

## PRESTATIEVERKLARING

### DoP 0317

voor fischer injectiesysteem FIS AB (Verbindingsbevestiging voor gebruik in beton)

NL

1. Unieke identificatiecode van het producttype: DoP 0317
2. Beoogd(e) gebruik(en): Bevestigingen in gescheurd of ongescheurd beton, zie bijlage, met name de bijlagen B1 - B9.
3. Fabrikant: fischerwerke GmbH & Co. KG, Otto-Hahn-Straße 15, 79211 Denzlingen, Duitsland
4. Gemachtigde: -
5. Het systeem of de systemen voor de beoordeling en verificatie van de prestatiebestendigheid: 1
6. Europees beoordelingsdocument: EAD 330499-01-0601, Edition 04/2020  
Europese technische beoordeling: ETA-17/0350; 2022-07-29  
Technische beoordelingsinstantie: DIBt- Deutsches Institut für Bautechnik  
Aangemelde instantie(s): 2873 TU Darmstadt
7. Aangegeven prestatie(s):  
**Mechanische weerstand en stabiliteit (BWR 1)**  
**Kenmerkende weerstand tegen trekbelasting (statische en quasi-statische belasting):**  
Weerstand tegen staalbreuk: Bijlagen C1 - C3  
Weerstand tegen gecombineerd uittrekken en betonnen kegelbreuk: Bijlagen C4 - C6  
Weerstand tegen betonnen kegelbreuk: Bijlage C4  
Randafstand om spleetbreuk onder belasting te voorkomen: Bijlage C4  
Robuustheid: Bijlagen C4 - C6  
Maximaal montagekoppel: Bijlagen B3, B4  
Minimale rand- en hartafstand: Bijlagen B3 - B5  
**Kenmerkende weerstand tegen schuifbelasting (statische en quasi-statische belasting):**  
Weerstand tegen staalbreuk: Bijlagen C1 - C3  
Weerstand tegen uitbreken (pryout): Bijlage C4  
Weerstand tegen bezwijken van betonranden: Bijlage C4  
**Verplaatsingen onder korte- en langetermijnbelading:**  
Verplaatsingen onder korte- en langetermijnbelading: Bijlagen C7, C8  
**Kenmerkende weerstand en verplaatsingen voor de seismische prestatiecategorieën C1 en C2:**  
Trekkrachtweerstand, verplaatsingen categorie C1: NPd  
Trekkrachtweerstand, verplaatsingen categorie C2: NPd  
Weerstand afschuifbelasting, verplaatsingen categorie C1: NPd  
Weerstand afschuifbelasting, verplaatsingen categorie C2: NPd  
Factor ringvormige opening: NPd  
**Hygiëne, gezondheid en milieu (BWR 3)**  
Content, emission and/or release of dangerous substances: NPd
8. Geëigende technische documentatie en/of specifieke technische documentatie: -

De prestaties van het hierboven omschreven product zijn conform de aangegeven prestaties. Deze prestatieverklaring wordt in overeenstemming met Verordening (EU) nr. 305/2011 onder de exclusieve verantwoordelijkheid van de hierboven vermelde fabrikant verstrekt.

Ondertekend voor en namens de fabrikant door:



Dr.-Ing. Oliver Geibig, Directeur Business Units & Engineering  
Tumlingen, 2022-10-24



Jürgen Grün, Directeur Chemie & Kwaliteit

Deze DoP is opgesteld in meerdere talen. In het geval van geschillen over de interpretatie zal de Engelse tekst altijd prevaleren.

Het aanhangsel bevat vrijwillige en aanvullende informatie in het Engels die de (taal-neutraal gespecificeerde) wettelijke vereisten overschrijdt.

**Specific Part**

**1 Technical description of the product**

The "fischer injection system FIS AB" is a bonded fastener consisting of a cartridge with injection mortar fischer FIS AB, fischer FIS AB High Speed or fischer FIS AB Low Speed and a steel element according to Annex A4.

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 fastener 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 fastener 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 5, C 1 to C 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 7 and C 8            |
| 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**

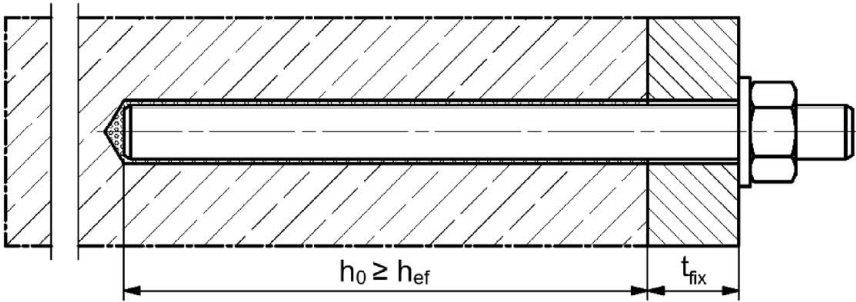
In accordance with the European Assessment Document EAD 330499-01-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

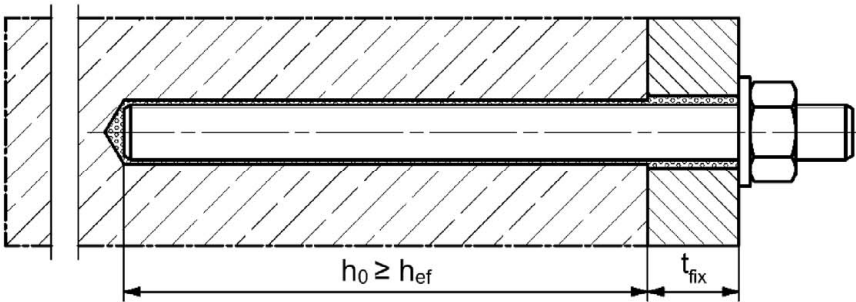
Installation conditions part 1

fischer anchor rod

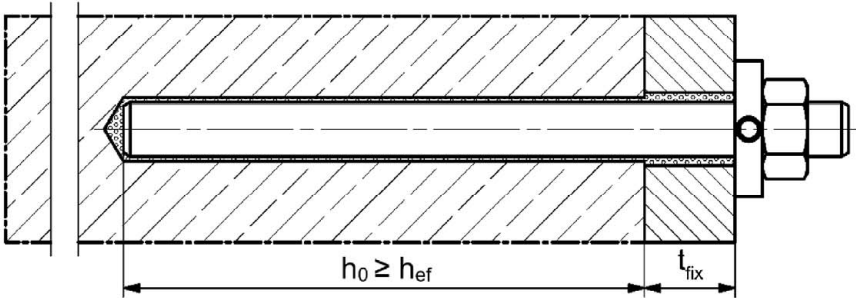
Pre-positioned installation



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

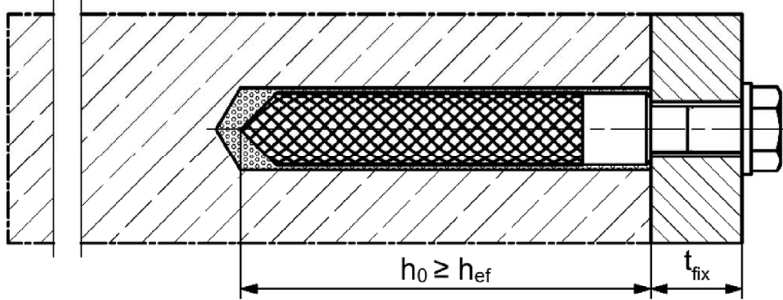
fischer injection system FIS AB

Product description  
Installation conditions part 1

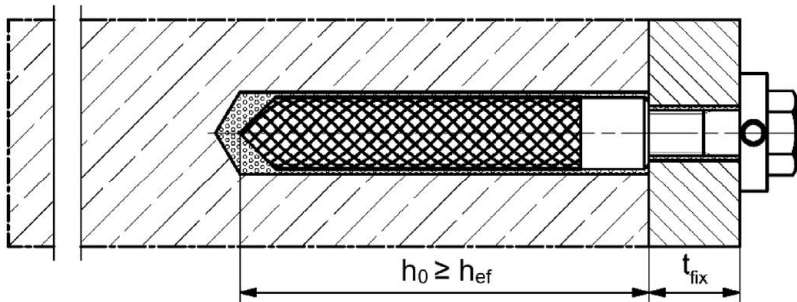
Installation conditions part 2

fischer internal threaded anchor RG M I

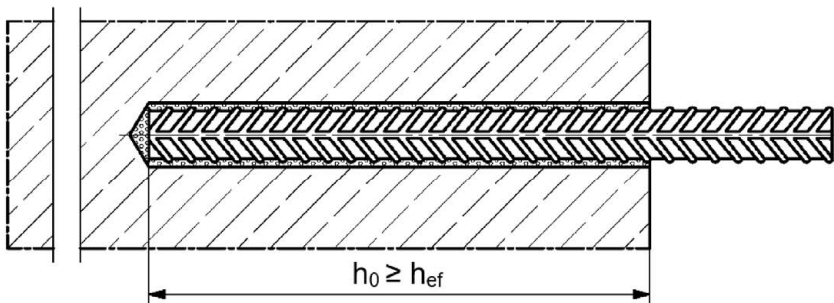
Pre-positioned installation



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



Reinforcing bar



Figures not to scale

$h_0$  = drill hole depth

$h_{ef}$  = effective embedment depth

$t_{fix}$  = thickness of fixture

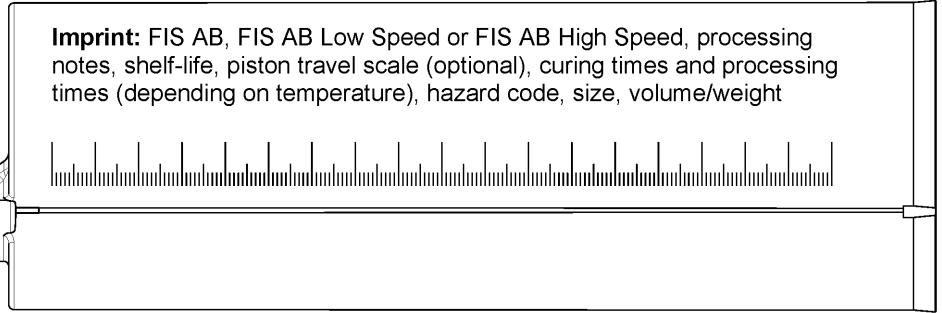
fischer injection system FIS AB

Product description  
Installation conditions part 2

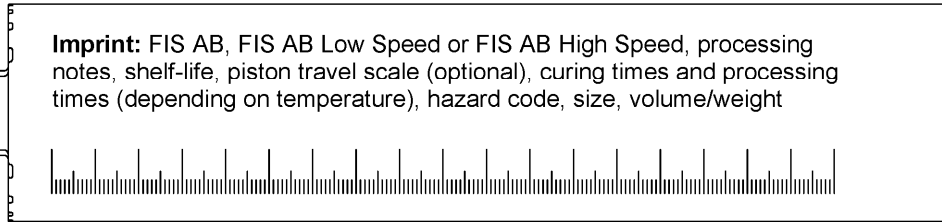
Annex A 2  
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## Overview system components part 1

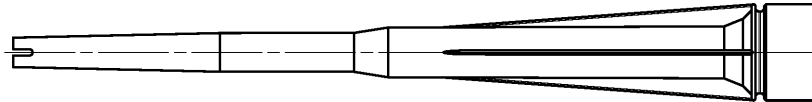
**Injection cartridge (shuttle cartridge) with sealing cap; Sizes: 360 ml, 825 ml**



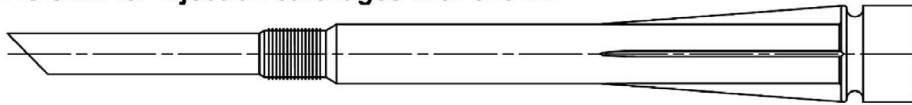
**Injection cartridge (coaxial cartridge) with sealing cap; Sizes: 100 ml, 150 ml, 300 ml, 380 ml, 400 ml, 410 ml**



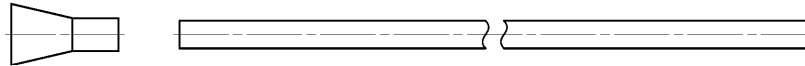
**Static mixer FIS MR Plus for injection cartridges up to 410 ml**



Static mixer FIS JMR for injection cartridges with 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 | Compressed-air cleaning tool ABP |
|--------------------|----------------------------------|



### Compressed-air cleaning tool ABP



Figures not to scale

fischer injection system FIS AB

## Product description

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

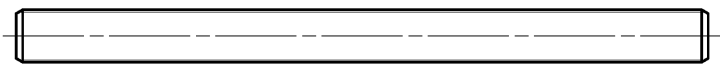
## Annex A 3

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Overview system components part 2

fischer anchor rod

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

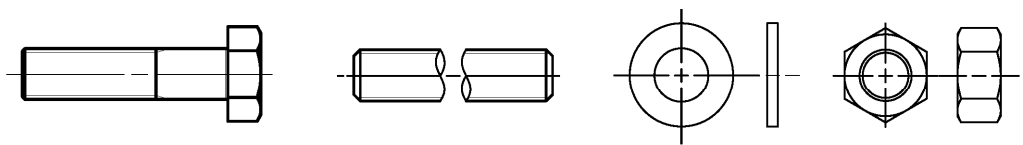


fischer internal threaded anchor RG M I

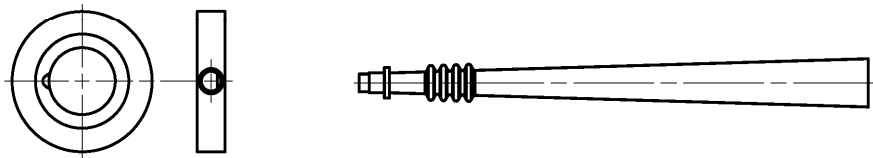
Size: M8, M10, M12, M16, M20



Screw / threaded rod / washer / hexagon nut



fischer filling disc with injection adapter



Reinforcing bar

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



Figures not to scale

|                                                                                                                 |                                                 |
|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| fischer injection system FIS AB                                                                                 | <div>Annex A 4</div> <div>Appendix 6 / 24</div> |
| <div>Product description</div> <div>Overview system components part 2;<br/>metal parts, injection adapter</div> |                                                 |

| Table A5.1: Materials            |                                                                                                      |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                      |
|----------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Part                             | Designation                                                                                          | Material                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                      |
| 1                                | Injection cartridge                                                                                  | Mortar, hardener, filler                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                      |
|                                  | Steel grade                                                                                          | Steel<br><br>zinc plated                                                                                                                                                                                                                                                   | Stainless steel R<br><br>acc. to EN 10088-1:2014<br>Corrosion resistance class<br>CRC III acc. to<br>EN 1993-1-4: 2006+A1:2015                                                                                                               | High corrosion<br>resistant steel HCR<br><br>acc. to EN 10088-1:2014<br>Corrosion resistance class<br>CRC V acc. to<br>EN 1993-1-4: 2006+A1:2015                                                                                                     |
| 2                                | Anchor rod                                                                                           | Property class<br>4.6, 4.8, 5.8 or 8.8;<br>EN ISO 898-1:2013<br>electroplated ≥ 5 µm,<br>EN ISO 4042:2018/Zn5/An(A2K)<br>or hot dip galvanised ≥ 40 µm<br>EN ISO 10684:2004+AC:2009<br>f <sub>uk</sub> ≤ 1000 N/mm <sup>2</sup><br>A <sub>5</sub> > 8% fracture elongation | Property class 50, 70 or 80<br>EN ISO 3506-1:2020<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% fracture elongation | Property class 50 or 80<br>EN ISO 3506-1:2020 or<br>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% fracture elongation |
| 3                                | Washer<br>ISO 7089:2000                                                                              | electroplated ≥ 5 µm,<br>EN ISO 4042:2018/Zn5/An(A2K)<br>or hot dip galvanised ≥ 40 µm<br>EN ISO 10684:2004+AC:2009                                                                                                                                                        | 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 acc.<br>EN ISO 898-2:2012<br>electroplated ≥ 5 µm,<br>EN ISO 4042:2018/Zn5/An(A2K)<br>or hot dip galvanised ≥ 40 µm<br>EN ISO 10684:2004+AC:2009                                                                                                  | Property class<br>50, 70 or 80 acc.<br>EN ISO 3506-2:2020<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 acc.<br>EN ISO 3506-2:2020<br>1.4565; 1.4529<br>EN 10088-1:2014                                                                                                                                                       |
| 5                                | fischer<br>internal threaded<br>anchor RG M I                                                        | Property class 5.8<br>ISO 898-1:2013<br>electroplated ≥ 5 µm,<br>EN ISO 4042:2018/Zn5/An(A2K)                                                                                                                                                                              | Property class 70<br>EN ISO 3506-1:2020; 1.4401;<br>1.4404; 1.4578; 1.4571;<br>1.4439; 1.4362;<br>EN 10088-1:2014                                                                                                                            | Property class 70<br>EN ISO 3506-1:2020<br>1.4565; 1.4529;<br>EN 10088-1:2014                                                                                                                                                                        |
| 6                                | Commercial<br>standard screw<br>or threaded rod<br>for fischer<br>internal threaded<br>anchor RG M I | Property class 5.8 or 8.8;<br>EN ISO 898-1:2013<br>electroplated ≥ 5 µm,<br>EN ISO 4042:2018/Zn5/An(A2K)<br>A <sub>5</sub> > 8 % fracture elongation                                                                                                                       | Property class 70<br>EN ISO 3506-1:2020<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 3506-1:2020<br>1.4565; 1.4529;<br>EN 10088-1:2014<br>A <sub>5</sub> > 8 %<br>fracture elongation                                                                                                                         |
| 7                                | fischer filling disc                                                                                 | electroplated ≥ 5 µm,<br>EN ISO 4042:2018/Zn5/An(A2K)<br>or hot dip galvanised ≥ 40 µm<br>EN ISO 10684:2004+AC:2009                                                                                                                                                        | 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-<br>1:2004 and<br>AC:2010,<br>Annex C                                   | Bars and de-coiled rods, class B or C with<br>f <sub>yk</sub> and k according to NDP or NCI according to EN 1992-1-1:2004/NA<br>f <sub>uk</sub> = f <sub>tk</sub> = k · f <sub>yk</sub> (A <sub>5</sub> > 8%)                                                              |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                      |
|                                  |                                                                                                      |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                      |
| fischer injection system FIS AB  |                                                                                                      |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                              | Annex A 5<br>Appendix 7 / 24                                                                                                                                                                                                                         |
| Product description<br>Materials |                                                                                                      |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                      |

# Specifications of intended use part 1

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

|                                                                                                                                                                                                                                                 |                                    | FIS AB with ...                                                                                 |                                         |                                                                                                                               |                                         |                                                                                                        |                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------|
|                                                                                                                                                                                                                                                 |                                    | Anchor rod<br> |                                         | fischer internal threaded anchor RG M I<br> |                                         | Reinforcing bar<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“, DreBo „D-Plus“, DreBo „D-Max“) |                                    | Nominal drill bit diameter (d <sub>0</sub> )<br>12 mm to 35 mm                                  |                                         |                                                                                                                               |                                         |                                                                                                        |                                         |
| Static and quasi static loading, in                                                                                                                                                                                                             | uncracked concrete                 | all sizes                                                                                       | Tables:<br>C1.1<br>C4.1<br>C5.1<br>C7.1 | all sizes                                                                                                                     | Tables:<br>C2.1<br>C4.1<br>C6.1<br>C7.2 | all sizes                                                                                              | Tables:<br>C3.1<br>C4.1<br>C6.2<br>C8.1 |
|                                                                                                                                                                                                                                                 | cracked concrete                   | M8 to M20                                                                                       |                                         | <sub>-1)</sub>                                                                                                                |                                         | ϕ 10 to<br>ϕ 20                                                                                        |                                         |
| Seismic performance category                                                                                                                                                                                                                    | C1                                 | <sub>-1)</sub>                                                                                  |                                         |                                                                                                                               |                                         |                                                                                                        |                                         |
|                                                                                                                                                                                                                                                 | C2                                 |                                                                                                 |                                         |                                                                                                                               |                                         |                                                                                                        |                                         |
| Use category                                                                                                                                                                                                                                    | I1 dry or wet concrete             | all sizes                                                                                       |                                         |                                                                                                                               |                                         |                                                                                                        |                                         |
|                                                                                                                                                                                                                                                 | I2 water filled hole <sup>2)</sup> | M 12 to M 30                                                                                    | all sizes                               |                                                                                                                               | <sub>-1)</sub>                          |                                                                                                        |                                         |
| Installation direction                                                                                                                                                                                                                          |                                    | D3 (downward and horizontal and upwards (e.g. overhead))                                        |                                         |                                                                                                                               |                                         |                                                                                                        |                                         |
| Installation temperature                                                                                                                                                                                                                        |                                    | T <sub>i,min</sub> = -10 °C to T <sub>i,max</sub> = +40 °C                                      |                                         |                                                                                                                               |                                         |                                                                                                        |                                         |
| Service temperature                                                                                                                                                                                                                             | Temperature range I                | -40 °C to +80 °C                                                                                |                                         | (max. short term temperature +80 °C;<br>max. long term temperature +50 °C)                                                    |                                         |                                                                                                        |                                         |
|                                                                                                                                                                                                                                                 | Temperature range II               | -40 °C to +120 °C                                                                               |                                         | (max. short term temperature +120 °C;<br>max. long term temperature +72 °C)                                                   |                                         |                                                                                                        |                                         |

<sup>1)</sup> Performance not assessed

<sup>2)</sup> Valid for shuttle cartridges with 360 ml, 825 ml and coaxial cartridges with 380 ml, 400 ml, 410 ml

fischer injection system FIS AB

**Intended use**  
Specifications part 1

**Annex B 1**

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## 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 EN1993-1-4:2006+A1:2015 corresponding to corrosion resistance classes to Annex A 5 Table 5.1.

### Design:

- Fastenings are designed under the responsibility of an engineer experienced in fastenings and concrete work.
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the fastener is indicated on the design drawings (e. g. position of the fastener relative to reinforcement or to supports, etc.).
- Fastenings are designed in accordance with:  
EN 1992-4:2018 and EOTA Technical Report TR 055, Edition February 2018.

### Installation:

- Fastener installation is to be carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- Fastening depth should be marked and adhered to installation
- Overhead installation is allowed (necessary equipment see installation instruction)

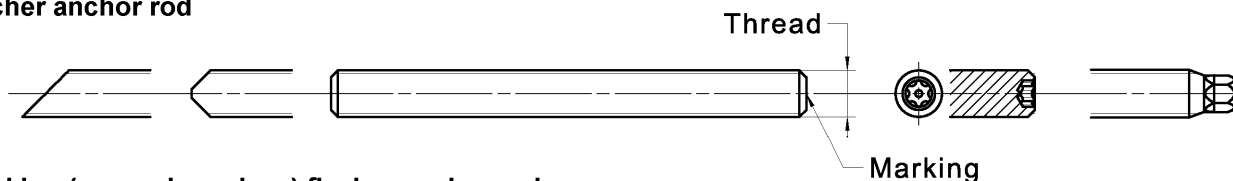
fischer injection system FIS AB

**Intended use**  
Specifications part 2

**Annex B 2**  
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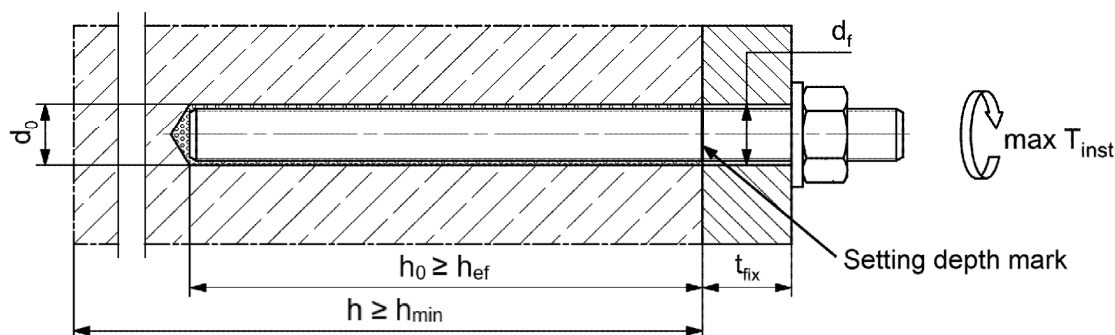
**Table B3.1: Installation parameters for anchor rods**

| Anchor rods                                   |                                                                      | Thread | M6                       | M8  | M10 | M12 | M16             | M20 | M24 | M27 | M30 |
|-----------------------------------------------|----------------------------------------------------------------------|--------|--------------------------|-----|-----|-----|-----------------|-----|-----|-----|-----|
| Nominal drill hole diameter                   | $d_0$                                                                | [mm]   | 8                        | 10  | 12  | 14  | 18              | 24  | 28  | 30  | 35  |
| Drill hole depth                              | $h_0$                                                                |        | $h_0 \geq h_{ef}$        |     |     |     |                 |     |     |     |     |
| 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     | $s_{min} = c_{min}$                                                  |        | 40                       | 40  | 45  | 55  | 65              | 85  | 105 | 125 | 140 |
| Diameter of the clearance hole of the fixture | pre-positioned installation $d_f$<br>push through installation $d_f$ |        | 7                        | 9   | 12  | 14  | 18              | 22  | 26  | 30  | 33  |
|                                               |                                                                      |        | 9                        | 12  | 14  | 16  | 20              | 26  | 30  | 33  | 40  |
| Minimum thickness of concrete member          | $h_{min}$                                                            |        | $h_{ef} + 30 (\geq 100)$ |     |     |     | $h_{ef} + 2d_0$ |     |     |     |     |
| 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 <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 <sup>1)</sup>      | ~ |
| Stainless steel R property class 80 <sup>1)</sup>      | *      |                                                        |   |

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 5, Table A5.1
- 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 AB

**Intended use**

Installation parameters anchor rods

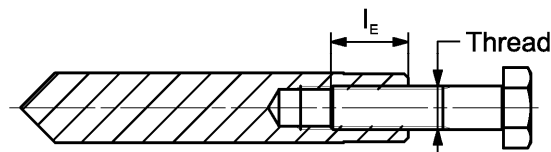
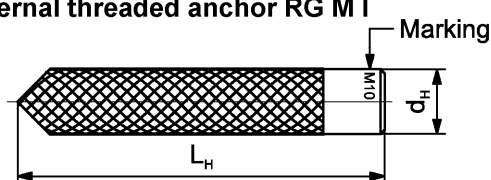
**Annex B 3**

Appendix 10 / 24

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

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

**fischer internal threaded anchor RG M I**



**Marking:**

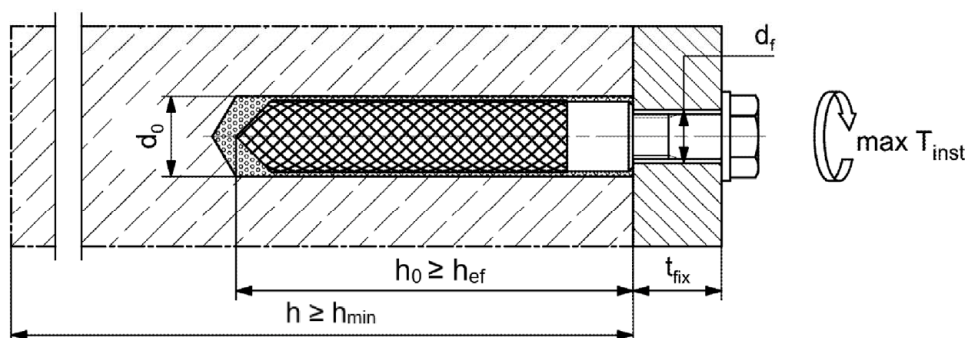
Anchor size e. g.: **M10**

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 5, Table A5.1

**Installation conditions:**



Figures not to scale

fischer injection system FIS AB

**Intended use**

Installation parameters internal threaded anchors RG M I

**Annex B 4**

Appendix 11 / 24

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

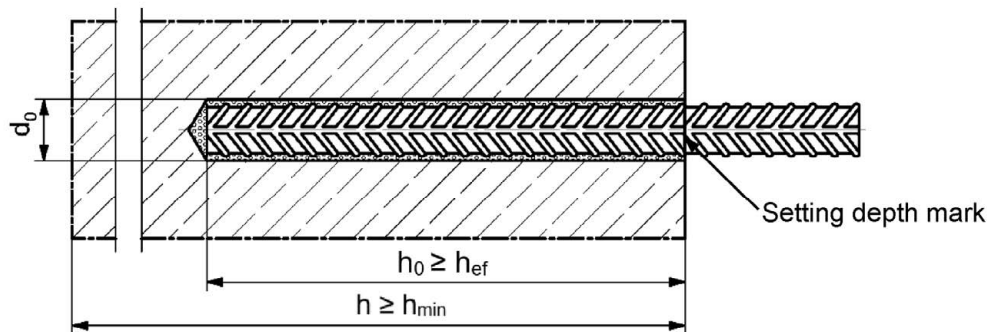
1) Both drill hole diameters can be used

**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:  $0,05 \cdot \phi \leq h_{rib} \leq 0,07 \cdot \phi$   
( $\phi$  = Nominal diameter of the bar,  $h_{rib}$  = rib height)

**Installation conditions:**



Figures not to scale

fischer injection system FIS AB

**Intended use**  
Installation parameters reinforcing bars

**Table B6.1: 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 BS     | $d_b$ |      | 9 | 11 | 14 | 16 | 20 |    | 25 | 26 | 27 | 30 | 40 |    |



**Table B6.2 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<br>$t_{work}$ |        |                  | Minimum curing time <sup>1)</sup><br>$t_{cure}$ |        |                  |
|------------------------------------|---------------------------------------|--------|------------------|-------------------------------------------------|--------|------------------|
|                                    | FIS AB High Speed                     | FIS AB | FIS AB Low Speed | FIS AB High Speed                               | FIS AB | FIS AB Low Speed |
| -10 to -5 <sup>2)</sup>            | -                                     | -      | -                | 12 h                                            | -      | -                |
| > -5 to 0 <sup>2)</sup>            | 5 min                                 | -      | -                | 3 h                                             | 24 h   | -                |
| > 0 to 5 <sup>2)</sup>             | 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           |

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

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

fischer injection system FIS AB

**Intended use**

Cleaning brush (steel brush)

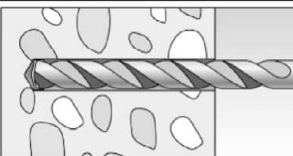
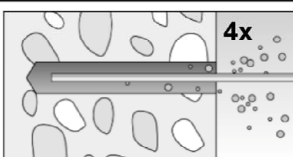
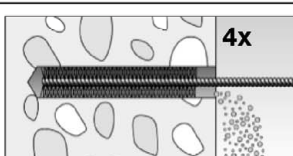
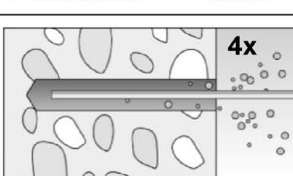
Processing time and curing time

**Annex B 6**

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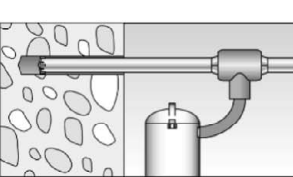
## Installation instructions part 1

### 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</b>                                                 |
| 2 |  | Clean the drill hole:<br>For $h_{ef} \leq 12d$ and $d_0 < 18$ mm<br>blow out the hole four times by hand                                                              |
| 3 |  | Brush the drill hole four times. For drill hole diameter $\geq 30$ mm use a power drill. For deep holes use an extension. Corresponding brushes see <b>table B6.1</b> |
| 4 |  | Clean the drill hole:<br>For $h_{ef} \leq 12d$ and $d_0 < 18$ mm<br>blow out the hole four times by hand                                                              |
|   |  | 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 <b>table B1.1</b> ) 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<br><br>Drill the hole with hollow drill bit. The dust extraction system has to extract the drill dust nonstop during the drilling process and must be adjusted to maximum power. Nominal drill hole diameter $d_0$ and drill hole depth $h_0$<br>see <b>tables B3.1, B4.1, B5.1</b> |

Go to step 5

fischer injection system FIS AB

#### Intended use

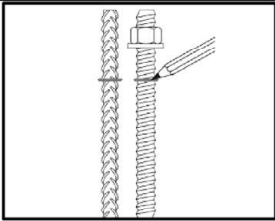
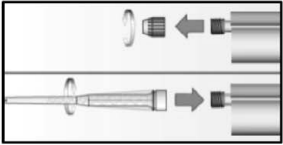
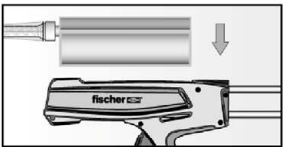
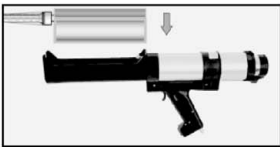
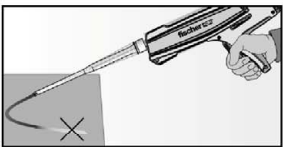
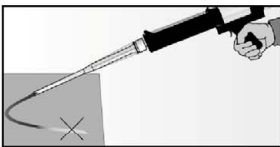
Installation instructions part 1

#### Annex B 7

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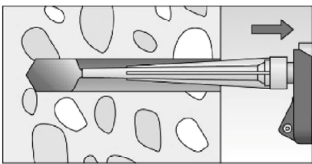
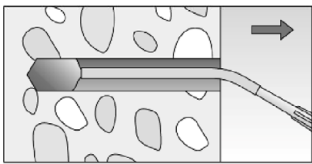
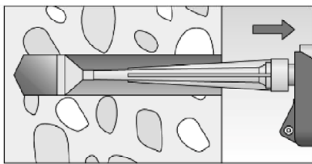
## Installation instructions part 2

### Preparing the cartridge

|   |                                                                                                                                                                     |                                                                                                                                    |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 5 |                                                                                    | Mark the setting depth.                                                                                                            |
| 6 |                                                                                    | Remove the sealing cap<br>Screw on the static mixer<br>(the spiral in the static mixer must be clearly visible)                    |
| 7 |   | Place the cartridge into the dispenser                                                                                             |
| 8 |   | 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 9

### Injection of the mortar

|   |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                               |                                                                                                                                                                                           |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9 |  <p>For <math>h_0 = h_{ef}</math> fill approximately 2/3 of the drill hole with mortar. For <math>h_0 &gt; h_{ef}</math> more mortar is needed. Always begin from the bottom of the hole and avoid bubbles</p> |  <p>For drill hole depth <math>\geq 150</math> mm use an extension tube</p> |  <p>For overhead installation, deep holes (<math>h_0 &gt; 250</math> mm) use an injection adapter</p> |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Go to step 10

fischer injection system FIS AB

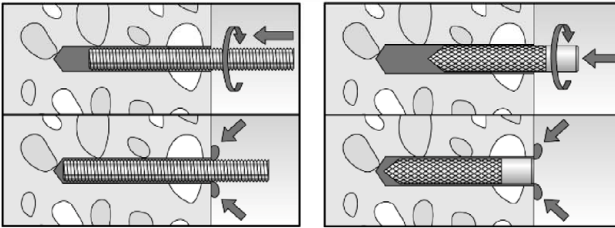
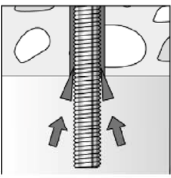
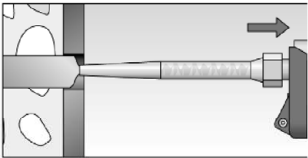
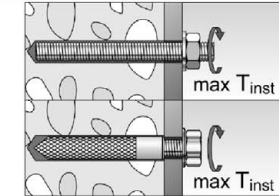
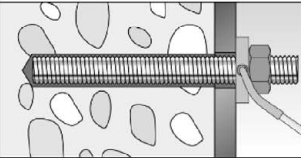
**Intended use**  
Installation instructions part 2

**Annex B 8**

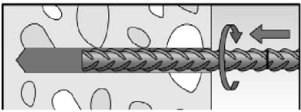
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## Installation instructions part 3

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

|        |                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10     |                                                                                                                                  | <p>Only use clean and oil-free metal parts. 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>                                                                                                                                                                                                                                                                          |
| 11     |  <p>Wait for the specified curing time <math>t_{cure}</math> see <b>table B6.2</b></p>                                           | <p>12</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 AB, FIS HB, FIS SB, FIS V, FIS V Plus, FIS EM Plus).<br/><b>ATTENTION:</b> Using fischer filling disc reduces <math>t_{fix}</math> (usable length of the anchor)</p> |

### Installation reinforcing bars

|    |                                                                                     |                                                                                                                                                                                                                                                                                |
|----|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 |  | <p>Only use clean and oil-free reinforcing bars. Push the reinforcement bar with the setting depth mark into the filled hole up to the setting depth mark. Recommendation: Rotation back and forth of the reinforcement bar or the fischer rebar anchor 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>                                                                                                                                                                 |
| 11 |  | <p>Wait for the specified curing time <math>t_{cure}</math> see <b>table B6.2</b></p>                                                                                                                                                                                          |

fischer injection system FIS AB

**Intended use**  
Installation instructions part 3

**Annex B 9**

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**Table C1.1: Characteristic resistance to steel failure under tension / shear loading of fischer anchor rods and standard threaded rods**

| Anchor rod / standard threaded rod                                             |                                                          |                |                                                                              | M6   | M8                        | M10            | M12    | M16 | M20 | M24 | M27 | M30  |      |
|--------------------------------------------------------------------------------|----------------------------------------------------------|----------------|------------------------------------------------------------------------------|------|---------------------------|----------------|--------|-----|-----|-----|-----|------|------|
| Characteristic resistance to steel failure under tension loading <sup>3)</sup> |                                                          |                |                                                                              |      |                           |                |        |     |     |     |     |      |      |
| Characteristic resistance $N_{Rk,s}$                                           | Steel zinc plated                                        | Property class | 4.6                                                                          | [kN] | 8                         | 15(13)         | 23(21) | 33  | 63  | 98  | 141 | 184  | 224  |
|                                                                                |                                                          |                | 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  |
|                                                                                |                                                          |                | Partial factors <sup>1)</sup>                                                |      |                           |                |        |     |     |     |     |      |      |
| Partial factor $\gamma_{Ms,N}$                                                 | Steel zinc plated                                        | Property class | 4.6                                                                          | [-]  | 2.00                      |                |        |     |     |     |     |      |      |
|                                                                                |                                                          |                | 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                      |                |        |     |     |     |     |      |      |
|                                                                                |                                                          |                | Characteristic resistance to steel failure under shear loading <sup>3)</sup> |      |                           |                |        |     |     |     |     |      |      |
| without lever arm                                                              |                                                          |                |                                                                              |      |                           |                |        |     |     |     |     |      |      |
| Characteristic resistance $V_{Rk,s}^0$                                         | Steel zinc plated                                        | Property class | 4.6                                                                          | [kN] | 4                         | 9(8)           | 14(13) | 20  | 38  | 59  | 85  | 110  | 135  |
|                                                                                |                                                          |                | 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  |
|                                                                                |                                                          |                | Ductility factor                                                             |      |                           | k <sub>7</sub> | [-]    | 1,0 |     |     |     |      |      |
| with lever arm                                                                 |                                                          |                |                                                                              |      |                           |                |        |     |     |     |     |      |      |
| Characteristic resistance $M_{Rk,s}^0$                                         | Steel zinc plated                                        | Property class | 4.6                                                                          | [Nm] | 6                         | 15(13)         | 30(27) | 52  | 133 | 259 | 448 | 665  | 899  |
|                                                                                |                                                          |                | 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 |
|                                                                                |                                                          |                | Partial factors <sup>1)</sup>                                                |      |                           |                |        |     |     |     |     |      |      |
| Partial factor $\gamma_{Ms,V}$                                                 | Steel zinc plated                                        | Property class | 4.6                                                                          | [-]  | 1.67                      |                |        |     |     |     |     |      |      |
|                                                                                |                                                          |                | 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                      |                |        |     |     |     |     |      |      |
|                                                                                |                                                          |                |                                                                              |      |                           |                |        |     |     |     |     |      |      |

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

<sup>2)</sup> 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)

<sup>3)</sup> Values in brackets are valid for hot dip galvanised fischer anchors and hot dip galvanised standard threaded-rods

fischer injection system FIS AB

#### Performances

Characteristic resistance to steel failure under tension / shear loading of fischer anchor rods and standard threaded rods

#### Annex C 1

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**Table C2.1:** Characteristic resistance to **steel failure** under tension / shear loading of **fischer internal threaded anchors RG M I**

| fischer internal threaded anchors RG M I                         |                                |                   |                | M8   | M10  | M12  | M16  | M20  |      |
|------------------------------------------------------------------|--------------------------------|-------------------|----------------|------|------|------|------|------|------|
| Characteristic resistance to steel failure under tension loading |                                |                   |                |      |      |      |      |      |      |
| Characteristic resistance with screw                             | N <sub>Rk,s</sub>              | Property class    | 5.8            | [kN] | 19   | 29   | 43   | 79   | 123  |
|                                                                  |                                |                   | 8.8            |      | 29   | 47   | 68   | 108  | 179  |
|                                                                  |                                | Property class 70 | R              |      | 26   | 41   | 59   | 110  | 172  |
|                                                                  |                                |                   | HCR            |      | 26   | 41   | 59   | 110  | 172  |
| 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 |      |      |      |      |
| Characteristic resistance to steel failure under shear loading   |                                |                   |                |      |      |      |      |      |      |
| Without lever arm                                                |                                |                   |                |      |      |      |      |      |      |
| Characteristic resistance with screw                             | V <sup>0</sup> <sub>Rk,s</sub> | Property class    | 5.8            | [kN] | 9,2  | 14,5 | 21,1 | 39,2 | 62,0 |
|                                                                  |                                |                   | 8.8            |      | 14,6 | 23,2 | 33,7 | 54,0 | 90,0 |
|                                                                  |                                | Property class 70 | 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 <sub>7</sub> | [-]  | 1,0  |      |      |      |      |
| With lever arm                                                   |                                |                   |                |      |      |      |      |      |      |
| Characteristic resistance with screw                             | M <sup>0</sup> <sub>Rk,s</sub> | Property class    | 5.8            | [Nm] | 20   | 39   | 68   | 173  | 337  |
|                                                                  |                                |                   | 8.8            |      | 30   | 60   | 105  | 266  | 519  |
|                                                                  |                                | Property class 70 | R              |      | 26   | 52   | 92   | 232  | 454  |
|                                                                  |                                |                   | HCR            |      | 26   | 52   | 92   | 232  | 454  |
| 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

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## Performances

Characteristic resistance to steel failure under shear loading of fischer internal threaded anchor RG M I

## Annex C 2

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**Table C3.1:** Characteristic resistance to **steel failure** under tension / shear loading of reinforcing bars

| Nominal diameter of the bar                                      | $\phi$       | 8    | 10                                       | 12 | 14 | 16 | 20 |
|------------------------------------------------------------------|--------------|------|------------------------------------------|----|----|----|----|
| Characteristic resistance to steel failure under tension loading |              |      |                                          |    |    |    |    |
| Characteristic resistance                                        | $N_{Rk,s}$   | [kN] | $A_s \cdot f_{uk}^{(2)}$                 |    |    |    |    |
| Characteristic resistance to steel failure under shear loading   |              |      |                                          |    |    |    |    |
| Without lever arm                                                |              |      |                                          |    |    |    |    |
| Characteristic resistance                                        | $V^0_{Rk,s}$ | [kN] | $k_6^{(1)} \cdot A_s \cdot f_{uk}^{(2)}$ |    |    |    |    |
| Ductility factor                                                 | $k_7$        | [-]  | 1,0                                      |    |    |    |    |
| With lever arm                                                   |              |      |                                          |    |    |    |    |
| Characteristic resistance                                        | $M^0_{Rk,s}$ | [Nm] | $1,2 \cdot W_{el} \cdot f_{uk}^{(2)}$    |    |    |    |    |

- 1) In accordance with EN 1992-4:2018 section 7.2.2.3.1  
 $k_6 = 0,6$  for fasteners made of carbon steel with  $f_{uk} \leq 500 \text{ N/mm}^2$   
 $= 0,5$  for fasteners made of carbon steel with  $500 < f_{uk} \leq 1000 \text{ N/mm}^2$   
 $= 0,5$  for fasteners made of stainless steel
- 2)  $f_{uk}$  respectively must be taken from the specifications of the reinforcing bar

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**Performances**

Characteristic resistance to steel failure under tension / shear loading of reinforcing bars

**Annex C 3**

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**Table C4.1:** Characteristic resistance to **concrete failure** under **tension / shear loading**

| Size                                                                                                         |                          |                 | All sizes      |                                                                                                                            |      |     |          |      |     |                               |                 |                 |  |    |  |
|--------------------------------------------------------------------------------------------------------------|--------------------------|-----------------|----------------|----------------------------------------------------------------------------------------------------------------------------|------|-----|----------|------|-----|-------------------------------|-----------------|-----------------|--|----|--|
| Characteristic resistance to concrete failure under tension loading                                          |                          |                 |                |                                                                                                                            |      |     |          |      |     |                               |                 |                 |  |    |  |
| Installation factor                                                                                          |                          | $\gamma_{inst}$ | [-]            | See annex C 5 to C 6                                                                                                       |      |     |          |      |     |                               |                 |                 |  |    |  |
| Factors for the compressive strength of concrete > C20/25                                                    |                          |                 |                |                                                                                                                            |      |     |          |      |     |                               |                 |                 |  |    |  |
| Increasing factor $\psi_c$ for cracked or uncracked concrete<br>$\tau_{Rk} = \psi_c \cdot \tau_{Rk}(C20/25)$ | C25/30                   | [-]             | 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 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 loading                                                                        |                          |                 |                |                                                                                                                            |      |     |          |      |     |                               |                 |                 |  |    |  |
| Temperature range                                                                                            |                          |                 | [°C]           | 50 / 80                                                                                                                    |      |     | 72 / 120 |      |     |                               |                 |                 |  |    |  |
| Factor                                                                                                       |                          |                 | $\psi_{sus}^0$ | [-]                                                                                                                        | 0,74 |     |          | 0,87 |     |                               |                 |                 |  |    |  |
| Characteristic resistance to concrete failure under shear loading                                            |                          |                 |                |                                                                                                                            |      |     |          |      |     |                               |                 |                 |  |    |  |
| 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 M I                                                                     |                          | $d_{nom}$       |                | - <sup>1)</sup>                                                                                                            | 12   | 16  | 18       | 22   | 28  | - <sup>1)</sup>               | - <sup>1)</sup> | - <sup>1)</sup> |  |    |  |
| Size (nominal diameter of the bar)                                                                           |                          | $\phi$          | [mm]           | 8                                                                                                                          |      | 10  |          | 12   |     | 14                            |                 | 16              |  | 20 |  |
| Reinforcing bar                                                                                              |                          | $d_{nom}$       |                | 8                                                                                                                          |      | 10  |          | 12   |     | 14                            |                 | 16              |  | 20 |  |
| 1) Anchor type not part of this assessment                                                                   |                          |                 |                |                                                                                                                            |      |     |          |      |     |                               |                 |                 |  |    |  |
| fischer injection system FIS AB                                                                              |                          |                 |                |                                                                                                                            |      |     |          |      |     | Annex C 4<br>Appendix 20 / 24 |                 |                 |  |    |  |
| Performances<br>Characteristic resistance to concrete failure under tension / shear loading                  |                          |                 |                |                                                                                                                            |      |     |          |      |     |                               |                 |                 |  |    |  |

**Table C5.1:** Characteristic resistance to **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 pull-out 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/mm <sup>2</sup> ] | 9,0              | 11,0             | 11,0             | 11,0              | 10,0 | 9,5              | 9,0              | 8,5              | 8,5              |
|                                                                                   | II: 72 °C / 120 °C |                 |                                      | 6,5              | 9,5              | 9,5              | 9,0               | 8,5  | 8,0              | 7,5              | 7,0              | 7,0              |
| Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)   |                    |                 |                                      |                  |                  |                  |                   |      |                  |                  |                  |                  |
| Temperature range                                                                 | I: 50 °C / 80 °C   |                 | $\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ] | - <sub>2</sub> ) | - <sub>2</sub> ) | - <sub>2</sub> ) | 9,5               | 8,5  | 8,0              | 7,5              | 7,0              | 7,0              |
|                                                                                   | II: 72 °C / 120 °C |                 |                                      | - <sub>2</sub> ) | - <sub>2</sub> ) | - <sub>2</sub> ) | 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                                                                 |                    |                 |                                      | - <sub>2</sub> ) | - <sub>2</sub> ) | - <sub>2</sub> ) | 1,2 <sup>1)</sup> |      |                  |                  |                  |                  |
| Cracked concrete                                                                  |                    |                 |                                      |                  |                  |                  |                   |      |                  |                  |                  |                  |
| Characteristic bond resistance in cracked concrete C20/25                         |                    |                 |                                      |                  |                  |                  |                   |      |                  |                  |                  |                  |
| Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete) |                    |                 |                                      |                  |                  |                  |                   |      |                  |                  |                  |                  |
| Temperature range                                                                 | I: 50 °C / 80 °C   |                 | $\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]  | - <sub>2</sub> ) | 5,5              | 6,0              | 6,0               | 6,0  | 5,5              | - <sub>2</sub> ) | - <sub>2</sub> ) | - <sub>2</sub> ) |
|                                                                                   | II: 72 °C / 120 °C |                 |                                      | - <sub>2</sub> ) | 4,5              | 5,0              | 6,0               | 6,0  | 5,0              | - <sub>2</sub> ) | - <sub>2</sub> ) | - <sub>2</sub> ) |
| Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)   |                    |                 |                                      |                  |                  |                  |                   |      |                  |                  |                  |                  |
| Temperature range                                                                 | I: 50 °C / 80 °C   |                 | $\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]  | - <sub>2</sub> ) | - <sub>2</sub> ) | - <sub>2</sub> ) | 5,0               | 5,0  | 4,5              | - <sub>2</sub> ) | - <sub>2</sub> ) | - <sub>2</sub> ) |
|                                                                                   | II: 72 °C / 120 °C |                 |                                      | - <sub>2</sub> ) | - <sub>2</sub> ) | - <sub>2</sub> ) | 4,0               | 4,0  | 4,0              | - <sub>2</sub> ) | - <sub>2</sub> ) | - <sub>2</sub> ) |
| Installation factors                                                              |                    |                 |                                      |                  |                  |                  |                   |      |                  |                  |                  |                  |
| Dry or wet concrete                                                               |                    | $\gamma_{inst}$ | [-]                                  | - <sub>2</sub> ) | 1,0              |                  |                   |      | - <sub>2</sub> ) | - <sub>2</sub> ) | - <sub>2</sub> ) |                  |
| Water filled hole                                                                 |                    |                 |                                      | - <sub>2</sub> ) | - <sub>2</sub> ) | - <sub>2</sub> ) | 1,2 <sup>1)</sup> |      |                  | - <sub>2</sub> ) | - <sub>2</sub> ) | - <sub>2</sub> ) |

<sup>1)</sup> Valid for shuttle cartridges with 360 ml, 825 ml and coaxial cartridges with 380 ml, 400 ml, 410 ml

2) Performance not assessed

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## Performances

Characteristic resistance to combined pull-out and concrete failure for fischer anchor rod and standard threaded rods

## Annex C 5

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|                    |                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Table C6.1:</b> | Characteristic resistance to <b>combined pull-out and concrete failure</b> for <b>fischer internal threaded anchors RG M I</b> in hammer drilled holes; <b>uncracked concrete</b> |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Internal threaded anchor RG M I                                                   |                    |                 | M8                   | M10               | M12  | M16 | M20 |     |
|-----------------------------------------------------------------------------------|--------------------|-----------------|----------------------|-------------------|------|-----|-----|-----|
| Combined pull-out 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/mm <sup>2</sup> ] | 10,5              | 10,0 | 9,5 | 9,0 | 8,5 |
|                                                                                   | II: 72 °C / 120 °C |                 |                      | 9,0               | 8,0  | 8,0 | 7,5 | 7,0 |
| Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)   |                    |                 |                      |                   |      |     |     |     |
| Temperature range                                                                 | I: 50 °C / 80 °C   | $\tau_{Rk,ucr}$ | [N/mm <sup>2</sup> ] | 10,0              | 9,0  | 9,0 | 8,5 | 8,0 |
|                                                                                   | II: 72 °C / 120 °C |                 |                      | 7,5               | 6,5  | 6,5 | 6,0 | 6,0 |
| Installation factors                                                              |                    |                 |                      |                   |      |     |     |     |
| Dry or wet concrete                                                               |                    | $\gamma_{inst}$ | [-]                  | 1,0               |      |     |     |     |
| Water filled hole                                                                 |                    |                 |                      | 1,2 <sup>1)</sup> |      |     |     |     |

<sup>1)</sup> Valid for shuttle cartridges with 360 ml, 825 ml and coaxial cartridges with 380 ml, 400 ml, 410 ml

**Table C6.2:** Characteristic resistance to **combined pull-out and concrete failure** for **reinforcing bars** in hammer drilled holes; **uncracked or cracked concrete**

|                                                                                   |                    |                 |                      |                 |      |      |      |      |     |
|-----------------------------------------------------------------------------------|--------------------|-----------------|----------------------|-----------------|------|------|------|------|-----|
| Nominal diameter of the bar                                                       |                    | $\phi$          | 8                    | 10              | 12   | 14   | 16   | 20   |     |
| Combined pull-out and concrete cone failure                                       |                    |                 |                      |                 |      |      |      |      |     |
| Calculation diameter                                                              |                    | d               | [mm]                 | 8               | 10   | 12   | 14   | 16   | 20  |
| 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/mm <sup>2</sup> ] | 11,0            | 11,0 | 11,0 | 10,0 | 10,0 | 9,5 |
|                                                                                   | II: 72 °C / 120 °C |                 |                      | 9,5             | 9,5  | 9,0  | 8,5  | 8,5  | 8,0 |
| 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/mm <sup>2</sup> ] | - <sup>1)</sup> | 3,0  | 5,0  | 5,0  | 5,0  | 4,5 |
|                                                                                   | II: 72 °C / 120 °C |                 |                      | - <sup>1)</sup> | 3,0  | 4,5  | 4,5  | 4,5  | 4,0 |
| Installation factor                                                               |                    |                 |                      |                 |      |      |      |      |     |
| Dry or wet concrete                                                               |                    | $\gamma_{inst}$ | [-]                  | - <sup>1)</sup> | 1,0  |      |      |      |     |

1) Performance not assessed

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## Performances

Characteristic resistance to combined pull-out and concrete failure for fischer internal threaded anchors RG M I and reinforcing bars

## Annex C 6

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**Table C7.1: Displacements for anchor rods**

| Anchor rod                                                                                                                                                                                                                            |                           | M6              | M8   | M10  | M12                                                                                                                                                                                                    | M16  | M20  | M24             | M27             | M30             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------|------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------------|-----------------|-----------------|
| <b>Displacement-Factors for tension loading<sup>1)</sup></b>                                                                                                                                                                          |                           |                 |      |      |                                                                                                                                                                                                        |      |      |                 |                 |                 |
| <b>Uncracked concrete; Temperature range I, II</b>                                                                                                                                                                                    |                           |                 |      |      |                                                                                                                                                                                                        |      |      |                 |                 |                 |
| $\delta_{N0}$ -Factor                                                                                                                                                                                                                 | [mm/(N/mm <sup>2</sup> )] | 0,09            | 0,09 | 0,09 | 0,10                                                                                                                                                                                                   | 0,10 | 0,10 | 0,10            | 0,11            | 0,12            |
| $\delta_{N\infty}$ -Factor                                                                                                                                                                                                            |                           | 0,10            | 0,10 | 0,10 | 0,12                                                                                                                                                                                                   | 0,12 | 0,12 | 0,13            | 0,13            | 0,14            |
| <b>Cracked concrete; Temperature range I, II</b>                                                                                                                                                                                      |                           |                 |      |      |                                                                                                                                                                                                        |      |      |                 |                 |                 |
| $\delta_{N0}$ -Factor                                                                                                                                                                                                                 | [mm/(N/mm <sup>2</sup> )] | _ <sup>3)</sup> | 0,12 | 0,12 | 0,12                                                                                                                                                                                                   | 0,13 | 0,13 | _ <sup>3)</sup> | _ <sup>3)</sup> | _ <sup>3)</sup> |
| $\delta_{N0}$ -Factor                                                                                                                                                                                                                 |                           | _ <sup>3)</sup> | 0,25 | 0,27 | 0,30                                                                                                                                                                                                   | 0,30 | 0,30 | _ <sup>3)</sup> | _ <sup>3)</sup> | _ <sup>3)</sup> |
| <b>Displacement-Factors for shear loading<sup>2)</sup></b>                                                                                                                                                                            |                           |                 |      |      |                                                                                                                                                                                                        |      |      |                 |                 |                 |
| <b>Uncracked or cracked concrete; Temperature range I, II</b>                                                                                                                                                                         |                           |                 |      |      |                                                                                                                                                                                                        |      |      |                 |                 |                 |
| $\delta_{V0}$ -Factor                                                                                                                                                                                                                 | [mm/kN]                   | 0,11            | 0,11 | 0,11 | 0,10                                                                                                                                                                                                   | 0,10 | 0,09 | 0,09            | 0,08            | 0,07            |
| $\delta_{V\infty}$ -Factor                                                                                                                                                                                                            |                           | 0,12            | 0,12 | 0,12 | 0,11                                                                                                                                                                                                   | 0,11 | 0,10 | 0,10            | 0,09            | 0,09            |
| <sup>1)</sup> Calculation of effective displacement:<br>$\delta_{N0} = \delta_{N0}\text{-Factor} \cdot \tau$<br>$\delta_{N\infty} = \delta_{N\infty}\text{-Factor} \cdot \tau$<br>$\tau$ = acting bond strength under tension loading |                           |                 |      |      | <sup>2)</sup> Calculation of effective displacement:<br>$\delta_{V0} = \delta_{V0}\text{-Factor} \cdot V$<br>$\delta_{V\infty} = \delta_{V\infty}\text{-Factor} \cdot V$<br>$V$ = acting shear loading |      |      |                 |                 |                 |
| <sup>3)</sup> Performance not assessed                                                                                                                                                                                                |                           |                 |      |      |                                                                                                                                                                                                        |      |      |                 |                 |                 |

**Table C7.2: Displacements for fischer internal threaded anchors RG M I**

| Internal threaded anchor RG M I                                                                                                                                                                                                        |                           | M8   | M10  | M12                                                                                                                                                                                                     | M16  | M20  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|
| Displacement-Factors for tension loading <sup>1)</sup>                                                                                                                                                                                 |                           |      |      |                                                                                                                                                                                                         |      |      |
| Uncracked concrete; Temperature range I, II                                                                                                                                                                                            |                           |      |      |                                                                                                                                                                                                         |      |      |
| $\delta_{N0}$ -Factor                                                                                                                                                                                                                  | [mm/(N/mm <sup>2</sup> )] | 0,10 | 0,11 | 0,12                                                                                                                                                                                                    | 0,13 | 0,14 |
| $\delta_{N\infty}$ -Factor                                                                                                                                                                                                             |                           | 0,13 | 0,14 | 0,15                                                                                                                                                                                                    | 0,16 | 0,18 |
| Displacement-Factors for shear loading <sup>2)</sup>                                                                                                                                                                                   |                           |      |      |                                                                                                                                                                                                         |      |      |
| Uncracked concrete; Temperature range I, II                                                                                                                                                                                            |                           |      |      |                                                                                                                                                                                                         |      |      |
| $\delta_{V0}$ -Factor                                                                                                                                                                                                                  | [mm/kN]                   | 0,12 | 0,12 | 0,12                                                                                                                                                                                                    | 0,12 | 0,12 |
| $\delta_{V\infty}$ -Factor                                                                                                                                                                                                             |                           | 0,14 | 0,14 | 0,14                                                                                                                                                                                                    | 0,14 | 0,14 |
| 1) Calculation of effective displacement:<br><br>$\delta_{N0} = \delta_{N0}\text{-Factor} \cdot \tau$<br><br>$\delta_{N\infty} = \delta_{N\infty}\text{-Factor} \cdot \tau$<br><br>$\tau$ = acting bond strength under tension loading |                           |      |      | 2) Calculation of effective displacement:<br><br>$\delta_{V0} = \delta_{V0}\text{-Factor} \cdot V$<br><br>$\delta_{V\infty} = \delta_{V\infty}\text{-Factor} \cdot V$<br><br>$V$ = acting shear loading |      |      |
| fischer injection system FIS AB                                                                                                                                                                                                        |                           |      |      |                                                                                                                                                                                                         |      |      |

fischer injection system FIS AB

## Performances

Displacements for anchor rods and fischer internal threaded anchors RG M I

## Annex C 7

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**Table C8.1: Displacements for reinforcing bars**

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

1) Calculation of effective displacement:

$$\delta_{N0} = \delta_{N0\text{-Factor}} \cdot \tau$$

$$\delta_{N_{\infty}} = \delta_{N_{\infty}\text{-Factor}} \cdot \tau$$

$\tau$  = acting bond strength under tension loading

2) Calculation of effective displacement:

$$\delta_{V0} = \delta_{V0\text{-Factor}} \cdot V$$

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

$V$  = acting shear loading

3) Performance not assessed