# DECLARATION OF PERFORMANCE

## DoP 0188

for fischer injection system FIS V (Bonded fastener for use in concrete) EN

| | | | | |
|---|---|---|---|---|
| 1. | Unique identification code of the product-type: | **DoP 0188** | | |
| 2. | Intended use/es: | **Post-installed fastening in cracked or uncracked concrete.** | | |
| | | **See appendix, especially annexes** | **B1- B10** | |
| 3. | Manufacturer: | **fischerwerke GmbH & Co. KG, Otto-Hahn-Straße 15, 79211 Denzlingen, Germany** | | |
| 4. | Authorised representative: | **–** | | |
| 5. | System/s of AVCP: | **1** | | |
| 6. | European Assessment Document: | **EAD 330499-01-0601** | | |
| | European Technical Assessment: | **ETA-02/0024; 2020-05-13** | | |
| | Technical Assessment Body: | **DIBt- Deutsches Institut für Bautechnik** | | |
| | Notified body/ies: | **1343 MPA Darmstadt / 2873 TU Darmstadt** | | |
| 7. | Declared performance/s: | | | |

**Mechanical resistance and stability (BWR 1)**

| | | | |
|---|---|---|---|
| Characteristic resistance to tension load (static and quasi-static loading): | Resistance to steel failure: | Annexes C1- C3 | |
| | Resistance to combined pull- out and concrete cone failure: | Annexes C4- C8 | $\tau_{Rk,100}$= NPD |
| | Resistance to concrete cone failure: | Annex C4 | |
| | Edge distance to prevent splitting under load: | Annexes C4 | |
| | Robustness: | Annex C4-C8, C13, | |
| | Maximum installation torque: | Annexes B4- B6 | |
| | Minimum edge distance and spacing: | Annexes B4- B6 | |
| Characteristic resistance to shear load (static and quasi-static loading): | Resistance to steel failure: | Annexes C1- C3 | |
| | Resistance to pry-out failure: | Annex C4 | |
| | Resistance to concrete edge failure: | Annex C4 | |
| Characteristic resistance and displacements for seismic performance categories C1 and C2: | Resistance to tension load, displacements, category C1: | Annexes C11, C13 | |
| | Resistance to tension load, displacements, category C2: | Annexes C11, C14 | |
| | Resistance to shear load, displacements, category C1: | Annex C11 | |
| | Resistance to shear load, displacements, category C2: | Annexes C11, C14 | |
| | Factor annular gap: | Annex C11 | |
| Displacements under short-term and long-term loading: | Displacements under short-term and long-term loading: | Annexes C9, C10 | |

**Hygiene, health and the environment (BWR 3)**

| | | |
|---|---|---|
| Content, emission and/or release of dangerous substances: | NPA | |

8. Appropriate Technical Documentation and/or Specific Technical Documentation: –

The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Signed for and on behalf of the manufacturer by:

Thilo Pregartner, Dr.-Ing.

Peter Schillinger, Dipl.-Ing.

Tumlingen, 2020-05-27

This DoP has been prepared in different languages. In case there is a dispute on the interpretation the English version shall always prevail.

The Appendix includes voluntary and complementary information in English language exceeding the (language-neutrally specified) legal requirements.

**Specific Part**

## 1 Technical description of the product

The "fischer injection system FIS V" is a bonded fastener consisting of a cartridge with injection mortar fischer FIS V, fischer FIS VW High Speed or fischer FIS VS Low Speed and a steel element according to Annex A5.

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 B 3 to B 6, C 1 to C 8 |
| 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 9 and C 10 |
| Characteristic resistance and displacements for seismic performance categories C1 and C2 | See Annex C 11 to C 14 |

### 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

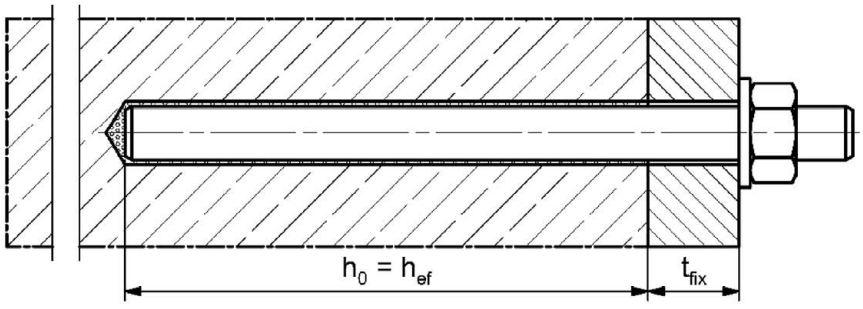
In accordance with the European Assessment Document EAD 330499-01-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

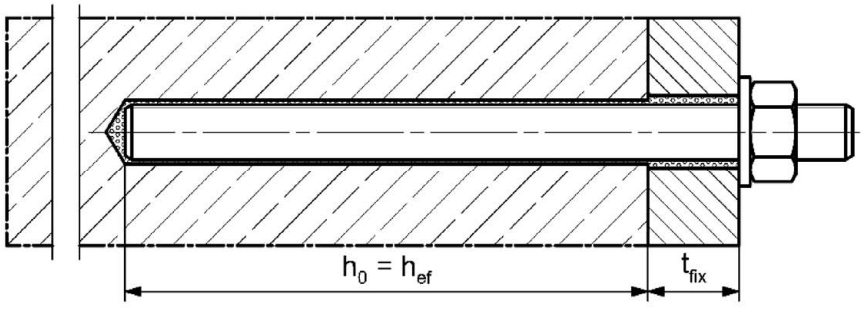
## Installation conditions part 1

**fischer anchor rod**

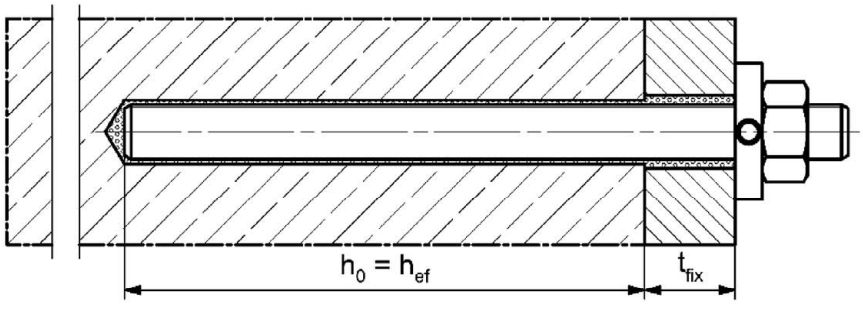
**Pre-positioned installation**




**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

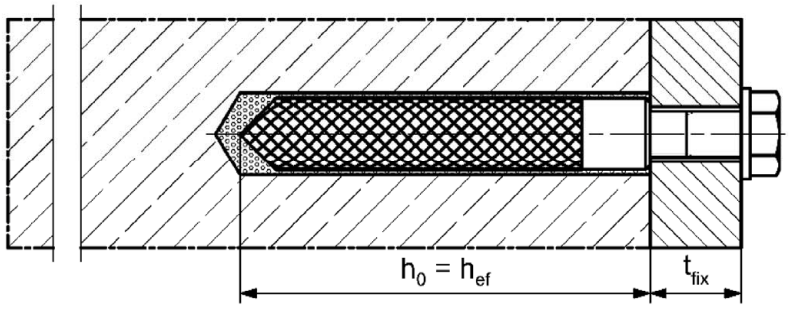
**Product description**
Installation conditions part 1

**Annex A 1**
Appendix 3/ 32

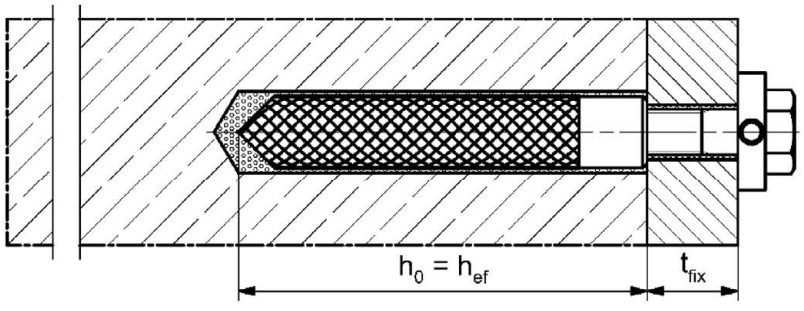
## Installation conditions part 2

**fischer internal threaded anchor RG MI**

**Pre-positioned installation**




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




Figures not to scale

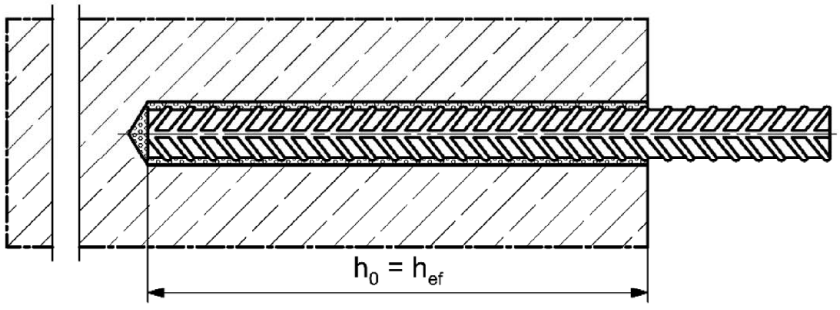
$h_0$ = drill hole depth

$h_{ef}$ = effective embedment depth

$t_{fix}$ = thickness of fixture

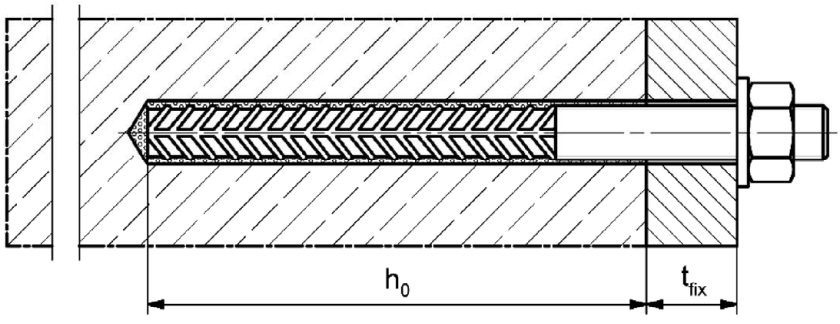
## Installation conditions part 3

**Reinforcing bar**

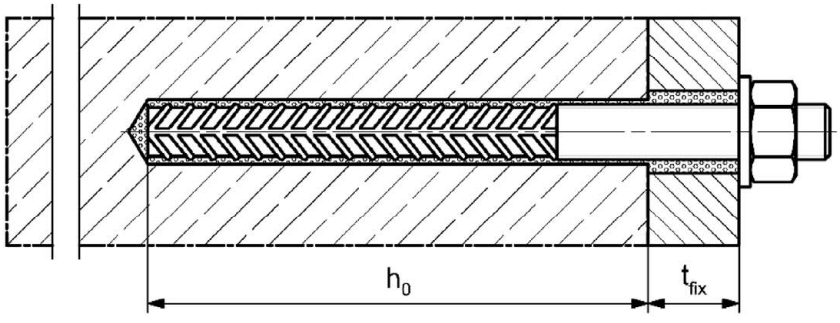



**fischer rebar anchor FRA**

**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

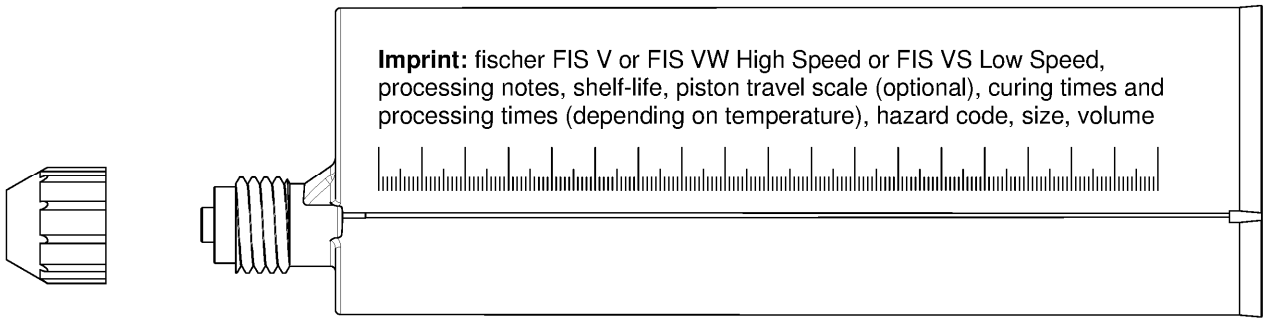
fischer injection system FIS V

**Product description**
Installation conditions part 3

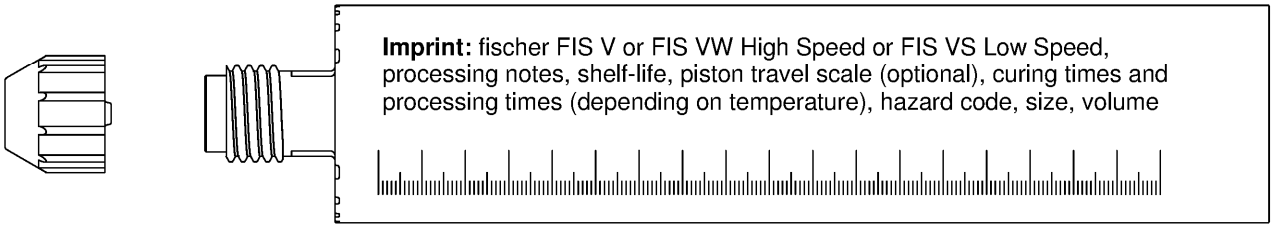
**Annex A 3**
Appendix 5/ 32

## Overview system components part 1

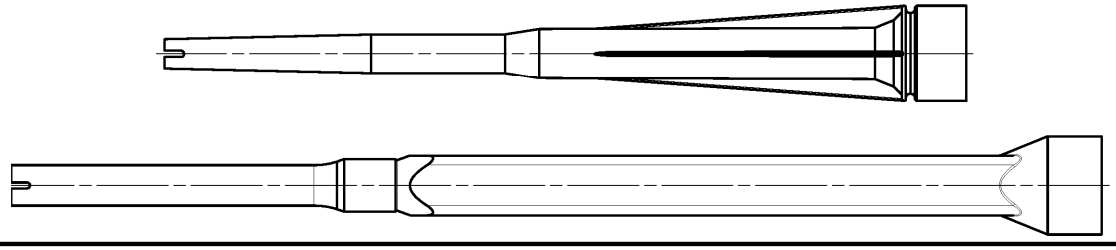
**Injection cartridge (shuttle cartridge) with sealing cap; Sizes: 350 ml, 360 ml, 390 ml, 550 ml, 1100 ml, 1500 ml**



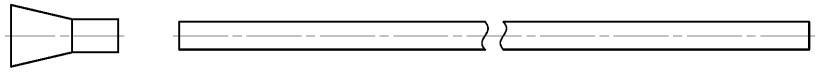

**Injection cartridge (coaxial cartridge) with sealing cap; Sizes: 100 ml, 150 ml, 300 ml, 380 ml, 400 ml, 410 ml**




**Static mixer FIS MR Plus or UMR**



**Injection adapter and Extension tube for static mixer**



**Cleaning brush BS**

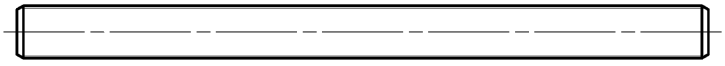
**Blow-out pump AB G or ABP**


Figures not to scale

## Overview system components part 2

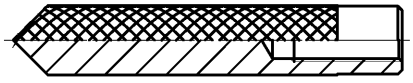
**fischer anchor rod**

Size: M6, M8, M10, M12, M16, M20, M24, M27, M30

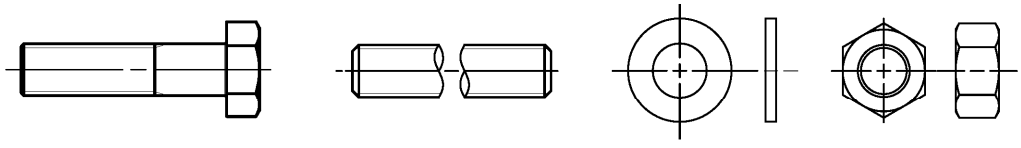


**fischer internal threaded anchor RG MI**

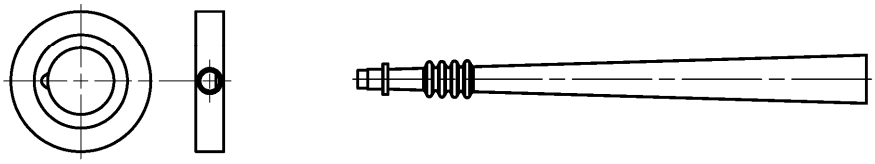
Size: M8, M10, M12, M16, M20



**Screw / threaded rod / washer / hexagon nut**



**fischer filling disc with injection adapter**



**Reinforcing bar**

Nominal diameter: ϕ8, ϕ10, ϕ12, ϕ14, ϕ16, ϕ20, ϕ25, ϕ28

**fischer rebar anchor FRA**

Size: M12, M16, M20, M24

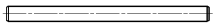
Figures not to scale

**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 Corrosion resistance class CRC III acc. to EN 1993-1-4:2015 | acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4:2015 |
| 2 | Anchor rod | Property class 4.8, 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004 $f_{uk}$ ≤ 1000 N/mm² $A_5$ > 12% fracture elongation | Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062, 1.4662, 1.4462; EN 10088-1:2014 $f_{uk}$ ≤ 1000 N/mm² $A_5$ > 12% fracture elongation | Property class 50 or 80 EN ISO 3506-1:2009 or property class 70 with $f_{yk}$= 560 N/mm² 1.4565; 1.4529; EN 10088-1:2014 $f_{uk}$ ≤ 1000 N/mm² $A_5$ > 12% fracture elongation |
| | | Fracture elongation $A_5$ > 8 %, for applications without requirements for seismic performance category C2 | | |
| 3 | Washer ISO 7089:2000 | zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004 | 1.4401; 1.4404; 1.4578;1.4571; 1.4439; 1.4362; EN 10088-1:2014 | 1.4565; 1.4529; EN 10088-1:2014 |
| 4 | Hexagon nut | Property class 4, 5 or 8; EN ISO 898-2:2012 zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004 | Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014 | Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4565; 1.4529 EN 10088-1:2014 |
| 5 | fischer internal threaded anchor RG MI | Property class 5.8 ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) | Property class 70 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014 | Property class 70 EN ISO 3506-1:2009 1.4565; 1.4529; EN 10088-1:2014 |
| 6 | Commercial standard screw or threaded rod for fischer internal threaded anchor RG MI | Property class 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) $A_5$ > 8 % fracture elongation | Property class 70 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014 $A_5$ > 8 % fracture elongation | Property class 70 EN ISO 3506-1:2009 1.4565; 1.4529; EN 10088-1:2014 $A_5$ > 8 % fracture elongation |
| 7 | fischer filling disc similar to DIN 6319-G | zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004 | 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014 | 1.4565;1.4529; EN 10088-1:2014 |
| 8 | Reinforcing bar EN 1992-1-1:2004 and AC:2010, Annex C | Bars and de-coiled rods, class B or C with $f_{yk}$ and k according to NDP or NCL of according to EN 1992-1-1/NA $f_{uk} = f_{tk} = k \cdot f_{yk}$ | | |
| 9 | fischer rebar anchor FRA | Rebar part: Bars and de-coiled rods class B or C with $f_{yk}$ and k according to NDP or NCL of EN 1992-1-1:2004+AC:2010 $f_{uk} = f_{tk} = k \cdot f_{yk}$ | Threaded part: Property class 70 or 80 EN ISO 3506-1:2009 1.4401, 1.4404, 1.4571, 1.4578, 1.4439, 1.4362, 1.4062 acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4:2015 1.4565; 1.4529 acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4:2015 | |

## Specifications of intended use (part 1)

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

| Anchorages subject to | | FIS V with … | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Anchor rod  | | fischer internal threaded anchor RG MI  | | Reinforcing bar  | | fischer rebar anchor FRA  | |
| Hammer drilling with standard drill bit  | | all sizes | | | | | | | |
| Hammer drilling with hollow drill bit (fischer "FHD", Heller "Duster Expert"; Bosch „Speed Clean"; Hilti "TE-CD, TE-YD"), DreBo D-Plus, DreBo D-Max  | | Nominal drill bit diameter ($d_0$) 12 mm to 35 mm | | | | | | | |
| Static and quasi static load, in | uncracked concrete | all sizes | Tables: C1.1 C4.1 C5.1 C9.1 | all sizes | Tables: C2.1 C4.1 C6.1 C9.2 | all sizes | Tables: C3.1 C4.1 C7.1 C10.1 | all sizes | Tables: C3.2 C4.1 C8.1 C10.2 |
| | cracked concrete | M8 to M30 | | -[2] | | ϕ 10 to ϕ 28 | | | |
| Seismic performance category (only hammer drilling with standard / hollow drill bits) | C1[1] | M10 to M30 | Tables: C11.1 C12.1 C13.1 | -[2] | | -[2] | | -[2] | |
| | C2[1] | M12 M16 M20 M24 | Tables: C11.1 C12.1 C14.1 | | | | | | |
| Use category | I1 dry or wet concrete | all sizes | | | | | | | |
| | I2 water filled hole | M 12 to M 30 | | all sizes | | -[2] | | -[2] | |
| Installation direction | | D3 (downward and horizontal and upwards (e.g. overhead) installation) | | | | | | | |
| Installation temperature | | $T_{i,min}$ = -10 °C to $T_{i,max}$ = +40 °C | | | | | | | |
| In-service temperature | Temperature range I | -40 °C to +80 °C | | (max. short term temperature +80 °C; max. long term temperature +50 °C) | | | | | |
| | Temperature range II | -40 °C to +120 °C | | (max. short term temperature +120 °C; max. long term temperature +72 °C) | | | | | |

[1] Not for FIS VW High Speed and FIS VS Low Speed
[2] No performance assessed

## 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 coated steel, stainless steel or high corrosion resistant steel).
- For all other conditions according to EN1993-1-4:2015 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.

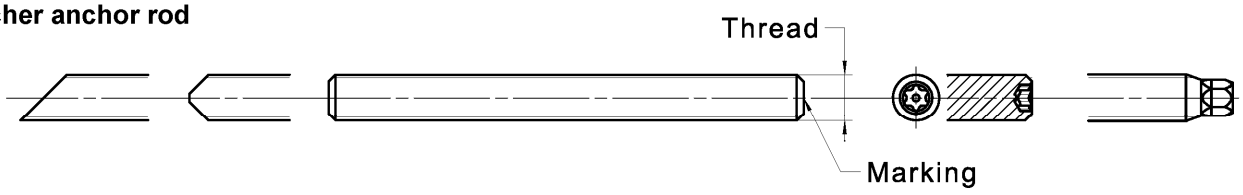
**Installation:**

- 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 on installation
- Overhead installation is allowed

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

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

**fischer anchor rod**



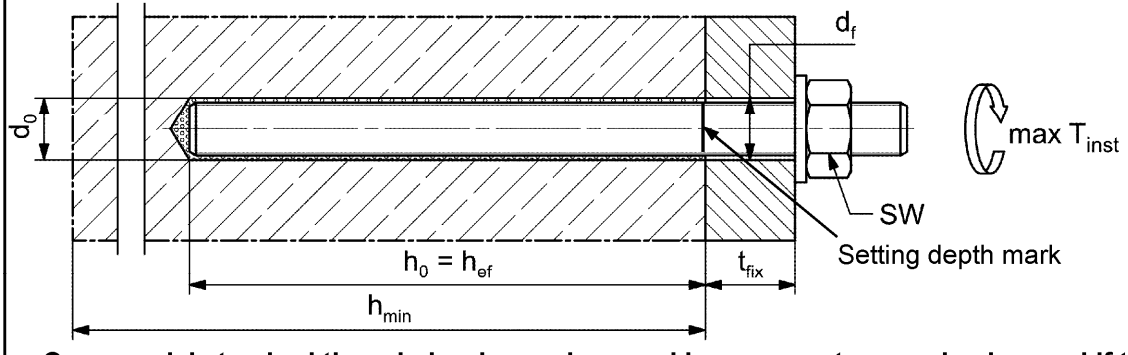

**Marking (on random place) fischer anchor rod:**

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

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

[1] 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

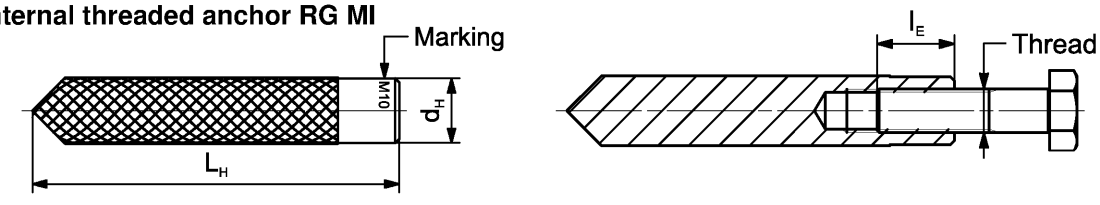
**Intended use**
Installation parameters anchor rods

**Annex B 3**
Appendix 11/ 32

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

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

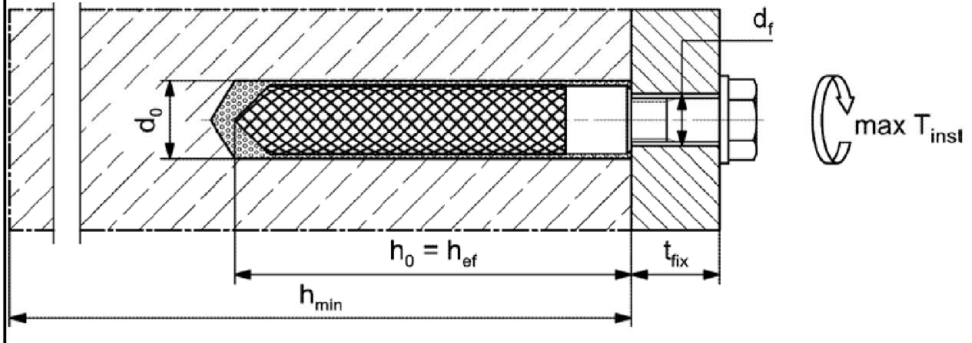
**fischer internal threaded anchor RG MI**




**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

**Intended use**
Installation parameters internal threaded anchors RG MI

**Annex B 4**
Appendix 12/ 32

**Table B5.1:** Installation parameters for **reinforcing bars**

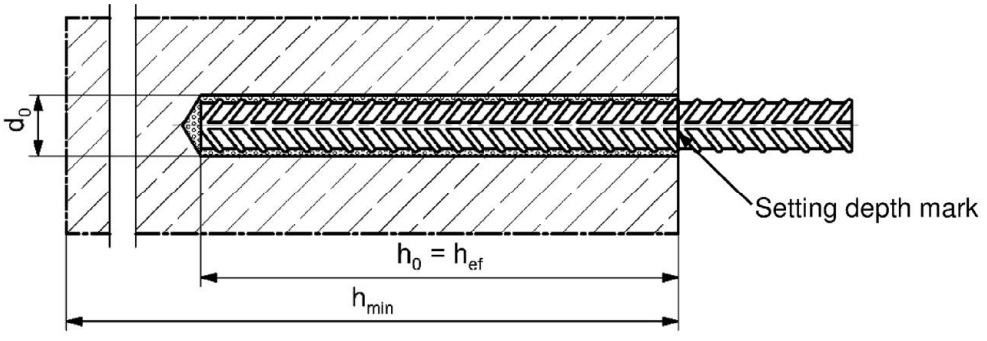
| **Nominal diameter of the bar** | | **ϕ** | **8[1)]** | **10[1)]** | **12[1)]** | **14** | **16** | **20** | **25** | **28** |
|---|---|---|---|---|---|---|---|---|---|---|
| Nominal drill hole diameter | $d_0$ | [mm] | 10 12 | 12 14 | 14 16 | 18 | 20 | 25 | 30 | 35 |
| Drill hole depth | $h_0$ | |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

[1)] 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: $0{,}05 \cdot \phi \le h_{rib} \le 0{,}07 \cdot \phi$
  ($\phi$ = Nominal diameter of the bar, $h_{rib}$ = rib height)

**Installation conditions:**



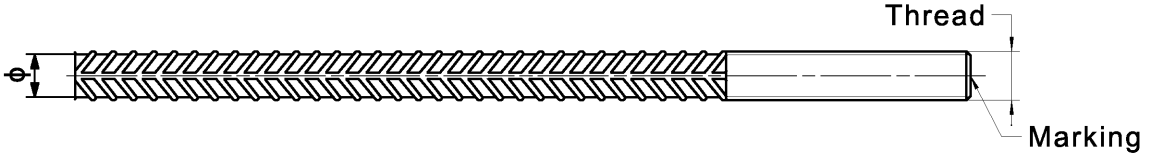

Figures not to scale

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

| Rebar anchor FRA | | Thread | M12[1)] | | M16 | M20 | M24 |
|---|---|---|---|---|---|---|---|
| Nominal diameter of the bar | $\phi$ | | 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 | $l_e$ | [mm] | 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 |
| Diameter of clearance hole in the fixture: 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 |

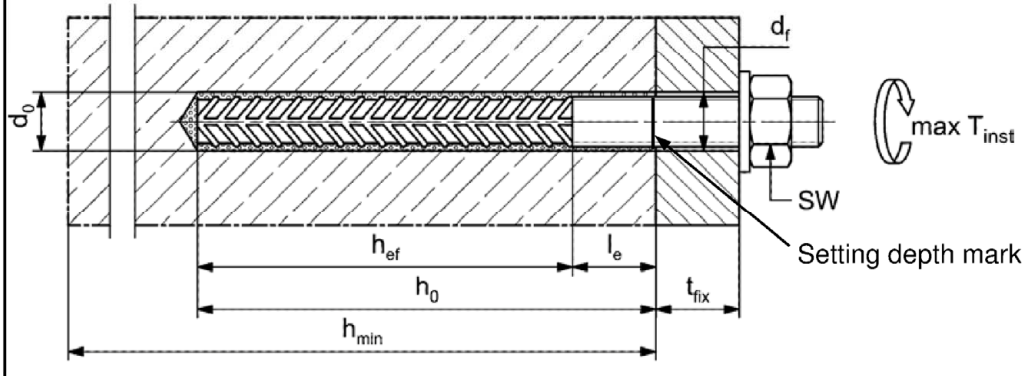
[1)] Both drill hole diameters can be used

**fischer rebar anchor FRA**




Marking frontal e. g: FRA (for stainless steel);
FRA HCR (for high corrosion resistant steel)

**Installation conditions:**




Figures not to scale

fischer injection system FIS V

**Intended use**
Installation parameters rebar anchor FRA

**Annex B 6**
Appendix 14/ 32

**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] | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 | 25 | 28 | 30 | 35 |
| Steel brush diameter | $d_b$ | | 9 | 11 | 14 | 16 | 20 | | 25 | 26 | 27 | 30 | 40 | |

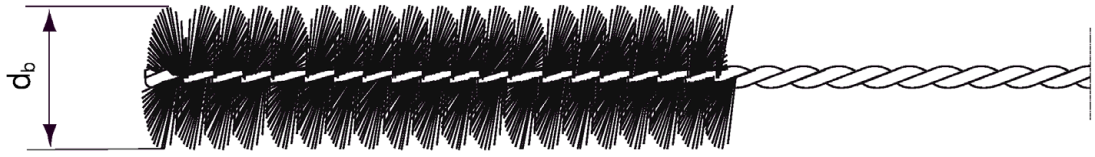



**Table B7.2** **Maximum processing** time of the mortar and **minimum curing** time (During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature)

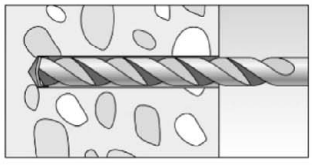
| Temperature at anchoring base [°C] | Maximum processing time $t_{work}$ | | | Minimum curing time [1] $t_{cure}$ | | |
|---|---|---|---|---|---|---|
| | FIS VW High Speed | FIS V | FIS VS Low Speed | FIS VW High Speed | FIS V | FIS VS Low Speed |
| -10 to -5 [2] | - | - | - | 12 h | - | - |
| > -5 to 0 [2] | 5 min | - | - | 3 h | 24 h | - |
| > 0 to 5 [2] | 5 min | 13 min | - | 3 h | 3 h | 6 h |
| > 5 to 10 | 3 min | 9 min | 20 min | 50 min | 90 min | 3 h |
| > 10 to 20 | 1 min | 5 min | 10 min | 30 min | 60 min | 2 h |
| > 20 to 30 | - | 4 min | 6 min | - | 45 min | 60 min |
| > 30 to 40 | - | 2 min | 4 min | - | 35 min | 30 min |

[1] In wet concrete or water filled holes the curing times must be doubled
[2] Minimal cartridge temperature +5°C

## Installation instructions part 1

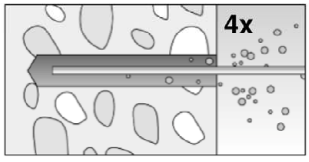
### Drilling and cleaning the hole (hammer drilling with standard drill bit)

**1**

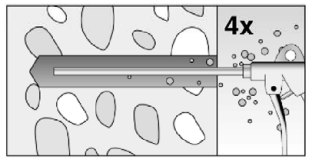


Drill the hole.
Nominal drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$
see **tables B3.1, B4.1, B5.1, B6.1**

**2**

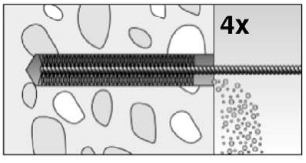



Clean the drill hole:
For $h_{ef} \leq 12d$ and
$d_0 < 18$ mm
blow out the hole four times by hand



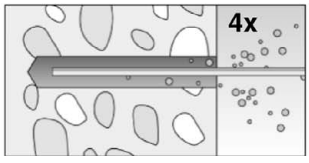

For $h_{ef} > 12d$ and / or
$d_0 \geq 18$ mm blow out the hole four times with oil-free compressed air
($p \geq 6$ bar)

**3**

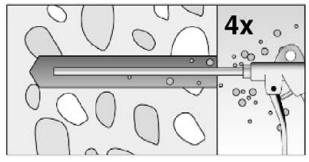



Brush the drill hole four times. For deep holes use an extension.
Corresponding brushes see **table B7.1**

**4**




Clean the drill hole:
For $h_{ef} \leq 12d$ and
$d_0 < 18$ mm
blow out the hole four times by hand




For $h_{ef} > 12d$ and / or
$d_0 \geq 18$ mm blow out the hole four times with oil-free compressed air
($p \geq 6$ bar)

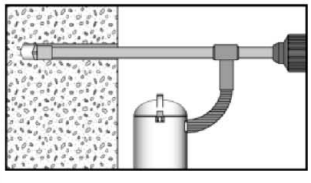
Go to step 5

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

**1**

Check a suitable hollow drill (see **table B1.1**)
for correct operation of the dust extraction

**2**



Use a suitable dust extraction system, e. g.
fischer FVC 35 M or a comparable dust extraction system
with equivalent performance data

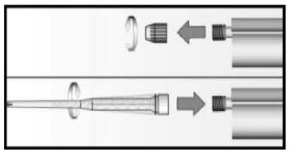
Drill the hole with hollow drill bit. The dust extraction system has to extract the drill dust nonstop during the drilling process and must be adjusted to maximum power. Nominal drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$
see **tables B3.1, B4.1, B5.1, B6.1**

Go to step 5

## Installation instructions part 2

### Preparing the cartridge

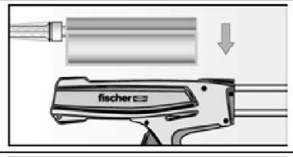
**5**

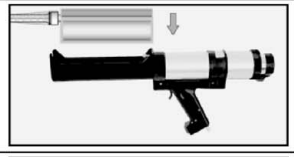


Remove the sealing cap

Screw on the static mixer
(the spiral in the static mixer must be clearly visible)

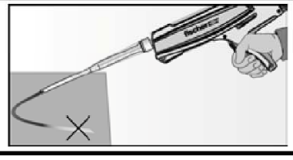
**6**

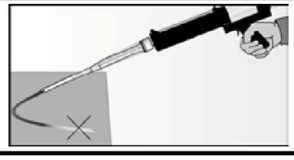




Place the cartridge into the dispenser

**7**



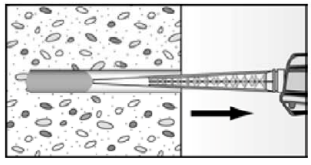


Extrude approximately 10 cm of material out until the resin is evenly grey in colour. Do not use mortar that is not uniformly grey

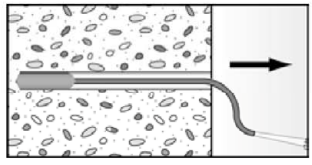
Go to step 8

### Injection of the mortar

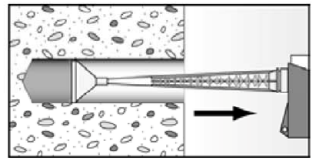
**8**



Fill approximately 2/3 of the drill hole with mortar. Always begin from the bottom of the hole and avoid bubbles



For drill hole depth ≥ 150 mm use an extension tube



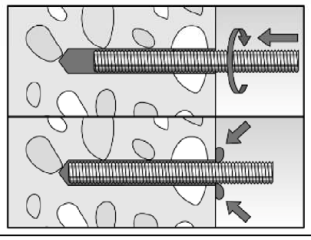
For overhead installation, deep holes ($h_0$ > 250 mm) or drill hole diameter ($d_0$ ≥ 40 mm) use an injection adapter

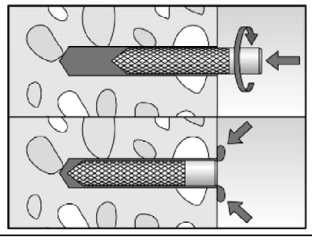
Go to step 9

## Installation instructions part 3

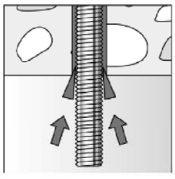
Installation of anchor rods or fischer internal threaded anchors RG MI

**9**

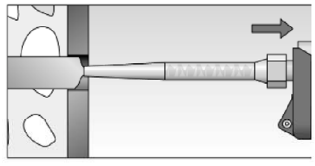




Only use clean and oil-free metal parts.
Mark the setting depth of the metal part. Push the anchor rod or fischer internal threaded RG MI anchor down to the bottom of the hole, turning it slightly while doing so.
After inserting the metal parts, excess mortar must be emerged around the anchor element.



For overhead installations support the metal part with wedges (e. g. fischer centering wedges) or fischer overhead clips.

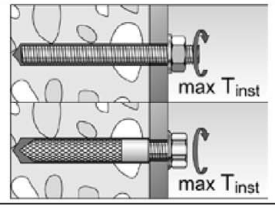


For push through installation fill the annular gap with mortar

**10**

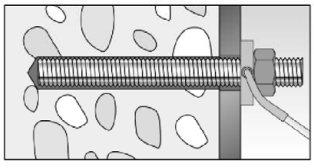
Wait for the specified curing time $t_{cure}$
see **table B7.2**

**11**




Mounting the fixture
max $T_{inst}$ see **tables B3.1 and B4.1**

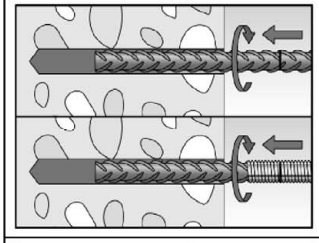
**Option**



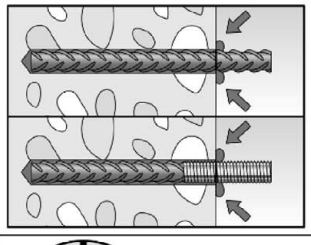
After the minimum curing time is reached, the gap between metal part and fixture (annular clearance) may be filled with mortar via the fischer filling disc. Compressive strength ≥ 50 N/mm² (e.g. fischer injection mortars FIS HB, FIS SB, FIS V, FIS EM Plus). ATTENTION: Using fischer filling disc reduces $t_{fix}$ (usable length of the anchor)

Installation reinforcing bars and fischer rebar anchor FRA

**9**

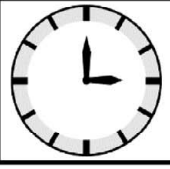


Only use clean and oil-free reinforcing bars or fischer FRA. Mark the setting depth. Turn while using force to push the reinforcement bar or the fischer FRA into the filled hole up to the setting depth mark



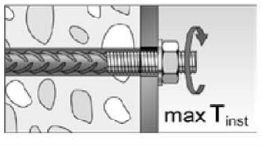
When the setting depth mark is reached, excess mortar must be emerged from the mouth of the drill hole.

**10**



Wait for the specified curing time $t_{cure}$ see **table B7.2**

**11**




Mounting the fixture
max $T_{inst}$
see **table B6.1**

fischer injection system FIS V

**Intended use**
Installation instructions part 3

**Annex B 10**
Appendix 18/ 32

**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 | | | | M6 | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bearing capacity under tension load, steel failure** [3] | | | | | | | | | | | | |
| Characteristic resistance $N_{Rk,s}$ | Steel zinc plated | Property class | 4.8 | 8 | 15(13) | 23(21) | 33 | 63 | 98 | 141 | 184 | 224 |
| | | | 5.8 | 10 | 19(17) | 29(27) | 43 | 79 | 123 | 177 | 230 | 281 |
| | | | 8.8 | 16 | 29(27) | 47(43) | 68 | 126 | 196 | 282 | 368 | 449 |
| | Stainless steel R and high corrosion resistant steel HCR | | 50 | 10 | 19 | 29 | 43 | 79 | 123 | 177 | 230 | 281 |
| | | | 70 | 14 | 26 | 41 | 59 | 110 | 172 | 247 | 322 | 393 |
| | | | 80 | 16 | 30 | 47 | 68 | 126 | 196 | 282 | 368 | 449 |
| | | [kN] | | | | | | | | | | |
| **Partial factors** [1] | | | | | | | | | | | | |
| Partial factor $\gamma_{Ms,N}$ | 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[2] / 1,87 | | | | | | | | |
| | | | 80 | 1,60 | | | | | | | | |
| | | [-] | | | | | | | | | | |
| **Bearing capacity under shear load, steel failure** [3] | | | | | | | | | | | | |
| **without lever arm** | | | | | | | | | | | | |
| Characteristic resistance $V^0_{Rk,s}$ | Steel zinc plated | Property class | 4.8 | 4 | 9(8) | 14(13) | 20 | 38 | 59 | 85 | 110 | 135 |
| | | | 5.8 | 6 | 11(10) | 17(16) | 25 | 47 | 74 | 106 | 138 | 168 |
| | | | 8.8 | 8 | 15(13) | 23(21) | 34 | 63 | 98 | 141 | 184 | 225 |
| | Stainless steel R and high corrosion resistant steel HCR | | 50 | 5 | 9 | 15 | 21 | 39 | 61 | 89 | 115 | 141 |
| | | | 70 | 7 | 13 | 20 | 30 | 55 | 86 | 124 | 161 | 197 |
| | | | 80 | 8 | 15 | 23 | 34 | 63 | 98 | 141 | 184 | 225 |
| | | [kN] | | | | | | | | | | |
| Ductility factor | | $k_7$ | [-] | 1,0 | | | | | | | | |
| **with lever arm** | | | | | | | | | | | | |
| Charact. resistance $M^0_{Rk,s}$ | Steel zinc plated | Property class | 4.8 | 6 | 15(13) | 30(27) | 52 | 133 | 259 | 448 | 665 | 899 |
| | | | 5.8 | 7 | 19(16) | 37(33) | 65 | 166 | 324 | 560 | 833 | 1123 |
| | | | 8.8 | 12 | 30(26) | 60(53) | 105 | 266 | 519 | 896 | 1333 | 1797 |
| | Stainless steel R and high corrosion resistant steel HCR | | 50 | 7 | 19 | 37 | 65 | 166 | 324 | 560 | 833 | 1123 |
| | | | 70 | 10 | 26 | 52 | 92 | 232 | 454 | 784 | 1167 | 1573 |
| | | | 80 | 12 | 30 | 60 | 105 | 266 | 519 | 896 | 1333 | 1797 |
| | | [Nm] | | | | | | | | | | |
| **Partial factors** [1] | | | | | | | | | | | | |
| Partial factor $\gamma_{Ms,V}$ | 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[2] / 1.56 | | | | | | | | |
| | | | 80 | 1.33 | | | | | | | | |
| | | [-] | | | | | | | | | | |

[1] In absence of other national regulations

[2] Only admissible for high corrosion resist. steel HCR, with $f_{yk} / f_{uk} \geq 0,8$ and $A_5 > 12$ % (e.g. fischer anchor rods)

[3] Values in brackets are valid for undersized threaded rods with smaller stress area $A_s$ for hot dip galvanised standard threaded rods according to EN ISO 10684:2004+AC:2009

**Table C2.1: Characteristic values for steel failure** under tension / shear load of **fischer internal threaded anchors RG MI**

| fischer internal threaded anchors RG MI | | | | | M8 | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|---|---|---|---|
| **Bearing capacity under tension load, steel failure** | | | | | | | | | |
| Charact. resistance with screw | $N_{Rk,s}$ | Property class | 5.8 | [kN] | 19 | 29 | 43 | 79 | 123 |
| | | | 8.8 | | 29 | 47 | 68 | 108 | 179 |
| | | Property class 70 | R | | 26 | 41 | 59 | 110 | 172 |
| | | | HCR | | 26 | 41 | 59 | 110 | 172 |
| **Partial factors**[1)] | | | | | | | | | |
| Partial factors | $\gamma_{Ms,N}$ | 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. resistance with screw | $V^0_{Rk,s}$ | Property class | 5.8 | [kN] | 9,2 | 14,5 | 21,1 | 39,2 | 62,0 |
| | | | 8.8 | | 14,6 | 23,2 | 33,7 | 54,0 | 90,0 |
| | | Property class 70 | R | | 12,8 | 20,3 | 29,5 | 54,8 | 86,0 |
| | | | HCR | | 12,8 | 20,3 | 29,5 | 54,8 | 86,0 |
| Ductility factor | | | $k_7$ | [-] | 1,0 | | | | |
| **With lever arm** | | | | | | | | | |
| Charact. resistance with screw | $M^0_{Rk,s}$ | Property class | 5.8 | [Nm] | 20 | 39 | 68 | 173 | 337 |
| | | | 8.8 | | 30 | 60 | 105 | 266 | 519 |
| | | Property class 70 | R | | 26 | 52 | 92 | 232 | 454 |
| | | | HCR | | 26 | 52 | 92 | 232 | 454 |
| **Partial factors**[1)] | | | | | | | | | |
| Partial factors | $\gamma_{Ms,V}$ | Property class | 5.8 | [-] | 1,25 | | | | |
| | | | 8.8 | | 1,25 | | | | |
| | | Property class 70 | R | | 1,56 | | | | |
| | | | HCR | | 1,56 | | | | |

[1)] In absence of other national regulations

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

| **Nominal diameter of the bar** | | **ϕ** | **8** | **10** | **12** | **14** | **16** | **20** | **25** | **28** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Bearing capacity under tension load, steel failure** | | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | $A_s \cdot f_{uk}$ [1)] | | | | | | | |
| **Bearing capacity under shear load, steel failure** | | | | | | | | | | |
| **Without lever arm** | | | | | | | | | | |
| Characteristic resistance | $V^0_{Rk,s}$ | [kN] | $0,5 \cdot A_s \cdot f_{uk}$ [1)] | | | | | | | |
| Ductility factor | $k_7$ | [-] | 1,0 | | | | | | | |
| **With lever arm** | | | | | | | | | | |
| Characteristic resistance | $M^0_{Rk,s}$ | [Nm] | $1,2 \cdot W_{el} \cdot f_{uk}$ [1)] | | | | | | | |

[1)] $f_{uk}$ or $f_{yk}$ respectively must be taken from the specifications of the reinforcing bar

**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] | 63 | 111 | 173 | 270 |
| **Partial factor[1)]** | | | | | | |
| 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 | 124 |
| Ductility factor | $k_7$ | [-] | 1,0 | | | |
| **With lever arm** | | | | | | |
| Characteristic resistance | $M^0_{Rk,s}$ | [Nm] | 92 | 233 | 454 | 785 |
| **Partial factor[1)]** | | | | | | |
| Partial factor | $\gamma_{Ms,V}$ | [-] | 1,56 | | | |

[1)] In absence of other national regulations

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

| Size | | | All sizes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tension load** | | | | | | | | | | | |
| Installation factor | $\gamma_{inst}$ | [-] | See annex C 5 to C 8 and C 13 to C14 | | | | | | | | |
| **Factors for the compressive strength of concrete > C20/25** | | | | | | | | | | | |
| Increasing factor for $\tau_{Rk}$ | C25/30 | $\Psi_c$ | [-] | 1,05 | | | | | | | |
| | C30/37 | | | 1,10 | | | | | | | |
| | C35/45 | | | 1,15 | | | | | | | |
| | C40/50 | | | 1,19 | | | | | | | |
| | C45/55 | | | 1,22 | | | | | | | |
| | C50/60 | | | 1,26 | | | | | | | |
| **Splitting failure** | | | | | | | | | | | |
| Edge distance | $h / h_{ef} \geq 2,0$ | $c_{cr,sp}$ | [mm] | $1,0\ h_{ef}$ | | | | | | | |
| | $2,0 > h / h_{ef} > 1,3$ | | | $4,6\ h_{ef} - 1,8\ h$ | | | | | | | |
| | $h / h_{ef} \leq 1,3$ | | | $2,26\ h_{ef}$ | | | | | | | |
| Spacing | | $s_{cr,sp}$ | | $2\ c_{cr,sp}$ | | | | | | | |
| **Concrete cone failure** | | | | | | | | | | | |
| Uncracked concrete | | $k_{ucr,N}$ | [-] | 11,0 | | | | | | | |
| Cracked concrete | | $k_{cr,N}$ | | 7,7 | | | | | | | |
| Edge distance | | $c_{cr,N}$ | [mm] | $1,5\ h_{ef}$ | | | | | | | |
| Spacing | | $s_{cr,N}$ | | $2\ c_{cr,N}$ | | | | | | | |
| **Factors for sustained tension load** | | | | | | | | | | | |
| Temperature range | | | [-] | 50 °C / 80 °C | | | | | 72 °C / 120 °C | | |
| Factor | | $\Psi^0_{sus}$ | [-] | 0,74 | | | | | 0,87 | | |
| **Shear load** | | | | | | | | | | | |
| Installation factor | | $\gamma_{inst}$ | [-] | 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 | | $l_f$ | [mm] | for $d_{nom} \leq 24$ mm: min ($h_{ef}$; 12 $d_{nom}$)<br>for $d_{nom} > 24$ mm: min ($h_{ef}$; 8 $d_{nom}$; 300 mm) | | | | | | | |
| **Calculation diameters** | | | | | | | | | | | |
| Size | | | | M6 | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
| fischer anchor rods and standard threaded rods | | $d_{nom}$ | [mm] | 6 | 8 | 10 | 12 | 16 | 20 | 24 | 27 | 30 |
| fischer internal threaded anchors RG MI | | $d_{nom}$ | | -[1] | 12 | 16 | 18 | 22 | 28 | -[1] | -[1] | -[1] |
| fischer rebar anchor FRA | | $d_{nom}$ | | -[1] | -[1] | -[1] | 12 | 16 | 20 | 25 | -[1] | -[1] |
| Size (nominal diameter of the bar) | | | $\phi$ | 8 | 10 | 12 | 14 | 16 | 20 | 25 | 28 | |
| Reinforcing bar | | $d_{nom}$ | [mm] | 8 | 10 | 12 | 14 | 16 | 20 | 25 | 28 | |

[1] Anchor type not part of the assessment

**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** | | | | **M6** | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** | **M30** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Combined pullout and concrete cone failure** | | | | | | | | | | | | |
| Calculation diameter | | d | [mm] | 6 | 8 | 10 | 12 | 16 | 20 | 24 | 27 | 30 |
| **Uncracked concrete** | | | | | | | | | | | | |
| **Characteristic bond resistance in uncracked concrete C20/25** | | | | | | | | | | | | |
| Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete) | | | | | | | | | | | | |
| Temperature range | I: 50 °C / 80 °C | $\tau_{Rk,ucr}$ | [N/mm²] | 9,0 | 11,0 | 11,0 | 11,0 | 10,0 | 9,5 | 9,0 | 8,5 | 8,5 |
| | II: 72 °C / 120 °C | | | 6,5 | 9,5 | 9,5 | 9,0 | 8,5 | 8,0 | 7,5 | 7,0 | 7,0 |
| Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)[1] | | | | | | | | | | | | |
| Temperature range | I: 50 °C / 80 °C | $\tau_{Rk,ucr}$ | [N/mm²] | -[2] | -[2] | -[2] | 9,5 | 8,5 | 8,0 | 7,5 | 7,0 | 7,0 |
| | II: 72 °C / 120 °C | | | -[2] | -[2] | -[2] | 7,5 | 7,0 | 6,5 | 6,0 | 6,0 | 6,0 |
| **Installation factors** | | | | | | | | | | | | |
| Dry or wet concrete | | $\gamma_{inst}$ | [-] | 1,0 | | | | | | | | |
| Water filled hole | | | | -[2] | -[2] | -[2] | 1,2 [1] | | | | | |
| **Cracked concrete** | | | | | | | | | | | | |
| **Characteristic bond resistance in cracked concrete C20/25** | | | | | | | | | | | | |
| Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete) | | | | | | | | | | | | |
| Temperature range | I: 50 °C / 80 °C | $\tau_{Rk,cr}$ | [N/mm²] | -[2] | 5,5 | 6,0 | 6,0 | 6,0 | 5,5 | 4,5 | 4,0 | 4,0 |
| | II: 72 °C / 120 °C | | | -[2] | 4,5 | 5,0 | 6,0 | 6,0 | 5,0 | 4,0 | 3,5 | 3,5 |
| Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)[1] | | | | | | | | | | | | |
| Temperature range | I: 50 °C / 80 °C | $\tau_{Rk,cr}$ | [N/mm²] | -[2] | -[2] | -[2] | 5,0 | 5,0 | 4,5 | 4,0 | 3,5 | 3,5 |
| | II: 72 °C / 120 °C | | | -[2] | -[2] | -[2] | 4,0 | 4,0 | 4,0 | 3,5 | 3,0 | 3,0 |
| **Installation factors** | | | | | | | | | | | | |
| Dry or wet concrete | | $\gamma_{inst}$ | [-] | 1,0 | | | | | | | | |
| Water filled hole | | | | -[2] | -[2] | -[2] | 1,2 [1] | | | | | |

[1] Only with coaxial cartridges: 380ml, 400 ml, 410 ml
[2] No performance assessed

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

| **Internal threaded anchor RG MI** | | | | **M8** | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| **Combined pullout and concrete cone failure** | | | | | | | | |
| Calculation diameter | | d | [mm] | 12 | 16 | 18 | 22 | 28 |
| **Uncracked concrete** | | | | | | | | |
| **Characteristic bond resistance in uncracked concrete C20/25** | | | | | | | | |
| Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete) | | | | | | | | |
| Temperature range | I: 50 °C / 80 °C | $\tau_{Rk,ucr}$ | [N/mm²] | 10,5 | 10,0 | 9,5 | 9,0 | 8,5 |
| | II: 72 °C / 120 °C | | | 9,0 | 8,0 | 8,0 | 7,5 | 7,0 |
| Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)[1)] | | | | | | | | |
| Temperature range | I: 50 °C / 80 °C | $\tau_{Rk,ucr}$ | [N/mm²] | 10,0 | 9,0 | 9,0 | 8,5 | 8,0 |
| | II: 72 °C / 120 °C | | | 7,5 | 6,5 | 6,5 | 6,0 | 6,0 |
| **Installation factors** | | | | | | | | |
| Dry or wet concrete | | $\gamma_{inst}$ | [-] | 1,0 | | | | |
| Water filled hole | | | | 1,2[1)] | | | | |

[1)] Only with coaxial cartridges: 380 ml, 400 ml, 410 ml

**Table C7.1: Characteristic values** for combined pull-out and concrete failure for **reinforcing bars** in hammer drilled holes; **uncracked or cracked concrete**

| **Nominal diameter of the bar** | | **ϕ** | **8** | **10** | **12** | **14** | **16** | **20** | **25** | **28** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Combined pullout and concrete cone failure** | | | | | | | | | | |
| Calculation diameter | d | [mm] | 8 | 10 | 12 | 14 | 16 | 20 | 25 | 28 |
| **Uncracked concrete** | | | | | | | | | | |
| **Characteristic bond resistance in uncracked concrete C20/25** | | | | | | | | | | |
| Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete) | | | | | | | | | | |
| Temperature range I: 50 °C / 80 °C | $\tau_{Rk,ucr}$ | [N/mm²] | 11,0 | 11,0 | 11,0 | 10,0 | 10,0 | 9,5 | 9,0 | 8,5 |
| Temperature range II: 72 °C / 120 °C | $\tau_{Rk,ucr}$ | [N/mm²] | 9,5 | 9,5 | 9,0 | 8,5 | 8,5 | 8,0 | 7,5 | 7,0 |
| **Installation factor** | | | | | | | | | | |
| Dry or wet concrete | $\gamma_{inst}$ | [-] | 1,0 | | | | | | | |
| **Cracked concrete** | | | | | | | | | | |
| **Characteristic bond resistance in cracked concrete C20/25** | | | | | | | | | | |
| Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete) | | | | | | | | | | |
| Temperature range I: 50 °C / 80 °C | $\tau_{Rk,cr}$ | [N/mm²] | -[1)] | 3,0 | 5,0 | 5,0 | 5,0 | 4,5 | 4,0 | 4,0 |
| Temperature range II: 72 °C / 120 °C | $\tau_{Rk,cr}$ | [N/mm²] | -[1)] | 3,0 | 4,5 | 4,5 | 4,5 | 4,0 | 3,5 | 3,5 |
| **Installation factor** | | | | | | | | | | |
| Dry or wet concrete | $\gamma_{inst}$ | [-] | 1,0 | | | | | | | |

1) No performance assessed

**Table C8.1: Characteristic values** for combined pull-out and concrete failure for **fischer rebar anchors FRA** in hammer drilled holes; **uncracked or cracked concrete**

| **fischer rebar anchor 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 or hollow drill bit (dry or wet concrete) | | | | | | | |
| Temperature range | I: 50 °C / 80 °C | $\tau_{Rk,ucr}$ | [N/mm²] | 11,0 | 10,0 | 9,5 | 9,5 |
| | II: 72 °C / 120 °C | | | 9,0 | 8,5 | 8,0 | 7,5 |
| **Installation factors** | | | | | | | |
| Dry or wet concrete | | $\gamma_{inst}$ | [-] | 1,0 | | | |
| **Cracked concrete** | | | | | | | |
| **Characteristic bond resistance in cracked concrete C20/25** | | | | | | | |
| Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete) | | | | | | | |
| Temperature range | I: 50 °C / 80 °C | $\tau_{Rk,cr}$ | [N/mm²] | 5,0 | 5,0 | 4,5 | 4,0 |
| | II: 72 °C / 120 °C | | | 4,5 | 4,5 | 4,0 | 3,5 |
| **Installation factors** | | | | | | | |
| Dry or wet concrete | | $\gamma_{inst}$ | [-] | 1,0 | | | |

## Table C9.1: Displacements for anchor rods

| Anchor rod | | M6 | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Displacement-Factors for tension load[1)]** | | | | | | | | | | |
| **Uncracked concrete; Temperature range I, II** | | | | | | | | | | |
| $\delta_{N0\text{-Factor}}$ | [mm/(N/mm²)] | 0,09 | 0,09 | 0,09 | 0,10 | 0,10 | 0,10 | 0,10 | 0,11 | 0,12 |
| $\delta_{N\infty\text{-Factor}}$ | | 0,10 | 0,10 | 0,10 | 0,12 | 0,12 | 0,12 | 0,13 | 0,13 | 0,14 |
| **Cracked concrete; Temperature range I, II** | | | | | | | | | | |
| $\delta_{N0\text{-Factor}}$ | [mm/(N/mm²)] | -[3)] | 0,12 | 0,12 | 0,12 | 0,13 | 0,13 | 0,13 | 0,14 | 0,15 |
| $\delta_{N0\text{-Factor}}$ | | -[3)] | 0,25 | 0,27 | 0,30 | 0,30 | 0,30 | 0,35 | 0,35 | 0,40 |
| **Displacement-Factors for shear load[2)]** | | | | | | | | | | |
| **Uncracked or cracked concrete; Temperature range I, II** | | | | | | | | | | |
| $\delta_{V0\text{-Factor}}$ | [mm/kN] | 0,11 | 0,11 | 0,11 | 0,10 | 0,10 | 0,09 | 0,09 | 0,08 | 0,07 |
| $\delta_{V\infty\text{-Factor}}$ | | 0,12 | 0,12 | 0,12 | 0,11 | 0,11 | 0,10 | 0,10 | 0,09 | 0,09 |

[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 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)

[3)] No performance assessed

## Table C9.2: Displacements for fischer internal threaded anchors RG MI

| Internal threaded anchor RG MI | | M8 | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|---|
| **Displacement-Factors for tension load[1)]** | | | | | | |
| **Uncracked concrete; Temperature range I, II** | | | | | | |
| $\delta_{N0\text{-Factor}}$ | [mm/(N/mm²)] | 0,10 | 0,11 | 0,12 | 0,13 | 0,14 |
| $\delta_{N\infty\text{-Factor}}$ | | 0,13 | 0,14 | 0,15 | 0,16 | 0,18 |
| **Displacement-Factors for shear load[2)]** | | | | | | |
| **Uncracked concrete; Temperature range I, II** | | | | | | |
| $\delta_{V0\text{-Factor}}$ | [mm/kN] | 0,12 | 0,12 | 0,12 | 0,12 | 0,12 |
| $\delta_{V\infty\text{-Factor}}$ | | 0,14 | 0,14 | 0,14 | 0,14 | 0,14 |

[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 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)

## Table C10.1: Displacements for reinforcing bars

| Nominal diameter of the bar $\phi$ | | 8 | 10 | 12 | 14 | 16 | 20 | 25 | 28 |
|---|---|---|---|---|---|---|---|---|---|
| **Displacement-Factors for tension load[1)]** | | | | | | | | | |
| **Uncracked concrete; Temperature range I, II** | | | | | | | | | |
| $\delta_{N0\text{-Factor}}$ | [mm/(N/mm²)] | 0,09 | 0,09 | 0,10 | 0,10 | 0,10 | 0,10 | 0,10 | 0,11 |
| $\delta_{N\infty\text{-Factor}}$ | | 0,10 | 0,10 | 0,12 | 0,12 | 0,12 | 0,12 | 0,13 | 0,13 |
| **Cracked concrete; Temperature range I, II** | | | | | | | | | |
| $\delta_{N0\text{-Factor}}$ | [mm/(N/mm²)] | -[3)] | 0,12 | 0,13 | 0,13 | 0,13 | 0,13 | 0,13 | 0,14 |
| $\delta_{N\infty\text{-Factor}}$ | | -[3)] | 0,27 | 0,30 | 0,30 | 0,30 | 0,30 | 0,35 | 0,37 |
| **Displacement-Factors for shear load[2)]** | | | | | | | | | |
| **Uncracked or cracked concrete; Temperature range I, II** | | | | | | | | | |
| $\delta_{V0\text{-Factor}}$ | [mm/kN] | 0,11 | 0,11 | 0,10 | 0,10 | 0,10 | 0,09 | 0,09 | 0,08 |
| $\delta_{V\infty\text{-Factor}}$ | | 0,12 | 0,12 | 0,11 | 0,11 | 0,11 | 0,10 | 0,10 | 0,09 |

[1)] Calculation of effective displacement:

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

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

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

[3)] No performance assessed

## Table C10.2: Displacements for fischer rebar anchors FRA

| fischer rebar anchor FRA | | M12 | M16 | M20 | M24 |
|---|---|---|---|---|---|
| **Displacement-Factors for tension load[1)]** | | | | | |
| **Uncracked concrete; Temperature range I, II** | | | | | |
| $\delta_{N0\text{-Factor}}$ | [mm/(N/mm²)] | 0,10 | 0,10 | 0,10 | 0,10 |
| $\delta_{N\infty\text{-Factor}}$ | | 0,12 | 0,12 | 0,12 | 0,13 |
| **Cracked concrete; Temperature range I, II** | | | | | |
| $\delta_{N0\text{-Factor}}$ | [mm/(N/mm²)] | 0,12 | 0,13 | 0,13 | 0,13 |
| $\delta_{N\infty\text{-Factor}}$ | | 0,30 | 0,30 | 0,30 | 0,35 |
| **Displacement-Factors for shear load[2)]** | | | | | |
| **Uncracked or cracked concrete; Temperature range I, II** | | | | | |
| $\delta_{V0\text{-Factor}}$ | [mm/kN] | 0,10 | 0,10 | 0,09 | 0,09 |
| $\delta_{V\infty\text{-Factor}}$ | | 0,11 | 0,11 | 0,10 | 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 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)

**Table C11.1: Characteristic values for steel failure under tension / shear load of fischer anchor rods and standard threaded rods under seismic action performance category C1 or C2**

| Anchor rod / standard threaded rod | | | | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Bearing capacity under tension load, steel failure[1)]** | | | | | | | | | | |
| **fischer anchor rods and standard threaded rods, performance category C1 [2)]** | | | | | | | | | | |
| Characteristic resistance $N_{Rk,s,C1}$ | Steel zinc plated | Property class | 5.8 | [kN] | 29(27) | 43 | 79 | 123 | 177 | 230 | 281 |
| | | | 8.8 | | 47(43) | 68 | 126 | 196 | 282 | 368 | 449 |
| | Stainless steel R and high corrosion resistant steel HCR | | 50 | | 29 | 43 | 79 | 123 | 177 | 230 | 281 |
| | | | 70 | | 41 | 59 | 110 | 172 | 247 | 322 | 393 |
| | | | 80 | | 47 | 68 | 126 | 196 | 282 | 368 | 449 |
| **fischer anchor rods and standard threaded rods, performance category C2 [2)]** | | | | | | | | | | |
| Characteristic reistance $N_{Rk,s,C2}$ | Steel zinc plated | Property class | 5.8 | [kN] | -[4)] | 39 | 72 | 108 | -[4)] | -[4)] | -[4)] |
| | | | 8.8 | | -[4)] | 61 | 116 | 173 | -[4)] | -[4)] | -[4)] |
| | Stainless steel R and high corrosion resistant steel HCR | | 50 | | -[4)] | 39 | 72 | 108 | -[4)] | -[4)] | -[4)] |
| | | | 70 | | -[4)] | 53 | 101 | 152 | -[4)] | -[4)] | -[4)] |
| | | | 80 | | -[4)] | 61 | 116 | 173 | -[4)] | -[4)] | -[4)] |
| **Bearing capacity under shear load, steel failure without lever arm[1)]** | | | | | | | | | | |
| **fischer anchor rods, performance category C1 [2)]** | | | | | | | | | | |
| Characteristic resistance $V_{Rk,s,C1}$ | Steel zinc plated | Property class | 5.8 | [kN] | 17(16) | 25 | 47 | 74 | 106 | 138 | 168 |
| | | | 8.8 | | 23(21) | 34 | 63 | 98 | 141 | 184 | 225 |
| | Stainless steel R and high corrosion resistant steel HCR | | 50 | | 15 | 21 | 39 | 61 | 89 | 115 | 141 |
| | | | 70 | | 20 | 30 | 55 | 86 | 124 | 161 | 197 |
| | | | 80 | | 23 | 34 | 63 | 98 | 141 | 184 | 225 |
| **Standard threaded rods, performance category C1 [2)]** | | | | | | | | | | |
| Characteristic resistance $V_{Rk,s,C1}$ | Steel zinc plated | Property class | 5.8 | [kN] | 12(11) | 17 | 33 | 52 | 74 | 97 | 118 |
| | | | 8.8 | | 16(14) | 24 | 44 | 69 | 99 | 129 | 158 |
| | Stainless steel R and high corrosion resistant steel HCR | | 50 | | 11 | 15 | 27 | 43 | 62 | 81 | 99 |
| | | | 70 | | 14 | 21 | 39 | 60 | 87 | 113 | 138 |
| | | | 80 | | 16 | 24 | 44 | 69 | 99 | 129 | 158 |
| **fischer anchor rods and standard threaded rods, performance category C2** | | | | | | | | | | |
| Characteristic resistance $V_{Rk,s,C2}$ | Steel zinc plated | Property class | 5.8 | [kN] | -[4)] | 14 | 27 | 43 | -[4)] | -[4)] | -[4)] |
| | | | 8.8 | | -[4)] | 22 | 44 | 69 | -[4)] | -[4)] | -[4)] |
| | Stainless steel R and high corrosion resistant steel HCR | | 50 | | -[4)] | 14 | 27 | 43 | -[4)] | -[4)] | -[4)] |
| | | | 70 | | -[4)] | 20 | 39 | 60 | -[4)] | -[4)] | -[4)] |
| | | | 80 | | -[4)] | 22 | 44 | 69 | -[4)] | -[4)] | -[4)] |
| Factor for the annular gap | | $\alpha_{gap}$ | | [-] | 0,5 (1,0)[3)] | | | | | | |

[1)] Partial factors for performance category C1 or C2 see table C12.1;
for fischer anchor rods FIS A / RGM the factor for steel ductility is 1,0

[2)] Values in brackets are valid for undersized threaded rods with smaller stress area $A_s$ for hot dip galvanised standard threaded rods according to EN ISO 10684:2004+AC:2009.

[3)] Values in brackets are valid for filled annular gaps between the anchor rod and the through-hole in the attachment. It is necessary to use the fischer filling disc according to Annex A 1

[4)] No performance assessed

**Table C12.1: Partial factors** for **fischer anchor rods, standard threaded rods** under seismic action performance category **C1 or C2**

| Anchor rod / standard threaded rod | | | | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Tension load, steel failure[1)]** | | | | | | | | | | |
| Partial factor $\gamma_{Ms,N}$ | Steel zinc plated | Property class | 5.8 | [-] | 1,50 | | | | | |
| | | | 8.8 | | 1,50 | | | | | |
| | Stainless steel R and high corrosion resistant steel HCR | | 50 | | 2,86 | | | | | |
| | | | 70 | | 1,50[2)] / 1,87 | | | | | |
| | | | 80 | | 1,60 | | | | | |
| **Shear load, steel failure[1)]** | | | | | | | | | | |
| Partial factor $\gamma_{Ms,V}$ | Steel zinc plated | Property class | 5.8 | [-] | 1,25 | | | | | |
| | | | 8.8 | | 1,25 | | | | | |
| | Stainless steel R and high corrosion resistant steel HCR | | 50 | | 2,38 | | | | | |
| | | | 70 | | 1,25[2)] / 1,56 | | | | | |
| | | | 80 | | 1,33 | | | | | |

[1)] In absence of other national regulations

[2)] Only admissible for high corrosion resistant steel HCR, with $f_{yk} / f_{uk} \geq 0,8$ and $A_5 > 12$ % (e.g. fischer anchor rods)

**Table C13.1: Characteristic values** for combined pull-out and concrete failure for **fischer anchor rods** and **standard threaded rods** in hammer drilled holes under seismic action performance category **C1**

| **Anchor rod / standard threaded rod** | | | | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** | **M30** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Characteristic bond resistance, combined pullout and concrete cone failure** | | | | | | | | | | |
| **Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)** | | | | | | | | | | |
| Temperature range | I: 50 °C / 80 °C | $\tau_{Rk,C1}$ | [N/mm²] | 4,5 | 5,5 | 5,5 | 5,5 | 4,5 | 4,0 | 4,0 |
| | II: 72 °C / 120 °C | | | 4,0 | 4,5 | 4,5 | 4,5 | 4,0 | 3,5 | 3,5 |
| **Hammer-drilling with standard drill bit or hollow drill bit (water filled hole [1])** | | | | | | | | | | |
| Temperature range | I: 50 °C / 80 °C | $\tau_{Rk,C1}$ | [N/mm²] | -[2] | 5,0 | 5,0 | 4,5 | 4,0 | 3,5 | 3,5 |
| | II: 72 °C / 120 °C | | | -[2] | 4,0 | 4,0 | 4,0 | 3,5 | 3,0 | 3,0 |
| **Installation factors** | | | | | | | | | | |
| Dry or wet concrete | | $\gamma_{inst}$ | [-] | 1,0 | | | | | | |
| Water filled hole | | | | -[2] | 1,2 [1] | | | | | |

[1] Only with coaxial cartridges: 380ml, 400 ml, 410 ml
[2] No performance assessed

**Table C14.1: Characteristic values** for combined pull-out and concrete failure for **fischer anchor rods** and **standard threaded rods** in hammer drilled holes under seismic action performance category **C2**

| **Anchor rod / standard threaded rod** | | | | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|
| **Characteristic bond resistance, combined pullout and concrete cone failure** | | | | | | |
| **Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)** | | | | | | |
| Temperature range | I: 50 °C / 80 °C | $\tau_{Rk,C2}$ | [N/mm²] | 1,5 | 1,3 | 2,1 |
| | II: 72 °C / 120 °C | | | 1,3 | 1,2 | 1,9 |
| **Hammer-drilling with standard drill bit or hollow drill bit (water filled hole 3))** | | | | | | |
| Temperature range | I: 50 °C / 80 °C | $\tau_{Rk,C2}$ | [N/mm²] | 1,3 | 1,1 | 1,8 |
| | II: 72 °C / 120 °C | | | 1,1 | 1,0 | 1,6 |
| **Installation factors** | | | | | | |
| Dry or wet concrete | | $\gamma_{inst}$ | [-] | 1,0 | | |
| Water filled hole | | | | -4) | 1,2 3) | |
| **Displacement-Factors for tension load 1)** | | | | | | |
| $\delta_{N,C2\ (DLS)}$-Factor | | [mm/(N/mm²)] | | 0,20 | 0,13 | 0,21 |
| $\delta_{N,C2\ (ULS)}$-Factor | | | | 0,38 | 0,18 | 0,24 |
| **Displacement-Factors for shear load 2)** | | | | | | |
| $\delta_{V,C2\ (DLS)}$-Factor | | [mm/kN] | | 0,18 | 0,10 | 0,07 |
| $\delta_{V,C2\ (ULS)}$-Factor | | | | 0,25 | 0,14 | 0,11 |

1) Calculation of effective displacement:

$\delta_{N,C2\ (DLS)} = \delta_{N,C2\ (DLS)\text{-Factor}} \cdot \tau_{Ed}$

$\delta_{N,C2\ (ULS)} = \delta_{N,C2\ (ULS)\text{-Factor}} \cdot \tau_{Ed}$

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

2) Calculation of effective displacement:

$\delta_{V,C2\ (DLS)} = \delta_{V,C2\ (DLS)\text{-Factor}} \cdot V_{Ed}$

$\delta_{V,C2\ (ULS)} = \delta_{V,C2\ (ULS)\text{-Factor}} \cdot V_{Ed}$

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

3) Only with coaxial cartridges: 380ml, 400 ml, 410 ml

4) No performance assessed