9/16	89,3	±0,7

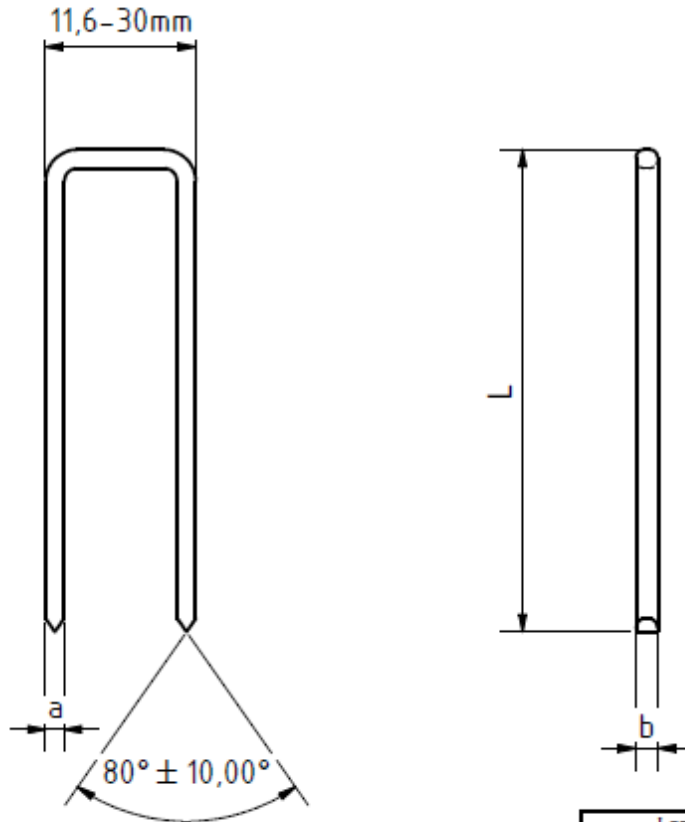
Non-alloy steel rod in accordance with EN ISO 16120
Tensile-strength min. 900N/mm²
Resin coating Typ 3 (DIN EN 14592:2008+A1:2012)
Galvanized with a zinc-thickness of 12µ

Coating over the entire length

BeA / KMR staples d = 1.55 mm; d = 1.8 mm; d = 2.02 mm - with bright yellow coating for long-term and permanent load duration withdrawal capacity

Product description:
BeA: 180 VZHZ, Q180 VZHZ with bright yellow coating
KMR: Q Galv with bright yellow coating

Annex 1.2



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

Length L		min	tolerance
Nominal size	approx.	L	total
mm	inch	mm	mm
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 1/8	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

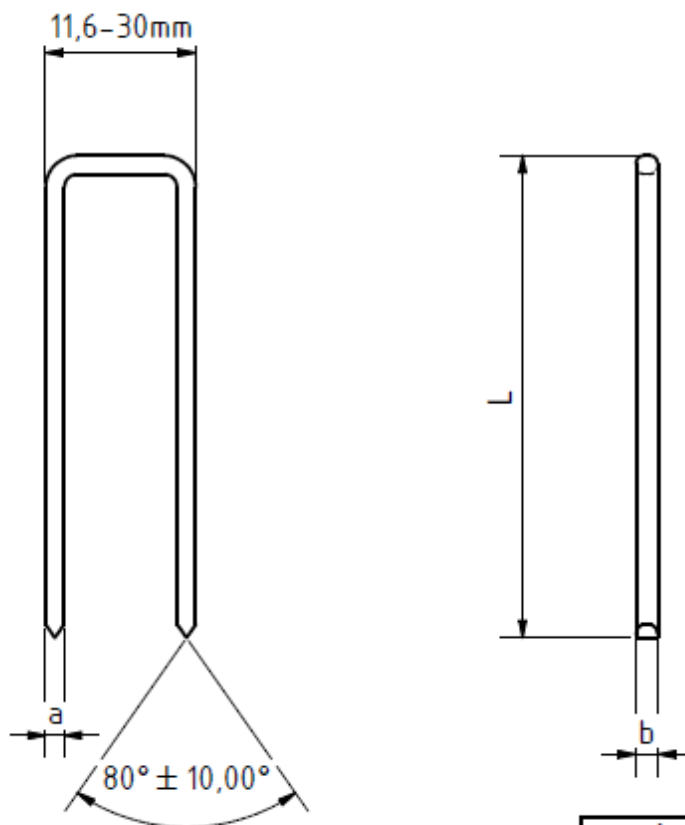
Non-alloy steel rod in accordance with EN ISO 16120
Tensile-strength min. 900N/mm²
Resin coating Typ 3 (DIN EN 14592:2008+A1:2012)
Galvanized with a zinc-thickness of 12µ

Coating over the entire length

BeA / KMR staples d = 1.55 mm; d = 1.8 mm; d = 2.02 mm - with bright yellow coating for long-term and permanent load duration withdrawal capacity

Product description:
BeA: 200 VZHZ, 246 VZHZ with bright yellow coating
KMR: BS Galv with bright yellow coating

Annex 1.3



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

Length L		min	tolerance
Nominal size	approx.	L	total
mm	inch	mm	mm
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 1/8	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

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

Coating over the entire length

BeA / KMR staples d = 1.55 mm; d = 1.8 mm; d = 2.02 mm - with bright yellow coating for long-term and permanent load duration withdrawal capacity

Product description:
BeA: 200 RFHZ, 246 RFHZ with bright yellow coating
KMR: BS A2 with bright yellow coating

Annex 1.4

Annex 2 Specifications of intended use

A.2.1 Loading

- Static and quasi-static loads (not relevant to fatigue)
- Short-, medium-, long-term and permanent load duration withdrawal as well as lateral loading

A.2.2 Connection material

BeA/KMR staples $d = 1.55$ mm, $d = 1.8$ mm and $d = 2.02$ mm with bright yellow coating are used for load bearing connections of the following material.

Material for base building components

- Solid timber (softwood) in accordance with EN 14081-1¹,
- Glued laminated timber in accordance with EN 14080²,
- Glued solid timber in accordance with EN 14080,
- Laminated veneer lumber LVL (softwood) in accordance with EN 14374³,
- Cross laminated timber (softwood) in accordance with European Technical Assessments.

Material for connected building components

- Oriented strand board (OSB) in accordance with EN 300⁴ and EN 13986⁵,
- Plywood in accordance with EN 636⁶ and EN 13986,
- Cement-bonded particleboards in accordance with EN 634-2⁷ and EN 13986,
- Fibreboards in accordance with EN 622-2⁸, EN 622-3⁹ and EN 13986,
- Laminated veneer lumber LVL (softwood) in accordance with EN 13986 in connection with EN 14279¹⁰ or EN 14374,
- Solid wood panels (SWP) in accordance with EN 13353¹¹ and EN 13986,
- Gypsum plasterboards in accordance with EN 520¹², density $\rho \geq 680$ kg/m³, including Type D with a density of $\rho \geq 800$ kg/m³,
- Gypsum boards with mat reinforcement in accordance with EN 15283-1¹³ and gypsum fibre boards in accordance with EN 15283-2¹⁴,
- Fibre-cement flat sheets in accordance with EN 12467¹⁵,
- Wood fibre insulation material in accordance with EN 13171¹⁶.

1	EN 14081-1:2005+A1:2011	Timber structures – Strength graded structural timber with rectangular cross section – Part 1: General requirements
2	EN 14080:2013	Timber structures – Glued laminated timber and glued solid timber - Requirements
3	EN 14374:2004	Timber structures – Structural laminated veneer lumber - Requirements
4	EN 300:2006	Oriented strand boards (OSB) – Definition, classification and specifications
5	EN 13986:2004+A1:2015	Wood-based panels for use in construction – Characteristics, evaluation of conformity and marking
6	EN 636:2012+A1:2015	Plywood – Specifications
7	EN 634-2:2007	Cement-bonded particleboards – Specifications – Part 2: Requirements for OPC bonded particleboards for use in dry, humid and external conditions
8	EN 622-2:2004/AC:2005	Fibreboards – Specifications – Part 2: Requirements for hardboards
9	EN 622-3:2004	Fibreboards – Specifications – Part 3: Requirements for medium boards
10	EN 14279:2004+A1:2009	Laminated Veneer Lumber (LVL) – Definitions, classification and specifications
11	EN 13353:2008+A1:2011	Solid wood panels (SWP) – Requirements
12	EN 520:2004+A1:2009	Gypsum plasterboards – Definitions, requirements and test methods
13	EN 15283-1:2008+A1:2009	Gypsum boards with fibrous reinforcement – Definitions, requirements and test methods – Part 1: Gypsum boards with mat reinforcement
14	EN 15283-2:2008+A1:2009	Gypsum boards with fibrous reinforcement – Definitions, requirements and test methods – Part 2: Gypsum fibre boards
15	EN 12467:2012+ A1+2016+A2:2018	Fibre-cement flat sheets – Product specification and test methods
16	EN 13171:2012+A1:2015	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 $d = 1.55$ mm, $d = 1.8$ mm, $d = 2.02$ mm with bright yellow coating made from non-alloy steel rods are galvanized. The mean thickness of the zinc coating is $12 \mu\text{m}$. Steel no. 1.4301 is used for BeA/KMR staples $d = 2.02$ mm made from stainless steel.

A.2.3.2 Durability of the resin coating

The BeA/KMR staples $d = 1.55$ mm, $d = 1.8$ mm, $d = 2.02$ mm with bright yellow coating are resin-coated over their entire length in accordance with Annex 1. The following kind of resin is used:

resin type "Type 2/bright yellow".

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 1995-1-1¹⁷ applies for the installation of constructions with BeA/KMR staples $d = 1.55$ mm, $d = 1.8$ mm, $d = 2.02$ mm with bright yellow coating.

The pointside penetration length t_2 of the staples is 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 $b = 20$ mm and the maximum thickness of the insulation is $70 \cdot d$.

Annex 3 Specifications of essential characteristics

A.3.1 Characteristic yield moment

Table A.3.1 Characteristic yield moment $M_{y,k}$ of one leg of BeA/KMR staples $d = 1.55$ mm, $d = 1.8$ mm, $d = 2.02$ mm with bright yellow coating

Type	Nominal diameter d [mm]	Characteristic yield moment $M_{y,k}$ [Nm]
BeA: 155 VZHZ, 145 VZHZ, 146 VZHZ KMR: KG700 Galv, G Galv	1.55	0.6
BeA: 180 VZHZ, Q180 VZHZ KMR: Q Galv	1.80	0.8
BeA: 200 VZHZ, 246 VZHZ KMR: BS Galv	2.02	1.1
BeA: 200 RFHZ, 246 RFHZ KMR: BS A2	2.02	1.3

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 $\rho_k \geq 350$ kg/m³ as well as for short-term and medium-term withdrawal loads shall be taken from Table A.3.2.

Table A.3.2 Characteristic withdrawal parameter $f_{ax,k}$ of one leg of BeA/KMR staples $d = 1.55$ mm, $d = 1.8$ mm, $d = 2.02$ mm with bright yellow coating

Type	Nominal diameter d [mm]	Withdrawal parameter short- and medium-term load $f_{ax,k}$ [N/mm ²]
BeA: 155 VZHZ, 145 VZHZ, 146 VZHZ KMR: KG700 Galv, G Galv	1.55	7.9
BeA: 180 VZHZ, Q180 VZHZ KMR: Q Galv	1.80	6.2
BeA: 200 VZHZ, 246 VZHZ KMR: BS Galv	2.02	5.3
BeA: 200 RFHZ, 246 RFHZ KMR: BS A2	2.02	6.2

The withdrawal parameter given in 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 as:

$$R_{ax,d} = 70 \text{ N, with } \gamma_M = 1.3.$$

The design value of withdrawal capacity applies for a characteristic density of the timber product of $\rho_k \geq 350$ kg/m³.

A.3.4 Maximum thickness of the connected material

The maximum thickness t_1 given in Table A.3.3 applies for connected material (made of material described in chapter A.2.2) depending on the density of the connected material.

Table A.3.3 Maximum thickness t_1 of connected material

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

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 parameter $f_{head,k}$ for one staple of BeA/KMR staples $d = 1.55$ mm, $d = 1.8$ mm, $d = 2.02$ mm with bright yellow coating for a minimum thickness of material given in Table A.3.4 (for material with a characteristic density of $\rho_k \geq 350$ kg/m³) shall be taken from Table A.3.5:

Table A.3.4 Minimum thickness t_1 of wood and wood-based panels

Wood or wood-based panels	Minimum thickness t_1 [mm]
Solid timber (softwood)	24
Solid wood panels (SWP)	$7d^*$
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 with equation (1)

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

with: $f_{head,k}$: characteristic head pull-through parameter in N/mm²

b : width of staple crown in mm, $b \leq 30$ mm

d : nominal diameter of raw staple wire in mm

Table A.3.5 Characteristic head pull-through parameter $f_{head,k}$ for material $\rho_k \geq 350$ kg/m³, $b \leq 30$ mm

Type	Nominal diameter d [mm]	Width of staple crown b_{min} [mm]	Head pull-through parameter $f_{head,k}$ [N/mm ²]
BeA: 155 VZHZ KMR: KG700 Galv, G Galv	1.55	10.5	37
BeA: 146 VZHZ, 145 VZHZ		25.8	39
BeA: 180 VZHZ, Q180 VZHZ KMR: Q Galv	1.80	11.0	33
BeA: 200 VZHZ, 200 RFHZ	2.02	11.6	30
BeA: 246 VZHZ, 246 RFHZ KMR: BS Galv, BS A2		27.3	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 with bright yellow coating $d = 2.02$ 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.

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

Type	Nominal diameter d [mm]	Minimum density ρ [kg/m ³]	Width of staple crown b_{min} [mm]	Head pull-through parameter $f_{\text{head,k}}$ [N/mm ²]
BeA: 246 VZHZ, 246 RFHZ KMR: BS Galv, BS A2	2.02	≥ 110	27.3	1.6
		≥ 140		8.6

A.3.7 Minimum tensile strength of the wire

Table A.3.7 Minimum tensile strength f_u [N/mm²] of the raw wire of BeA/KMR staples $d = 1.55$ mm, $d = 1.8$ mm, $d = 2.02$ mm with bright yellow coating

Nominal diameter d [mm]	1.55	1.80	2.02
Galvanized	900		
Stainless steel	-	-	900