



...eine starke Verbindung

## DECLARATION OF PERFORMANCE

DoP Nr.: **MKT-1.1-901\_en**

- ❖ **Unique identification code of product-type:** **Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR**
- ❖ **Intended use/es:** Mechanical fastener for use in concrete, see Annex B
- ❖ **Manufacturer:** MKT Metall-Kunststoff-Technik GmbH & Co.KG  
Auf dem Immel 2  
67685 Weilerbach
- ❖ **System or systems of assessment and verification of constancy of performance:** 1
- ❖ **European Assessment Document:** **EAD 330232-01-0601**  
European Technical Assessment: **ETA-19/0619, 10.12.2021**  
Technical Assessment Body: DIBt, Berlin  
Notified body/ies: NB 2873 – Technische Universität Darmstadt

❖ **Declared performance/s:**


| Essential Characteristics   | Performance  |
|---|--------------|
| <b>Mechanical resistance and stability (BWR 1)</b>                          |              |
| Minimum edge distances and spacing  | Annex B3     |
| Characteristic resistance to tension load (static and quasi-static loading) | Annex C1, C2 |
| Characteristic resistance to shear load (static and quasi-static loading)   | Annex C3     |
| Characteristic values for seismic performance category C1+C2                | Annex C4     |
| Displacements   | Annex C7, C8 |
| Durability  | Annex B1     |
| <b>Safety in case of fire (BWR 2)</b>                                       |              |
| Reaction to fire  | Class A1     |
| Resistance to fire  | Annex C5, C6 |

The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Signed for and on behalf of the manufacturer by:



**Stefan Weustenhagen**  
(General manager)  
**Weilerbach, 10.12.2021**

p.p. 

**Dipl.-Ing. Detlef Bigalke**  
(Head of product development)



The original of this declaration of performance was written in German. In the event of deviations in the translation, the German version shall be valid.

## Specifications of intended use

| Wedge Anchor                             | BZ3 / BZ3 A4 / BZ3 HCR |                    |                    |                    |
|--|------------------------|--------------------|--------------------|--------------------|
|  | M8                     | M10                | M12                | M16                |
| Static or quasi-static action            | ✓                      |                    |                    |                    |
| Seismic performance categories C1 and C2 | ✓                      |                    |                    |                    |
| Fire exposure                            | R30 / R60 / R90 / R120 |                    |                    |                    |
| Variable, effective anchorage depth      | 35 mm to<br>90 mm      | 40 mm to<br>100 mm | 50 mm to<br>125 mm | 65 mm to<br>160 mm |

### Base materials:

- Cracked or uncracked concrete
- 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: all materials
- For all other conditions according to EN 1993-1-2006 + A1:2015-10, corresponding to corrosion resistance classes CRC according to Annex A3, Table A2

### 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 Technical Report TR 055:2018

### Installation:

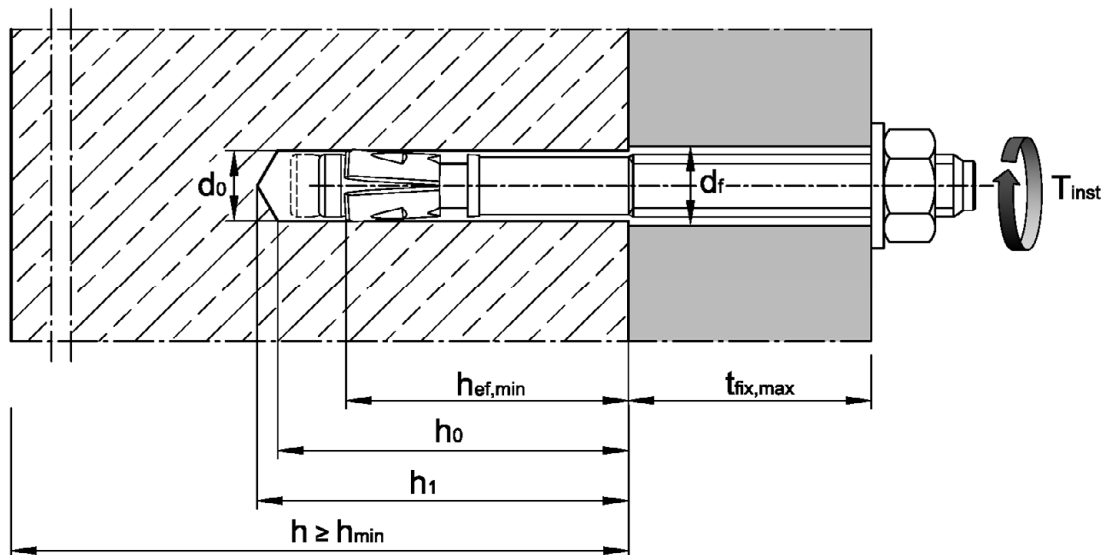
- Hole drilling by hammer drill bit or vacuum drill bit
- Use of the fastener only as supplied by the manufacturer without exchanging the components of the fastener (exception: when using the cap nut HM)
- The anchor can be set in pre- or through-setting installation.
- Optionally, the annular gap between fixture and stud of BZ3 can be filled to reduce the hole clearance. For this purpose, the filling washer (Annex A3) must be used in addition to the supplied washer. For filling use MKT Injection Adhesive VMH, VMU plus, VMZ or other high-strength injection mortar with compressive strength  $\geq 40\text{N/mm}^2$ .

|  |                 |
|--|-----------------|
| <b>Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR</b> | <b>Annex B1</b> |
| <b>Intended use</b><br>Specifications      |                 |

**Table B1: Installation parameters**

| Anchor size  |                |            | BZ3 / BZ3 A4 / BZ3 HCR |               |               |               |     |
|--|----------------|------------|------------------------|---------------|---------------|---------------|-----|
|  |                |            | M8                     | M10           | M12           | M16           |     |
| Nominal drill hole diameter  | $d_0$          | [mm]       | 8                      | 10            | 12            | 16            |     |
| Cutting diameter of drill bit  | $d_{cut} \leq$ | [mm]       | 8,45                   | 10,45         | 12,5          | 16,5          |     |
| Minimum effective anchorage depth  | $h_{ef,min}$   | [mm]       | 35                     | 40            | 50            | 65            |     |
| Maximum effective anchorage depth  | $h_{ef,max}$   | [mm]       | 90                     | 100           | 125           | 160           |     |
| Depth of drill hole  | $h_0 \geq$     | [mm]       | $h_{ef} + 8$           | $h_{ef} + 9$  | $h_{ef} + 10$ | $h_{ef} + 14$ |     |
|  | $h_1 \geq$     | [mm]       | $h_{ef} + 10$          | $h_{ef} + 11$ | $h_{ef} + 13$ | $h_{ef} + 17$ |     |
| Diameter of clearance hole in the fixture <sup>1)</sup>  | $d_f \leq$     | [mm]       | 9                      | 12            | 14            | 18            |     |
| Projection after anchor has been inserted for installing with cap nut HM (according to Annex B6, Figure 3) | C              | [mm]       | 10,5                   | 12,5          | 16,0          | 19,5          |     |
| Installation torque  | BZ3            | $T_{inst}$ | [Nm]                   | 15            | 40            | 60            | 110 |
|  | BZ3 A4 / HCR   | $T_{inst}$ | [Nm]                   | 15            | 40            | 55            | 100 |

<sup>1)</sup> For larger diameters of clearance hole in the fixture, see EN 1992-4:2018, chapter 6.2.2.2



**Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR**

**Intended use**  
Installation parameters

**Annex B2**

**Table B2: Minimum thickness of concrete member, minimum spacings, edge distances**

| Anchor size   |                |      | BZ3 / BZ3 A4 / BZ3 HCR    |     |                            |                            |
|---|----------------|------|---------------------------|-----|----------------------------|----------------------------|
|   |                |      | M8                        | M10 | M12                        | M16                        |
| Minimum member thickness depending on $h_{ef}$  | $h_{min} \geq$ | [mm] | max (1,5 · $h_{ef}$ ; 80) |     | max (1,5 · $h_{ef}$ ; 100) | max (1,5 · $h_{ef}$ ; 120) |
| <b>Minimum edge distances and spacings</b>  |                |      |                           |     |                            |                            |
| Minimum edge distance   | $c_{min}$      | [mm] | 40                        | 45  | 55                         | 65                         |
|   | for $s \geq$   | [mm] | see Table B4              |     |                            |                            |
| Minimum spacings  | $s_{min}$      | [mm] | 35                        | 40  | 50                         | 65                         |
|   | for $c \geq$   | [mm] | see Table B4              |     |                            |                            |
| <p>The following equation must be fulfilled for the calculation of the minimum spacing and edge distance during installation in combination with variable anchorage depth and member thickness:</p> $A_{sp,req} \leq A_{sp,ef}$ <p>Required splitting area <math>A_{sp,req}</math> and idealized splitting area <math>A_{sp,ef}</math> according to Table B4.</p> |                |      |                           |     |                            |                            |

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

| Anchor size                                 |                          |          |                    | M8  | M10                                    | M12                                    | M16                                     |
|---|--------------------------|----------|--------------------|---|--|--|---|
| Applicable concrete thickness               | BZ3<br>BZ3 A4<br>BZ3 HCR | $h_{sp}$ | [mm]               | $\min(h ; h_{ef} + 1,5 \cdot c \cdot \sqrt{2})$ |  |  |   |
| Area to determine $c_{cr,sp}$ <sup>1)</sup> | BZ3                      | $A_{sp}$ | [mm <sup>2</sup> ] | $\frac{N_{Rk,sp}^0 - 2,573}{0,000436}$          | $\frac{N_{Rk,sp}^0 + 2,040}{0,000693}$ | $\frac{N_{Rk,sp}^0 + 3,685}{0,000692}$ | $\frac{N_{Rk,sp}^0 + 3,738}{0,000875}$  |
|   | BZ3 A4<br>BZ3 HCR        | $A_{sp}$ | [mm <sup>2</sup> ] | $\frac{N_{Rk,sp}^0 + 4,177}{0,000862}$          | $\frac{N_{Rk,sp}^0 + 7,235}{0,000967}$ | $\frac{N_{Rk,sp}^0 + 7,847}{0,000951}$ | $\frac{N_{Rk,sp}^0 + 11,415}{0,000742}$ |

<sup>1)</sup> with  $N_{Rk,sp}^0$  in kN

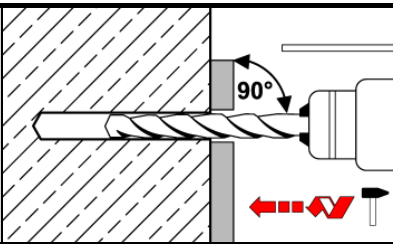
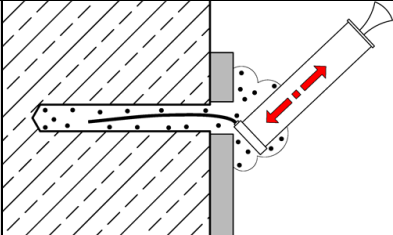
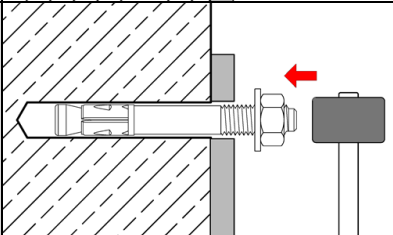
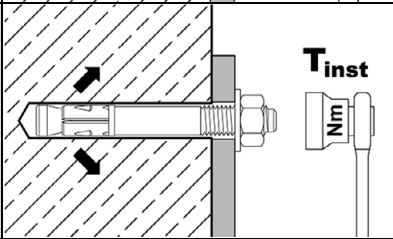
|   |                 |
|---|-----------------|
| <b>Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR</b>  | <b>Annex B3</b> |
| <b>Intended use</b><br>Minimum spacings and edge distances<br>Required area and applicable concrete thickness |                 |

**Table B4: Areas to determine spacings and edge distances for installation**

| Anchor size   | BZ3 / BZ3 A4 / BZ3 HCR    |  |                    |                    |        |        |        |
|---|---------------------------|--|--------------------|--------------------|--------|--------|--------|
|   | M8                        | M10  | M12                | M16                |        |        |        |
| <p>The following equation must be fulfilled for the calculation of the minimum spacing and edge distance during installation in combination with variable anchorage depth and member thickness:</p> $A_{sp,req} \leq A_{sp,ef}$ |                           |  |                    |                    |        |        |        |
| <p><b>Idealized splitting area <math>A_{sp,ef}</math></b><br/>                     The edge distances and spacings shall be selected or rounded in steps of 5 mm.</p>   |                           |  |                    |                    |        |        |        |
| <p><b>Member thickness: <math>h &gt; h_{ef} + 1,5 \cdot c</math></b></p>  |                           |  |                    |                    |        |        |        |
| <p>Single anchor or anchor group with <math>s \geq 3 \cdot c</math></p>   |                           |  |                    |                    |        |        |        |
| Effective anchorage depth   | $h_{ef} < 1,5 \cdot c$    | $A_{sp,ef} = (6 \cdot c) \cdot (1,5 \cdot c + h_{ef})$         |                    | [mm <sup>2</sup> ] |        |        |        |
| Effective anchorage depth   | $h_{ef} \geq 1,5 \cdot c$ | $A_{sp,ef} = (6 \cdot c) \cdot (3 \cdot c)$                    |                    | [mm <sup>2</sup> ] |        |        |        |
| <p>Anchor group (<math>s &lt; 3 \cdot c</math>)</p>   |                           |  |                    |                    |        |        |        |
| Effective anchorage depth   | $h_{ef} < 1,5 \cdot c$    | $A_{sp,ef} = (3 \cdot c + s) \cdot (1,5 \cdot c + h_{ef})$     |                    | [mm <sup>2</sup> ] |        |        |        |
| Effective anchorage depth   | $h_{ef} \geq 1,5 \cdot c$ | $A_{sp,ef} = (3 \cdot c + s) \cdot (3 \cdot c)$                |                    | [mm <sup>2</sup> ] |        |        |        |
| <p><b>Member thickness: <math>h \leq h_{ef} + 1,5 \cdot c</math></b></p>  |                           |  |                    |                    |        |        |        |
| <p>Single anchor or anchor group with <math>s \geq 3 \cdot c</math></p>   |                           |  |                    |                    |        |        |        |
| Effective anchorage depth   | $h_{ef} < 1,5 \cdot c$    | $A_{sp,ef} = (6 \cdot c) \cdot h$                              |                    | [mm <sup>2</sup> ] |        |        |        |
| Effective anchorage depth   | $h_{ef} \geq 1,5 \cdot c$ | $A_{sp,ef} = (6 \cdot c) \cdot (h - h_{ef} + 1,5 \cdot c)$     |                    | [mm <sup>2</sup> ] |        |        |        |
| <p>Anchor group (<math>s &lt; 3 \cdot c</math>)</p>   |                           |  |                    |                    |        |        |        |
| Effective anchorage depth   | $h_{ef} < 1,5 \cdot c$    | $A_{sp,ef} = (3 \cdot c + s) \cdot h$                          |                    | [mm <sup>2</sup> ] |        |        |        |
| Effective anchorage depth   | $h_{ef} \geq 1,5 \cdot c$ | $A_{sp,ef} = (3 \cdot c + s) \cdot (h - h_{ef} + 1,5 \cdot c)$ |                    | [mm <sup>2</sup> ] |        |        |        |
| <p><b>Required splitting area <math>A_{sp,req}</math></b></p>   |                           |  |                    |                    |        |        |        |
| BZ3   | cracked concrete          | $A_{sp,req}$   | [mm <sup>2</sup> ] | 13 900             | 23 700 | 31 500 | 42 300 |
|   | uncracked concrete        | $A_{sp,req}$   | [mm <sup>2</sup> ] | 22 500             | 34 700 | 41 300 | 50 200 |
| BZ3 A4  | cracked concrete          | $A_{sp,req}$   | [mm <sup>2</sup> ] | 16 900             | 25 900 | 29 800 | 44 300 |
| BZ3 HCR   | uncracked concrete        | $A_{sp,req}$   | [mm <sup>2</sup> ] | 19 700             | 35 700 | 35 300 | 54 800 |

|   |                 |
|---|-----------------|
| <b>Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR</b>  | <b>Annex B4</b> |
| <p><b>Intended use</b><br/>                     Projected effective area to determine spacings and edge distances</p> |                 |

## Installation instructions

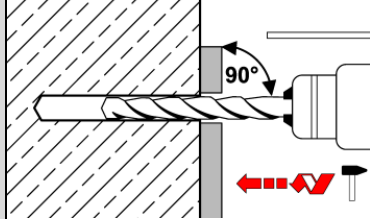
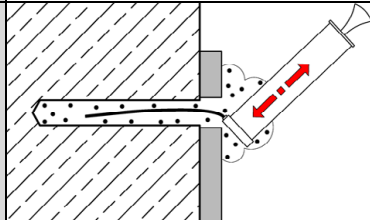
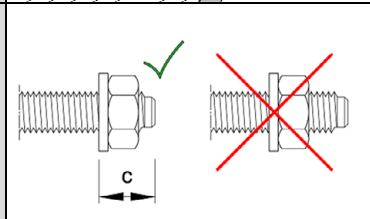
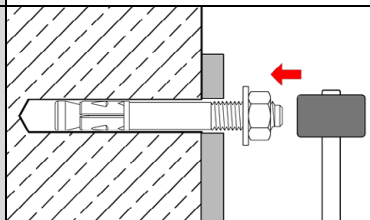
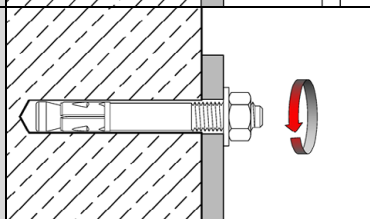
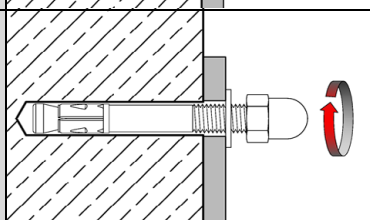
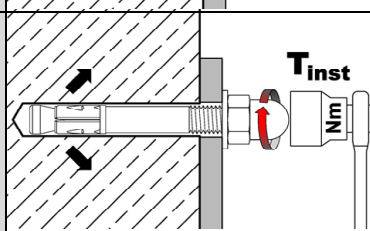
|   |  |  |
|---|--|--|
| 1 |   | <p>Drill hole perpendicular to concrete surface.<br/>If using a vacuum drill bit, proceed with step 3.</p> |
| 2 |   | <p>Blow out dust. Alternatively vacuum clean down to the bottom of the hole.</p>                           |
| 3 |   | <p>Drive in fastener.</p>  |
| 4 |  | <p>Apply installation torque <math>T_{inst}</math>.</p>  |

Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR

Intended use  
Installation instructions

Annex B5

## Installation with cap nut HM

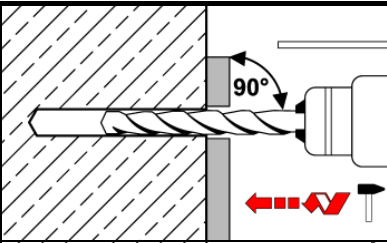
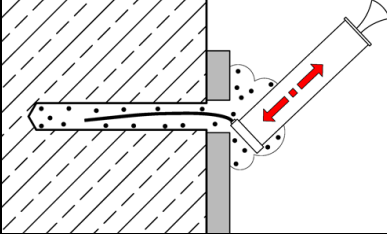
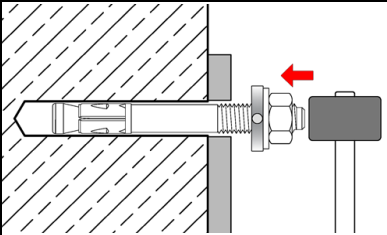
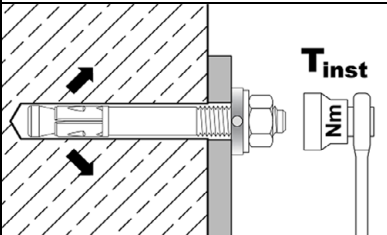
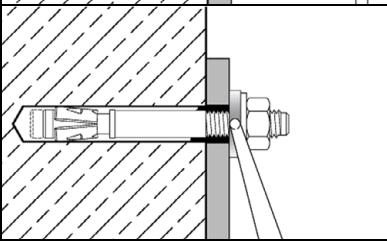
|   |   |  |
|---|---|--|
| 1 |    | <p>Drill hole perpendicular to concrete surface.<br/>If using a vacuum drill bit, proceed with step 3.</p> |
| 2 |    | <p>Blow out dust. Alternatively vacuum clean down to the bottom of the hole.</p>                           |
| 3 |    | <p>Check position of nut. Projection C after anchor has been inserted see Annex B2, Table B1.</p>          |
| 4 |   | <p>Drive in fastener.</p>  |
| 5 |  | <p>Remove nut.</p>   |
| 6 |  | <p>Screw on cap nut</p>  |
| 7 |  | <p>Apply installation torque <math>T_{inst}</math>.</p>  |

Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR

Intended use  
Installation instructions with cap nut

Annex B6

# Installation instructions with filling of annular gap

|   |   |   |
|---|---|---|
| 1 |    | <p>Drill hole perpendicular to concrete surface.<br/>If using a vacuum drill bit, proceed with step 3.</p>  |
| 2 |    | <p>Blow out dust. Alternatively vacuum clean down to the bottom of the hole.</p>  |
| 3 |    | <p>Drive in fastener with additionally mounted filling washer.</p>  |
| 4 |   | <p>Apply installation torque <math>T_{inst}</math>.</p>   |
| 5 |  | <p>Fill the annular gap between anchor and fixture with injection adhesive (see Annex B1).<br/>Use enclosed reducing adapter.<br/>The annular gap is completely filled, when excess mortar seeps out.</p> |

Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR

Intended use  
Installation instructions with filling of annular gap

Annex B7



**Table C1:** Characteristic values for **tension loads** under static and quasi-static action, **BZ3** (steel, zinc plated)

| Fastener size  |                    |             | BZ3  |  |  |  |
|--|--------------------|-------------|--|--|--|--|
|  |                    |             | M8   | M10                                      | M12                                    | M16                                      |
| Installation factor  | $\gamma_{inst}$    | [-]         | 1,0  |  |  |  |
| <b>Steel failure</b>   |                    |             |  |  |  |  |
| Characteristic resistance  | $N_{Rk,s}$         | [kN]        | 19,8   | 30,4                                     | 44,9                                   | 79,3                                     |
| Partial factor <sup>4)</sup>   | $\gamma_{Ms}$      | [-]         | 1,5  |  |  |  |
| <b>Pull-out</b>  |                    |             |  |  |  |  |
| Characteristic resistance in cracked concrete C20/25                     | $N_{Rk,p,cr}$      | [kN]        | 9,5  | 15                                       | 22                                     | 30                                       |
| Increasing factor<br>$N_{Rk,p,cr} = \psi_C \cdot N_{Rk,p,cr} (C20/25)$   | $\psi_C$           | [-]         | $\left(\frac{f_{ck}}{20}\right)^{0,439}$   | $\left(\frac{f_{ck}}{20}\right)^{0,265}$ | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | $\left(\frac{f_{ck}}{20}\right)^{0,339}$ |
| Characteristic resistance in uncracked concrete C20/25                   | $N_{Rk,p,ucr}$     | [kN]        | 14   | 24                                       | 30                                     | 50                                       |
| Increasing factor<br>$N_{Rk,p,ucr} = \psi_C \cdot N_{Rk,p,ucr} (C20/25)$ | $\psi_C$           | [-]         | $\left(\frac{f_{ck}}{20}\right)^{0,489}$   | $\left(\frac{f_{ck}}{20}\right)^{0,448}$ | $\left(\frac{f_{ck}}{20}\right)^{0,5}$ | $\left(\frac{f_{ck}}{20}\right)^{0,203}$ |
| <b>Splitting</b>   |                    |             |  |  |  |  |
| Characteristic resistance  | $N^0_{Rk,sp}$      | [kN]        | $\min ( N_{Rk,p} ; N^0_{Rk,c} )^3$   |  |  |  |
| Characteristic edge distance <sup>2)</sup>                               | $C_{cr,sp}$        | [mm]        | $\frac{A_{sp} + 0,8 \cdot (h_{sp} - h_{ef})^2}{(3,41 \cdot h_{sp} - 0,59 \cdot h_{ef})}$ |  |  |  |
| Characteristic spacing   | $S_{cr,sp}$        | [mm]        | $2 \cdot C_{cr,sp}$  |  |  |  |
| <b>Concrete cone failure</b>   |                    |             |  |  |  |  |
| Minimum, effective anchorage depth                                       | $h_{ef,min}$       | [mm]        | 35 <sup>1)</sup>   | 40                                       | 50                                     | 65                                       |
| Maximum, effective anchorage depth                                       | $h_{ef,max}$       | [mm]        | 90   | 100                                      | 125                                    | 160                                      |
| Characteristic edge distance   | $C_{cr,N}$         | [mm]        | $1,5 \cdot h_{ef}$   |  |  |  |
| Characteristic spacing   | $S_{cr,N}$         | [mm]        | $2 \cdot C_{cr,N}$   |  |  |  |
| Factor   | cracked concrete   | $k_{cr,N}$  | 7,7  |  |  |  |
|  | uncracked concrete | $k_{ucr,N}$ | 11,0   |  |  |  |

<sup>1)</sup> Fastenings with anchorage depth  $h_{ef} < 40$ mm are restricted to the use of structural components which are statically indeterminate and subject to internal exposure conditions only.

<sup>2)</sup> Applicable concrete thickness  $h_{sp}$  and area  $A_{sp}$  to determine characteristic edge distance  $C_{cr,sp}$  according to Table B3

<sup>3)</sup>  $N^0_{Rk,c}$  according to EN 1992-4:2018

<sup>4)</sup> In absence of other national regulations

**Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR**

**Annex C1**

**Performance**

Characteristic values for **tension loads, BZ3** (Steel, zinc plated)

**Table C2:** Characteristic values for **tension loads** under static or quasi-static action, **BZ3 A4** and **BZ3 HCR**

| Fastener size  |                    |             | BZ3 A4 / BZ3 HCR   |  |  |  |
|--|--------------------|-------------|--|--|--|--|
|  |                    |             | M8   | M10                                      | M12                                      | M16                                      |
| Installation factor  | $\gamma_{inst}$    | [-]         | 1,0  |  |  |  |
| <b>Steel failure</b>   |                    |             |  |  |  |  |
| Characteristic resistance  | $N_{Rk,s}$         | [kN]        | 19,8   | 30,4                                     | 44,9                                     | 74,6                                     |
| Partial factor <sup>4)</sup>   | $\gamma_{Ms}$      | [-]         | 1,5  |  |  |  |
| <b>Pull-out</b>  |                    |             |  |  |  |  |
| Characteristic resistance in cracked concrete C20/25                     | $N_{Rk,p,cr}$      | [kN]        | 9,5  | 17                                       | 22                                       | 35                                       |
| Increasing factor<br>$N_{Rk,p,cr} = \psi_C \cdot N_{Rk,p,cr}$ (C20/25)   | $\psi_C$           | [-]         | $\left(\frac{f_{ck}}{20}\right)^{0,488}$   | $\left(\frac{f_{ck}}{20}\right)^{0,5}$   | $\left(\frac{f_{ck}}{20}\right)^{0,435}$ | $\left(\frac{f_{ck}}{20}\right)^{0,350}$ |
| Characteristic resistance in uncracked concrete C20/25                   | $N_{Rk,p,ucr}$     | [kN]        | 20   | 25                                       | 42                                       | 50                                       |
| Increasing factor<br>$N_{Rk,p,ucr} = \psi_C \cdot N_{Rk,p,ucr}$ (C20/25) | $\psi_C$           | [-]         | $\left(\frac{f_{ck}}{20}\right)^{0,240}$   | $\left(\frac{f_{ck}}{20}\right)^{0,364}$ | $\left(\frac{f_{ck}}{20}\right)^{0,213}$ | $\left(\frac{f_{ck}}{20}\right)^{0,196}$ |
| <b>Splitting</b>   |                    |             |  |  |  |  |
| Characteristic resistance  | $N^0_{Rk,sp}$      | [kN]        | $\min ( N_{Rk,p} ; N^0_{Rk,c}{}^3 )$   |  |  |  |
| Characteristic edge distance <sup>2)</sup>                               | $C_{cr,sp}$        | [mm]        | $\frac{A_{sp} + 0,8 \cdot (h_{sp} - h_{ef})^2}{(3,41 \cdot h_{sp} - 0,59 \cdot h_{ef})}$ |  |  |  |
| Characteristic spacing   | $S_{cr,sp}$        | [mm]        | $2 \cdot C_{cr,sp}$  |  |  |  |
| <b>Concrete cone failure</b>   |                    |             |  |  |  |  |
| Minimum, effective anchorage depth                                       | $h_{ef,min}$       | [mm]        | 35 <sup>1)</sup>   | 40                                       | 50                                       | 65                                       |
| Maximum, effective anchorage depth                                       | $h_{ef,max}$       | [mm]        | 90   | 100                                      | 125                                      | 160                                      |
| Characteristic edge distance   | $C_{cr,N}$         | [mm]        | $1,5 \cdot h_{ef}$   |  |  |  |
| Characteristic spacing   | $S_{cr,N}$         | [mm]        | $2 \cdot C_{cr,N}$   |  |  |  |
| Factor   | cracked concrete   | $k_{cr,N}$  | 7,7  |  |  |  |
|  | uncracked concrete | $k_{ucr,N}$ | 11,0   |  |  |  |

1) Fastenings with anchorage depth  $h_{ef} < 40$  mm are restricted to the use of structural components which are statically indeterminate and subject to internal exposure conditions only

2) Applicable concrete thickness  $h_{sp}$  and area  $A_{sp}$  according to Table B3 to determine characteristic edge distance  $C_{cr,sp}$

3)  $N^0_{Rk,c}$  according to EN 1992-4:2018

4) In absence of other national regulations

**Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR**

**Performance**  
Characteristic values for **tension loads, BZ3 A4** and **BZ3 HCR**

**Annex C2**

**Table C3:** Characteristic values for **shear loads** under static and quasi-static action

| Fastener size                                 |                 |              |               | BZ3 / BZ3 A4 / BZ3 HCR |      |      |      |
|---|-----------------|--------------|---------------|------------------------|------|------|------|
|   |                 |              |               | M8                     | M10  | M12  | M16  |
| Installation factor                           | $\gamma_{inst}$ | [-]          | 1,0           |                        |      |      |      |
| <b>Steel failure <u>without</u> lever arm</b> |                 |              |               |                        |      |      |      |
| Characteristic resistance                     | BZ3             | $V_{RK,s}^0$ | [kN]          | 15,7                   | 26,8 | 38,3 | 60,0 |
|   | BZ3 A4 / HCR    | $V_{RK,s}^0$ | [kN]          | 16,8                   | 27,8 | 39,8 | 69,5 |
| Partial factor <sup>2)</sup>                  | $\gamma_{Ms}$   | [-]          | 1,25          |                        |      |      |      |
| Ductility factor                              | $k_7$           | [-]          | 1,0           |                        |      |      |      |
| <b>Steel failure <u>with</u> lever arm</b>    |                 |              |               |                        |      |      |      |
| Characteristic bending resistance             | BZ3             | $M_{RK,s}^0$ | [Nm]          | 30                     | 60   | 105  | 240  |
|   | BZ3 A4 / HCR    | $M_{RK,s}^0$ | [Nm]          | 27                     | 55   | 99   | 223  |
| Partial factor <sup>2)</sup>                  | $\gamma_{Ms}$   | [-]          | 1,25          |                        |      |      |      |
| <b>Concrete pry-out failure</b>               |                 |              |               |                        |      |      |      |
| Pry-out factor                                | BZ3             | $k_8$        | [-]           | 2,8                    | 3,1  | 3,0  | 3,6  |
|   | BZ3 A4 / HCR    | $k_8$        | [-]           | 2,7                    | 2,8  | 3,3  | 3,4  |
| <b>Concrete edge failure</b>                  |                 |              |               |                        |      |      |      |
| Effective length of fastener in shear loading | $l_f$           | [mm]         | $h_{ef}^{1)}$ |                        |      |      |      |
| Outside diameter of fastener                  | $d_{nom}$       | [mm]         | 8             | 10                     | 12   | 16   |      |

<sup>1)</sup> Fastenings with anchorage depth  $h_{ef} < 40$  mm are restricted to the use of structural components which are statically indeterminate and subject to internal exposure conditions only.

<sup>2)</sup> In absence of other national regulations

**Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR**

**Performance**  
Characteristic values for **shear loads**

**Annex C3**

**Table C4: Characteristic values for seismic loading, performance category C1**

| Fastener size                          |                     |                |      | BZ3 / BZ3 A4 / BZ3 HCR |      |      |      |      |      |      |      |
|--|---------------------|----------------|------|------------------------|------|------|------|------|------|------|------|
|  |                     |                |      | M8                     |      | M10  |      | M12  |      | M16  |      |
| Effective anchorage depth              | $h_{ef} \geq$       | [mm]           |      | 40                     | 45   | 40   | 60   | 50   | 70   | 65   | 85   |
| <b>Tension load</b>                    |                     |                |      |                        |      |      |      |      |      |      |      |
| Installation factor                    | $\gamma_{inst}$     | [-]            |      | 1,0                    |      |      |      |      |      |      |      |
| <b>Steel failure</b>                   |                     |                |      |                        |      |      |      |      |      |      |      |
| Characteristic resistance              | BZ3                 | $N_{Rk,s,C1}$  | [kN] | 19,8                   | 30,4 | 44,9 | 79,3 |      |      |      |      |
|  | BZ3 A4 / HCR        | $N_{Rk,s,C1}$  | [kN] | 19,8                   | 30,4 | 44,9 | 74,6 |      |      |      |      |
| <b>Pull-out</b>                        |                     |                |      |                        |      |      |      |      |      |      |      |
| Characteristic resistance              | BZ3                 | $N_{Rk,p,C1}$  | [kN] | 9,1                    | 15,0 | 22,0 | 30,0 |      |      |      |      |
|  | BZ3 A4 / HCR        | $N_{Rk,p,C1}$  | [kN] | 9,0                    | 17,0 | 22,0 | 35,0 |      |      |      |      |
| <b>Shear load</b>                      |                     |                |      |                        |      |      |      |      |      |      |      |
| <b>Steel failure without lever arm</b> |                     |                |      |                        |      |      |      |      |      |      |      |
| Characteristic resistance              | BZ3                 | $V_{Rk,s,C1}$  | [kN] | 11,7                   | 13,4 | 22,5 | 24,4 | 30,0 | 33,8 | 48,8 | 52,3 |
|  | BZ3 A4 / HCR        | $V_{Rk,s,C1}$  | [kN] | 11,0                   | 12,7 | 20,6 | 22,2 | 33,2 | 33,2 | 61,1 | 64,3 |
| Factor for anchorages                  | with annular gap    | $\alpha_{gap}$ | [-]  | 0,5                    |      |      |      |      |      |      |      |
|  | without annular gap | $\alpha_{gap}$ | [-]  | 1,0                    |      |      |      |      |      |      |      |

**Table C5: Characteristic values for seismic loading, performance category C2**

| Fastener size                          |                     |                |      | BZ3 / BZ3 A4 / BZ3 HCR |      |      |      |      |      |      |      |
|--|---------------------|----------------|------|------------------------|------|------|------|------|------|------|------|
|  |                     |                |      | M8                     |      | M10  |      | M12  |      | M16  |      |
| Effective anchorage depth              | $h_{ef} \geq$       | [mm]           |      | 40                     | 45   | 40   | 60   | 50   | 70   | 65   | 85   |
| <b>Tension load</b>                    |                     |                |      |                        |      |      |      |      |      |      |      |
| Installation factor                    | $\gamma_{inst}$     | [-]            |      | 1,0                    |      |      |      |      |      |      |      |
| <b>Steel failure</b>                   |                     |                |      |                        |      |      |      |      |      |      |      |
| Characteristic resistance              | BZ3                 | $N_{Rk,s,C2}$  | [kN] | 19,8                   | 30,4 | 44,9 | 79,3 |      |      |      |      |
|  | BZ3 A4 / HCR        | $N_{Rk,s,C2}$  | [kN] | 19,8                   | 30,4 | 44,9 | 74,6 |      |      |      |      |
| <b>Pull-out</b>                        |                     |                |      |                        |      |      |      |      |      |      |      |
| Characteristic resistance              | BZ3                 | $N_{Rk,p,C2}$  | [kN] | 2,8                    | 3,6  | 7,3  | 12,5 | 10,7 | 19,0 | 19,8 | 35,2 |
|  | BZ3 A4 / HCR        | $N_{Rk,p,C2}$  | [kN] | 2,3                    | 3,2  | 5,0  | 7,7  | 8,0  | 13,8 | 19,0 | 29,4 |
| <b>Shear load</b>                      |                     |                |      |                        |      |      |      |      |      |      |      |
| <b>Steel failure without lever arm</b> |                     |                |      |                        |      |      |      |      |      |      |      |
| Characteristic resistance              | BZ3                 | $V_{Rk,s,C2}$  | [kN] | 7,3                    | 11,3 | 15,4 | 19,0 | 18,3 | 28,0 | 39,4 | 43,3 |
|  | BZ3 A4 / HCR        | $V_{Rk,s,C2}$  | [kN] | 7,5                    | 8,6  | 12,5 | 15,9 | 22,4 | 25,6 | 42,7 | 46,1 |
| Factor for anchorages                  | with annular gap    | $\alpha_{gap}$ | [-]  | 0,5                    |      |      |      |      |      |      |      |
|  | without annular gap | $\alpha_{gap}$ | [-]  | 1,0                    |      |      |      |      |      |      |      |

**Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR**

**Performance**  
Characteristic resistance for **seismic loading**

**Annex C4**

**Table C6:** Characteristic values for tension and shear load under fire exposure, BZ3 (steel, zinc plated)

| Fastener size                                 |      | BZ3             |      |     |     |      |      |
|---|------|-----------------|------|-----|-----|------|------|
|   |      | M8              | M10  | M12 | M16 |      |      |
| <b>Tension load</b>                           |      |                 |      |     |     |      |      |
| <b>Steel failure</b>                          |      |                 |      |     |     |      |      |
| Characteristic resistance                     | R30  | $N_{Rk,s,fi}$   | [kN] | 1,2 | 2,6 | 4,6  | 7,7  |
|   | R60  |                 |      | 1,0 | 1,9 | 3,3  | 5,6  |
|   | R90  |                 |      | 0,7 | 1,3 | 2,1  | 3,5  |
|   | R120 |                 |      | 0,6 | 1,0 | 1,5  | 2,5  |
| <b>Shear load</b>                             |      |                 |      |     |     |      |      |
| <b>Steel failure <u>without</u> lever arm</b> |      |                 |      |     |     |      |      |
| Characteristic resistance                     | R30  | $V_{Rk,s,fi}$   | [kN] | 4,0 | 7,5 | 12,3 | 20,7 |
|   | R60  |                 |      | 2,7 | 5,1 | 8,5  | 14,2 |
|   | R90  |                 |      | 1,4 | 2,7 | 4,6  | 7,7  |
|   | R120 |                 |      | 0,8 | 1,6 | 2,7  | 4,5  |
| <b>Steel failure <u>with</u> lever arm</b>    |      |                 |      |     |     |      |      |
| Characteristic resistance                     | R30  | $M^0_{Rk,s,fi}$ | [Nm] | 4,1 | 9,6 | 19,1 | 43,8 |
|   | R60  |                 |      | 2,8 | 6,6 | 13,1 | 30,1 |
|   | R90  |                 |      | 1,5 | 3,5 | 7,2  | 16,4 |
|   | R120 |                 |      | 0,8 | 2,0 | 4,2  | 9,6  |

$N_{Rk,p,fi}$  and  $N_{Rk,c,fi}$  according to EN 1992-4:2018

**Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR**

**Performance**  
Characteristic values under fire exposure, BZ3 (steel, zinc plated)

**Annex C5**

**Table C7: Characteristic values for tension and shear load under fire exposure, BZ3 A4 and BZ3 HCR**

| Fastener size                                 |      |                 |      | BZ3 A4 / BZ3 HCR |      |      |       |
|---|------|-----------------|------|------------------|------|------|-------|
|   |      |                 |      | M8               | M10  | M12  | M16   |
| <b>Tension load</b>                           |      |                 |      |                  |      |      |       |
| <b>Steel failure</b>                          |      |                 |      |                  |      |      |       |
| Characteristic resistance                     | R30  | $N_{Rk,s,fi}$   | [kN] | 4,0              | 6,9  | 11,0 | 18,1  |
|   | R60  |                 |      | 2,9              | 5,0  | 8,0  | 13,1  |
|   | R90  |                 |      | 1,8              | 3,1  | 4,9  | 8,1   |
|   | R120 |                 |      | 1,2              | 2,1  | 3,4  | 5,6   |
| <b>Shear load</b>                             |      |                 |      |                  |      |      |       |
| <b>Steel failure <u>without</u> lever arm</b> |      |                 |      |                  |      |      |       |
| Characteristic resistance                     | R30  | $V_{Rk,s,fi}$   | [kN] | 8,5              | 17,6 | 32,0 | 52,6  |
|   | R60  |                 |      | 6,2              | 12,6 | 22,6 | 37,1  |
|   | R90  |                 |      | 3,9              | 7,5  | 13,1 | 21,5  |
|   | R120 |                 |      | 2,8              | 5,0  | 8,4  | 13,8  |
| <b>Steel failure <u>with</u> lever arm</b>    |      |                 |      |                  |      |      |       |
| Characteristic resistance                     | R30  | $M^0_{Rk,s,fi}$ | [Nm] | 8,7              | 22,7 | 49,8 | 111,5 |
|   | R60  |                 |      | 6,3              | 16,2 | 35,1 | 78,6  |
|   | R90  |                 |      | 4,0              | 9,7  | 20,4 | 45,6  |
|   | R120 |                 |      | 2,8              | 6,5  | 13,0 | 29,2  |

$N_{Rk,p,fi}$  and  $N_{Rk,c,fi}$  according to EN 1992-4:2018

**Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR**

**Performance**  
 Characteristic values under **fire exposure, BZ3 A4 and BZ3 HCR**

**Annex C6**

**Table C8: Displacements under tension load, BZ3 (steel, zinc plated)**

| Fastener size   |                                  |         | BZ3                    |      |      |      |       |      |       |      |
|---|----------------------------------|---------|------------------------|------|------|------|-------|------|-------|------|
|   |                                  |         | M8                     |      | M10  |      | M12   |      | M16   |      |
| <b>Displacements under static or quasi-static action</b>    |                                  |         |                        |      |      |      |       |      |       |      |
| $\delta_{N0} = \delta_{N0\text{-factor}} \cdot N$           |                                  |         | N: acting tension load |      |      |      |       |      |       |      |
| $\delta_{N\infty} = \delta_{N\infty\text{-factor}} \cdot N$ |                                  |         |                        |      |      |      |       |      |       |      |
| Effective anchorage depth                                   | $h_{ef} \geq$                    | [mm]    | 35                     |      | 40   |      | 50    |      | 65    |      |
| <b>Cracked concrete</b>                                     |                                  |         |                        |      |      |      |       |      |       |      |
| Factor for displacement                                     | $\delta_{N0\text{-factor}}$      | [mm/kN] | 0,13                   |      | 0,05 |      | 0,04  |      | 0,03  |      |
|   | $\delta_{N\infty\text{-factor}}$ | [mm/kN] | 0,29                   |      | 0,20 |      | 0,15  |      | 0,11  |      |
| <b>Uncracked concrete</b>                                   |                                  |         |                        |      |      |      |       |      |       |      |
| Factor for displacement                                     | $\delta_{N0\text{-factor}}$      | [mm/kN] | 0,03                   |      | 0,01 |      | 0,004 |      | 0,005 |      |
|   | $\delta_{N\infty\text{-factor}}$ | [mm/kN] | 0,03                   |      | 0,03 |      | 0,03  |      | 0,03  |      |
| <b>Displacement under seismic action C2</b>                 |                                  |         |                        |      |      |      |       |      |       |      |
| Effective anchorage depth                                   | $h_{ef} \geq$                    | [mm]    | 40                     | 45   | 40   | 60   | 50    | 70   | 65    | 85   |
| Displacements for DLS                                       | $\delta_{N, C2(DLS)}$            | [mm]    | 3,9                    | 4,9  | 2,8  | 4,7  | 2,4   | 4,2  | 2,5   | 4,5  |
| Displacements for ULS                                       | $\delta_{N, C2(ULS)}$            | [mm]    | 11,3                   | 14,3 | 9,4  | 16,1 | 7,3   | 12,9 | 7,2   | 12,8 |

**Table C9: Displacements under tension load, BZ3 A4 and BZ3 HCR**

| Fastener size   |                                  |         | BZ3 A4 / BZ3 HCR       |      |      |      |       |      |      |      |
|---|----------------------------------|---------|------------------------|------|------|------|-------|------|------|------|
|   |                                  |         | M8                     |      | M10  |      | M12   |      | M16  |      |
| <b>Displacements under static or quasi-static action</b>    |                                  |         |                        |      |      |      |       |      |      |      |
| $\delta_{N0} = \delta_{N0\text{-factor}} \cdot N$           |                                  |         | N: acting tension load |      |      |      |       |      |      |      |
| $\delta_{N\infty} = \delta_{N\infty\text{-factor}} \cdot N$ |                                  |         |                        |      |      |      |       |      |      |      |
| Effective anchorage depth                                   | $h_{ef} \geq$                    | [mm]    | 35                     |      | 40   |      | 50    |      | 65   |      |
| <b>Cracked concrete</b>                                     |                                  |         |                        |      |      |      |       |      |      |      |
| Factor for displacement                                     | $\delta_{N0\text{-factor}}$      | [mm/kN] | 0,11                   |      | 0,06 |      | 0,05  |      | 0,02 |      |
|   | $\delta_{N\infty\text{-factor}}$ | [mm/kN] | 0,27                   |      | 0,17 |      | 0,16  |      | 0,08 |      |
| <b>Uncracked concrete</b>                                   |                                  |         |                        |      |      |      |       |      |      |      |
| Factor for displacement                                     | $\delta_{N0\text{-factor}}$      | [mm/kN] | 0,02                   |      | 0,00 |      | 0,001 |      | 0,00 |      |
|   | $\delta_{N\infty\text{-factor}}$ | [mm/kN] | 0,05                   |      | 0,05 |      | 0,05  |      | 0,05 |      |
| <b>Displacement under seismic action C2</b>                 |                                  |         |                        |      |      |      |       |      |      |      |
| Effective anchorage depth                                   | $h_{ef} \geq$                    | [mm]    | 40                     | 45   | 40   | 60   | 50    | 70   | 65   | 85   |
| Displacements for DLS                                       | $\delta_{N, C2(DLS)}$            | [mm]    | 2,0                    | 2,9  | 2,6  | 4,1  | 3,3   | 5,7  | 3,3  | 5,1  |
| Displacements for ULS                                       | $\delta_{N, C2(ULS)}$            | [mm]    | 7,7                    | 11,1 | 10,8 | 16,8 | 10,4  | 18,0 | 9,0  | 13,9 |

**Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR**

**Performance**  
Displacements under tension load

**Annex C7**

**Table C10: Displacements under shear load, BZ3 (steel, zinc plated)**

| Fastener size   |                                  |         | BZ3                  |      |      |      |     |     |     |     |
|---|----------------------------------|---------|----------------------|------|------|------|-----|-----|-----|-----|
|   |                                  |         | M8                   | M10  | M12  | M16  |     |     |     |     |
| <b>Displacements under static or quasi-static action</b>    |                                  |         |                      |      |      |      |     |     |     |     |
| $\delta_{V0} = \delta_{V0\text{-factor}} \cdot V$           |                                  |         | V: acting shear load |      |      |      |     |     |     |     |
| $\delta_{V\infty} = \delta_{V\infty\text{-factor}} \cdot V$ |                                  |         |                      |      |      |      |     |     |     |     |
| Effective anchorage depth                                   | $h_{ef} \geq$                    | [mm]    | 35                   | 40   | 50   | 65   |     |     |     |     |
| Factor for displacement                                     | $\delta_{V0\text{-factor}}$      | [mm/kN] | 0,15                 | 0,09 | 0,09 | 0,07 |     |     |     |     |
|   | $\delta_{V\infty\text{-factor}}$ | [mm/kN] | 0,22                 | 0,13 | 0,14 | 0,11 |     |     |     |     |
| <b>Displacement under seismic action C2 <sup>1)</sup></b>   |                                  |         |                      |      |      |      |     |     |     |     |
| Effective anchorage depth                                   | $h_{ef} \geq$                    | [mm]    | 40                   | 45   | 40   | 60   | 50  | 70  | 65  | 85  |
| Displacements for DLS                                       | $\delta_{V,C2(DLS)}$             | [mm]    | 2,8                  | 2,7  | 3,0  | 3,1  | 3,4 | 3,7 | 3,4 | 3,8 |
| Displacements for ULS                                       | $\delta_{V,C2(ULS)}$             | [mm]    | 5,1                  | 5,0  | 5,0  | 5,5  | 6,3 | 9,9 | 6,0 | 9,6 |

<sup>1)</sup> For anchorages with clearance in the fixture the annular gap must also be taken into account.

**Table C11: Displacements under shear load, BZ3 A4 and BZ3 HCR**

| Fastener size   |                                  |         | BZ3 A4 / BZ3 HCR     |      |      |      |     |      |     |      |
|---|----------------------------------|---------|----------------------|------|------|------|-----|------|-----|------|
|   |                                  |         | M8                   | M10  | M12  | M16  |     |      |     |      |
| <b>Displacements under static or quasi-static action</b>    |                                  |         |                      |      |      |      |     |      |     |      |
| $\delta_{V0} = \delta_{V0\text{-factor}} \cdot V$           |                                  |         | V: acting shear load |      |      |      |     |      |     |      |
| $\delta_{V\infty} = \delta_{V\infty\text{-factor}} \cdot V$ |                                  |         |                      |      |      |      |     |      |     |      |
| Effective anchorage depth                                   | $h_{ef} \geq$                    | [mm]    | 35                   | 40   | 50   | 65   |     |      |     |      |
| Factor for displacement                                     | $\delta_{V0\text{-factor}}$      | [mm/kN] | 0,26                 | 0,14 | 0,12 | 0,09 |     |      |     |      |
|   | $\delta_{V\infty\text{-factor}}$ | [mm/kN] | 0,39                 | 0,20 | 0,17 | 0,14 |     |      |     |      |
| <b>Displacement under seismic action C2 <sup>1)</sup></b>   |                                  |         |                      |      |      |      |     |      |     |      |
| Effective anchorage depth                                   | $h_{ef} \geq$                    | [mm]    | 40                   | 45   | 40   | 60   | 50  | 70   | 65  | 85   |
| Displacements for DLS                                       | $\delta_{V,C2(DLS)}$             | [mm]    | 2,8                  | 3,0  | 3,4  | 3,5  | 3,5 | 4,2  | 3,8 | 4,4  |
| Displacements for ULS                                       | $\delta_{V,C2(ULS)}$             | [mm]    | 5,2                  | 5,1  | 7,0  | 8,4  | 7,5 | 11,8 | 7,8 | 11,1 |

<sup>1)</sup> For anchorages with clearance in the fixture the annular gap must also be taken into account

|  |                 |
|--|-----------------|
| <b>Wedge Anchor BZ3 / BZ3 A4 / BZ3 HCR</b>             | <b>Annex C8</b> |
| <b>Performance</b><br>Displacements under tension load |                 |