# European Technical Assessment

## ETA-20/0117
## of 19 June 2020

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 | Wedge Anchor BZ3 dynamic |
| Product family to which the construction product belongs | Mechanical Fastener for use in concrete |
| Manufacturer | MKT Metall-Kunststoff-Technik GmbH & Co. KG Auf dem Immel 2 67685 Weilerbach DEUTSCHLAND |
| Manufacturing plant | MKT Metall-Kunststoff-Technik GmbH & Co.KG |
| This European Technical Assessment contains | 12 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 330250-00-0601 Edition 09/2019 |

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**Specific Part**

## 1 Technical description of the product

The Wedge anchor BZ3 dynamic is a fastener made of zinc plated 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 fastener 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 fastener 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 fatigue resistance under cyclic tension loading (Assessment method B) | |
| Characteristic steel fatigue resistance | See Annex C1 |
| Characteristic concrete cone, pull-out, splitting and blow out fatigue resistance | |
| Characteristic fatigue resistance under cyclic shear loading (Assessment method B) | |
| Characteristic steel fatigue resistance | See Annex C1 |
| Characteristic concrete edge fatigue resistance | |
| Characteristic concrete pry out fatigue resistance | |
| Characteristic fatigue resistance under cyclic combined tension and shear loading (Assessment method B) | |
| Characteristic steel fatigue resistance | See Annex C1 |
| Load transfer factor for cyclic tension and shear loading | |
| Load transfer factor | See Annex C1 |

**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 330250-00-0601 the applicable European legal act is: 1996/582/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.
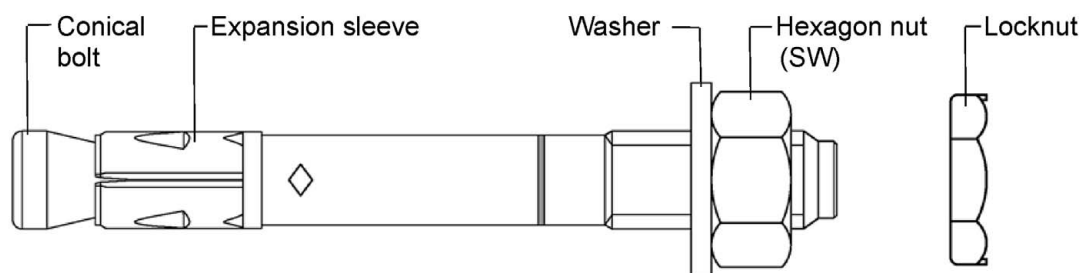
Issued in Berlin 19 June 2020 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow                    *beglaubigt:*
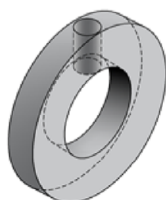Head of Department                                            G. Lange

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## Wedge anchor BZ3 dynamic

### BZ3 dynamic M10, M12, M16

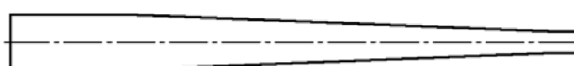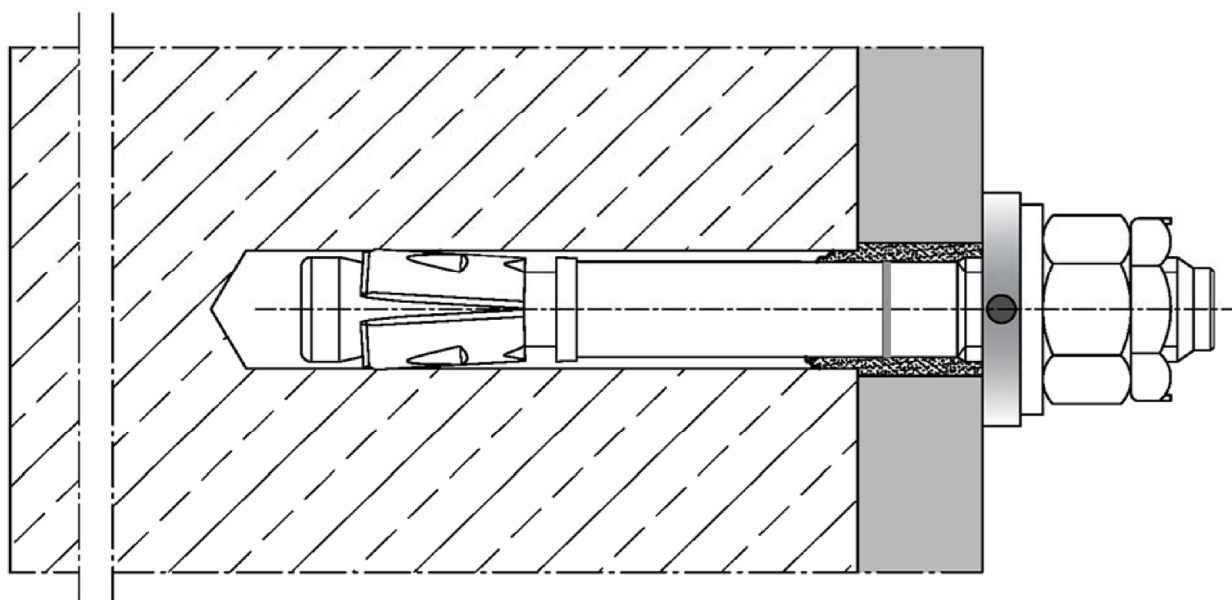Conical bolt — Expansion sleeve — Washer — Hexagon nut (SW) — Locknut

Filling washer

Reducing adapter

### Installation situation

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**Wedge Anchor BZ3 dynamic**

**Product description**
Product, installation situation

**Annex A1**

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## Marking

e.g. ◇ BZ3 dyn 30

◇ Identifying mark of
manufacturing plant
BZ3 dyn   fastener identity
30        max.thickness of fixture

Cone marking: e.g.
K   Marking of length
d   dynamic

1  2

Marking:
M10  Anchor size

M10

Optional: marking of
embedment depth

3  4  5  6

Kd

B

L
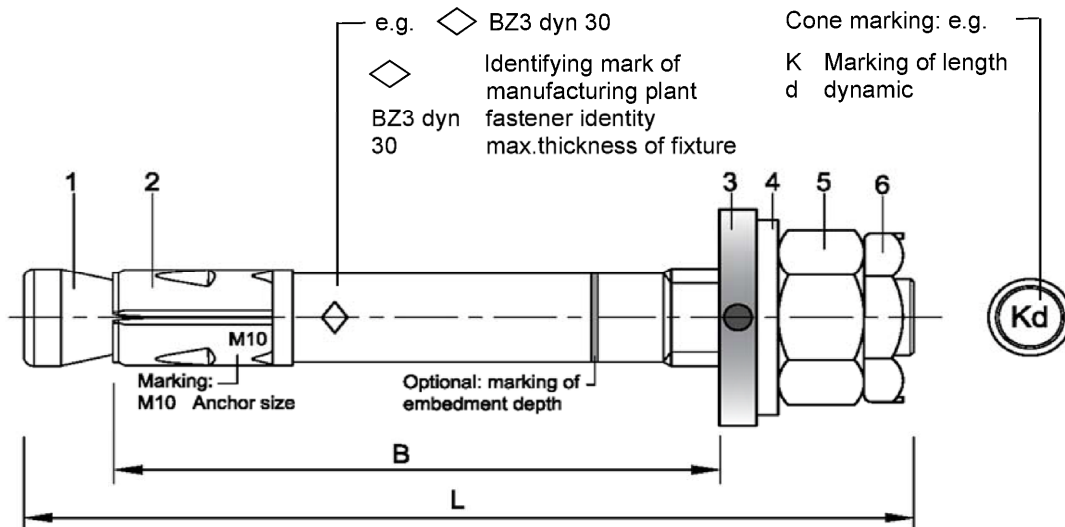
**Usable length:**   $B = h_{ef} + t_{fix}$

$h_{ef}$:  (existing) effective anchorage depth
$t_{fix}$:  fixture thickness

### Table A1:   Length identification

| Length identifier | | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Usable length B | ≥ | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 105 | 110 | 115 | 120 | 125 | 130 | 135 |

| Length identifier | | V | W | X | Y | Z |
|---|---|---|---|---|---|---|
| Usable length B | ≥ | 140 | 145 | 150 | 160 | 170 |

Dimensions in mm

### Table A2:   Material

| Part | Designation | Steel, zinc plated |
|---|---|---|
| 1 | Conical bolt | Steel, galvanized ≥ 5 µm, fracture elongation $A_5$ ≥ 8% |
| 2 | Expansion sleeve | Stainless steel |
| 3 | Filling washer | Steel, galvanized ≥ 5 µm |
| 4 | Washer | |
| 5 | Hexagon nut | |
| 6 | Locknut | |
| 7 | Filling mortar | e.g. MKT VMH, VMZ or VMU plus |

**Wedge Anchor BZ3 dynamic**

**Product description**
Marking, length identification, material

**Annex A2**

## Specifications of intended use

**Anchorages subject to:**

- Fatigue cyclic loading
- Static and quasi-static action, fire exposure and seismic performance according to ETA-19/0619

**Base materials:**

- Cracked or uncracked concrete
- Compacted, reinforced or unreinforced 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):**

- Structures 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.).
- Design method EN 1992-4:2018 and TR 061 (design method II)

**Installation:**

- Hole drilling by hammer drill bit or vacuum drill bit
- Use of the fastener only as supplied by the manufacturer without exchanging the components of the fastener
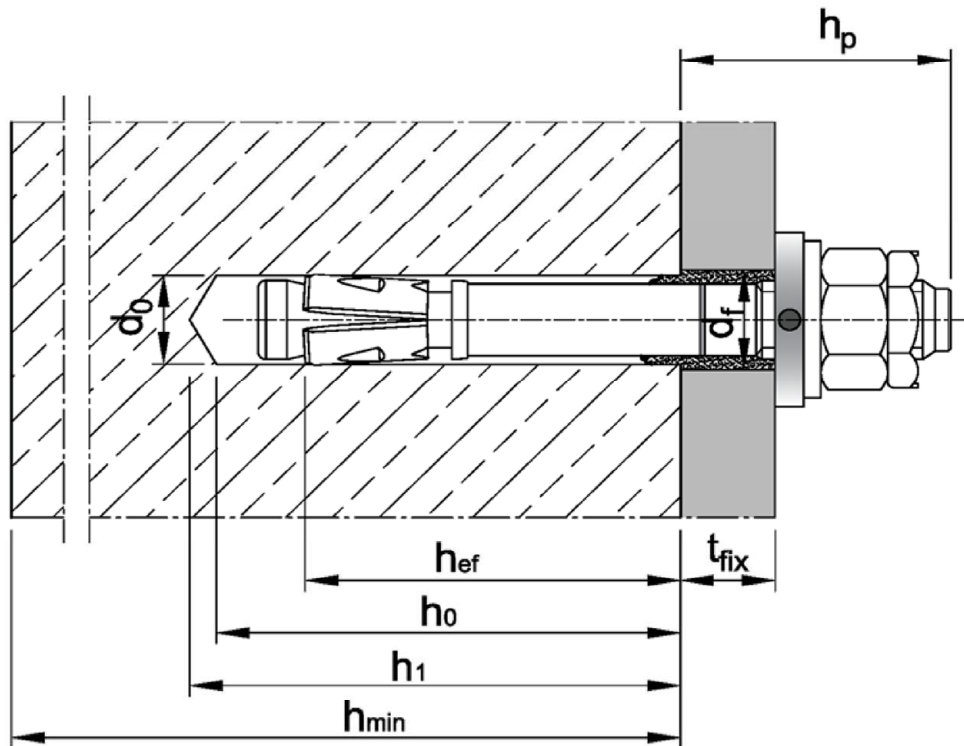
| Wedge Anchor BZ3 dynamic | |
|---|---|
| **Intended use**<br>Specifications of intended use | **Annex B1** |

## Table B1: Installation parameters

| Anchor size | | | M10 | M12 | M16 |
|---|---|---|---|---|---|
| Nominal drill hole diameter | $d_0 =$ | [mm] | 10 | 12 | 16 |
| Cutting diameter of drill bit | $d_{cut} \leq$ | [mm] | 10,45 | 12,5 | 16,5 |
| Effective anchorage depth[1] | $h_{ef} \geq$ | [mm] | 60 | 70 | 85 |
| Depth of drill hole | $h_0 \geq$ | [mm] | $h_{ef} + 9$ | $h_{ef} + 10$ | $h_{ef} + 14$ |
| | $h_1 \geq$ | [mm] | $h_{ef} + 11$ | $h_{ef} + 13$ | $h_{ef} + 17$ |
| Diameter of clearance hole in the fixture | $d_f =$ | [mm] | 12 | 14 | 18 |
| Minimum fixture thickness | $t_{fix,min} =$ | [mm] | 5 | 6 | 8 |
| Installation torque | $T_{inst} =$ | [Nm] | 40 | 60 | 110 |
| Overstand | $h_p \leq$ | [mm] | $21,5 + t_{fix}$ | $25,5 + t_{fix}$ | $29,5 + t_{fix}$ |
| Length of fastener | L | [mm] | $h_{ef} + t_{fix} + 30,5$ | $h_{ef} + t_{fix} + 35,5$ | $h_{ef} + t_{fix} + 43$ |
| Hexagon nut | width across nut | SW | [mm] | 17 | 19 | 24 |
| Locknut | width across nut | SW | [mm] | 17 | 19 | 24 |

[1] End of thread must be above the concrete surface



| Wedge Anchor BZ3 dynamic | |
|---|---|
| **Intended use** <br> Installation parameters | **Annex B2** |

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## Table B2: Minimum thickness of concrete member, minimum spacings, edge distances and required area

| Anchor size | | | M10 | M12 | M16 |
|---|---|---|---|---|---|
| Minimum member thickness depending on $h_{ef}$ | $h_{min} \geq$ | [mm] | | $1{,}5 \cdot h_{ef}$ | |
| **Minimum edge distances and spacings** | | | | | |
| Minimum edge distance | $c_{min}$ | [mm] | 45 | 55 | 65 |
| Minimum spacings | $s_{min}$ | [mm] | 40 | 50 | 65 |
| **Projected required area $A_{pr,req}$** | | | | | |
| Projected required area — cracked concrete | $A_{pr,req}$ | [mm²] | 23 700 | 31 500 | 42 300 |
| Projected required area — uncracked concrete | $A_{pr,req}$ | [mm²] | 34 700 | 41 300 | 50 200 |

**The edge distances and spacings shall be selected in steps of 5 mm. In combination with variable anchorage depths and member thicknesses, the following equation must be fulfilled:**

$$A_{pr,req} \leq A_{pr,ef}$$

$A_{pr,req}$   Projected required area
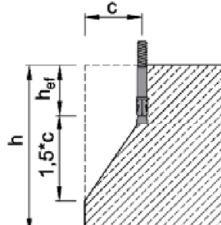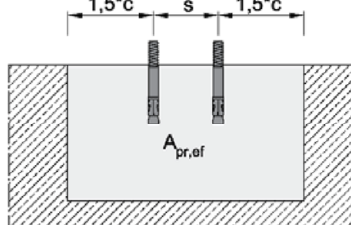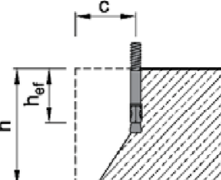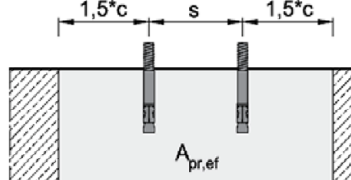$A_{pr,ef}$   Projected effective area (acc. to Table B4)

## Table B3: Applicable concrete thickness $h_{sp}$ and area $A_{sp}$ to determine characteristic edge distance $c_{cr,sp}$

| Anchor size | | | M10 | M12 | M16 |
|---|---|---|---|---|---|
| Applicable concrete thickness | $h_{sp}$ | [mm] | | $\min(h\,;\ h_{ef} + 1{,}5 \cdot c \cdot \sqrt{2})$ | |
| Area to determine $c_{cr,sp}$ [1] | $A_{sp}$ | [mm²] | $\dfrac{N^0_{Rk,sp} + 2{,}040}{0{,}000693}$ | $\dfrac{N^0_{Rk,sp} + 3{,}685}{0{,}000692}$ | $\dfrac{N^0_{Rk,sp} + 3{,}738}{0{,}000875}$ |

[1] with $N^0_{Rk,sp}$ in kN according to ETA-19/0619

**Wedge Anchor BZ3 dynamic**

**Intended use**
Minimum spacings and edge distances
Required area and applicable concrete thickness

**Annex B3**

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## Table B4: Projected effective area $A_{pr,ef}$ to determine spacings and edge distances

| Member thickness: | $h > h_{ef} + 1{,}5 \cdot c$ |
|---|---|

| Effective anchorage depth $\quad h_{ef} < 1{,}5 \cdot c$ | Effective anchorage depth $\quad h_{ef} \geq 1{,}5 \cdot c$ |
|---|---|

| Anchor group with $s \geq 3 \cdot c$ or single anchor | |
|---|---|
| $A_{pr,ef} = 2 \cdot (3 \cdot c) \cdot (1{,}5 \cdot c + h_{ef})$ [mm²] | $A_{pr,ef} = 2 \cdot (3 \cdot c) \cdot (3 \cdot c)$ [mm²] |

| Anchor group $(s < 3 \cdot c)$ | |
|---|---|
| $A_{pr,ef} = (3 \cdot c + s) \cdot (1{,}5 \cdot c + h_{ef})$ [mm²] | $A_{pr,ef} = (3 \cdot c + s) \cdot (3 \cdot c)$ [mm²] |



| Member thickness: | $h \leq h_{ef} + 1{,}5 \cdot c$ |
|---|---|

| Effective anchorage depth $\quad h_{ef} \leq 1{,}5 \cdot c$ | Effective anchorage depth $\quad h_{ef} > 1{,}5 \cdot c$ |
|---|---|

| Anchor group with $s \geq 3 \cdot c$ or single anchor | |
|---|---|
| $A_{pr,ef} = 2 \cdot (3 \cdot c) \cdot h$ [mm²] | $A_{pr,ef} = 2 \cdot (3 \cdot c) \cdot (h - h_{ef} + 1{,}5 \cdot c)$ [mm²] |

| Anchor group $(s < 3 \cdot c)$ | |
|---|---|
| $A_{pr,ef} = (3 \cdot c + s) \cdot h$ [mm²] | $A_{pr,ef} = (3 \cdot c + s) \cdot (h - h_{ef} + 1{,}5 \cdot c)$ [mm²] |



If the area $A_{pr,ef}$ is trimmed by lateral edges ($c_2 < 1{,}5 \cdot c$), calculate the area actually present.
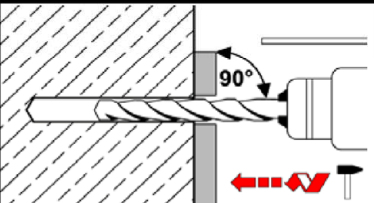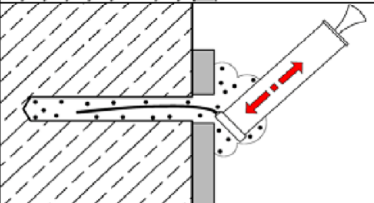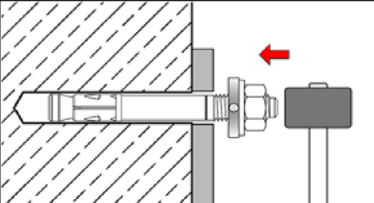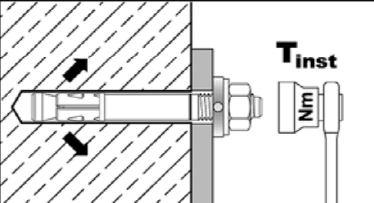The spacings and edge distances shall be rounded to 5 mm.
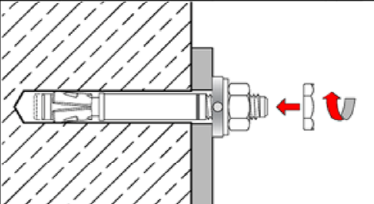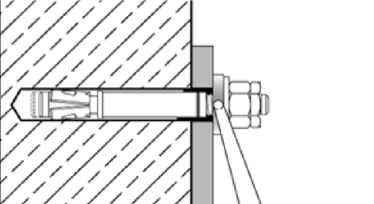
**Wedge Anchor BZ3 dynamic**

**Intended use**
Projected effective area to determine spacings and edge distances

**Annex B4**

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## Installation instructions

| | | |
|---|---|---|
| 1 |  | Drill hole perpendicular to concrete surface. If using a vacuum drill bit, proceed with step 3. |
| 2 |  | Blow out dust. Alternatively vacuum clean down to the bottom of the hole. |
| 3 |  | Drive in fastener with filling washer until effective anchorage depth is reached. |
| 4 |  | Apply installation torque $T_{inst}$ according to Table B1 by using torque wrench. |
| 5 |  | Screw on locknut until hand tight then tighten ¼ to ½ turn. |
| 6 |  | Fill the annular gap between anchor and fixture with mortar (compressive strength ≥ 40 N/mm², e.g. MKT Injection System VMH, VMZ or VMU plus). Use enclosed reducing adapter. Observe the processing information of the mortar! The annular gap is completely filled, when excess mortar seeps out. |

**Wedge Anchor BZ3 dynamic**

**Intended use**
Installation instructions

**Annex B5**

## Table C1: Characteristic values of fatigue resistance

| Anchor size | | | M10 | M12 | M16 |
|---|---|---|---|---|---|
| **Tension load** | | | | | |
| **Steel failure** | | | | | |
| Characteristic fatigue resistance | $\Delta N_{Rk,s,0,\infty}$ | [kN] | 4,6 | 6,2 | 9,7 |
| Exponent for combined loading | $\alpha_s$ | [-] | 0,5 | 0,5 | 0,7 |
| Load-transfer factor for fastener groups | $\psi_{FN}$ | [-] | | 0,5 | |
| **Pull-out** | | | | | |
| Characteristic fatigue resistance | $\Delta N_{Rk,p,0,\infty}$ | [kN] | | $0,5\ N_{Rk,p}$ [1] | |
| **Concrete cone and splitting failure** | | | | | |
| Characteristic fatigue resistance | $\Delta N_{Rk,c,0,\infty}$ | [kN] | | $0,5\ N_{Rk,c}$ [1] | |
| | $\Delta N_{Rk,sp,0,\infty}$ | [kN] | | $0,5\ N_{Rk,sp}$ [1] | |
| Effective anchorage depth | $h_{ef} \geq$ | [mm] | 60 | 70 | 85 |
| **Shear load** | | | | | |
| **Steel failure without lever arm** | | | | | |
| Characteristic fatigue resistance | $\Delta V_{Rk,s,0,\infty}$ | [kN] | 2,5 | 4,0 | 7,5 |
| Exponent for combined loading | $\alpha_s$ | [-] | 0,5 | 0,5 | 0,7 |
| Load-transfer factor for fastener groups | $\psi_{FV}$ | [-] | | 0,5 | |
| **Concrete pry-out failure** | | | | | |
| Characteristic fatigue resistance | $\Delta V_{Rk,cp,0,\infty}$ | [kN] | | $0,5\ V_{Rk,cp}$ [1] | |
| **Concrete edge failure** | | | | | |
| Characteristic fatigue resistance | $\Delta V_{Rk,c,0,\infty}$ | [kN] | | $0,5\ V_{Rk,c}$ [1] | |
| Effective length of anchor | $l_f$ | [mm] | 60 | 70 | 85 |
| Diameter of anchor | $d_{nom}$ | [mm] | 10 | 12 | 16 |

[1] $N_{Rk,c}$, $N_{Rk,p}$, $N_{Rk,sp}$, $V_{Rk,c}$ and $V_{Rk,cp}$ – Characteristic values of resistance under static or quasi-static actions according to ETA-19/0619 and EN 1992-4:2018

| **Wedge Anchor BZ3 dynamic** | |
|---|---|
| **Performance**<br>Characteristic values of fatigue resistance | **Annex C1** |