

## DECLARACIÓN DE PRESTACIONES

### DoP 0187

para el anclaje- perno fischer FBZ, FBZ R (anclaje mecánico para uso en hormigón)

ES

|                                                                                              |                                                                                                                 |                                                      |                              |          |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------------------------------|----------|
| 1. <u>Código de identificación única del producto tipo:</u>                                  | DoP 0187                                                                                                        |                                                      |                              |          |
| 2. <u>Usos previstos:</u>                                                                    | Fijación a posteriori en hormigón fisurado y no fisurado.<br>Véase el apéndice, especialmente los anexos B1- B4 |                                                      |                              |          |
| 3. <u>Fabricante:</u>                                                                        | fischerwerke GmbH & Co. KG, Klaus-Fischer-Str. 1, 72178 Waldachtal, Alemania                                    |                                                      |                              |          |
| 4. <u>Representante autorizado:</u>                                                          | -                                                                                                               |                                                      |                              |          |
| 5. <u>Sistemas de evaluación y verificación de la constancia de las prestaciones (EVCP):</u> | 1                                                                                                               |                                                      |                              |          |
| 6. <u>Documento de evaluación europeo:</u>                                                   | EAD 330232-00-0601                                                                                              |                                                      |                              |          |
| Evaluación técnica europea:                                                                  | ETA-17/0624; 2020-04-28                                                                                         |                                                      |                              |          |
| Organismo de evaluación técnica:                                                             | DIBt- Deutsches Institut für Bautechnik                                                                         |                                                      |                              |          |
| Organismos notificados:                                                                      | 1343 MPA Darmstadt / 2873 TU Darmstadt                                                                          |                                                      |                              |          |
| 7. <u>Prestaciones declaradas:</u>                                                           |                                                                                                                 |                                                      |                              |          |
| <b>Resistencia mecánica y estabilidad (BWR 1)</b>                                            |                                                                                                                 |                                                      |                              |          |
| Resistencia característica a tracción (carga estática y cuasi-estática):                     | Resistencia de rotura del acero:                                                                                | Anexos C1, C2                                        | E <sub>s</sub> = 210 000 MPa |          |
|                                                                                              | Résistance à la rupture par extraction glissement:                                                              | Anexos C1, C2                                        |                              |          |
|                                                                                              | Resistencia de rotura por cono de hormigón:                                                                     | Anexos C1, C2                                        |                              |          |
|                                                                                              | Robustez:                                                                                                       | Anexos C1, C2                                        |                              |          |
|                                                                                              | Distancia mínima entre el borde y el centro:                                                                    | Anexo B3                                             |                              |          |
|                                                                                              | Distancia al borde para evitar la rotura del acero sometido a carga:                                            | Anexos C1, C2                                        |                              |          |
|                                                                                              | Desplazamiento por carga estática y cuasi-estática:                                                             | Anexo C5                                             |                              |          |
|                                                                                              | Resistencia característica a cortante (carga estática y cuasi-estática):                                        | Resistencia de rotura del acero (esfuerzo cortante): |                              | Anexo C3 |
|                                                                                              |                                                                                                                 | Resistencia falla por arrancamiento lateral:         |                              | Anexo C3 |
|                                                                                              |                                                                                                                 | Resistencia de rotura del hormigón al borde:         |                              | Anexo C3 |
| Desplazamiento por carga estática y cuasi-estática:                                          |                                                                                                                 | Anexo C5                                             |                              |          |
| Resistencia y desplazamientos característicos para las categorías sísmicas C1 y C2:          | Durabilidad:                                                                                                    | Anexos A4, B1                                        |                              |          |
|                                                                                              | Resistencia de rotura del acero:                                                                                | NPD                                                  |                              |          |
|                                                                                              | Résistance à la rupture par extraction glissement:                                                              | NPD                                                  |                              |          |
|                                                                                              | Alargamiento de rotura:                                                                                         | NPD                                                  |                              |          |
|                                                                                              | Factor espacio anular:                                                                                          | NPD                                                  |                              |          |
|                                                                                              | Desplazamientos:                                                                                                | NPD                                                  |                              |          |
| <b>Seguridad en caso de incendio (BWR 2)</b>                                                 |                                                                                                                 |                                                      |                              |          |
| Reacción al fuego:                                                                           | Clase (A1)                                                                                                      |                                                      |                              |          |
| Resistencia al fuego:                                                                        | Resistencia al fuego, rotura del acero (carga de                                                                | Anexo C4                                             |                              |          |
|                                                                                              | Resistencia al fuego, a la extracción (carga de                                                                 | Anexo C4                                             |                              |          |
|                                                                                              | Resistencia al fuego, rotura del acero (esfuerzo                                                                | Anexo C4                                             |                              |          |



8. Documentación técnica adecuada o documentación técnica específica: -

Las prestaciones del producto identificado anteriormente son conformes con el conjunto de prestaciones declaradas. La presente declaración de prestaciones se emite, de conformidad con el Reglamento (UE) no 305/2011, bajo la sola responsabilidad del fabricante arriba identificado.

Firmado por y en nombre del fabricante por:

ppa. Thilo Prg

Thilo Pregartner, Dr.-Ing.  
Tumlingen, 2020-05-12

i.V. P. Sch

Peter Schillinger, Dipl.-Ing.

Esta DdR se ha preparado en distintos idiomas. En caso de que haya alguna controversia sobre la interpretación prevalecerá siempre la versión inglesa.

El Apéndice incluye información voluntaria y complementaria en idioma inglés que excede los requisitos legales (de idioma neutral).

**Specific Part**

**1      Technical description of the product**

The fischer Bolt Anchor FBZ is an anchor made of galvanised steel (FBZ) or made of stainless steel (FBZ R) 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 resistance to tension load (static and quasi-static loading)              | See Annex B 3, C 1 and C 2 |
| Characteristic resistance to shear load (static and quasi-static loading)                | See Annex C 3              |
| Displacements (static and quasi-static loading)                                          | See Annex C 5              |
| Characteristic resistance and displacements for seismic performance categories C1 and C2 | No performance assessed    |
| Durability                                                                               | See Annex B 1              |

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

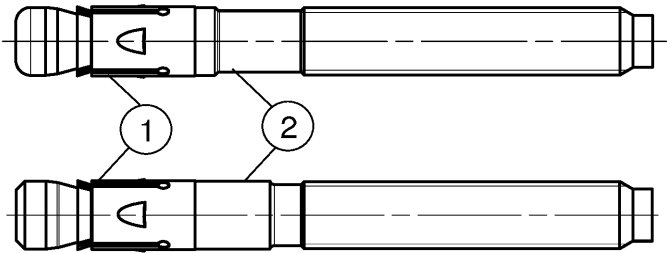
| Essential characteristic | Performance   |
|--------------------------|---------------|
| Reaction to fire         | Class A1      |
| Resistance to fire       | See Annex C 4 |

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

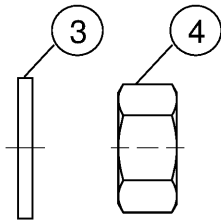
In accordance with the European Assessment Document EAD 330232-00-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

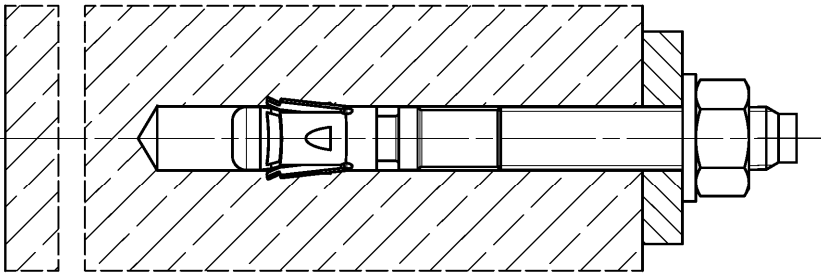
Cone bolt manufactured by cold - forming:



Cone bolt manufactured by turning:



- ① Expansion sleeve
- ② Cone bolt (cold – formed or turned)
- ③ Washer
- ④ Hexagon nut

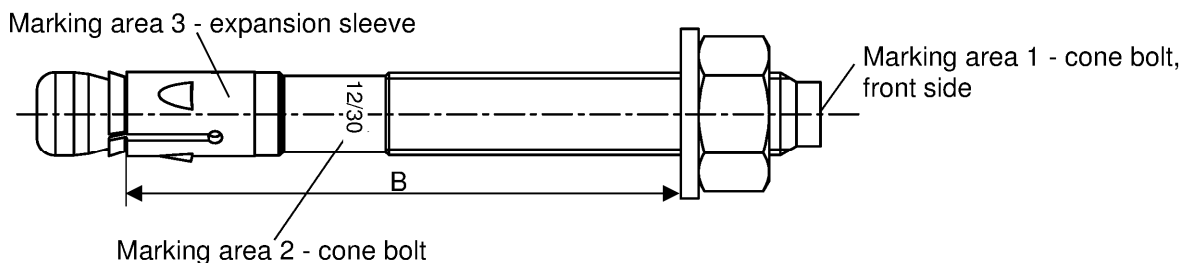


(Fig. not to scale)

fischer Bolt Anchor FBZ, FBZ R

**Product description**  
Installed condition

## Product label and letter-code:



Product label, example:

 FBZ 12/30 R

Brand | type of fastener  
placed at marking area 2 or marking area 3

Thread size / max. thickness of the fixture ( $t_{fix}$ )  
identification R placed at marking area 2

FBZ: carbon steel, galvanized  
FBZ R: stainless steel

**Table A2.1:** Letter - code at marking area 1:

| Marking              |     | (a) | (b) | (c) | (d) | (A) | (B) | (C) | (D) | (E) | (F) | (G) | (H) | (I) | (K) |
|----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Max. $t_{fix}$       |     | 5   | 10  | 15  | 20  | 5   | 10  | 15  | 20  | 25  | 30  | 35  | 40  | 45  | 50  |
| $B \geq [\text{mm}]$ | M8  | 40  | 45  | -   | -   | 50  | 55  | 60  | 65  | 70  | 75  | 80  | 85  | 90  | 95  |
|                      | M10 | 45  | 50  | 55  | 60  | 65  | 70  | 75  | 80  | 85  | 90  | 95  | 100 | 105 | 110 |
|                      | M12 | 55  | 60  | 65  | 70  | 75  | 80  | 85  | 90  | 95  | 100 | 105 | 110 | 115 | 120 |
|                      | M16 | 70  | 75  | 80  | 85  | 90  | 95  | 100 | 105 | 110 | 115 | 120 | 125 | 130 | 135 |
|                      | M20 | -   | -   | -   | -   | 105 | 110 | 115 | 120 | 125 | 130 | 135 | 140 | 145 | 150 |

| Marking              |     | (L) | (M) | (N) | (O) | (P) | (R) | (S) | (T) | (U) | (V) | (W) | (X) | (Y) | (Z) |
|----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Max. $t_{fix}$       |     | 60  | 70  | 80  | 90  | 100 | 120 | 140 | 160 | 180 | 200 | 250 | 300 | 350 | 400 |
| $B \geq [\text{mm}]$ | M8  | 105 | 115 | 125 | 135 | 145 | 165 | 185 | 205 | 225 | 245 | 295 | 345 | 395 | 445 |
|                      | M10 | 120 | 130 | 140 | 150 | 160 | 180 | 200 | 220 | 240 | 260 | 310 | 360 | 410 | 460 |
|                      | M12 | 130 | 140 | 150 | 160 | 170 | 190 | 210 | 230 | 250 | 270 | 320 | 370 | 420 | 470 |
|                      | M16 | 145 | 155 | 165 | 175 | 185 | 205 | 225 | 245 | 265 | 285 | 335 | 385 | 435 | 485 |
|                      | M20 | 160 | 170 | 180 | 190 | 200 | 220 | 240 | 260 | 280 | 300 | 350 | 400 | 450 | 500 |

### Calculation existing $h_{ef}$ for installed fasteners:

$$\text{existing } h_{ef} = B_{(\text{according to table A2.1})} - \text{existing } t_{fix}$$

Thickness of the fixture  $t_{fix}$  including thickness of fastener plate  $t$  and e.g. thickness of grout layer  $t_{grout}$  or other non-structural layers

(Fig. not to scale)

fischer Bolt Anchor FBZ, FBZ R

**Product description**  
Product label and letter code

**Annex A 2**

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Product dimensions

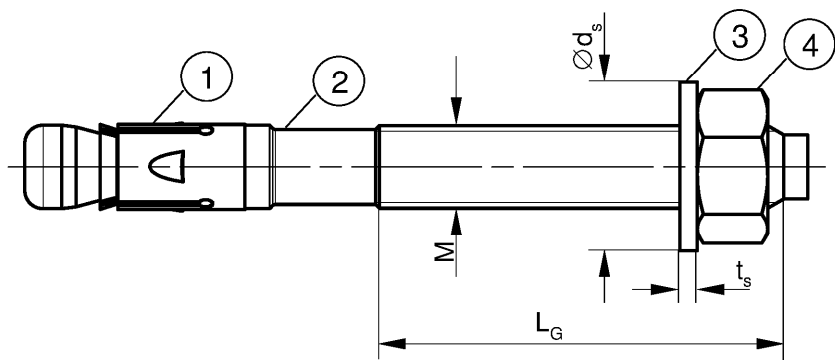


Table A3.1: Dimensions [mm]

| Part | Designation      |                   | FBZ, FBZ R |     |     |     |     |
|------|------------------|-------------------|------------|-----|-----|-----|-----|
|      |                  |                   | M8         | M10 | M12 | M16 | M20 |
| 1    | Expansion sleeve | Sheet thickness   | 1,3        | 1,4 | 1,6 | 2,4 |     |
| 2    | Cone bolt        | Thread size M     | 8          | 10  | 12  | 16  | 20  |
|      |                  | $L_G$             | 19         | 26  | 31  | 40  | 50  |
| 3    | Washer           | $t_s$             | 1,4        | 1,8 | 2,3 | 2,7 |     |
|      |                  | $\varnothing d_s$ |            |     |     |     |     |
| 4    | Hexagon nut      | Wrench size       | 13         | 17  | 19  | 24  | 30  |

(Fig. not to scale)

fischer Bolt Anchor FBZ, FBZ R

Product description  
Dimensions

Annex A 3

| Table A4.1: Materials FBZ (ISO 4042:2018/Zn5/An(A2K)) |                  |                                                                             |
|-------------------------------------------------------|------------------|-----------------------------------------------------------------------------|
| Part                                                  | Designation      | Material                                                                    |
| 1                                                     | Expansion sleeve | Cold strip, EN 10139:2016 or stainless steel EN 10088:2014                  |
| 2                                                     | Cone bolt        | Cold form steel or free cutting steel                                       |
| 3                                                     | Washer           | Cold strip, EN 10139:2016                                                   |
| 4                                                     | Hexagon nut      | Steel, property class min. 8, EN ISO 898-2:2012                             |
|                                                       |                  |                                                                             |
| Table A4.2: Materials FBZ R                           |                  |                                                                             |
| Part                                                  | Designation      | Material                                                                    |
| 1                                                     | Expansion sleeve | Stainless steel EN 10088:2014                                               |
| 2                                                     | Cone bolt        |                                                                             |
| 3                                                     | Washer           |                                                                             |
| 4                                                     | Hexagon nut      | Stainless steel EN 10088:2014;<br>ISO 3506-2:2018; property class – min. 70 |
|                                                       |                  |                                                                             |
| fischer Bolt Anchor FBZ, FBZ R                        |                  | <b>Annex A 4</b><br><br>Appendix 5/ 14                                      |
| <b>Product description</b><br>Materials               |                  |                                                                             |

## Specifications of intended use

### Anchorage subject to:

| Size                           | FBZ, FBZ R |     |     |     |     |
|--------------------------------|------------|-----|-----|-----|-----|
|                                | M8         | M10 | M12 | M16 | M20 |
| Static and quasi-static loads  | ✓          |     |     |     |     |
| Cracked and uncracked concrete |            |     |     |     |     |
| Fire exposure                  |            |     |     |     |     |

### Base materials:

- Compacted reinforced and unreinforced normal weight concrete without fibres (cracked and uncracked) according to EN 206-1:2013+A1:2016
- Strength classes C20/25 to C50/60 according to EN 206-1:2013+A1:2016

### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (FBZ, FBZ R)
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist (FBZ R)  
 Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where deicing materials are used)

### Design:

- Anchorages are to be designed under the responsibility of an engineer experienced in anchorages and concrete work
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.)
- Design of fastenings according to EN 1992-4:2018 and EOTA Technical Report TR 055
- For effective embedment depth  $h_{ef} < 40$  mm only statically indeterminate fixings (e.g. light-weight suspended ceilings with internal exposure) are covered by the ETA

fischer Bolt Anchor FBZ, FBZ R

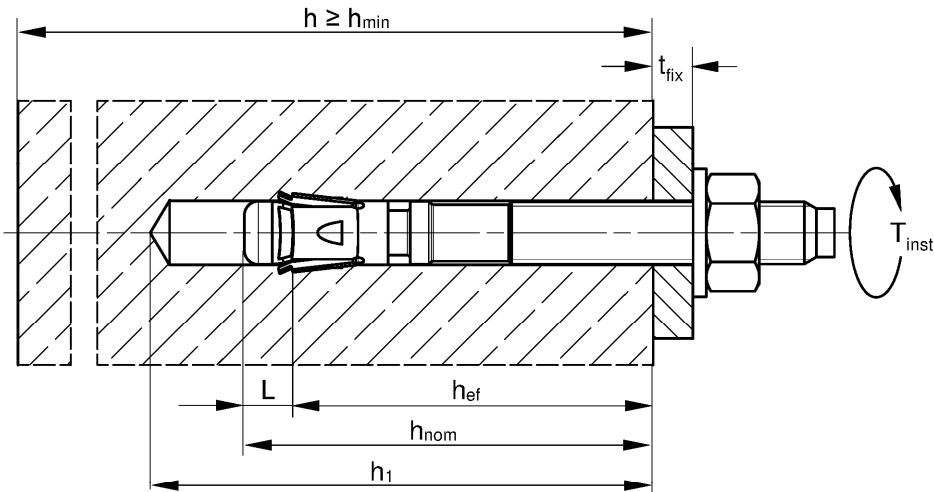
**Intended Use**  
Specifications

**Annex B 1**

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**Table B2.1:** Installation parameters

| Size                                                                     | FBZ, FBZ R    |              |                |                |                |
|--------------------------------------------------------------------------|---------------|--------------|----------------|----------------|----------------|
|                                                                          | M8            | M10          | M12            | M16            | M20            |
| Nominal drill hole diameter $d_0 =$                                      | 8             | 10           | 12             | 16             | 20             |
| Maximum bit diameter with hammer or hollow drilling $d_{cut,max}$ [mm]   | 8,45          | 10,45        | 12,5           | 16,5           | 20,55          |
| Maximum bit diameter with diamond drilling                               | 8,15          |              | 12,25          | 16,45          | 20,50          |
| Overall fastener embedment depth in the concrete $h_{nom} \geq (L)$ [mm] | 44,5<br>(9,5) | 52,0<br>(12) | 63,5<br>(13,5) | 82,5<br>(17,5) | 120<br>(20)    |
| Existing $h_{ef} + L = h_{nom}$                                          |               |              |                |                |                |
| Depth of drill hole to deepest point $h_1 \geq$                          | $h_{nom} + 5$ |              |                |                | $h_{nom} + 10$ |
| Diameter of clearance hole in the fixture $d_f \leq$ [mm]                | 9             | 12           | 14             | 18             | 22             |
| Required setting torque $T_{inst} =$ [Nm]                                | 20            | 45           | 60             | 110            | 200            |



- $h_{ef}$  = Effective embedment depth
- $t_{fix}$  = Thickness of the fixture
- $h_1$  = Depth of drill hole to deepest point
- $h$  = Thickness of the concrete member
- $h_{min}$  = Minimum thickness of concrete member
- $h_{nom}$  = Overall fastener embedment depth in the concrete
- $T_{inst}$  = Required setting torque

(Fig. not to scale)

|                                                |                                        |
|------------------------------------------------|----------------------------------------|
| fischer Bolt Anchor FBZ, FBZ R                 | <b>Annex B 2</b><br><br>Appendix 7/ 14 |
| <b>Intended Use</b><br>Installation parameters |                                        |

**Table B3.1:** Minimum thickness of concrete members, minimum spacings and minimum edge distances of anchors for **standard anchorage depth** ( $h_{ef, sta}$ )

| Size                                                        |                                                                 | FBZ, FBZ R |            |            |            |            |
|-------------------------------------------------------------|-----------------------------------------------------------------|------------|------------|------------|------------|------------|
|                                                             |                                                                 | M8         | M10        | M12        | M16        | M20        |
| <b>Standard anchorage depth</b> $h_{ef, sta} \geq$          |                                                                 | <b>45</b>  | <b>60</b>  | <b>70</b>  | <b>85</b>  | <b>100</b> |
| Concrete members with thickness $\geq 2 \times h_{ef, sta}$ | Minimum thickness of concrete member $h_{min,1}$ [mm]           | <b>100</b> | <b>120</b> | <b>140</b> | <b>170</b> | <b>200</b> |
|                                                             | <b>Uncracked concrete</b>                                       |            |            |            |            |            |
|                                                             | Minimum spacing $\frac{s_{min}}{\text{for } c \geq}$ [mm]       | 40         |            | 50         | 65         | 95         |
|                                                             | Minimum edge distance $\frac{c_{min}}{\text{for } s \geq}$ [mm] | 50         | 60         | 70         | 95         | 180        |
|                                                             |                                                                 | 40         | 45         | 55         | 65         | 95         |
|                                                             |                                                                 | 100        | 80         | 110        | 150        | 190        |
|                                                             | <b>Cracked concrete</b>                                         |            |            |            |            |            |
|                                                             | Minimum spacing $\frac{s_{min}}{\text{for } c \geq}$ [mm]       | 35         | 40         | 50         | 65         | 95         |
| Concrete members with thickness $< 2 \times h_{ef, sta}$    |                                                                 | 50         | 55         | 70         | 95         | 140        |
|                                                             | Minimum edge distance $\frac{c_{min}}{\text{for } s \geq}$ [mm] | 40         | 45         | 55         | 65         | 85         |
|                                                             |                                                                 | 70         | 80         | 110        | 150        | 190        |
|                                                             | <b>Cracked and uncracked concrete</b>                           |            |            |            |            |            |
|                                                             | Minimum thickness of concrete member $h_{min,2}$ [mm]           | <b>80</b>  | <b>100</b> | <b>120</b> | <b>140</b> | <b>160</b> |
|                                                             | Minimum spacing $\frac{s_{min}}{\text{for } c \geq}$ [mm]       | 35         | 40         | 50         | 80         | 125        |
|                                                             |                                                                 | 70         | 100        | 90         | 130        | 220        |
|                                                             | Minimum edge distance $\frac{c_{min}}{\text{for } s \geq}$ [mm] | 40         | 60         |            | 65         | 125        |
|                                                             |                                                                 | 100        | 90         | 120        | 180        | 230        |

Intermediate values for  $s_{min}$  and  $c_{min}$  inside of the same thickness of concrete member by linear interpolation

**Table B3.2:** Minimum thickness of concrete members, minimum spacings and minimum edge distances of anchors for **reduced anchorage depth** ( $h_{ef, red}$ )

| Size                                                             |                                                                 | FBZ, FBZ R       |     |     |     |
|------------------------------------------------------------------|-----------------------------------------------------------------|------------------|-----|-----|-----|
|                                                                  |                                                                 | M8               | M10 | M12 | M16 |
| Reduced anchorage depth $h_{ef,red} \geq$                        |                                                                 | 35 <sup>1)</sup> | 40  | 50  | 65  |
| Concrete members with<br>thickness<br>$\geq 2 \times h_{ef,red}$ | Minimum thickness of<br>concrete member $h_{min,3}$ [mm]        | 80               |     | 100 | 140 |
|                                                                  | Uncracked concrete                                              |                  |     |     |     |
|                                                                  | Minimum spacing $\frac{s_{min}}{\text{for } c \geq}$ [mm]       | 40               |     | 50  | 65  |
|                                                                  |                                                                 | 100              |     | 110 | 130 |
|                                                                  | Minimum edge distance $\frac{c_{min}}{\text{for } s \geq}$ [mm] | 45               |     | 55  | 65  |
|                                                                  |                                                                 | 180              |     | 220 | 250 |
|                                                                  | Cracked concrete                                                |                  |     |     |     |
|                                                                  | Minimum spacing $\frac{s_{min}}{\text{for } c \geq}$ [mm]       | 40               |     | 50  | 65  |
|                                                                  |                                                                 | 90               |     | 110 | 130 |
| Minimum edge distance $\frac{c_{min}}{\text{for } s \geq}$ [mm]  | 45                                                              |                  | 55  | 65  |     |
|                                                                  | 180                                                             |                  | 220 | 250 |     |

Intermediate values for  $s_{min}$  and  $c_{min}$  by linear interpolation

<sup>1)</sup> Only in anchoring structural components which are statically indeterminate

fischer Bolt Anchor FBZ, FBZ R

**Intended Use**

Minimum thickness of member, minimum spacing and edge distance

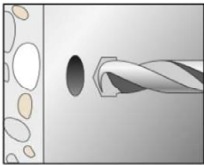
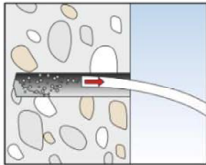
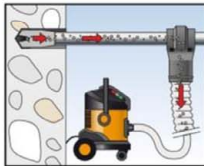
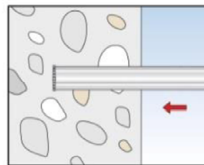
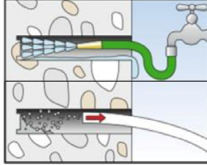
**Annex B 3**

## Installation instructions:

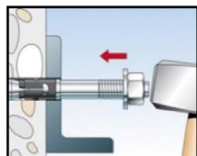
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- Use of the anchor only as supplied by the manufacturer without exchanging the components of the anchor
- Checking before placing the anchor to ensure that the strength class of the concrete in which the anchor is to be placed is in the range given and is not lower than that of the concrete to which the characteristic loads apply
- Check of concrete being well compacted, e.g. without significant voids
- Hammer, hollow or diamond drilling according to Annex B4
- Drill hole created perpendicular  $\pm 5^\circ$  to concrete surface, positioning without damaging the reinforcement
- In case of aborted hole: new drilling at a minimum distance twice the depth of the aborted drill hole or smaller distance if the aborted drill hole is filled with high strength mortar and if under shear or oblique tension load it is not in the direction of load application
- It must be ensured that in case of fire local spalling of the concrete cover does not occur
- Fastenings in stand-off installation or with a grout layer under seismic action are not covered
- In case of seismic applications the fastener shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure

## Installation instructions: Drilling and cleaning the hole

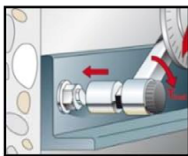
Types of drills and cleaning

|                                                                                   |                                                                                     |                                                                                     |                                                                                      |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Hammer drill                                                                      |    |    |    |
|                                                                                   |                                                                                     | 1: Drill the hole                                                                   | 2: Clean the hole                                                                    |
| Hollow drill                                                                      |  |   | -                                                                                    |
|                                                                                   |                                                                                     | 1: Drill the hole with automatic cleaning                                           |                                                                                      |
| Diamond drill, for non seismic applications only and $\geq$ drill $\varnothing 8$ |  |  |  |
|                                                                                   |                                                                                     | 1: Drill the hole                                                                   | 2: Clean the hole                                                                    |

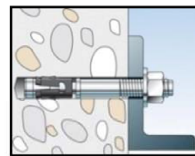
## Installation instructions: Installation of the anchor



3: Set the fastener



4: Apply  $T_{inst}$



5: Installed fastener

fischer Bolt Anchor FBZ, FBZ R

### Intended Use

Installation instructions

## Annex B 4

**Table C1.1: Characteristic tension resistance for standard anchorage depth**

| Size                                                                                                                                         |       |                   |                                 | FBZ, FBZ R |                       |      |      |       |     |
|----------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------|---------------------------------|------------|-----------------------|------|------|-------|-----|
|                                                                                                                                              |       |                   |                                 | M8         | M10                   | M12  | M16  | M20   |     |
| Steel failure for standard anchorage depth                                                                                                   |       |                   |                                 |            |                       |      |      |       |     |
| Characteristic resistance                                                                                                                    | FBZ   | N <sub>Rk,s</sub> | [kN]                            | 16,6       | 28,3                  | 43,2 | 67,0 | 123,3 |     |
|                                                                                                                                              | FBZ R |                   |                                 | 17,0       | 29,0                  | 44,3 | 70,6 | 124,9 |     |
| Partial factor for steel failure                                                                                                             |       |                   | γ <sub>Ms</sub> <sup>1)</sup>   | [-]        |                       |      |      |       |     |
| Pullout failure for standard anchorage depth                                                                                                 |       |                   |                                 |            |                       |      |      |       |     |
| Effective embedment depth for calculation                                                                                                    |       |                   | h <sub>ef,sta</sub>             | [mm]       | 45                    | 60   | 70   | 85    | 100 |
| Characteristic resistance in cracked concrete C20/25                                                                                         |       |                   | N <sub>Rk,p</sub>               | [kN]       | 6                     | 10   | 16   | 26    | 30  |
| Characteristic resistance in uncracked concrete C20/25                                                                                       |       |                   |                                 |            | 11                    | 16   | 17   | 34    | 42  |
| Increasing factors for N <sub>Rk,p</sub> for cracked and uncracked concrete                                                                  |       |                   | ψ <sub>c</sub>                  | C25/30     | 1,12                  |      |      |       |     |
|                                                                                                                                              |       |                   |                                 | C30/37     | 1,22                  |      |      |       |     |
|                                                                                                                                              |       |                   |                                 | C35/45     | 1,32                  |      |      |       |     |
|                                                                                                                                              |       |                   |                                 | C40/50     | 1,41                  |      |      |       |     |
|                                                                                                                                              |       |                   |                                 | C45/55     | 1,50                  |      |      |       |     |
|                                                                                                                                              |       |                   |                                 | C50/60     | 1,58                  |      |      |       |     |
| Installation factor                                                                                                                          |       |                   | γ <sub>inst</sub>               | [-]        |                       |      |      |       |     |
| Concrete cone and splitting failure for standard anchorage depth in applications with concrete members of thickness ≥ 2x h <sub>ef,sta</sub> |       |                   |                                 |            |                       |      |      |       |     |
| Effective embedment depth                                                                                                                    |       |                   | h <sub>ef,sta</sub>             | [mm]       | 45                    | 60   | 70   | 85    | 100 |
| Factor for uncracked concrete                                                                                                                |       |                   | k <sub>ucr,N</sub>              | [-]        | 11,0 <sup>2)</sup>    |      |      |       |     |
| Factor for cracked concrete                                                                                                                  |       |                   | k <sub>cr,N</sub>               |            | 7,7 <sup>2)</sup>     |      |      |       |     |
| Minimum thickness of concrete member                                                                                                         |       |                   | h <sub>min,1</sub>              | [mm]       | 100                   | 120  | 140  | 170   | 200 |
| Characteristic spacing                                                                                                                       |       |                   | s <sub>cr,N</sub>               |            | 3 · h <sub>ef</sub>   |      |      |       |     |
| Characteristic edge distance                                                                                                                 |       |                   | c <sub>cr,N</sub>               |            | 1,5 · h <sub>ef</sub> |      |      |       |     |
| Spacing (splitting failure) <sup>4)</sup>                                                                                                    |       |                   | s <sub>cr,sp</sub>              |            | 140                   | 180  | 210  | 260   | 370 |
| Edge distance (splitting failure) <sup>4)</sup>                                                                                              |       |                   | c <sub>cr,sp</sub>              |            | 70                    | 90   | 105  | 130   | 185 |
| Characteristic resistance to splitting                                                                                                       |       |                   | N <sup>0</sup> <sub>Rk,sp</sub> |            | [kN]                  |      |      |       |     |
| Concrete cone and splitting failure for standard anchorage depth in applications with concrete members of thickness ≥ 2x h <sub>ef,sta</sub> |       |                   |                                 |            |                       |      |      |       |     |
| Effective embedment depth                                                                                                                    |       |                   | h <sub>ef,sta</sub>             | [mm]       | 45                    | 60   | 70   | 85    | 100 |
| Factor for uncracked concrete                                                                                                                |       |                   | k <sub>ucr,N</sub>              | [-]        | 11,0 <sup>2)</sup>    |      |      |       |     |
| Factor for cracked concrete                                                                                                                  |       |                   | k <sub>cr,N</sub>               |            | 7,7 <sup>2)</sup>     |      |      |       |     |
| Minimum thickness of concrete member                                                                                                         |       |                   | h <sub>min,2</sub>              | [mm]       | 80                    | 100  | 120  | 140   | 160 |
| Characteristic spacing                                                                                                                       |       |                   | s <sub>cr,N</sub>               |            | 3 · h <sub>ef</sub>   |      |      |       |     |
| Characteristic edge distance                                                                                                                 |       |                   | c <sub>cr,N</sub>               |            | 1,5 · h <sub>ef</sub> |      |      |       |     |
| Spacing (splitting failure) <sup>4)</sup>                                                                                                    |       |                   | s <sub>cr,sp</sub>              |            | 180                   | 240  | 280  | 340   | 480 |
| Edge distance (splitting failure) <sup>4)</sup>                                                                                              |       |                   | c <sub>cr,sp</sub>              |            | 90                    | 120  | 140  | 170   | 240 |
| Characteristic resistance to splitting                                                                                                       |       |                   | N <sup>0</sup> <sub>Rk,sp</sub> |            | [kN]                  |      |      |       |     |

1) In absence of other national regulations

2) Based on concrete strength as cylinder strength

3) N<sup>0</sup><sub>Rk,c</sub> according to EN 1992-4:2018

4) Intermediate values for s<sub>cr,sp</sub> and c<sub>cr,sp</sub> between concrete thickness h<sub>min,2</sub> and h<sub>min,1</sub> by linear interpolation

fischer Bolt Anchor FBZ, FBZ R

## Performances

### Characteristic values of resistance under tension loads

## Annex C 1

Appendix 10/ 14

| Table C2.1: Characteristic tension resistance for reduced anchorage depth                             |                   |            |                    |      |      |                 |                                      |
|-------------------------------------------------------------------------------------------------------|-------------------|------------|--------------------|------|------|-----------------|--------------------------------------|
| Size                                                                                                  |                   | FBZ, FBZ R |                    |      |      |                 |                                      |
|                                                                                                       |                   | M8         | M10                | M12  | M16  |                 |                                      |
| Steel failure for reduced anchorage depth                                                             |                   |            |                    |      |      |                 |                                      |
| Characteristic resistance                                                                             | FBZ               | $N_{Rk,s}$ | [kN]               | 16,6 | 28,3 | 43,2            | 67,0                                 |
|                                                                                                       | FBZ R             | $N_{Rk,s}$ |                    | 17,0 | 29,0 | 44,3            | 70,6                                 |
| Partial factor for steel failure                                                                      |                   |            | $\gamma_{Ms}^{3)}$ | [-]  |      |                 | 1,5                                  |
| Pullout failure for reduced anchorage depth                                                           |                   |            |                    |      |      |                 |                                      |
| Effective anchorage depth for calculation                                                             | $h_{ef,red} \geq$ | [mm]       | 35 <sup>1)</sup>   | 40   | 50   | 65              |                                      |
| Characteristic resistance in cracked concrete C20/25                                                  | $N_{Rk,p}$        | [kN]       | 4                  | 7    | 10   | 15              |                                      |
| Characteristic resistance in uncracked concrete 20/25                                                 | $N_{Rk,p}$        |            | 8                  | 10   | 15   | 22              |                                      |
| Increasing factors for $N_{Rk,p}$ for cracked and uncracked concrete                                  | C25/30            |            | 1,12               |      |      |                 |                                      |
|                                                                                                       | C30/37            |            | 1,22               |      |      |                 |                                      |
|                                                                                                       | C35/45            |            | 1,32               |      |      |                 |                                      |
|                                                                                                       | C40/50            | $\psi_c$   | 1,41               |      |      |                 |                                      |
|                                                                                                       | C45/55            |            | 1,50               |      |      |                 |                                      |
|                                                                                                       | C50/60            |            | 1,58               |      |      |                 |                                      |
| Installation factor                                                                                   |                   |            | $\gamma_{inst}$    | [-]  |      |                 | 1,0                                  |
| Concrete cone and splitting failure for reduced anchorage depth                                       |                   |            |                    |      |      |                 |                                      |
| Effective anchorage depth                                                                             | $h_{ef,red}$      | [mm]       | 35 <sup>1)</sup>   | 40   | 50   | 65              |                                      |
| Factor for uncracked concrete                                                                         | $k_{ucr,N}$       | [-]        | 11 <sup>2)</sup>   |      |      |                 |                                      |
| Factor for cracked concrete                                                                           | $k_{cr,N}$        |            | 7,7 <sup>2)</sup>  |      |      |                 |                                      |
| Min. thickness of concrete member                                                                     | $h_{min,3}$       | [mm]       | 80                 |      | 100  | 140             |                                      |
| Characteristic spacing                                                                                | $s_{cr,N}$        |            | 3 $h_{ef}$         |      |      |                 |                                      |
| Characteristic edge distance                                                                          | $c_{cr,N}$        |            | 1,5 $h_{ef}$       |      |      |                 |                                      |
| Spacing (splitting failure)                                                                           | $s_{cr,sp}$       |            | 140                | 160  | 200  | 260             |                                      |
| Edge distance (splitting failure)                                                                     | $c_{cr,sp}$       |            | 70                 | 80   | 100  | 130             |                                      |
| Characteristic resistance to splitting                                                                |                   |            | $N^0_{Rk,sp}$      | [kN] |      |                 | $\min \{N^0_{Rk,c}; N_{Rk,p}\}^{4)}$ |
| <sup>1)</sup> Use restricted to anchoring of structural components which are statically indeterminate |                   |            |                    |      |      |                 |                                      |
| <sup>2)</sup> Based on concrete strength as cylinder strength                                         |                   |            |                    |      |      |                 |                                      |
| <sup>3)</sup> In absence of other national regulations                                                |                   |            |                    |      |      |                 |                                      |
| <sup>4)</sup> $N^0_{Rk,c}$ according to EN 1992-4:2018                                                |                   |            |                    |      |      |                 |                                      |
| fischer Bolt Anchor FBZ, FBZ R                                                                        |                   |            |                    |      |      | Annex C 2       |                                      |
| Performances                                                                                          |                   |            |                    |      |      |                 |                                      |
| Characteristic values of resistance under tension loads                                               |                   |            |                    |      |      | Appendix 11/ 14 |                                      |

| Table C3.1: Characteristic values of <b>shear</b> resistance<br>for <b>standard and reduced anchorage depth</b> |       |                    |      |            |      |      |                 |      |
|-----------------------------------------------------------------------------------------------------------------|-------|--------------------|------|------------|------|------|-----------------|------|
| Size                                                                                                            |       |                    |      | FBZ, FBZ R |      |      |                 |      |
|                                                                                                                 |       |                    |      | M8         | M10  | M12  | M16             | M20  |
| Steel failure without lever arm for standard and reduced anchorage depth                                        |       |                    |      |            |      |      |                 |      |
| Characteristic resistance                                                                                       | FBZ   | $V_{Rk,s}^0$       | [kN] | 12,0       | 21,4 | 30,6 | 55,0            | 70,0 |
|                                                                                                                 | FBZ R | $V_{Rk,s}^0$       |      | 16,1       | 26,5 | 37,4 | 57,2            |      |
| Partial factor for steel failure                                                                                |       | $\gamma_{Ms}^{1)}$ | [-]  | 1,25       |      |      |                 |      |
| Factor for ductility                                                                                            |       | $k_7$              |      | 1,0        |      |      |                 |      |
| Standard anchorage depth                                                                                        |       |                    |      |            |      |      |                 |      |
| Steel failure with lever arm                                                                                    |       |                    |      |            |      |      |                 |      |
| Characteristic bending resistance                                                                               | FBZ   | $M_{Rk,s}^0$       | [Nm] | 26         | 52   | 92   | 233             | 513  |
|                                                                                                                 | FBZ R | $M_{Rk,s}^0$       |      | 29         | 59   | 100  | 256             | 519  |
| Partial factor for steel failure                                                                                |       | $\gamma_{Ms}^{1)}$ | [-]  | 1,25       |      |      |                 |      |
| Factor for ductility                                                                                            |       | $k_7$              |      | 1,0        |      |      |                 |      |
| Concrete pryout failure                                                                                         |       |                    |      |            |      |      |                 |      |
| Factor for pryout failure                                                                                       |       | $k_8$              | [-]  | 2,8        | 3,2  |      | 3,0             | 2,6  |
| Concrete edge failure                                                                                           |       |                    |      |            |      |      |                 |      |
| Effective embedment depth for calculation                                                                       |       | $l_f$              | [mm] | 45         | 60   | 70   | 85              | 100  |
| Outside diameter of a fastener                                                                                  |       | $d_{nom}$          |      | 8          | 10   | 12   | 16              | 20   |
| Reduced anchorage depth                                                                                         |       |                    |      |            |      |      |                 |      |
| Steel failure with lever arm                                                                                    |       |                    |      |            |      |      |                 |      |
| Characteristic bending resistance                                                                               | FBZ   | $M_{Rk,s}^0$       | [Nm] | 20         | 44   | 92   | 184             | -    |
|                                                                                                                 | FBZ R | $M_{Rk,s}^0$       |      | 21         | 45   | 100  | 193             | -    |
| Partial factor for steel failure                                                                                |       | $\gamma_{Ms}^{1)}$ | [-]  | 1,25       |      |      |                 |      |
| Factor for ductility                                                                                            |       | $k_7$              |      | 1,0        |      |      |                 |      |
| Concrete pryout failure                                                                                         |       |                    |      |            |      |      |                 |      |
| Factor for pryout failure                                                                                       |       | $k_8$              | [-]  | 2,5        | 2,6  | 3,1  | 3,2             | -    |
| Concrete edge failure                                                                                           |       |                    |      |            |      |      |                 |      |
| Effective embedment depth for calculation                                                                       |       | $l_f$              | [mm] | 35         | 40   | 50   | 65              | -    |
| Outside diameter of a fastener                                                                                  |       | $d_{nom}$          |      | 8          | 10   | 12   | 16              | -    |
| 1) In absence of other national regulations                                                                     |       |                    |      |            |      |      |                 |      |
| fischer Bolt Anchor FBZ, FBZ R                                                                                  |       |                    |      |            |      |      | Annex C 3       |      |
| Performances<br>Characteristic values of resistance under shear loads                                           |       |                    |      |            |      |      |                 |      |
|                                                                                                                 |       |                    |      |            |      |      | Appendix 12/ 14 |      |

| Table C4.1: Characteristic values of <b>tension</b> resistance under <b>fire exposure</b> |                      |           |                                                                                                 |           |           |           |      |
|-------------------------------------------------------------------------------------------|----------------------|-----------|-------------------------------------------------------------------------------------------------|-----------|-----------|-----------|------|
| Size                                                                                      |                      |           | FBZ, FBZ R                                                                                      |           |           |           |      |
|                                                                                           |                      |           | M8                                                                                              | M10       | M12       | M16       | M20  |
| h <sub>ef</sub> ≥ [mm]                                                                    |                      |           | 35 / 45                                                                                         | 40 / 60   | 50 / 70   | 65 / 85   | 100  |
| Characteristic resistance<br>steel failure                                                | N <sub>Rk,s,fi</sub> | R30       | 1,4                                                                                             | 2,8       | 5,0       | 9,4       | 14,7 |
|                                                                                           |                      | R60       | 1,2                                                                                             | 2,3       | 4,1       | 7,7       | 12,0 |
|                                                                                           |                      | R90       | 0,9                                                                                             | 1,9       | 3,2       | 6,0       | 9,4  |
|                                                                                           |                      | R120      | 0,8                                                                                             | 1,6       | 2,8       | 5,2       | 8,1  |
| Characteristic resistance<br>Concrete cone failure                                        | N <sub>Rk,c,fi</sub> | R30 - R90 | 7,7 · h <sub>ef</sub> <sup>1,5</sup> · (20) <sup>0,5</sup> · h <sub>ef</sub> / 200 / 1000       |           |           |           |      |
|                                                                                           |                      | R120      | 7,7 · h <sub>ef</sub> <sup>1,5</sup> · (20) <sup>0,5</sup> · h <sub>ef</sub> / 200 / 1000 · 0,8 |           |           |           |      |
| Characteristic resistance<br>pullout failure                                              | N <sub>Rk,p,fi</sub> | R30       | 0,9 / 2,0                                                                                       | 2,2 / 3,3 | 3,0 / 5,0 | 4,5 / 6,8 | 8,6  |
|                                                                                           |                      | R60       | 0,8 / 2,0                                                                                       |           |           |           |      |
|                                                                                           |                      | R90       | 0,5 / 2,0                                                                                       |           |           |           |      |
|                                                                                           |                      | R120      | 0,3 / 1,6                                                                                       | 1,7 / 2,6 | 2,4 / 4,0 | 3,6 / 5,4 | 6,9  |

| Size<br>FBZ, FBZ R |                   | R30                          |                                           | R60                           |                                            |      |
|--------------------|-------------------|------------------------------|-------------------------------------------|-------------------------------|--------------------------------------------|------|
|                    |                   | V <sub>Rk,s,fi,30</sub> [kN] | M <sup>0</sup> <sub>Rk,s,fi,30</sub> [Nm] | V <sub>Rk,s,fi,60</sub> [kN]  | M <sup>0</sup> <sub>Rk,s,fi,60</sub> [Nm]  |      |
| M8                 | h <sub>ef</sub> ≥ | 35                           | 1,8                                       | 1,4                           | 1,6                                        | 1,2  |
| M10                |                   | 40                           | 3,6                                       |                               | 2,9                                        | 3,0  |
| M12                |                   | 50                           | 6,3                                       | 7,8                           | 4,9                                        | 6,4  |
| M16                |                   | 65                           | 11,7                                      | 19,9                          | 9,1                                        | 16,3 |
| M20                |                   | 100                          | 18,2                                      | 39,0                          | 14,2                                       | 31,8 |
| Size<br>FBZ, FBZ R |                   | R90                          |                                           | R120                          |                                            |      |
|                    |                   | V <sub>Rk,s,fi,90</sub> [kN] | M <sup>0</sup> <sub>Rk,s,fi,90</sub> [Nm] | V <sub>Rk,s,fi,120</sub> [kN] | M <sup>0</sup> <sub>Rk,s,fi,120</sub> [Nm] |      |
| M8                 | h <sub>ef</sub> ≥ | 35                           | 1,3                                       | 1,0                           | 1,2                                        | 0,8  |
| M10                |                   | 40                           | 2,2                                       | 2,4                           | 1,9                                        | 2,1  |
| M12                |                   | 50                           | 3,5                                       | 5,0                           | 2,8                                        | 4,3  |
| M16                |                   | 65                           | 6,6                                       | 12,6                          | 5,3                                        | 11,0 |
| M20                |                   | 100                          | 10,3                                      | 24,6                          | 8,3                                        | 21,4 |

Concrete pryout failure according to EN 1992-4:2018

**Table C4.3:** Minimum spacings and minimum edge distances of anchors under **fire exposure** for **tension** and **shear** load

| Size          |                | FBZ, FBZ R                                                                                      |     |     |     |     |
|---------------|----------------|-------------------------------------------------------------------------------------------------|-----|-----|-----|-----|
|               |                | M8                                                                                              | M10 | M12 | M16 | M20 |
| Spacing       | $s_{min}$      | Annex B3                                                                                        |     |     |     |     |
| Edge distance | $c_{min}$ [mm] | $c_{min} = 2 \cdot h_{ef}$ ,<br>for fire exposure from more than one side $c_{min} \geq 300$ mm |     |     |     |     |

|                                                                                |                                  |
|--------------------------------------------------------------------------------|----------------------------------|
| fischer Bolt Anchor FBZ, FBZ R                                                 | Annex C 4<br><br>Appendix 13/ 14 |
| <b>Performances</b><br>Characteristic values of resistance under fire exposure |                                  |

| Table C5.1: Displacements under static and quasi static <b>tension</b> loads                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |       |      |      |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------|------|------|-----------------|
| Size                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | FBZ, FBZ R |       |      |      |                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | M8         | M10   | M12  | M16  | M20             |
| Displacement – factor for tensile load <sup>1)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |       |      |      |                 |
| $\delta_{N0}$ - factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0,22       | 0,12  | 0,09 | 0,08 | 0,07            |
| $\delta_{N\infty}$ - factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0,78       | 0,40  | 0,19 | 0,09 |                 |
| in cracked concrete                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | [mm/kN]    | 0,07  | 0,05 | 0,06 |                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            | 0,29  | 0,21 | 0,14 | 0,10            |
| in uncracked concrete                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |       |      |      |                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |       |      |      |                 |
| Table C5.2: Displacements under static and quasi static <b>shear</b> loads                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |       |      |      |                 |
| Size                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | FBZ        |       |      |      |                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | M8         | M10   | M12  | M16  | M20             |
| Displacement – factor for shear load <sup>2)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |       |      |      |                 |
| $\delta_{V0}$ - factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0,35       | 0,37  | 0,27 | 0,10 | 0,09            |
| $\delta_{V\infty}$ - factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0,52       | 0,55  | 0,40 | 0,14 | 0,15            |
| in cracked and uncracked concrete                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | [mm/kN]    | FBZ R |      |      |                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            | 0,23  | 0,19 | 0,18 | 0,10            |
| $\delta_{V0}$ - factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            | 0,27  | 0,22 | 0,16 | 0,11            |
| $\delta_{V\infty}$ - factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |       |      | 0,11 | 0,05            |
| <div><div><div><div><div>1)</div><div>Calculation of effective displacement:</div><div><math>\delta_{N0} = \delta_{N0} - \text{factor} \cdot N_{ED}</math></div><div><math>\delta_{N\infty} = \delta_{N\infty} - \text{factor} \cdot N_{ED}</math></div><div>(N<sub>ED</sub>: Design value of the applied tension force)</div></div></div><div><div><div>2)</div><div>Calculation of effective displacement:</div><div><math>\delta_{V0} = \delta_{V0} - \text{factor} \cdot V_{ED}</math></div><div><math>\delta_{V\infty} = \delta_{V\infty} - \text{factor} \cdot V_{ED}</math></div><div>(V<sub>ED</sub>: Design value of the applied shear force)</div></div></div></div></div> |            |       |      |      |                 |
| fischer Bolt Anchor FBZ, FBZ R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |       |      |      | Annex C 5       |
| Performances<br>Displacements under tension and shear loads                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |       |      |      |                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |       |      |      | Appendix 14/ 14 |