

## DICHIARAZIONE DI PRESTAZIONE

### DoP 0166

per ancorante fischer Zykon- Anchor FZA-Q (ancorante meccanico per l'utilizzo nel calcestruzzo)

IT

|                                                                                           |                                                                                                                                   |                 |                             |
|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------|
| 1. <u>Codice di identificazione unico del prodotto-tipo:</u>                              | <b>DoP 0166</b>                                                                                                                   |                 |                             |
| 2. <u>Usi previsti:</u>                                                                   | <b>Fissaggio post-installato in calcestruzzo fessurato o non fessurato. Vedi appendice, in particolare gli allegati da B1- B4</b> |                 |                             |
| 3. <u>Fabbricante:</u>                                                                    | <b>fischerwerke GmbH &amp; Co. KG, Klaus-Fischer-Str. 1, 72178 Waldachtal, Germany</b>                                            |                 |                             |
| 4. <u>Mandatario:</u>                                                                     | —                                                                                                                                 |                 |                             |
| 5. <u>Sistemi di VVCP:</u>                                                                | <b>1</b>                                                                                                                          |                 |                             |
| 6. <u>Documento per la valutazione europea:</u>                                           | <b>EAD 330232-01-0601, (Edition 12/ 2019)</b>                                                                                     |                 |                             |
| Valutazione tecnica europea:                                                              | <b>ETA-16/0338; 2020-03-30</b>                                                                                                    |                 |                             |
| Organismo di valutazione tecnica:                                                         | <b>DIBt- Deutsches Institut für Bautechnik</b>                                                                                    |                 |                             |
| Organismi notificati:                                                                     | <b>1343 MPA Darmstadt / 2873 TU Darmstadt</b>                                                                                     |                 |                             |
| 7. <u>Prestazioni dichiarate:</u>                                                         |                                                                                                                                   |                 |                             |
| <b>Resistenza meccanica e stabilità (BWR 1)</b>                                           |                                                                                                                                   |                 |                             |
| Resistenza caratteristica al carico di tensione (carico statico e quasi-statico):         | Resistenza alla rottura dell'acciaio:                                                                                             | Allegato C1     | $E_s = 210\,000\text{ MPa}$ |
|                                                                                           | Resistenza alla rottura per sfilamento:                                                                                           | Allegato C1     |                             |
|                                                                                           | Resistenza alla rottura del cono di calcestruzzo:                                                                                 | Allegato C1     |                             |
|                                                                                           | Robustezza:                                                                                                                       | Allegato C1     |                             |
|                                                                                           | Distanza dal bordo e interassi minimi:                                                                                            | Allegato C2     |                             |
|                                                                                           | Distanza dal bordo per evitare lo splitting sotto carico:                                                                         | Allegato C1     |                             |
| Resistenza caratteristica al carico di taglio (carico statico e quasi statico), metodo A: | Resistenza alla rottura dell'acciaio (carico di taglio):                                                                          | Allegato C1     |                             |
|                                                                                           | Resistenza alla rottura per pry-out:                                                                                              | Allegato C1     |                             |
| Resistenza e spostamenti caratteristici per le categorie di prestazione sismica C1 e C2   | Resistenza al carico di trazione, spostamenti, categoria C1:                                                                      | Allegato C4     |                             |
|                                                                                           | Resistenza al carico di trazione, spostamenti, categoria C2:                                                                      | Allegati C4, C5 |                             |
|                                                                                           | Resistenza al carico di taglio, spostamenti, categoria C1:                                                                        | Allegato C4     |                             |
|                                                                                           | Resistenza al carico di taglio, spostamenti, categoria C2:                                                                        | Allegati C3, C5 |                             |
|                                                                                           | Fattore spazio anulare:                                                                                                           | Allegato C4     |                             |
| Resistenza caratteristica per una progettazione semplificata:                             | Metodo B:                                                                                                                         | NPD             |                             |
|                                                                                           | Metodo C:                                                                                                                         | NPD             |                             |
| Spostamenti e Durabilità:                                                                 | Spostamenti sotto azioni statiche e quasi statiche:                                                                               | Allegato C5     |                             |
|                                                                                           | Durabilità:                                                                                                                       | Allegati A2, B1 |                             |
| <b>Sicurezza in caso di incendio (BWR 2)</b>                                              |                                                                                                                                   |                 |                             |
| Reazione al fuoco:                                                                        | Classe (A1)                                                                                                                       |                 |                             |
| Resistenza al fuoco:                                                                      | Resistenza al fuoco alla rottura dell'acciaio (carico)                                                                            | Allegato C3     |                             |
|                                                                                           | Resistenza al fuoco alla rottura per sfilamento                                                                                   | Allegato C3     |                             |
|                                                                                           | Resistenza al fuoco alla rottura dell'acciaio (carico)                                                                            | Allegato C3     |                             |



8. Documentazione tecnica appropriata e/o  
documentazione tecnica specifica:

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La prestazione del prodotto sopra identificato è conforme all'insieme delle prestazioni dichiarate. La presente dichiarazione di prestazione è emessa, in conformità al regolamento (UE) n. 305/2011, sotto la sola responsabilità del fabbricante sopra identificato.

Firmato a nome e per conto del fabbricante da:

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

Peter Schillinger, Dipl.-Ing.

Questa Dichiarazione di Prestazione (DoP) è stata preparata in varie lingue. In caso di contestazioni sull'interpretazione, prevarrà sempre la versione inglese.

L'Appendice include informazioni volontarie e complementari in lingua inglese che superano i requisiti di legge (lingua specificata in modo neutrale).

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 |

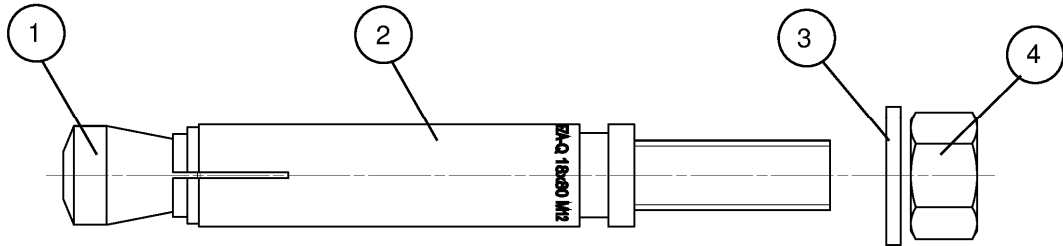
3.2 Safety in case of fire (BWR 2)

| 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

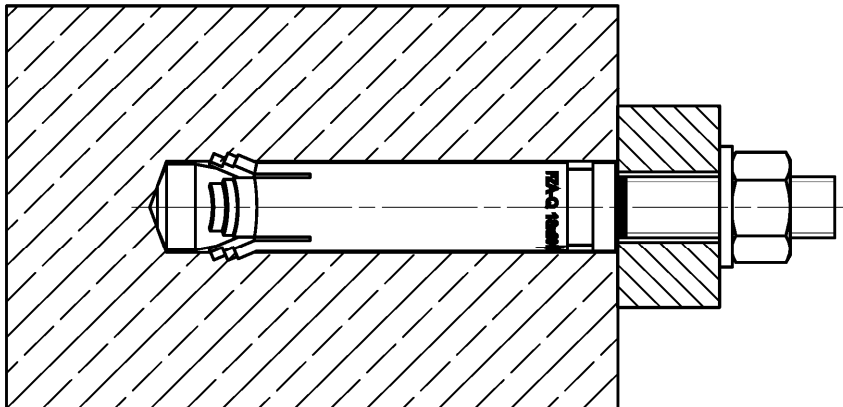
In accordance with the European Assessment Document EAD 330232-01-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1



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

### Installed condition



(Fig. not to scale)

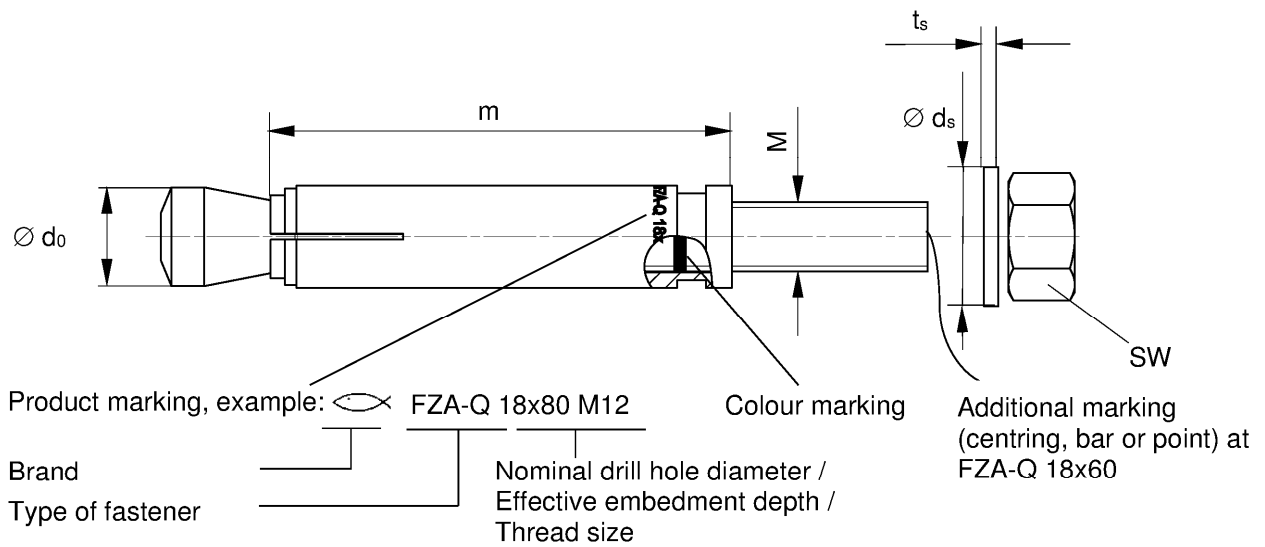
fischer Zykon Anchor FZA-Q

**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          |             |
| ts                | 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

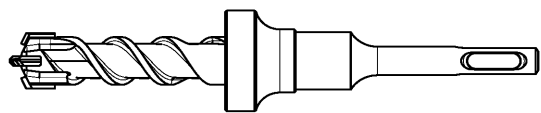
Product marking, dimensions and materials

## Annex A 2

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**Tools**

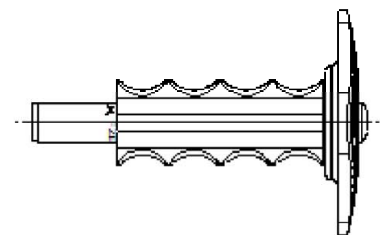
**Drill bit FZBB**



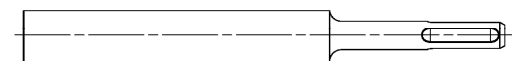
**Standard drill bit**



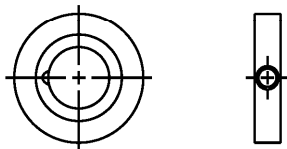
**Setting tool FZE**



**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**

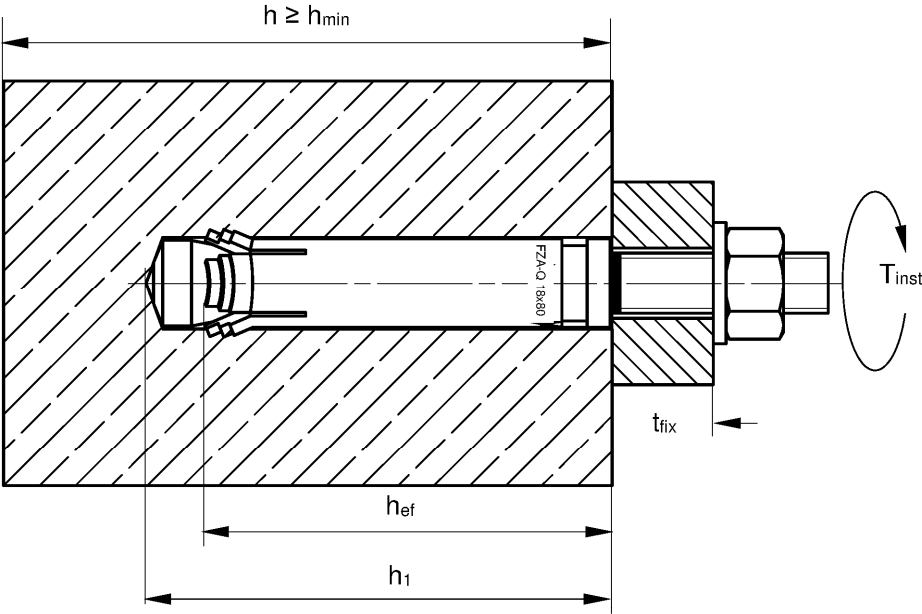
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Installation parameters

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

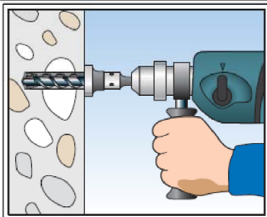
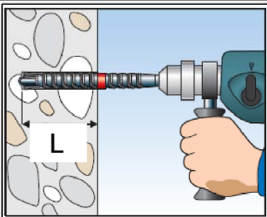
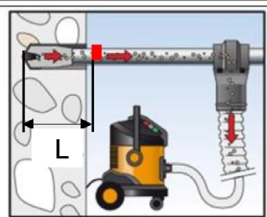
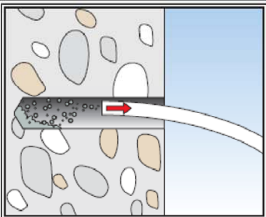
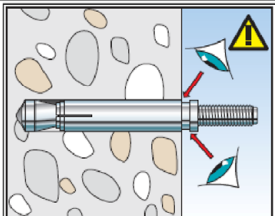
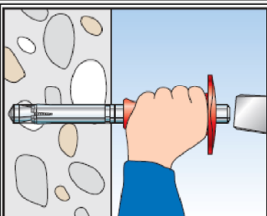
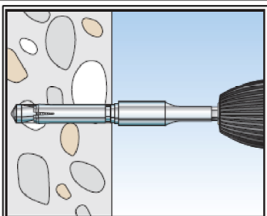
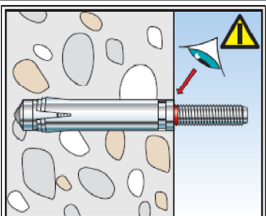
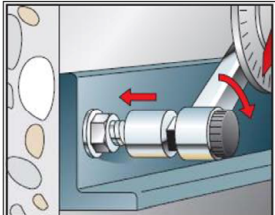
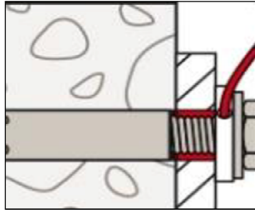
Intended Use  
Installation parameters

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                           | <div></div> <div>1a<br/>Stop drill FZBB</div>             | <div></div> <div>1b<br/>Hammer drill</div>                                                                                                                                                                                                                                                                                        | <div></div> <div>1c (next step: 3)<br/>Drill the hole with hollow drill</div> | <div></div> <div>2<br/>Clean drill hole</div>     |      |   |                 |    |                 |    |                 |    |
| Set fastener                              | <div></div> <div>3<br/>Check drill depth</div>            | <div></div> <div>4a<br/>Hand-setting</div>                                                                                                                                                                                                                                                                                        | <div></div> <div>4b<br/>Machine-setting</div>                                 | <div></div> <div>5<br/>Check control colour</div> |      |   |                 |    |                 |    |                 |    |
| Installation torque / marking length      | <div></div> <div>6<br/>Apply <math>T_{inst}</math></div>  | <div>1b / 1c – marking length / stop length:</div> <table><tr><td>Size</td><td>L</td></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                                  | <div></div> <div>7<br/>Filling of the annular gap</div> | <div>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.</div> |                                                                                                                                                                 |                                                                                                                                      |      |   |                 |    |                 |    |                 |    |
| <div>(Fig. not to scale)</div>            |                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                 |                                                                                                                                      |      |   |                 |    |                 |    |                 |    |
| 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        |
|                                         | uncracked concrete              |                      |                                                                         | 22,2        |             |
|                                         |                                 |                      | 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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