

## ДЕКЛАРАЦИЯ ЗА ЕКСПЛОАТАЦИОННИ ПОКАЗАТЕЛИ

DoP 0238

за инжекционна система fischer FIS V Zero (Свързващ анкер за употреба в бетон)

BG

1. Уникален идентификационен код на типа продукт: DoP 0238
2. Предвидена употреба/употреби: Предварително монтирано укрепване в напукан или ненапукан бетон, виж Приложението, по-специално Приложения B1 - B10.
3. Производител: fischerwerke GmbH & Co. KG, Otto-Hahn-Straße 15, 79211 Denzlingen, Германия
4. Упълномощен представител: –
5. Система/системи за оценяване и проверка на постоянството на експлоатационните показатели: 1
6. Европейски документ за оценяване: EAD 330499-01-0601, Edition 04/2020  
Европейска техническа оценка: ETA-20/0572; 2021-04-28  
Орган за техническа оценка: DIBt- Deutsches Institut für Bautechnik  
Нотифициран орган/органи: 2873 TU Darmstadt
7. Деклариран експлоатационни показатели:  
**Механична устойчивост и здравина (BWR 1)**  
**Характерна носимоспособност на опън (за статично и квази статично действие):**  
Устойчивост на разрушаване на стомана: Приложения C1 - C3  $E_s = 210\,000\text{ MPa}$   
Устойчивост на комбинирано въздействие издърпване и разрушаване на бетонния конус: Приложения C4 - C7  $\tau_{Rk,100} = \text{NPD}$   
Товароустойчивост при при отказ от излизане на бетонния конус: Приложение C4  
Разстояние до ръба, за да се предотврати сцепването при натоварване: Приложение C4  
Здравина: Приложения C4 - C7  
Максимален инсталационен въртящ момент: Приложения B3, B4, B6  
Минимални отстояния от ръба и междусови отстояния: Приложения B3 - B6  
**Характерна носимоспособност на срез (за статично и квази статично действие):**  
Товароустойчивост при натоварване на срез, отказ на стоманата: Приложения C1 - C3  
Устойчивост на отказ при отклонение: Приложение C4  
Устойчивост на разрушаване на бетонния ръб: Приложение C4  
**Характерно съпротивление и Измествания за сеизмични класове C1 и C2:**  
Товароустойчивост при натоварване на опън, Измествания, категория C1: NPD  
Товароустойчивост при натоварване на опън, Измествания, категория C2: NPD  
Товароустойчивост при натоварване на срез, Измествания, категория C1: NPD  
Товароустойчивост при натоварване на срез, Измествания, категория C2: NPD  
Фактор пръстеновидна fuga: NPD  
**Размествания при краткосрочно и дългосрочно натоварване:**  
Размествания при краткосрочно и дългосрочно натоварване: Приложения C8, C9  
**Хигиена, здраве и околна среда (BWR 3)**  
Съдържание, емисия и / или освобождаване на опасни вещества: NPD
8. Подходяща техническа документация и/или специфична техническа документация: –

Експлоатационните показатели на продукта, посочени по-горе, са в съответствие с декларираните експлоатационни показатели. Настоящата декларация за експлоатационни показатели се издава в съответствие с Регламент (ЕС) № 305/2011, като отговорността за нея се носи изцяло от посочения по-горе

Подписано за и от името на производителя от:



Dr. Oliver Geibig, Управляващ директор Бизнес звена и инженеринг  
Tumlingen, 2021-05-12



Jürgen Grün, Управляващ директор Химия и качество

Тази Декларация за съответствие е изготвена на различни езици. В случай, че възникне спор, относно интерпретирането, трябва да се вземе предвид английската версия.

Приложението съдържа доброволна и допълнителна информация на английски език в обем и съдържание, надхвърлящи (независимо от езика) законовите изисквания.

## Specific Part

### 1 Technical description of the product

The fischer injection system FIS V Zero is a bonded fastener consisting of an injection cartridge with injection mortar FIS V Zero and a steel element according to Annex A.

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 resistance to tension load (static and quasi-static loading)              | See Annex C 1 to C 7, B 3 to B 6 |
| Characteristic resistance to shear load (static and quasi-static loading)                | See Annex C 1 to C 4             |
| Displacements under short-term and long-term loading                                     | See Annex C 8 to C 9             |
| Characteristic resistance and displacements for seismic performance categories C1 and C2 | No performance assessed          |

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

| Essential characteristic                                 | Performance             |
|----------------------------------------------------------|-------------------------|
| Content, emission and/or release of dangerous substances | No performance assessed |

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

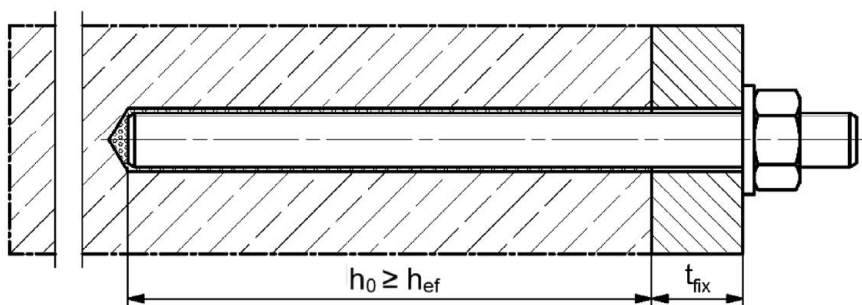
In accordance with the European Assessment Document EAD 330499-01-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

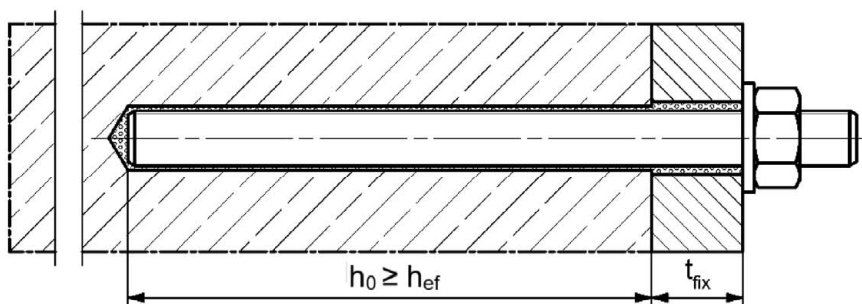
# Installation conditions part 1

fischer anchor rod

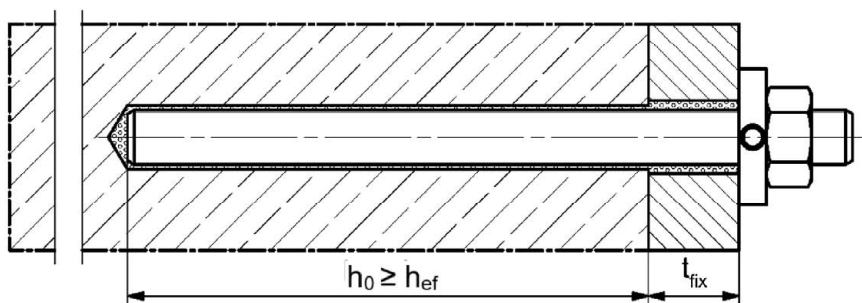
Pre-positioned installation



Push through installation (annular gap filled with mortar)



Pre-positioned or push through installation with subsequently injected fischer filling disc  
(annular gap filled with mortar)



Figures not to scale

$h_0$  = drill hole depth

$h_{ef}$  = effective embedment depth

$t_{fix}$  = thickness of fixture

fischer injection system FIS V Zero

**Product description**

Installation conditions part 1

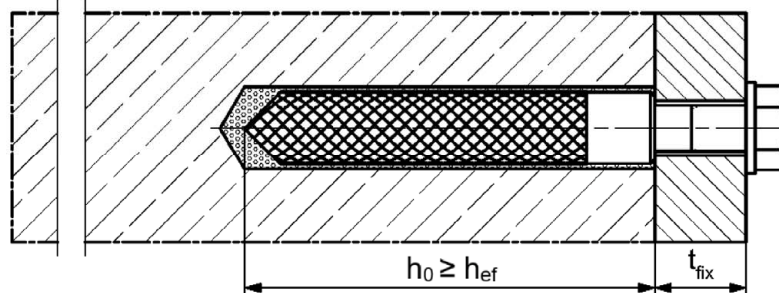
**Annex A 1**

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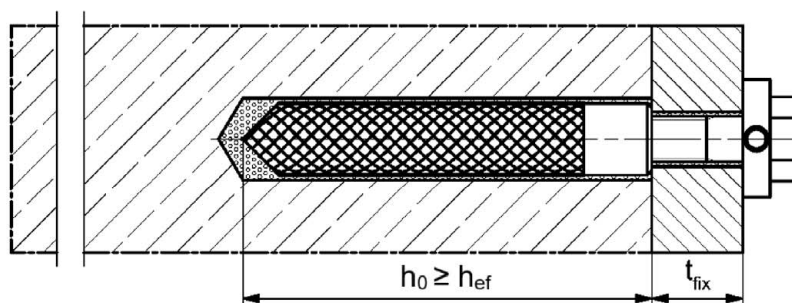
# Installation conditions part 2

fischer internal threaded anchor RG M I

## Pre-positioned installation



## Pre-positioned installation with subsequently injected fischer filling disc (annular gap filled with mortar)



Figures not to scale

$h_0$  = drill hole depth

$h_{ef}$  = effective embedment depth

$t_{fix}$  = thickness of fixture

fischer injection system FIS V Zero

### Product description

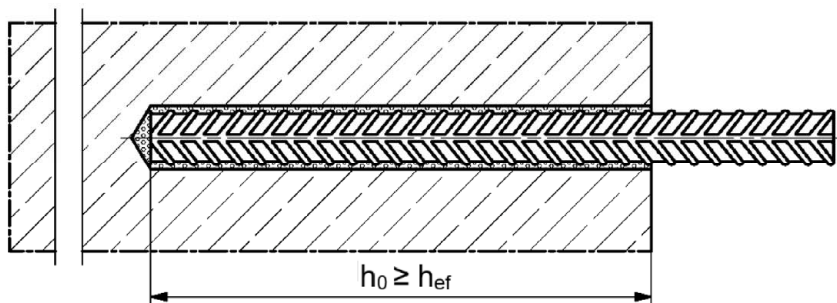
Installation conditions part 2

**Annex A 2**

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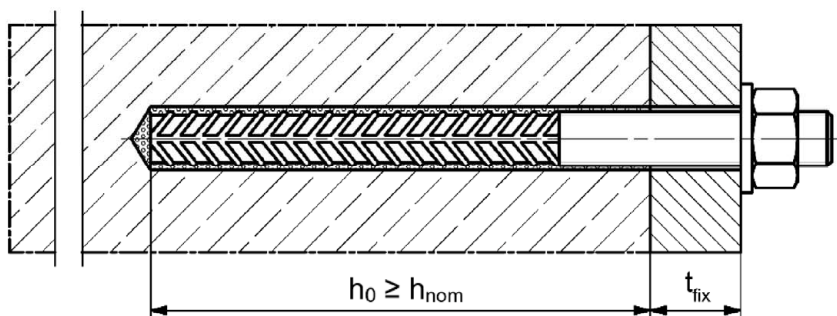
Installation conditions part 3

Reinforcing bar

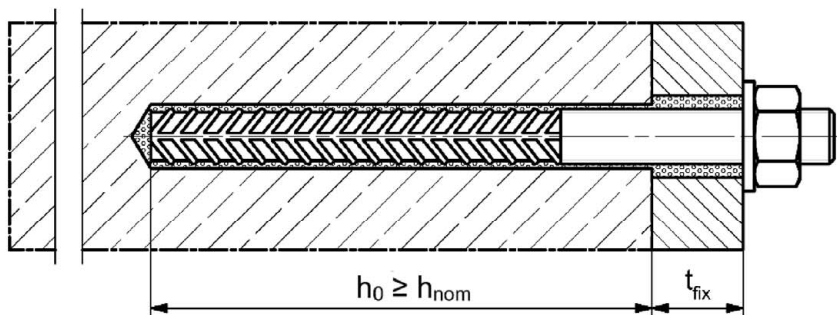


fischer rebar anchor FRA

Pre-positioned installation



Push through installation (annular gap filled with mortar)



Figures not to scale

$h_0$  = drill hole depth

$h_{ef}$  = effective embedment depth

$t_{fix}$  = thickness of fixture

$h_{nom}$  = overall fastener embedment depth in the concrete

fischer injection system FIS V Zero

**Product description**

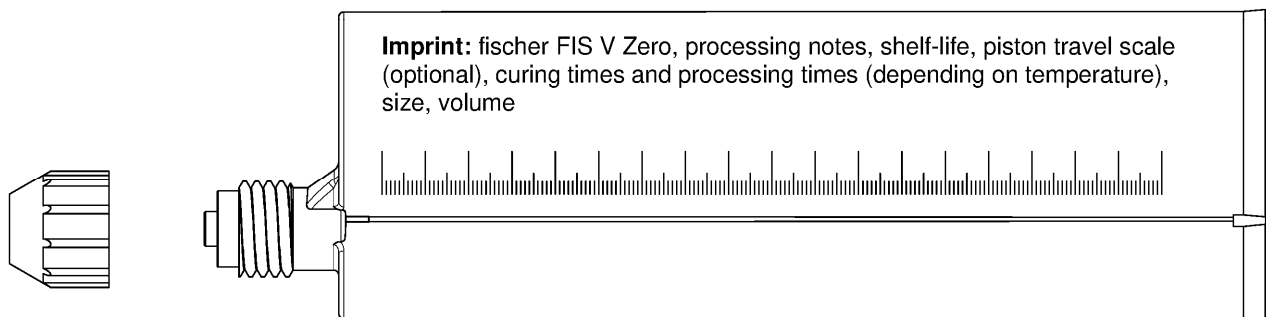
Installation conditions part 3

**Annex A 3**

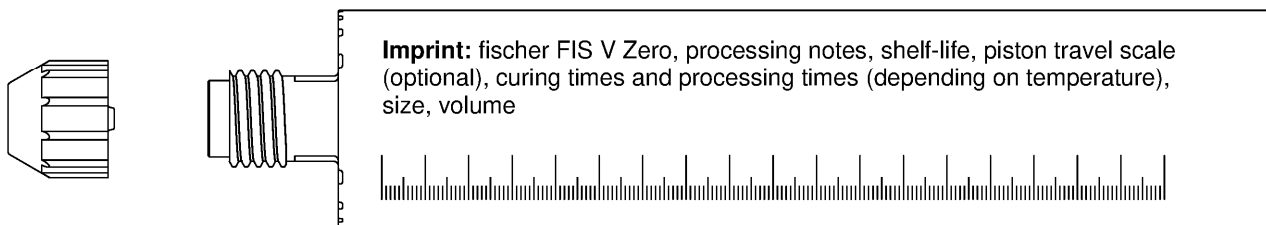
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# Overview system components part 1

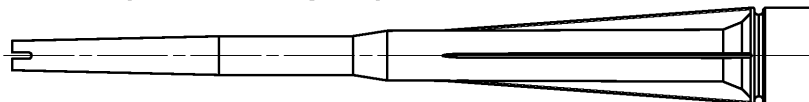
## Injection cartridge (shuttle cartridge) with sealing cap; Sizes: 360 ml, 825 ml



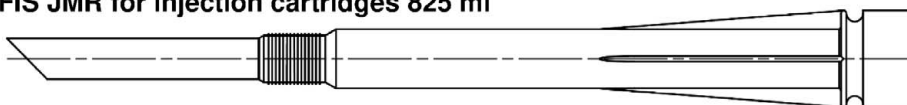
## Injection cartridge (coaxial cartridge) with sealing cap; Sizes: 100 ml, 150 ml, 300 ml, 380 ml, 400 ml, 410 ml



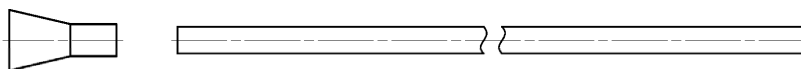
## Static mixer FIS MR Plus for injection cartridges up to 410 ml



## Static mixer FIS JMR for injection cartridges 825 ml



## Injection adapter and extension tube Ø 9 for static mixer FIS MR Plus; Injection adapter and extension tube Ø 9 or Ø 15 for static mixer FIS JMR



## Cleaning brush BS



## Blow-out pump

AB G



ABP:



Figures not to scale

fischer injection system FIS V Zero

### Product description

Overview system components part 1;  
cartridges / static mixer / accessories

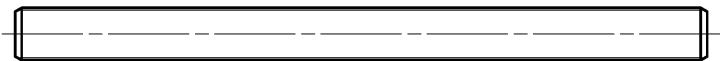
## Annex A 4

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Overview system components part 2

fischer anchor rod

Size: M8, M10, M12, M16, M20, M24

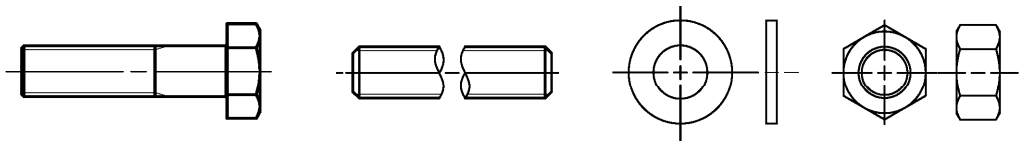


fischer internal threaded anchor RG M I

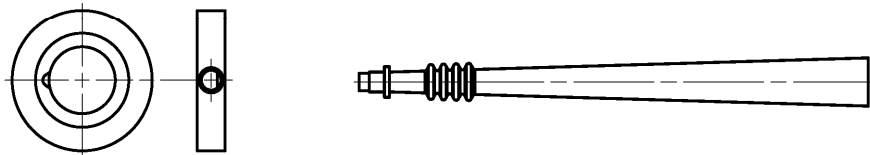
Size: M8, M10, M12, M16



Screw / threaded rod / washer / hexagon nut



fischer filling disc with injection adapter



Reinforcing bar

Nominal diameter:  $\phi 8$ ,  $\phi 10$ ,  $\phi 12$ ,  $\phi 14$ ,  $\phi 16$ ,  $\phi 20$ ,  $\phi 22$ ,  $\phi 24$ ,  $\phi 25$



fischer rebar anchor FRA

Size: M12, M16, M20, M24



Figures not to scale

fischer injection system FIS V Zero

**Product description**  
Overview system components part 2;  
steel components, injection adapter

**Annex A 5**

**Table A6.1: Materials**

| Part                                    | Designation                                                                                       | Material                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                       |
|-----------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                                       | Injection cartridge                                                                               | Mortar, hardener, filler                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                       |
|                                         | Steel grade                                                                                       | Steel                                                                                                                                                                                                                                                    | Stainless steel R                                                                                                                                                                                                                                                                                                                         | High corrosion resistant steel HCR                                                                                                                                                                                                                    |
|                                         |                                                                                                   | zinc plated                                                                                                                                                                                                                                              | acc. to EN 10088-1:2014<br>Corrosion resistance class CRC III<br>acc. to EN 1993-1-4:2015                                                                                                                                                                                                                                                 | acc. to EN 10088-1:2014<br>Corrosion resistance class CRC V<br>acc. to EN 1993-1-4:2015                                                                                                                                                               |
| 2                                       | Anchor rod                                                                                        | Property class 4.8, 5.8 or 8.8;<br>EN ISO 898-1:2013<br>zinc plated ≥ 5 µm,<br>ISO 4042:2018/Zn5/An(A2K)<br>or hot dip galvanised ≥ 40 µm<br>EN ISO 10684:2004<br>f <sub>uk</sub> ≤ 1000 N/mm <sup>2</sup><br>A <sub>5</sub> > 8%<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 <sub>uk</sub> ≤ 1000 N/mm <sup>2</sup><br>A <sub>5</sub> > 8%<br>fracture elongation                                                                                           | Property class 50 or 80<br>EN ISO 3506-1:2009<br>or property class 70 with<br>f <sub>yk</sub> = 560 N/mm <sup>2</sup><br>1.4565; 1.4529;<br>EN 10088-1:2014<br>f <sub>uk</sub> ≤ 1000 N/mm <sup>2</sup><br>A <sub>5</sub> > 8%<br>fracture elongation |
| 3                                       | Washer<br>ISO 7089:2000                                                                           | zinc plated ≥ 5 µm,<br>ISO 4042:2018/Zn5/An(A2K)<br>or hot dip galvanised ≥ 40 µm<br>EN ISO 10684:2004                                                                                                                                                   | 1.4401; 1.4404;<br>1.4578; 1.4571;<br>1.4439; 1.4362;<br>EN 10088-1:2014                                                                                                                                                                                                                                                                  | 1.4565; 1.4529;<br>EN 10088-1:2014                                                                                                                                                                                                                    |
| 4                                       | Hexagon nut                                                                                       | Property class 4, 5 or 8;<br>EN ISO 898-2:2012<br>zinc plated ≥ 5 µm,<br>ISO 4042:2018/Zn5/An(A2K)<br>or hot dip galvanised ≥ 40 µm<br>EN ISO 10684:2004                                                                                                 | Property class<br>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<br>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 anchor<br>RG M I                                                     | Property class 5.8<br>ISO 898-1:2013<br>zinc plated ≥ 5 µm,<br>ISO 4042:2018/Zn5/An(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 threaded rod<br>for fischer internal<br>threaded anchor<br>RG M I | Property class 5.8 or 8.8;<br>EN ISO 898-1:2013<br>zinc plated ≥ 5 µm,<br>ISO 4042:2018/Zn5/An(A2K)<br>A <sub>5</sub> > 8 %<br>fracture elongation                                                                                                       | 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>A <sub>5</sub> > 8 % fracture elongation                                                                                                                                                                              | Property class 70<br>EN ISO 3506-1:2009<br>1.4565; 1.4529;<br>EN 10088-1:2014<br>A <sub>5</sub> > 8 %<br>fracture elongation                                                                                                                          |
| 7                                       | fischer filling disc<br>similar to DIN 6319-G                                                     | zinc plated ≥ 5 µm,<br>ISO 4042:2018/Zn5/An(A2K)<br>or hot dip galvanised ≥ 40 µm<br>EN ISO 10684:2004                                                                                                                                                   | 1.4401; 1.4404; 1.4578;<br>1.4571; 1.4439; 1.4362;<br>EN 10088-1:2014                                                                                                                                                                                                                                                                     | 1.4565;1.4529;<br>EN 10088-1:2014                                                                                                                                                                                                                     |
| 8                                       | 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 <sub>yk</sub> and k according to NDP or NCL of according to EN 1992-1-1/NA<br>f <sub>uk</sub> = f <sub>tk</sub> = k · f <sub>yk</sub> (A <sub>5</sub> > 8%)                                              |                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                       |
| 9                                       | fischer<br>rebar anchor FRA                                                                       | Rebar part:<br>Bars and de-coiled rods class B or C with f <sub>yk</sub><br>and k according to NDP or NCL of EN<br>1992-1-1:2004+AC:2010<br>f <sub>uk</sub> = f <sub>tk</sub> = k · f <sub>yk</sub>                                                      | Threaded part: Property class 70 or for<br>M24 PC 80, EN ISO 3506-1:2009<br>1.4401, 1.4404, 1.4571, 1.4578, 1.4439,<br>1.4362, 1.4062 acc. to EN 10088-1:2014<br>Corrosion resistance class CRC III<br>acc. to EN 1993-1-4:2015<br>1.4565; 1.4529 acc. to EN 10088-1:2014<br>Corrosion resistance class CRC V<br>acc. to EN 1993-1-4:2015 |                                                                                                                                                                                                                                                       |
|                                         |                                                                                                   |                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                       |
| fischer injection system FIS V Zero     |                                                                                                   |                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                           | <b>Annex A 6</b><br><br>Appendix 7 / 26                                                                                                                                                                                                               |
| <b>Product description</b><br>Materials |                                                                                                   |                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                       |

**Table B1.1:** Overview use and performance categories

| FIS V Zero with ...                                                                                                                                                                                              |                       |                                                                                                                            |                   |                                                                                                                               |                                                                             |                                                                                                        |           |                                                                                                                 |                                  |                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------------|
|                                                                                                                                                                                                                  |                       | Anchor rod<br>                            |                   | fischer internal threaded anchor RG M I<br> |                                                                             | Reinforcing bar<br> |           | fischer rebar anchor FRA<br> |                                  |                                         |
| Hammer drilling with standard drill bit<br>                                                                                     |                       | all sizes                                                                                                                  |                   |                                                                                                                               |                                                                             |                                                                                                        |           |                                                                                                                 |                                  |                                         |
| Hammer drilling with hollow drill bit<br><br>(fischer „FHD“, Heller „Duster Expert“, Bosch „Speed Clean“, Hilti „TE-CD, TE-YD“) |                       | Nominal drill bit diameter (d <sub>0</sub> )<br>12 mm to 30 mm                                                             |                   |                                                                                                                               |                                                                             |                                                                                                        |           |                                                                                                                 |                                  |                                         |
| Static and quasi static load, in                                                                                                                                                                                 |                       | uncracked concrete                                                                                                         | all sizes         | Tables:<br>C1.1<br>C4.1<br>C5.1<br>C8.1                                                                                       | all sizes                                                                   | Tables:<br>C2.1<br>C4.1<br>C6.1<br>C8.2                                                                | all sizes | Tables:<br>C3.1<br>C4.1<br>C7.1<br>C9.1                                                                         | all sizes                        | Tables:<br>C3.2<br>C4.1<br>C7.2<br>C9.2 |
|                                                                                                                                                                                                                  |                       | cracked concrete <sup>2)</sup>                                                                                             | all sizes         |                                                                                                                               | all sizes                                                                   |                                                                                                        | -1)       |                                                                                                                 | -1)                              |                                         |
| Seismic performance category                                                                                                                                                                                     |                       | C1 <sup>1)</sup>                                                                                                           | -1)               |                                                                                                                               | -1)                                                                         |                                                                                                        | -1)       |                                                                                                                 | -1)                              |                                         |
|                                                                                                                                                                                                                  |                       | C2 <sup>1)</sup>                                                                                                           |                   |                                                                                                                               |                                                                             |                                                                                                        |           |                                                                                                                 |                                  |                                         |
| Use conditions                                                                                                                                                                                                   | I1                    | dry or wet concrete                                                                                                        | all sizes         |                                                                                                                               | all sizes                                                                   |                                                                                                        | all sizes |                                                                                                                 | all sizes                        |                                         |
|                                                                                                                                                                                                                  | I2                    | water filled hole <sup>2)</sup>                                                                                            | all sizes         |                                                                                                                               | all sizes                                                                   |                                                                                                        | all sizes |                                                                                                                 | all sizes                        |                                         |
| Installation direction                                                                                                                                                                                           |                       | D3 (downward and horizontal and upwards (e.g. overhead) installation)                                                      |                   |                                                                                                                               |                                                                             |                                                                                                        |           |                                                                                                                 |                                  |                                         |
| Installation temperature                                                                                                                                                                                         |                       | T <sub>i,min</sub> = -10 °C to T <sub>i,max</sub> = +40 °C<br>for the standard variation of temperature after installation |                   |                                                                                                                               |                                                                             |                                                                                                        |           |                                                                                                                 |                                  |                                         |
| In-service temperature                                                                                                                                                                                           | Temperature range I   |                                                                                                                            | -40 °C to +40 °C  |                                                                                                                               | (max. short term temperature +40 °C;<br>max. long term temperature +24 °C)  |                                                                                                        |           |                                                                                                                 |                                  |                                         |
|                                                                                                                                                                                                                  | Temperature range II  |                                                                                                                            | -40 °C to +80 °C  |                                                                                                                               | (max. short term temperature +80 °C;<br>max. long term temperature +50 °C)  |                                                                                                        |           |                                                                                                                 |                                  |                                         |
|                                                                                                                                                                                                                  | Temperature range III |                                                                                                                            | -40 °C to +120 °C |                                                                                                                               | (max. short term temperature +120 °C;<br>max. long term temperature +72 °C) |                                                                                                        |           |                                                                                                                 |                                  |                                         |
| <sup>1)</sup> No performance assessed<br><sup>2)</sup> No performance assessed for installation with hollow drill bit in cracked concrete or water filled hole                                                   |                       |                                                                                                                            |                   |                                                                                                                               |                                                                             |                                                                                                        |           |                                                                                                                 |                                  |                                         |
| fischer injection system FIS V Zero                                                                                                                                                                              |                       |                                                                                                                            |                   |                                                                                                                               |                                                                             |                                                                                                        |           |                                                                                                                 | Annex B 1<br><br>Appendix 8 / 26 |                                         |
| Intended use<br>Specifications (part 1)                                                                                                                                                                          |                       |                                                                                                                            |                   |                                                                                                                               |                                                                             |                                                                                                        |           |                                                                                                                 |                                  |                                         |

**Specifications of intended use (part 2)**

**Base materials:**

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

**Use conditions (Environmental conditions):**

- Structures subject to dry internal conditions (zinc plated steel, stainless steel or high corrosion resistant steel).
- For all other conditions according to EN 1993-1-4:2015 corresponding to corrosion resistance classes to Annex A 6 table A6.1.

**Design:**

- Anchorages 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.).
- Anchorages are designed in accordance with:  
EN 1992-4:2018 and EOTA Technical Report TR 055, Edition February 2018.

**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 installation
- Overhead installation is allowed (necessary equipment see installation instruction)

fischer injection system FIS V Zero

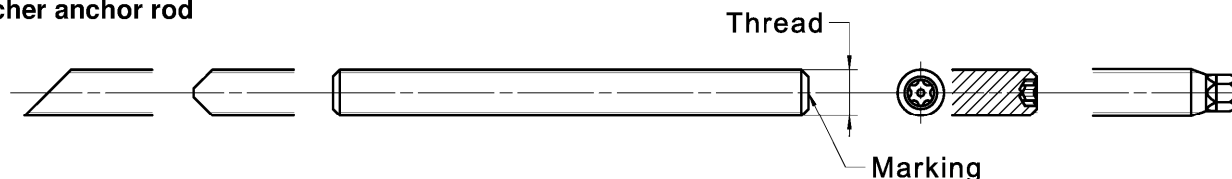
**Intended use**  
Specifications (part 2)

**Annex B 2**

Appendix 9 / 26

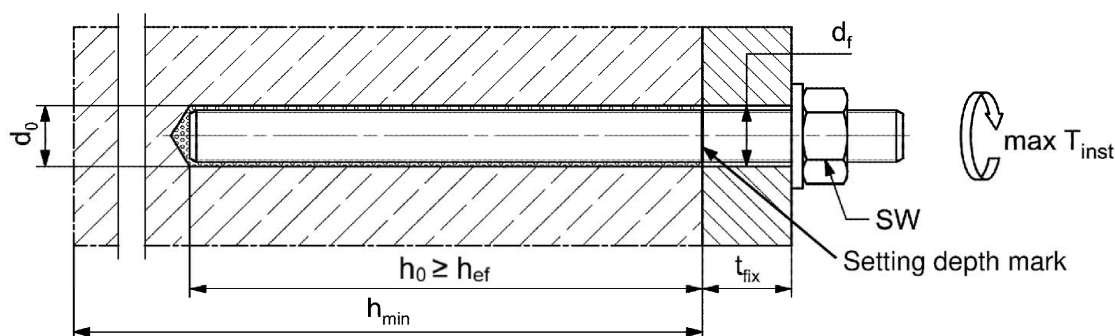
**Table B3.1:** Installation parameters for **anchor rods**

| Anchor rods                                   |                                      | Thread | M8                       | M10 | M12 | M16             | M20 | M24 |
|-----------------------------------------------|--------------------------------------|--------|--------------------------|-----|-----|-----------------|-----|-----|
| Width across flats                            | SW                                   | [mm]   | 13                       | 17  | 19  | 24              | 30  | 36  |
| Nominal drill hole diameter                   | $d_0$                                |        | 10                       | 12  | 14  | 18              | 22  | 28  |
| Drill hole depth                              | $h_0$                                |        | $h_0 = h_{ef}$           |     |     |                 |     |     |
| Effective embedment depth                     | $h_{ef, min}$                        |        | 60                       | 60  | 70  | 80              | 90  | 96  |
|                                               | $h_{ef, max}$                        |        | 160                      | 200 | 240 | 320             | 400 | 480 |
| Minimum spacing and minimum edge distance     | $s_{min} = c_{min}$                  |        | 40                       | 45  | 55  | 65              | 85  | 105 |
| Diameter of the clearance hole of the fixture | pre-positioned installation<br>$d_f$ |        | 9                        | 12  | 14  | 18              | 22  | 26  |
|                                               | push through installation<br>$d_f$   |        | 12                       | 14  | 16  | 20              | 24  | 30  |
| Minimum thickness of concrete member          | $h_{min}$                            |        | $h_{ef} + 30 (\geq 100)$ |     |     | $h_{ef} + 2d_0$ |     |     |
| Maximum installation torque                   | $\max T_{inst}$                      | [Nm]   | 10                       | 20  | 40  | 60              | 120 | 150 |

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

|                                                        |        |                                                        |   |
|--------------------------------------------------------|--------|--------------------------------------------------------|---|
| Steel zinc plated PC <sup>1)</sup> 8.8                 | • or + | Steel hot-dip PC <sup>1)</sup> 8.8                     | • |
| High corrosion resistant steel HCR PC <sup>1)</sup> 50 | •      | High corrosion resistant steel HCR PC <sup>1)</sup> 70 | - |
| High corrosion resistant steel HCR PC <sup>1)</sup> 80 | (      | Stainless steel R property class 50                    | ~ |
| Stainless steel R property class 80                    | *      |                                                        |   |

Alternatively: Colour coding according to DIN 976-1: 2016

<sup>1)</sup> PC = property class**Installation conditions:****Commercial standard threaded rods, washers and hexagon nuts may also be used, if the following requirements are fulfilled:**

- Materials, dimensions and mechanical properties according to Annex A 6, Table A6.1
- Inspection certificate 3.1 according to EN 10204:2004, the documents have to be stored
- Setting depth is marked

Figures not to scale

fischer injection system FIS V Zero

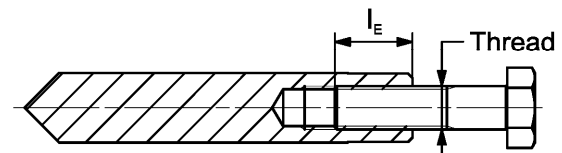
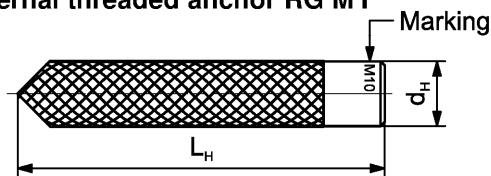
**Intended use**  
Installation parameters anchor rods

**Annex B 3**

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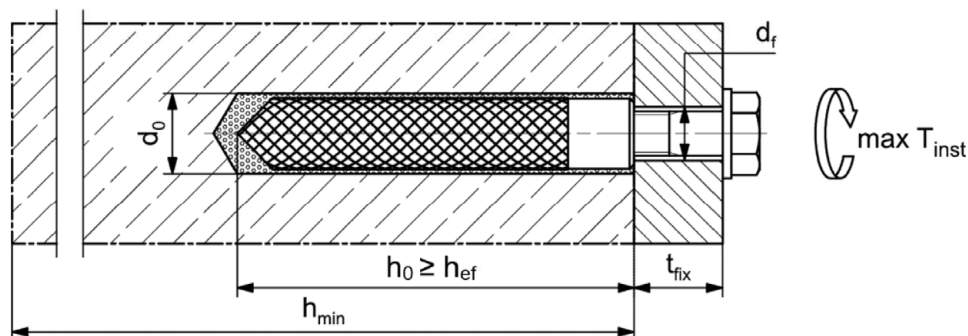
**Table B4.1:** Installation parameters for **fischer internal threaded anchors RG M I**

| Internal threaded anchors RG M I                |                             | Thread | M8                   | M10 | M12 | M16 |
|-------------------------------------------------|-----------------------------|--------|----------------------|-----|-----|-----|
| Diameter of anchor                              | $d_{nom} = d_H$             | [mm]   | 12                   | 16  | 18  | 22  |
| Nominal drill hole diameter                     | $d_0$                       |        | 14                   | 18  | 20  | 24  |
| Drill hole depth                                | $h_0$                       |        | $h_0 = h_{ef} = L_H$ |     |     |     |
| Effective embedment depth<br>( $h_{ef} = L_H$ ) | $h_{ef}$                    |        | 90                   | 90  | 125 | 160 |
| Minimum spacing and<br>minimum edge distance    | $s_{min}$<br>=<br>$c_{min}$ |        | 55                   | 65  | 75  | 95  |
| Diameter of clearance hole<br>in the fixture    | $d_f$                       |        | 9                    | 12  | 14  | 18  |
| Minimum thickness<br>of concrete member         | $h_{min}$                   |        | 120                  | 125 | 165 | 205 |
| Maximum screw-in depth                          | $l_{E,max}$                 |        | 18                   | 23  | 26  | 35  |
| Minimum screw-in depth                          | $l_{E,min}$                 |        | 8                    | 10  | 12  | 16  |
| Maximum installation torque                     | $\max T_{inst}$             | [Nm]   | 10                   | 20  | 40  | 80  |

**fischer internal threaded anchor RG M I**

**Marking:** Anchor size e. g.: **M10**  
Stainless steel → additional **R**; e.g.: **M10 R**  
High corrosion resistant steel → additional **HCR**; e.g.: **M10 HCR**

Retaining bolt or threaded rods (including nut and washer) must comply with the appropriate material and strength class of Annex A 6, Table A6.1

**Installation conditions:**

Figures not to scale

fischer injection system FIS V Zero

**Intended use**  
Installation parameters internal threaded anchors RG M I

**Annex B 4**

Appendix 11 / 26

**Table B5.1:** 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  | 22 | 24 | 25 |
|-------------------------------------------|---------------------|--------|---------------------------------|-----|------------------|-----------------|------------------|-----|-----|-----|-----|----|----|----|
| Nominal drill hole diameter               | $d_0$               | [mm]   | 10                              | 12  | 12               | 14              | 14               | 16  | 18  | 20  | 25  | 28 | 30 | 30 |
| Drill hole depth                          | $h_0$               |        | $h_0 = h_{ef}$                  |     |                  |                 |                  |     |     |     |     |    |    |    |
| Effective embedment depth                 | $h_{ef,min}$        |        | 60                              | 60  | 70               | 75              | 80               | 90  | 94  | 98  | 100 |    |    |    |
|                                           | $h_{ef,max}$        |        | 160                             | 200 | 240              | 280             | 320              | 400 | 440 | 480 | 500 |    |    |    |
| Minimum spacing and minimum edge distance | $s_{min} = c_{min}$ |        | 40                              | 45  | 55               | 60              | 65               | 85  | 95  | 105 | 110 |    |    |    |
| Minimum thickness of concrete member      | $h_{min}$           |        | $h_{ef} + 30$<br>( $\geq 100$ ) |     |                  | $h_{ef} + 2d_0$ |                  |     |     |     |     |    |    |    |

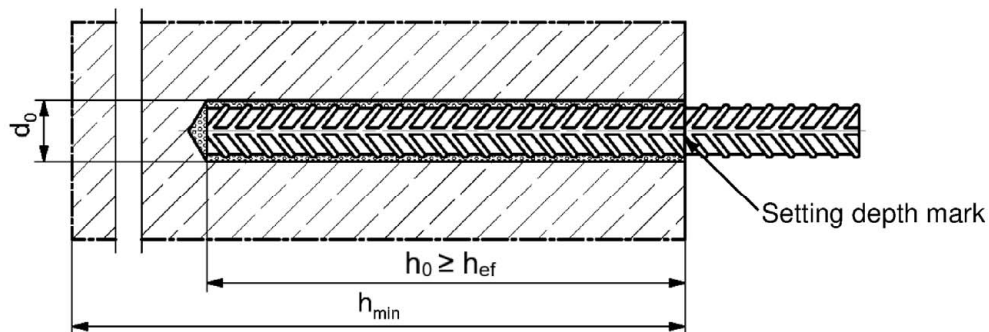
<sup>1)</sup> Both drill hole diameters can be used

### 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)

### Installation conditions:



Figures not to scale

fischer injection system FIS V Zero

**Intended use**  
Installation parameters reinforcing bars

**Annex B 5**

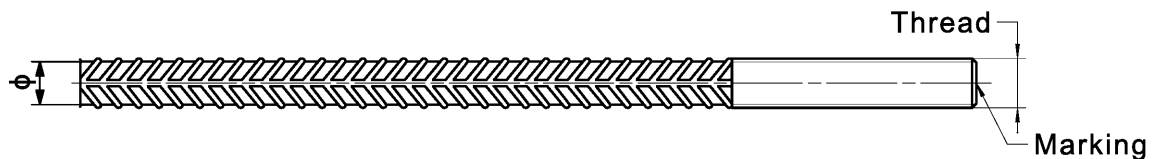
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**Table B6.1:** Installation parameters for **fischer rebar anchor FRA**

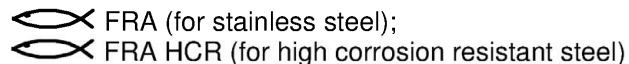
| Rebar anchor FRA                          |                                     | Thread | M12 <sup>1)</sup> |              | M16 | M20 | M24 |
|-------------------------------------------|-------------------------------------|--------|-------------------|--------------|-----|-----|-----|
| Nominal diameter of the bar               | $\phi$                              | [mm]   | 12                |              | 16  | 20  | 25  |
| Width across flats                        | SW                                  |        | 19                |              | 24  | 30  | 36  |
| Nominal drill hole diameter               | $d_0$                               |        | 14                | 16           | 20  | 25  | 30  |
| Drill hole depth                          | $h_0$                               |        | $h_{ef} + l_e$    |              |     |     |     |
| Effective embedment depth                 | $h_{ef,min}$                        |        | 70                |              | 80  | 90  | 96  |
|                                           | $h_{ef,max}$                        |        | 140               |              | 220 | 300 | 380 |
| Distance concrete surface to welded joint | $l_e$                               |        | 100               |              |     |     |     |
| Minimum spacing and minimum edge distance | $s_{min} = c_{min}$                 |        | 55                |              | 65  | 85  | 105 |
| Diameter of clearance hole in the fixture | 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      | $h_{min}$                           |        | $h_0 + 30$        | $h_0 + 2d_0$ |     |     |     |
| Maximum installation torque               | $\max T_{inst}$                     | [Nm]   | 40                |              | 60  | 120 | 150 |

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

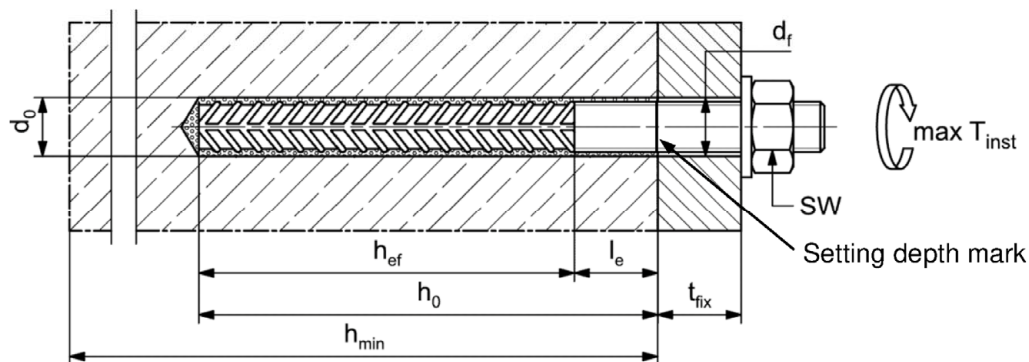
#### fischer rebar anchor FRA



Marking frontal e.g:



#### Installation conditions:



Figures not to scale

fischer injection system FIS V Zero

#### Intended use

Installation parameters fischer rebar anchor FRA

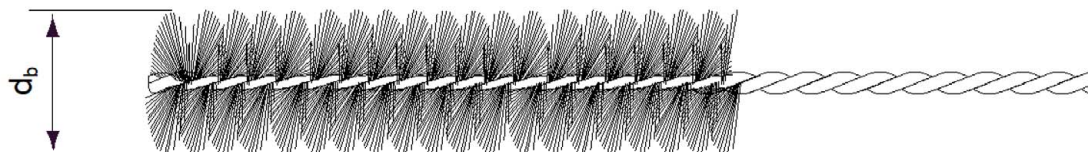
#### Annex B 6

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**Table B7.1:** Parameters of the **cleaning brush BS** (steel brush with steel bristles)

The size of the cleaning brush refers to the drill hole diameter

|                             |       |      |    |    |    |    |    |    |    |    |    |    |    |
|-----------------------------|-------|------|----|----|----|----|----|----|----|----|----|----|----|
| Nominal drill hole diameter | $d_0$ | [mm] | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 25 | 28 | 30 |
| Steel brush diameter        | $d_b$ |      | 11 | 14 | 16 | 20 |    | 25 |    | 26 | 27 | 30 | 40 |

**Table B7.2:** Conditions for use **static mixer** without an **extension tube**

|                                 |             |      |           |    |            |            |            |            |            |            |            |            |    |
|---------------------------------|-------------|------|-----------|----|------------|------------|------------|------------|------------|------------|------------|------------|----|
| Nominal drill hole diameter     | $d_0$       | [mm] | 10        | 12 | 14         | 16         | 18         | 20         | 22         | 24         | 25         | 28         | 30 |
| Drill hole depth $h_0$ by using | FIS MR Plus | [mm] | $\leq 90$ |    | $\leq 120$ | $\leq 140$ | $\leq 150$ | $\leq 160$ | $\leq 170$ | $\leq 190$ | $\leq 210$ |            |    |
|                                 | FIS JMR     |      | -         | -  | $\leq 90$  | $\leq 160$ | $\leq 180$ | $\leq 190$ | $\leq 210$ | $\leq 220$ |            | $\leq 250$ |    |

**Table B7.3**      **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)

| Temperature at anchoring base<br>[°C] | Maximum processing time<br>$t_{work}$ | Minimum curing time <sup>1)</sup><br>$t_{cure}$ |
|---------------------------------------|---------------------------------------|-------------------------------------------------|
|                                       | FIS V Zero                            | FIS V Zero                                      |
| -10 to -5 <sup>2)</sup>               | 6 h                                   | 72 h                                            |
| > -5 to 0 <sup>2)</sup>               | 2 h                                   | 24 h                                            |
| > 0 to 5 <sup>2)</sup>                | 45 min                                | 12 h                                            |
| > 5 to 10                             | 20 min                                | 6 h                                             |
| > 10 to 15                            | 8 min                                 | 3 h                                             |
| > 15 to 20                            | 5 min                                 | 2 h                                             |
| > 20 to 25                            | 3 min                                 | 1 h                                             |
| > 25 to 30                            | 2 min                                 | 45 min                                          |
| > 30 to 40                            | 1 min                                 | 30 min                                          |

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

<sup>2)</sup> Minimum cartridge temperature +5°C

fischer injection system FIS V Zero

**Intended use**

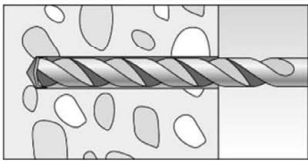
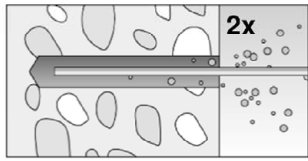
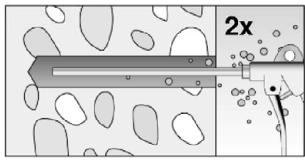
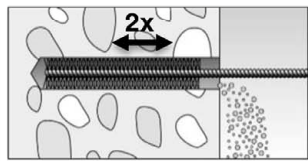
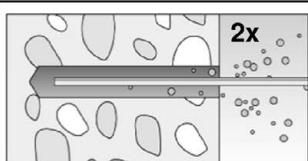
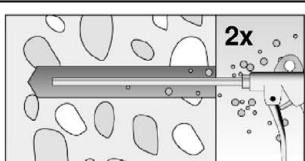
Cleaning brush (steel brush)  
Processing time and curing time

**Annex B 7**

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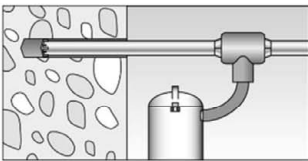
## Installation instructions part 1

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

|   |                                                                                   |                                                                                                                                                                                                    |                                                                                                                                                                                                                       |
|---|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 |  | Drill the hole.<br>Nominal drill hole diameter $d_0$ and drill hole depth $h_0$<br>see <b>tables B3.1, B4.1, B5.1, B6.1</b>                                                                        |                                                                                                                                                                                                                       |
| 2 |  | Clean the drill hole:<br>For $h_{ef} \leq 12d$ and<br>$d_0 < 18$ mm<br>blow out the hole twice<br>by hand                                                                                          | <br>For $h_{ef} > 12d$ and / or<br>$d_0 \geq 18$ mm blow out<br>the hole twice with<br>oil-free compressed air<br>( $p \geq 6$ bar) |
| 3 |  | Brush the drill hole twice. For drill hole diameter $d_0 \geq 18$ mm and / or $h_{ef} > 12d$<br>use a power drill. For deep holes use an extension. Corresponding brushes<br>see <b>table B7.1</b> |                                                                                                                                                                                                                       |
| 4 |  | Clean the drill hole:<br>For $h_{ef} \leq 12d$ and<br>$d_0 < 18$ mm<br>blow out the hole twice<br>by hand                                                                                          | <br>For $h_{ef} > 12d$ and / or<br>$d_0 \geq 18$ mm blow out the<br>hole twice with<br>oil-free compressed air<br>( $p \geq 6$ bar) |

Go to step 5

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

|   |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
|---|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 1 |   | Check a suitable hollow drill (see <b>table B1.1</b> )<br>for correct operation of the dust extraction                                                                                                                                                                                                                                                                                                                                     |  |
| 2 |  | Use a suitable dust extraction system, e.g.<br>fischer FVC 35 M or a comparable dust extraction system<br>with equivalent performance data<br><br>Drill the hole with hollow drill bit. The dust extraction system has to extract the<br>drill dust nonstop during the drilling process and must be adjusted to<br>maximum power. Nominal drill hole diameter $d_0$ and drill hole depth $h_0$<br>see <b>tables B3.1, B4.1, B5.1, B6.1</b> |  |

Go to step 5

fischer injection system FIS V Zero

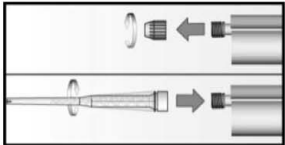
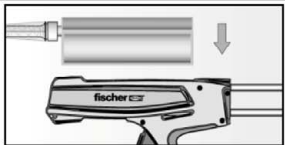
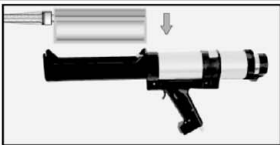
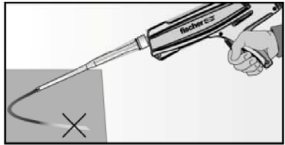
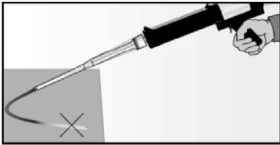
**Intended use**  
Installation instructions part 1

**Annex B 8**

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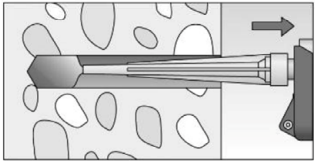
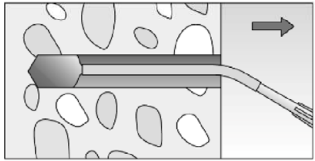
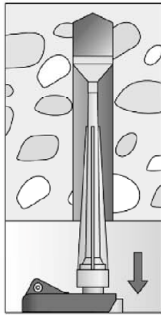
## Installation instructions part 2

### Preparing the cartridge

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

Go to step 8

### Injection of the mortar

|   |                                                                                                                  |                                                                                                                                                                                                   |                                                                                                                          |
|---|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 8 |                                 |                                                                                                                 |                                      |
|   | Fill approximately 2/3 of the drill hole with mortar. Always begin from the bottom of the hole and avoid bubbles | The conditions for mortar injection without extension tube can be found in <b>table B7.2</b><br>For deeper drill holes, than those mentioned in <b>table B7.2</b> , use a suitable extension tube | For overhead installation, deep holes ( $h_0 > 250$ mm) or drill hole diameter ( $d_0 = 30$ mm) use an injection adapter |

Go to step 9

fischer injection system FIS V Zero

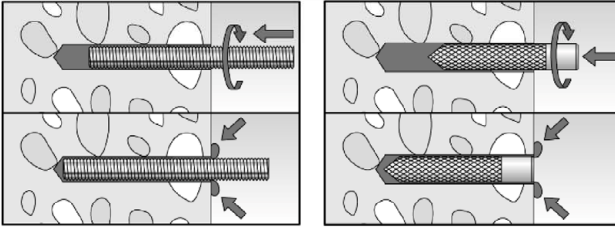
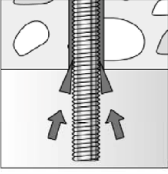
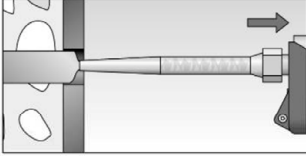
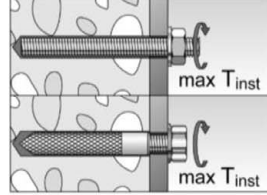
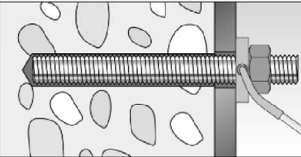
**Intended use**  
Installation instructions part 2

**Annex B 9**

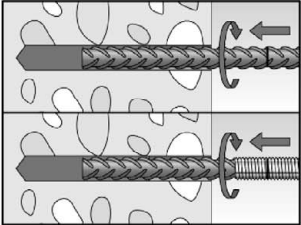
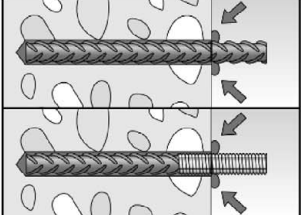
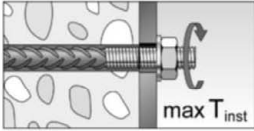
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### Installation instructions part 3

#### Installation of anchor rods or fischer internal threaded anchors RG M I

|        |                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9      |                                                                                                                                  | <p>Only use clean and oil-free metal parts. Mark the setting depth of the metal part. Push the anchor rod or fischer internal threaded RG M I anchor down to the bottom of the hole, turning it slightly while doing so. After inserting the metal parts, excess mortar must be emerged around the anchor element.</p>                                                                                                     |
|        |  <p>For overhead installations support the metal part with wedges (e.g. fischer centering wedges) or fischer overhead clips.</p> |  <p>For push through installation fill the annular gap with mortar</p>                                                                                                                                                                                                                                                                   |
| 10     |  <p>Wait for the specified curing time <math>t_{cure}</math> see <b>table B7.3</b></p>                                           | <p>11</p>  <p>Mounting the fixture<br/>max <math>T_{inst}</math> see <b>tables B3.1 and B4.1</b></p>                                                                                                                                                                                                                                    |
| Option |                                                                                                                                  | <p>After the minimum curing time is reached, the gap between metal part and fixture (annular clearance) may be filled with mortar via the fischer filling disc. Compressive strength <math>\geq 50 \text{ N/mm}^2</math> (e.g. fischer injection mortars FIS V Zero, FIS HB, FIS SB, FIS V, FIS V Plus, FIS EM Plus). ATTENTION: Using fischer filling disc reduces <math>t_{fix}</math> (usable length of the anchor)</p> |

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

|    |                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                            |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9  |                                                                                        | <p>Only use clean and oil-free reinforcing bars or fischer rebar anchor FRA. Mark the setting depth. Push the reinforcement bar or the fischer rebar anchor FRA into the filled hole up to the setting depth mark. Recommendation: Rotation back and forth of the reinforcement bar or the fischer rebar anchor FRA makes pushing easy</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_{cure}</math> see <b>table B7.3</b></p> | <p>11</p>  <p>Mounting the fixture<br/>max <math>T_{inst}</math> see <b>table B6.1</b></p>                                                                                                                                                             |

fischer injection system FIS V Zero

**Intended use**  
Installation instructions part 3

**Annex B 10**

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| Table C1.1: Characteristic values for steel failure under tension / shear load of fischer anchor rods and standard threaded rods                                                                                                                                                                                                                                                                                                                                                      |                                                          |                |                           |      |        |        |     |                  |     |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|----------------|---------------------------|------|--------|--------|-----|------------------|-----|-----|
| Anchor rod / standard threaded rod                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                          |                | M8                        | M10  | M12    | M16    | M20 | M24              |     |     |
| Bearing capacity under tension load, steel failure <sup>3)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                          |                |                           |      |        |        |     |                  |     |     |
| Characteristic resistance N <sub>Rk,s</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                           | Steel zinc plated                                        | Property class | 4.8                       | [kN] | 15(13) | 23(21) | 33  | 63               | 98  | 141 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 5.8            | 19(17)                    |      | 29(27) | 43     | 79  | 123              | 177 |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 8.8            | 29(27)                    |      | 47(43) | 68     | 126 | 196              | 282 |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Stainless steel R and high corrosion resistant steel HCR | 50             | 19                        |      | 29     | 43     | 79  | 123              | 177 |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 70             | 26                        |      | 41     | 59     | 110 | 172              | 247 |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 80             | 30                        |      | 47     | 68     | 126 | 196              | 282 |     |
| Partial factors <sup>1)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                          |                |                           |      |        |        |     |                  |     |     |
| Partial factor γ <sub>Ms,N</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Steel zinc plated                                        | Property class | 4.8                       | [-]  | 1,50   |        |     |                  |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 5.8            | 1,50                      |      |        |        |     |                  |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 8.8            | 1,50                      |      |        |        |     |                  |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Stainless steel R and high corrosion resistant steel HCR | 50             | 2,86                      |      |        |        |     |                  |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 70             | 1,50 <sup>2)</sup> / 1,87 |      |        |        |     |                  |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 80             | 1,60                      |      |        |        |     |                  |     |     |
| Bearing capacity under shear load, steel failure <sup>3)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                          |                |                           |      |        |        |     |                  |     |     |
| without lever arm                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                          |                |                           |      |        |        |     |                  |     |     |
| Characteristic resistance V <sub>Rk,s</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                           | Steel zinc plated                                        | Property class | 4.8                       | [kN] | 9(8)   | 14(13) | 20  | 38               | 59  | 85  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 5.8            | 11(10)                    |      | 17(16) | 25     | 47  | 74               | 106 |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 8.8            | 15(13)                    |      | 23(21) | 34     | 63  | 98               | 141 |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Stainless steel R and high corrosion resistant steel HCR | 50             | 9                         |      | 15     | 21     | 39  | 61               | 89  |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 70             | 13                        |      | 20     | 30     | 55  | 86               | 124 |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 80             | 15                        |      | 23     | 34     | 63  | 98               | 141 |     |
| Ductility factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                          |                | k <sub>7</sub>            | [-]  | 1,0    |        |     |                  |     |     |
| with lever arm                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                          |                |                           |      |        |        |     |                  |     |     |
| Characteristic resistance M <sub>Rk,s</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                           | Steel zinc plated                                        | Property class | 4.8                       | [Nm] | 15(13) | 30(27) | 52  | 133              | 259 | 448 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 5.8            | 19(16)                    |      | 37(33) | 65     | 166 | 324              | 560 |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 8.8            | 30(26)                    |      | 60(53) | 105    | 266 | 519              | 896 |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Stainless steel R and high corrosion resistant steel HCR | 50             | 19                        |      | 37     | 65     | 166 | 324              | 560 |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 70             | 26                        |      | 52     | 92     | 232 | 454              | 784 |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 80             | 30                        |      | 60     | 105    | 266 | 519              | 896 |     |
| Partial factors <sup>1)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                          |                |                           |      |        |        |     |                  |     |     |
| Partial factor γ <sub>Ms,V</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Steel zinc plated                                        | Property class | 4.8                       | [-]  | 1,25   |        |     |                  |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 5.8            | 1,25                      |      |        |        |     |                  |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 8.8            | 1,25                      |      |        |        |     |                  |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Stainless steel R and high corrosion resistant steel HCR | 50             | 2,38                      |      |        |        |     |                  |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 70             | 1,25 <sup>2)</sup> / 1,56 |      |        |        |     |                  |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | 80             | 1,33                      |      |        |        |     |                  |     |     |
| <div><div><div><sup>1)</sup> In absence of other national regulations</div><div><sup>2)</sup> Only admissible for high corrosion resist. steel HCR, with f<sub>yk</sub> / f<sub>uk</sub> ≥ 0,8 and A<sub>s</sub> &gt; 12 % (e.g. fischer anchor rods)</div><div><sup>3)</sup> Values in brackets are valid for undersized threaded rods with smaller stress area A<sub>s</sub> for hot dip galvanised standard threaded rods according to EN ISO 10684:2004+AC:2009</div></div></div> |                                                          |                |                           |      |        |        |     |                  |     |     |
| fischer injection system FIS V Zero                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          |                |                           |      |        |        |     | Annex C 1        |     |     |
| <b>Performances</b><br>Characteristic values for steel failure under tension / shear load of fischer anchor rods and standard threaded rods                                                                                                                                                                                                                                                                                                                                           |                                                          |                |                           |      |        |        |     |                  |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          |                |                           |      |        |        |     | Appendix 18 / 26 |     |     |

|                    |                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Table C2.1:</b> | Characteristic values <b>for steel failure</b> under <b>tension</b> / <b>shear load</b> of <b>fischer internal threaded anchors RG M I</b> |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------|

| fischer internal threaded anchors RG M I           |                                |                   |                | M8   | M10  | M12  | M16  |      |
|----------------------------------------------------|--------------------------------|-------------------|----------------|------|------|------|------|------|
| Bearing capacity under tension load, steel failure |                                |                   |                |      |      |      |      |      |
| Charact.<br>resistance with<br>screw               | N <sub>Rk,s</sub>              | Property class    | 5.8            | [kN] | 19   | 29   | 43   | 79   |
|                                                    |                                |                   | 8.8            |      | 29   | 47   | 68   | 108  |
|                                                    |                                | Property class 70 | R              |      | 26   | 41   | 59   | 110  |
|                                                    |                                |                   | HCR            |      | 26   | 41   | 59   | 110  |
| Partial factors <sup>1)</sup>                      |                                |                   |                |      |      |      |      |      |
| Partial factors                                    | γ <sub>Ms,N</sub>              | Property class    | 5.8            | [-]  | 1,50 |      |      |      |
|                                                    |                                |                   | 8.8            |      | 1,50 |      |      |      |
|                                                    |                                | Property class 70 | R              |      | 1,87 |      |      |      |
|                                                    |                                |                   | HCR            |      | 1,87 |      |      |      |
| Bearing capacity under shear load, steel failure   |                                |                   |                |      |      |      |      |      |
| Without lever arm                                  |                                |                   |                |      |      |      |      |      |
| Charact.<br>resistance with<br>screw               | V <sup>0</sup> <sub>Rk,s</sub> | Property class    | 5.8            | [kN] | 9,2  | 14,5 | 21,1 | 39,2 |
|                                                    |                                |                   | 8.8            |      | 14,6 | 23,2 | 33,7 | 54,0 |
|                                                    |                                | Property class 70 | R              |      | 12,8 | 20,3 | 29,5 | 54,8 |
|                                                    |                                |                   | HCR            |      | 12,8 | 20,3 | 29,5 | 54,8 |
| Ductility factor                                   |                                |                   | k <sub>7</sub> | [-]  | 1,0  |      |      |      |
| With lever arm                                     |                                |                   |                |      |      |      |      |      |
| Charact.<br>resistance with<br>screw               | M <sup>0</sup> <sub>Rk,s</sub> | Property class    | 5.8            | [Nm] | 20   | 39   | 68   | 173  |
|                                                    |                                |                   | 8.8            |      | 30   | 60   | 105  | 266  |
|                                                    |                                | Property class 70 | R              |      | 26   | 52   | 92   | 232  |
|                                                    |                                |                   | HCR            |      | 26   | 52   | 92   | 232  |
| Partial factors <sup>1)</sup>                      |                                |                   |                |      |      |      |      |      |
| Partial factors                                    | γ <sub>Ms,V</sub>              | Property class    | 5.8            | [-]  | 1,25 |      |      |      |
|                                                    |                                |                   | 8.8            |      | 1,25 |      |      |      |
|                                                    |                                | Property class 70 | R              |      | 1,56 |      |      |      |
|                                                    |                                |                   | HCR            |      | 1,56 |      |      |      |

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

fischer injection system FIS V Zero

## Performances

Characteristic values for steel failure under tension / shear load of fischer internal threaded anchor RG M I

## Annex C 2

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**Table C3.1:** Characteristic values for steel failure under tension / shear load of reinforcing bars

| Nominal diameter of the bar                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | $\phi$       | 8    | 10                                       | 12 | 14 | 16 | 20 | 22 | 24 | 25 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------|------------------------------------------|----|----|----|----|----|----|----|
| <b>Bearing capacity under tension load, steel failure</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        |              |      |                                          |    |    |    |    |    |    |    |
| Characteristic resistance                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | $N_{Rk,s}$   | [kN] | $A_s \cdot f_{uk}^{(2)}$                 |    |    |    |    |    |    |    |
| <b>Bearing capacity under shear load, steel failure</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          |              |      |                                          |    |    |    |    |    |    |    |
| <b>Without lever arm</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |              |      |                                          |    |    |    |    |    |    |    |
| Characteristic resistance                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | $V_{Rk,s}^0$ | [kN] | $k_6^{(1)} \cdot A_s \cdot f_{uk}^{(2)}$ |    |    |    |    |    |    |    |
| Ductility factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | $k_7$        | [-]  | 1,0                                      |    |    |    |    |    |    |    |
| <b>With lever arm</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |              |      |                                          |    |    |    |    |    |    |    |
| Characteristic resistance                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | $M_{Rk,s}^0$ | [Nm] | $1,2 \cdot W_{el} \cdot f_{uk}^{(2)}$    |    |    |    |    |    |    |    |
| <p>1) In accordance with EN 1992-4:2018 section 7.2.2.3.1<br/> <math>k_6 = 0,6</math> for fasteners made of carbon steel with <math>f_{uk} \leq 500 \text{ N/mm}^2</math><br/> <math>= 0,5</math> for fasteners made of carbon steel with <math>500 &lt; f_{uk} \leq 1000 \text{ N/mm}^2</math><br/> <math>= 0,5</math> for fasteners made of stainless steel</p> <p>2) <math>f_{uk}</math> or <math>f_{yk}</math> respectively must be taken from the specifications of the reinforcing bar</p> |              |      |                                          |    |    |    |    |    |    |    |

**Table C3.2:** Characteristic values for steel failure under tension / shear load of fischer rebar anchors FRA

| fischer rebar anchor FRA                           |                 |      | M12  | M16 | M20 | M24 |
|----------------------------------------------------|-----------------|------|------|-----|-----|-----|
| Bearing capacity under tension load, steel failure |                 |      |      |     |     |     |
| Characteristic resistance                          | $N_{Rk,s}$      | [kN] | 59   | 110 | 172 | 270 |
| Partial factor <sup>1)</sup>                       |                 |      |      |     |     |     |
| Partial factor                                     | $\gamma_{Ms,N}$ | [-]  | 1,4  |     |     |     |
| Bearing capacity under shear load, steel failure   |                 |      |      |     |     |     |
| Without lever arm                                  |                 |      |      |     |     |     |
| Characteristic resistance                          | $V^0_{Rk,s}$    | [kN] | 30   | 55  | 86  | 141 |
| Ductility factor                                   | $k_7$           | [-]  | 1,0  |     |     |     |
| With lever arm                                     |                 |      |      |     |     |     |
| Characteristic resistance                          | $M^0_{Rk,s}$    | [Nm] | 92   | 233 | 454 | 898 |
| Partial factor <sup>1)</sup>                       |                 |      |      |     |     |     |
| Partial factor                                     | $\gamma_{Ms,V}$ | [-]  | 1,56 |     |     |     |

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

fischer injection system FIS V Zero

## Performances

Characteristic values for steel failure under tension / shear load of reinforcing bars and fischer rebar anchors FRA

## Annex C 3

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**Table C4.1:** Characteristic values for **concrete failure** under **tension** / **shear load**

| Size                                                                                  |                                 |                        | All sizes |                                                                                                                                                                                        |    |                 |    |                |    |                               |    |                 |  |                 |  |
|---------------------------------------------------------------------------------------|---------------------------------|------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----------------|----|----------------|----|-------------------------------|----|-----------------|--|-----------------|--|
| Tension load                                                                          |                                 |                        |           |                                                                                                                                                                                        |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Installation factor                                                                   |                                 | $\gamma_{\text{inst}}$ | [-]       | See annex C 5 to C 8                                                                                                                                                                   |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Factors for the compressive strength of concrete > C20/25                             |                                 |                        |           |                                                                                                                                                                                        |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Increasing factor for $\tau_{\text{Rk}}$                                              | C25/30                          | $\Psi_{\text{c}}$      | [-]       | 1,03                                                                                                                                                                                   |    |                 |    |                |    |                               |    |                 |  |                 |  |
|                                                                                       | C30/37                          |                        |           | 1,06                                                                                                                                                                                   |    |                 |    |                |    |                               |    |                 |  |                 |  |
|                                                                                       | C35/45                          |                        |           | 1,09                                                                                                                                                                                   |    |                 |    |                |    |                               |    |                 |  |                 |  |
|                                                                                       | C40/50                          |                        |           | 1,11                                                                                                                                                                                   |    |                 |    |                |    |                               |    |                 |  |                 |  |
|                                                                                       | C45/55                          |                        |           | 1,13                                                                                                                                                                                   |    |                 |    |                |    |                               |    |                 |  |                 |  |
|                                                                                       | C50/60                          |                        |           | 1,15                                                                                                                                                                                   |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Splitting failure                                                                     |                                 |                        |           |                                                                                                                                                                                        |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Edge distance                                                                         | $h / h_{\text{ef}} \geq 2,0$    | $C_{\text{cr,sp}}$     | [mm]      | 1,0 $h_{\text{ef}}$                                                                                                                                                                    |    |                 |    |                |    |                               |    |                 |  |                 |  |
|                                                                                       | $2,0 > h / h_{\text{ef}} > 1,3$ |                        |           | 4,6 $h_{\text{ef}}$ - 1,8 h                                                                                                                                                            |    |                 |    |                |    |                               |    |                 |  |                 |  |
|                                                                                       | $h / h_{\text{ef}} \leq 1,3$    |                        |           | 2,26 $h_{\text{ef}}$                                                                                                                                                                   |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Spacing                                                                               |                                 | $S_{\text{cr,sp}}$     |           | 2 $C_{\text{cr,sp}}$                                                                                                                                                                   |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Concrete cone failure                                                                 |                                 |                        |           |                                                                                                                                                                                        |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Uncracked concrete                                                                    |                                 | $k_{\text{ucr,N}}$     | [-]       | 11,0                                                                                                                                                                                   |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Cracked concrete                                                                      |                                 | $k_{\text{cr,N}}$      |           | 7,7                                                                                                                                                                                    |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Edge distance                                                                         |                                 | $C_{\text{cr,N}}$      | [mm]      | 1,5 $h_{\text{ef}}$                                                                                                                                                                    |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Spacing                                                                               |                                 | $S_{\text{cr,N}}$      |           | 2 $C_{\text{cr,N}}$                                                                                                                                                                    |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Factors for sustained tension load                                                    |                                 |                        |           |                                                                                                                                                                                        |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Temperature range                                                                     |                                 |                        | [-]       | 24 °C / 40 °C                                                                                                                                                                          |    | 50 °C / 80 °C   |    | 72 °C / 120 °C |    |                               |    |                 |  |                 |  |
| Factor                                                                                |                                 | $\Psi_{\text{sus}}^0$  | [-]       | 0,67                                                                                                                                                                                   |    | 0,67            |    | 0,75           |    |                               |    |                 |  |                 |  |
| Shear load                                                                            |                                 |                        |           |                                                                                                                                                                                        |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Installation factor                                                                   |                                 | $\gamma_{\text{inst}}$ | [-]       | 1,0                                                                                                                                                                                    |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Concrete pry-out failure                                                              |                                 |                        |           |                                                                                                                                                                                        |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Factor for pry-out failure                                                            |                                 | $k_8$                  | [-]       | 2,0                                                                                                                                                                                    |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Concrete edge failure                                                                 |                                 |                        |           |                                                                                                                                                                                        |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Effective length of fastener in shear loading                                         |                                 | $l_{\text{f}}$         | [mm]      | for $d_{\text{nom}} \leq 24 \text{ mm}$ : min ( $h_{\text{ef}}$ ; 12 $d_{\text{nom}}$ )<br>for $d_{\text{nom}} > 24 \text{ mm}$ : min ( $h_{\text{ef}}$ ; 8 $d_{\text{nom}}$ ; 300 mm) |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Calculation diameters                                                                 |                                 |                        |           |                                                                                                                                                                                        |    |                 |    |                |    |                               |    |                 |  |                 |  |
| Size                                                                                  |                                 |                        |           | M8                                                                                                                                                                                     |    | M10             |    | M12            |    | M16                           |    | M20             |  | M24             |  |
| fischer anchor rods and standard threaded rods                                        |                                 | $d_{\text{nom}}$       | [mm]      | 8                                                                                                                                                                                      |    | 10              |    | 12             |    | 16                            |    | 20              |  | 24              |  |
| fischer internal threaded anchors RG M I                                              |                                 | $d_{\text{nom}}$       |           | 12                                                                                                                                                                                     |    | 16              |    | 18             |    | 22                            |    | - <sup>1)</sup> |  | - <sup>1)</sup> |  |
| fischer rebar anchor FRA                                                              |                                 | $d_{\text{nom}}$       |           | - <sup>1)</sup>                                                                                                                                                                        |    | - <sup>1)</sup> |    | 12             |    | 16                            |    | 20              |  | 25              |  |
| Size (nominal diameter of the bar)                                                    |                                 |                        | $\phi$    | 8                                                                                                                                                                                      | 10 | 12              | 14 | 16             | 20 | 22                            | 24 | 25              |  |                 |  |
| Reinforcing bar                                                                       |                                 |                        | [mm]      | 8                                                                                                                                                                                      | 10 | 12              | 14 | 16             | 20 | 22                            | 24 | 25              |  |                 |  |
| 1) Anchor type not part of the assessment                                             |                                 |                        |           |                                                                                                                                                                                        |    |                 |    |                |    |                               |    |                 |  |                 |  |
| fischer injection system FIS V Zero                                                   |                                 |                        |           |                                                                                                                                                                                        |    |                 |    |                |    | Annex C 4<br>Appendix 21 / 26 |    |                 |  |                 |  |
| Performances<br>Characteristic values for concrete failure under tension / shear load |                                 |                        |           |                                                                                                                                                                                        |    |                 |    |                |    |                               |    |                 |  |                 |  |

**Table C5.1:** Characteristic values for **combined pull-out** and **concrete failure** for **fischer anchor rods** and **standard threaded rods** in hammer drilled holes; **uncracked or cracked concrete**

| Anchor rod / standard threaded rod                                                                                                 |                     |                 | M8              | M10     | M12             | M16 | M20                           | M24 |     |     |
|------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------|-----------------|---------|-----------------|-----|-------------------------------|-----|-----|-----|
| Combined pullout and concrete cone failure                                                                                         |                     |                 |                 |         |                 |     |                               |     |     |     |
| Calculation diameter                                                                                                               |                     | d               | [mm]            | 8       | 10              | 12  | 16                            | 20  | 24  |     |
| Uncracked concrete                                                                                                                 |                     |                 |                 |         |                 |     |                               |     |     |     |
| Characteristic bond resistance in uncracked concrete C20/25                                                                        |                     |                 |                 |         |                 |     |                               |     |     |     |
| Hammer-drilling with standard drill bit (dry or wet concrete, water filled hole)                                                   |                     |                 |                 |         |                 |     |                               |     |     |     |
| Temperature range                                                                                                                  | I: 24 °C / 40 °C    |                 | $\tau_{Rk,ucr}$ | [N/mm²] | 10              | 10  | 10                            | 10  | 9,5 | 8,5 |
|                                                                                                                                    | II: 50 °C / 80 °C   |                 |                 |         | 10              | 10  | 10                            | 10  | 9,5 | 8,5 |
|                                                                                                                                    | III: 72 °C / 120 °C |                 |                 |         | 8               | 8   | 8                             | 8   | 8   | 7   |
| Hammer-drilling with hollow drill bit (dry or wet concrete)                                                                        |                     |                 |                 |         |                 |     |                               |     |     |     |
| Temperature range                                                                                                                  | I: 24 °C / 40 °C    |                 | $\tau_{Rk,ucr}$ | [N/mm²] | - <sup>1)</sup> | 6,5 | 6                             | 6   | 6   | 5   |
|                                                                                                                                    | II: 50 °C / 80 °C   |                 |                 |         | - <sup>1)</sup> | 6,5 | 6                             | 6   | 6   | 5   |
|                                                                                                                                    | III: 72 °C / 120 °C |                 |                 |         | - <sup>1)</sup> | 5,5 | 5                             | 5   | 5   | 4,5 |
| Installation factors                                                                                                               |                     |                 |                 |         |                 |     |                               |     |     |     |
| Dry or wet concrete and water filled hole                                                                                          |                     | $\gamma_{inst}$ | [-]             | 1,4     |                 |     |                               |     |     |     |
| Cracked concrete                                                                                                                   |                     |                 |                 |         |                 |     |                               |     |     |     |
| Characteristic bond resistance in cracked concrete C20/25                                                                          |                     |                 |                 |         |                 |     |                               |     |     |     |
| Hammer-drilling with standard drill bit (dry or wet concrete, water filled hole)                                                   |                     |                 |                 |         |                 |     |                               |     |     |     |
| Temperature range                                                                                                                  | I: 24 °C / 40 °C    |                 | $\tau_{Rk,cr}$  | [N/mm²] | 4               | 4   | 4                             | 4   | 4   | 4   |
|                                                                                                                                    | II: 50 °C / 80 °C   |                 |                 |         | 4               | 4   | 4                             | 4   | 4   | 4   |
|                                                                                                                                    | III: 72 °C / 120 °C |                 |                 |         | 3               | 3   | 3,5                           | 3,5 | 3,5 | 3,5 |
| Installation factors                                                                                                               |                     |                 |                 |         |                 |     |                               |     |     |     |
| Dry or wet concrete and water filled hole                                                                                          |                     | $\gamma_{inst}$ | [-]             | 1,4     |                 |     |                               |     |     |     |
| 1) No performance assessed                                                                                                         |                     |                 |                 |         |                 |     |                               |     |     |     |
| fischer injection system FIS V Zero                                                                                                |                     |                 |                 |         |                 |     | Annex C 5<br>Appendix 22 / 26 |     |     |     |
| Performances<br>Characteristic values for combined pull-out and concrete failure for fischer anchor rod and standard threaded rods |                     |                 |                 |         |                 |     |                               |     |     |     |

**Table C6.1:** Characteristic values for **combined pull-out** and **concrete failure** for **fischer internal threaded anchors RG M I** in hammer drilled holes; **uncracked** or **cracked concrete**

| Internal threaded anchor RG M I                                                  |                     |                 | M8                                   | M10 | M12 | M16 |     |
|----------------------------------------------------------------------------------|---------------------|-----------------|--------------------------------------|-----|-----|-----|-----|
| Combined pullout and concrete cone failure                                       |                     |                 |                                      |     |     |     |     |
| Calculation diameter                                                             |                     | d               | [mm]                                 | 12  | 16  | 18  | 22  |
| Uncracked concrete                                                               |                     |                 |                                      |     |     |     |     |
| Characteristic bond resistance in uncracked concrete C20/25                      |                     |                 |                                      |     |     |     |     |
| Hammer-drilling with standard drill bit (dry or wet concrete, water filled hole) |                     |                 |                                      |     |     |     |     |
| Temperature range                                                                | I: 24 °C / 40 °C    |                 | $\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ] | 7,5 | 7,5 | 7,5 | 7   |
|                                                                                  | II: 50 °C / 80 °C   |                 |                                      | 7,5 | 7,5 | 7,5 | 7   |
|                                                                                  | III: 72 °C / 120 °C |                 |                                      | 6,5 | 6,5 | 6,5 | 6   |
| Hammer-drilling with hollow drill bit (dry or wet concrete)                      |                     |                 |                                      |     |     |     |     |
| Temperature range                                                                | I: 24 °C / 40 °C    |                 | $\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ] | 6,5 | 6,5 | 6,5 | 6,5 |
|                                                                                  | II: 50 °C / 80 °C   |                 |                                      | 6,5 | 6,5 | 6,5 | 6,5 |
|                                                                                  | III: 72 °C / 120 °C |                 |                                      | 5,5 | 5,5 | 5,5 | 5,5 |
| Installation factors                                                             |                     |                 |                                      |     |     |     |     |
| Dry or wet concrete and                                                          |                     | $\gamma_{inst}$ | [-]                                  | 1,4 |     |     |     |
| water filled hole                                                                |                     |                 |                                      |     |     |     |     |
| Cracked concrete                                                                 |                     |                 |                                      |     |     |     |     |
| Characteristic bond resistance in cracked concrete C20/25                        |                     |                 |                                      |     |     |     |     |
| Hammer-drilling with standard drill bit (dry or wet concrete, water filled hole) |                     |                 |                                      |     |     |     |     |
| Temperature range                                                                | I: 24 °C / 40 °C    |                 | $\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]  | 4,5 | 4   | 4   | 3,5 |
|                                                                                  | II: 50 °C / 80 °C   |                 |                                      | 4,5 | 4   | 4   | 3,5 |
|                                                                                  | III: 72 °C / 120 °C |                 |                                      | 3,5 | 3,5 | 3   | 3   |
| Installation factors                                                             |                     |                 |                                      |     |     |     |     |
| Dry or wet concrete and                                                          |                     | $\gamma_{inst}$ | [-]                                  | 1,4 |     |     |     |
| water filled hole                                                                |                     |                 |                                      |     |     |     |     |

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## Performances

Characteristic values for combined pull-out and concrete failure for fischer internal threaded anchors RG M I

## Annex C 6

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| Table C7.1: Characteristic values for <b>combined pull-out</b> and <b>concrete failure</b> for <b>reinforcing bars</b> in hammer drilled holes; <b>uncracked concrete</b> |                     |                 |                      |     |     |    |     |     |     |     |     |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------|----------------------|-----|-----|----|-----|-----|-----|-----|-----|-----|
| Nominal diameter of the bar                                                                                                                                               |                     | $\phi$          | 8                    | 10  | 12  | 14 | 16  | 20  | 22  | 24  | 25  |     |
| Combined pullout and concrete cone failure                                                                                                                                |                     |                 |                      |     |     |    |     |     |     |     |     |     |
| Calculation diameter                                                                                                                                                      |                     | d               | [mm]                 | 8   | 10  | 12 | 14  | 16  | 20  | 22  | 24  | 25  |
| Uncracked concrete                                                                                                                                                        |                     |                 |                      |     |     |    |     |     |     |     |     |     |
| Characteristic bond resistance in uncracked concrete C20/25                                                                                                               |                     |                 |                      |     |     |    |     |     |     |     |     |     |
| Hammer-drilling with standard drill bit (dry or wet concrete, water filled hole)                                                                                          |                     |                 |                      |     |     |    |     |     |     |     |     |     |
| Tem-<br>perature<br>range                                                                                                                                                 | I: 24 °C / 40 °C    | $\tau_{Rk,ucr}$ | [N/mm <sup>2</sup> ] | 6,5 | 7   | 7  | 7,5 | 7,5 | 8   | 8   | 8   | 8   |
|                                                                                                                                                                           | II: 50 °C / 80 °C   |                 |                      | 6,5 | 7   | 7  | 7,5 | 7,5 | 8   | 8   | 8   | 8   |
|                                                                                                                                                                           | III: 72 °C / 120 °C |                 |                      | 5,5 | 5,5 | 6  | 6   | 6,5 | 6,5 | 6,5 | 6,5 | 6,5 |
| Hammer-drilling with hollow drill bit (dry or wet concrete)                                                                                                               |                     |                 |                      |     |     |    |     |     |     |     |     |     |
| Tem-<br>perature<br>range                                                                                                                                                 | I: 24 °C / 40 °C    | $\tau_{Rk,ucr}$ | [N/mm <sup>2</sup> ] | 6   | 6   | 6  | 6   | 6   | 6   | 5,5 | 5,5 | 5,5 |
|                                                                                                                                                                           | II: 50 °C / 80 °C   |                 |                      | 6   | 6   | 6  | 6   | 6   | 6   | 5,5 | 5,5 | 5,5 |
|                                                                                                                                                                           | III: 72 °C / 120 °C |                 |                      | 5   | 5   | 5  | 5   | 5   | 5   | 4,5 | 4,5 | 4,5 |
| Installation factors                                                                                                                                                      |                     |                 |                      |     |     |    |     |     |     |     |     |     |
| Dry or wet concrete and<br>water filled hole                                                                                                                              |                     | $\gamma_{inst}$ | [-]                  | 1,4 |     |    |     |     |     |     |     |     |

| Table C7.2: Characteristic values for <b>combined pull-out</b> and <b>concrete failure</b> for <b>fischer rebar anchors FRA</b> in hammer drilled holes; <b>uncracked concrete</b> |                     |                 |                      |     |  |     |  |     |  |     |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------|----------------------|-----|--|-----|--|-----|--|-----|--|--|
| fischer rebar anchors FRA                                                                                                                                                          |                     |                 |                      | 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 (dry or wet concrete, water filled hole)                                                                                                   |                     |                 |                      |     |  |     |  |     |  |     |  |  |
| Tem-<br>perature<br>range                                                                                                                                                          | I: 24 °C / 40 °C    | $\tau_{Rk,ucr}$ | [N/mm <sup>2</sup> ] | 7   |  | 7,5 |  | 8   |  | 8   |  |  |
|                                                                                                                                                                                    | II: 50 °C / 80 °C   |                 |                      | 7   |  | 7,5 |  | 8   |  | 8   |  |  |
|                                                                                                                                                                                    | III: 72 °C / 120 °C |                 |                      | 6   |  | 6,5 |  | 6,5 |  | 6,5 |  |  |
| Hammer-drilling with hollow drill bit (dry or wet concrete)                                                                                                                        |                     |                 |                      |     |  |     |  |     |  |     |  |  |
| Tem-<br>perature<br>range                                                                                                                                                          | I: 24 °C / 40 °C    | $\tau_{Rk,ucr}$ | [N/mm <sup>2</sup> ] | 6   |  | 6   |  | 6   |  | 5,5 |  |  |
|                                                                                                                                                                                    | II: 50 °C / 80 °C   |                 |                      | 6   |  | 6   |  | 5,5 |  |     |  |  |
|                                                                                                                                                                                    | III: 72 °C / 120 °C |                 |                      | 5   |  | 5   |  | 5   |  | 4,5 |  |  |
| Installation factors                                                                                                                                                               |                     |                 |                      |     |  |     |  |     |  |     |  |  |
| Dry or wet concrete and<br>water filled hole                                                                                                                                       |                     | $\gamma_{inst}$ | [-]                  | 1,4 |  |     |  |     |  |     |  |  |

|                                                                                                                                    |  |  |  |  |  |  |  |                               |  |  |  |
|------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|-------------------------------|--|--|--|
| fischer injection system FIS V Zero                                                                                                |  |  |  |  |  |  |  | Annex C 7<br>Appendix 24 / 26 |  |  |  |
| Performances<br>Characteristic values for combined pull-out and concrete failure for reinforcing bars and fischer rebar anchor FRA |  |  |  |  |  |  |  |                               |  |  |  |

**Table C8.1: Displacements for anchor rods**

| Anchor rod                                                                                                                                                                                                                                                   |                           | M8   | M10  | M12                                                                                                                                                                                                                                         | M16  | M20  | M24  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|
| <b>Displacement-Factors for tension load<sup>1)</sup></b>                                                                                                                                                                                                    |                           |      |      |                                                                                                                                                                                                                                             |      |      |      |
| <b>Uncracked concrete; Temperature range I, II, III</b>                                                                                                                                                                                                      |                           |      |      |                                                                                                                                                                                                                                             |      |      |      |
| $\delta_{N0}$ -Factor                                                                                                                                                                                                                                        | [mm/(N/mm <sup>2</sup> )] | 0,04 | 0,04 | 0,05                                                                                                                                                                                                                                        | 0,06 | 0,07 | 0,08 |
| $\delta_{N\infty}$ -Factor                                                                                                                                                                                                                                   |                           | 0,04 | 0,04 | 0,05                                                                                                                                                                                                                                        | 0,06 | 0,07 | 0,08 |
| <b>Cracked concrete; Temperature range I, II, III</b>                                                                                                                                                                                                        |                           |      |      |                                                                                                                                                                                                                                             |      |      |      |
| $\delta_{N0}$ -Factor                                                                                                                                                                                                                                        | [mm/(N/mm <sup>2</sup> )] | 0,10 | 0,11 | 0,11                                                                                                                                                                                                                                        | 0,13 | 0,14 | 0,16 |
| $\delta_{N\infty}$ -Factor                                                                                                                                                                                                                                   |                           | 0,10 | 0,11 | 0,11                                                                                                                                                                                                                                        | 0,13 | 0,14 | 0,16 |
| <b>Displacement-Factors for shear load<sup>2)</sup></b>                                                                                                                                                                                                      |                           |      |      |                                                                                                                                                                                                                                             |      |      |      |
| <b>Uncracked or cracked concrete; Temperature range I, II, III</b>                                                                                                                                                                                           |                           |      |      |                                                                                                                                                                                                                                             |      |      |      |
| $\delta_{V0}$ -Factor                                                                                                                                                                                                                                        | [mm/kN]                   | 0,18 | 0,15 | 0,12                                                                                                                                                                                                                                        | 0,09 | 0,07 | 0,06 |
| $\delta_{V\infty}$ -Factor                                                                                                                                                                                                                                   |                           | 0,27 | 0,22 | 0,18                                                                                                                                                                                                                                        | 0,14 | 0,11 | 0,09 |
| <sup>1)</sup> Calculation of effective displacement:<br>$\delta_{N0} = \delta_{N0}\text{-Factor} \cdot \tau_{Ed}$<br>$\delta_{N\infty} = \delta_{N\infty}\text{-Factor} \cdot \tau_{Ed}$<br>( $\tau_{Ed}$ : Design value of the applied tensile bond stress) |                           |      |      | <sup>2)</sup> Calculation of effective displacement:<br>$\delta_{V0} = \delta_{V0}\text{-Factor} \cdot V_{Ed}$<br>$\delta_{V\infty} = \delta_{V\infty}\text{-Factor} \cdot V_{Ed}$<br>( $V_{Ed}$ : Design value of the applied shear force) |      |      |      |

**Table C8.2: Displacements for fischer internal threaded anchors RG M I**

| Internal threaded anchor RG M I                                    |                           | M8   | M10  | M12  | M16  |
|--------------------------------------------------------------------|---------------------------|------|------|------|------|
| <b>Displacement-Factors for tension load<sup>1)</sup></b>          |                           |      |      |      |      |
| <b>Uncracked concrete; Temperature range I, II, III</b>            |                           |      |      |      |      |
| $\delta_{N0}$ -Factor                                              | [mm/(N/mm <sup>2</sup> )] | 0,06 | 0,07 | 0,07 | 0,07 |
| $\delta_{N\infty}$ -Factor                                         |                           | 0,06 | 0,07 | 0,07 | 0,07 |
| <b>Cracked concrete; Temperature range I, II, III</b>              |                           |      |      |      |      |
| $\delta_{N0}$ -Factor                                              | [mm/(N/mm <sup>2</sup> )] | 0,10 | 0,11 | 0,11 | 0,12 |
| $\delta_{N\infty}$ -Factor                                         |                           | 0,10 | 0,11 | 0,11 | 0,12 |
| <b>Displacement-Factors for shear load<sup>2)</sup></b>            |                           |      |      |      |      |
| <b>Uncracked or cracked concrete; Temperature range I, II, III</b> |                           |      |      |      |      |
| $\delta_{V0}$ -Factor                                              | [mm/kN]                   | 0,12 | 0,09 | 0,08 | 0,07 |
| $\delta_{V\infty}$ -Factor                                         |                           | 0,18 | 0,14 | 0,12 | 0,10 |

1) Calculation of effective displacement:

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

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

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

2) Calculation of effective displacement:

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

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

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

fischer injection system FIS V Zero

## Performances

Displacements for anchor rods and fischer internal threaded anchor rods

## Annex C 8

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| Table C9.1: Displacements for reinforcing bars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                           |      |      |      |                                   |      |      |      |      |      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------|------|------|-----------------------------------|------|------|------|------|------|
| Nominal diameter of the bar $\phi$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                           | 8    | 10   | 12   | 14                                | 16   | 20   | 22   | 24   | 25   |
| Displacement-Factors for tension load <sup>1)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                           |      |      |      |                                   |      |      |      |      |      |
| Uncracked concrete; Temperature range I, II, III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                           |      |      |      |                                   |      |      |      |      |      |
| $\delta_{N0}$ -Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | [mm/(N/mm <sup>2</sup> )] | 0,05 | 0,06 | 0,07 | 0,08                              | 0,09 | 0,10 | 0,11 | 0,12 | 0,12 |
| $\delta_{N\infty}$ -Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                           | 0,05 | 0,06 | 0,07 | 0,08                              | 0,09 | 0,10 | 0,11 | 0,12 | 0,12 |
| Displacement-Factors for shear load <sup>2)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                           |      |      |      |                                   |      |      |      |      |      |
| Uncracked concrete; Temperature range I, II, III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                           |      |      |      |                                   |      |      |      |      |      |
| $\delta_{V0}$ -Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | [mm/kN]                   | 0,18 | 0,15 | 0,12 | 0,10                              | 0,09 | 0,07 | 0,07 | 0,06 | 0,06 |
| $\delta_{V\infty}$ -Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                           | 0,27 | 0,22 | 0,18 | 0,16                              | 0,14 | 0,11 | 0,10 | 0,09 | 0,09 |
| <div>1) Calculation of effective displacement:<br/><math>\delta_{N0} = \delta_{N0}\text{-Factor} \cdot \tau_{Ed}</math><br/><math>\delta_{N\infty} = \delta_{N\infty}\text{-Factor} \cdot \tau_{Ed}</math><br/>(<math>\tau_{Ed}</math>: Design value of the applied tensile bond stress)</div> <div>2) Calculation of effective displacement:<br/><math>\delta_{V0} = \delta_{V0}\text{-Factor} \cdot V_{Ed}</math><br/><math>\delta_{V\infty} = \delta_{V\infty}\text{-Factor} \cdot V_{Ed}</math><br/>(<math>V_{Ed}</math>: Design value of the applied shear force)</div> |                           |      |      |      |                                   |      |      |      |      |      |
| Table C9.2: Displacements for fischer rebar anchors FRA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                           |      |      |      |                                   |      |      |      |      |      |
| fischer rebar anchor FRA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           | M12  | M16  | M20  | M24                               |      |      |      |      |      |
| Displacement-Factors for tension load <sup>1)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                           |      |      |      |                                   |      |      |      |      |      |
| Uncracked concrete; Temperature range I, II, III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                           |      |      |      |                                   |      |      |      |      |      |
| $\delta_{N0}$ -Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | [mm/(N/mm <sup>2</sup> )] | 0,07 | 0,09 | 0,10 | 0,12                              |      |      |      |      |      |
| $\delta_{N\infty}$ -Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                           | 0,07 | 0,09 | 0,10 | 0,12                              |      |      |      |      |      |
| Displacement-Factors for shear load <sup>2)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                           |      |      |      |                                   |      |      |      |      |      |
| Uncracked concrete; Temperature range I, II, III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                           |      |      |      |                                   |      |      |      |      |      |
| $\delta_{V0}$ -Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | [mm/kN]                   | 0,12 | 0,09 | 0,07 | 0,06                              |      |      |      |      |      |
| $\delta_{V\infty}$ -Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                           | 0,18 | 0,14 | 0,11 | 0,09                              |      |      |      |      |      |
| <div>1) Calculation of effective displacement:<br/><math>\delta_{N0} = \delta_{N0}\text{-Factor} \cdot \tau_{Ed}</math><br/><math>\delta_{N\infty} = \delta_{N\infty}\text{-Factor} \cdot \tau_{Ed}</math><br/>(<math>\tau_{Ed}</math>: Design value of the applied tensile bond stress)</div> <div>2) Calculation of effective displacement:<br/><math>\delta_{V0} = \delta_{V0}\text{-Factor} \cdot V_{Ed}</math><br/><math>\delta_{V\infty} = \delta_{V\infty}\text{-Factor} \cdot V_{Ed}</math><br/>(<math>V_{Ed}</math>: Design value of the applied shear force)</div> |                           |      |      |      |                                   |      |      |      |      |      |
| fischer injection system FIS V Zero                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                           |      |      |      | Annex C 9<br><br>Appendix 26 / 26 |      |      |      |      |      |
| Performances<br>Displacements for reinforcing bars and fischer rebar anchors FRA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                           |      |      |      |                                   |      |      |      |      |      |