Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Member of EOTA

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# European Technical Assessment

# ETA-15/0842 of 31 May 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 | BeCoFix |
| Product family to which the construction product belongs | Mechanical fastener for use in concrete |
| Manufacturer | BeA GmbH<br>Bogenstraße 43-45<br>22926 Ahrensburg<br>DEUTSCHLAND |
| Manufacturing plant | BeA Plant 22 |
| This European Technical Assessment contains | 11 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 330232-00-0601 Edition 10/2016 |
| This version replaces | ETA-15/0842 issued on 13 April 2017 |



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## Specific Part

### 1 Technical description of the product

The BeCoFix Bolt Anchor is an anchor made of galvanized steel which is placed into a drilled hole and anchored by torque-controlled expansion.

The product description is given in Annex A.

### 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 anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor 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 |
|---|---|
| Characteristic resistance to tension load (static and quasi-static loading) Method A | See Annex B 1 and C 1 |
| Characteristic resistance to shear load (static and quasi-static loading) | See Annex C 2 |
| Displacements | See Annex C 1 and C 2 |
| Durability | See Annex B 1 |
| Characteristic resistance and displacements for seismic performance category C1 and C2 | No performance assessed |

### 3.2 Safety in case of fire (BWR 2)

| Essential characteristic | Performance |
|---|---|
| Reaction to fire | Class A1 |
| Resistance to fire | No performance assessed |

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

In accordance with the European Assessment Document EAD 330232-00-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

## 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 31 May 2021 by Deutsches Institut für Bautechnik

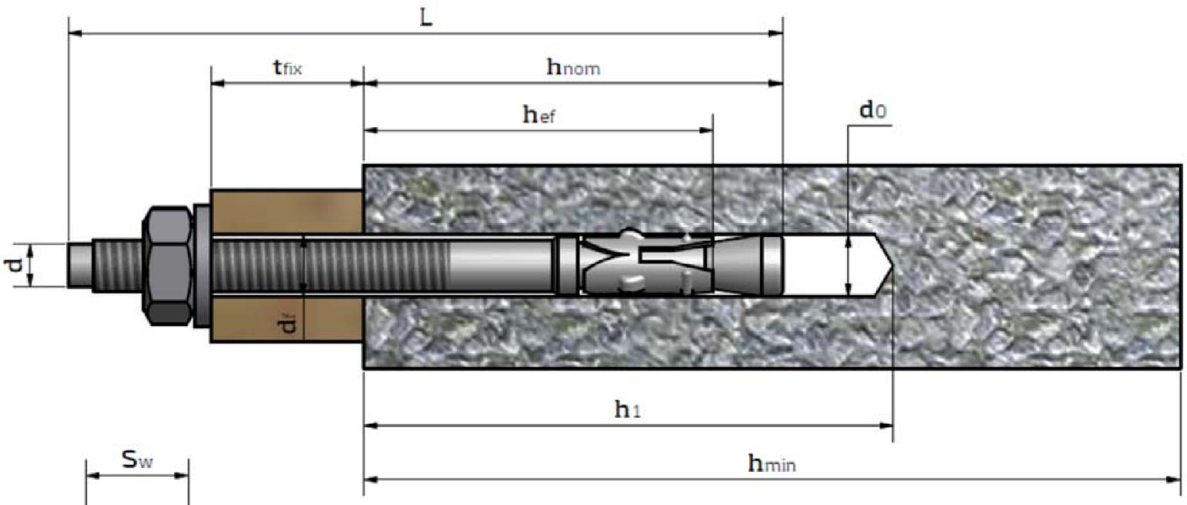
Dipl.-Ing. Beatrix Wittstock
Head of Section

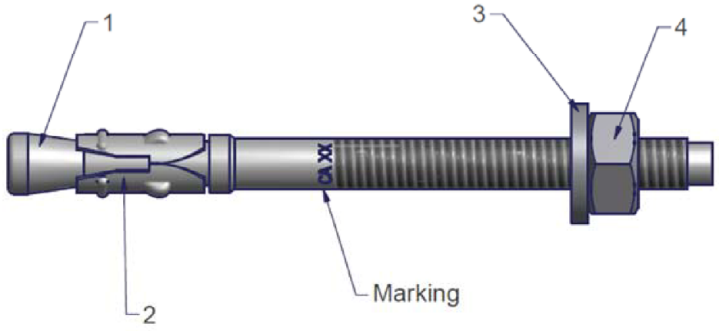
*beglaubigt:*
Lange

Deutsches Institut für Bautechnik DIBt

## Installed condition

## Metal expansion fastener BeCoFix




1. Bolt
2. Expansion clip
3. Washer
4. Nut

**Marking:**

CA (Product name)
XX = fixture thickness

| | |
|---|---|
| **BeCoFix** | |
| **Product description**<br>Installed condition and marking | **Annex A 1** |

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## Table A1: Dimensions

| | | | | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|---|---|
| Length of the fastener | Minimum | L | [mm] | 65 | 65 | 75 | 100 | 125 |
| | Maximum | | [mm] | 100 | 150 | 220 | 220 | 200 |
| Fixture thickness | Minimum | $t_{fix}$ | [mm] | 15 | 7 | 5 | 10 | 10 |
| | Maximum | | [mm] | 50 | 90 | 150 | 130 | 80 |

## Table A2: Materials

| Part | Designation | Material | Coating |
|---|---|---|---|
| 1 | Bolt | cold formed steel<br>SWRCH35K acc. to JIS G 3507-1 (2005) | Zinc electroplated |
| 2 | Expansion clip | M6: ST12<br>M8: ST14<br>M10-M16: DX51D+Z | Zinc electroplated |
| 3 | Washer | EN 10263-1:2017<br>1.1172 | Zinc electroplated |
| 4 | Hexagonal nut | EN 10263-1:2017<br>1.1172 | Zinc electroplated |

## Table A3: Steel strength

| Part | Parameter | Unit | | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|---|---|
| **Thread** | ultimate steel strength | $f_{uk}$ | [N/mm²] | 500 | 650 | 650 | 650 | 600 |
| | yield steel strength | $f_{yk}$ | [N/mm²] | 480 | 600 | 600 | 600 | 550 |
| **Neck** | ultimate steel strength | $f_{uk}$ | [N/mm²] | 600 | 800 | 820 | 740 | 740 |
| | yield steel strength | $f_{yk}$ | [N/mm²] | 550 | 700 | 710 | 620 | 620 |



**BeCoFix**

**Product description**
Dimensions, materials and steel strengths

**Annex A 2**

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## Intended use

**Anchorages subject to:**

- Static and quasi-static loads: All sizes.
- Size M6 with $h_{ef}$ < 40 mm only for statically indeterminate structural components

**Base materials:**

- Compacted, uncracked normal weight concrete without fibres according to EN 206:2013 + A1: 2016,
- Strength classes C20/25 to C50/60 according to EN 206:2013 + A1: 2016,

**Use conditions (Environmental conditions)**

- Anchorages subject to dry internal conditions.

**Design:**

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the fastener is indicated on the design drawings (e. g. position of the fastener relative to reinforcement or to supports, etc.).
- Anchorages under static or quasi-static actions are designed in accordance with EN 1992-4:2018

**Installation:**

- Hammer drilling only: all sizes.
- Installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Use of the fastener only as supplied by the manufacturer without exchanging the components.



| | |
|---|---|
| **BeCoFix** | |
| **Intended Use**<br>Specifications | **Annex B 1** |

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## Table B1: Installation parameters

| | | | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|---|
| Nominal drill hole diameter | $d_0$ | [mm] | 6 | 8 | 10 | 12 | 16 |
| Diameter through hole fixture | $d_f$ | [mm] | 7 | 9 | 12 | 14 | 18 |
| Drill hole diameter | $d_{cut} \leq$ | [mm] | 6,40 | 8,45 | 10,45 | 12,5 | 16,5 |
| Drill hole depth | $h_1$ | [mm] | 50 | 60 | 70 | 85 | 115 |
| Thread engagement | $h_{nom}$ | [mm] | 41 | 48 | 59 | 71 | 96 |
| Min. member thickness | $h_{min}$ | [mm] | 80 | 80 | 100 | 120 | 170 |
| Installation torque | $T_{inst}$ | [Nm] | 5 | 10 | 28 | 34 | 120 |

## Table B2: Minimum thickness of the concrete member, distances and spacing

| | | | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|---|
| Minimum member thickness of the concrete member | $h_{min}$ | [mm] | 80 | 80 | 100 | 120 | 170 |
| Minimum edge distance | $c_{min}$ | [mm] | 50 | 55 | 70 | 70 | 120 |
| | for s | [mm] | 50 | 55 | 100 | 140 | 120 |
| Minimum spacing | $s_{min}$ | [mm] | 50 | 55 | 70 | 70 | 120 |
| | for c | [mm] | 50 | 55 | 80 | 90 | 120 |



**BeCoFix**

**Intended Use**
Installation parameters
Minimum thickness of concrete member, distances and spacing

**Annex B 2**

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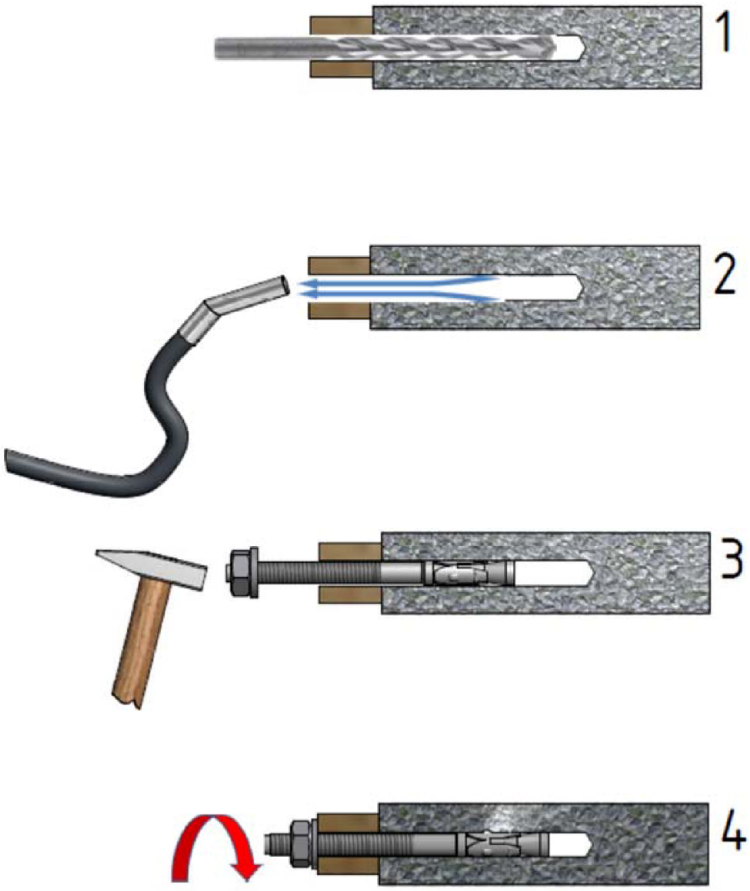
## Installation instructions




1: Drill bore hole with hammer drill.
2: Clean bore hole using a vacuum cleaner and a tube.
3: Set the fastener.
4: Expand the fastener with the prescribed installation torque $T_{inst}$.



| | |
|---|---|
| **BeCoFix** | **Annex B 3** |
| **Intended Use**<br>Installation instruction | |

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## Table C1: Fastener performance under tension load

| **Steel failure** | | | **M6** | **M8** | **M10** | **M12** | **M16** |
|---|---|---|---|---|---|---|---|
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 8,7 | 20,4 | 34,4 | 49,2 | 90,8 |
| Partial factor[1)] | $\gamma_{Ms}$ | [-] | 1,40 | 1,40 | 1,40 | 1,43 | 1,43 |

| **Pull-out failure (uncracked)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Characteristic resistance in uncracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 7,5 | 12 | 16 | 20 | 35 |
| Installation factor | $\gamma_{inst}$ | [-] | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 |
| Increasing factor for $N_{RK}$ concrete C30/37 | $\Psi_c$ | [-] | 1 | 1 | 1 | 1,22 | 1,12 |
| Increasing factor for $N_{RK}$ concrete C40/50 | | [-] | 1 | 1 | 1 | 1,41 | 1,23 |
| Increasing factor for $N_{RK}$ concrete C50/60 | | [-] | 1 | 1 | 1 | 1,23 | 1,30 |

| **Concrete cone failure and splitting failure** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Effective embedment depth | $h_{ef}$ | [mm] | 35 | 40 | 50 | 60 | 85 |
| Factor for uncracked concrete | $k_{ucr}$ | [-] | 11,0 | | | | |
| Factor for cracked concrete | $k_{cr}$ | [-] | No performance assessed | | | | |
| Characteristic spacing concrete cone failure | $s_{cr,N}$ | [mm] | $3xh_{ef}$ | | | | |
| Characteristic edge distance concrete cone failure | $c_{cr,N}$ | [mm] | $1,5xh_{ef}$ | | | | |
| Characteristic resistance for splitting concrete | $N^0_{Rk,sp}$ | [kN] | 7,5 | 12 | 16 | 20 | 35 |
| Characteristic spacing splitting failure | $s_{cr,sp}$ | [mm] | 160 | 220 | 240 | 250 | 330 |
| Characteristic edge distance splitting failure | $c_{cr,sp}$ | [mm] | 80 | 110 | 120 | 125 | 165 |

| **Displacements under tension load** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Tension load in uncracked concrete | N | [kN] | 3,6 | 5,7 | 7,6 | 9,5 | 16,7 |
| Short term displacement | $\delta_{N0}$ | [mm] | 0,7 | 1,1 | 1,1 | 1,2 | 1,3 |
| Long term displacement | $\delta_{N\infty}$ | [mm] | 1,1 | 1,7 | 1,7 | 1,9 | 2,0 |

[1)] In absence of other national regulations



**BeCoFix**

**Performance under tension load**

**Annex C 1**

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## Table C2: Fastener performance under shear load

| **Steel failure without lever arm** | | | **M6** | **M8** | **M10** | **M12** | **M16** |
|---|---|---|---|---|---|---|---|
| Characteristic resistance | $V^0_{Rk,s}$ | [kN] | 3,7 | 7,9 | 12,4 | 18,1 | 31,1 |
| Ductility factor | $k_7$ | [-] | 0,8 | 0,8 | 0,8 | 0,8 | 0,8 |
| Partial factor | $\gamma_{Ms}$ [1)] | [-] | 1,5 | 1,5 | 1,5 | 1,5 | 1,5 |

| **Steel failure with lever arm** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Characteristic bending resistance | $M^0_{Rk,s}$ | [Nm] | 7,6 [2)] | 24,4 | 48,5 | 85,2 | 199,0 |
| Partial factor | $\gamma_{Ms}$ [1)] | [-] | 1,5 | 1,5 | 1,5 | 1,5 | 1,5 |

| **Concrete pry-out failure** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Factor | $k_8$ | [-] | 1 | 1 | 1 | 2 | 2 |
| Partial factor | $\gamma_{Mc}$ [1)] | [-] | 1,50 | 1,50 | 1,50 | 1,50 | 1,50 |

| **Concrete edge failure** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Effective length of fastener under shear loading | $\ell_{f,min}$ | [mm] | 35 | 40 | 50 | 60 | 85 |
| Outside diameter of fastener | $d_{nom}$ | [mm] | 6 | 8 | 10 | 12 | 16 |
| Factor | $k_9$ | [-] | 2,4 | | | | |
| Partial factor | $\gamma_{Mc}$ [1)] | - | 1,50 | 1,50 | 1,50 | 1,50 | 1,50 |

| **Displacements under shear load** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Shear load in uncracked concrete | V | [kN] | 1,8 | 3,8 | 5,9 | 8,6 | 14,8 |
| Short term displacement | $\delta_{V0}$ | [mm] | 0,5 | 0,7 | 0,9 | 1,1 | 1,5 |
| Long term displacement | $\delta_{V\infty}$ | [mm] | 0,8 | 1,1 | 1,4 | 1,7 | 2,3 |

[1)] In absence of other national regulations



**BeCoFix**

**Performances under shear load**

**Annex C 2**