

## PRESTANDEDEKLARATION

### DoP 0179

för fischer Zykon- Anchor FZA, FZA-D, FZA-I, FZA ST (Metallankare för användning i betong)

SV

|                                                                                                                                                                          |                                                                                                                                                                                            |                                  |                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------------|
| 1. <u>Produkttypens unika identifikationskod:</u>                                                                                                                        | <b>DoP 0179</b>                                                                                                                                                                            |                                  |                              |
| 2. <u>Avsedd användning/avsedda användningar:</u>                                                                                                                        | <b>Infästning i efterhand i sprucken och osprucken betong.<br/>Se bilaga, särskilt bilagor B1- B5<br/>fischerwerke GmbH &amp; Co. KG, Klaus-Fischer-Str. 1, 72178 Waldachtal, Tyskland</b> |                                  |                              |
| 3. <u>Tillverkare:</u>                                                                                                                                                   | —                                                                                                                                                                                          |                                  |                              |
| 4. <u>Tillverkarens representant:</u>                                                                                                                                    | —                                                                                                                                                                                          |                                  |                              |
| 5. <u>System för bedömning och fortlöpande kontroll av prestanda:</u>                                                                                                    | <b>1</b>                                                                                                                                                                                   |                                  |                              |
| 6. <u>Europeiskt bedömningsdokument:</u><br>Europeisk teknisk bedömning:<br>Tekniskt bedömningsorgan:<br>Anmält/annmällda organ:                                         | <b>EAD 330232-01-0601, (Edition 12/ 2019)<br/>ETA-98/0004; 2020-02-18<br/>DIBt- Deutsches Institut für Bautechnik<br/>1343 MPA Darmstadt / 2873 TU Darmstadt</b>                           |                                  |                              |
| 7. <u>Angiven prestanda:</u><br><b>Mekanisk hållfasthet och stabilitet (BWR 1)</b><br>Karakteristisk bärförmåga för spänning (för statisk och kvasi-statisk belastning): | Stålets motståndskraft:<br>Motstånd mot att skruven dras ut:                                                                                                                               | Bilagor C1-C3<br>Bilagor C1-C3   | E <sub>s</sub> = 210 000 MPa |
|                                                                                                                                                                          | Motstånd i betongkonen:<br>Kraftighet:                                                                                                                                                     | Bilagor C1-C3<br>Bilagor C1-C3   |                              |
|                                                                                                                                                                          | Minsta kant- och axelavstånd:<br>Kantavstånd för att slippa sprickor under last:                                                                                                           | Bilagor C7<br>Bilagor C1- C3     |                              |
|                                                                                                                                                                          |                                                                                                                                                                                            |                                  |                              |
| Karakteristisk bärförmåga för skjuvning (för statisk och kvasi-statisk belastning), Metod A:                                                                             | Motstånd i stålet (tvärlast):<br>Motstånd mot fläkning:                                                                                                                                    | Bilagor C4- C6<br>Bilagor C4- C6 |                              |
| Karakteristiskt motstånd och Förskjutningar för seismiska prestandakategorier C1 och C2:                                                                                 | Motstånd mot draglast, förskjutningar, kategori C1:                                                                                                                                        | Bilagor C8, C9                   |                              |
|                                                                                                                                                                          | Motstånd mot draglast, förskjutningar, kategori C2:                                                                                                                                        | Bilagor C10, C11, C15            |                              |
|                                                                                                                                                                          | Motstånd mot tvärlast, förskjutningar, kategori C1:                                                                                                                                        | Bilagor C8, C9                   |                              |
|                                                                                                                                                                          | Motstånd mot tvärlast, förskjutningar, kategori C2:                                                                                                                                        | Bilagor C10, C11, C15            |                              |
|                                                                                                                                                                          | Faktor cirkulärt håll:                                                                                                                                                                     | Bilagor C8- C11                  |                              |
| Karakteristiskt motstånd för förenklad design:                                                                                                                           | Metod B:                                                                                                                                                                                   | NPD                              |                              |
|                                                                                                                                                                          | Metod C:                                                                                                                                                                                   | NPD                              |                              |
| Förskjutningar och Hållbarhet:                                                                                                                                           | Förskjutningar under statisk och kvasistatisk belastning:                                                                                                                                  | Bilagor C14, C15                 |                              |
|                                                                                                                                                                          | Hållbarhet:                                                                                                                                                                                | Bilagor A7, B1                   |                              |
| <b>Säkerhet vid brand (BWR 2)</b>                                                                                                                                        |                                                                                                                                                                                            |                                  |                              |
| Reaktion vid brand:                                                                                                                                                      | Klass (A1)                                                                                                                                                                                 |                                  |                              |
| Motståndskraft mot eld:                                                                                                                                                  | Brandmotstånd i stålet (tvärlast):                                                                                                                                                         | Bilagor C12, C13                 |                              |
|                                                                                                                                                                          | Brandmotstånd mot utdrag (draglast):                                                                                                                                                       | Bilagor C12, C13                 |                              |
|                                                                                                                                                                          | Brandmotstånd i stålet (tvärlast):                                                                                                                                                         | Bilagor C12, C13                 |                              |



8. Lämplig teknisk dokumentation och/eller särskild teknisk dokumentation: -

Prestandan för ovanstående produkt överensstämmer med den angivna prestandan. Denna prestandadeklaration har utfärdats i enlighet med förordning (EU) nr 305/2011 på eget ansvar av den tillverkare som anges ovan.

Undertecknad på tillverkarens vägnar av:

Thilo Pregartner, Dr.-Ing.  
Tumlingen, 2020-03-03

Peter Schillinger, Dipl.-Ing.

Denna DoP har förberetts på olika språk. I händelse av tvist om tolkningen ska den engelska versionen alltid råda.

Bilagan innehåller frivilliga och kompletterande information på engelska som överskrider (det specifika språkets) lagkrav.

## Specific Part

### 1 Technical description of the product

The fischer-Zykon-Anchor FZA, FZA-D, FZA-I and FZA ST is an anchor made of galvanised or stainless or high corrosion resistant steel which is placed in an undercut hole and anchored by mechanical interlock with displacement-controlled installation.

The bolt projection anchor FZA and the through bolt anchor FZA-D consists of a conical bolt with external thread, an expansion sleeve and a hexagon nut with washer. The internal threaded anchor FZA-I consists of a conical bolt with internal thread and an expansion sleeve. The bold projecting anchor FZA ST consists of a conical bolt with hexagon projecting end, an expansion sleeve with colour marking, a hexagon nut with washer and a plastic sleeve.

The anchor is anchored by impact acting on the expansion sleeve over the cone bolts in the undercuts of the borehole.

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 C1 to C3, Annex C7 |
| Characteristic resistance to shear load (static and quasi-static loading)                | See Annex C4 to C6           |
| Displacements (static and quasi-static loading)                                          | See Annex C14 to C15         |
| Durability                                                                               | See Annex B1                 |
| Characteristic resistance and displacements for seismic performance categories C1 and C2 | See Annex C8 to C11          |

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

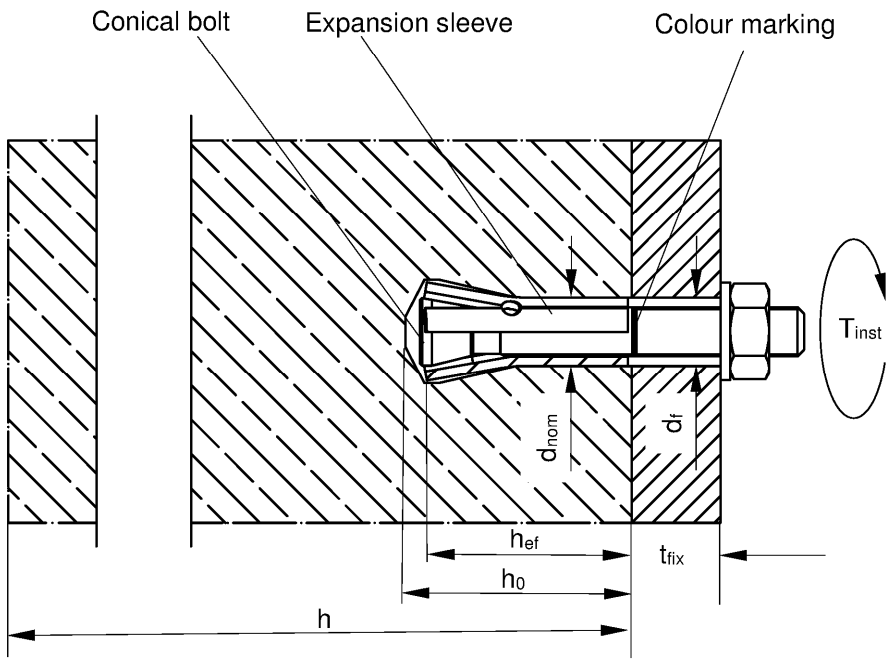
| Essential characteristic | Performance          |
|--------------------------|----------------------|
| Reaction to fire         | Class A1             |
| Resistance to fire       | See Annex C12 to C13 |

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

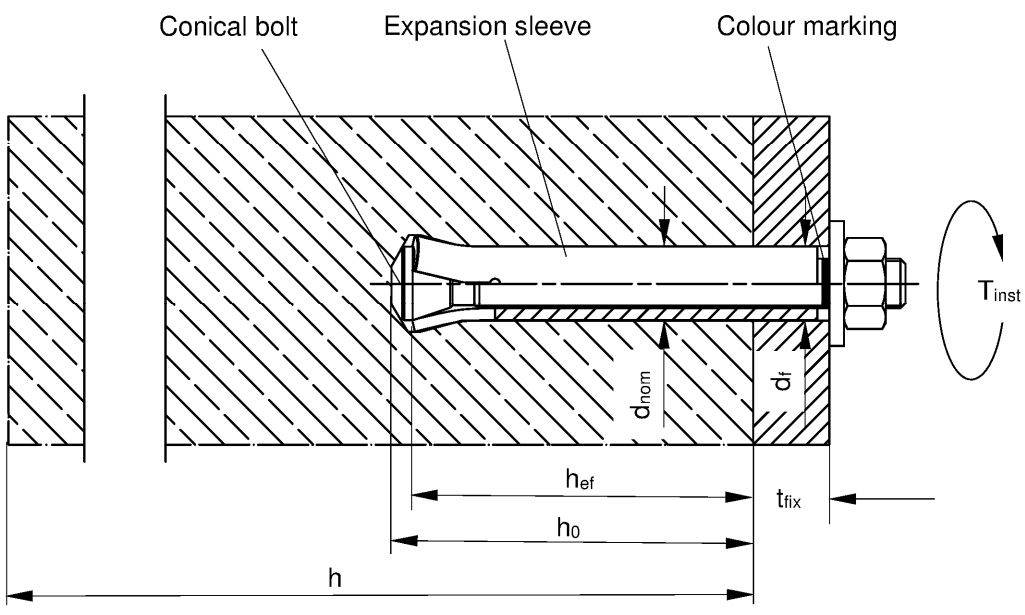
In accordance with the European Assessment Document EAD 330232-01-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

**Bolt projecting anchor FZA:**



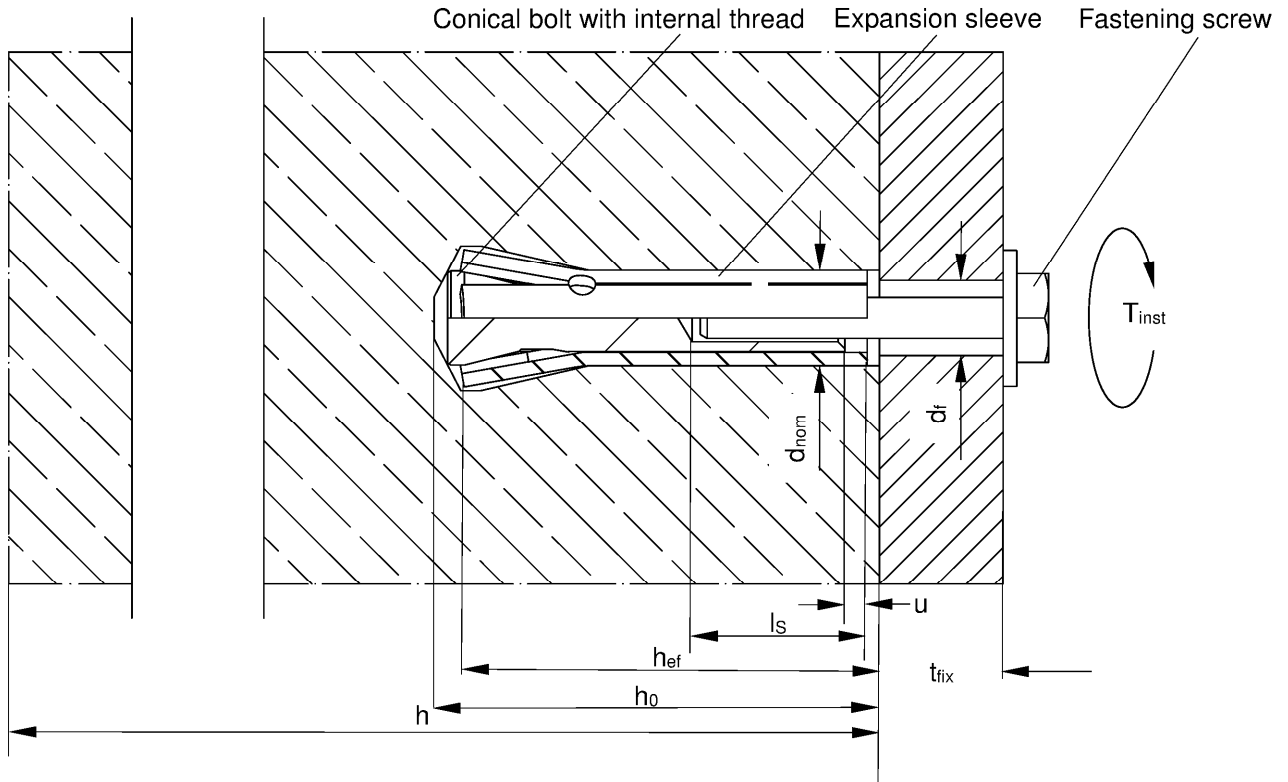
**Through bolt anchor FZA D:**



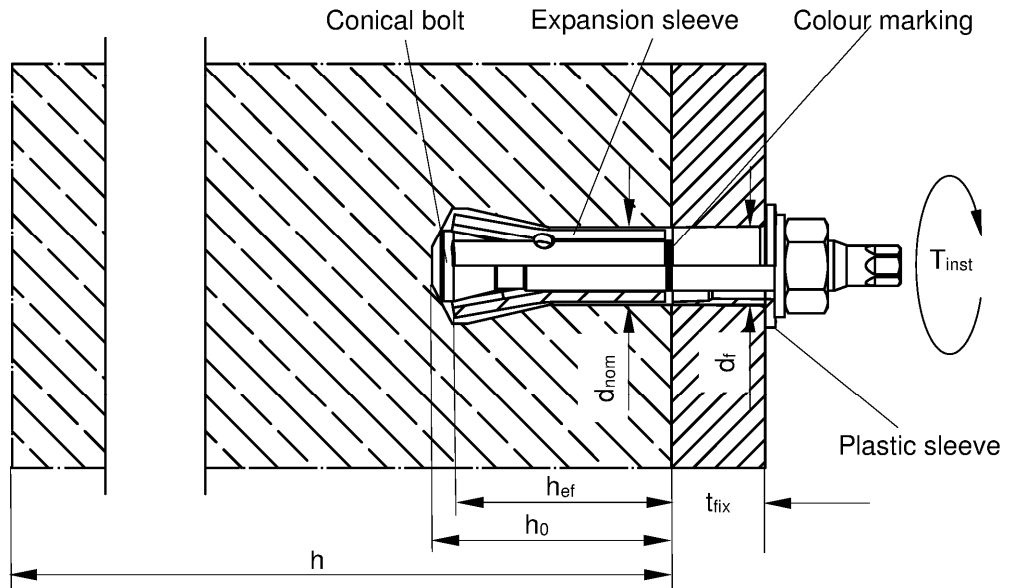
(figure not to scale)

|                                                |                                       |
|------------------------------------------------|---------------------------------------|
| fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST |                                       |
| Product description<br>Installed condition     | <b>Annex A1</b><br><br>Appendix 3/ 29 |

## Internal thread anchor FZA I:



## Bolt projecting anchor FZA ST:



|         |                                                                                  |                                     |
|---------|----------------------------------------------------------------------------------|-------------------------------------|
| Legend: | $h_{ef}$ = Effective embedment depth                                             | $d_{nom}$ = Nominal anchor diameter |
|         | $t_{fix}$ = Thickness of fixture                                                 | $h_0$ = Drill hole depth            |
|         | $d_r$ = Diameter of the clearance hole in the fixture                            |                                     |
|         | $u$ = Gap between conical bolt with internal thread and expansion sleeve (FZA I) |                                     |
|         | $h$ = Thickness of concrete member                                               |                                     |
|         | $T_{inst}$ = Required torque moment                                              |                                     |
|         | $l_s$ = Screwing depth                                                           |                                     |

(figure not to scale)

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

**Product description**  
Installed condition

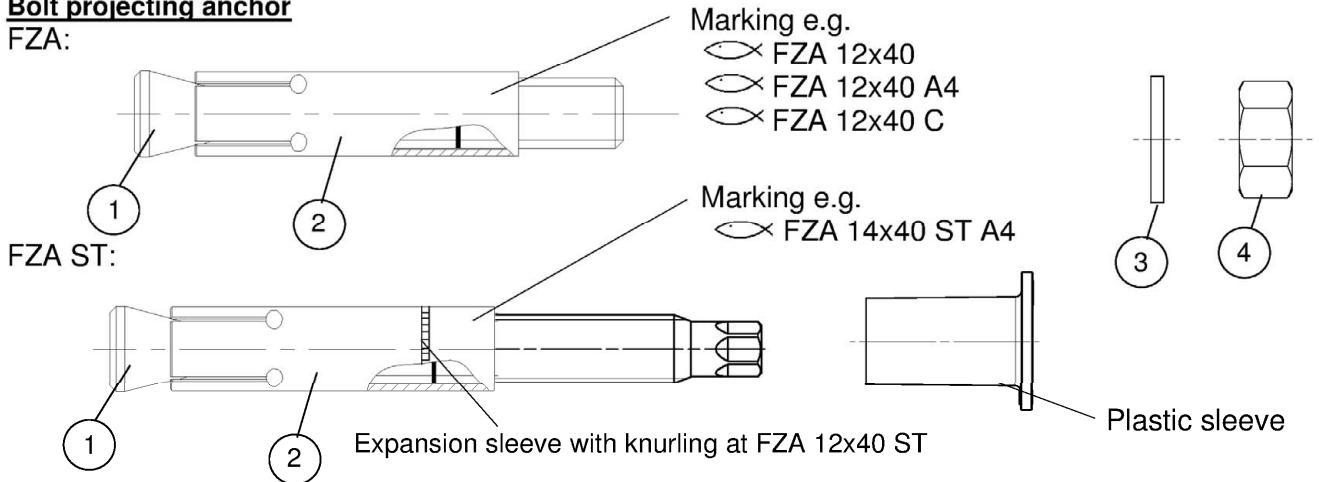
**Annex A2**

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## Type of anchors

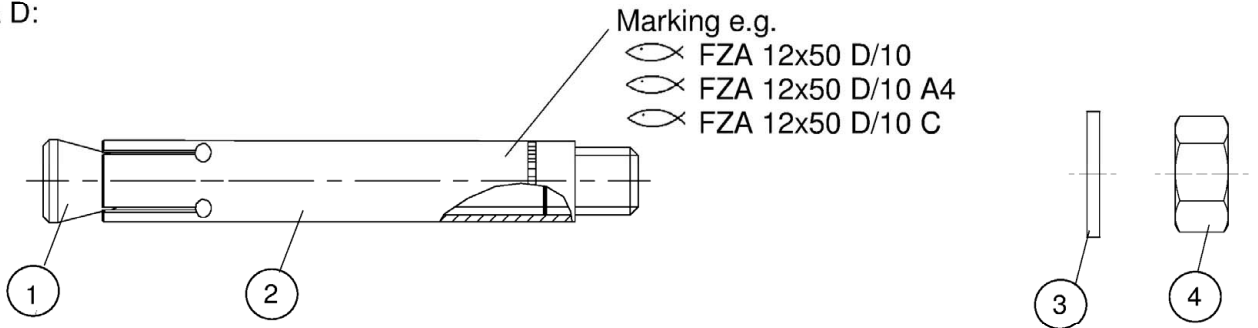
### Bolt projecting anchor

FZA:



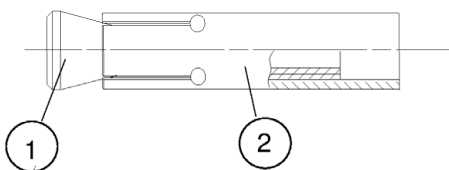
### Through bolt anchor

FZA D:



### Internal thread anchor

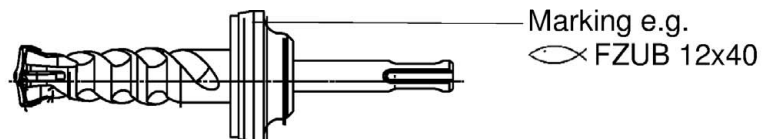
FZA I:



Related fastening screws respectively threaded rods must correspond to Annex A7 and with inspection certificate 3.1 acc. to EN 10204:2005-01

### Zykon drill

FZUB:

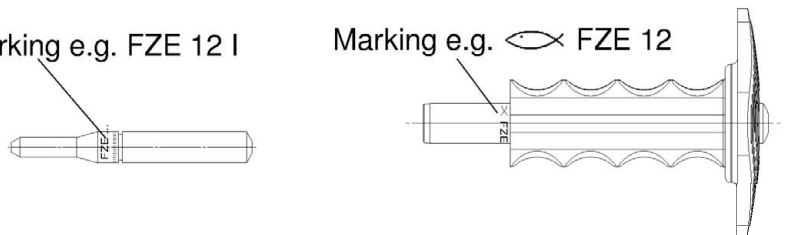


### Setting tool FZE Plus

centring pin for internal thread anchor

Marking e.g. FZE 12 I

Marking e.g. FZE 12



(figure not to scale)

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

**Product description**  
 Anchor Types and tools

**Annex A3**

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## Types of expansion-sleeve

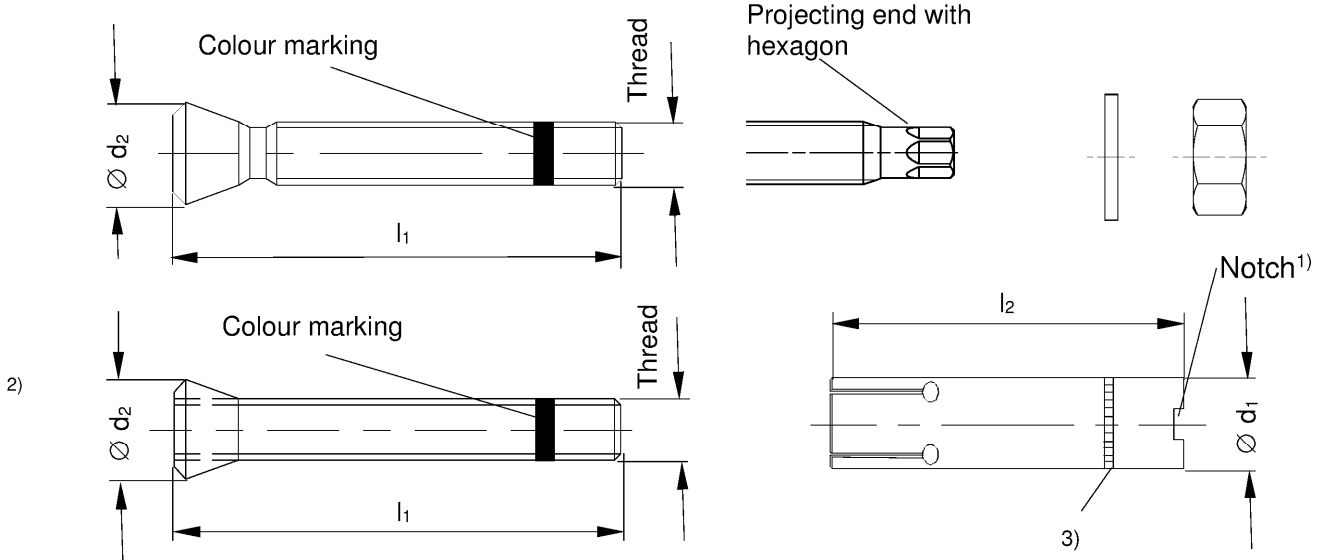


manufactured by punching



manufactured by turning

## FZA



**Table A4.1:** Dimensions bolt projecting anchor FZA [mm]

| Type of anchor                                    | Thread | d  | t <sub>fix</sub> min | t <sub>fix</sub> max | l <sub>1</sub> min | l <sub>1</sub> max | l <sub>2</sub>   | ∅ d <sub>1</sub> | ∅ d <sub>2</sub> |
|---------------------------------------------------|--------|----|----------------------|----------------------|--------------------|--------------------|------------------|------------------|------------------|
| FZA 10 x 40 M 6 / t <sub>fix</sub> <sup>1)</sup>  | M6     | 6  | 1                    | 50                   | 50                 | 100                | 40               | 10               |                  |
| FZA 12 x 40 M 8 / t <sub>fix</sub> <sup>1)</sup>  | M8     | 8  |                      | 100                  | 52                 | 154                |                  | 12               |                  |
| FZA 14 x 40 M 10 / t <sub>fix</sub> <sup>1)</sup> | M10    | 10 |                      | 150                  | 54                 | 204                |                  | 14               |                  |
| FZA 12 x 50 M 8 / t <sub>fix</sub>                | M8     | 8  |                      | 100                  | 62                 | 164                | 50               | 12               |                  |
| FZA 14 x 60 M 10 / t <sub>fix</sub>               | M10    | 10 |                      | 150                  | 80                 | 232                | 60               | 14               |                  |
| FZA 18 x 80 M 12 / t <sub>fix</sub>               | M12    | 12 |                      | 200                  | 99                 | 301                | 80               | 18               |                  |
| FZA 22 x 100 M16 / t <sub>fix</sub>               | M16    | 16 |                      | 250                  | 122                | 374                | 100              | 22               |                  |
| FZA 22 x 125 M16 / t <sub>fix</sub> <sup>1)</sup> |        |    |                      |                      | 147                | 399                | 125              |                  |                  |
| FZA 12 x 40 ST A4 <sup>1)</sup>                   | M8     | 8  | 1                    | 100                  | 62                 | 164                | 50 <sup>3)</sup> | 12               |                  |
| FZA 14 x 40 ST A4 <sup>1)</sup>                   | M10    | 10 |                      | 150                  | 54                 | 204                | 40               | 14               |                  |
| FZA 14 x 60 ST A4                                 |        |    |                      |                      | 80                 | 232                | 60               |                  |                  |

<sup>1)</sup> Expansion sleeve with notch

<sup>2)</sup> Design: threaded bolt with cone nut

<sup>3)</sup> Expansion sleeve with knurling at FZA 12x40 ST

(figure not to scale)

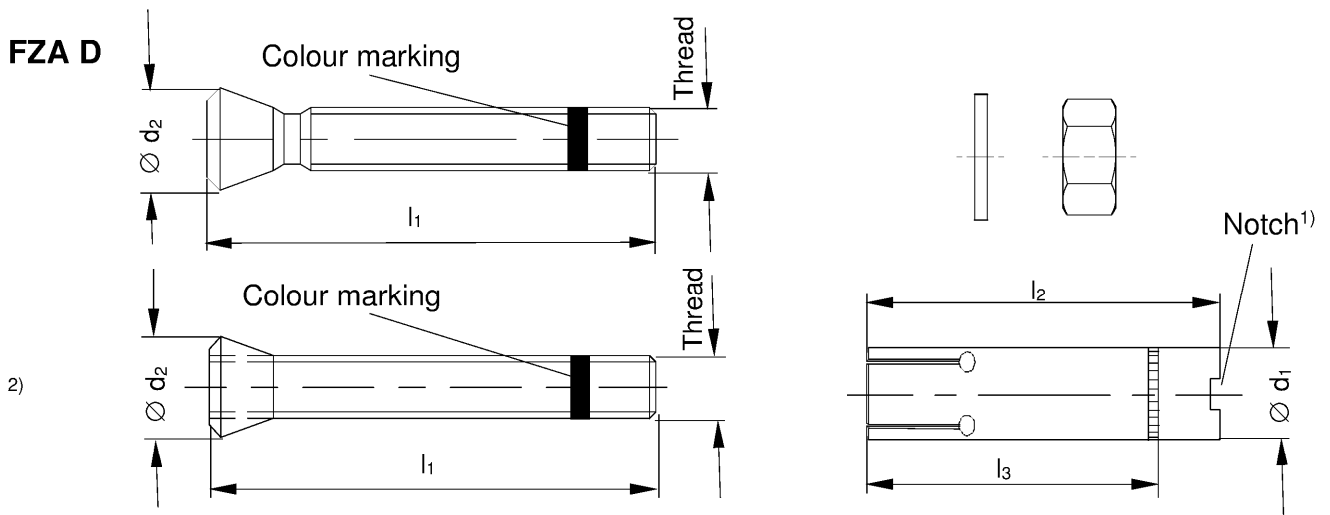
fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

**Product description**  
Anchor dimensions

**Annex A4**

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## FZA D



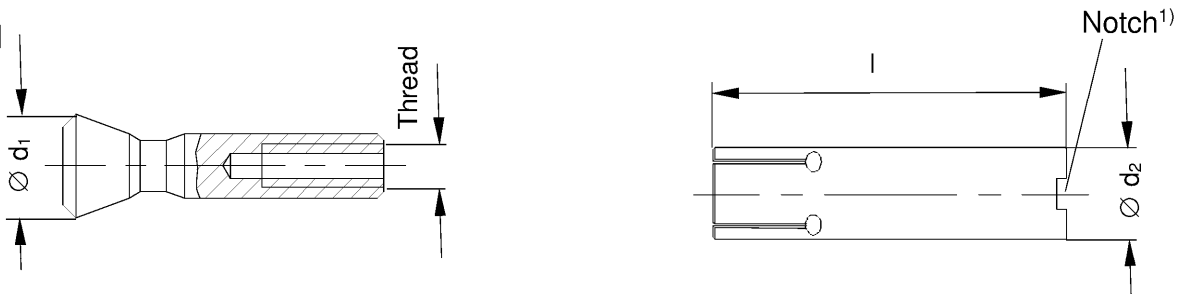
**Table A5.1:** Dimensions through bolt anchor FZA D [mm]

| Type of anchor                       | Thread | d  | t <sub>fix</sub> min | t <sub>fix</sub> max | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | Ø d <sub>1</sub> | Ø d <sub>2</sub> |
|--------------------------------------|--------|----|----------------------|----------------------|----------------|----------------|----------------|------------------|------------------|
| FZA 12 x 50 M 8 D / 10 <sup>1)</sup> | M8     | 8  | 1                    | 10                   | 69             | 50             | 40             | 12               |                  |
| FZA 12 x 60 M 8 D / 10               |        |    |                      |                      | 79             | 60             | 50             |                  |                  |
| FZA 12 x 80 M 8 D / 30               |        |    |                      | 30                   | 99             | 80             |                |                  |                  |
| FZA 14 x 80 M 10 D / 20              | M10    | 10 |                      | 20                   | 102            | 100            | 60             | 14               |                  |
| FZA 14 x 100 M 10 D / 40             |        |    |                      | 40                   | 126            |                |                |                  |                  |
| FZA 18 x 100 M 12 D / 20             | M12    | 12 |                      | 20                   | 126            | 130            | 80             | 18               |                  |
| FZA 18 x 130 M 12 D / 50             |        |    |                      | 50                   | 156            |                |                |                  |                  |
| FZA 22 x 125 M 16 D / 25             | M16    | 16 |                      | 25                   | 156            | 125            | 100            | 22               |                  |

<sup>1)</sup> Expansion sleeve with notch

<sup>2)</sup> Design: threaded bolt with cone nut

## FZA I



**Table A5.2:** Dimensions internal thread anchor FZA I [mm]

| Type of anchor                    | Thread | d  | Ø d <sub>1</sub> | Ø d <sub>2</sub> | l   |
|-----------------------------------|--------|----|------------------|------------------|-----|
| FZA 12 x 40 M 6 I <sup>1)</sup>   | M6     | 6  | 12               |                  | 40  |
| FZA 12 x 50 M 6 I                 |        |    |                  |                  | 50  |
| FZA 14 x 60 M 8 I                 | M8     | 8  | 14               |                  | 60  |
| FZA 18 x 80 M 10 I                | M10    | 10 | 18               |                  | 80  |
| FZA 22 x 100 M 12 I               | M12    | 12 | 22               |                  | 100 |
| FZA 22 x 125 M 12 I <sup>1)</sup> |        |    |                  |                  | 125 |

<sup>1)</sup> Expansion sleeve with notch

(figure not to scale)

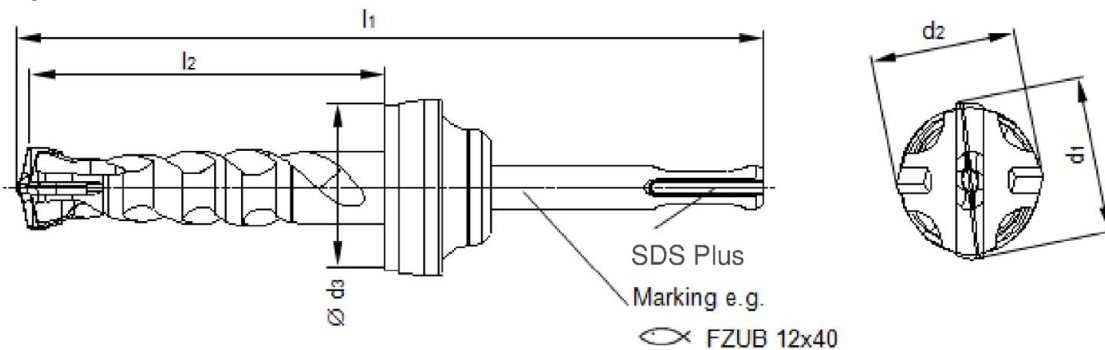
fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

**Product description**  
Anchor dimensions

**Annex A5**

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## Zykon drill FZUB

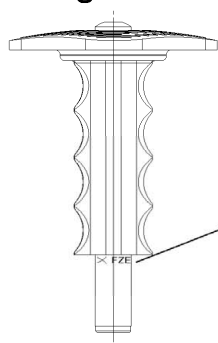


**Table A6.1:** Dimensions Zykon drill FZUB [mm]

| Type of drill | Connection | $l_1$ | $l_2 \geq$ | $d_1$         | $d_2$          | $\varnothing d_3 \leq$ |
|---------------|------------|-------|------------|---------------|----------------|------------------------|
| FZUB 10 x 40  | SDS plus   | 126   | 40         | 10,35 - 10,80 | $d_2 \leq d_1$ | 39,5                   |
| FZUB 12 x 40  |            | 127   |            | 12,45 - 12,85 |                |                        |
| FZUB 12 x 50  |            | 137   | 50         |               |                |                        |
| FZUB 12 x 60  |            | 147   | 60         |               |                |                        |
| FZUB 12 x 80  |            | 167   | 80         |               |                |                        |
| FZUB 14 x 40  |            | 130   | 40         | 14,45 - 14,85 |                |                        |
| FZUB 14 x 60  |            | 152   | 60         |               |                |                        |
| FZUB 14 x 80  |            | 172   | 80         |               |                |                        |
| FZUB 14 x 100 |            | 192   | 100        |               |                |                        |
| FZUB 18 x 80  |            | 172   | 80         | 18,75 - 19,15 |                |                        |
| FZUB 18 x 100 |            | 192   | 100        |               |                |                        |
| FZUB 18 x 130 |            | 222   | 130        |               |                |                        |
| FZUB 22 x 100 |            | 197   | 100        | 22,45 - 22,95 |                | 43,5                   |
| FZUB 22 x 125 |            | 222   | 125        |               |                |                        |

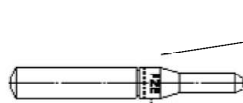
Zykon drills FZUB and setting tools to use, acc. to Annex B2

### Setting tool FZE Plus:



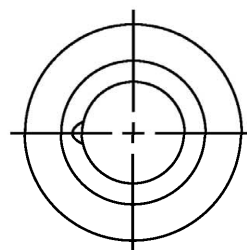
Marking e.g.  
FZE 12

Centring pin for setting tool FZE Plus:



Marking e.g.  
FZE 12 I

Optional fischer filling disc FFD for e.g. seismic C2 application:



(figure not to scale)

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

### Product description

Zykon drill FZUB and setting tool FZE Plus

## Annex A6

**Table A7.1:** Materials FZA, FZA D, FZA I (zinc plated  $\geq 5\mu\text{m}$ , ISO 4042:2018)  
FZA, FZA D (hot-dip galvanized <sup>1)</sup>, ISO 10684:2011)

| Part | Designation                                     | Material                                                                                                   |
|------|-------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| 1    | Cone bolt with external thread                  | Cold form steel or free cutting steel<br>Nominal steel tensile strength: $f_{uk} \leq 1000 \text{ N/mm}^2$ |
|      | Conical bolt with internal thread <sup>2)</sup> | Steel, EN 10277:2018<br>Nominal steel tensile strength $f_{uk} \leq 1000 \text{ N/mm}^2$                   |
| 2    | Expansion sleeve seamless or rolled             | Steel                                                                                                      |
| 3    | Washer                                          | Cold strip, EN 10139:2016                                                                                  |
| 4    | Hexagon nut                                     | Steel, property class min. 8, ENISO 898-2:2012                                                             |

**Table A7.2:** Materials FZA A4, FZA D A4, FZA I A4, FZA ST A4

| Part | Designation                                     | Material                                                                    |
|------|-------------------------------------------------|-----------------------------------------------------------------------------|
| 1    | Cone bolt with external thread                  | Stainless steel EN 10088:2014                                               |
|      | Conical bolt with internal thread <sup>3)</sup> |                                                                             |
| 2    | Expansion sleeve seamless or rolled             | Stainless steel EN 10088:2014                                               |
| 3    | Washer                                          |                                                                             |
| 4    | Hexagon nut                                     | Stainless steel EN 10088:2014;<br>ISO 3506-2:2018; property class – min. 70 |

**Table A7.3:** Materials FZA C, FZA D C, FZA I C

| Part | Designation                                     | Material                                                                                   |
|------|-------------------------------------------------|--------------------------------------------------------------------------------------------|
| 1    | Cone bolt with external thread                  | High corrosion resistant steel EN 10088:2014                                               |
|      | Conical bolt with internal thread <sup>4)</sup> |                                                                                            |
| 2    | Expansion sleeve seamless or rolled             |                                                                                            |
| 3    | Washer                                          | High corrosion resistant steel EN 10088:2014;<br>ISO 3506-2:2018; property class – min. 70 |
| 4    | Hexagon nut                                     |                                                                                            |

<sup>1)</sup> Alternative method sherardized, EN 13811:2003

<sup>2)</sup> Related screws or threaded rods: property class 8.8 according to ENISO 898-1:2012; ductility  $A_5 > 8\%$ ; zinc plated

<sup>3)</sup> Related screws or threaded rods: property class  $\geq 70$  according to ENISO 3506-1:2018; ductility  $A_5 > 8\%$ ; stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 according to EN 10088: 2014

<sup>4)</sup> Related screws or threaded rods: property class  $\geq 70$  according to ENISO 3506-1:2018; ductility  $A_5 > 8\%$ ; high corrosion resistant steel 1.4529, 1.4565 according to EN 10088:2014

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

**Product description**  
Materials

**Annex A7**

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## Specifications of intended use

### Anchorage subject to:

| Size                           | FZA 10x40<br>FZA 12x40<br>FZA 12x40 ST<br>FZA 12x50 | FZA 14x40<br>FZA 14x40 ST<br>FZA 14x60<br>FZA 14x60 ST<br>FZA 18x80<br>FZA 22x100<br>FZA 22x125 | FZA 12x50 D<br>FZA 12x60 D<br>FZA 12x80 D | FZA 14x80 D<br>FZA 14x100 D<br>FZA 18x100 D<br>FZA 18x130 D<br>FZA 22x125 D | FZA 12x40 I<br>FZA 12x50 I<br>FZA 14x60 I<br>FZA 18x80 I<br>FZA 22x100 I<br>FZA 22x125 I |
|--------------------------------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Static and quasi-static loads  | ✓                                                   | ✓                                                                                               | ✓                                         | ✓                                                                           | ✓                                                                                        |
| Cracked and uncracked concrete |                                                     |                                                                                                 |                                           |                                                                             |                                                                                          |
| Fire exposure                  |                                                     |                                                                                                 |                                           |                                                                             |                                                                                          |
| Seismic performance category   | -                                                   |                                                                                                 | -                                         |                                                                             | -                                                                                        |
| C1<br>C2                       |                                                     |                                                                                                 |                                           |                                                                             |                                                                                          |

### Base materials:

- Compacted reinforced or unreinforced normal weight concrete without fibers of strength classes C20/25 to C50/60 according to EN 206:2013+A1:2016

### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions  
(Zinc plated steel, hot-dip galvanized steel, stainless steel, high corrosion-resistant steel)
- For all other conditions according to EN 1993-1-4:2006 + A1:2015 corresponding to corrosion resistance class
  - CRC III for FZA A4
  - CRC V for FZA C

### Design:

- Anchorages are 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

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

**Intended Use**  
Specifications

**Annex B1**

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**Table B2.1:** Installation parameters for FZA, FZA D, FZA I, FZA ST

| Type of anchor                      | Drill hole depth<br><br>≥ h <sub>0</sub><br>[mm] | Drill    | Setting tool  | d <sub>f</sub> <sup>2)</sup> | Torque moment <sup>1)</sup> | Gap     | Screwing depth<br>l <sub>s</sub> [mm] |     |  |  |  |  |
|-------------------------------------|--------------------------------------------------|----------|---------------|------------------------------|-----------------------------|---------|---------------------------------------|-----|--|--|--|--|
|                                     |                                                  | FZUB     | FZE Plus      | ≤ [mm]                       | T <sub>inst</sub> [Nm]      | u [mm]  | max                                   | min |  |  |  |  |
| FZA 10 x 40 M 6 / t <sub>fix</sub>  | 43                                               | 10 x 40  | 10            | 7                            | 8,5                         | -       |                                       |     |  |  |  |  |
| FZA 12 x 40 M 8 / t <sub>fix</sub>  |                                                  | 12 x 40  | 12            | 9                            | 20                          |         |                                       |     |  |  |  |  |
| FZA 14 x 40 M 10 / t <sub>fix</sub> |                                                  | 14 x 40  | 14            | 12                           | 40                          |         |                                       |     |  |  |  |  |
| FZA 12 x 50 M 8 / t <sub>fix</sub>  | 54                                               | 12 x 50  | 12            | 9                            | 20                          |         |                                       |     |  |  |  |  |
| FZA 14 x 60 M 10 / t <sub>fix</sub> | 63                                               | 14 x 60  | 14            | 12                           | 40                          |         |                                       |     |  |  |  |  |
| FZA 18 x 80 M 12 / t <sub>fix</sub> | 83                                               | 18 x 80  | 18            | 14                           | 60                          |         |                                       |     |  |  |  |  |
| FZA 22 x 100 M16 / t <sub>fix</sub> | 103                                              | 22 x 100 | 22            | 18                           | 100                         |         |                                       |     |  |  |  |  |
| FZA 22 x 125 M16 / t <sub>fix</sub> | 127                                              | 22 x 125 |               |                              |                             |         |                                       |     |  |  |  |  |
| FZA 12 x 40 ST A4                   | 43                                               | 12 x 40  | 12            | 17                           | 20                          | -       |                                       |     |  |  |  |  |
| FZA 14 x 40 ST A4                   |                                                  | 14 x 40  | 14            |                              |                             |         |                                       |     |  |  |  |  |
| FZA 14 x 60 ST A4                   | 63                                               | 14 x 60  |               |                              |                             |         |                                       |     |  |  |  |  |
| FZA 12 x 50 M 8 D / 10              | 43                                               | 12 x 50  | 12            | 14                           | 20                          | -       |                                       |     |  |  |  |  |
| FZA 12 x 60 M 8 D / 10              | 53                                               | 12 x 60  |               |                              |                             |         |                                       |     |  |  |  |  |
| FZA 12 x 80 M 8 D / 30              |                                                  | 12 x 80  |               |                              |                             |         |                                       |     |  |  |  |  |
| FZA 14 x 80 M 10 D / 20             | 63                                               | 14 x 80  | 14            | 16                           | 40                          |         |                                       |     |  |  |  |  |
| FZA 14 x 100 M 10 D / 40            |                                                  | 14 x 100 |               |                              |                             |         |                                       |     |  |  |  |  |
| FZA 18 x 100 M 12 D / 20            | 83                                               | 18 x 100 | 18            | 20                           | 60                          |         |                                       |     |  |  |  |  |
| FZA 18 x 130 M 12 D / 50            |                                                  | 18 x 130 |               |                              |                             |         |                                       |     |  |  |  |  |
| FZA 22 x 125 M 16 D / 25            | 105                                              | 22 x 125 | 22            | 24                           | 100                         |         |                                       |     |  |  |  |  |
| FZA 12 x 40 M 6 I                   | 43                                               | 12 x 40  | 12 + FZE 12 I | 7                            | 8,5                         | 0 – 4,0 | 15                                    | 10  |  |  |  |  |
| FZA 12 x 50 M 6 I                   | 53                                               | 12 x 50  |               |                              |                             |         | 18                                    | 12  |  |  |  |  |
| FZA 14 x 60 M 8 I                   | 63                                               | 14 x 60  | 14 + FZE 14 I | 9                            | 15                          | 0 – 4,5 | 24                                    | 16  |  |  |  |  |
| FZA 18 x 80 M 10 I                  | 83                                               | 18 x 80  | 18 + FZE 18 I | 12                           | 30                          |         | 26                                    |     |  |  |  |  |
| FZA 22 x 100 M 12 I                 | 103                                              | 22 x 100 | 22 + FZE 22 I | 14                           | 60                          |         |                                       |     |  |  |  |  |
| FZA 22 x 125 M 12 I                 | 127                                              | 22 x 125 |               |                              |                             |         |                                       |     |  |  |  |  |

<sup>1)</sup> If the FZA with an internal thread (FZA I) is used with a threaded rod or a screw according to Annex A7 the torque moment must be applied as given in the table

<sup>2)</sup> Diameter of the clearance hole in the fixture

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

**Intended Use**  
Installation parameters

**Annex B2**

Appendix 11/ 29

## Installation instructions for FZA, FZA D, FZA I, FZA ST

- 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
- 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
- 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
- Anchor must be installed to comply with the correct anchorage depth. This is assured when the front face of the sleeve, for the internal thread, is approximately 1mm below the concrete surface or, in the case of the through bolt versions, approximately 1mm below the front surface of fixture. When using the FZA 12x40 ST the knurling on the sleeve is flush or below the concrete surface. For the bolt version the anchor is correctly expanded if the colour marking on the thread of the tapered bolt is visible.

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

### Intended Use

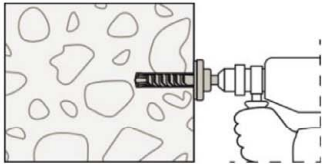
Installation instructions

## Annex B3

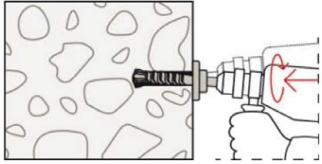
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## Pre-positioned installation

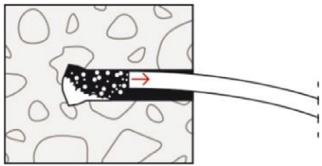
FZA



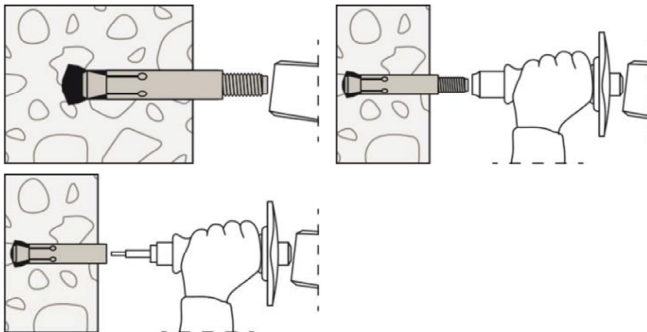
**1.:** Create a drill hole perpendicular to the surface of the anchor base with a hammer drill, using the corresponding Zykon universal drill bit FZUB. The required drill depth is reached once the FZUB depth stop meets the concrete.



**2.:** Once the FZUB depth stop meets the concrete, create the drill hole undercut by making circular swiveling movements with the hammer drill while the hammer mechanism is engaged. Press the hammer drill firmly against the anchor base: 1 - 2 swiveling movements are sufficient for  $\varnothing 14$  mm, with 3 - 5 movements for  $\varnothing 18$  mm and  $\varnothing 22$  mm.

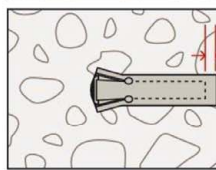
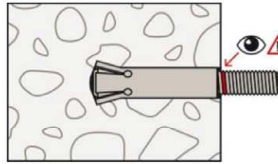


**3.:** Clean drill hole.

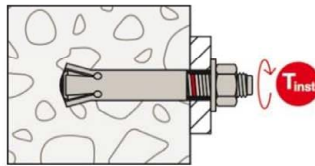


**4.:** Insert the anchor into the drill hole and then drive the expansion sleeve in with hammer-set device FZE Plus, using a manual hammer.

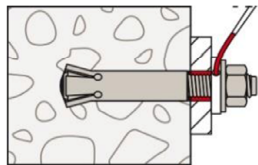
FZA I



**5.:** The anchor is correctly expanded if the colour marking on the thread of the tapered bolt is visible or the gap  $u$  between conical bolt with internal thread and expansion sleeve (FZA I) is fulfilled. When using the FZA 12x40 ST the knurling on the sleeve is flush or below the concrete surface.



**6.:** Mount installation object (e.g. anchor plate), washer and nut, screw (for FZA I) or threaded rod with washer and nut (for FZA I) and apply installation torque with torque spanner.



**Optional:** The gap between bolt and fixture may be filled with mortar (compressive strength  $\geq 50$  N/mm<sup>2</sup> e.g. FIS SB) after step 6 (for eliminating the annular gap). The filling disc is additional to the standard washer. The thickness of the filling disc must be considered for definition of  $t_{fix}$ . Countersunk of the filling disc in direction to the anchor plate.

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

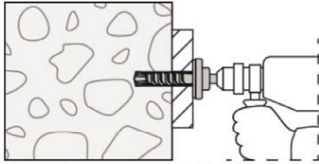
### Intended Use

Installation instructions

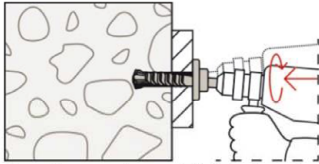
### Annex B4

## Push-through installation

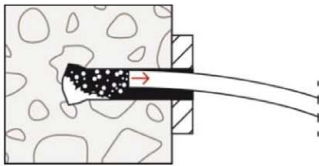
FZA D



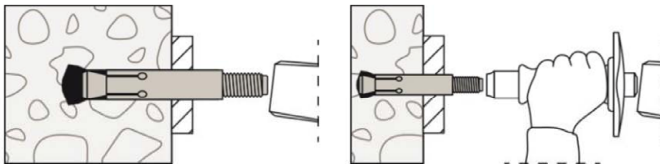
**1.:** Create a drill hole through the installation object perpendicular to the surface of the anchor base with a hammer drill, using the corresponding Zykon universal drill bit FZUB. The required drill depth is reached once the FZUB depth stop meets the fixture.



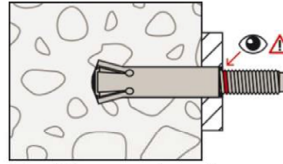
**2.:** Once the FZUB depth stop meets the fixture, create the drill hole undercut by making circular swiveling movements with the hammer drill while the hammer mechanism is engaged. Press the hammer drill firmly against the anchor base: 1 - 2 swiveling movements are sufficient for  $\varnothing$  14 mm, with 3 - 5 movements for  $\varnothing$  18 mm and  $\varnothing$  22 mm.



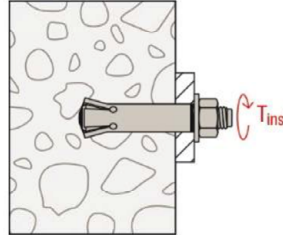
**3.:** Clean drill hole.



**4.:** Insert the anchor into the drill hole through the installation object (e.g. anchor plate) and then drive the expansion sleeve in with hammer-set device FZE Plus, using a manual hammer.



**5.:** The anchor is correctly expanded if the colour marking on the thread of the tapered bolt is visible.



**6.:** Mount installation object (e.g. anchor plate), washer and nut and apply installation torque with torque spanner.

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

### Intended Use

Installation instructions

**Annex B5**

**Table C1.1:** Characteristic values of **tension** resistance under static and quasi-static action for **bolt projecting anchor FZA**

| Type of anchor / size                                                       | FZA (bolt projecting anchor)   |                                                                         |                                             |                                |                                             |                                 |                                  |                                     |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------|---------------------------------------------|--------------------------------|---------------------------------------------|---------------------------------|----------------------------------|-------------------------------------|
|                                                                             | 10x40<br>M6 / t <sub>fix</sub> | 12x40<br>12x40 ST<br>M8 / t <sub>fix</sub>                              | 14x40<br>14x40 ST<br>M10 / t <sub>fix</sub> | 12x50<br>M8 / t <sub>fix</sub> | 14x60<br>14x60 ST<br>M10 / t <sub>fix</sub> | 18x80<br>M12 / t <sub>fix</sub> | 22x100<br>M16 / t <sub>fix</sub> | 22x125<br>M16 /<br>t <sub>fix</sub> |
| Steel failure for FZA galvanized                                            |                                |                                                                         |                                             |                                |                                             |                                 |                                  |                                     |
| Characteristic resistance N <sub>Rk,s</sub> [kN]                            | 16,1                           | 29,3                                                                    | 46,4                                        | 29,3                           | 46,4                                        | 67,4                            | 125,6                            |                                     |
| Partial factor γ <sub>Ms</sub> [-]                                          | 1,5                            |                                                                         |                                             |                                |                                             |                                 |                                  |                                     |
| Steel failure for FZA hot-dip galvanized                                    |                                |                                                                         |                                             |                                |                                             |                                 |                                  |                                     |
| Characteristic resistance N <sub>Rk,s</sub> [kN]                            | 13,1                           | 25,0                                                                    | 40,7                                        | 25,0                           | 40,7                                        | 60,1                            | 115                              |                                     |
| Partial factor γ <sub>Ms</sub> [-]                                          | 1,5                            |                                                                         |                                             |                                |                                             |                                 |                                  |                                     |
| Steel failure for FZA A4                                                    |                                |                                                                         |                                             |                                |                                             |                                 |                                  |                                     |
| Characteristic resistance N <sub>Rk,s</sub> [kN]                            | 14,1                           | 25,6                                                                    | 40,6                                        | 25,6                           | 40,6                                        | 59,0                            | 109,9                            |                                     |
| Partial factor γ <sub>Ms</sub> [-]                                          | 1,87                           |                                                                         |                                             |                                |                                             |                                 |                                  |                                     |
| Steel failure for FZA C                                                     |                                |                                                                         |                                             |                                |                                             |                                 |                                  |                                     |
| Characteristic resistance N <sub>Rk,s</sub> [kN]                            | 14,1                           | 25,6                                                                    | 40,6                                        | 25,6                           | 40,6                                        | 59,0                            | 109,9                            |                                     |
| Partial factor γ <sub>Ms</sub> [-]                                          | 1,5                            |                                                                         |                                             |                                |                                             |                                 |                                  |                                     |
| Modulus of elasticity E <sub>s</sub> [N/mm <sup>2</sup> ]                   | 210.000                        |                                                                         |                                             |                                |                                             |                                 |                                  |                                     |
| Pullout failure for FZA, FZA A4, FZA C                                      |                                |                                                                         |                                             |                                |                                             |                                 |                                  |                                     |
| Characteristic resistance in concrete C20/25                                | cracked                        | 6                                                                       |                                             | 9                              | 12                                          | 24                              | 40                               |                                     |
|                                                                             | uncracked                      | 12                                                                      |                                             | 17,4                           | 22,9                                        | 35,2                            | 49,2                             | 68,8                                |
| Increasing factors concrete                                                 | ψ <sub>c</sub> C25/30          | 1,12                                                                    |                                             |                                |                                             |                                 |                                  |                                     |
|                                                                             | ψ <sub>c</sub> C30/37          | 1,22                                                                    |                                             |                                |                                             |                                 |                                  |                                     |
|                                                                             | ψ <sub>c</sub> C35/45          | 1,32                                                                    |                                             |                                |                                             |                                 |                                  |                                     |
|                                                                             | ψ <sub>c</sub> C40/50          | 1,41                                                                    |                                             |                                |                                             |                                 |                                  |                                     |
|                                                                             | ψ <sub>c</sub> C45/55          | 1,50                                                                    |                                             |                                |                                             |                                 |                                  |                                     |
|                                                                             | ψ <sub>c</sub> C50/60          | 1,58                                                                    |                                             |                                |                                             |                                 |                                  |                                     |
| Installation factor γ <sub>inst</sub> [-]                                   | 1,2                            |                                                                         |                                             | 1,0                            |                                             |                                 |                                  |                                     |
| Concrete cone failure and splitting failure for FZA, FZA A4, FZA C          |                                |                                                                         |                                             |                                |                                             |                                 |                                  |                                     |
| Effective embedment depth h <sub>ef</sub> [mm]                              | 40                             |                                                                         |                                             | 50                             | 60                                          | 80                              | 100                              | 125                                 |
| Factor for uncracked concrete k <sub>ucr,N</sub>                            | [-]                            | 11,0                                                                    |                                             |                                |                                             |                                 |                                  |                                     |
| Factor for cracked concrete k <sub>cr,N</sub>                               |                                | 7,7                                                                     |                                             |                                |                                             |                                 |                                  |                                     |
| Minimum thickness of concrete member h <sub>min</sub>                       | [mm]                           | 100                                                                     |                                             | 110                            | 130                                         | 160                             | 200                              | 250                                 |
| Characteristic spacing s <sub>cr,N</sub> = s <sub>cr,sp</sub>               |                                | 3 h <sub>ef</sub>                                                       |                                             |                                |                                             |                                 |                                  |                                     |
| Characteristic edge distance c <sub>cr,N</sub> = c <sub>cr,sp</sub>         |                                | 1,5 h <sub>ef</sub>                                                     |                                             |                                |                                             |                                 |                                  |                                     |
| Characteristic resistance to splitting N <sup>0</sup> <sub>Rk,sp</sub> [kN] |                                | min {N <sup>0</sup> <sub>Rk,c</sub> ; N <sub>Rk,p</sub> } <sup>1)</sup> |                                             |                                |                                             |                                 |                                  |                                     |

<sup>1)</sup> N<sup>0</sup><sub>Rk,c</sub> according to EN 1992-4:2018

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

#### Performances

Characteristic values of resistance under tension loads for bolt projecting anchor FZA

#### Annex C1

**Table C2.1:** Characteristic values of **tension** resistance under static and quasi-static action for **through bolt anchor FZA D**

| Type of anchor / size                                                    |                        | FZA D (through bolt anchor) |                                      |                 |                  |                   |                   |                   |                   |
|--------------------------------------------------------------------------|------------------------|-----------------------------|--------------------------------------|-----------------|------------------|-------------------|-------------------|-------------------|-------------------|
|                                                                          |                        | 12x50<br>M8D/10             | 12x60<br>M8D/10                      | 12x80<br>M8D/30 | 14x80<br>M10D/20 | 14x100<br>M10D/40 | 18x100<br>M12D/20 | 18x130<br>M12D/50 | 22x125<br>M16D/25 |
| Steel failure for FZA D galvanized                                       |                        |                             |                                      |                 |                  |                   |                   |                   |                   |
| Characteristic resistance                                                | $N_{Rk,s}$             | [kN]                        | 29,3                                 |                 | 46,4             |                   | 67,4              |                   | 125,6             |
| Partial factor                                                           | $\gamma_{Ms}$          | [-]                         | 1,5                                  |                 |                  |                   |                   |                   |                   |
| Steel failure for FZA D hot-dip galvanized                               |                        |                             |                                      |                 |                  |                   |                   |                   |                   |
| Characteristic resistance                                                | $N_{Rk,s}$             | [kN]                        | 25,0                                 |                 | 40,7             |                   | 60,1              |                   | 115,0             |
| Partial factor                                                           | $\gamma_{Ms}$          | [-]                         | 1,5                                  |                 |                  |                   |                   |                   |                   |
| Steel failure for FZA D A4                                               |                        |                             |                                      |                 |                  |                   |                   |                   |                   |
| Characteristic resistance                                                | $N_{Rk,s}$             | [kN]                        | 25,6                                 |                 | 40,6             |                   | 59,0              |                   | 109,9             |
| Partial factor                                                           | $\gamma_{Ms}$          | [-]                         | 1,87                                 |                 |                  |                   |                   |                   |                   |
| Steel failure for FZA D C                                                |                        |                             |                                      |                 |                  |                   |                   |                   |                   |
| Characteristic resistance                                                | $N_{Rk,s}$             | [kN]                        | 25,6                                 |                 | 40,6             |                   | 59,0              |                   | 109,9             |
| Partial factor                                                           | $\gamma_{Ms}$          | [-]                         | 1,5                                  |                 |                  |                   |                   |                   |                   |
| Modulus of elasticity                                                    | $E_s$                  | [N/mm <sup>2</sup> ]        | 210.000                              |                 |                  |                   |                   |                   |                   |
| Pullout failure for FZA D, FZA D A4, FZA D C                             |                        |                             |                                      |                 |                  |                   |                   |                   |                   |
| Characteristic resistance in concrete C20/25                             | cracked                | $N_{Rk,p}$ [kN]             | 6                                    | 9               | 12               |                   | 24                |                   | 40                |
|                                                                          | uncracked              |                             | 12                                   | 17,4            | 22,9             |                   | 35,2              |                   | 49,2              |
| Increasing factors concrete                                              | $\psi_c$               | 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                                                      | $\gamma_{inst}$        | [-]                         | 1,2                                  | 1,0             |                  |                   |                   |                   |                   |
| Concrete cone failure and splitting failure for FZA D, FZA D A4, FZA D C |                        |                             |                                      |                 |                  |                   |                   |                   |                   |
| Effective embedment depth                                                | $h_{ef}$               | [mm]                        | 40                                   | 50              | 60               |                   | 80                |                   | 100               |
| Factor for uncracked concrete                                            | $k_{ucr,N}$            | [-]                         | 11,0                                 |                 |                  |                   |                   |                   |                   |
| Factor for cracked concrete                                              | $k_{cr,N}$             |                             | 7,7                                  |                 |                  |                   |                   |                   |                   |
| Minimum thickness of concrete member                                     | $h_{min}$              |                             | 100                                  | 110             | 130              |                   | 160               |                   | 200               |
| Characteristic spacing                                                   | $s_{cr,N} = s_{cr,sp}$ | [mm]                        | 3 $h_{ef}$                           |                 |                  |                   |                   |                   |                   |
| Characteristic edge distance                                             | $c_{cr,N} = c_{cr,sp}$ |                             | 1,5 $h_{ef}$                         |                 |                  |                   |                   |                   |                   |
| Characteristic resistance to splitting                                   | $N^0_{Rk,sp}$          | [kN]                        | $\min \{N^0_{Rk,c}; N_{Rk,p}\}^{1)}$ |                 |                  |                   |                   |                   |                   |

<sup>1)</sup>  $N^0_{Rk,c}$  according to EN 1992-4:2018

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

### Performances

Characteristic values of resistance under tension loads for through bolt anchor FZA D

## Annex C2

**Table C3.1:** Characteristic values of **tension** resistance under static and quasi-static action for **internal thread anchor FZA I**<sup>1)</sup>

| Type of anchor / size                                                    |                        |                      | FZA I (internal thread anchor)        |               |               |                |                 |                 |
|--------------------------------------------------------------------------|------------------------|----------------------|---------------------------------------|---------------|---------------|----------------|-----------------|-----------------|
|                                                                          |                        |                      | 12x40<br>M6 I                         | 12x50<br>M6 I | 14x60<br>M8 I | 18x80<br>M10 I | 22x100<br>M12 I | 22x125<br>M12 I |
| Steel failure for FZA I                                                  |                        |                      |                                       |               |               |                |                 |                 |
| Characteristic resistance                                                | $N_{Rk,s}$             | [kN]                 | 21,7                                  |               | 28,7          | 37,4           | 84,2            |                 |
| Partial factor                                                           | $\gamma_{Ms}$          | [-]                  | 1,5                                   |               |               |                |                 |                 |
| Steel failure for FZA I A4                                               |                        |                      |                                       |               |               |                |                 |                 |
| Characteristic resistance                                                | $N_{Rk,s}$             | [kN]                 | 22,2                                  |               | 26,8          | 34,9           | 61,7            |                 |
| Partial factor                                                           | $\gamma_{Ms}$          | [-]                  | 1,5                                   |               |               |                |                 |                 |
| Steel failure for FZA I C                                                |                        |                      |                                       |               |               |                |                 |                 |
| Characteristic resistance                                                | $N_{Rk,s}$             | [kN]                 | 19,4                                  |               | 26,8          | 34,9           | 78,5            |                 |
| Partial factor                                                           | $\gamma_{Ms}$          | [-]                  | 1,5                                   |               |               |                |                 |                 |
| Modulus of elasticity                                                    | $E_s$                  | [N/mm <sup>2</sup> ] | 210.000                               |               |               |                |                 |                 |
| Pullout failure for FZA I, FZA I A4, FZA I C                             |                        |                      |                                       |               |               |                |                 |                 |
| Characteristic resistance in concrete C20/25                             | cracked                | $N_{Rk,p}$           | [kN]                                  | 6             | 9             | 12             | 24              | 40              |
|                                                                          | uncracked              |                      |                                       | 12            | 17,4          | 22,9           | 35,2            | 49,2            |
| Increasing factors concrete                                              | $\psi_c$               | [-]                  | 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                                                      | $\gamma_{inst}$        | [-]                  | 1,2                                   | 1,0           |               |                |                 |                 |
| Concrete cone failure and splitting failure for FZA I, FZA I A4, FZA I C |                        |                      |                                       |               |               |                |                 |                 |
| Effective embedment depth                                                | $h_{ef}$               | [mm]                 | 40                                    | 50            | 60            | 80             | 100             | 125             |
| Factor for uncracked concrete                                            | $k_{ucr,N}$            | [-]                  | 11,0                                  |               |               |                |                 |                 |
| Factor for cracked concrete                                              | $k_{cr,N}$             |                      | 7,7                                   |               |               |                |                 |                 |
| Min. thickness of concrete member                                        | $h_{min}$              |                      | 100                                   | 110           | 130           | 160            | 200             | 250             |
| Characteristic spacing                                                   | $s_{cr,N} = s_{cr,sp}$ | [mm]                 | 3 $h_{ef}$                            |               |               |                |                 |                 |
| Characteristic edge distance                                             | $c_{cr,N} = c_{cr,sp}$ |                      | 1,5 $h_{ef}$                          |               |               |                |                 |                 |
| Characteristic resistance to splitting                                   | $N^0_{Rk,sp}$          | [kN]                 | $\min \{N^0_{Rk,c}; N_{Rk,p}\}^{(2)}$ |               |               |                |                 |                 |

<sup>1)</sup> Related screws or threaded rods see Annex A7

<sup>2)</sup>  $N^0_{Rk,c}$  according to EN 1992-4:2018

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

#### Performances

Characteristic values of resistance under tension loads for internal thread anchor FZA I

#### Annex C3

**Table C4.1:** Characteristic values of **shear** resistance under static and quasi-static action for **bolt projecting anchor FZA**

| Type of anchor / size                                               |                                     | FZA (bolt projecting anchor)      |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
|---------------------------------------------------------------------|-------------------------------------|-----------------------------------|--------------------------------------------|---------------------------------------------|-----------------------------------|---------------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|
|                                                                     |                                     | 10x40<br>M6 /<br>t <sub>fix</sub> | 12x40<br>12x40 ST<br>M8 / t <sub>fix</sub> | 14x40<br>14x40 ST<br>M10 / t <sub>fix</sub> | 12x50<br>M8 /<br>t <sub>fix</sub> | 14x60<br>14x60 ST<br>M10 / t <sub>fix</sub> | 18x80<br>M12 /<br>t <sub>fix</sub> | 22x100<br>M16 /<br>t <sub>fix</sub> | 22x125<br>M16 /<br>t <sub>fix</sub> |
| Steel failure without lever arm FZA galvanized / hot-dip galvanized |                                     |                                   |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Characteristic resistance                                           | V <sup>0</sup> <sub>Rk,s</sub> [kN] | 8,8                               | 16,1                                       | 25,5                                        | 16,1                              | 25,5                                        | 37,1                               | 69,1                                |                                     |
| Partial factor                                                      | γ <sub>Ms</sub> [-]                 | 1,25                              |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Factor for ductility                                                | k <sub>7</sub>                      | 1,0                               |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Steel failure with lever arm FZA galvanized / hot-dip galvanized    |                                     |                                   |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Characteristic bending resistance                                   | M <sup>0</sup> <sub>Rk,s</sub> [Nm] | 12,2                              | 30,0                                       | 59,8                                        | 30,0                              | 59,8                                        | 104,8                              | 266,4                               |                                     |
| Partial factor                                                      | γ <sub>Ms</sub> [-]                 | 1,25                              |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Factor for ductility                                                | k <sub>7</sub>                      | 1,0                               |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Steel failure without lever arm FZA A4                              |                                     |                                   |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Characteristic resistance                                           | V <sup>0</sup> <sub>Rk,s</sub> [kN] | 9,2                               | 16,7                                       | 26,4                                        | 16,7                              | 26,4                                        | 38,4                               | 76,9                                |                                     |
| Partial factor                                                      | γ <sub>Ms</sub> [-]                 | 1,56                              |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Factor for ductility                                                | k <sub>7</sub>                      | 1,0                               |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Steel failure with lever arm FZA A4                                 |                                     |                                   |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Characteristic bending resistance                                   | M <sup>0</sup> <sub>Rk,s</sub> [Nm] | 10,7                              | 26,2                                       | 52,3                                        | 26,2                              | 52,3                                        | 91,7                               | 233,1                               |                                     |
| Partial factor                                                      | γ <sub>Ms</sub> [-]                 | 1,56                              |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Factor for ductility                                                | k <sub>7</sub>                      | 1,0                               |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Steel failure without lever arm FZA C                               |                                     |                                   |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Characteristic resistance                                           | V <sup>0</sup> <sub>Rk,s</sub> [kN] | 9,2                               | 16,7                                       | 26,4                                        | 16,7                              | 26,4                                        | 38,4                               | 76,9                                |                                     |
| Partial factor                                                      | γ <sub>Ms</sub> [-]                 | 1,25                              |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Factor for ductility                                                | k <sub>7</sub>                      | 1,0                               |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Steel failure with lever arm FZA C                                  |                                     |                                   |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Characteristic bending resistance                                   | M <sup>0</sup> <sub>Rk,s</sub> [Nm] | 10,7                              | 26,2                                       | 52,3                                        | 26,2                              | 52,3                                        | 91,7                               | 233,1                               |                                     |
| Partial factor                                                      | γ <sub>Ms</sub> [-]                 | 1,25                              |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Factor for ductility                                                | k <sub>7</sub>                      | 1,0                               |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Concrete pryout failure FZA, FZA A4, FZA C                          |                                     |                                   |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Factor for pryout failure                                           | k <sub>8</sub> [-]                  | 1,3                               | 2,4                                        | 1,3                                         | 3,1                               |                                             |                                    |                                     |                                     |
| Concrete edge failure                                               |                                     |                                   |                                            |                                             |                                   |                                             |                                    |                                     |                                     |
| Effective length in concrete                                        | l <sub>f</sub> [mm]                 | 40                                |                                            |                                             | 50                                | 60                                          | 80                                 | 100                                 | 125                                 |
| Effective diameter of anchor                                        | d <sub>nom</sub>                    | 10                                | 12                                         | 14                                          | 12                                | 14                                          | 18                                 | 22                                  |                                     |
| Installation factor                                                 | γ <sub>inst</sub> [-]               | 1,0                               |                                            |                                             |                                   |                                             |                                    |                                     |                                     |

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

## Performances

### Characteristic values of resistance under shear loads for bolt projecting anchor FZA

## Annex C4

**Table C5.1:** Characteristic values of **shear** resistance under static and quasi-static action for **through bolt anchor FZA D**

| Type of anchor / size                                                                               |                 |      | FZA D (through bolt anchor) |                     |                     |                      |                       |                       |                       |
|-----------------------------------------------------------------------------------------------------|-----------------|------|-----------------------------|---------------------|---------------------|----------------------|-----------------------|-----------------------|-----------------------|
|                                                                                                     |                 |      | 12x50<br>M8D/<br>10         | 12x60<br>M8D/<br>10 | 12x80<br>M8D/<br>30 | 14x80<br>M10D/<br>20 | 14x100<br>M10D/<br>40 | 18x100<br>M12D/<br>20 | 18x130<br>M12D/<br>50 |
| Steel failure without lever arm FZA D galvanized / hot-dip galvanized                               |                 |      |                             |                     |                     |                      |                       |                       |                       |
| Characteristic resistance                                                                           | $V_{Rk,s}^0$    | [kN] | 26,2                        |                     | 41,4                |                      | 64,9                  |                       | 104,8                 |
| Partial factor                                                                                      | $\gamma_{Ms}$   | [-]  | 1,26                        |                     |                     |                      |                       |                       |                       |
| Factor for ductility                                                                                | $k_7$           |      | 1,0                         |                     |                     |                      |                       |                       |                       |
| Steel failure with lever arm FZA D galvanized / hot-dip galvanized                                  |                 |      |                             |                     |                     |                      |                       |                       |                       |
| Characteristic bending resistance                                                                   | $M_{Rk,s}^0$    | [Nm] | 30,0                        |                     | 59,8                |                      | 104,8                 |                       | 266,4                 |
| Partial factor                                                                                      | $\gamma_{Ms}$   | [-]  | 1,25                        |                     |                     |                      |                       |                       |                       |
| Factor for ductility                                                                                | $k_7$           |      | 1,0                         |                     |                     |                      |                       |                       |                       |
| Steel failure without lever arm FZA D A4                                                            |                 |      |                             |                     |                     |                      |                       |                       |                       |
| Characteristic resistance                                                                           | $V_{Rk,s}^0$    | [kN] | 30,4                        |                     | 43,2                |                      | 88,3                  |                       | 141,0                 |
| Partial factor                                                                                      | $\gamma_{Ms}$   | [-]  | 1,96                        |                     | 1,92                |                      | 1,56                  |                       |                       |
| Factor for ductility                                                                                | $k_7$           |      | 1,0                         |                     |                     |                      |                       |                       |                       |
| Steel failure with lever arm FZA D A4                                                               |                 |      |                             |                     |                     |                      |                       |                       |                       |
| Characteristic bending resistance                                                                   | $M_{Rk,s}^0$    | [Nm] | 26,2                        |                     | 52,3                |                      | 91,7                  |                       | 233,1                 |
| Partial factor                                                                                      | $\gamma_{Ms}$   | [-]  | 1,56                        |                     |                     |                      |                       |                       |                       |
| Factor for ductility                                                                                | $k_7$           |      | 1,0                         |                     |                     |                      |                       |                       |                       |
| Steel failure without lever arm FZA D C                                                             |                 |      |                             |                     |                     |                      |                       |                       |                       |
| Characteristic resistance                                                                           | $V_{Rk,s}^0$    | [kN] | 30,4                        |                     | 43,2                |                      | 88,3                  |                       | 141,0                 |
| Partial factor                                                                                      | $\gamma_{Ms}$   | [-]  | 1,85                        |                     | 1,79                |                      | 1,44                  |                       | 1,46                  |
| Factor for ductility                                                                                | $k_7$           |      | 1,0                         |                     |                     |                      |                       |                       |                       |
| Steel failure with lever arm FZA D C                                                                |                 |      |                             |                     |                     |                      |                       |                       |                       |
| Characteristic bending resistance                                                                   | $M_{Rk,s}^0$    | [Nm] | 26,2                        |                     | 52,3                |                      | 91,7                  |                       | 233,1                 |
| Partial factor                                                                                      | $\gamma_{Ms}$   | [-]  | 1,25                        |                     |                     |                      |                       |                       |                       |
| Factor for ductility                                                                                | $k_7$           |      | 1,0                         |                     |                     |                      |                       |                       |                       |
| Concrete pryout failure FZA D, FZA D A4, FZA D C                                                    |                 |      |                             |                     |                     |                      |                       |                       |                       |
| Factor for pryout failure                                                                           | $k_8$           | [-]  | 1,3                         |                     | 3,1                 |                      |                       |                       |                       |
| Concrete edge failure                                                                               |                 |      |                             |                     |                     |                      |                       |                       |                       |
| Effective length in concrete                                                                        | $l_f$           | [mm] | 40                          | 50                  | 60                  |                      | 80                    |                       | 100                   |
| Effective diameter of anchor                                                                        | $d_{nom}$       |      | 12                          |                     | 14                  |                      | 18                    |                       | 22                    |
| Installation factor                                                                                 | $\gamma_{inst}$ | [-]  | 1,0                         |                     |                     |                      |                       |                       |                       |
|                                                                                                     |                 |      |                             |                     |                     |                      |                       |                       |                       |
| fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST                                                      |                 |      |                             |                     |                     |                      |                       | Annex C5              |                       |
| Performances<br>Characteristic values of resistance under shear loads for through bolt anchor FZA D |                 |      |                             |                     |                     |                      |                       |                       |                       |
|                                                                                                     |                 |      |                             |                     |                     |                      |                       | Appendix 19/ 29       |                       |

**Table C6.1:** Characteristic values of **shear** resistance under static and quasi-static action for **internal thread anchor FZA I<sup>1)</sup>**

| Type of anchor / size                            |                 |      | FZA I (internal thread anchor) |               |               |                |                 |                 |
|--------------------------------------------------|-----------------|------|--------------------------------|---------------|---------------|----------------|-----------------|-----------------|
|                                                  |                 |      | 12x40<br>M6 I                  | 12x50<br>M6 I | 14x60<br>M8 I | 18x80<br>M10 I | 22x100<br>M12 I | 22x125<br>M12 I |
| Steel failure without lever arm FZA I            |                 |      |                                |               |               |                |                 |                 |
| Characteristic resistance                        | $V^0_{Rk,s}$    | [kN] | 11,9                           |               | 15,8          | 20,6           | 46,3            |                 |
| Partial factor                                   | $\gamma_{Ms}$   | [-]  | 1,25                           |               |               |                |                 |                 |
| Factor for ductility                             | $k_7$           |      | 1,0                            |               |               |                |                 |                 |
| Steel failure with lever arm FZA I               |                 |      |                                |               |               |                |                 |                 |
| Characteristic bending resistance                | $M^0_{Rk,s}$    | [Nm] | 19,3                           |               | 30,1          | 44,7           | 150,9           |                 |
| Partial factor                                   | $\gamma_{Ms}$   | [-]  | 1,25                           |               |               |                |                 |                 |
| Factor for ductility                             | $k_7$           |      | 1,0                            |               |               |                |                 |                 |
| Steel failure without lever arm FZA I A4         |                 |      |                                |               |               |                |                 |                 |
| Characteristic resistance                        | $V^0_{Rk,s}$    | [kN] | 14,4                           |               | 17,4          | 22,7           | 43,2            |                 |
| Partial factor                                   | $\gamma_{Ms}$   | [-]  | 1,25                           |               |               |                |                 |                 |
| Factor for ductility                             | $k_7$           |      | 1,0                            |               |               |                |                 |                 |
| Steel failure with lever arm FZA I A4            |                 |      |                                |               |               |                |                 |                 |
| Characteristic bending resistance                | $M^0_{Rk,s}$    | [Nm] | 19,8                           |               | 28,1          | 41,7           | 110,7           |                 |
| Partial factor                                   | $\gamma_{Ms}$   | [-]  | 1,25                           |               |               |                |                 |                 |
| Factor for ductility                             | $k_7$           |      | 1,0                            |               |               |                |                 |                 |
| Steel failure without lever arm FZA I C          |                 |      |                                |               |               |                |                 |                 |
| Characteristic resistance                        | $V^0_{Rk,s}$    | [kN] | 12,6                           |               | 17,4          | 22,7           | 55,0            |                 |
| Partial factor                                   | $\gamma_{Ms}$   | [-]  | 1,25                           |               |               |                |                 |                 |
| Factor for ductility                             | $k_7$           |      | 1,0                            |               |               |                |                 |                 |
| Steel failure with lever arm FZA I C             |                 |      |                                |               |               |                |                 |                 |
| Characteristic bending resistance                | $M^0_{Rk,s}$    | [Nm] | 17,3                           |               | 28,1          | 41,7           | 140,8           |                 |
| Partial factor                                   | $\gamma_{Ms}$   | [-]  | 1,25                           |               |               |                |                 |                 |
| Factor for ductility                             | $k_7$           |      | 1,0                            |               |               |                |                 |                 |
| Concrete pryout failure FZA I, FZA I A4, FZA I C |                 |      |                                |               |               |                |                 |                 |
| Factor for pryout failure                        | $k_8$           | [-]  | 1,3                            |               | 3,1           |                |                 |                 |
| Concrete edge failure                            |                 |      |                                |               |               |                |                 |                 |
| Effective length in concrete                     | $l_f$           | [mm] | 40                             | 50            | 60            | 80             | 100             | 125             |
| Effective diameter of anchor                     | $d_{nom}$       |      | 12                             |               | 14            | 18             | 22              |                 |
| Installation factor                              | $\gamma_{inst}$ | [-]  | 1,0                            |               |               |                |                 |                 |

<sup>1)</sup> Related screws or threaded rods see Annex A7

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

**Performances**

Characteristic values of resistance under shear loads for internal thread anchor FZA I

**Annex C6**

**Table C7.1: Minimum thickness of concrete members, minimum spacings and minimum edge distances of bolt projecting anchor FZA**

| Type of anchor                                        | FZA<br>10x40<br>M6 /<br>t <sub>fix</sub> | FZA<br>12x40<br>12x40 ST<br>M8 / t <sub>fix</sub> | FZA<br>14x40<br>14x40 ST<br>M10 / t <sub>fix</sub> | FZA<br>12x50<br>M8 /<br>t <sub>fix</sub> | FZA<br>14x60<br>14x60 ST<br>M10 / t <sub>fix</sub> | FZA<br>18x80<br>M12 /<br>t <sub>fix</sub> | FZA<br>22x100<br>M16 /<br>t <sub>fix</sub> | FZA<br>22x125<br>M16 /<br>t <sub>fix</sub> |
|-------------------------------------------------------|------------------------------------------|---------------------------------------------------|----------------------------------------------------|------------------------------------------|----------------------------------------------------|-------------------------------------------|--------------------------------------------|--------------------------------------------|
| Minimum spacing s <sub>min</sub>                      | 40                                       |                                                   | 70                                                 | 50                                       | 60                                                 | 80                                        | 100                                        | 125                                        |
| Minimum edge distance c <sub>min</sub>                | 35                                       | 40                                                |                                                    | 45                                       | 55                                                 | 70                                        |                                            |                                            |
| Minimum thickness of concrete member h <sub>min</sub> | 100                                      |                                                   |                                                    | 110                                      | 130                                                | 160                                       | 200                                        | 250                                        |

**Table C7.2: Minimum thickness of concrete members, minimum spacings and minimum edge distances of through bolt anchor FZA D**

| Type of anchor                                 | FZA<br>12x50<br>M8<br>D/10 | FZA<br>12x60<br>M8<br>D/10 | FZA<br>12x80<br>M8<br>D/30 | FZA<br>14x80<br>M10<br>D/20 | FZA<br>14x100<br>M10<br>D/40 | FZA<br>18x100<br>M12<br>D/20 | FZA<br>18x130<br>M12<br>D/50 | FZA<br>22x125<br>M16<br>D/25 |
|------------------------------------------------|----------------------------|----------------------------|----------------------------|-----------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| Minimum spacing $s_{min}$                      | 40                         | 50                         | 60                         |                             | 80                           |                              | 100                          |                              |
| Minimum edge distance $c_{min}$ [mm]           | 35                         | 45                         | 55                         |                             | 70                           |                              |                              |                              |
| Minimum thickness of concrete member $h_{min}$ | 100                        | 110                        | 130                        |                             | 160                          |                              |                              | 200                          |

**Table C7.3: Minimum thickness of concrete members, minimum spacings and minimum edge distances of internal thread anchor FZA I**

| Type of anchor                                 | FZA<br>12x40<br>M6 I | FZA<br>12x50<br>M6 I | FZA<br>14x60<br>M8 I | FZA<br>18x80<br>M10 I | FZA<br>22x100<br>M12 I | FZA<br>22x125<br>M12 I |
|------------------------------------------------|----------------------|----------------------|----------------------|-----------------------|------------------------|------------------------|
| Minimum spacing $S_{min}$                      | 40                   | 50                   | 60                   | 80                    | 100                    | 125                    |
| Minimum edge distance $C_{min}$ [mm]           | 35                   | 45                   | 55                   | 70                    |                        |                        |
| Minimum thickness of concrete member $h_{min}$ | 100                  | 110                  | 130                  | 160                   | 200                    | 250                    |

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

**Performances**

Minimum thickness of concrete members, minimum spacings and minimum edge distances

**Annex C7**

**Table C8.1:** Characteristic values for **seismic performance category C1** for **bolt projecting anchor FZA**

| Type of anchor / size                         |                           | FZA (bolt projecting anchor)    |                                 |                                 |                                  |                                  |
|-----------------------------------------------|---------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|----------------------------------|
|                                               |                           | 14x40<br>M10 / t <sub>fix</sub> | 14x60<br>M10 / t <sub>fix</sub> | 18x80<br>M12 / t <sub>fix</sub> | 22x100<br>M16 / t <sub>fix</sub> | 22x125<br>M16 / t <sub>fix</sub> |
| Steel failure FZA galvanized                  |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance                     | N <sub>Rk,s,C1</sub> [kN] | 46,4                            |                                 | 67,4                            | 126                              |                                  |
| Partial factor                                | γ <sub>Ms,C1</sub> [-]    | 1,5                             |                                 |                                 |                                  |                                  |
| Steel failure FZA hot-dip galvanized          |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance                     | N <sub>Rk,s,C1</sub> [kN] | 40,7                            |                                 | 60,1                            | 115                              |                                  |
| Partial factor                                | γ <sub>Ms,C1</sub> [-]    | 1,5                             |                                 |                                 |                                  |                                  |
| Steel failure FZA A4                          |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance                     | N <sub>Rk,s,C1</sub> [kN] | 40,6                            |                                 | 59,0                            | 110                              |                                  |
| Partial factor                                | γ <sub>Ms,C1</sub> [-]    | 1,87                            |                                 |                                 |                                  |                                  |
| Steel failure FZA C                           |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance                     | N <sub>Rk,s,C1</sub> [kN] | 40,6                            |                                 | 59,0                            | 110                              |                                  |
| Partial factor                                | γ <sub>Ms,C1</sub> [-]    | 1,5                             |                                 |                                 |                                  |                                  |
| Pullout failure                               |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance in cracked concrete | N <sub>Rk,p,C1</sub> [kN] | 6,0                             |                                 | 20,0                            | 40,0                             |                                  |
| Installation factor                           | γ <sub>2,C1</sub> [-]     | 1,0                             |                                 |                                 |                                  |                                  |
| Steel failure without lever arm FZA           |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance                     | V <sub>Rk,s,C1</sub> [kN] | 20,9                            |                                 | 33,8                            | 62,8                             |                                  |
| Partial factor                                | γ <sub>Ms,C1</sub> [-]    | 1,25                            |                                 |                                 |                                  |                                  |
| Steel failure without lever arm FZA A4        |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance                     | V <sub>Rk,s,C1</sub> [kN] | 18,3                            |                                 | 29,5                            | 55,0                             |                                  |
| Partial factor                                | γ <sub>Ms,C1</sub> [-]    | 1,56                            |                                 |                                 |                                  |                                  |
| Steel failure without lever arm FZA C         |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance                     | V <sub>Rk,s,C1</sub> [kN] | 18,3                            |                                 | 29,5                            | 55,0                             |                                  |
| Partial factor                                | γ <sub>Ms,C1</sub> [-]    | 1,25                            |                                 |                                 |                                  |                                  |

**Table C8.2:** Annular gap for **seismic action category C1**

| Δ <sub>gap</sub>                      |      |                    |      |      |      |      |      |        |
|---------------------------------------|------|--------------------|------|------|------|------|------|--------|
| Δ <sub>gap</sub> = d <sub>f</sub> – d | [mm] | 0,00 <sup>1)</sup> | 0,25 | 0,50 | 0,75 | 1,00 | 1,25 | ≥ 1,50 |
| α <sub>gap</sub>                      |      | 1,00               | 0,86 | 0,75 | 0,66 | 0,60 | 0,54 | 0,50   |

<sup>1)</sup> Filling of the Δ<sub>gap</sub> according Annex B4

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

**Performances**

Characteristic values for seismic performance category C1  
for bolt projecting anchor FZA

**Annex C8**

**Table C9.1:** Characteristic values for **seismic performance category C1** for **through bolt anchor FZA D**

| Type of anchor / size                         |                      | FZA D (through bolt anchor) |                   |                   |                   |                   |
|-----------------------------------------------|----------------------|-----------------------------|-------------------|-------------------|-------------------|-------------------|
|                                               |                      | 14x80<br>M10D/20            | 14x100<br>M10D/40 | 18x100<br>M12D/20 | 18x130<br>M12D/50 | 22x125<br>M16D/25 |
| Steel failure FZA D galvanized                |                      |                             |                   |                   |                   |                   |
| Characteristic resistance                     | $N_{Rk,s,C1}$ [kN]   | 46,4                        |                   | 67,4              |                   | 126               |
| Partial factor                                | $\gamma_{Ms,C1}$ [-] | 1,5                         |                   |                   |                   |                   |
| Steel failure FZA D hot-dip galvanized        |                      |                             |                   |                   |                   |                   |
| Characteristic resistance                     | $N_{Rk,s,C1}$ [kN]   | 40,7                        |                   | 60,1              |                   | 115               |
| Partial factor                                | $\gamma_{Ms,C1}$ [-] | 1,5                         |                   |                   |                   |                   |
| Steel failure FZA D A4                        |                      |                             |                   |                   |                   |                   |
| Characteristic resistance                     | $N_{Rk,s,C1}$ [kN]   | 40,6                        |                   | 59,0              |                   | 110               |
| Partial factor                                | $\gamma_{Ms,C1}$ [-] | 1,87                        |                   |                   |                   |                   |
| Steel failure FZA D C                         |                      |                             |                   |                   |                   |                   |
| Characteristic resistance                     | $N_{Rk,s,C1}$ [kN]   | 40,6                        |                   | 59,0              |                   | 110               |
| Partial factor                                | $\gamma_{Ms,C1}$ [-] | 1,5                         |                   |                   |                   |                   |
| Pullout failure                               |                      |                             |                   |                   |                   |                   |
| Characteristic resistance in cracked concrete | $N_{Rk,p,C1}$ [kN]   | 6,0                         |                   | 20,0              |                   | 40,0              |
| Installation factor                           | $\gamma_{2,C1}$ [-]  | 1,0                         |                   |                   |                   |                   |
| Steel failure without lever arm FZA D         |                      |                             |                   |                   |                   |                   |
| Characteristic resistance                     | $V_{Rk,s,C1}$ [kN]   | 20,9                        |                   | 33,8              |                   | 62,8              |
| Partial factor                                | $\gamma_{Ms,C1}$ [-] | 1,25                        |                   |                   |                   |                   |
| Steel failure without lever arm FZA D A4      |                      |                             |                   |                   |                   |                   |
| Characteristic resistance                     | $V_{Rk,s,C1}$ [kN]   | 18,3                        |                   | 29,5              |                   | 55,0              |
| Partial factor                                | $\gamma_{Ms,C1}$ [-] | 1,56                        |                   |                   |                   |                   |
| Steel failure without lever arm FZA D C       |                      |                             |                   |                   |                   |                   |
| Characteristic resistance                     | $V_{Rk,s,C1}$ [kN]   | 18,3                        |                   | 29,5              |                   | 55,0              |
| Partial factor                                | $\gamma_{Ms,C1}$ [-] | 1,25                        |                   |                   |                   |                   |

**Table C9.2:** Annular gap for seismic action category C1

| $\Delta_{gap}$                      |                    |      |      |      |      |      |             |
|-------------------------------------|--------------------|------|------|------|------|------|-------------|
| $\Delta_{gap} = d_f - d_{nom}$ [mm] | 0,00 <sup>1)</sup> | 0,25 | 0,50 | 0,75 | 1,00 | 1,25 | $\geq 1,50$ |
| $\alpha_{gap}$                      | 1,00               | 0,86 | 0,75 | 0,66 | 0,60 | 0,54 | 0,50        |

<sup>1)</sup> Filling of the  $\Delta_{gap}$  according Annex B4

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

**Performances**

Characteristic values for seismic performance category C1  
for through bolt anchor FZA D

**Annex C9**

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**Table C10.1: Characteristic values for seismic performance category C2 for bolt projecting anchor FZA**

| Type of anchor / size                                                      |                           | FZA (bolt projecting anchor)    |                                 |                                 |                                  |                                  |
|----------------------------------------------------------------------------|---------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|----------------------------------|
|                                                                            |                           | 14x40<br>M10 / t <sub>fix</sub> | 14x60<br>M10 / t <sub>fix</sub> | 18x80<br>M12 / t <sub>fix</sub> | 22x100<br>M16 / t <sub>fix</sub> | 22x125<br>M16 / t <sub>fix</sub> |
| <b>Steel failure FZA galvanized</b>                                        |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance                                                  | N <sub>Rk,s,C2</sub> [kN] | 46,4                            |                                 | 67,4                            | 126,0                            |                                  |
| Partial factor                                                             | γ <sub>Ms,C2</sub> [-]    |                                 |                                 | 1,50                            |                                  |                                  |
| <b>Steel failure FZA hot-dip galvanized</b>                                |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance                                                  | N <sub>Rk,s,C2</sub> [kN] | 40,7                            |                                 | 60,1                            | 115,0                            |                                  |
| Partial factor                                                             | γ <sub>Ms,C2</sub> [-]    |                                 |                                 | 1,50                            |                                  |                                  |
| <b>Steel failure FZA A4</b>                                                |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance                                                  | N <sub>Rk,s,C2</sub> [kN] | 40,6                            |                                 | 59,0                            | 110,0                            |                                  |
| Partial factor                                                             | γ <sub>Ms,C2</sub> [-]    |                                 |                                 | 1,87                            |                                  |                                  |
| <b>Steel failure FZA C</b>                                                 |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance                                                  | N <sub>Rk,s,C2</sub> [kN] | 40,6                            |                                 | 59,0                            | 110,0                            |                                  |
| Partial factor                                                             | γ <sub>Ms,C2</sub> [-]    |                                 |                                 | 1,50                            |                                  |                                  |
| <b>Pullout failure</b>                                                     |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance in cracked concrete                              | N <sub>Rk,p,C2</sub> [kN] | 6,0                             | 7,5                             | 24,0                            | 25,0                             | 40,0                             |
| Installation factor                                                        | γ <sub>2,C2</sub> [-]     |                                 |                                 | 1,50                            |                                  |                                  |
| <b>Steel failure without lever arm FZA galvanized / hot-dip galvanized</b> |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance                                                  | V <sub>Rk,s,C2</sub> [kN] | 15,6                            |                                 | 24,5                            | 47,0                             |                                  |
| Partial factor                                                             | γ <sub>Ms,C2</sub> [-]    |                                 |                                 | 1,25                            |                                  |                                  |
| <b>Steel failure without lever arm FZA A4</b>                              |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance                                                  | V <sub>Rk,s,C2</sub> [kN] | 16,1                            |                                 | 25,3                            | 52,3                             |                                  |
| Partial factor                                                             | γ <sub>Ms,C2</sub> [-]    |                                 |                                 | 1,56                            |                                  |                                  |
| <b>Steel failure without lever arm FZA C</b>                               |                           |                                 |                                 |                                 |                                  |                                  |
| Characteristic resistance                                                  | V <sub>Rk,s,C2</sub> [kN] | 16,1                            |                                 | 25,3                            | 52,3                             |                                  |
| Partial factor                                                             | γ <sub>Ms,C2</sub> [-]    |                                 |                                 | 1,25                            |                                  |                                  |

**Table C10.2: Annular gap for seismic action category C2**

| Δ <sub>gap</sub>                           |                    |      |      |      |      |      |        |
|--------------------------------------------|--------------------|------|------|------|------|------|--------|
| Δ <sub>gap</sub> = d <sub>f</sub> – d [mm] | 0,00 <sup>1)</sup> | 0,25 | 0,50 | 0,75 | 1,00 | 1,25 | ≥ 1,50 |
| α <sub>gap</sub>                           | 1,00               | 0,86 | 0,75 | 0,66 | 0,60 | 0,54 | 0,50   |

<sup>1)</sup> Filling of the Δ<sub>gap</sub> according Annex B4

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

**Performances**

Characteristic values for seismic performance category C2  
for bolt projecting anchor FZA

**Annex C10**

**Table C11.1: Characteristic values for seismic performance category C2 for through bolt anchor FZA D**

| Type of anchor / size                                                 | FZA D (through bolt anchor) |                   |                   |                   |                   |      |
|-----------------------------------------------------------------------|-----------------------------|-------------------|-------------------|-------------------|-------------------|------|
|                                                                       | 14x80<br>M10D/20            | 14x100<br>M10D/40 | 18x100<br>M12D/20 | 18x130<br>M12D/50 | 22x125<br>M16D/25 |      |
| Steel failure FZA D galvanized                                        |                             |                   |                   |                   |                   |      |
| Characteristic resistance                                             | $N_{Rk,s,C2}$ [kN]          | 46,4              | 67,4              | 126,0             |                   |      |
| Partial factor                                                        | $\gamma_{Ms,C2}$ [-]        | 1,50              |                   |                   |                   |      |
| Steel failure FZA D hot-dip galvanized                                |                             |                   |                   |                   |                   |      |
| Characteristic resistance                                             | $N_{Rk,s,C2}$ [kN]          | 40,7              | 60,1              | 115,0             |                   |      |
| Partial factor                                                        | $\gamma_{Ms,C2}$ [-]        | 1,50              |                   |                   |                   |      |
| Steel failure FZA D A4                                                |                             |                   |                   |                   |                   |      |
| Characteristic resistance                                             | $N_{Rk,s,C2}$ [kN]          | 40,6              | 59,0              | 110,0             |                   |      |
| Partial factor                                                        | $\gamma_{Ms,C2}$ [-]        | 1,87              |                   |                   |                   |      |
| Steel failure FZA D C                                                 |                             |                   |                   |                   |                   |      |
| Characteristic resistance                                             | $N_{Rk,s,C2}$ [kN]          | 40,6              | 59,0              | 110,0             |                   |      |
| Partial factor                                                        | $\gamma_{Ms,C2}$ [-]        | 1,50              |                   |                   |                   |      |
| Pullout failure                                                       |                             |                   |                   |                   |                   |      |
| Characteristic resistance in cracked concrete                         | $N_{Rk,p,C2}$ [kN]          | 6,0               | 7,5               | 24,0              | 25,0              | 40,0 |
| Installation factor                                                   | $\gamma_{2,C2}$ [-]         | 1,50              |                   |                   |                   |      |
| Steel failure without lever arm FZA D galvanized / hot-dip galvanized |                             |                   |                   |                   |                   |      |
| Characteristic resistance                                             | $V_{Rk,s,C2}$ [kN]          | 15,6              | 24,5              | 47,0              |                   |      |
| Partial factor                                                        | $\gamma_{Ms,C2}$ [-]        | 1,25              |                   |                   |                   |      |
| Steel failure without lever arm FZA D A4                              |                             |                   |                   |                   |                   |      |
| Characteristic resistance                                             | $V_{Rk,s,C2}$ [kN]          | 16,1              | 25,3              | 52,3              |                   |      |
| Partial factor                                                        | $\gamma_{Ms,C2}$ [-]        | 1,56              |                   |                   |                   |      |
| Steel failure without lever arm FZA D C                               |                             |                   |                   |                   |                   |      |
| Characteristic resistance                                             | $V_{Rk,s,C2}$ [kN]          | 16,1              | 25,3              | 52,3              |                   |      |
| Partial factor                                                        | $\gamma_{Ms,C2}$ [-]        | 1,25              |                   |                   |                   |      |

**Table C11.2: Annular gap for seismic action category C2**

| $\Delta_{gap}$                      |                    |      |      |      |      |      |             |
|-------------------------------------|--------------------|------|------|------|------|------|-------------|
| $\Delta_{gap} = d_f - d_{nom}$ [mm] | 0,00 <sup>1)</sup> | 0,25 | 0,50 | 0,75 | 1,00 | 1,25 | $\geq 1,50$ |
| $\alpha_{gap}$                      | 1,00               | 0,86 | 0,75 | 0,66 | 0,60 | 0,54 | 0,50        |

<sup>1)</sup> Filling of the  $\Delta_{gap}$  according Annex B4

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

**Performances**

Characteristic values for seismic performance category C2  
for through bolt anchor FZA D

**Annex C11**

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**Table C12.1:** Characteristic values for resistance to fire<sup>1)</sup>

| FZA galvanized                                                                                            |                      | 10x40 M6<br>12x40 M6 I<br>12x50 M6 I                           | 12x40 M8<br>12x40 ST M8<br>12x50 M8 D/10                                        | 12x50 M8<br>12x60 M8 D/10<br>12x80 M8 D/30<br>14x60 M8 I<br>18x80 M10 I | 14x40 M10<br>14x40 ST M10 |
|-----------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------|
| Steel failure for tension load and shear load ( $F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$ )               |                      |                                                                |                                                                                 |                                                                         |                           |
| Characteristic resistance                                                                                 | $F_{Rk,s,fi}$ [kN]   | R30                                                            | 1,2                                                                             | 2,2                                                                     | 5,2                       |
|                                                                                                           |                      | R60                                                            | 0,7                                                                             | 1,3                                                                     | 2,6                       |
|                                                                                                           |                      | R90                                                            | 0,5                                                                             | 1,0                                                                     | 1,8                       |
|                                                                                                           |                      | R120                                                           |                                                                                 | 0,8                                                                     | 1,3                       |
|                                                                                                           | $M^0_{Rk,s,fi}$ [Nm] | R30                                                            | 0,9                                                                             | 2,3                                                                     | 6,7                       |
|                                                                                                           |                      | R60                                                            | 0,5                                                                             | 1,3                                                                     | 3,4                       |
|                                                                                                           |                      | R90                                                            | 0,4                                                                             | 1,0                                                                     | 2,3                       |
|                                                                                                           |                      | R120                                                           |                                                                                 | 0,9                                                                     | 1,7                       |
| Pullout failure                                                                                           |                      |                                                                |                                                                                 |                                                                         |                           |
| Characteristic resistance                                                                                 | $N_{Rk,p,fi}$ [kN]   | R30                                                            | 1,5                                                                             | 2,3                                                                     | 1,5                       |
|                                                                                                           |                      | R60                                                            |                                                                                 |                                                                         |                           |
|                                                                                                           |                      | R90                                                            |                                                                                 |                                                                         |                           |
|                                                                                                           |                      | R120                                                           | 1,2                                                                             | 1,8                                                                     | 1,2                       |
| FZA galvanized                                                                                            |                      | 14x60 M10<br>14x60 ST M10<br>14x80 M10 D/20<br>14x100 M10 D/40 | 18x80 M12<br>18x100 M12 D/20<br>18x130 M12 D/50<br>22x100 M12 I<br>22x125 M12 I | 22x100 M16<br>22x125 M16 D/25                                           | 22x125 M16                |
| Steel failure for tension load and shear load ( $F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$ )               |                      |                                                                |                                                                                 |                                                                         |                           |
| Characteristic resistance                                                                                 | $F_{Rk,s,fi}$ [kN]   | R30                                                            | 5,2                                                                             | 7,5                                                                     | 13,9                      |
|                                                                                                           |                      | R60                                                            | 2,6                                                                             | 3,8                                                                     | 7,0                       |
|                                                                                                           |                      | R90                                                            | 1,8                                                                             | 2,5                                                                     | 4,7                       |
|                                                                                                           |                      | R120                                                           | 1,3                                                                             | 1,9                                                                     | 3,6                       |
|                                                                                                           | $M^0_{Rk,s,fi}$ [Nm] | R30                                                            | 6,7                                                                             | 11,6                                                                    | 29,5                      |
|                                                                                                           |                      | R60                                                            | 3,4                                                                             | 5,9                                                                     | 14,9                      |
|                                                                                                           |                      | R90                                                            | 2,3                                                                             | 4,0                                                                     | 10,0                      |
|                                                                                                           |                      | R120                                                           | 1,7                                                                             | 3,0                                                                     | 7,6                       |
| Pullout failure                                                                                           |                      |                                                                |                                                                                 |                                                                         |                           |
| Characteristic resistance                                                                                 | $N_{Rk,p,fi}$ [kN]   | R30                                                            | 3,0                                                                             | 5,0                                                                     | 10,0                      |
|                                                                                                           |                      | R60                                                            |                                                                                 |                                                                         |                           |
|                                                                                                           |                      | R90                                                            |                                                                                 |                                                                         |                           |
|                                                                                                           |                      | R120                                                           | 2,4                                                                             | 4,0                                                                     | 8,0                       |
| Edge distance                                                                                             |                      |                                                                |                                                                                 |                                                                         |                           |
| R30 to R120 $c_{cr,fi}$ [mm]                                                                              |                      | -                                                              | $2 \cdot h_{ef}$                                                                |                                                                         |                           |
| In case of fire attack from more than one side, the minimum edge distance shall be $\geq 300$ mm          |                      |                                                                |                                                                                 |                                                                         |                           |
| Spacing                                                                                                   |                      |                                                                |                                                                                 |                                                                         |                           |
| R30 to R120 $s_{cr,fi}$ [mm]                                                                              |                      | -                                                              | $2 \cdot c_{cr,fi}$                                                             |                                                                         |                           |
| 1) The embedment depth has to be increased for wet concrete by at least 30 mm compared to the given value |                      |                                                                |                                                                                 |                                                                         |                           |
| fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST                                                            |                      |                                                                |                                                                                 |                                                                         | Annex C12                 |
| Performances<br>Characteristic values for resistance to fire                                              |                      |                                                                |                                                                                 |                                                                         |                           |
|                                                                                                           |                      |                                                                |                                                                                 |                                                                         | Appendix 26/ 29           |

**Table C13.1:** Characteristic values for resistance to fire<sup>1)</sup>

| FZA A4 / C                                                                                                |                      | 10x40 M6<br>12x40 M6 I<br>12x50 M6 I                           | 12x40 M8<br>12x40 ST M8<br>12x50 M8 D/10                                        | 12x50 M8<br>12x60 M8 D/10<br>12x80 M8 D/30<br>14x60 M8 I<br>18x80 M10 I | 14x40 M10<br>14x40 ST M10 |
|-----------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------|
| Steel failure for tension load and shear load ( $F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$ )               |                      |                                                                |                                                                                 |                                                                         |                           |
| Characteristic resistance                                                                                 | $F_{Rk,s,fi}$ [kN]   | R30                                                            | 2,0                                                                             | 3,6                                                                     | 5,7                       |
|                                                                                                           |                      | R60                                                            | 1,2                                                                             | 2,3                                                                     | 3,6                       |
|                                                                                                           |                      | R90                                                            | 0,9                                                                             | 1,9                                                                     | 3,0                       |
|                                                                                                           |                      | R120                                                           | 0,7                                                                             | 1,6                                                                     | 2,6                       |
|                                                                                                           | $M^0_{Rk,s,fi}$ [Nm] | R30                                                            | 1,5                                                                             | 3,7                                                                     | 7,4                       |
|                                                                                                           |                      | R60                                                            | 0,9                                                                             | 2,4                                                                     | 4,7                       |
|                                                                                                           |                      | R90                                                            | 0,7                                                                             | 1,9                                                                     | 3,8                       |
|                                                                                                           |                      | R120                                                           | 0,5                                                                             | 1,7                                                                     | 3,4                       |
| Pullout failure                                                                                           |                      |                                                                |                                                                                 |                                                                         |                           |
| Characteristic resistance                                                                                 | R30                  | 1,5                                                            | 2,3                                                                             | 1,5                                                                     |                           |
|                                                                                                           | R60                  |                                                                |                                                                                 |                                                                         |                           |
|                                                                                                           | R90                  |                                                                |                                                                                 |                                                                         |                           |
|                                                                                                           | R120                 | 1,2                                                            | 1,8                                                                             | 1,2                                                                     |                           |
| FZA A4 / C                                                                                                |                      | 14x60 M10<br>14x60 ST M10<br>14x80 M10 D/20<br>14x100 M10 D/40 | 18x80 M12<br>18x100 M12 D/20<br>18x130 M12 D/50<br>22x100 M12 I<br>22x125 M12 I | 22x100 M16<br>22x125 M16 D/25                                           | 22x125 M16                |
| Steel failure for tension load and shear load ( $F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$ )               |                      |                                                                |                                                                                 |                                                                         |                           |
| Characteristic resistance                                                                                 | $F_{Rk,s,fi}$ [kN]   | R30                                                            | 5,7                                                                             | 11,8                                                                    | 22,0                      |
|                                                                                                           |                      | R60                                                            | 3,6                                                                             | 7,0                                                                     | 13,1                      |
|                                                                                                           |                      | R90                                                            | 3,0                                                                             | 5,5                                                                     | 10,2                      |
|                                                                                                           |                      | R120                                                           | 2,6                                                                             | 4,7                                                                     | 8,7                       |
|                                                                                                           | $M^0_{Rk,s,fi}$ [Nm] | R30                                                            | 7,4                                                                             | 18,3                                                                    | 46,6                      |
|                                                                                                           |                      | R60                                                            | 4,7                                                                             | 10,9                                                                    | 27,9                      |
|                                                                                                           |                      | R90                                                            | 3,8                                                                             | 8,5                                                                     | 21,6                      |
|                                                                                                           |                      | R120                                                           | 3,4                                                                             | 7,3                                                                     | 18,5                      |
| Pullout failure                                                                                           |                      |                                                                |                                                                                 |                                                                         |                           |
| Characteristic resistance                                                                                 | R30                  | 3,0                                                            | 5,0                                                                             | 10,0                                                                    |                           |
|                                                                                                           | R60                  |                                                                |                                                                                 |                                                                         |                           |
|                                                                                                           | R90                  |                                                                |                                                                                 |                                                                         |                           |
|                                                                                                           | R120                 | 2,4                                                            | 4,0                                                                             | 8,0                                                                     |                           |
| Edge distance                                                                                             |                      |                                                                |                                                                                 |                                                                         |                           |
| R30 to R120                                                                                               | $c_{cr,fi}$ [mm]     | -                                                              | $2 \cdot h_{ef}$                                                                |                                                                         |                           |
| In case of fire attack from more than one side, the minimum edge distance shall be $\geq 300$ mm          |                      |                                                                |                                                                                 |                                                                         |                           |
| Spacing                                                                                                   |                      |                                                                |                                                                                 |                                                                         |                           |
| R30 to R120                                                                                               | $s_{cr,fi}$ [mm]     | -                                                              | $2 \cdot c_{cr,fi}$                                                             |                                                                         |                           |
| 1) The embedment depth has to be increased for wet concrete by at least 30 mm compared to the given value |                      |                                                                |                                                                                 |                                                                         |                           |
| fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST                                                            |                      |                                                                |                                                                                 |                                                                         | Annex C13                 |
| Performances<br>Characteristic values for resistance to fire                                              |                      |                                                                |                                                                                 |                                                                         |                           |
|                                                                                                           |                      |                                                                |                                                                                 |                                                                         | Appendix 27/ 29           |

**Table C14.1:** Displacements due to **tension** loads for **bolt projecting anchor FZA**

| Type of anchor / size              |                                        |      | FZA (bolt projecting anchor)   |                                |                                 |                                |                                    |                                    |                                     |                                     |
|------------------------------------|----------------------------------------|------|--------------------------------|--------------------------------|---------------------------------|--------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|
|                                    |                                        |      | 10x40<br>M6 / t <sub>fix</sub> | 12x40<br>M8 / t <sub>fix</sub> | 14x40<br>M10 / t <sub>fix</sub> | 12x50<br>M8 / t <sub>fix</sub> | 14x60<br>M10 /<br>t <sub>fix</sub> | 18x80<br>M12 /<br>t <sub>fix</sub> | 22x100<br>M16 /<br>t <sub>fix</sub> | 22x125<br>M16 /<br>t <sub>fix</sub> |
| Tension load in cracked concrete   | N                                      | [kN] | 2,0                            |                                |                                 | 3,5                            | 5,0                                | 8,0                                | 16,0                                |                                     |
| Displacement                       | $\frac{\delta_{N0}}{\delta_{N\infty}}$ | [mm] | 0,8                            |                                |                                 |                                |                                    |                                    |                                     |                                     |
|                                    |                                        |      | 1,1                            |                                |                                 |                                |                                    |                                    |                                     |                                     |
| Tension load in uncracked concrete | N                                      | [kN] | 3,3                            |                                |                                 | 4,8                            | 7,5                                | 12,7                               | 17,9                                |                                     |
| Displacement                       | $\frac{\delta_{N0}}{\delta_{N\infty}}$ | [mm] | 0,8                            |                                |                                 |                                |                                    |                                    |                                     |                                     |
|                                    |                                        |      | 1,1                            |                                |                                 |                                |                                    |                                    |                                     |                                     |

The displacements do not apply for FZA ST

**Table C14.2:** Displacements due to **tension** loads for **through bolt anchor FZA D**

| Type of anchor / size              |                                        |      | FZA D (through bolt anchor) |                     |                     |                      |                       |                       |                       |                       |
|------------------------------------|----------------------------------------|------|-----------------------------|---------------------|---------------------|----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                                    |                                        |      | 12x50<br>M8D/<br>10         | 12x60<br>M8D/<br>10 | 12x80<br>M8D/<br>30 | 14x80<br>M10D/<br>20 | 14x100<br>M10D/<br>40 | 18x100<br>M12D/<br>20 | 18x130<br>M12D/<br>50 | 22x125<br>M16D/<br>25 |
| Tension load in cracked concrete   | N                                      | [kN] | 2,0                         | 3,5                 |                     | 5,0                  |                       | 8,0                   |                       | 16,0                  |
| Displacement                       | $\frac{\delta_{N0}}{\delta_{N\infty}}$ | [mm] | 0,8                         |                     |                     |                      |                       |                       |                       |                       |
|                                    |                                        |      | 1,1                         |                     |                     |                      |                       |                       |                       |                       |
| Tension load in uncracked concrete | N                                      | [kN] | 3,3                         | 4,8                 |                     | 7,5                  |                       | 12,7                  |                       | 17,9                  |
| Displacement                       | $\frac{\delta_{N0}}{\delta_{N\infty}}$ | [mm] | 0,8                         |                     |                     |                      |                       |                       |                       |                       |
|                                    |                                        |      | 1,1                         |                     |                     |                      |                       |                       |                       |                       |

**Table C14.3:** Displacements due to **tension** loads for **internal thread anchor FZA I**

| Type of anchor / size              |                                        |      | FZA I (internal thread anchor FZA I) |               |               |                |                 |                 |
|------------------------------------|----------------------------------------|------|--------------------------------------|---------------|---------------|----------------|-----------------|-----------------|
|                                    |                                        |      | 12x40<br>M6 I                        | 12x50<br>M6 I | 14x60<br>M8 I | 18x80<br>M10 I | 22x100<br>M12 I | 22x125<br>M12 I |
| Tension load in cracked concrete   | N                                      | [kN] | 2,0                                  | 3,5           | 5,0           | 8,0            | 16,0            |                 |
| Displacement                       | $\frac{\delta_{N0}}{\delta_{N\infty}}$ | [mm] | 0,8                                  |               |               |                |                 |                 |
|                                    |                                        |      | 1,1                                  |               |               |                |                 |                 |
| Tension load in uncracked concrete | N                                      | [kN] | 3,3                                  | 4,8           | 7,5           | 12,7           | 17,9            |                 |
| Displacement                       | $\frac{\delta_{N0}}{\delta_{N\infty}}$ | [mm] | 0,8                                  |               |               |                |                 |                 |
|                                    |                                        |      | 1,1                                  |               |               |                |                 |                 |

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

#### Performances

Displacements due to tension loads

#### Annex C14

**Table C15.1: Displacements due to shear loads for bolt projecting anchor FZA and through bolt anchor FZA D**

| Type of anchor / size                                    | FZA (bolt projecting anchor) and FZA D (through bolt anchor) |                                 |                                 |                                |                       |                                  |                                     |                       |
|----------------------------------------------------------|--------------------------------------------------------------|---------------------------------|---------------------------------|--------------------------------|-----------------------|----------------------------------|-------------------------------------|-----------------------|
|                                                          | 10x40<br>M6 / t <sub>fix</sub>                               | 14x40<br>M10 / t <sub>fix</sub> | 12x40<br>M8 / t <sub>fix</sub>  | 12x50<br>M8 / t <sub>fix</sub> | 12x50<br>M8D/10       | 12x60<br>M8D/10                  | 12x80<br>M8D/30                     | 14x80<br>M10D/20      |
| Shear load in cracked and uncracked concrete V [kN]      | 4,0                                                          | 9,0                             | 5,0                             |                                |                       |                                  |                                     | 12,5                  |
| Displacement $\frac{\delta_{V0}}{\delta_{V\infty}}$ [mm] | 2,0                                                          | 1,9                             | 0,7                             |                                |                       |                                  |                                     | 1,9                   |
|                                                          | 3,0                                                          | 2,8                             | 1,0                             |                                |                       |                                  |                                     | 2,8                   |
|                                                          | 14x60<br>M10 / t <sub>fix</sub>                              | 14x100<br>M10D/<br>40           | 18x80<br>M12 / t <sub>fix</sub> | 18x100<br>M12D/<br>20          | 18x130<br>M12D/<br>50 | 22x100<br>M16 / t <sub>fix</sub> | 22x125<br>M16 /<br>t <sub>fix</sub> | 22x125<br>M16D/<br>25 |
| Shear load in cracked and uncracked concrete V [kN]      | 12,5                                                         | 12,5                            | 19,0                            |                                |                       | 30,0                             |                                     |                       |
| Displacement $\frac{\delta_{V0}}{\delta_{V\infty}}$ [mm] | 1,9                                                          |                                 | 2,1                             |                                |                       |                                  |                                     |                       |
|                                                          | 2,8                                                          |                                 | 3,1                             |                                |                       |                                  |                                     |                       |

The displacements do not apply for FZA ST

**Table C15.2: Displacements due to shear loads for internal thread anchor FZA I**

| Type of anchor / size                           |                    |      | FZA I (internal thread anchor) |               |               |                |                 |                 |
|-------------------------------------------------|--------------------|------|--------------------------------|---------------|---------------|----------------|-----------------|-----------------|
|                                                 |                    |      | 12x40<br>M6 I                  | 12x50<br>M6 I | 14x60<br>M8 I | 18x80<br>M10 I | 22x100<br>M12 I | 22x125<br>M12 I |
| Shear load in cracked and<br>Uncracked concrete | V                  | [kN] | 5,0                            |               | 12,5          | 19,0           | 30,0            |                 |
| Displacement                                    | $\delta_{N0}$      | [mm] | 0,7                            |               | 1,9           | 2,1            |                 |                 |
|                                                 | $\delta_{N\infty}$ |      | 1,0                            |               | 2,8           | 3,1            |                 |                 |

**Table C15.3: Displacements due to tension and shear loads for seismic performance category C2 for FZA and FZA D**

| Type of anchor / size                                                                                           | FZA (bolt projecting anchor) and FZA D (through bolt anchor) |                                          |                                           |                            |            |
|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------|-------------------------------------------|----------------------------|------------|
|                                                                                                                 | 14x40 M10                                                    | 14x60 M10<br>14x80 M10 D<br>14x100 M10 D | 18x80 M12<br>18x100 M12 D<br>18x130 M12 D | 22x100 M16<br>22x125 M16 D | 22x125 M16 |
| Displacement $\frac{\delta_{N,C2(DLS)}}{\delta_{N,C2(ULS)}} \frac{\delta_{V,C2(DLS)}}{\delta_{V,C2(ULS)}} [mm]$ | 3,8                                                          |                                          | 4,7                                       | 4,9                        |            |
|                                                                                                                 | 13,5                                                         |                                          | 12,7                                      | 13,1                       |            |
|                                                                                                                 | 4,3                                                          |                                          | 4,6                                       | 5,0                        |            |
|                                                                                                                 | 6,9                                                          |                                          | 7,0                                       | 6,9                        |            |

fischer-Zykon-Anchor FZA, FZA D, FZA I, FZA ST

**Performances**

Displacements due to shear loads

Displacements due to tension and shear loads for seismic performance category C2

**Annex C15**