

## DEKLARACJA WŁAŚCIWOŚCI UŻYTKOWYCH

### DoP 0166

dla fischer Zykon- Anchor FZA-Q (Kotwy metalowe do stosowania w betonie)

PL

|                                                                                             |                                                                                                        |               |                              |
|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|---------------|------------------------------|
| 1. <u>Niepowtarzalny kod identyfikacyjny typu wyrobu:</u>                                   | DoP 0166                                                                                               |               |                              |
| 2. <u>Zamierzone zastosowanie:</u>                                                          | Mocowanie w betonie zarysowanym lub niezarysowanym.<br>Zobacz załącznik, w szczególności aneksy B1- B4 |               |                              |
| 3. <u>Producent:</u>                                                                        | fischerwerke GmbH & Co. KG, Klaus-Fischer-Str. 1, 72178 Waldachtal, Niemcy                             |               |                              |
| 4. <u>Upoważniony przedstawiciel:</u>                                                       | -                                                                                                      |               |                              |
| 5. <u>System(-y) oceny i weryfikacji stałości właściwości użytkowych:</u>                   | 1                                                                                                      |               |                              |
| 6. <u>Europejski dokument oceny:</u>                                                        | EAD 330232-01-0601, (Edition 12/ 2019)                                                                 |               |                              |
| Europejska ocena techniczna:                                                                | ETA-16/0338; 2020-03-30                                                                                |               |                              |
| Jednostka ds. oceny technicznej:                                                            | DIBt- Deutsches Institut für Bautechnik                                                                |               |                              |
| Jednostka lub jednostki notyfikowane:                                                       | 1343 MPA Darmstadt / 2873 TU Darmstadt                                                                 |               |                              |
| 7. <u>Deklarowane właściwości użytkowe:</u>                                                 |                                                                                                        |               |                              |
| <b>Wytrzymałość mechaniczna i stabilność osadzenia (BWR 1)</b>                              |                                                                                                        |               |                              |
| Nośność charakterystyczna na wrywanie (nośności statyczne i quasi-statyczne):               | Nośność do uszkodzenia stali:                                                                          | Aneksy C1     | E <sub>s</sub> = 210 000 MPa |
|                                                                                             | Nośność na wrywanie:                                                                                   | Aneksy C1     |                              |
|                                                                                             | Nośność do wyrwania stożka betonu:                                                                     | Aneksy C1     |                              |
|                                                                                             | Solidność:                                                                                             | Aneksy C1     |                              |
|                                                                                             | Minimalne odstępki osiowe i krawędziowe:                                                               | Aneksy C2     |                              |
|                                                                                             | Odległość od krawędzi zapobiegająca pękaniu pod obciążeniem:                                           | Aneksy C1     |                              |
| Nośność charakterystyczna na ścinanie (nośności statyczne i quasi-statyczne), metoda A:     | Nośność do uszkodzenia stali (obciążenie ścinające):                                                   | Aneksy C1     |                              |
|                                                                                             | Nośność do uszkodzenia wyważenia:                                                                      | Aneksy C1     |                              |
| Nośność charakterystyczna i przemieszczenia w warunkach sejsmicznych dla kategorii C1 i C2: | Nośność na wrywanie, kategoria C1:                                                                     | Aneksy C4     |                              |
|                                                                                             | Nośność na wrywanie, kategoria C2:                                                                     | Aneksy C4, C5 |                              |
|                                                                                             | Nośność na ścinanie, kategoria C1:                                                                     | Aneksy C4     |                              |
|                                                                                             | Nośność na ścinanie, kategoria C2:                                                                     | Aneksy C3, C5 |                              |
|                                                                                             | Współczynnik szczeliny pierścieniowej:                                                                 | Aneksy C4     |                              |
| Charakterystyczna wytrzymałość dla uproszczonego projektu:                                  | Metoda B:                                                                                              | NPD           |                              |
|                                                                                             | Metoda C:                                                                                              | NPD           |                              |
| Przesunięcia i Trwałość:                                                                    | Przemieszczenia przy obciążeniu statycznym i quasi-statycznym:                                         | Aneksy C5     |                              |
|                                                                                             | Trwałość:                                                                                              | Aneksy A2, B1 |                              |
| <b>Ochrona przeciwpożarowa (BWR 2)</b>                                                      |                                                                                                        |               |                              |
| Reakcja na ogień:                                                                           | Klasy (A1)                                                                                             |               |                              |
| Odporność na działanie ognia:                                                               | Odporność ogniowa do zniszczenia stali                                                                 | Aneksy C3     |                              |
|                                                                                             | Odporność ogniowa na wrywanie (obciążenie                                                              | Aneksy C3     |                              |
|                                                                                             | Odporność ogniowa na zniszczenie stali                                                                 | Aneksy C3     |                              |

8. Odpowiednia dokumentacja techniczna lub specjalna –  
dokumentacja techniczna:

Właściwości użytkowe określonego powyżej wyrobu są zgodne z zestawem deklarowanych właściwości użytkowych. Niniejsza deklaracja właściwości użytkowych wydana zostaje zgodnie z rozporządzeniem (UE) nr 305/2011 na wyłączną odpowiedzialność producenta określonego powyżej.

W imieniu producenta podpisał(-a):



Thilo Pregartner, Dr.-Ing.  
Tumlingen, 2020-04-20



Peter Schillinger, Dipl.-Ing.

Niniejsza Deklaracja Właściwości Użytkowych została przygotowana w różnych językach. W razie wątpliwości w interpretacji, wersja angielska jest zawsze miarodajna.

Załącznik zawiera dobrowolne i uzupełniające informacje w języku angielskim (neutralne językowo), a wykraczające poza wymagania prawne.

Specific Part

1 Technical description of the product

The fischer Zykon Anchor FZA-Q is an anchor made of hot-dipped galvanized steel which is placed into a drilled hole and anchored by torque controlled expansion and mechanical interlock.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

| Essential characteristic                                                               | Performance           |
|----------------------------------------------------------------------------------------|-----------------------|
| Characteristic resistance to tension load (static and quasi-static loading)            | See Annex C 1 and C 2 |
| Characteristic resistance to shear load (static and quasi-static loading)              | See Annex C 1         |
| Displacements (static and quasi-static loading)                                        | See Annex C 5         |
| Durability                                                                             | See Annex B 1         |
| Characteristic resistance and displacements for seismic performance category C1 and C2 | See Annex C 4 and C 5 |

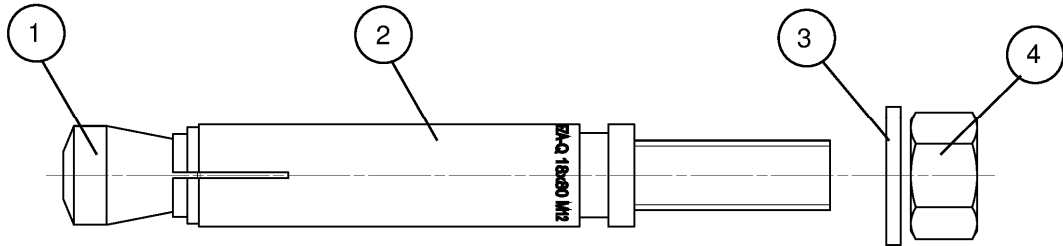
3.2 Safety in case of fire (BWR 2)

| Essential characteristic | Performance   |
|--------------------------|---------------|
| Reaction to fire         | Class A1      |
| Resistance to fire       | See Annex C 3 |

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

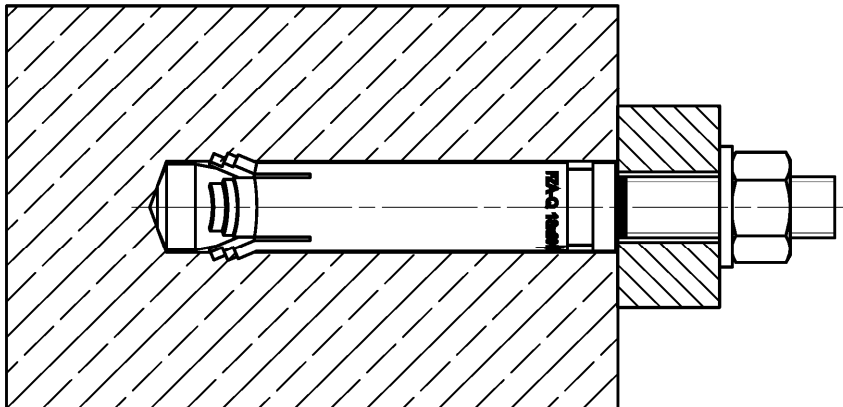
In accordance with the European Assessment Document EAD 330232-01-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1



- ① Cone bolt
- ② Expansion sleeve
- ③ Washer
- ④ Hexagon nut

### Installed condition



(Fig. not to scale)

fischer Zykon Anchor FZA-Q

**Product description**  
Installed condition

**Annex A 1**

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Product marking and dimensions

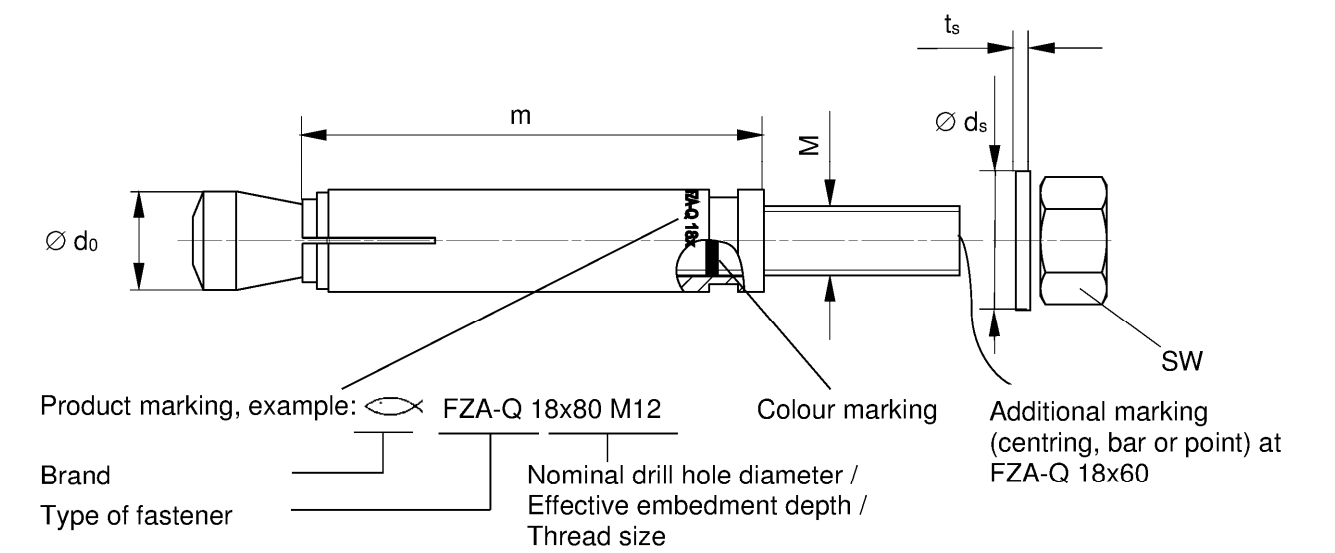


Table A2.1: Dimensions [mm]

| Size              | FZA-Q       |             |             |
|-------------------|-------------|-------------|-------------|
|                   | 14 x 50 M10 | 18 x 60 M12 | 18 x 80 M12 |
| $M = d$           | 10          | 12          |             |
| $\varnothing d_0$ | 13,5        | 17          |             |
| $m$               | 50          | 60          | 80          |
| $SW$              | 17          | 19          |             |
| $t_s$             | 1,8         | 2,3         |             |
| $\varnothing d_s$ | 19          | 23          |             |

Table A2.2: Materials (hot-dip galvanised  $\geq 50\mu\text{m}$ , EN ISO 10684:2011<sup>1)</sup>)

| Part | Designation                    | Material                                                                                                                                      |
|------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Cone bolt <sup>2)</sup>        | Cold form steel or free cutting steel class 8.8 acc. to EN ISO 898-1:2013<br>Nominal steel tensile strength $f_{uk} \leq 1000 \text{ N/mm}^2$ |
| 2    | Expansion sleeve <sup>2)</sup> | Steel                                                                                                                                         |
| 3    | Washer                         | Cold strip, EN 10139:2016                                                                                                                     |
| 4    | Hexagon nut                    | Steel, property class min. 8, EN ISO 898-2:2012                                                                                               |

<sup>1)</sup> Alternative method: sherardised  $\geq 50 \mu\text{m}$ , EN 13811:2003

<sup>2)</sup> Optional: clear paint

(Fig. not to scale)

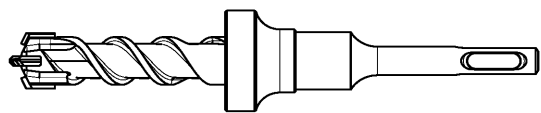
fischer Zykon Anchor FZA-Q

Product description  
Product marking, dimensions and materials

Annex A 2

**Tools**

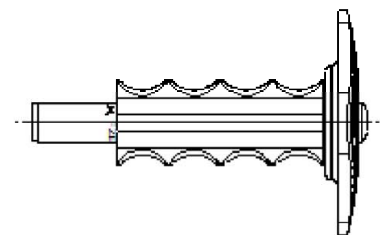
**Drill bit FZBB**



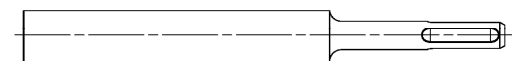
**Standard drill bit**



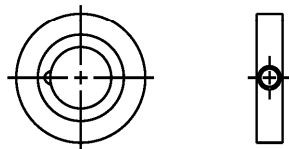
**Setting tool FZE**



**Machine setting tool FZA-Q**



**Optional fischer filling disc FFD for e.g. seismic applications**



fischer Zykon Anchor FZA-Q

**Intended Use**  
Tools

## Specifications of intended use

| Size                                    | FZA-Q                                                                              |             |             |    |
|-----------------------------------------|------------------------------------------------------------------------------------|-------------|-------------|----|
|                                         | 14 x 50 M10                                                                        | 18 x 60 M12 | 18 x 80 M12 |    |
| Hot-dip galvanised                      |  |             |             |    |
| Static and quasi-static loads           |                                                                                    |             |             |    |
| Cracked and uncracked concrete          |                                                                                    |             |             |    |
| Seismic action for performance category |                                                                                    |             |             | C1 |
|                                         |                                                                                    |             |             | C2 |
| Fire exposure                           |                                                                                    |             |             |    |

### Base materials:

- Compacted reinforced or unreinforced normal weight concrete without fibers (cracked and uncracked) 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

### Design:

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

fischer Zykon Anchor FZA-Q

**Intended Use**  
Specifications

**Annex B 1**

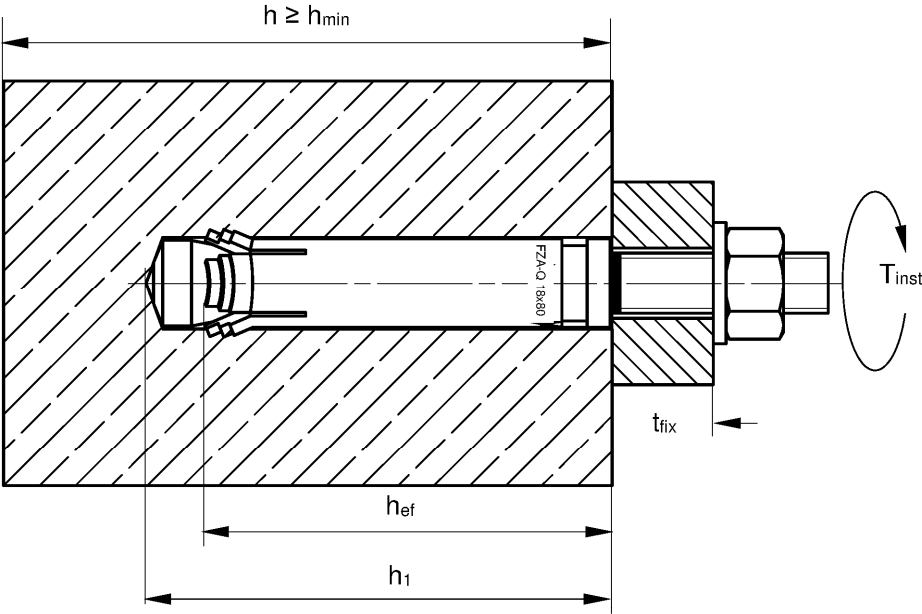
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Installation parameters

Table B2.1: Installation parameters

| Size                                      |            | FZA-Q       |             |             |
|-------------------------------------------|------------|-------------|-------------|-------------|
|                                           |            | 14 x 50 M10 | 18 x 60 M12 | 18 x 80 M12 |
| Nominal drill hole diameter               | $d_0$      | 14          | 18          |             |
| Depth of drill hole in concrete           | $h_1$      | 58          | 74          | 94          |
| Cutting diameter of drill bit             | $d_{cut}$  | 14,50       | 18,50       |             |
| Diameter of clearance hole in the fixture | $d_f$      | 12          | 14          |             |
| Maximum installation torque <sup>1)</sup> | $T_{inst}$ | 20          | 45          |             |

<sup>1)</sup> Minimum installation torque = hand - tightening



- $h_{ef}$  = Effective embedment depth  
 $t_{fix}$  = Thickness of the fixture  
 $h_1$  = Depth of drill hole to deepest point  
 $h$  = Thickness of the concrete member  
 $h_{min}$  = Minimum thickness of concrete member  
 $T_{inst} \leq$  Maximum installation torque

fischer Zykon Anchor FZA-Q

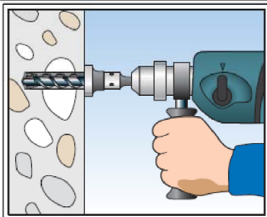
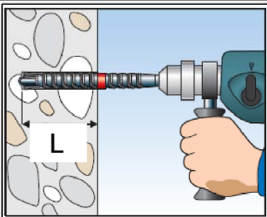
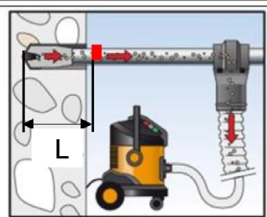
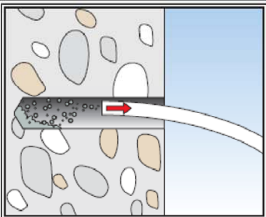
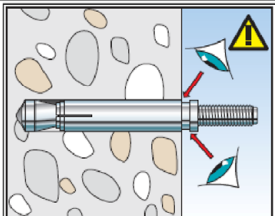
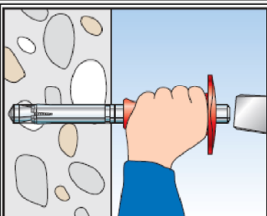
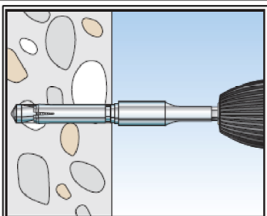
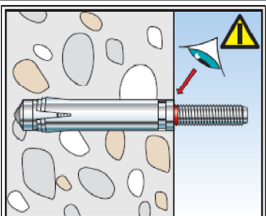
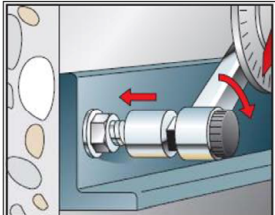
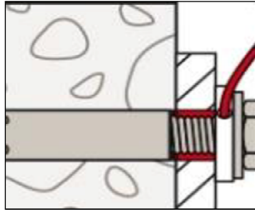
Intended Use  
Installation parameters

Annex B 2

**Installation instructions**

- Fastener installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- Use of the fastener only as supplied by the manufacturer without exchanging the components of the fastener
- Checking before placing the fastener to ensure that the strength class of the concrete in which the fastener 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 +/- 5° 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 is not in the direction of load application

|                                                  |                                        |
|--------------------------------------------------|----------------------------------------|
| fischer Zykon Anchor FZA-Q                       | <b>Annex B 3</b><br><br>Appendix 7/ 13 |
| <b>Intended Use</b><br>Installation instructions |                                        |

| Drill and clean                           | <br>1a<br>Stop drill FZBB             | <br>1b<br>Hammer drill                                                                                                                                                                                                                                                                                                        | <br>1c (next step: 3)<br>Drill the hole with hollow drill | <br>2<br>Clean drill hole     |      |   |                 |    |                 |    |                 |    |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------|---|-----------------|----|-----------------|----|-----------------|----|
| Set fastener                              | <br>3<br>Check drill depth            | <br>4a<br>Hand-setting                                                                                                                                                                                                                                                                                                        | <br>4b<br>Machine-setting                                 | <br>5<br>Check control colour |      |   |                 |    |                 |    |                 |    |
| Installation torque / marking length      | <br>6<br>Apply $T_{inst}$             | <div>1b / 1c – marking length / stop length:</div> <table><tr><th>Size</th><th>L</th></tr><tr><td>FZA-Q 14x50 M10</td><td>58</td></tr><tr><td>FZA-Q 18x60 M12</td><td>74</td></tr><tr><td>FZA-Q 18x80 M12</td><td>94</td></tr></table>                                                                                                                                                                         |                                                                                                                                             |                                                                                                                  | Size | L | FZA-Q 14x50 M10 | 58 | FZA-Q 18x60 M12 | 74 | FZA-Q 18x80 M12 | 94 |
| Size                                      | L                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                             |                                                                                                                  |      |   |                 |    |                 |    |                 |    |
| FZA-Q 14x50 M10                           | 58                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                             |                                                                                                                  |      |   |                 |    |                 |    |                 |    |
| FZA-Q 18x60 M12                           | 74                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                             |                                                                                                                  |      |   |                 |    |                 |    |                 |    |
| FZA-Q 18x80 M12                           | 94                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                             |                                                                                                                  |      |   |                 |    |                 |    |                 |    |
| Optional                                  | <br>7<br>Filling of the annular gap | <p>The gap between bolt and fixture may be filled with mortar (compressive strength <math>\geq 50 \text{ N/mm}^2</math> 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 <math>t_{fix}</math>. Countersunk of the filling disc in direction to the anchor plate.</p> |                                                                                                                                             |                                                                                                                  |      |   |                 |    |                 |    |                 |    |
| (Fig. not to scale)                       |                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                             |                                                                                                                  |      |   |                 |    |                 |    |                 |    |
| fischer Zykon Anchor FZA-Q                |                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                             | Annex B 4<br><br>Appendix 8/ 13                                                                                  |      |   |                 |    |                 |    |                 |    |
| Intended Use<br>Installation instructions |                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                             |                                                                                                                  |      |   |                 |    |                 |    |                 |    |

**Table C1.1:** Characteristic **tension resistance** under static and quasi-static action

| Size                                    |                                 |                      | FZA-Q                                                                   |             |             |      |
|-----------------------------------------|---------------------------------|----------------------|-------------------------------------------------------------------------|-------------|-------------|------|
|                                         |                                 |                      | 14 x 50 M10                                                             | 18 x 60 M12 | 18 x 80 M12 |      |
| Steel failure                           |                                 |                      |                                                                         |             |             |      |
| Characteristic resistance               | N <sub>Rk,s</sub>               | [kN]                 | 40,7                                                                    | 60,1        |             |      |
| Partial factor for steel failure        | γ <sub>Ms</sub>                 | [-]                  | 1,5                                                                     |             |             |      |
| Modulus of elasticity                   | E <sub>s</sub>                  | [N/mm <sup>2</sup> ] | 210.000                                                                 |             |             |      |
| Pullout failure                         |                                 |                      |                                                                         |             |             |      |
| Characteristic resistance in C20/25     | cracked concrete                | N <sub>Rk,p</sub>    | [kN]                                                                    | 10,0        | 16,0        | 22,2 |
|                                         | uncracked concrete              |                      |                                                                         | 17,4        | 22,9        | 35,2 |
| Increasing factor for N <sub>Rk,p</sub> | ψ/c                             | [-]                  | (f <sub>ck</sub> / 20) <sup>0,5</sup>                                   |             |             |      |
| Installation safety factor              | γ <sub>inst</sub>               | [-]                  | 1,0                                                                     |             |             |      |
| Concrete cone and splitting failure     |                                 |                      |                                                                         |             |             |      |
| Effective embedment depth               | h <sub>ef</sub>                 | [mm]                 | 50                                                                      | 60          | 80          |      |
| Factor for cracked concrete             | k <sub>cr,N</sub>               | [-]                  | 7,7                                                                     |             |             |      |
| Factor for uncracked concrete           | k <sub>ucr,N</sub>              |                      | 11,0                                                                    |             |             |      |
| Characteristic spacing                  | s <sub>cr,N</sub>               | [mm]                 | 3 h <sub>ef</sub>                                                       |             |             |      |
| Characteristic edge distance            | c <sub>cr,N</sub>               |                      | 1,5 h <sub>ef</sub>                                                     |             |             |      |
| Characteristic spacing                  | s <sub>cr,sp</sub>              |                      | 3,5 h <sub>ef</sub>                                                     |             |             |      |
| Characteristic edge distance            | c <sub>cr,sp</sub>              |                      | 1,75 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>  $N^0_{Rk,c}$  according to EN 1992-4:2018

**Table C1.2:** Characteristic **shear resistance** under static and quasi-static action

| Size                                                     |               |      | FZA-Q       |             |             |
|----------------------------------------------------------|---------------|------|-------------|-------------|-------------|
|                                                          |               |      | 14 x 50 M10 | 18 x 60 M12 | 18 x 80 M12 |
| Steel failure without lever arm                          |               |      |             |             |             |
| Characteristic resistance                                | $V_{Rk,s}^0$  | [kN] | 20,4        | 33,7        |             |
| Partial factor for steel failure                         | $\gamma_{Ms}$ | [-]  | 1,25        |             |             |
| Factor for ductility                                     | $k_7$         |      | 1,0         |             |             |
| Steel failure with lever arm and concrete pryout failure |               |      |             |             |             |
| Characteristic bending resistance                        | $M_{Rk,s}^0$  | [Nm] | 60,0        | 105,0       |             |
| Partial factor for steel failure                         | $\gamma_{Ms}$ | [-]  | 1,25        |             |             |
| Factor for ductility                                     | $k_7$         |      | 1,0         |             |             |
| Factor for pryout failure                                | $k_8$         |      | 1,0         | 2,0         |             |
| Concrete edge failure                                    |               |      |             |             |             |
| Effective length in concrete                             | $l_f$         | [mm] | 50          | 60          | 80          |
| Effective diameter of fastener                           | $d_{nom}$     |      | 14          | 18          |             |

fischer Zykon Anchor FZA-Q

#### Performances

Characteristic tension resistance under static and quasi-static action  
Characteristic shear resistance under static and quasi-static action

**Annex C 1**

Appendix 9/ 13

**Table C2.1:** Minimum thickness of concrete members, minimum spacings and edge distances

| Size                                                                    |                              | FZA-Q       |                            |                                           |
|-------------------------------------------------------------------------|------------------------------|-------------|----------------------------|-------------------------------------------|
|                                                                         |                              | 14 x 50 M10 | 14 x 50 M10<br>18 x 60 M12 | 14 x 50 M10<br>18 x 60 M12<br>18 x 80 M12 |
| Minimum thickness of concrete member $h_{min}$ [mm]                     |                              | 100         | 120                        | 160                                       |
| Cracked concrete                                                        |                              |             |                            |                                           |
| Minimum                                                                 | spacing $s_{min}$ [mm]       | 120         | 120                        | 75                                        |
|                                                                         | edge distance $c_{min}$ [mm] | 100         | 100                        | 75                                        |
| Uncracked concrete                                                      |                              |             |                            |                                           |
| Minimum spacing                                                         | $s_{min}$ [mm]               | 120         | 100                        | 75                                        |
|                                                                         | for $c \geq$                 | 120         | 120                        | 90                                        |
| Minimum edge distance                                                   | $c_{min}$ [mm]               | 100         | 100                        | 90                                        |
|                                                                         | for $s \geq$                 | 180         | 160                        | 75                                        |
| Intermediate values for $s_{min}$ and $c_{min}$ by linear interpolation |                              |             |                            |                                           |
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**Table C3.1: Characteristic tension resistance under fire exposure**

| FZA-Q       | R30           |               |               | R60           |               |               |
|-------------|---------------|---------------|---------------|---------------|---------------|---------------|
|             | $N_{Rk,s,fi}$ | $N_{Rk,p,fi}$ | $N_{Rk,c,fi}$ | $N_{Rk,s,fi}$ | $N_{Rk,p,fi}$ | $N_{Rk,c,fi}$ |
| 14 x 50 M10 | 2,6           | 2,7           | 3,0           | 1,4           | 2,7           | 3,0           |
| 18 x 60 M12 | 8,4           | 4,0           | 4,8           | 4,2           | 4,0           | 4,8           |
| 18 x 80 M12 |               | 5,5           | 9,9           |               | 5,5           | 9,9           |

| FZA-Q       | R90           |               |               | R120          |               |               |
|-------------|---------------|---------------|---------------|---------------|---------------|---------------|
|             | $N_{Rk,s,fi}$ | $N_{Rk,p,fi}$ | $N_{Rk,c,fi}$ | $N_{Rk,s,fi}$ | $N_{Rk,p,fi}$ | $N_{Rk,c,fi}$ |
| 14 x 50 M10 | 1,0           | 2,7           | 3,0           | 0,8           | 2,1           | 2,4           |
| 18 x 60 M12 | 2,5           | 4,0           | 4,8           | 1,7           | 3,2           | 3,8           |
| 18 x 80 M12 |               | 5,5           | 9,9           |               | 4,4           | 7,9           |

**Table C3.2: Characteristic shear resistance under fire exposure**

| FZA-Q       | R30                |                      | R60                |                      |
|-------------|--------------------|----------------------|--------------------|----------------------|
|             | $V_{Rk,s,fi}$ [kN] | $M^0_{Rk,s,fi}$ [Nm] | $V_{Rk,s,fi}$ [kN] | $M^0_{Rk,s,fi}$ [Nm] |
| 14 x 50 M10 | 2,6                | 3,4                  | 1,4                | 1,8                  |
| 18 x 60 M12 | 8,4                | 13,1                 | 4,2                | 6,5                  |
| 18 x 80 M12 |                    |                      |                    |                      |

| FZA-Q       | R90                |                      | R120               |                      |
|-------------|--------------------|----------------------|--------------------|----------------------|
|             | $V_{Rk,s,fi}$ [kN] | $M^0_{Rk,s,fi}$ [Nm] | $V_{Rk,s,fi}$ [kN] | $M^0_{Rk,s,fi}$ [Nm] |
| 14 x 50 M10 | 1,0                | 1,3                  | 0,8                | 1,0                  |
| 18 x 60 M12 | 2,5                | 3,9                  | 1,7                | 2,6                  |
| 18 x 80 M12 |                    |                      |                    |                      |

**Table C3.3: Minimum spacings and minimum edge distances under fire exposure for tension and shear load**

| Size                       | FZA-Q                                                                                                 |             |             |
|----------------------------|-------------------------------------------------------------------------------------------------------|-------------|-------------|
|                            | 14 x 50 M10                                                                                           | 18 x 60 M12 | 18 x 80 M12 |
| Spacing $S_{min,fi}$       | $4 \cdot h_{ef}$                                                                                      |             |             |
| Edge distance $C_{min,fi}$ | $C_{min,fi} = 2 \cdot h_{ef}$ ,<br>for fire exposure from more than one side $C_{min,fi} \geq 300$ mm |             |             |

fischer Zykon Anchor FZA-Q

**Performances**

Characteristic resistance under fire exposure

**Annex C 3**

Appendix 11/ 13

**Table C4.1:** Characteristic values of **tension** and **shear resistance** under **seismic performance category C1**

| Size                                                          |                  |      | FZA-Q       |             |             |
|---------------------------------------------------------------|------------------|------|-------------|-------------|-------------|
|                                                               |                  |      | 14 x 50 M10 | 18 x 60 M12 | 18 x 80 M12 |
| Steel failure                                                 |                  |      |             |             |             |
| Characteristic resistance tension load C1                     | $N_{Rk,s,C1}$    | [kN] | 40,7        | 60,1        |             |
| Partial factor for steel failure                              | $\gamma_{Ms,C1}$ | [-]  | 1,5         |             |             |
| Pullout failure                                               |                  |      |             |             |             |
| Characteristic resistance tension load in cracked concrete C1 | $N_{Rk,p,C1}$    | [kN] | 10,0        | 16,0        | 22,0        |
| Installation sensitivity factor                               | $\gamma_{2,C1}$  | [-]  | 1,0         |             |             |
| Steel failure without lever arm                               |                  |      |             |             |             |
| Characteristic resistance shear load C1                       | $V_{Rk,s,C1}$    | [kN] | 15,9        | 30,3        |             |
| Partial factor for steel failure                              | $\gamma_{Ms,C1}$ | [-]  | 1,25        |             |             |

**Table C4.2:** Characteristic values of **tension** and **shear resistance** under **seismic performance category C2**

| Size                                                          |                  |      | FZA-Q       |             |             |
|---------------------------------------------------------------|------------------|------|-------------|-------------|-------------|
|                                                               |                  |      | 14 x 50 M10 | 18 x 60 M12 | 18 x 80 M12 |
| Steel failure                                                 |                  |      |             |             |             |
| Characteristic resistance tension load C2                     | $N_{Rk,s,C2}$    | [kN] | 40,7        | 60,1        |             |
| Partial factor for steel failure                              | $\gamma_{Ms,C2}$ | [-]  | 1,5         |             |             |
| Pullout failure                                               |                  |      |             |             |             |
| Characteristic resistance tension load in cracked concrete C2 | $N_{Rk,p,C2}$    | [kN] | 4,0         | 4,7         | 6,5         |
| Installation safety factor                                    | $\gamma_{2,C2}$  | [-]  | 1,0         |             |             |
| Steel failure without lever arm                               |                  |      |             |             |             |
| Characteristic resistance shear load C2                       | $V_{Rk,s,C2}$    | [kN] | 11,8        | 23,3        |             |
| Partial factor for steel failure                              | $\gamma_{Ms,C2}$ | [-]  | 1,25        |             |             |

**Table C4.3:** Annular gap for **seismic performance categories C1 and C2**

| $\Delta_{gap}$           |      |                    |      |      |      |      |      |             |
|--------------------------|------|--------------------|------|------|------|------|------|-------------|
| $\Delta_{gap} = d_f - d$ | [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

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**Performances**

Characteristic resistance under seismic performance categories C1 and C2

**Annex C 4**

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**Table C5.1: Displacements** under static and quasi-static **tension** loads

| Size                                      |                    |      | FZA-Q       |             |             |
|-------------------------------------------|--------------------|------|-------------|-------------|-------------|
|                                           |                    |      | 14 x 50 M10 | 18 x 60 M12 | 18 x 80 M12 |
| Tension load in cracked concrete C20/25   | N                  | [kN] | 5,1         | 10,5        |             |
| Displacements                             | $\delta_{N0}$      | [mm] | 0,4         | 0,8         |             |
|                                           | $\delta_{N\infty}$ |      | 0,9         | 1,7         |             |
| Tension load in uncracked concrete C20/25 | N                  | [kN] | 12,2        | 16,2        |             |
| Displacements                             | $\delta_{N0}$      | [mm] | 0,9         | 1,0         |             |
|                                           | $\delta_{N\infty}$ |      | 1,5         | 1,7         |             |

**Table C5.2: Displacements** under static and quasi-static **shear** loads

| Size                                                |                    |      | FZA-Q       |             |             |
|-----------------------------------------------------|--------------------|------|-------------|-------------|-------------|
|                                                     |                    |      | 14 x 50 M10 | 18 x 60 M12 | 18 x 80 M12 |
| Shear load in cracked and uncracked concrete C20/25 | V                  | [kN] | 9,5         | 19,3        |             |
| Displacements                                       | $\delta_{V0}$      | [mm] | 0,9         | 2,1         |             |
|                                                     | $\delta_{V\infty}$ |      | 1,6         | 3,1         |             |

**Table C5.3: Displacements** under **tension** loads for **seismic performance category C2**

| Size         |     |                 | FZA-Q       |             |             |
|--------------|-----|-----------------|-------------|-------------|-------------|
|              |     |                 | 14 x 50 M10 | 18 x 60 M12 | 18 x 80 M12 |
| Displacement | DLS | $\delta_{N,C2}$ | 3,2         | 4,0         |             |
|              | ULS | $\delta_{N,C2}$ |             | 12,9        |             |

**Table C5.4: Displacements** under **shear** loads for **seismic performance category C2**

| Size         |     |                 | FZA-Q       |             |             |
|--------------|-----|-----------------|-------------|-------------|-------------|
|              |     |                 | 14 x 50 M10 | 18 x 60 M12 | 18 x 80 M12 |
| Displacement | DLS | $\delta_{V,C2}$ | 3,6         | 4,6         | 4,6         |
|              | ULS | $\delta_{V,C2}$ |             | 6,8         | 6,6         |

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**Performances**

Displacement under tension and shear loads

**Annex C 5**

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