



## PROHLÁŠENÍ O VLASTNOSTECH



DoP: 0094

pro injektážní systém FIS V (Lepená kotva pro použití v betonu)– CS

1. Jedinečný identifikační kód typu výrobku: **DoP: 0094**
2. Zamýšlené/zamýšlená použití: **Dodatečné upevnění v tažené a tlačené zóně betonu, viz. doplněk, obzvláště Přílohy B 1 - B 10**
3. Výrobce: **fischerwerke GmbH & Co. KG, Otto-Hahn-Straße 15, 79211 Denzlingen, Německo**
4. Zplnomocněný zástupce: --
5. Systém/systémy POSV: **1**
6. Evropský dokument pro posuzování: **ETAG 001; 2013-04**  
Evropské technické posouzení: **ETA-02/0024; 2017-02-13**  
Subjekt pro technické posuzování: **DIBt**  
Oznámený subjekt/oznámené subjekty: **1343 – MPA Darmstadt**
7. Deklarovaná vlastnost/Deklarované vlastnosti:

### **Mechanická odolnost a stabilita (BWR 1), Bezpečnost při použití (BWR 4)**

- Charakteristické hodnoty pod statickým a quasi-statickým namáháním, Posuny: Viz. doplněk, obzvláště Přílohy C 1 - C 9
- Charakteristická únosnost při seismické kategorii C1 a C2, Posuny: Viz. doplněk, obzvláště Přílohy C 10 - C 12

### **Bezpečnost v případě požáru (BWR 2)**

- Odolnost proti ohni: Kotvení splňuje požadavky Třídy A 1
- Požární odolnost: VNS

8. Příslušná technická dokumentace a/nebo specifická technická dokumentace: ---

Vlastnosti výše uvedeného výrobku jsou ve shodě se souborem deklarovaných vlastností. Toto prohlášení o vlastnostech se v souladu s nařízením (EU) č. 305/2011 vydává na výhradní odpovědnost výrobce uvedeného výše.

Podepsáno za výrobce a jeho jménem:

Andreas Bucher, Dipl.-Ing.

Wolfgang Hengesbach, Dipl.-Ing., Dipl.-Wirtsch.-Ing.

Tumlingen, 2017-02-20

- Toto PoV bylo připraveno v různých jazykových mutacích.. V případě rozporu vždy rozhoduje interpretace verze v anglickém jazyce.
- Příloha obsahuje nepovinné a doplňkové informace v anglickém jazyce na rámec zákonných požadavků.

## Specific Part

### 1 Technical description of the product

The injection system fischer FIS V is a bonded anchor consisting of a cartridge with injection mortar fischer FIS V and a steel element.

The steel element is placed into a drilled hole filled with injection mortar and is anchored via the bond between metal part, injection mortar and concrete.

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 values for static and quasi-static action, displacements           | See Annex C 1 to C 9   |
| Characteristic values for seismic performance categories C1 and C2, displacements | See Annex C 10 to C 12 |

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

| Essential characteristic | Performance                                 |
|--------------------------|---------------------------------------------|
| Reaction to fire         | Anchorage satisfy requirements for Class A1 |
| Resistance to fire       | No performance assessed                     |

#### 3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances there may be requirements (e.g. transposed European legislation and national laws, regulations and administrative provisions) applicable to the products falling within the scope of this European Technical Assessment. In order to meet the provisions of Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.

#### 3.4 Safety in use (BWR 4)

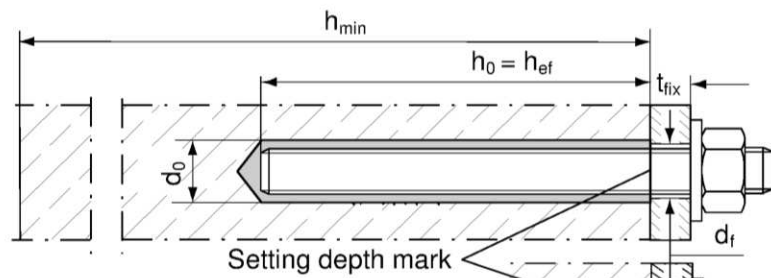
The essential characteristics regarding Safety in use are included under the Basic Works Requirement Mechanical resistance and stability.

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

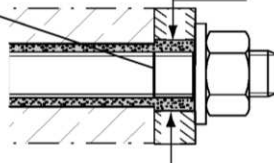
In accordance with guideline for European technical approval ETAG 001, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

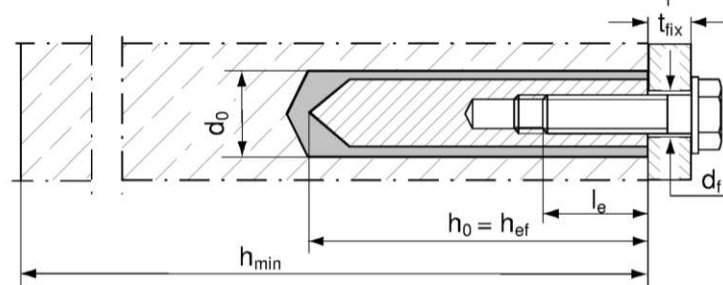
## Installation conditions



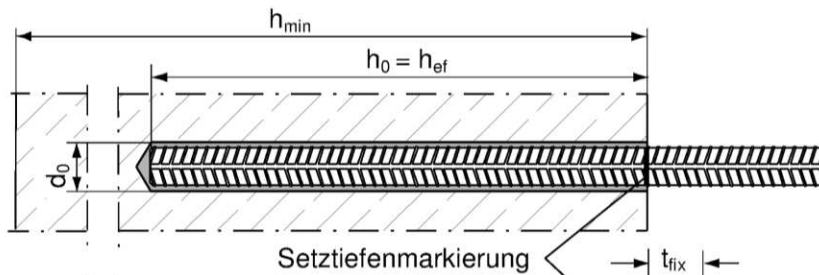
**Anchor rod**  
Pre-positioned anchor



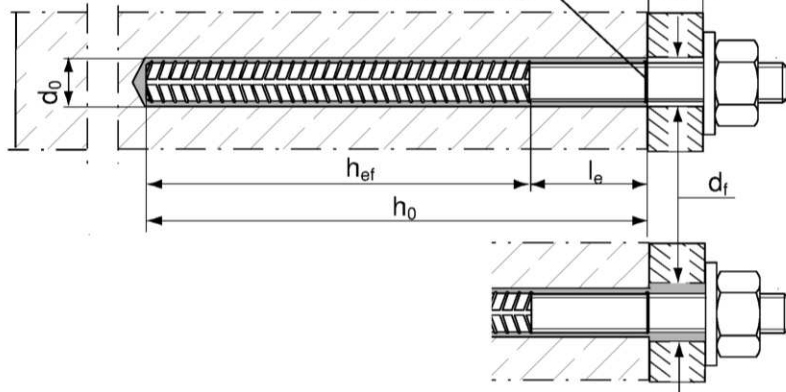
**Anchor rod**  
Push through anchor  
(annular gap filled with mortar)



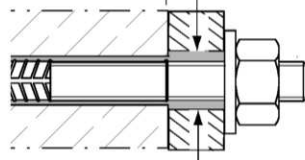
**fischer**  
**internal threaded anchor RG MI**  
Pre-positioned anchor only



**Reinforcing bar**



**fischer rebar anchor FRA**  
Pre-positioned anchor



**fischer rebar anchor FRA**  
Push through anchor  
(annular gap filled with mortar)

fischer injection system FIS V

**Product description**  
Installation conditions

**Annex A 1**

|                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Extension tube</p> <p>Static mixer FIS MR or FIS ME</p>                                                                                                                                                                                   | <p><b>Shuttle cartridge sizes</b><br/>(345 ml, 360 ml, 390 ml, 550 ml, 950 ml, 1100 ml, 1500 ml)</p> <p><b>Imprint:</b> fischer FIS V or FIS VW High Speed or FIS VS Low Speed, processing notes, shelf-life, piston travel scale, curing times and processing times (depending on temperature), hazard code, size, volume</p> <p><b>Coaxial cartridge sizes</b><br/>(100 ml, 150 ml, 300 ml, 380 ml, 400 ml, 410 ml)</p> <p><b>Imprint:</b> fischer FIS V or FIS VW High Speed or FIS VS Low Speed, processing notes, shelf-life, piston travel scale, curing times and processing times (depending on temperature), hazard code, size, volume</p> <p>Sealing cap</p> <p>Injection-adapter</p> |
| <p><b>Anchor rod</b><br/>Size: M6, M8, M10, M12, M16, M20, M24, M27, M30</p>                                                                                                                                                                 | <p>Washer</p> <p>Hexagon nut</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p><b>fischer internal threaded anchor RG MI</b><br/>Size: M8, M10, M12, M16, M20</p>                                                                                                                                                        | <p>Screw</p> <p>Threaded rod</p> <p>Washer</p> <p>Hexagon nut</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p><b>Reinforcing bar</b><br/>Nominal diameter of the bar: <math>\phi 8</math>, <math>\phi 10</math>, <math>\phi 12</math>, <math>\phi 14</math>, <math>\phi 16</math>, <math>\phi 20</math>, <math>\phi 25</math>, <math>\phi 28</math></p> | <p>Setting depth mark</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <p><b>fischer rebar anchor FRA</b><br/>Size: M12, M16, M20, M24</p>                                                                                                                                                                          | <p>Setting depth mark</p> <p>Washer</p> <p>Hexagon nut</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| fischer injection system FIS V                                                                                                                                                                                                               | Annex A 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <p><b>Product description</b><br/>Cartridges / Static mixer / Steel elements</p>                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**Table A1: Materials**

| Part                             | Designation                                                                                               | Material                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                   |                                                                                                                                                                                                                               |
|----------------------------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                                | Mortar cartridge                                                                                          | Mortar, hardener, filler                                                                                                                                                                                                                 |                                                                                                                                                                                                                                   |                                                                                                                                                                                                                               |
|                                  | Steel grade                                                                                               | Steel, zinc plated                                                                                                                                                                                                                       | Stainless steel A4                                                                                                                                                                                                                | High corrosion resistant steel C                                                                                                                                                                                              |
| 2                                | Anchor rod                                                                                                | Property class 5.8 or 8.8;<br>EN ISO 898-1:2013<br>zinc plated $\geq 5 \mu\text{m}$ ,<br>EN ISO 4042:1999 A2K<br>or hot-dip galvanised<br>EN ISO 10684:2004<br>$f_{uk} \leq 1000 \text{ N/mm}^2$<br>$A_5 > 12 \%$<br>fracture elongation | Property class 50, 70 or 80<br>EN ISO 3506-1:2009<br>1.4401; 1.4404; 1.4578;<br>1.4571; 1.4439; 1.4362;<br>1.4062, 1.4662, 1.4462<br>EN 10088-1:2014<br>$f_{uk} \leq 1000 \text{ N/mm}^2$<br>$A_5 > 12 \%$<br>fracture elongation | Property class 50 or 80<br>EN ISO 3506-1:2009<br>or property class 70 with<br>$f_{yk} = 560 \text{ N/mm}^2$<br>1.4565; 1.4529<br>EN 10088-1:2014<br>$f_{uk} \leq 1000 \text{ N/mm}^2$<br>$A_5 > 12 \%$<br>fracture elongation |
|                                  |                                                                                                           | Fracture elongation $A_5 > 8 \%$ , for applications without requirements for seismic performance category C2                                                                                                                             |                                                                                                                                                                                                                                   |                                                                                                                                                                                                                               |
| 3                                | Washer<br>ISO 7089:2000                                                                                   | zinc plated $\geq 5 \mu\text{m}$ ,<br>EN ISO 4042:1999 A2K<br>or hot-dip galvanised<br>EN ISO 10684:2004                                                                                                                                 | 1.4401; 1.4404;<br>1.4578;1.4571; 1.4439;<br>1.4362<br>EN 10088-1:2014                                                                                                                                                            | 1.4565;1.4529<br>EN 10088-1:2014                                                                                                                                                                                              |
| 4                                | Hexagon nut                                                                                               | Property class 5 or 8;<br>EN ISO 898-2:2012<br>zinc plated $\geq 5 \mu\text{m}$ ,<br>ISO 4042:1999 A2K<br>or hot-dip galvanised<br>EN ISO 10684:2004                                                                                     | Property class 50, 70 or 80<br>EN ISO 3506-1:2009<br>1.4401; 1.4404; 1.4578;<br>1.4571; 1.4439; 1.4362<br>EN 10088-1:2014                                                                                                         | Property class 50, 70 or 80<br>EN ISO 3506-1:2009<br>1.4565; 1.4529<br>EN 10088-1:2014                                                                                                                                        |
| 5                                | fischer<br>internal threaded<br>anchor RG MI                                                              | Property class 5.8<br>ISO 898-1:2013<br>zinc plated $\geq 5 \mu\text{m}$ ,<br>ISO 4042:1999 A2K                                                                                                                                          | Property class 70<br>EN ISO 3506-1:2009<br>1.4401; 1.4404; 1.4578;<br>1.4571; 1.4439; 1.4362<br>EN 10088-1:2014                                                                                                                   | Property class 70<br>EN ISO 3506-1:2009<br>1.4565; 1.4529<br>EN 10088-1:2014                                                                                                                                                  |
| 6                                | Commercial standard<br>screw or anchor /<br>threaded rod for fischer<br>internal threaded<br>anchor RG MI | Property class 5.8 or 8.8;<br>EN ISO 898-1:2013<br>zinc plated $\geq 5 \mu\text{m}$ ,<br>ISO 4042:1999 A2K<br>fracture elongation<br>$A_5 > 8 \%$                                                                                        | Property class 70<br>EN ISO 3506-1:2009<br>1.4401; 1.4404; 1.4578;<br>1.4571; 1.4439; 1.4362<br>EN 10088-1:2014<br>fracture elongation<br>$A_5 > 8 \%$                                                                            | Property class 70<br>EN ISO 3506-1:2009<br>1.4565; 1.4529<br>EN 10088-1:2014<br>fracture elongation<br>$A_5 > 8 \%$                                                                                                           |
| 7                                | Reinforcing bar<br>EN 1992-1-1:2004 and<br>AC:2010, Annex C                                               | Bars and de-coiled rods, class B or C with<br>$f_{yk}$ and $k$ according to NDP or NCL of EN 1992-1-1:2004+AC:2010<br>$f_{uk} = f_{tk} = k \cdot f_{yk}$                                                                                 |                                                                                                                                                                                                                                   |                                                                                                                                                                                                                               |
| 8                                | fischer<br>rebar anchor FRA                                                                               | Rebar part:<br>Bars and de-coiled rods class B or C<br>with $f_{yk}$ and $k$ according to NDP or NCL<br>of EN 1992-1-1:2004+AC:2010<br>$f_{uk} = f_{tk} = k \cdot f_{yk}$                                                                | Threaded part:<br>Property class 70 or 80<br>EN ISO 3506-1:2009<br>1.4565; 1.4529, 1.4401, 1.4404, 1.4571,<br>1.4578, 1.4439, 1.4362, 1.4062<br>EN 10088-1:2014                                                                   |                                                                                                                                                                                                                               |
| fischer injection system FIS V   |                                                                                                           |                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                   | Annex A 3                                                                                                                                                                                                                     |
| Product description<br>Materials |                                                                                                           |                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                   |                                                                                                                                                                                                                               |

**Specifications of intended use (part 1)****Table B1:** Overview use and performance categories

| Anchorages subject to                                                                                 |                         | FIS V with ...                                                                                   |                               |                                                                                   |                               |                                                                                     |                               |                                                                                     |                               |
|-------------------------------------------------------------------------------------------------------|-------------------------|--------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------|-------------------------------|
|                                                                                                       |                         | Anchor rod                                                                                       |                               | fischer<br>internal threaded<br>anchor RG MI                                      |                               | Reinforcing bar                                                                     |                               | fischer<br>rebar anchor<br>FRA                                                      |                               |
|                                                                                                       |                         |                 |                               |  |                               |  |                               |  |                               |
| Hammer drilling<br>with standard<br>drill bit                                                         |                         | all sizes                                                                                        |                               |                                                                                   |                               |                                                                                     |                               |                                                                                     |                               |
| Hammer drilling<br>with hollow drill<br>bit (Heller<br>"Duster Expert"<br>or Hilti "TE-CD,<br>TE-YD") |                         | Nominal drill bit diameter (d <sub>0</sub> ) 12 mm to 35 mm                                      |                               |                                                                                   |                               |                                                                                     |                               |                                                                                     |                               |
| Static and quasi<br>static load, in                                                                   | uncracked<br>concrete   | all sizes                                                                                        | Tables:<br>C1, C5,<br>C6, C10 | all sizes                                                                         | Tables:<br>C2, C5,<br>C7, C11 | all sizes                                                                           | Tables:<br>C3, C5,<br>C8, C12 | all sizes                                                                           | Tables:<br>C4, C5,<br>C9, C13 |
|                                                                                                       | cracked<br>concrete     | M10 to<br>M30                                                                                    |                               | not<br>assessed                                                                   |                               | ϕ10 bis<br>ϕ28                                                                      |                               |                                                                                     |                               |
| Seismic<br>performance<br>category (only<br>hammer drilling<br>with Standard /<br>hollow drill bits)  | C1 <sup>1)</sup>        | M10<br>to<br>M30                                                                                 | Tables:<br>C14,<br>C15, C16   | ---                                                                               |                               | ---                                                                                 |                               | ---                                                                                 |                               |
|                                                                                                       | C2 <sup>1)</sup>        | M12,<br>M16,<br>M20                                                                              | Tables:<br>C14,<br>C15, C17   |                                                                                   |                               |                                                                                     |                               |                                                                                     |                               |
| Use category                                                                                          | dry or wet<br>concrete  | all sizes                                                                                        |                               |                                                                                   |                               |                                                                                     |                               |                                                                                     |                               |
|                                                                                                       | flooded hole            | M12 to M30                                                                                       | all sizes                     |                                                                                   | not assessed                  |                                                                                     | not assessed                  |                                                                                     |                               |
| Installation<br>temperature                                                                           |                         | -10 °C to +40 °C                                                                                 |                               |                                                                                   |                               |                                                                                     |                               |                                                                                     |                               |
| In-service<br>temperature                                                                             | Temperature<br>range I  | -40 °C to +80 °C (max. long term temperature +50 °C and<br>max. short term temperature +80 °C)   |                               |                                                                                   |                               |                                                                                     |                               |                                                                                     |                               |
|                                                                                                       | Temperature<br>range II | -40 °C to +120 °C (max. long term temperature +72 °C and<br>max. short term temperature +120 °C) |                               |                                                                                   |                               |                                                                                     |                               |                                                                                     |                               |

<sup>1)</sup> Not for FIS VW High Speed and FIS VS Low Speed

fischer injection system FIS V

**Intended Use**  
Specifications (part 1)

**Annex B 1**

## Specifications of intended use (part 2)

### Base materials:

- Reinforced or unreinforced normal weight concrete Strength classes C20/25 to C50/60 according to EN 206-1:2000

### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (zinc coated steel, stainless steel or high corrosion resistant steel)
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel or high corrosion resistant steel)
- Structures subject to external atmospheric exposure, to permanently damp internal conditions or in other particular aggressive conditions (high corrosion resistant steel)

Note: Particular aggressive conditions are e. g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e. g. in desulphurization plants or road tunnels where de-icing materials are used)

### Design:

- Anchorage have to be designed by a responsible engineer with experience of concrete anchor design
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e. g. position of the anchor relative to reinforcement or to supports, etc.)
- Anchorage under static or quasi-static actions are designed in accordance with EOTA Technical Report TR 029 "Design of bonded anchors" Edition September 2010 or CEN/TS 1992-4:2009
- Anchorage under seismic actions (cracked concrete) have to be designed in accordance with:
  - EOTA Technical Report TR 045 "Design of Metal Anchors under Seismic Action", Edition February 2013
  - Anchorage shall be positioned outside of critical regions (e. g. plastic hinges) of the concrete structure
  - Fastenings in stand-off installation or with a grout layer are not allowed

### Installation:

- Anchor installation is to be carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- In case of aborted hole: The hole shall be filled with mortar
- Anchorage depth should be marked and adhered to on installation
- Overhead installation is allowed

fischer injection system FIS V

**Intended Use**  
Specifications (part 2)

**Annex B 2**

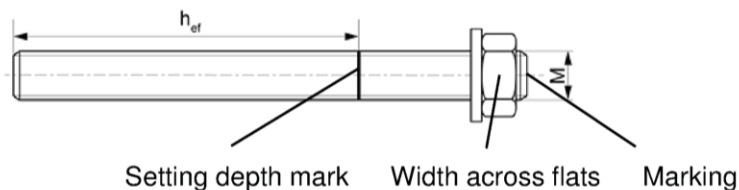
**Table B2:** Installation parameters for anchor rods

| Size                                                    |                                   | M6                              | M8  | M10 | M12 | M16             | M20 | M24 | M27 | M30 |
|---------------------------------------------------------|-----------------------------------|---------------------------------|-----|-----|-----|-----------------|-----|-----|-----|-----|
| Width across flats                                      | SW                                | 10                              | 13  | 17  | 19  | 24              | 30  | 36  | 41  | 46  |
| Nominal drill bit diameter                              | $d_0$                             | 8                               | 10  | 12  | 14  | 18              | 24  | 28  | 30  | 35  |
| Drill hole depth                                        | $h_0$                             | $h_0 = h_{ef}$                  |     |     |     |                 |     |     |     |     |
| Effective anchorage depth                               | $h_{ef,min}$                      | 50                              | 60  | 60  | 70  | 80              | 90  | 96  | 108 | 120 |
|                                                         | $h_{ef,max}$                      | 72                              | 160 | 200 | 240 | 320             | 400 | 480 | 540 | 600 |
| Minimum spacing and minimum edge distance               | $s_{min} = c_{min}$               | 40                              | 40  | 45  | 55  | 65              | 85  | 105 | 125 | 140 |
| Diameter of clearance hole in the fixture <sup>1)</sup> | pre-positioned anchorage<br>$d_f$ | 7                               | 9   | 12  | 14  | 18              | 22  | 26  | 30  | 33  |
|                                                         | push through anchorage<br>$d_f$   | 9                               | 11  | 14  | 16  | 20              | 26  | 30  | 32  | 40  |
| Minimum thickness of concrete member                    | $h_{min}$                         | $h_{ef} + 30$<br>( $\geq 100$ ) |     |     |     | $h_{ef} + 2d_0$ |     |     |     |     |
| Maximum installation torque                             | $T_{inst,max}$ [Nm]               | 5                               | 10  | 20  | 40  | 60              | 120 | 150 | 200 | 300 |

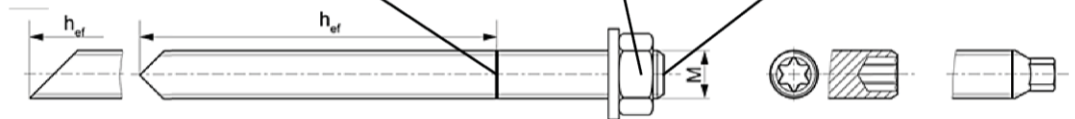
<sup>1)</sup> For larger clearance holes in the fixture see TR 029, 4.2.2.1 or CEN/TS 1992-4-1:2009, 5.2.3.1

### Anchor rods:

**fischer  
FIS A**



**fischer  
RG M**



### Marking (on random place) fischer anchor rod:

Property class 8.8, stainless steel, property class 80 or high corrosion resistant steel, property class 80: •  
Stainless steel A4, property class 50 and high corrosion resistant steel, property class 50: ••  
Or colour coding according to DIN 976-1

### Commercial standard threaded rods, washers and hexagon nuts may also be used if the following requirements are fulfilled:

- Materials, dimensions and mechanical properties according Annex A 3, Table A1
- Inspection certificate 3.1 according to EN 10204:2004, the documents have to be stored
- Setting depth is marked

fischer injection system FIS V

**Intended Use**  
Installation parameters anchor rods

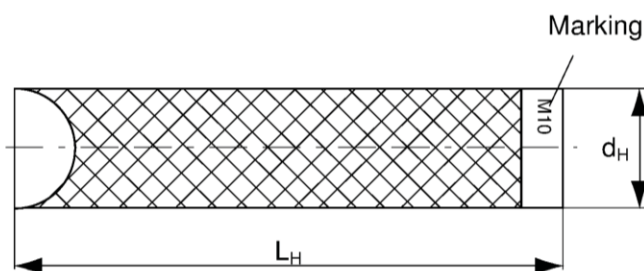
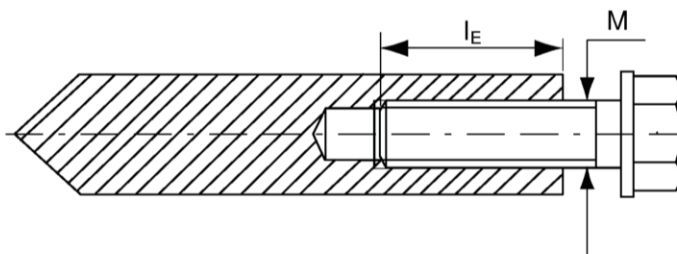
**Annex B 3**

**Table B3:** Installation parameters for fischer internal threaded anchors RG MI

| Size                                                       |                             | M8             | M10 | M12 | M16 | M20 |
|------------------------------------------------------------|-----------------------------|----------------|-----|-----|-----|-----|
| Diameter of anchor                                         | $d_H$                       | 12             | 16  | 18  | 22  | 28  |
| Nominal drill bit diameter                                 | $d_0$                       | 14             | 18  | 20  | 24  | 32  |
| Drill hole depth                                           | $h_0$                       | $h_0 = h_{ef}$ |     |     |     |     |
| Effective anchorage depth<br>( $h_{ef} = L_H$ )            | $h_{ef}$                    | 90             | 90  | 125 | 160 | 200 |
| Minimum spacing and<br>minimum edge distance               | $s_{min}$<br>=<br>$c_{min}$ | 55             | 65  | 75  | 95  | 125 |
| Diameter of clearance hole in<br>the fixture <sup>1)</sup> | $d_f$                       | 9              | 12  | 14  | 18  | 22  |
| Minimum thickness<br>of concrete member                    | $h_{min}$                   | 120            | 125 | 165 | 205 | 260 |
| Maximum screw-in depth                                     | $l_{E,max}$                 | 18             | 23  | 26  | 35  | 45  |
| Minimum screw-in depth                                     | $l_{E,min}$                 | 8              | 10  | 12  | 16  | 20  |
| Maximum<br>installation torque                             | $T_{inst,max}$ [Nm]         | 10             | 20  | 40  | 80  | 120 |

<sup>1)</sup> For larger clearance holes in the fixture see TR 029, 4.2.2.1 or CEN/TS 1992-4-1:2009, 5.2.3.1

### fischer internal threaded anchor RG MI



**Marking:** Anchor size  
e. g.: **M10**

Stainless steel additional **A4**  
e. g.: **M10 A4**

High corrosion resistant steel  
additional **C**  
e. g.: **M10 C**

Retaining bolt or threaded rods (including nut and washer) must comply with the appropriate material and strength class of Annex A 3, Table A1

fischer injection system FIS V

#### Intended Use

Installation parameters fischer internal threaded anchors RG MI

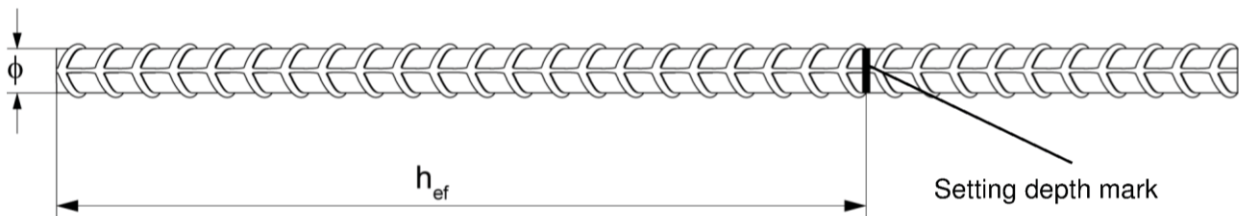
**Annex B 4**

**Table B4:** Installation parameters for reinforcing bars

| Nominal diameter of the bar $\phi$        |                                 | 8 <sup>1)</sup>                 |     | 10 <sup>1)</sup> |     | 12 <sup>1)</sup> |     | 14  | 16  | 20 | 25 | 28 |
|-------------------------------------------|---------------------------------|---------------------------------|-----|------------------|-----|------------------|-----|-----|-----|----|----|----|
| Nominal drill bit diameter                | $d_0$                           | 10                              | 12  | 12               | 14  | 14               | 16  | 18  | 20  | 25 | 30 | 35 |
| Drill hole depth                          | $h_0$                           | $h_0 = h_{ef}$                  |     |                  |     |                  |     |     |     |    |    |    |
| Effective anchorage depth                 | $\frac{h_{ef,min}}{h_{ef,max}}$ | 60                              | 60  | 70               | 75  | 80               | 90  | 100 | 112 |    |    |    |
|                                           | $[mm]$                          | 160                             | 200 | 240              | 280 | 320              | 400 | 500 | 560 |    |    |    |
| Minimum spacing and minimum edge distance | $\frac{s_{min}}{c_{min}}$       | 40                              | 45  | 55               | 60  | 65               | 85  | 110 | 130 |    |    |    |
| Minimum thickness of concrete member      | $h_{min}$                       | $h_{ef} + 30$<br>( $\geq 100$ ) |     |                  |     | $h_{ef} + 2d_0$  |     |     |     |    |    |    |

<sup>1)</sup> Both drill bit diameters can be used

### Reinforcing bar



- The minimum value of related rib area  $f_{R,min}$  must fulfil the requirements of EN 1992-1-1:2004+AC:2010
- The rib height must be within the range:  $0,05 \cdot \phi \leq h_{rib} \leq 0,07 \cdot \phi$   
( $\phi$  = Nominal diameter of the bar ,  $h_{rib}$  = rib height)

fischer injection system FIS V

**Intended Use**  
Installation parameters reinforcing bars

**Annex B 5**

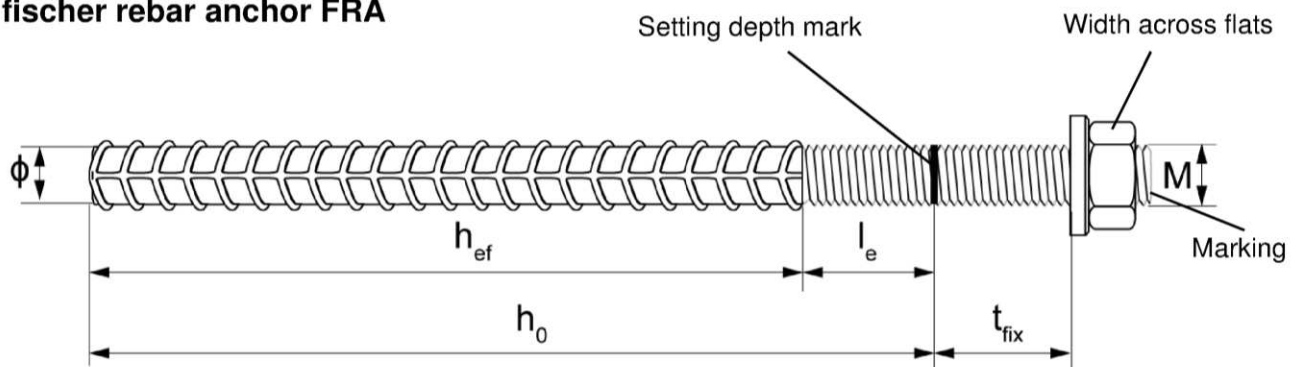
**Table B5:** Installation parameters for fischer rebar anchor FRA

| Size                                                    |                                     | M12 <sup>1)</sup>            |              | M16       | M20       | M24       |
|---------------------------------------------------------|-------------------------------------|------------------------------|--------------|-----------|-----------|-----------|
| Nominal diameter of the bar                             | $\phi$                              | 12                           |              | 16        | 20        | 25        |
| Width across flats                                      | SW                                  | 19                           |              | 24        | 30        | 36        |
| Nominal drill bit diameter                              | $d_0$                               | 14                           | 16           | 20        | 25        | 30        |
| Drill hole depth                                        | $h_0$                               | $h_{ef} + l_e$               |              |           |           |           |
| Effective anchorage depth                               | $h_{ef,min}$<br>$h_{ef,max}$        | 70<br>140                    |              | 80<br>220 | 90<br>300 | 96<br>380 |
| Distance concrete surface to welded joint               | $l_e$                               | 100                          |              |           |           |           |
| Minimum spacing and minimum edge distance               | $s_{min}$<br>=<br>$c_{min}$         | 55                           |              | 65        | 85        | 105       |
| Diameter of clearance hole in the fixture <sup>2)</sup> | pre-positioned anchorage $\leq d_f$ | 14                           |              | 18        | 22        | 26        |
|                                                         | push through anchorage $\leq d_f$   | 18                           |              | 22        | 26        | 32        |
| Minimum thickness of concrete member                    | $h_{min}$                           | $h_0 + 30$<br>( $\geq 100$ ) | $h_0 + 2d_0$ |           |           |           |
| Maximum installation torque                             | $T_{inst,max}$ [Nm]                 | 40                           |              | 60        | 120       | 150       |

<sup>1)</sup> Both drill bit diameters can be used

<sup>2)</sup> For larger clearance holes in the fixture see TR 029, 4.2.2.1 or CEN/TS 1992-4-1:2009, 5.2.3.1

### fischer rebar anchor FRA



Marking frontal e. g.:



FRA (for stainless steel);



FRA C (for high corrosion resistant steel)

fischer injection system FIS V

#### Intended Use

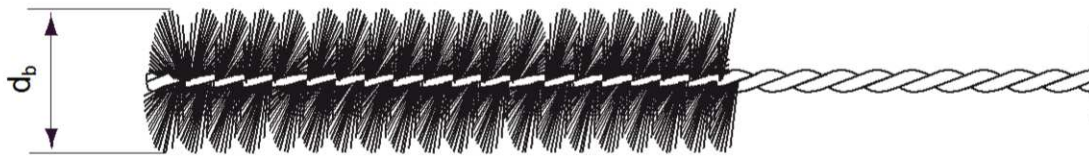
Installation parameters rebar anchor FRA

**Annex B 6**

**Table B6:** Diameters of steel brush FIS BS Ø

The size of the steel brush refers to the nominal drill bit diameter

|                                  |      |   |    |    |    |    |    |    |    |    |    |    |    |
|----------------------------------|------|---|----|----|----|----|----|----|----|----|----|----|----|
| Nominal drill bit diameter $d_0$ | [mm] | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 | 25 | 28 | 30 | 35 |
| Steel brush diameter $d_b$       |      | 9 | 11 | 14 | 16 | 20 |    | 25 | 26 | 27 | 30 | 40 |    |



**Table B7:** Maximum processing time of the mortar and minimum curing time  
(During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature)

| System temperature<br>[°C] | Maximum processing time<br>$t_{work}$<br>[minutes] |       |                     | Minimum curing time <sup>1)</sup><br>$t_{cure}$<br>[minutes] |          |                     |
|----------------------------|----------------------------------------------------|-------|---------------------|--------------------------------------------------------------|----------|---------------------|
|                            | FIS VW<br>High Speed                               | FIS V | FIS VS<br>Low Speed | FIS VW<br>High Speed                                         | FIS V    | FIS VS<br>Low Speed |
| -10 to -5                  | ---                                                | ---   | ---                 | 12 hours                                                     | ---      | ---                 |
| > -5 to $\pm 0$            | 5                                                  | ---   | ---                 | 3 hours                                                      | 24 hours | ---                 |
| > $\pm 0$ to +5            | 5                                                  | 13    | ---                 | 3 hours                                                      | 3 hours  | 6 hours             |
| > +5 to +10                | 3                                                  | 9     | 20                  | 50                                                           | 90       | 3 hours             |
| > +10 to +20               | 1                                                  | 5     | 10                  | 30                                                           | 60       | 2 hours             |
| > +20 to +30               | ---                                                | 4     | 6                   | ---                                                          | 45       | 60                  |
| > +30 to +40               | ---                                                | 2     | 4                   | ---                                                          | 35       | 30                  |

<sup>1)</sup> In wet concrete or flooded holes the curing times must be doubled

fischer injection system FIS V

**Intended Use**

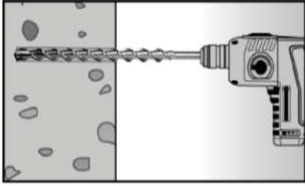
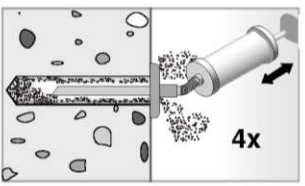
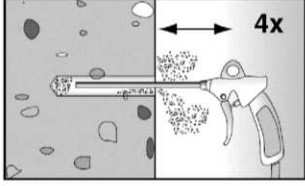
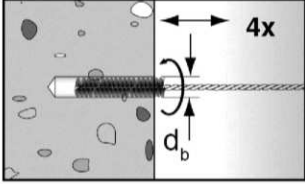
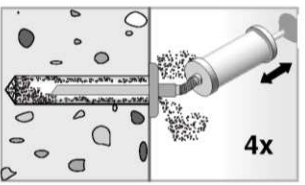
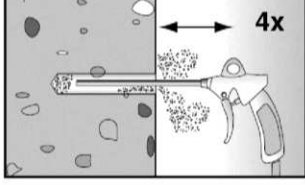
Cleaning tools

Processing times and curing times

**Annex B 7**

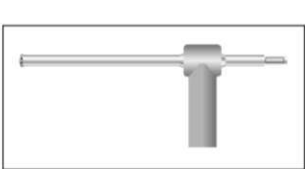
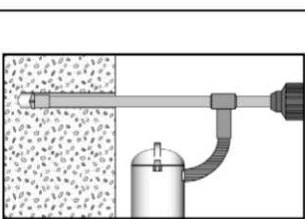
# Installation instructions part 1

## Drilling and cleaning the hole (hammer drilling with standard drill bit)

|   |                                                                                    |                                                                                                             |                                                                                     |
|---|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1 |   | Drill the hole.<br>Drill hole diameter $d_0$ and drill hole depth $h_0$ see <b>Tables B2, B3, B4, B5</b>    |                                                                                     |
| 2 |   | Clean the drill hole:<br>For $h_{ef} \leq 12d$ and $d_0 < 18$ mm<br>blow out the hole four times by hand    |   |
| 3 |   | Brush the drill hole four times. For deep holes use an extension. Corresponding brushes see <b>Table B6</b> |                                                                                     |
| 4 |  | Clean the drill hole:<br>For $h_{ef} \leq 12d$ and $d_0 < 18$ mm<br>blow out the hole four times by hand    |  |

Go to step 5

## Drilling and cleaning the hole (hammer drilling with hollow drill bit)

|   |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|---|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 1 |  | Check a suitable hollow drill (see <b>Table B1</b> ) for correct operation of the dust extraction                                                                                                                                                                                                                                                                                                                 |  |
| 2 |  | Use a suitable dust extraction system, e. g. Bosch GAS 35 M AFC or a comparable dust extraction system with equivalent performance data<br><br>Drill the hole with hollow drill bit. The dust extraction system has to extract the drill dust nonstop during the drilling process and must be adjusted to maximum power. Diameter of drill hole $d_0$ and drill hole depth $h_0$ see <b>Tables B2, B3, B4, B5</b> |  |

Go to step 5

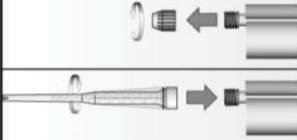
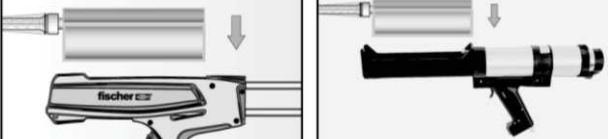
fischer injection system FIS V

**Intended use**  
Installation instructions part 1

**Annex B 8**

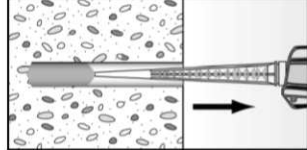
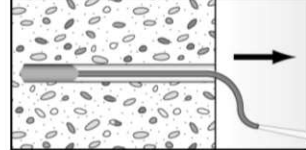
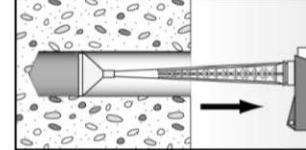
## Installation instructions part 2

### Preparing the cartridge

|   |                                                                                   |                                                                                                                                       |
|---|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 5 |  | <p>Remove the sealing cap</p> <p>Screw on the static mixer<br/>(the spiral in the static mixer must be clearly visible)</p>           |
| 6 |  | <p>Place the cartridge into the dispenser</p>                                                                                         |
| 7 |  | <p>Extrude approximately 10 cm of material until the resin is evenly grey in colour. Do not use mortar that is not uniformly grey</p> |

Go to step 8

### Mörtelinjektion

|   |                                                                                                                                                                                                             |                                                                                                                                                                |                                                                                                                                                                                                                                                 |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8 |  <p>Fill approximately 2/3 of the drill hole with mortar. Always begin from the bottom of the hole and avoid bubbles</p> |  <p>For drill hole depth <math>\geq 150</math> mm use an extension tube</p> |  <p>For overhead installation, deep holes (<math>h_0 &gt; 250</math> mm) or drill hole diameter (<math>d_0 \geq 40</math> mm) use an injection-adapter</p> |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

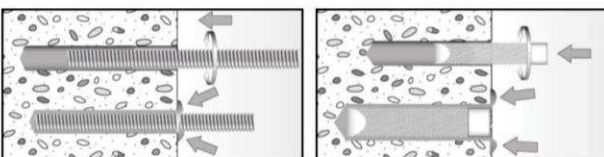
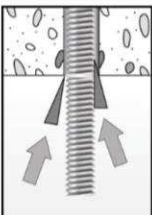
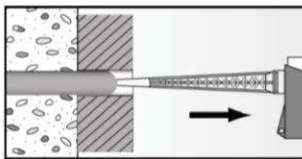
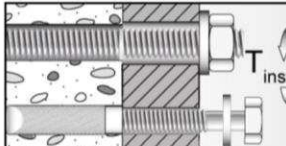
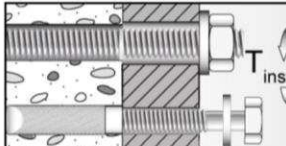
Go to step 9

fischer injection system FIS V

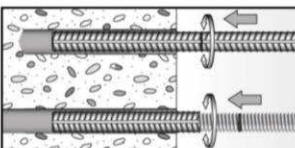
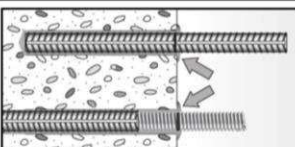
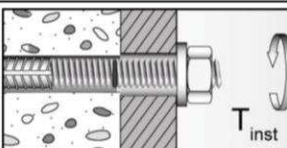
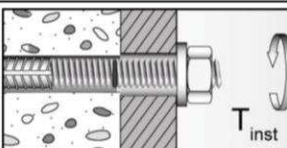
**Intended use**  
Installation instructions part 2

**Annex B 9**

**Installation instructions part 3****Installation of anchor rods or fischer internal threaded anchors RG MI**

|    |                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                          |    |                                                                                    |                                                                                              |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 9  |                                                                                                         | <p>Only use clean and oil-free anchor elements. Mark the setting depth of the anchor. Push the anchor rod or fischer internal threaded RG MI anchor down to the bottom of the hole, turning it slightly while doing so. After inserting the anchor element, excess mortar must be emerged around the anchor element.</p> |    |                                                                                    |                                                                                              |
|    |  <p>For overhead installations support the anchor rod with wedges. (e. g. fischer centering wedges)</p> |  <p>For push through installation fill the annular gap with mortar</p>                                                                                                                                                                 |    |                                                                                    |                                                                                              |
| 10 |  <p>Wait for the specified curing time <math>t_{\text{cure}}</math> see <b>Table B7</b></p>             | <td data-bbox="861 817 941 1005">11</td> <td data-bbox="941 817 1260 1005">  </td> <td data-bbox="1260 817 1522 1005"> <p>Mounting the fixture<br/><math>T_{\text{inst,max}}</math> see <b>Tables B2 and B3</b></p> </td>              | 11 |  | <p>Mounting the fixture<br/><math>T_{\text{inst,max}}</math> see <b>Tables B2 and B3</b></p> |

**Installation reinforcing bars and fischer rebar anchor FRA**

|    |                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                          |    |                                                                                      |                                                                                      |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 9  |                                                                                             | <p>Only use clean and oil-free reinforcing bars or fischer FRA. Mark the setting depth. Turn while using force to push the reinforcement bar or the fischer FRA into the filled hole up to the setting depth mark</p>                                                                                    |    |                                                                                      |                                                                                      |
|    |                                                                                             | <p>When the setting depth mark is reached, excess mortar must be emerged from the mouth of the drill hole.</p>                                                                                                                                                                                           |    |                                                                                      |                                                                                      |
| 10 |  <p>Wait for the specified curing time <math>t_{\text{cure}}</math> see <b>Table B7</b></p> | <td data-bbox="813 1433 893 1606">11</td> <td data-bbox="893 1433 1212 1606">  </td> <td data-bbox="1212 1433 1522 1606"> <p>Mounting the fixture<br/><math>T_{\text{inst,max}}</math> see <b>Table B5</b></p> </td> | 11 |  | <p>Mounting the fixture<br/><math>T_{\text{inst,max}}</math> see <b>Table B5</b></p> |

fischer injection system FIS V

**Intended use**  
Installation instructions part 3

**Annex B 10**

**Table C1:** Characteristic values for the **steel bearing capacity** of **anchor rods** under tensile / shear load

| Size                                                          |                                                         |                |       | M6   | M8                        | M10 | M12 | M16 | M20 | M24 | M27 | M30  |      |
|---------------------------------------------------------------|---------------------------------------------------------|----------------|-------|------|---------------------------|-----|-----|-----|-----|-----|-----|------|------|
| Bearing capacity under tensile load, steel failure            |                                                         |                |       |      |                           |     |     |     |     |     |     |      |      |
| Charact.bearing capacity $N_{Rk,s}$                           | Steel zinc plated                                       | Property class | 5.8   | [kN] | 10                        | 19  | 29  | 43  | 79  | 123 | 177 | 230  | 281  |
|                                                               |                                                         |                | 8.8   |      | 16                        | 29  | 47  | 68  | 126 | 196 | 282 | 368  | 449  |
|                                                               | Stainless steel A4 and High corrosion resistant steel C |                | 50    |      | 10                        | 19  | 29  | 43  | 79  | 123 | 177 | 230  | 281  |
|                                                               |                                                         |                | 70    |      | 14                        | 26  | 41  | 59  | 110 | 172 | 247 | 322  | 393  |
|                                                               |                                                         |                | 80    |      | 16                        | 30  | 47  | 68  | 126 | 196 | 282 | 368  | 449  |
| Partial safety factors <sup>1)</sup>                          |                                                         |                |       |      |                           |     |     |     |     |     |     |      |      |
| Partial safety factor $\gamma_{Ms,N}$                         | Steel zinc plated                                       | Property class | 5.8   | [-]  | 1,50                      |     |     |     |     |     |     |      |      |
|                                                               |                                                         |                | 8.8   |      | 1,50                      |     |     |     |     |     |     |      |      |
|                                                               | Stainless steel A4 and High corrosion resistant steel C |                | 50    |      | 2,86                      |     |     |     |     |     |     |      |      |
|                                                               |                                                         |                | 70    |      | 1,50 <sup>2)</sup> / 1,87 |     |     |     |     |     |     |      |      |
|                                                               |                                                         |                | 80    |      | 1,60                      |     |     |     |     |     |     |      |      |
| Bearing capacity under shear load, steel failure              |                                                         |                |       |      |                           |     |     |     |     |     |     |      |      |
| without lever arm                                             |                                                         |                |       |      |                           |     |     |     |     |     |     |      |      |
| Charact.bearing capacity $V_{Rk,s}$                           | Steel zinc plated                                       | Property class | 5.8   | [kN] | 5                         | 9   | 15  | 21  | 39  | 61  | 89  | 115  | 141  |
|                                                               |                                                         |                | 8.8   |      | 8                         | 15  | 23  | 34  | 63  | 98  | 141 | 184  | 225  |
|                                                               | Stainless steel A4 and High corrosion resistant steel C |                | 50    |      | 5                         | 9   | 15  | 21  | 39  | 61  | 89  | 115  | 141  |
|                                                               |                                                         |                | 70    |      | 7                         | 13  | 20  | 30  | 55  | 86  | 124 | 161  | 197  |
|                                                               |                                                         |                | 80    |      | 8                         | 15  | 23  | 34  | 63  | 98  | 141 | 184  | 225  |
| Ductility factor acc. to CEN/TS 1992-4-5:2009 Section 6.3.2.1 |                                                         |                | $k_2$ | [-]  | 1,0                       |     |     |     |     |     |     |      |      |
| with lever arm                                                |                                                         |                |       |      |                           |     |     |     |     |     |     |      |      |
| Charact. bending moment $M_{0,Rk}$                            | Steel zinc plated                                       | Property class | 5.8   | [Nm] | 7                         | 19  | 37  | 65  | 166 | 324 | 560 | 833  | 1123 |
|                                                               |                                                         |                | 8.8   |      | 12                        | 30  | 60  | 105 | 266 | 519 | 896 | 1333 | 1797 |
|                                                               | Stainless steel A4 and High corrosion resistant steel C |                | 50    |      | 7                         | 19  | 37  | 65  | 166 | 324 | 560 | 833  | 1123 |
|                                                               |                                                         |                | 70    |      | 10                        | 26  | 52  | 92  | 232 | 454 | 784 | 1167 | 1573 |
|                                                               |                                                         |                | 80    |      | 12                        | 30  | 60  | 105 | 266 | 519 | 896 | 1333 | 1797 |
| Partial safety factors <sup>1)</sup>                          |                                                         |                |       |      |                           |     |     |     |     |     |     |      |      |
| Partial safety factor $\gamma_{Ms,V}$                         | Steel zinc plated                                       | Property class | 5.8   | [-]  | 1,25                      |     |     |     |     |     |     |      |      |
|                                                               |                                                         |                | 8.8   |      | 1,25                      |     |     |     |     |     |     |      |      |
|                                                               | Stainless steel A4 and High corrosion resistant steel C |                | 50    |      | 2,38                      |     |     |     |     |     |     |      |      |
|                                                               |                                                         |                | 70    |      | 1,25 <sup>2)</sup> / 1,56 |     |     |     |     |     |     |      |      |
|                                                               |                                                         |                | 80    |      | 1,33                      |     |     |     |     |     |     |      |      |

<sup>1)</sup> In absence of other national regulations<sup>2)</sup> Only for fischer FIS A and RG M made of high corrosion-resistant steel C

fischer injection system FIS V

**Performances**

Characteristic steel bearing capacity anchor rods

**Annex C 1**

**Table C2: Characteristic values for the steel bearing capacity of fischer internal threaded anchors RG MI under tensile / shear load**

| Size                                                          |                                |                   |                | M8   | M10  | M12  | M16  | M20  |      |
|---------------------------------------------------------------|--------------------------------|-------------------|----------------|------|------|------|------|------|------|
| Bearing capacity under tensile load, steel failure            |                                |                   |                |      |      |      |      |      |      |
| Characteristic bearing capacity with screw                    | N <sub>Rk,s</sub>              | Property class    | 5.8            | [kN] | 19   | 29   | 43   | 79   | 123  |
|                                                               |                                |                   | 8.8            |      | 29   | 47   | 68   | 108  | 179  |
|                                                               |                                | Property class 70 | A4             |      | 26   | 41   | 59   | 110  | 172  |
|                                                               |                                |                   | C              |      | 26   | 41   | 59   | 110  | 172  |
| Partial safety factors <sup>1)</sup>                          |                                |                   |                |      |      |      |      |      |      |
| Partial safety factor                                         | γ <sub>Ms,N</sub>              | Property class    | 5.8            | [-]  | 1,50 |      |      |      |      |
|                                                               |                                |                   | 8.8            |      | 1,50 |      |      |      |      |
|                                                               |                                | Property class 70 | A4             |      | 1,87 |      |      |      |      |
|                                                               |                                |                   | C              |      | 1,87 |      |      |      |      |
| Bearing capacity under shear load, steel failure              |                                |                   |                |      |      |      |      |      |      |
| without lever arm                                             |                                |                   |                |      |      |      |      |      |      |
| Characteristic bearing capacity with screw                    | V <sub>Rk,s</sub>              | Property class    | 5.8            | [kN] | 9,2  | 14,5 | 21,1 | 39,2 | 62,0 |
|                                                               |                                |                   | 8.8            |      | 14,6 | 23,2 | 33,7 | 54,0 | 90,0 |
|                                                               |                                | Property class 70 | A4             |      | 12,8 | 20,3 | 29,5 | 54,8 | 86,0 |
|                                                               |                                |                   | C              |      | 12,8 | 20,3 | 29,5 | 54,8 | 86,0 |
| Ductility factor acc. to CEN/TS 1992-4-5:2009 Section 6.3.2.1 |                                |                   | k <sub>2</sub> | [-]  | 1,0  |      |      |      |      |
| with lever arm                                                |                                |                   |                |      |      |      |      |      |      |
| Characteristic bending moment with screw                      | M <sup>0</sup> <sub>Rk,s</sub> | Property class    | 5.8            | [Nm] | 20   | 39   | 68   | 173  | 337  |
|                                                               |                                |                   | 8.8            |      | 30   | 60   | 105  | 266  | 519  |
|                                                               |                                | Property class 70 | A4             |      | 26   | 52   | 92   | 232  | 454  |
|                                                               |                                |                   | C              |      | 26   | 52   | 92   | 232  | 454  |
| Partial safety factors <sup>1)</sup>                          |                                |                   |                |      |      |      |      |      |      |
| Partial safety factor                                         | γ <sub>Ms,V</sub>              | Property class    | 5.8            | [-]  | 1,25 |      |      |      |      |
|                                                               |                                |                   | 8.8            |      | 1,25 |      |      |      |      |
|                                                               |                                | Property class 70 | A4             |      | 1,56 |      |      |      |      |
|                                                               |                                |                   | C              |      | 1,56 |      |      |      |      |

<sup>1)</sup> In absence of other national regulations

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**Performances**

Characteristic steel bearing capacity of fischer internal threaded anchors RG MI

**Annex C 2**

**Table C3:** Characteristic values for the **steel bearing capacity** of reinforcing bars under tensile / shear load

| Nominal diameter of the bar                                   | $\phi$       | 8    | 10                                   | 12 | 14 | 16 | 20 | 25 | 28 |
|---------------------------------------------------------------|--------------|------|--------------------------------------|----|----|----|----|----|----|
| Bearing capacity under tensile load, steel failure            |              |      |                                      |    |    |    |    |    |    |
| Characteristic bearing capacity                               | $N_{Rk,s}$   | [kN] | $A_s \cdot f_{uk}^{1)}$              |    |    |    |    |    |    |
| Bearing capacity under shear load, steel failure              |              |      |                                      |    |    |    |    |    |    |
| without lever arm                                             |              |      |                                      |    |    |    |    |    |    |
| Characteristic bearing capacity                               | $V_{Rk,s}$   | [kN] | $0,5 \cdot A_s \cdot f_{uk}^{1)}$    |    |    |    |    |    |    |
| Ductility factor acc. to CEN/TS 1992-4-5:2009 Section 6.3.2.1 | $k_2$        | [-]  | 0,8                                  |    |    |    |    |    |    |
| with lever arm                                                |              |      |                                      |    |    |    |    |    |    |
| Characteristic bending moment                                 | $M^0_{Rk,s}$ | [Nm] | $1,2 \cdot W_{el} \cdot f_{uk}^{1)}$ |    |    |    |    |    |    |

<sup>1)</sup>  $f_{uk}$  or  $f_{yk}$  respectively must be taken from the specifications of the reinforcing bar

**Table C4:** Characteristic values for the **steel bearing capacity** of **fischer rebar anchors FRA** under tensile / shear load

| Size                                                          |                                |      | M12  | M16 | M20 | M24 |
|---------------------------------------------------------------|--------------------------------|------|------|-----|-----|-----|
| Bearing capacity under tensile load, steel failure            |                                |      |      |     |     |     |
| Characteristic bearing capacity                               | N <sub>Rk,s</sub>              | [kN] | 63   | 111 | 173 | 270 |
| Partial safety factors <sup>1)</sup>                          |                                |      |      |     |     |     |
| Partial safety factor                                         | γ <sub>Ms,N</sub>              | [-]  | 1,4  |     |     |     |
| Bearing capacity under shear load, steel failure              |                                |      |      |     |     |     |
| without lever arm                                             |                                |      |      |     |     |     |
| Characteristic bearing capacity                               | V <sub>Rk,s</sub>              | [kN] | 30   | 55  | 86  | 124 |
| Ductility factor acc. to CEN/TS 1992-4-5:2009 Section 6.3.2.1 | k <sub>2</sub>                 | [-]  | 1,0  |     |     |     |
| with lever arm                                                |                                |      |      |     |     |     |
| Characteristic bearing capacity                               | M <sup>0</sup> <sub>Rk,s</sub> | [Nm] | 92   | 233 | 454 | 785 |
| Partial safety factors <sup>1)</sup>                          |                                |      |      |     |     |     |
| Partial safety factor                                         | γ <sub>Ms,V</sub>              | [-]  | 1,56 |     |     |     |

<sup>1)</sup> In absence of other national regulations

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**Performances**

Characteristic steel bearing capacity of reinforcing bars and  
fischer rebar anchors FRA

**Annex C 3**

**Table C5: General design factors for the bearing capacity under tensile / shear load; uncracked or cracked concrete**

| Size                                                                                                              |                            |             | All sizes            |                      |     |     |     |     |     |           |     |
|-------------------------------------------------------------------------------------------------------------------|----------------------------|-------------|----------------------|----------------------|-----|-----|-----|-----|-----|-----------|-----|
| Bearing capacity under tensile load                                                                               |                            |             |                      |                      |     |     |     |     |     |           |     |
| Factors acc. to CEN/TS 1992-4:2009 Section 6.2.2.3                                                                |                            |             |                      |                      |     |     |     |     |     |           |     |
| Uncracked concrete                                                                                                | $k_{ucr}$                  | [-]         | 10,1                 |                      |     |     |     |     |     |           |     |
| Cracked concrete                                                                                                  | $k_{cr}$                   |             | 7,2                  |                      |     |     |     |     |     |           |     |
| Factors for the compressive strength of concrete > C20/25                                                         |                            |             |                      |                      |     |     |     |     |     |           |     |
| Increasing factor for $\tau_{Rk}$                                                                                 | C25/30                     | $\Psi_c$    | [-]                  | 1,05                 |     |     |     |     |     |           |     |
|                                                                                                                   | C30/37                     |             |                      | 1,10                 |     |     |     |     |     |           |     |
|                                                                                                                   | C35/45                     |             |                      | 1,15                 |     |     |     |     |     |           |     |
|                                                                                                                   | C40/50                     |             |                      | 1,19                 |     |     |     |     |     |           |     |
|                                                                                                                   | C45/55                     |             |                      | 1,22                 |     |     |     |     |     |           |     |
|                                                                                                                   | C50/60                     |             |                      | 1,26                 |     |     |     |     |     |           |     |
| Splitting failure                                                                                                 |                            |             |                      |                      |     |     |     |     |     |           |     |
| Edge distance                                                                                                     | $h / h_{ef} \geq 2,0$      | $c_{cr,sp}$ | [mm]                 | 1,0 $h_{ef}$         |     |     |     |     |     |           |     |
|                                                                                                                   | $2,0 > h / h_{ef} > 1,3$   |             |                      | 4,6 $h_{ef}$ - 1,8 h |     |     |     |     |     |           |     |
|                                                                                                                   | $h / h_{ef} \leq 1,3$      |             |                      | 2,26 $h_{ef}$        |     |     |     |     |     |           |     |
| Spacing                                                                                                           | $s_{cr,sp}$                |             |                      | 2 $c_{cr,sp}$        |     |     |     |     |     |           |     |
| Concrete cone failure acc. to CEN/TS 1992-4-5:2009 Section 6.2.3.2                                                |                            |             |                      |                      |     |     |     |     |     |           |     |
| Edge distance                                                                                                     | $c_{cr,N}$                 | [mm]        | 1,5 $h_{ef}$         |                      |     |     |     |     |     |           |     |
| Spacing                                                                                                           | $s_{cr,N}$                 |             | 2 $c_{cr,N}$         |                      |     |     |     |     |     |           |     |
| Bearing capacity under shear load                                                                                 |                            |             |                      |                      |     |     |     |     |     |           |     |
| Installation safety factors                                                                                       |                            |             |                      |                      |     |     |     |     |     |           |     |
| All installation conditions                                                                                       | $\gamma_2 = \gamma_{inst}$ | [-]         | 1,0                  |                      |     |     |     |     |     |           |     |
| Concrete pry-out failure                                                                                          |                            |             |                      |                      |     |     |     |     |     |           |     |
| Factor k acc. to TR029 Section 5.2.3.3 resp. $k_3$ acc. to CEN/TS 1992-4-5:2009 Section 6.3.3                     | $k_{(3)}$                  | [-]         | 2,0                  |                      |     |     |     |     |     |           |     |
| Concrete edge failure                                                                                             |                            |             |                      |                      |     |     |     |     |     |           |     |
| The value of $h_{ef}$ (= $l_f$ ) under shear load                                                                 |                            | [mm]        | min ( $h_{ef}$ ; 8d) |                      |     |     |     |     |     |           |     |
| Calculation diameters                                                                                             |                            |             |                      |                      |     |     |     |     |     |           |     |
| Size                                                                                                              |                            |             | M6                   | M8                   | M10 | M12 | M16 | M20 | M24 | M27       | M30 |
| Anchor rods                                                                                                       | d                          | [mm]        | 6                    | 8                    | 10  | 12  | 16  | 20  | 24  | 27        | 30  |
| fischer internal threaded anchors RG MI                                                                           | $d_{nom}$                  |             | ---                  | 12                   | 16  | 18  | 22  | 28  | --- | ---       | --- |
| fischer rebar anchors FRA                                                                                         | d                          |             | ---                  | ---                  | --- | 12  | 16  | 20  | 25  | ---       | --- |
| Nominal diameter of the bar                                                                                       | $\phi$                     |             | 8                    | 10                   | 12  | 14  | 16  | 20  | 25  | 28        |     |
| Reinforcing bar                                                                                                   | d                          | [mm]        | 8                    | 10                   | 12  | 14  | 16  | 20  | 25  | 28        |     |
| fischer injection system FIS V                                                                                    |                            |             |                      |                      |     |     |     |     |     |           |     |
| Performances<br>General design factors relating to the characteristic bearing capacity under tensile / shear load |                            |             |                      |                      |     |     |     |     |     | Annex C 4 |     |

**Table C6:** Characteristic values of **resistance** for **anchor rods**  
in hammer drilled holes; **uncracked or cracked concrete**

| Size                                                                                     |                            | M6                                   | M8                | M10  | M12  | M16  | M20  | M24 | M27 | M30 |     |
|------------------------------------------------------------------------------------------|----------------------------|--------------------------------------|-------------------|------|------|------|------|-----|-----|-----|-----|
| Combined pullout and concrete cone failure                                               |                            |                                      |                   |      |      |      |      |     |     |     |     |
| Calculation diameter                                                                     | d                          | [mm]                                 | 6                 | 8    | 10   | 12   | 16   | 20  | 24  | 27  | 30  |
| Uncracked concrete                                                                       |                            |                                      |                   |      |      |      |      |     |     |     |     |
| Characteristic bond resistance in uncracked concrete C20/25                              |                            |                                      |                   |      |      |      |      |     |     |     |     |
| Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete)       |                            |                                      |                   |      |      |      |      |     |     |     |     |
| Temperature range                                                                        | I: 50 °C / 80 °C           | $\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ] | 9,0               | 11,0 | 11,0 | 11,0 | 10,0 | 9,5 | 9,0 | 8,5 | 8,5 |
|                                                                                          | II: 72 °C / 120 °C         |                                      | 6,5               | 9,5  | 9,5  | 9,0  | 8,5  | 8,0 | 7,5 | 7,0 | 7,0 |
| Hammer-drilling with standard drill bit or hollow drill bit (flooded hole) <sup>1)</sup> |                            |                                      |                   |      |      |      |      |     |     |     |     |
| Temperature range                                                                        | I: 50 °C / 80 °C           | $\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ] | ---               | ---  | ---  | 9,5  | 8,5  | 8,0 | 7,5 | 7,0 | 7,0 |
|                                                                                          | II: 72 °C / 120 °C         |                                      | ---               | ---  | ---  | 7,5  | 7,0  | 6,5 | 6,0 | 6,0 | 6,0 |
| Installation safety factors                                                              |                            |                                      |                   |      |      |      |      |     |     |     |     |
| Dry and wet concrete                                                                     | $\gamma_2 = \gamma_{inst}$ | [-]                                  | 1,0               |      |      |      |      |     |     |     |     |
| Flooded hole                                                                             |                            |                                      | 1,2 <sup>1)</sup> |      |      |      |      |     |     |     |     |
| Cracked concrete                                                                         |                            |                                      |                   |      |      |      |      |     |     |     |     |
| Characteristic bond resistance in cracked concrete C20/25                                |                            |                                      |                   |      |      |      |      |     |     |     |     |
| Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete)       |                            |                                      |                   |      |      |      |      |     |     |     |     |
| Temperature range                                                                        | I: 50 °C / 80 °C           | $\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]  | ---               | ---  | 6,0  | 6,0  | 6,0  | 5,5 | 4,5 | 4,0 | 4,0 |
|                                                                                          | II: 72 °C / 120 °C         |                                      | ---               | ---  | 5,0  | 5,0  | 5,0  | 5,0 | 4,0 | 3,5 | 3,5 |
| Hammer-drilling with standard drill bit or hollow drill bit (flooded hole) <sup>1)</sup> |                            |                                      |                   |      |      |      |      |     |     |     |     |
| Temperature range                                                                        | I: 50 °C / 80 °C           | $\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]  | ---               | ---  | ---  | 5,0  | 5,0  | 4,5 | 4,0 | 3,5 | 3,5 |
|                                                                                          | II: 72 °C / 120 °C         |                                      | ---               | ---  | ---  | 4,0  | 4,0  | 4,0 | 3,5 | 3,0 | 3,0 |
| Installation safety factors                                                              |                            |                                      |                   |      |      |      |      |     |     |     |     |
| Dry and wet concrete                                                                     | $\gamma_2 = \gamma_{inst}$ | [-]                                  | 1,0               |      |      |      |      |     |     |     |     |
| Flooded hole                                                                             |                            |                                      | 1,2 <sup>1)</sup> |      |      |      |      |     |     |     |     |

<sup>1)</sup> Only with coaxial cartridges: 380 ml, 400 ml, 410 ml

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**Performances**

Characteristic values for static or quasi-static action under tensile load for anchor rods (uncracked or cracked concrete)

**Annex C 5**

**Table C7: Characteristic values of resistance for fischer internal threaded anchors RG MI in hammer drilled holes; uncracked concrete**

| Size                                                                                     |                            | M8                                   | M10               | M12  | M16 | M20 |     |
|------------------------------------------------------------------------------------------|----------------------------|--------------------------------------|-------------------|------|-----|-----|-----|
| Combined pullout and concrete cone failure                                               |                            |                                      |                   |      |     |     |     |
| Calculation diameter                                                                     | d                          | [mm]                                 | 12                | 16   | 18  | 22  | 28  |
| Uncracked concrete                                                                       |                            |                                      |                   |      |     |     |     |
| Characteristic bond resistance in uncracked concrete C20/25                              |                            |                                      |                   |      |     |     |     |
| Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete)       |                            |                                      |                   |      |     |     |     |
| Temperature range                                                                        | I: 50 °C / 80 °C           | $\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ] | 10,5              | 10,0 | 9,5 | 9,0 | 8,5 |
|                                                                                          | II: 72 °C / 120 °C         |                                      | 9,0               | 8,0  | 8,0 | 7,5 | 7,0 |
| Hammer-drilling with standard drill bit or hollow drill bit (flooded hole) <sup>1)</sup> |                            |                                      |                   |      |     |     |     |
| Temperature range                                                                        | I: 50 °C / 80 °C           | $\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ] | 10,0              | 9,0  | 9,0 | 8,5 | 8,0 |
|                                                                                          | II: 72 °C / 120 °C         |                                      | 7,5               | 6,5  | 6,5 | 6,0 | 6,0 |
| Installation safety factors                                                              |                            |                                      |                   |      |     |     |     |
| Dry and wet concrete                                                                     | $\gamma_2 = \gamma_{inst}$ | [-]                                  | 1,0               |      |     |     |     |
| Flooded hole                                                                             |                            |                                      | 1,2 <sup>1)</sup> |      |     |     |     |

<sup>1)</sup> Only with coaxial cartridges: 380 ml, 400 ml, 410 ml

**Table C8: Characteristic values of resistance for reinforcing bars in hammer drilled holes; uncracked or cracked concrete**

| Nominal diameter of the bar                                                        |                    | $\phi$                     | 8                    | 10   | 12   | 14   | 16   | 20   | 25  | 28  |     |
|------------------------------------------------------------------------------------|--------------------|----------------------------|----------------------|------|------|------|------|------|-----|-----|-----|
| Combined pullout and concrete cone failure                                         |                    |                            |                      |      |      |      |      |      |     |     |     |
| Calculation diameter                                                               |                    | d                          | [mm]                 | 8    | 10   | 12   | 14   | 16   | 20  | 25  | 28  |
| Uncracked concrete                                                                 |                    |                            |                      |      |      |      |      |      |     |     |     |
| Characteristic bond resistance in uncracked concrete C20/25                        |                    |                            |                      |      |      |      |      |      |     |     |     |
| Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete) |                    |                            |                      |      |      |      |      |      |     |     |     |
| Temperature range                                                                  | I: 50 °C / 80 °C   | $\tau_{Rk,ucr}$            | [N/mm <sup>2</sup> ] | 11,0 | 11,0 | 11,0 | 10,0 | 10,0 | 9,5 | 9,0 | 8,5 |
|                                                                                    | II: 72 °C / 120 °C |                            |                      | 9,5  | 9,5  | 9,0  | 8,5  | 8,5  | 8,0 | 7,5 | 7,0 |
| Installation safety factor                                                         |                    |                            |                      |      |      |      |      |      |     |     |     |
| Dry and wet concrete                                                               |                    | $\gamma_2 = \gamma_{inst}$ | [-]                  | 1,0  |      |      |      |      |     |     |     |
| Cracked concrete                                                                   |                    |                            |                      |      |      |      |      |      |     |     |     |
| Characteristic bond resistance in cracked concrete C20/25                          |                    |                            |                      |      |      |      |      |      |     |     |     |
| Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete) |                    |                            |                      |      |      |      |      |      |     |     |     |
| Temperature range                                                                  | I: 50 °C / 80 °C   | $\tau_{Rk,cr}$             | [N/mm <sup>2</sup> ] | --   | 3,0  | 5,0  | 5,0  | 5,0  | 4,5 | 4,0 | 4,0 |
|                                                                                    | II: 72 °C / 120 °C |                            |                      | --   | 3,0  | 4,5  | 4,5  | 4,5  | 4,0 | 3,5 | 3,5 |
| Installation safety factor                                                         |                    |                            |                      |      |      |      |      |      |     |     |     |
| Dry and wet concrete                                                               |                    | $\gamma_2 = \gamma_{inst}$ | [-]                  | 1,0  |      |      |      |      |     |     |     |

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**Performances**

Characteristic values for static or quasi-static action under tensile load for fischer internal threaded anchors RG MI and reinforcing bars (uncracked concrete)

**Annex C 6**

**Table C9:** Characteristic values of **resistance** for **fischer rebar anchors FRA** in hammer drilled holes; **uncracked or cracked concrete**

| Size                                                                               |                            | M12                                  | M16  | M20  | M24 |     |
|------------------------------------------------------------------------------------|----------------------------|--------------------------------------|------|------|-----|-----|
| Combined pullout and concrete cone failure                                         |                            |                                      |      |      |     |     |
| Calculation diameter                                                               | d                          | [mm]                                 | 12   | 16   | 20  | 25  |
| Uncracked concrete                                                                 |                            |                                      |      |      |     |     |
| Characteristic bond resistance in uncracked concrete C20/25                        |                            |                                      |      |      |     |     |
| Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete) |                            |                                      |      |      |     |     |
| Temperature range                                                                  | I: 50 °C / 80 °C           | $\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ] | 11,0 | 10,0 | 9,5 | 9,0 |
|                                                                                    | II: 72 °C / 120 °C         |                                      | 9,0  | 8,5  | 8,0 | 7,5 |
| Installation safety factor                                                         |                            |                                      |      |      |     |     |
| Dry and wet concrete                                                               | $\gamma_2 = \gamma_{inst}$ | [-]                                  | 1,0  |      |     |     |
| Cracked concrete                                                                   |                            |                                      |      |      |     |     |
| Characteristic bond resistance in cracked concrete C20/25                          |                            |                                      |      |      |     |     |
| Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete) |                            |                                      |      |      |     |     |
| Temperature range                                                                  | I: 50 °C / 80 °C           | $\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]  | 5,0  | 5,0  | 4,5 | 4,0 |
|                                                                                    | II: 72 °C / 120 °C         |                                      | 4,5  | 4,5  | 4,0 | 3,5 |
| Installation safety factor                                                         |                            |                                      |      |      |     |     |
| Dry and wet concrete                                                               | $\gamma_2 = \gamma_{inst}$ | [-]                                  | 1,0  |      |     |     |

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**Performances**

Characteristic values for static or quasi-static action under tensile load for fischer rebar anchors FRA (uncracked or cracked concrete)

**Annex C 7**

**Table C10: Displacements for anchor rods**

| Size                                                   |                           | M6   | M8   | M10  | M12  | M16  | M20  | M24  | M27  | M30  |
|--------------------------------------------------------|---------------------------|------|------|------|------|------|------|------|------|------|
| Displacement-Factors for tensile load <sup>1)</sup>    |                           |      |      |      |      |      |      |      |      |      |
| Uncracked concrete; Temperature range I, II            |                           |      |      |      |      |      |      |      |      |      |
| $\delta_{N0}$ -Faktor                                  | [mm/(N/mm <sup>2</sup> )] | 0,09 | 0,09 | 0,09 | 0,10 | 0,10 | 0,10 | 0,10 | 0,11 | 0,12 |
| $\delta_{N\infty}$ -Faktor                             |                           | 0,10 | 0,10 | 0,10 | 0,12 | 0,12 | 0,12 | 0,13 | 0,13 | 0,14 |
| Cracked concrete; Temperature range I, II              |                           |      |      |      |      |      |      |      |      |      |
| $\delta_{N0}$ -Faktor                                  | [mm/(N/mm <sup>2</sup> )] | ---  | ---  | 0,12 | 0,12 | 0,13 | 0,13 | 0,13 | 0,14 | 0,15 |
| $\delta_{N\infty}$ -Faktor                             |                           | ---  | ---  | 0,27 | 0,30 | 0,30 | 0,30 | 0,35 | 0,35 | 0,40 |
| Displacement-Factors for shear load <sup>2)</sup>      |                           |      |      |      |      |      |      |      |      |      |
| Uncracked or cracked concrete; Temperature range I, II |                           |      |      |      |      |      |      |      |      |      |
| $\delta_{V0}$ -Faktor                                  | [mm/kN]                   | 0,11 | 0,11 | 0,11 | 0,10 | 0,10 | 0,09 | 0,09 | 0,08 | 0,07 |
| $\delta_{V\infty}$ -Faktor                             |                           | 0,12 | 0,12 | 0,12 | 0,11 | 0,11 | 0,10 | 0,10 | 0,09 | 0,09 |

<sup>1)</sup> Calculation of effective displacement:

$$\delta_{N0} = \delta_{N0\text{-Faktor}} \cdot \tau_{Ed}$$

$$\delta_{N\infty} = \delta_{N\infty\text{-Faktor}} \cdot \tau_{Ed}$$

( $\tau_{Ed}$ : Design value of the applied tensile stress)

<sup>2)</sup> Calculation of effective displacement:

$$\delta_{V0} = \delta_{V0\text{-Faktor}} \cdot V_{Ed}$$

$$\delta_{V\infty} = \delta_{V\infty\text{-Faktor}} \cdot V_{Ed}$$

( $V_{Ed}$ : Design value of the applied shear force)

**Table C11: Displacements for fischer internal threaded anchors RG MI**

| Size                                                |                           | M8   | M10  | M12  | M16  | M20  |
|-----------------------------------------------------|---------------------------|------|------|------|------|------|
| Displacement-Factors for tensile load <sup>1)</sup> |                           |      |      |      |      |      |
| Uncracked concrete; Temperature range I, II         |                           |      |      |      |      |      |
| $\delta_{N0}$ -Faktor                               | [mm/(N/mm <sup>2</sup> )] | 0,10 | 0,11 | 0,12 | 0,13 | 0,14 |
| $\delta_{N\infty}$ -Faktor                          |                           | 0,13 | 0,14 | 0,15 | 0,16 | 0,18 |
| Displacement-Factors for shear load <sup>2)</sup>   |                           |      |      |      |      |      |
| Uncracked concrete; Temperature range I, II         |                           |      |      |      |      |      |
| $\delta_{V0}$ -Faktor                               | [mm/kN]                   | 0,12 | 0,12 | 0,12 | 0,12 | 0,12 |
| $\delta_{V\infty}$ -Faktor                          |                           | 0,14 | 0,14 | 0,14 | 0,14 | 0,14 |

<sup>1)</sup> Calculation of effective displacement:

$$\delta_{N0} = \delta_{N0\text{-Faktor}} \cdot \tau_{Ed}$$

$$\delta_{N\infty} = \delta_{N\infty\text{-Faktor}} \cdot \tau_{Ed}$$

( $\tau_{Ed}$ : Design value of the applied tensile stress)

<sup>2)</sup> Calculation of effective displacement:

$$\delta_{V0} = \delta_{V0\text{-Faktor}} \cdot V_{Ed}$$

$$\delta_{V\infty} = \delta_{V\infty\text{-Faktor}} \cdot V_{Ed}$$

( $V_{Ed}$ : Design value of the applied shear force)

fischer injection system FIS V

**Performances**

Displacements for anchor rods and fischer internal threaded anchors RG MI

**Annex C 8**

**Table C12: Displacements for reinforcing bars**

| Nominal diameter of the bar $\phi$                     |                           | 8    | 10   | 12   | 14   | 16   | 20   | 25   | 28   |
|--------------------------------------------------------|---------------------------|------|------|------|------|------|------|------|------|
| Displacement-Factors for tensile load <sup>1)</sup>    |                           |      |      |      |      |      |      |      |      |
| Uncracked concrete; Temperature range I, II            |                           |      |      |      |      |      |      |      |      |
| $\delta_{N0}$ -Faktor                                  | [mm/(N/mm <sup>2</sup> )] | 0,09 | 0,09 | 0,10 | 0,10 | 0,10 | 0,10 | 0,10 | 0,11 |
| $\delta_{N\infty}$ -Faktor                             |                           | 0,10 | 0,10 | 0,12 | 0,12 | 0,12 | 0,12 | 0,13 | 0,13 |
| Cracked concrete; Temperature range I, II              |                           |      |      |      |      |      |      |      |      |
| $\delta_{N0}$ -Faktor                                  | [mm/(N/mm <sup>2</sup> )] | ---  | 0,12 | 0,12 | 0,13 | 0,13 | 0,13 | 0,13 | 0,14 |
| $\delta_{N\infty}$ -Faktor                             |                           | ---  | 0,27 | 0,30 | 0,30 | 0,30 | 0,30 | 0,35 | 0,37 |
| Displacement-Factors for shear load <sup>2)</sup>      |                           |      |      |      |      |      |      |      |      |
| Uncracked or cracked concrete; Temperature range I, II |                           |      |      |      |      |      |      |      |      |
| $\delta_{V0}$ -Faktor                                  | [mm/kN]                   | 0,11 | 0,11 | 0,10 | 0,10 | 0,10 | 0,09 | 0,09 | 0,08 |
| $\delta_{V\infty}$ -Faktor                             |                           | 0,12 | 0,12 | 0,11 | 0,11 | 0,11 | 0,10 | 0,10 | 0,09 |

1) Calculation of effective displacement:

$$\delta_{N0} = \delta_{N0\text{-Faktor}} \cdot \tau_{Ed}$$

$$\delta_{N\infty} = \delta_{N\infty\text{-Faktor}} \cdot \tau_{Ed}$$

( $\tau_{Ed}$ : Design value of the applied tensile stress)

2) Calculation of effective displacement:

$$\delta_{V0} = \delta_{V0\text{-Faktor}} \cdot V_{Ed}$$

$$\delta_{V\infty} = \delta_{V\infty\text{-Faktor}} \cdot V_{Ed}$$

( $V_{Ed}$ : Design value of the applied shear force)**Table C13: Displacements for fischer rebar anchors FRA**

| Size                                                   |                           | M12  | M16  | M20  | M24  |
|--------------------------------------------------------|---------------------------|------|------|------|------|
| Displacement-Factors for tensile load <sup>1)</sup>    |                           |      |      |      |      |
| Uncracked concrete; Temperature range I, II            |                           |      |      |      |      |
| $\delta_{N0}$ -Faktor                                  | [mm/(N/mm <sup>2</sup> )] | 0,10 | 0,10 | 0,10 | 0,10 |
| $\delta_{N\infty}$ -Faktor                             |                           | 0,12 | 0,12 | 0,12 | 0,13 |
| Cracked concrete; Temperature range I, II              |                           |      |      |      |      |
| $\delta_{N0}$ -Faktor                                  | [mm/(N/mm <sup>2</sup> )] | 0,12 | 0,13 | 0,13 | 0,13 |
| $\delta_{N\infty}$ -Faktor                             |                           | 0,30 | 0,30 | 0,30 | 0,35 |
| Displacement-Factors for shear load <sup>2)</sup>      |                           |      |      |      |      |
| Uncracked or cracked concrete; Temperature range I, II |                           |      |      |      |      |
| $\delta_{V0}$ -Faktor                                  | [mm/kN]                   | 0,10 | 0,10 | 0,09 | 0,09 |
| $\delta_{V\infty}$ -Faktor                             |                           | 0,11 | 0,11 | 0,10 | 0,10 |

1) Calculation of effective displacement:

$$\delta_{N0} = \delta_{N0\text{-Faktor}} \cdot \tau_{Ed}$$

$$\delta_{N\infty} = \delta_{N\infty\text{-Faktor}} \cdot \tau_{Ed}$$

( $\tau_{Ed}$ : Design value of the applied tensile stress)

2) Calculation of effective displacement:

$$\delta_{V0} = \delta_{V0\text{-Faktor}} \cdot V_{Ed}$$

$$\delta_{V\infty} = \delta_{V\infty\text{-Faktor}} \cdot V_{Ed}$$

( $V_{Ed}$ : Design value of the applied shear force)

fischer injection system FIS V

**Performances**

Displacements for reinforcing bars and fischer rebar anchors FRA

**Annex C 9**

**Table C14:** Characteristic values for the **steel bearing capacity** of **anchor rods** under seismic action performance category **C1 or C2**

| Size                                                                                                                                                                                                             |                                                         |     |      | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|-----|------|-----|-----|-----|-----|-----|-----|-----|
| Bearing capacity under tensile load, steel failure <sup>1)</sup>                                                                                                                                                 |                                                         |     |      |     |     |     |     |     |     |     |
| Anchor rods, performance category C1                                                                                                                                                                             |                                                         |     |      |     |     |     |     |     |     |     |
| Charact.bearing capacity $N_{Rk,s,C1}$                                                                                                                                                                           | Steel zinc plated                                       | 5.8 | [kN] | 29  | 43  | 79  | 123 | 177 | 230 | 281 |
|                                                                                                                                                                                                                  |                                                         | 8.8 |      | 47  | 68  | 126 | 196 | 282 | 368 | 449 |
|                                                                                                                                                                                                                  | Stainless steel A4 and High corrosion resistant steel C | 50  |      | 29  | 43  | 79  | 123 | 177 | 230 | 281 |
|                                                                                                                                                                                                                  |                                                         | 70  |      | 41  | 59  | 110 | 172 | 247 | 322 | 393 |
|                                                                                                                                                                                                                  |                                                         | 80  |      | 47  | 68  | 126 | 196 | 282 | 368 | 449 |
| Anchor rods, performance category C2                                                                                                                                                                             |                                                         |     |      |     |     |     |     |     |     |     |
| Charact.bearing capacity $N_{Rk,s,C2}$                                                                                                                                                                           | Steel zinc plated                                       | 5.8 | [kN] | --- | 39  | 72  | 108 | --- | --- | --- |
|                                                                                                                                                                                                                  |                                                         | 8.8 |      | --- | 61  | 116 | 173 | --- | --- | --- |
|                                                                                                                                                                                                                  | Stainless steel A4 and High corrosion resistant steel C | 50  |      | --- | 39  | 72  | 108 | --- | --- | --- |
|                                                                                                                                                                                                                  |                                                         | 70  |      | --- | 53  | 101 | 152 | --- | --- | --- |
|                                                                                                                                                                                                                  |                                                         | 80  |      | --- | 61  | 116 | 173 | --- | --- | --- |
| Bearing capacity under shear load, steel failure without lever arm <sup>1)</sup>                                                                                                                                 |                                                         |     |      |     |     |     |     |     |     |     |
| fischer FIS A and RG M, performance category C1                                                                                                                                                                  |                                                         |     |      |     |     |     |     |     |     |     |
| Charact.bearing capacity $V_{Rk,s,C1}$                                                                                                                                                                           | Steel zinc plated                                       | 5.8 | [kN] | 15  | 21  | 39  | 61  | 89  | 115 | 141 |
|                                                                                                                                                                                                                  |                                                         | 8.8 |      | 23  | 34  | 63  | 98  | 141 | 184 | 225 |
|                                                                                                                                                                                                                  | Stainless steel A4 and High corrosion resistant steel C | 50  |      | 15  | 21  | 39  | 61  | 89  | 115 | 141 |
|                                                                                                                                                                                                                  |                                                         | 70  |      | 20  | 30  | 55  | 86  | 124 | 161 | 197 |
|                                                                                                                                                                                                                  |                                                         | 80  |      | 23  | 34  | 63  | 98  | 141 | 184 | 225 |
| Commercial standard threaded rods, performance category C1                                                                                                                                                       |                                                         |     |      |     |     |     |     |     |     |     |
| Charact.bearing capacity $V_{Rk,s,C1}$                                                                                                                                                                           | Steel zinc plated                                       | 5.8 | [kN] | 11  | 15  | 27  | 43  | 62  | 81  | 99  |
|                                                                                                                                                                                                                  |                                                         | 8.8 |      | 16  | 24  | 44  | 69  | 99  | 129 | 158 |
|                                                                                                                                                                                                                  | Stainless steel A4 and High corrosion resistant steel C | 50  |      | 11  | 15  | 27  | 43  | 62  | 81  | 99  |
|                                                                                                                                                                                                                  |                                                         | 70  |      | 14  | 21  | 39  | 60  | 87  | 113 | 138 |
|                                                                                                                                                                                                                  |                                                         | 80  |      | 16  | 24  | 44  | 69  | 99  | 129 | 158 |
| Anchor rods, performance category C2                                                                                                                                                                             |                                                         |     |      |     |     |     |     |     |     |     |
| Charact.bearing capacity $V_{Rk,s,C2}$                                                                                                                                                                           | Steel zinc plated                                       | 5.8 | [kN] | --- | 14  | 27  | 43  | --- | --- | --- |
|                                                                                                                                                                                                                  |                                                         | 8.8 |      | --- | 22  | 44  | 69  | --- | --- | --- |
|                                                                                                                                                                                                                  | Stainless steel A4 and High corrosion resistant steel C | 50  |      | --- | 14  | 27  | 43  | --- | --- | --- |
|                                                                                                                                                                                                                  |                                                         | 70  |      | --- | 20  | 39  | 60  | --- | --- | --- |
|                                                                                                                                                                                                                  |                                                         | 80  |      | --- | 22  | 44  | 69  | --- | --- | --- |
| <div>fischer injection system FIS V</div> <div> <b>Performances</b><br/>           Characteristic steel bearing capacity for anchor rods and under seismic action (performance category C1 or C2)         </div> |                                                         |     |      |     |     |     |     |     |     |     |
| Annex C 10                                                                                                                                                                                                       |                                                         |     |      |     |     |     |     |     |     |     |

**Table C15: Partial safety factors for anchor rods**  
under seismic action performance category C1 or C2

| Size                                                             |                                                         |                |     | M10 | M12                       | M16 | M20 | M24 | M27 | M30 |
|------------------------------------------------------------------|---------------------------------------------------------|----------------|-----|-----|---------------------------|-----|-----|-----|-----|-----|
| Bearing capacity under tensile load, steel failure <sup>1)</sup> |                                                         |                |     |     |                           |     |     |     |     |     |
| Partial safety factor $\gamma_{Ms,N}$                            | Steel zinc plated                                       | Property class | 5.8 | [-] | 1,50                      |     |     |     |     |     |
|                                                                  |                                                         |                | 8.8 |     | 1,50                      |     |     |     |     |     |
|                                                                  | Stainless steel A4 and High corrosion resistant steel C |                | 50  |     | 2,86                      |     |     |     |     |     |
|                                                                  |                                                         |                | 70  |     | 1,50 <sup>2)</sup> / 1,87 |     |     |     |     |     |
|                                                                  |                                                         |                | 80  |     | 1,60                      |     |     |     |     |     |
|                                                                  |                                                         |                |     |     |                           |     |     |     |     |     |
| Bearing capacity under shear load, steel failure <sup>1)</sup>   |                                                         |                |     |     |                           |     |     |     |     |     |
| Partial safety factor $\gamma_{Ms,V}$                            | Steel zinc plated                                       | Property class | 5.8 | [-] | 1,25                      |     |     |     |     |     |
|                                                                  |                                                         |                | 8.8 |     | 1,25                      |     |     |     |     |     |
|                                                                  | Stainless steel A4 and High corrosion resistant steel C |                | 50  |     | 2,38                      |     |     |     |     |     |
|                                                                  |                                                         |                | 70  |     | 1,25 <sup>2)</sup> / 1,56 |     |     |     |     |     |
|                                                                  |                                                         |                | 80  |     | 1,33                      |     |     |     |     |     |
|                                                                  |                                                         |                |     |     |                           |     |     |     |     |     |

<sup>1)</sup> In absence of other national regulations

<sup>2)</sup> Only for fischer FIS A and RG M made of high corrosion-resistant steel C

**Table C16: Characteristic values of resistance for anchor rods**  
in hammer drilled holes under seismic action performance category C1

| Size                                                                               |                    |                |         | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|------------------------------------------------------------------------------------|--------------------|----------------|---------|-----|-----|-----|-----|-----|-----|-----|
| Characteristic bond resistance, combined pullout and concrete cone failure         |                    |                |         |     |     |     |     |     |     |     |
| Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete) |                    |                |         |     |     |     |     |     |     |     |
| Temperature range                                                                  | I: 50 °C / 80 °C   | $\tau_{Rk,C1}$ | [N/mm²] | 4,5 | 5,5 | 5,5 | 5,5 | 4,5 | 4,0 | 4,0 |
|                                                                                    | II: 72 °C / 120 °C |                |         | 4,0 | 4,5 | 4,5 | 4,5 | 4,0 | 3,5 | 3,5 |
| Hammer-drilling with standard drill bit or hollow drill bit (flooded hole)         |                    |                |         |     |     |     |     |     |     |     |
| Temperature range                                                                  | I: 50 °C / 80 °C   | $\tau_{Rk,C1}$ | [N/mm²] | --- | 5,0 | 5,0 | 4,5 | 4,0 | 3,5 | 3,5 |
|                                                                                    | II: 72 °C / 120 °C |                |         | --- | 4,0 | 4,0 | 4,0 | 3,5 | 3,0 | 3,0 |

fischer injection system FIS V

**Performances**

Partial safety factors (C1 or C2) and characteristic values under seismic action (C1) for anchor rods

**Annex C 11**

**Table C17:** Characteristic values of **resistance** for **anchor rods**  
in hammer drilled holes under seismic action performance category **C2**

| Size                                                                               |                    | M12                       | M16                  | M20  |      |     |
|------------------------------------------------------------------------------------|--------------------|---------------------------|----------------------|------|------|-----|
| Characteristic bond resistance, combined pullout and concrete cone failure         |                    |                           |                      |      |      |     |
| Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete) |                    |                           |                      |      |      |     |
| Temperature range                                                                  | I: 50 °C / 80 °C   | $\tau_{Rk,C2}$            | [N/mm <sup>2</sup> ] | 1,5  | 1,3  | 2,1 |
|                                                                                    | II: 72 °C / 120 °C |                           |                      | 1,3  | 1,2  | 1,9 |
| Hammer-drilling with standard drill bit or hollow drill bit (flooded hole)         |                    |                           |                      |      |      |     |
| Temperature range                                                                  | I: 50 °C / 80 °C   | $\tau_{Rk,C2}$            | [N/mm <sup>2</sup> ] | 1,3  | 1,1  | 1,8 |
|                                                                                    | II: 72 °C / 120 °C |                           |                      | 1,1  | 1,0  | 1,6 |
| Displacement-Factors for tensile load <sup>1)</sup>                                |                    |                           |                      |      |      |     |
| $\delta_{N,(DLS)}\text{-Factor}$                                                   |                    | [mm/(N/mm <sup>2</sup> )] | 0,20                 | 0,13 | 0,21 |     |
| $\delta_{N,(ULS)}\text{-Factor}$                                                   |                    |                           | 0,38                 | 0,18 | 0,24 |     |
| Displacement-Factors for shear load <sup>2)</sup>                                  |                    |                           |                      |      |      |     |
| $\delta_{V,(DLS)}\text{-Factor}$                                                   |                    | [mm/kN]                   | 0,18                 | 0,10 | 0,07 |     |
| $\delta_{V,(ULS)}\text{-Factor}$                                                   |                    |                           | 0,25                 | 0,14 | 0,11 |     |

<sup>1)</sup> Calculation of effective displacement:

$$\delta_{N,(DLS)} = \delta_{N,(DLS)\text{-Factor}} \cdot \tau_{Ed}$$

$$\delta_{N,(ULS)} = \delta_{N,(ULS)\text{-Factor}} \cdot \tau_{Ed}$$

( $\tau_{Ed}$ : Design value of the applied tensile stress)

<sup>2)</sup> Calculation of effective displacement:

$$\delta_{V,(DLS)} = \delta_{V,(DLS)\text{-Factor}} \cdot V_{Ed}$$

$$\delta_{V,(ULS)} = \delta_{V,(ULS)\text{-Factor}} \cdot V_{Ed}$$

( $V_{Ed}$ : Design value of the applied shear force)

fischer injection system FIS V

**Performances**

Characteristic values under seismic action (performance category C2)  
for anchor rods

**Annex C 12**