

## DÉCLARATION DES PERFORMANCES

### DoP 0392

pour le système d'injection fischer FIS EB II (fixation à scellement pour utilisation dans le béton)

FR

1. Code d'identification unique du type de produit: **DoP 0392**
2. Usage(s) prévu(s): **Fixation dans du béton fissuré ou non fissuré, voir annexes, en particulier les annexes B1 - B11.**
3. Fabricant: **fischerwerke GmbH & Co. KG, Otto-Hahn-Straße 15, 79211 Denzlingen, Allemagne**
4. Mandataire: **—**
5. Système(s) d'évaluation et de vérification de la constance des performances: **1**
6. Document d'évaluation européen: **EAD 330499-02-0601**  
Evaluation Technique Européenne: **ETA-21/0469; 2025-12-17**  
Organisme d'évaluation technique: **DIBt- Deutsches Institut für Bautechnik**  
Organisme(s) notifié(s): **2873 TU Darmstadt**
7. Performance(s) déclarée(s):  
**Résistance mécanique et stabilité (BWR 1)**  
**Résistance caractéristique à la charge de traction (charge statique et quasi-statique):**  
 1) Résistance à la rupture de l'acier (charge de traction): voir annexes, en particulier les annexes C1, C2  
 2) Résistance à la rupture par extraction glissement: et rupture du cône béton: voir annexes, en particulier les annexes C3 - C6  
 3) Résistance à la rupture du cône béton: voir annexes, en particulier annexe C3  
 4) Distance au bord pour éviter la rupture par fendage sous charge: voir annexes, en particulier annexe C3  
 5) Robustesse: voir annexes, en particulier les annexes C3 - C6  
 6) Couple de serrage maxi: voir annexes, en particulier les annexes B3, B5  
 7) Distance au bord et entraxe mini, Epaisseur du support: voir annexes, en particulier les annexes B3 - B7  
**Résistance caractéristique à la charge de cisaillement (charge statique et quasi-statique):**  
 8) Résistance à la rupture de l'acier: voir annexes, en particulier les annexes C2  
 9) Résistance à la rupture par effet de levier: voir annexes, en particulier annexe C3  
 10) Résistance à la rupture du béton en bord de dalle: voir annexes, en particulier annexe C3  
**Déplacements sous charge à court et long terme:**  
 11) Déplacements sous charge à court et long terme: voir annexes, en particulier annexe C7  
 12) Résistance du béton armé de fibres d'acier: NPD  
**Résistance caractéristique et déplacements pour les catégories de performance sismique C1 et C2:**  
 13) Résistance à la charge de traction, catégorie C1: voir annexes, en particulier les annexes C8, C9, C11  
 14) Résistance à la charge de traction, catégorie C2: voir annexes, en particulier les annexes C8, C9, C12, C13  
 15) Résistance à la charge de cisaillement, catégorie C1: voir annexes, en particulier les annexes C8, C9  
 16) Résistance à la charge de cisaillement, catégorie C2: voir annexes, en particulier les annexes C8, C9, C12, C13  
**Sécurité en cas d'incendie (BWR 2)**  
 17) Réaction au feu: Classe (A1)  
**Résistance au feu:**  
 18) Résistance en cas d'incendie, rupture de l'acier (charge de traction) : voir annexes, en particulier les annexes C14, C15  
 19) Résistance de l'adhérence dans des conditions d'incendie: voir annexes, en particulier annexe C16  
 20) Résistance en cas d'incendie, rupture de l'acier (charge de cisaillement) : voir annexes, en particulier les annexes C14, C15  
**Hygiène, santé et environnement (BWR 3)**  
 21) Contenu, émission et/ou rejet de substances dangereuses: NPD
8. Documentation technique appropriée et/ou documentation technique spécifique: **—**

Les performances du produit identifié ci-dessus sont conformes aux performances déclarées. Conformément au règlement (UE) no 305/2011, la présente déclaration des performances est établie sous la seule responsabilité du fabricant mentionné ci-dessus.

Signé pour le fabricant et en son nom par:



Dr. Christian Weber, Responsable du Développement



Dieter Pfaff, Chef de la Fédération Internationale de Production et Gestion de la Qualité

Tumlingen, 2026-09-01

Cette DoP a été préparée en plusieurs langues. En cas de différend relatif à l'interprétation, la version anglaise prévaudra.  
 L'annexe comprend des informations volontaires et complémentaires en langue anglaise dépassant les exigences légales (spécifiées de manière neutre).

Translation guidance Essential Characteristics and Performance Parameters for Annexes

**Guide de traduction des caractéristiques essentielles et des paramètres de performance pour les annexes**

|                                                                                                         |                                                                                                                                                   |                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Mechanical resistance and stability (BWR 1)</b>                                                      |                                                                                                                                                   |                                                                                                                                                         |
| <b>Résistance mécanique et stabilité (BWR 1)</b>                                                        |                                                                                                                                                   |                                                                                                                                                         |
| Characteristic resistance to tension load (static and quasi-static loading):                            |                                                                                                                                                   |                                                                                                                                                         |
| <b>Résistance caractéristique à la charge de traction (charge statique et quasi-statique):</b>          |                                                                                                                                                   |                                                                                                                                                         |
| 1                                                                                                       | Resistance to steel failure:<br><b>Résistance à la rupture de l'acier (charge de traction):</b>                                                   | $N_{Rk,s}$ [kN]                                                                                                                                         |
| 2                                                                                                       | Resistance to combined pull-out and concrete cone failure:<br><b>Résistance à la rupture par extraction glissement: et rupture du cône béton:</b> | $\tau_{Rk}$ and/or $\tau_{Rk,100}$ [N/mm <sup>2</sup> ],<br>$\psi_c, \psi^0_{sus}, \psi_{sus,100}$ [-] (BF)                                             |
|                                                                                                         | Resistance to pull-out failure:<br><b>Résistance à l'extraction glissement:</b>                                                                   | $N_{Rk,p}$ and/or $N_{Rk,p,100}$ [kN], $\psi_c$ [-] (BEF)                                                                                               |
| 3                                                                                                       | Resistance to concrete cone failure:<br><b>Résistance à la rupture du cône béton:</b>                                                             | $c_{cr,N}$ [mm], $k_{cr,N}$ , $k_{ucr,N}$ [-]                                                                                                           |
| 4                                                                                                       | Edge distance to prevent splitting under load:<br><b>Distance au bord pour éviter la rupture par fendage sous charge:</b>                         | $c_{cr,sp}$ [mm]                                                                                                                                        |
| 5                                                                                                       | Robustness:<br><b>Robustesse:</b>                                                                                                                 | $\gamma_{inst}$ [-]                                                                                                                                     |
| 6                                                                                                       | Maximum installation torque:<br><b>Couple de serrage maxi:</b>                                                                                    | $\max T_{inst}$ [Nm] (BF)                                                                                                                               |
|                                                                                                         | Installation torque:<br><b>Couple de serrage:</b>                                                                                                 | $T_{inst}$ [Nm] (BEF)                                                                                                                                   |
| 7                                                                                                       | Minimum edge distance, spacing and member thickness:<br><b>Distance au bord et entraxe mini, Epaisseur du support:</b>                            | $c_{min}, s_{min}, h_{min}$ [mm]                                                                                                                        |
| Characteristic resistance to shear load (static and quasi-static loading):                              |                                                                                                                                                   |                                                                                                                                                         |
| <b>Résistance caractéristique à la charge de cisaillement (charge statique et quasi-statique):</b>      |                                                                                                                                                   |                                                                                                                                                         |
| 8                                                                                                       | Resistance to steel failure:<br><b>Résistance à la rupture de l'acier:</b>                                                                        | $V^0_{Rk,s}$ [kN], $M^0_{Rk,s}$ [Nm], $k_7$ [-]                                                                                                         |
| 9                                                                                                       | Resistance to pry-out failure:<br><b>Résistance à la rupture par effet de levier:</b>                                                             | $k_8$ [-]                                                                                                                                               |
| 10                                                                                                      | Resistance to concrete edge failure:<br><b>Résistance à la rupture du béton en bord de dalle:</b>                                                 | $d_{nom}, l_f$ [mm]                                                                                                                                     |
| Displacements under short-term and long-term loading:                                                   |                                                                                                                                                   |                                                                                                                                                         |
| <b>Déplacements sous charge à court et long terme:</b>                                                  |                                                                                                                                                   |                                                                                                                                                         |
| 11                                                                                                      | Displacements factors under short-term and long-term loading:<br><b>Déplacements sous charge à court et long terme:</b>                           | $\delta_0, \delta_\infty$ [mm/(N/mm <sup>2</sup> )] or [mm/kN]                                                                                          |
| 12                                                                                                      | Resistance in steel fibre reinforced concrete:<br><b>Résistance du béton armé de fibres d'acier:</b>                                              | Description                                                                                                                                             |
| Characteristic resistance and displacements for seismic performance categories C1 and C2:               |                                                                                                                                                   |                                                                                                                                                         |
| <b>Résistance caractéristique et déplacements pour les catégories de performance sismique C1 et C2:</b> |                                                                                                                                                   |                                                                                                                                                         |
| 13                                                                                                      | Resistance to tension for seismic performance category C1<br><b>Résistance à la charge de traction, catégorie C1:</b>                             | $N_{Rk,s,C1}$ [kN] (all)<br>$T_{Rk,C1}$ [N/mm <sup>2</sup> ] (BF)<br>$N_{Rk,p,C1}$ [kN] (BEF)                                                           |
| 14                                                                                                      | Resistance to tension and displacements for seismic performance category C2<br><b>Résistance à la charge de traction, catégorie C2:</b>           | $N_{Rk,s,C2}$ [kN] (all)<br>$T_{Rk,C2}$ [N/mm <sup>2</sup> ] (BF)<br>$N_{Rk,p,C2}$ [kN] (BEF)<br>$\delta_{N,C2(50\%)}, \delta_{N,C2(100\%)}$ [mm] (all) |
| 15                                                                                                      | Resistance to shear for seismic performance category C1<br><b>Résistance à la charge de cisaillement, catégorie C1:</b>                           | $V_{Rk,s,C1}$ [kN] (all)                                                                                                                                |
| 16                                                                                                      | Resistance to shear load and displacements for seismic performance category C2<br><b>Résistance à la charge de cisaillement, catégorie C2:</b>    | $V_{Rk,s,C2}$ [kN] (all)<br>$\delta_{V,C2(50\%)}, \delta_{V,C2(100\%)}$ [mm] (all)                                                                      |
| Safety in case of fire (BWR 2)                                                                          |                                                                                                                                                   |                                                                                                                                                         |
| <b>Sécurité en cas d'incendie (BWR 2)</b>                                                               |                                                                                                                                                   |                                                                                                                                                         |
| 17                                                                                                      | Reaction to fire<br><b>Réaction au feu:</b>                                                                                                       | Class<br>Classe (A1)                                                                                                                                    |
| Resistance to fire                                                                                      |                                                                                                                                                   |                                                                                                                                                         |
| <b>Résistance au feu:</b>                                                                               |                                                                                                                                                   |                                                                                                                                                         |
| 18                                                                                                      | Fire resistance to steel failure (tension load):<br><b>Résistance en cas d'incendie, rupture de l'acier (charge de traction) :</b>                | $N_{Rk,s,fi}$ [kN]                                                                                                                                      |
| 19                                                                                                      | Bond resistance under fire conditions:<br><b>Résistance de l'adhérence dans des conditions d'incendie:</b>                                        | $k_{fi,p}(\theta)$ [-],<br>$\tau_{Rk,fi}(\theta)$ [N/mm <sup>2</sup> ] (BF)                                                                             |
| 20                                                                                                      | Fire resistance to steel failure under shear loading:<br><b>Résistance en cas d'incendie, rupture de l'acier (charge de cisaillement) :</b>       | $V_{Rk,s,fi}$ [kN], $M^0_{Rk,s,fi}$ [Nm]                                                                                                                |
| Hygiene, health and the environment (BWR 3)                                                             |                                                                                                                                                   |                                                                                                                                                         |
| <b>Hygiène, santé et environnement (BWR 3)</b>                                                          |                                                                                                                                                   |                                                                                                                                                         |
| 21                                                                                                      | Content, emission and/or release of dangerous substances:<br><b>Contenu, émission et/ou rejet de substances dangereuses:</b>                      | Description/Level                                                                                                                                       |

## Specific Part

### 1 Technical description of the product

The fischer injection system FIS EB II is a bonded fastener consisting of a cartridge with injection mortar fischer FIS EB II 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 anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

### 3 Performance of the product and references to the methods used for its assessment

#### 3.1 Mechanical resistance and stability (BWR 1)

| Essential characteristic                                                                 | Performance                  |
|------------------------------------------------------------------------------------------|------------------------------|
| Characteristic resistance to tension load (static and quasi-static loading)              | See Annex C1 to C6, B3 to B7 |
| Characteristic resistance to shear load (static and quasi-static loading)                | See Annex C1 to C3           |
| Displacements under short-term and long-term loading                                     | See Annex C7                 |
| Characteristic resistance and displacements for seismic performance categories C1 and C2 | See Annex C8 to C13          |

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

| Essential characteristic | Performance          |
|--------------------------|----------------------|
| Reaction to fire         | Class A1             |
| Resistance to fire       | See Annex C14 to C16 |

#### 3.3 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**

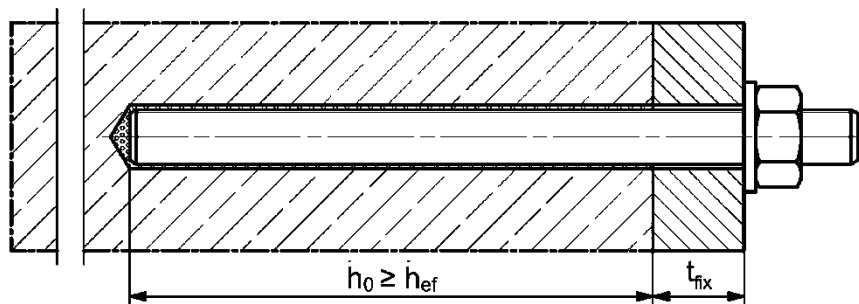
In accordance with EAD 330499-02-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

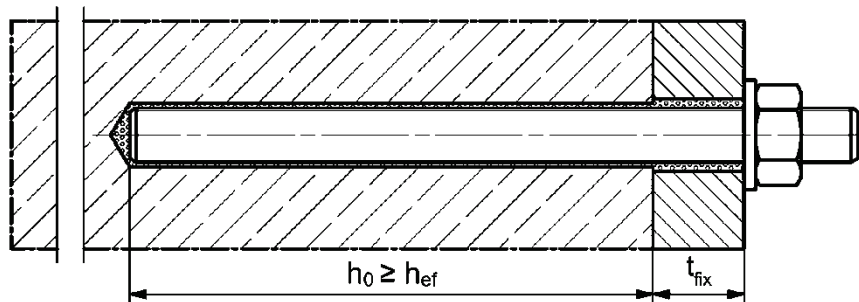
Installation conditions part 1

fischer anchor rod FIS A / RG (Anchor rod) and  
commercial standard threaded rods (Threaded rod)

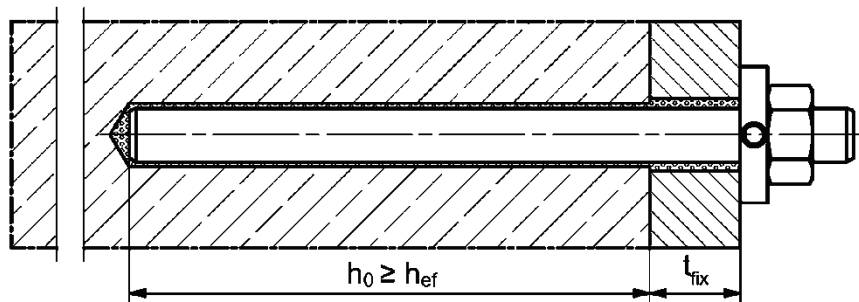
Pre-positioned installation



Push through installation (annular gap filled with mortar)



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



Figures not to scale

$h_0$  = drill hole depth  
 $t_{fix}$  = thickness of fixture

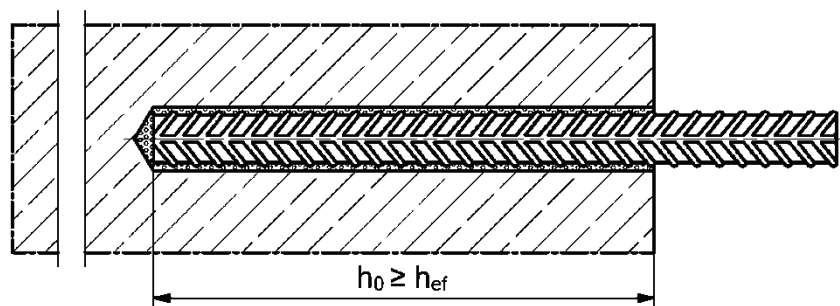
$h_{ef}$  = effective embedment depth

fischer injection system FIS EB II

Product description  
Installation conditions part 1

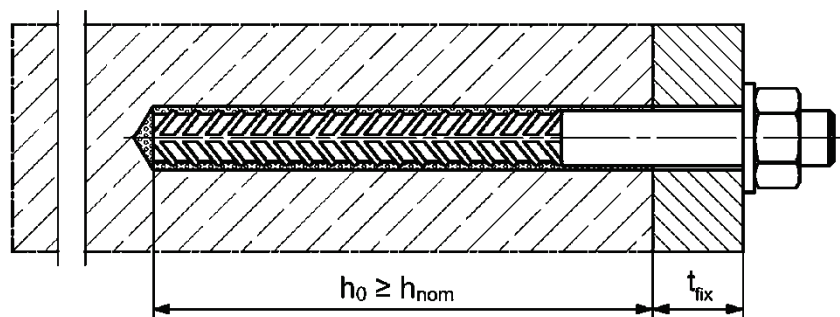
Installation conditions part 2

Reinforcing bar (Rebar)

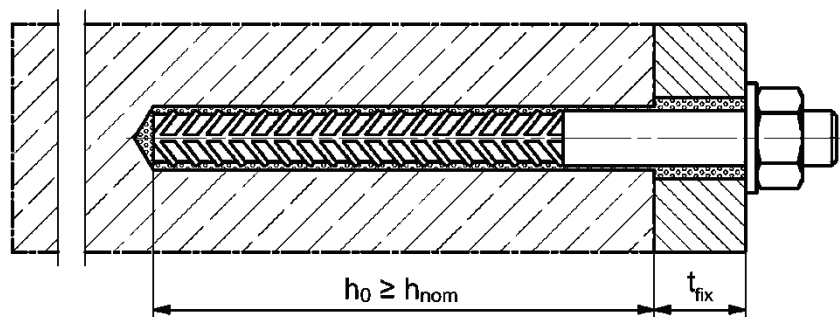


fischer rebar anchor FRA (fischer FRA)

Pre-positioned installation



Push through installation (annular gap filled with mortar)



Figures not to scale

$h_0$  = drill hole depth

$h_{ef}$  = effective embedment depth

$t_{fix}$  = thickness of fixture

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

fischer injection system FIS EB II

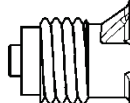
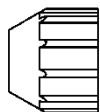
Product description  
Installation conditions part 2

Overview system components part 1

Injection cartridge (shuttle cartridge) FIS EB II with sealing cap

Sizes: 390 ml, 585 ml, 1500 ml (the 390 ml hard cartridge is shown as an example)

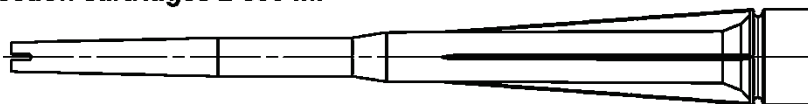
Size foil bag: 500 ml



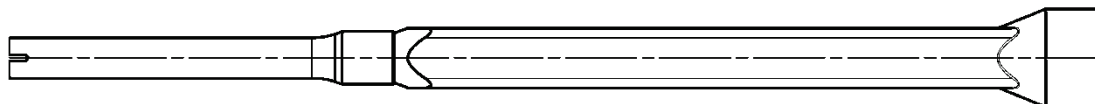
**Imprint:** fischer FIS EB II, processing notes optional, shelf-life, piston travel scale optional, curing times and processing times optional (depending on temperature), hazard code, size, volume



Static mixer FIS MR Plus for injection cartridges  $\leq 500$  ml

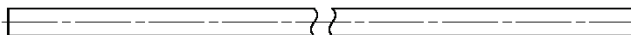
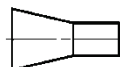


Static mixer FIS UMR for injection cartridges  $\geq 500$  ml



Injection adapter and extension tube  $\varnothing 9$  for static mixer FIS MR Plus;

Injection adapter and extension tube  $\varnothing 9$  or  $\varnothing 15$  for static mixer FIS UMR



Cleaning brush BS



Blow-out pump AB G



Compressed-air cleaning tool ABP



Figures not to scale

fischer injection system FIS EB II

Product description

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

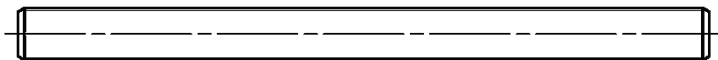
Annex A3

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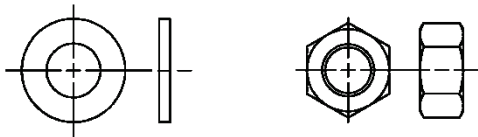
Overview system components part 2

Anchor rod

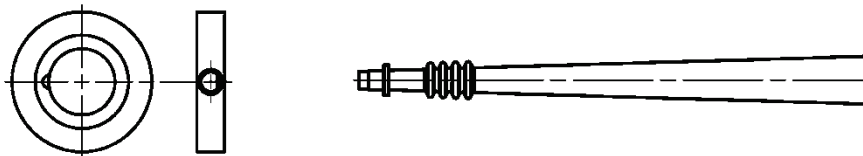
Size: M8, M10, M12, M16, M20, M24, M27, M30



Washer / hexagon nut



fischer filling disk with injection adapter



Rebar

Nominal diameter:  $\phi 8$ ,  $\phi 10$ ,  $\phi 12$ ,  $\phi 14$ ,  $\phi 16$ ,  $\phi 20$ ,  $\phi 25$ ,  $\phi 26$ ,  $\phi 28$ ,  $\phi 30$ ,  $\phi 32$



fischer FRA, FRA HCR

Size: M12, M16, M20, M24



Figures not to scale

fischer injection system FIS EB II

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

**Table A5.1: Materials**

| Part | Designation                                          | Material                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                         |
|------|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Injection cartridge                                  | Mortar, hardener, filler                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                         |
|      | Steel grade                                          | Steel                                                                                                                                                                                                                                                                      | Stainless steel R                                                                                                                                                                                                                                                                                                                                            | High corrosion resistant steel HCR                                                                                                                                                      |
|      |                                                      | zinc plated                                                                                                                                                                                                                                                                | acc. to EN 10088-1:2023<br>Corrosion resistance class CRC III acc. to EN 1993-1-4:2006+A1:2015                                                                                                                                                                                                                                                               | acc. to EN 10088-1:2023<br>Corrosion resistance class CRC V acc. to EN 1993-1-4:2006+A1:2015                                                                                            |
| 2    | Anchor rod or Threaded rod                           | Property class 4.8, 5.8 or 8.8;<br>EN ISO 898-1:2013<br>electroplated $\geq 5 \mu\text{m}$ ,<br>DIN EN ISO 4042:2022<br>or hot dip galvanised $\geq 40 \mu\text{m}$<br>EN ISO 10684:2004+AC:2009<br>$f_{uk} \leq 1000 \text{ N/mm}^2$<br>fracture elongation $A_5 > 12 \%$ | 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: 2023<br>$f_{uk} \leq 1000 \text{ N/mm}^2$<br>fracture elongation $A_5 > 12 \%$                                                                                                                            | Property class 50 or 80;<br>EN ISO 3506-1:2020<br>or property class 70<br>1.4565; 1.4529;<br>EN 10088-1: 2023<br>$f_{uk} \leq 1000 \text{ N/mm}^2$<br>fracture elongation $A_5 > 12 \%$ |
|      |                                                      | Fracture elongation $A_5 > 8 \%$ for applications without requirements for seismic performance category C2                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                         |
| 3    | Washer<br>ISO 7089:2000                              | electroplated $\geq 5 \mu\text{m}$ ,<br>EN ISO 4042:2022<br>or hot dip galvanised $\geq 40 \mu\text{m}$<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: 2023                                                                                                                                                                                                                                                                                     | 1.4565; 1.4529;<br>EN 10088-1: 2023                                                                                                                                                     |
| 4    | Hexagon nut                                          | Property class 5 or 8 acc.<br>EN ISO 898-2:2012<br>electroplated $\geq 5 \mu\text{m}$ ,<br>EN ISO 4042:2022<br>or hot dip galvanised $\geq 40 \mu\text{m}$<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: 2023                                                                                                                                                                                                                          | Property class<br>50, 70 or 80 acc.<br>EN ISO 3506-2:2020<br>1.4565; 1.4529<br>EN 10088-1: 2023                                                                                         |
| 5    | fischer filling disk                                 | electroplated $\geq 5 \mu\text{m}$ ,<br>EN ISO 4042:2022<br>or hot dip galvanised $\geq 40 \mu\text{m}$<br>EN ISO 10684:2004+AC:2009                                                                                                                                       | 1.4401; 1.4404; 1.4578;<br>1.4571; 1.4439; 1.4362;<br>EN 10088-1: 2023                                                                                                                                                                                                                                                                                       | 1.4565;1.4529;<br>EN 10088-1: 2023                                                                                                                                                      |
| 6    | Rebar<br>EN 1992-1-1:2004<br>and AC:2010,<br>Annex C | Bars and de-coiled rods, class B or C with<br>$f_{yk}$ and $k$ according to NDP or NCI according to EN 1992-1-1/NA<br>$f_{uk} = f_{tk} = k \cdot f_{yk} (A_5 > 12 \%)$                                                                                                     |                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                         |
|      |                                                      | Fracture elongation $A_5 > 8 \%$ for applications without requirements for seismic performance category C2                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                         |
| 7    | fischer FRA                                          | Rebar part:<br>Bars and de-coiled rods class B or C with<br>$f_{yk}$ and $k$ according to NDP or NCI of<br>EN 1992-1-1:2004+AC:2010<br>$f_{uk} = f_{tk} = k \cdot f_{yk} (A_5 > 12 \%)$<br>Threaded part: Property class 80<br>EN ISO 3506-1:2020                          | 1.4401, 1.4404, 1.4571, 1.4578, 1.4439,<br>1.4362, 1.4062 acc. to EN 10088-1: 2023<br>Corrosion resistance class CRC III<br>acc. to EN 1993-1-4:2006+A1:2015<br>1.4565; 1.4529 acc. to EN 10088-1: 2023<br>Corrosion resistance class CRC V<br>acc. to EN 1993-1-4: 2006+A1:2015<br>$f_{uk} \leq 1000 \text{ N/mm}^2$ ;<br>fracture elongation $A_5 > 12 \%$ |                                                                                                                                                                                         |
|      |                                                      | Fracture elongation $A_5 > 8 \%$ for applications without requirements for seismic performance category C2                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                         |

fischer injection system FIS EB II

**Product description**  
Materials**Annex A5**

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**Table B1:** Overview use and performance categoriesAppendix 8 / 34

## 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+A2:2021.

### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (zinc coated steel, stainless steel or high corrosion resistant steel).
- For all other conditions according to EN1993-1-4:2015 corresponding to corrosion resistance classes to Annex A 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 082 from June 2023.

### 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 EB II

**Intended use**  
Specifications part 2

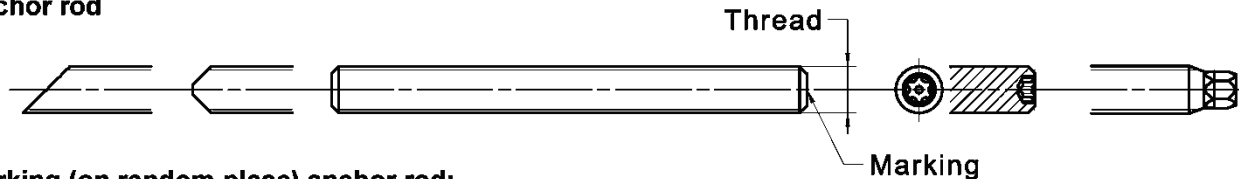
**Annex B2**  
Appendix 9 / 34

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

| Anchor rods                                        |                                   |      | M8                              | M10 | M12 | M16             | M20 | M24 | M27 | M30 |
|----------------------------------------------------|-----------------------------------|------|---------------------------------|-----|-----|-----------------|-----|-----|-----|-----|
| Nominal drill hole diameter                        | $d_0$                             | [mm] | 10                              | 12  | 14  | 18              | 24  | 28  | 30  | 35  |
| Drill hole depth                                   | $h_0$                             |      | $h_0 \geq h_{ef}$               |     |     |                 |     |     |     |     |
| Effective embedment depth                          | $h_{ef, min}$                     |      | 60                              | 60  | 70  | 80              | 90  | 96  | 108 | 120 |
|                                                    | $h_{ef, max}$                     |      | 160                             | 200 | 240 | 320             | 400 | 480 | 540 | 600 |
| Simplified spacing and edge distance <sup>1)</sup> | $s = c$                           |      | 40                              | 45  | 55  | 65              | 85  | 105 | 120 | 140 |
| Diameter of the clearance hole of the fixture      | pre-positioned installation $d_f$ |      | 9                               | 12  | 14  | 18              | 22  | 26  | 30  | 33  |
|                                                    | push through installation $d_f$   |      | 12                              | 14  | 16  | 20              | 26  | 30  | 33  | 40  |
| Minimum thickness of concrete member               | $h_{min}$                         |      | $h_{ef} + 30$<br>( $\geq 100$ ) |     |     | $h_{ef} + 2d_0$ |     |     |     |     |
| Maximum installation torque                        | $\max T_{inst}$                   | [Nm] | 10                              | 20  | 40  | 60              | 120 | 150 | 200 | 300 |

<sup>1)</sup> Detailed calculation according to **Annex B6** and **B7**

#### Anchor rod



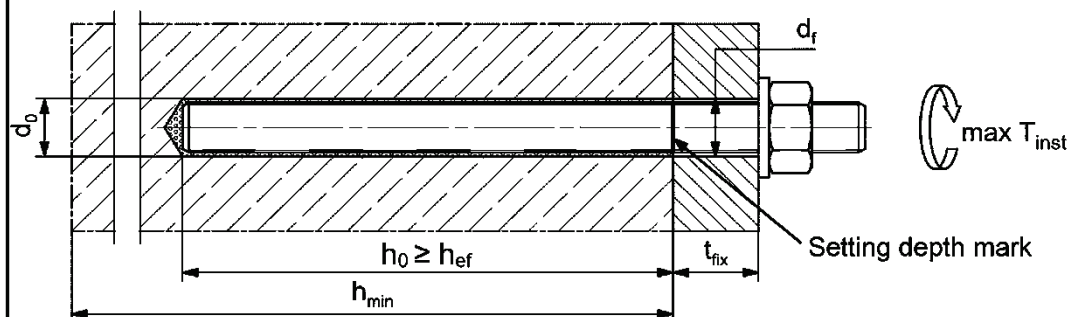
#### Marking (on random place) anchor rod:

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

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

<sup>1)</sup> PC = property class

#### Installation conditions:



#### 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 shall be stored
- Setting depth is marked

Figures not to scale

fischer injection system FIS EB II

**Intended use**  
Installation parameters Anchor rods

**Annex B3**

Appendix 10 / 34

**Table B4.1: Installation parameters for Rebars**

| Nominal diameter of the rebar                      |                 | $\phi$ | 8 <sup>1)</sup>                 |     | 10 <sup>1)</sup> |     | 12 <sup>1)</sup> |     | 14              | 16  | 20  | 25  | 26  | 28  | 30  | 32 |
|----------------------------------------------------|-----------------|--------|---------------------------------|-----|------------------|-----|------------------|-----|-----------------|-----|-----|-----|-----|-----|-----|----|
| Nominal drill hole diameter                        | $d_0$           | [mm]   | 10                              | 12  | 12               | 14  | 14               | 16  | 18              | 20  | 25  | 30  | 35  | 35  | 40  | 40 |
| Drill hole depth                                   | $h_0$           |        | $h_0 \geq h_{ef}$               |     |                  |     |                  |     |                 |     |     |     |     |     |     |    |
| Effective                                          | $h_{ef,min}$    |        | 60                              | 60  |                  | 70  |                  | 75  | 80              | 90  | 100 | 104 | 112 | 120 | 128 |    |
| embedment depth                                    | $h_{ef,max}$    |        | 160                             | 200 |                  | 240 |                  | 280 | 320             | 400 | 500 | 520 | 560 | 600 | 640 |    |
| Simplified spacing and edge distance <sup>2)</sup> | $s$<br>=<br>$c$ |        | 40                              | 45  |                  | 55  |                  | 60  | 65              | 85  | 120 | 120 | 140 | 140 | 160 |    |
| Minimum thickness of concrete member               | $h_{min}$       |        | $h_{ef} + 30$<br>( $\geq 100$ ) |     |                  |     |                  |     | $h_{ef} + 2d_0$ |     |     |     |     |     |     |    |

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

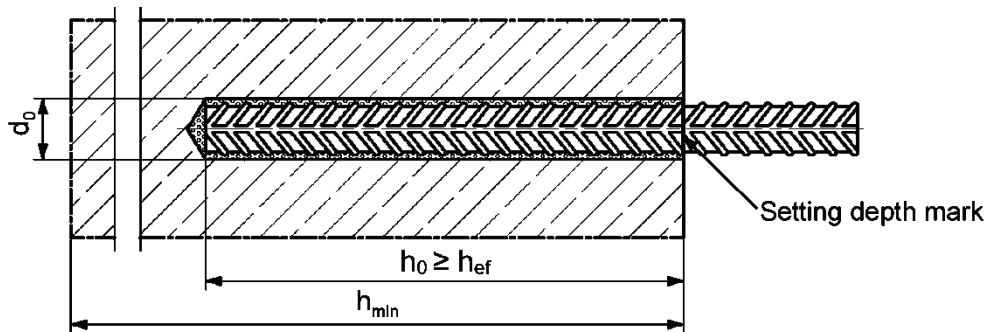
<sup>2)</sup> Detailed calculation according to **Annex B6** und **B7**

### Rebar



- The minimum value of related rib area  $f_{R,min}$  must fulfil the requirements of **EN 1992-1-1:2011**
- 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 rebar,  $h_{rib}$  = rib height)

### Installation conditions:



Figures not to scale

fischer injection system FIS EB II

**Intended use**  
Installation parameters Rebars

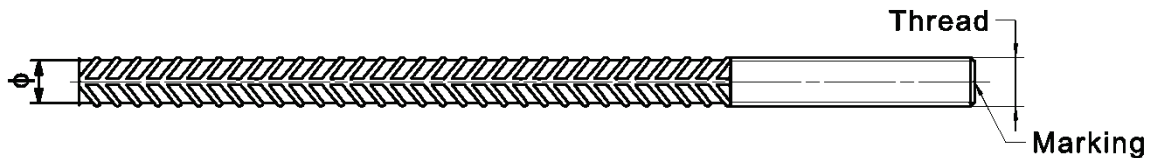
**Annex B4**

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**Table B5.1: Installation parameters for fischer FRA**

| fischer FRA                                         |                                     |      | M12 <sup>1)</sup>            |              | M16 | M20 | M24 |
|-----------------------------------------------------|-------------------------------------|------|------------------------------|--------------|-----|-----|-----|
| Nominal diameter of the rebar                       | $\phi$                              | [mm] | 12                           |              | 16  | 20  | 25  |
| Nominal drill hole diameter                         | $d_0$                               |      | 14                           | 16           | 20  | 25  | 30  |
| Drill hole depth                                    | $h_0$                               |      | $h_{ef} + l_e$               |              |     |     |     |
| Effective embedment depth                           | $h_{ef,min}$                        |      | 70                           |              | 80  | 90  | 96  |
|                                                     | $h_{ef,max}$                        |      | 140                          |              | 220 | 300 | 380 |
| Distance concrete surface to welded joint           | $l_e$                               |      | 100                          |              |     |     |     |
| Simplified spacing and edge distance <sup>2)</sup>  | $s$<br>=<br>$c$                     |      | 55                           |              | 65  | 85  | 105 |
| Diameter of clearance hole in the fixture           | pre-positioned anchorage $\leq d_f$ |      | 14                           |              | 18  | 22  | 26  |
|                                                     | push through anchorage $\leq d_f$   |      | 18                           |              | 22  | 26  | 32  |
| Minimum thickness of concrete member                | $h_{min}$                           |      | $h_0 + 30$<br>( $\geq 100$ ) | $h_0 + 2d_0$ |     |     |     |
| Maximum torque moment for attachment of the fixture | $\max T_{inst}$                     | [Nm] | 40                           |              | 60  | 120 | 150 |

1) Both drill hole diameters can be used

2) Detailed calculation according to **Annex B6 and B7****fischer FRA**

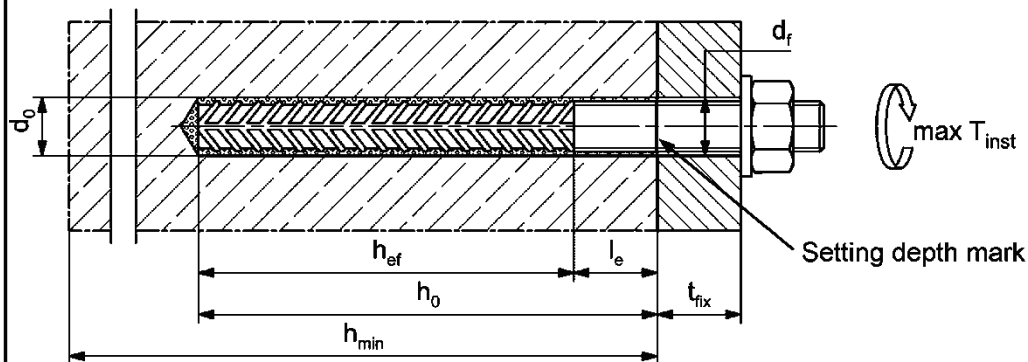
Marking frontal e. g:



FRA (for stainless steel);



FRA HCR (for high corrosion resistant steel)

**Installation conditions:**

Figures not to scale

fischer injection system FIS EB II

**Intended use**

Installation parameters fischer FRA

**Annex B5**

Appendix 12 / 34

**Table B6.1:** Minimum spacing and minimum edge distance for **Anchor rods, Rebars and fischer FRA**

|                                                   |               |                         |                       |      |      |      |      |      |
|---------------------------------------------------|---------------|-------------------------|-----------------------|------|------|------|------|------|
| Anchor rods                                       |               |                         | M8                    | M10  | M12  | -    | M16  | M20  |
| Rebars / fischer FRA<br>(nominal diameter) $\phi$ |               |                         | 8                     | 10   | 12   | 14   | 16   | 20   |
| Minimum edge distance                             |               |                         |                       |      |      |      |      |      |
| Uncracked / cracked concrete                      | $c_{min}$     | [mm]                    | 40                    | 45   | 45   | 45   | 50   | 55   |
| Spacing                                           | s             |                         | according to Annex B7 |      |      |      |      |      |
| Minimum spacing                                   |               |                         |                       |      |      |      |      |      |
| Uncracked / cracked concrete                      | $s_{min}$     | [mm]                    | 40                    | 45   | 55   | 60   | 65   | 85   |
| Edge distance                                     | c             |                         | according to Annex B7 |      |      |      |      |      |
| Required projecting area                          |               |                         |                       |      |      |      |      |      |
| Uncracked concrete                                | $A_{sp, req}$ | [1000 mm <sup>2</sup> ] | 8,0                   | 13,0 | 22,0 | 23,0 | 24,0 | 38,5 |
| Cracked concrete                                  |               |                         | 6,5                   | 10,0 | 16,5 | 17,5 | 18,5 | 29,5 |
|                                                   |               |                         |                       |      |      |      |      |      |
| Anchor rods                                       |               |                         | M24                   | -    | -    | M27  | -    | M30  |
| Rebars / fischer FRA<br>(nominal diameter) $\phi$ |               |                         | -                     | 25   | 26   | -    | 28   | 32   |
| Minimum edge distance                             |               |                         |                       |      |      |      |      |      |
| Uncracked / cracked concrete                      | $c_{min}$     | [mm]                    | 60                    | 75   | 75   | 75   | 80   | 80   |
| Spacing                                           | s             |                         | according to Annex B7 |      |      |      |      |      |
| Minimum spacing                                   |               |                         |                       |      |      |      |      |      |
| Uncracked / cracked concrete                      | $s_{min}$     | [mm]                    | 105                   | 120  | 120  | 120  | 140  | 140  |
| Edge distance                                     | c             |                         | according to Annex B7 |      |      |      |      |      |
| Required projecting area                          |               |                         |                       |      |      |      |      |      |
| Uncracked concrete                                | $A_{sp, req}$ | [1000 mm <sup>2</sup> ] | 40,0                  | 47,5 | 47,5 | 47,5 | 64,0 | 64,0 |
| Cracked concrete                                  |               |                         | 30,5                  | 36,5 | 36,5 | 36,5 | 49,0 | 49,0 |

**Splitting failure** for minimum edge distance and spacing in dependence of the effective embedment depth  $h_{ef}$ .

For the calculation of minimum spacing and minimum edge distance of anchors in combination with different embedment depths and thicknesses of concrete members the following equation shall be fulfilled:

$$A_{sp,req} < A_{sp,t}$$

 $A_{sp, req}$  = required projecting area

$A_{sp,t}$  = projecting area (according to Annex B7)

fischer injection system FIS EB II

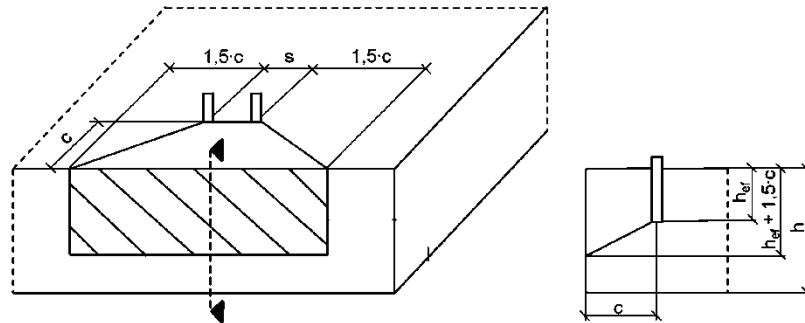
### Intended use

Minimum spacing and edge distance for Anchor rods, Rebars and fischer FRA

## Annex B6

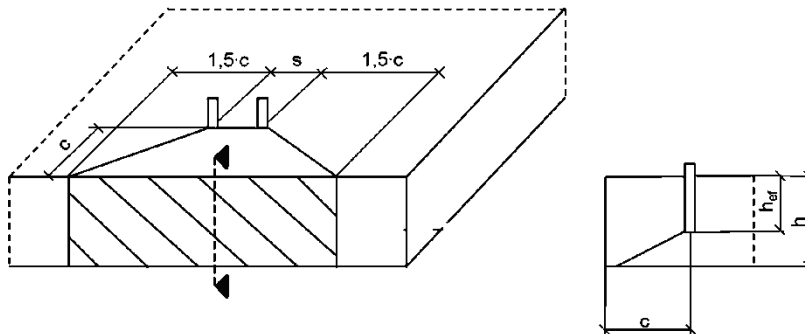
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**Table B7.1: Projecting area  $A_{sp,t}$  with concrete member thickness**  
 $h > h_{ef} + 1,5 \cdot c$  and  $h \geq h_{min}$



|                                           |                                                           |                    |                                            |
|-------------------------------------------|-----------------------------------------------------------|--------------------|--------------------------------------------|
| Single fastener                           | $A_{sp,t} = (3 \cdot c) \cdot (h_{ef} + 1,5 \cdot c)$     | [mm <sup>2</sup> ] | with $c \geq c_{min}$                      |
| Group of fastener with $s > 3 \cdot c$    | $A_{sp,t} = (6 \cdot c) \cdot (h_{ef} + 1,5 \cdot c)$     | [mm <sup>2</sup> ] |                                            |
| Group of fastener with $s \leq 3 \cdot c$ | $A_{sp,t} = (3 \cdot c + s) \cdot (h_{ef} + 1,5 \cdot c)$ | [mm <sup>2</sup> ] | with $c \geq c_{min}$ and $s \geq s_{min}$ |

**Table B7.2: Projecting area  $A_{sp}$  with concrete member thickness**  
 $h \leq h_{ef} + 1,5 \cdot c$  and  $h \geq h_{min}$



|                                           |                                                       |                    |                                            |
|-------------------------------------------|-------------------------------------------------------|--------------------|--------------------------------------------|
| Single fastener                           | $A_{sp,t} = 3 \cdot c \cdot \text{existing } h$       | [mm <sup>2</sup> ] | with $c \geq c_{min}$                      |
| Group of fastener with $s > 3 \cdot c$    | $A_{sp,t} = 6 \cdot c \cdot \text{existing } h$       | [mm <sup>2</sup> ] |                                            |
| Group of fastener with $s \leq 3 \cdot c$ | $A_{sp,t} = (3 \cdot c + s) \cdot \text{existing } h$ | [mm <sup>2</sup> ] | with $c \geq c_{min}$ and $s \geq s_{min}$ |

Edge distance and axial spacing shall be rounded up to at least 5 mm

Figures not to scale

fischer injection system FIS EB II

**Intended use**

Minimum thickness of concrete member for Anchor rods, Rebar, fischer FRA and minimum spacing and edge distance

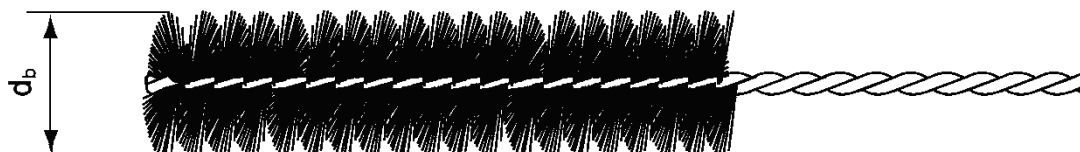
**Annex B7**

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**Table B8.1: Parameters of the cleaning brush BS (steel brush with steel bristles)**

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

|                             |       |      |    |    |    |    |    |    |    |    |    |    |    |    |
|-----------------------------|-------|------|----|----|----|----|----|----|----|----|----|----|----|----|
| Nominal drill hole diameter | $d_0$ | [mm] | 10 | 12 | 14 | 16 | 18 | 20 | 24 | 25 | 28 | 30 | 35 | 40 |
| Steel brush diameter BS     | $d_b$ |      | 11 | 14 | 16 | 20 |    | 25 | 26 | 27 | 30 | 40 |    | 42 |

**Table B8.2: Conditions for use static mixer without an extension tube**

|                                 |             |      |           |    |            |            |            |            |            |            |            |    |    |    |
|---------------------------------|-------------|------|-----------|----|------------|------------|------------|------------|------------|------------|------------|----|----|----|
| Nominal drill hole diameter     | $d_0$       | [mm] | 10        | 12 | 14         | 16         | 18         | 20         | 24         | 25         | 28         | 30 | 35 | 40 |
| Drill hole depth $h_0$ by using | FIS MR Plus |      | $\leq 90$ |    | $\leq 120$ | $\leq 140$ | $\leq 150$ | $\leq 160$ | $\leq 190$ | $\leq 210$ |            |    |    |    |
|                                 | FIS UMR     |      | -         | -  | $\leq 90$  | $\leq 160$ | $\leq 180$ | $\leq 190$ | $\leq 220$ |            | $\leq 250$ |    |    |    |

**Table B8.3 Maximum processing time of the mortar and minimum curing time**  
(During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature)

| Temperature at anchoring base [°C] | Maximum processing time $t_{work}$ | Minimum curing time $t_{cure}$ |
|------------------------------------|------------------------------------|--------------------------------|
| > 5 to 10                          | 180 min                            | 96 h                           |
| > 10 to 15                         | 90 min                             | 60 h                           |
| > 15 to 20                         | 60 min                             | 36 h                           |
| > 20 to 30                         | 30 min                             | 24 h                           |
| > 30 to 40                         | 15 min                             | 12 h                           |

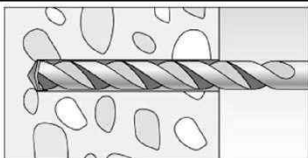
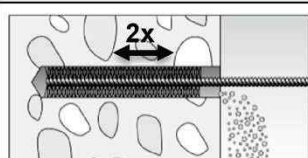
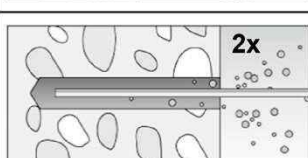
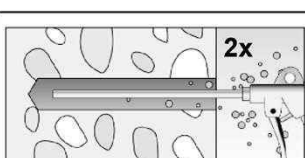
fischer injection system FIS EB II

**Intended use**  
Cleaning brush (steel brush)  
Processing time and curing time

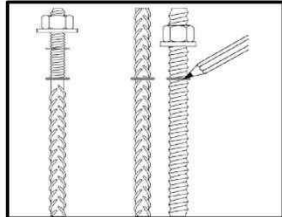
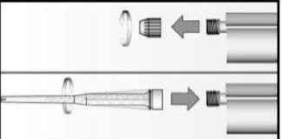
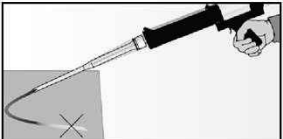
**Annex B8**  
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# Installation instructions part 1

## 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 twice<br>by hand.                                                                                       |  | For $h_{ef} > 12d$ and / or $d_0 \geq 18$ mm blow out the hole twice with oil-free compressed air ( $p \geq 6$ bar). |
| 3 |  | Brush the drill hole twice. For drill hole diameter $d_0 \geq 18$ mm and / or $h_{ef} > 12d$ use a power drill. For deep holes use an extension. Corresponding brushes see <b>Table B8.1.</b> |                                                                                    |                                                                                                                      |
| 4 |  | Clean the drill hole:<br>For $h_{ef} \leq 12d$ and $d_0 < 18$ mm<br>blow out the hole twice<br>by hand.                                                                                       |  | For $h_{ef} > 12d$ and / or $d_0 \geq 18$ mm blow out the hole twice with oil-free compressed air ( $p \geq 6$ bar). |

## Preparing

|   |                                                                                     |                                                                                                                                     |                                                                                     |
|---|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 5 |   | Mark the setting depth of the steel element                                                                                         |                                                                                     |
| 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.<br><br>When using the foilbag, the foil container holder must be used.                      |  |
| 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

fischer injection system FIS EB II

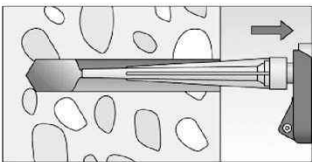
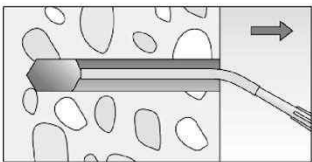
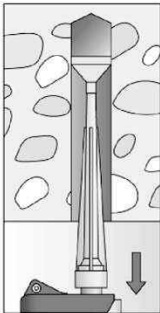
**Intended use**  
Installation instructions part 1

**Annex B9**

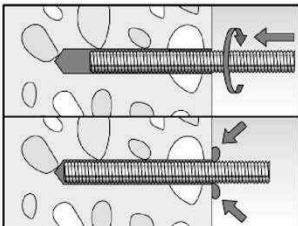
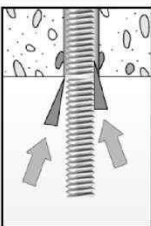
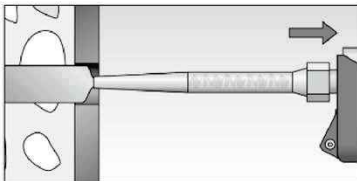
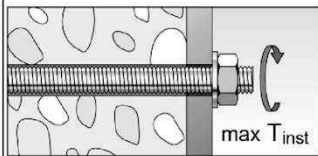
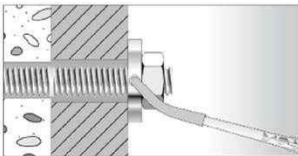
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## Installation instructions part 2

### Injection of the mortar

|   |                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9 |  <p>Fill approximately 2/3 of the drill hole with mortar. Always begin from the bottom of the hole and avoid bubbles.</p> |  <p>The conditions for mortar injection without extension tube can be found in <b>Table B8.2</b><br/>For deeper drill holes, than those mentioned in <b>Table B8.2</b>, use a suitable extension tube.</p> |  <p>For overhead installation, deep holes (<math>h_0 &gt; 250 \text{ mm}</math>) or drill hole diameter (<math>d_0 \geq 30 \text{ mm}</math>) use an injection-adapter.</p> |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Installation of Anchor rods

|        |                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                               |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10     |                                                                                                                                    | <p>Only use clean and oil-free anchor elements.<br/>Push the anchor rod with the setting depth mark down to the bottom of the hole, turning it slightly while doing so.<br/>After inserting the anchor element, excess mortar must be emerged around the anchor element.</p>                                                                                                                                                      |                                                                                                                                                                               |
|        |  <p>For overhead installations support the anchor rod with wedges (e. g. fischer centering wedges) 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_{\text{cure}}</math> see <b>Table B8.3</b>.</p>                                   | 12                                                                                                                                                                                                                                                                                                                                                                                                                                |  <p>Mounting the fixture<br/><math>\max T_{\text{inst}}</math> see <b>Table B3.1</b>.</p> |
| Option |                                                                                                                                  | <p>After the minimum curing time is reached, the gap between anchor and fixture (annular clearance) may be filled with mortar via the fischer filling disc.<br/>Compressive strength <math>\geq 50 \text{ N/mm}^2</math> (e.g. fischer injection mortars FIS EB II, FIS SB, FIS V Plus, FIS EM Plus).<br/><b>ATTENTION:</b><br/>Using fischer filling disk reduces <math>t_{\text{fix}}</math> (usable length of the anchor).</p> |                                                                                                                                                                               |

fischer injection system FIS EB II

#### Intended use

Installation instructions part 2

#### Annex B10

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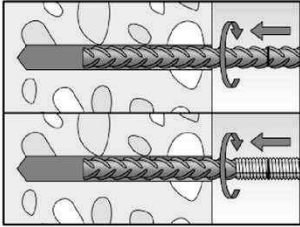
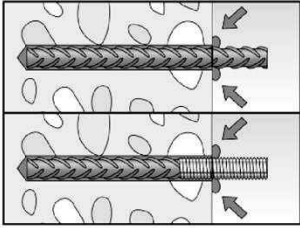
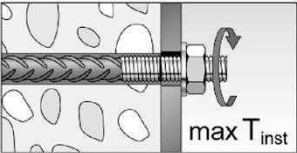
| Installation instructions part 3                 |                                                                                    |                                                                                                                                                                                                                                                                       |                                                                  |
|--------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| Installation Rebars and fischer FRA              |                                                                                    |                                                                                                                                                                                                                                                                       |                                                                  |
| 10                                               |   | Only use clean and oil-free rebars or fischer FRA. Push the rebar or the fischer FRA with the setting depth mark into the filled hole up to the setting depth mark.<br>Recommendation:<br>Rotation back and forth of the rebar or the fischer FRA makes pushing easy. |                                                                  |
|                                                  |   | When the setting depth mark is reached, excess mortar must be emerged from the mouth of the drill hole.                                                                                                                                                               |                                                                  |
| 11                                               |   | Wait for the specified curing time $t_{cure}$ see <b>Table B8.3</b>                                                                                                                                                                                                   |                                                                  |
| 12                                               |  |                                                                                                                                                                                                                                                                       | Mounting the fixture<br>$\max T_{inst}$<br>see <b>Table B5.1</b> |
|                                                  |                                                                                    |                                                                                                                                                                                                                                                                       |                                                                  |
| fischer injection system FIS EB II               |                                                                                    |                                                                                                                                                                                                                                                                       | <b>Annex B11</b><br>Appendix 18 / 34                             |
| Intended use<br>Installation instructions part 3 |                                                                                    |                                                                                                                                                                                                                                                                       |                                                                  |

**Table C1.1: Characteristic resistance to steel failure under tension and shear loading of Anchor rods and Threaded rods**

| Anchor rod / Threaded rod                                                      |                                                          |                |     | 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 | 4.8 | [kN] | 14,6 (13,2)                            | 23,2 (21,4) | 33,7  | 62,8  | 98,0  | 141,2 | 183,6  | 224,4  |
|                                                                                |                                                          |                | 5.8 |      | 18,3 (16,6)                            | 29,0 (26,8) | 42,1  | 78,5  | 122,5 | 176,5 | 229,5  | 280,5  |
|                                                                                |                                                          |                | 8.8 |      | 29,2 (26,5)                            | 46,4 (42,8) | 67,4  | 125,6 | 196,0 | 282,4 | 367,2  | 448,8  |
|                                                                                | Stainless steel R and high corrosion resistant steel HCR |                | 50  |      | 18,3                                   | 29,0        | 42,1  | 78,5  | 122,5 | 176,5 | 229,5  | 280,5  |
|                                                                                |                                                          |                | 70  |      | 25,6                                   | 40,6        | 59,0  | 109,9 | 171,5 | 247,1 | 321,3  | 392,7  |
|                                                                                |                                                          |                | 80  |      | 29,2                                   | 46,4        | 67,4  | 125,6 | 196,0 | 282,4 | 367,2  | 448,8  |
| Partial factors <sup>1)</sup>                                                  |                                                          |                |     |      |                                        |             |       |       |       |       |        |        |
| Partial factor $\gamma_{Ms}$                                                   | Steel zinc plated                                        | Property class | 4.8 | [-]  | 1,50                                   |             |       |       |       |       |        |        |
|                                                                                |                                                          |                | 5.8 |      | 1,50                                   |             |       |       |       |       |        |        |
|                                                                                |                                                          |                | 8.8 |      | 1,50                                   |             |       |       |       |       |        |        |
|                                                                                | Stainless steel R and high corrosion resistant steel HCR |                | 50  |      | 2,86                                   |             |       |       |       |       |        |        |
|                                                                                |                                                          |                | 70  |      | 1,87 / fischer HCR: 1,50 <sup>2)</sup> |             |       |       |       |       |        |        |
|                                                                                |                                                          |                | 80  |      | 1,60                                   |             |       |       |       |       |        |        |
| Characteristic resistance to steel failure under shear loading <sup>3)</sup>   |                                                          |                |     |      |                                        |             |       |       |       |       |        |        |
| without lever arm                                                              |                                                          |                |     |      |                                        |             |       |       |       |       |        |        |
| Characteristic resistance $V^0_{Rk,s}$                                         | Steel zinc plated                                        | Property class | 4.8 | [kN] | 8,7 (7,9)                              | 13,9 (12,8) | 20,2  | 37,6  | 58,8  | 84,7  | 110,1  | 134,6  |
|                                                                                |                                                          |                | 5.8 |      | 10,9 (9,9)                             | 17,4 (16,0) | 25,2  | 47,1  | 73,5  | 105,9 | 137,7  | 168,3  |
|                                                                                |                                                          |                | 8.8 |      | 14,6 (13,2)                            | 23,2 (21,4) | 33,7  | 62,8  | 98,0  | 141,2 | 183,6  | 224,4  |
|                                                                                | Stainless steel R and high corrosion resistant steel HCR |                | 50  |      | 9,1                                    | 14,5        | 21,0  | 39,2  | 61,2  | 88,2  | 114,7  | 140,2  |
|                                                                                |                                                          |                | 70  |      | 12,8                                   | 20,3        | 29,5  | 54,9  | 85,7  | 123,5 | 160,6  | 196,3  |
|                                                                                |                                                          |                | 80  |      | 14,6                                   | 23,2        | 33,7  | 62,8  | 98,0  | 141,2 | 183,6  | 224,4  |
| Ductility factor                                                               |                                                          | k <sub>7</sub> | [-] | 1,0  |                                        |             |       |       |       |       |        |        |
| with lever arm                                                                 |                                                          |                |     |      |                                        |             |       |       |       |       |        |        |
| Characteristic resistance $M^0_{Rk,s}$                                         | Steel zinc plated                                        | Property class | 4.8 | [Nm] | 14,9 (12,9)                            | 29,9 (26,5) | 52,3  | 132,9 | 259,6 | 448,8 | 665,7  | 899,5  |
|                                                                                |                                                          |                | 5.8 |      | 18,7 (16,1)                            | 37,3 (33,2) | 65,4  | 166,2 | 324,6 | 561,0 | 832,2  | 1124,4 |
|                                                                                |                                                          |                | 8.8 |      | 29,9 (25,9)                            | 59,8 (53,1) | 104,6 | 265,9 | 519,3 | 897,6 | 1331,5 | 1799,0 |
|                                                                                | Stainless steel R and high corrosion resistant steel HCR |                | 50  |      | 18,7                                   | 37,3        | 65,4  | 166,2 | 324,6 | 561,0 | 832,2  | 1124,4 |
|                                                                                |                                                          |                | 70  |      | 26,2                                   | 52,3        | 91,5  | 232,6 | 454,4 | 785,4 | 1165   | 1574,1 |
|                                                                                |                                                          |                | 80  |      | 29,9                                   | 59,8        | 104,6 | 265,9 | 519,3 | 897,6 | 1331,5 | 1799,0 |
| Partial factors <sup>1)</sup>                                                  |                                                          |                |     |      |                                        |             |       |       |       |       |        |        |
| Partial factor $\gamma_{Ms}$                                                   | Steel zinc plated                                        | Property class | 4.8 | [-]  | 1,25                                   |             |       |       |       |       |        |        |
|                                                                                |                                                          |                | 5.8 |      | 1,25                                   |             |       |       |       |       |        |        |
|                                                                                |                                                          |                | 8.8 |      | 1,25                                   |             |       |       |       |       |        |        |
|                                                                                | Stainless steel R and high corrosion resistant steel HCR |                | 50  |      | 2,38                                   |             |       |       |       |       |        |        |
|                                                                                |                                                          |                | 70  |      | 1,56 / fischer HCR: 1,25 <sup>2)</sup> |             |       |       |       |       |        |        |
|                                                                                |                                                          |                | 80  |      | 1,33                                   |             |       |       |       |       |        |        |

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

<sup>2)</sup> Only admissible for high corrosion resistant steel HCR, acc to **Table A5.1**.

<sup>3)</sup> Values in brackets are valid for undersized threaded rods with smaller stress area  $A_s$  for hot dip galvanized threaded rods according to EN ISO 10684:2004+AC:2009.

fischer injection system FIS EB II

#### Performance

Characteristic resistance to steel failure under tension and shear loading of Anchor rods and Threaded rods

#### Annex C1

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**Table C2.1:** Characteristic resistance to **steel failure** under tension and shear loading of Rebars

| Nominal diameter of the rebar                                                                                                                                                                                                                                                                                                                                                                                                                                           | $\phi$       | 8    | 10                                      | 12 | 14 | 16 | 20 | 25 | 26 | 28 | 30 | 32 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------|-----------------------------------------|----|----|----|----|----|----|----|----|----|
| <b>Characteristic resistance to steel failure under tension loading</b>                                                                                                                                                                                                                                                                                                                                                                                                 |              |      |                                         |    |    |    |    |    |    |    |    |    |
| Characteristic resistance                                                                                                                                                                                                                                                                                                                                                                                                                                               | $N_{Rk,s}$   | [kN] | $A_s \cdot f_{uk}^{2)}$                 |    |    |    |    |    |    |    |    |    |
| <b>Characteristic resistance to steel failure under shear loading</b>                                                                                                                                                                                                                                                                                                                                                                                                   |              |      |                                         |    |    |    |    |    |    |    |    |    |
| <b>Without lever arm</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                |              |      |                                         |    |    |    |    |    |    |    |    |    |
| Characteristic resistance                                                                                                                                                                                                                                                                                                                                                                                                                                               | $V^0_{Rk,s}$ | [kN] | $k_6^{1)}) \cdot A_s \cdot f_{uk}^{2)}$ |    |    |    |    |    |    |    |    |    |
| Ductility factor                                                                                                                                                                                                                                                                                                                                                                                                                                                        | $k_7$        | [-]  | 1,0                                     |    |    |    |    |    |    |    |    |    |
| <b>With lever arm</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |              |      |                                         |    |    |    |    |    |    |    |    |    |
| Characteristic resistance                                                                                                                                                                                                                                                                                                                                                                                                                                               | $M^0_{Rk,s}$ | [Nm] | $1,2 \cdot W_{el} \cdot f_{uk}^{2)}$    |    |    |    |    |    |    |    |    |    |
| <p>1) In accordance with EN 1992-4:2018 section 7.2.2.3.1</p> <p><math>k_6 = 0,6</math> for fasteners made of carbon steel with <math>f_{uk} \leq 500 \text{ N/mm}^2</math></p> <p><math>= 0,5</math> for fasteners made of carbon steel with <math>500 &lt; f_{uk} \leq 1000 \text{ N/mm}^2</math></p> <p><math>= 0,5</math> for fasteners made of stainless steel</p> <p>2) <math>f_{uk}</math> respectively shall be taken from the specifications of the rebar.</p> |              |      |                                         |    |    |    |    |    |    |    |    |    |

**Table C2.2:** Characteristic resistance to **steel failure** under tension and shear loading of **fischer FRA**

| fischer FRA                                                             |               |      | M12   | M16   | M20   | M24   |
|-------------------------------------------------------------------------|---------------|------|-------|-------|-------|-------|
| <b>Characteristic resistance to steel failure under tension loading</b> |               |      |       |       |       |       |
| Characteristic resistance                                               | $N_{Rk,s}$    | [kN] | 62,0  | 110,0 | 173,0 | 236,5 |
| <b>Partial factor<sup>1)</sup></b>                                      |               |      |       |       |       |       |
| Partial factor                                                          | $\gamma_{Ms}$ | [-]  | 1,4   |       |       |       |
| <b>Characteristic resistance to steel failure under shear loading</b>   |               |      |       |       |       |       |
| <b>Without lever arm</b>                                                |               |      |       |       |       |       |
| Characteristic resistance                                               | $V^0_{Rk,s}$  | [kN] | 34,5  | 64,3  | 100,4 | 144,7 |
| Ductility factor                                                        | $k_7$         | [-]  | 1,0   |       |       |       |
| <b>With lever arm</b>                                                   |               |      |       |       |       |       |
| Characteristic resistance                                               | $M^0_{Rk,s}$  | [Nm] | 107,4 | 273,0 | 532,2 | 920,4 |
| <b>Partial factor<sup>1)</sup></b>                                      |               |      |       |       |       |       |
| Partial factor                                                          | $\gamma_{Ms}$ | [-]  | 1,5   |       |       |       |

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

|                                                                                                                            |                                     |
|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| fischer injection system FIS EB II                                                                                         | <b>Annex C2</b><br>Appendix 20 / 34 |
| <b>Performance</b><br>Characteristic resistance to steel failure under tension and shear loading of Rebars and fischer FRA |                                     |

**Table C3.1:** Characteristic resistance to **concrete failure** under tension and shear loading

| Size                                                                                                              |                          |                 | All sizes      |                                                                                                                            |                |     |     |               |                  |                |                |                              |      |    |    |  |
|-------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------|----------------|----------------------------------------------------------------------------------------------------------------------------|----------------|-----|-----|---------------|------------------|----------------|----------------|------------------------------|------|----|----|--|
| Tension loading                                                                                                   |                          |                 |                |                                                                                                                            |                |     |     |               |                  |                |                |                              |      |    |    |  |
| Installation factor                                                                                               |                          | $\gamma_{inst}$ | [-]            | See annex C 4 to C 6                                                                                                       |                |     |     |               |                  |                |                |                              |      |    |    |  |
| Factors for the compressive strength of concrete > C20/25                                                         |                          |                 |                |                                                                                                                            |                |     |     |               |                  |                |                |                              |      |    |    |  |
|                                                                                                                   |                          |                 |                | Uncracked concrete                                                                                                         |                |     |     |               | Cracked concrete |                |                |                              |      |    |    |  |
| Increasing factor $\psi_c$ for cracked or uncracked concrete<br>$\tau_{RK}(X,Y) = \psi_c \cdot \tau_{RK}(C20/25)$ | C25/30                   | [-]             | [mm]           | 1,05                                                                                                                       |                |     |     |               | 1,02             |                |                |                              |      |    |    |  |
|                                                                                                                   | C30/37                   |                 |                | 1,09                                                                                                                       |                |     |     |               | 1,05             |                |                |                              |      |    |    |  |
|                                                                                                                   | C35/45                   |                 |                | 1,12                                                                                                                       |                |     |     |               | 1,06             |                |                |                              |      |    |    |  |
|                                                                                                                   | C40/50                   |                 |                | 1,16                                                                                                                       |                |     |     |               | 1,08             |                |                |                              |      |    |    |  |
|                                                                                                                   | C45/55                   |                 |                | 1,19                                                                                                                       |                |     |     |               | 1,09             |                |                |                              |      |    |    |  |
|                                                                                                                   | C50/60                   |                 |                | 1,21                                                                                                                       |                |     |     |               | 1,11             |                |                |                              |      |    |    |  |
| Splitting failure                                                                                                 |                          |                 |                |                                                                                                                            |                |     |     |               |                  |                |                |                              |      |    |    |  |
| Edge distance                                                                                                     | $h / h_{ef} \geq 2,0$    | $C_{cr,sp}$     | [mm]           | 1,0 $h_{ef}$                                                                                                               |                |     |     |               |                  |                |                |                              |      |    |    |  |
|                                                                                                                   | $2,0 > h / h_{ef} > 1,3$ |                 |                | 4,6 $h_{ef}$ - 1,8 h                                                                                                       |                |     |     |               |                  |                |                |                              |      |    |    |  |
|                                                                                                                   | $h / h_{ef} \leq 1,3$    |                 |                | 2,26 $h_{ef}$                                                                                                              |                |     |     |               |                  |                |                |                              |      |    |    |  |
| Spacing                                                                                                           |                          | $S_{cr,sp}$     |                | 2 $C_{cr,sp}$                                                                                                              |                |     |     |               |                  |                |                |                              |      |    |    |  |
| Concrete cone failure                                                                                             |                          |                 |                |                                                                                                                            |                |     |     |               |                  |                |                |                              |      |    |    |  |
| Uncracked concrete                                                                                                |                          | $k_{ucr,N}$     | [-]            | 11,0                                                                                                                       |                |     |     |               |                  |                |                |                              |      |    |    |  |
| Cracked concrete                                                                                                  |                          | $k_{cr,N}$      |                | 7,7                                                                                                                        |                |     |     |               |                  |                |                |                              |      |    |    |  |
| Edge distance                                                                                                     |                          | $C_{cr,N}$      | [mm]           | 1,5 $h_{ef}$                                                                                                               |                |     |     |               |                  |                |                |                              |      |    |    |  |
| Spacing                                                                                                           |                          | $S_{cr,N}$      |                | 2 $C_{cr,N}$                                                                                                               |                |     |     |               |                  |                |                |                              |      |    |    |  |
| Factors for sustained tension loading                                                                             |                          |                 |                |                                                                                                                            |                |     |     |               |                  |                |                |                              |      |    |    |  |
| Temperature range                                                                                                 |                          |                 | [-]            | 24 °C / 43 °C                                                                                                              |                |     |     | 43 °C / 60 °C |                  |                |                | 50 °C / 72 °C                |      |    |    |  |
| Factor                                                                                                            |                          |                 | $\psi_{sUS}^0$ | [-]                                                                                                                        | 0,66           |     |     |               | 0,61             |                |                |                              | 0,60 |    |    |  |
| 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 for 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) |                |     |     |               |                  |                |                |                              |      |    |    |  |
| Effective diameter of the fastener $d_{nom}$                                                                      |                          |                 |                |                                                                                                                            |                |     |     |               |                  |                |                |                              |      |    |    |  |
| Size                                                                                                              |                          |                 |                | M8                                                                                                                         | M10            | M12 | M16 | M20           | M24              | M27            | M30            |                              |      |    |    |  |
| Anchor rods and Threaded rods                                                                                     |                          | $d_{nom}$       | [mm]           | 8                                                                                                                          | 10             | 12  | 16  | 20            | 24               | 27             | 30             |                              |      |    |    |  |
| fischer FRA                                                                                                       |                          | $d_{nom}$       |                | <sup>-1)</sup>                                                                                                             | <sup>-1)</sup> | 12  | 16  | 20            | 25               | <sup>-1)</sup> | <sup>-1)</sup> |                              |      |    |    |  |
| Size (nominal diameter of the rebar)                                                                              |                          |                 | $\phi$         | 8                                                                                                                          | 10             | 12  | 14  | 16            | 20               | 25             | 26             | 28                           | 30   | 32 |    |  |
| Rebar                                                                                                             |                          |                 | $d_{nom}$      | [mm]                                                                                                                       | 8              | 10  | 12  | 14            | 16               | 20             | 25             | 26                           | 28   | 30 | 32 |  |
| <sup>1)</sup> Anchor type not part of the assessment                                                              |                          |                 |                |                                                                                                                            |                |     |     |               |                  |                |                |                              |      |    |    |  |
| fischer injection system FIS EB II                                                                                |                          |                 |                |                                                                                                                            |                |     |     |               |                  |                |                | Annex C3<br>Appendix 21 / 34 |      |    |    |  |
| Performance<br>Characteristic resistance to concrete failure under tension / shear loading                        |                          |                 |                |                                                                                                                            |                |     |     |               |                  |                |                |                              |      |    |    |  |

**Table C4.1:** Characteristic resistance to **combined pull-out and concrete failure** for **Anchor rods** and **Threaded rods** in hammer drilled holes; **uncracked or cracked concrete**

| Anchor rod / Threaded rod                                     |                    |                 | M8                      | M10  | M12  | M16  | M20  | M24  | M27  | M30  |      |
|---------------------------------------------------------------|--------------------|-----------------|-------------------------|------|------|------|------|------|------|------|------|
| Combined pullout and concrete cone failure                    |                    |                 |                         |      |      |      |      |      |      |      |      |
| Calculation diameter                                          |                    | d               | [mm]                    | 8    | 10   | 12   | 16   | 20   | 24   | 27   | 30   |
| Uncracked concrete                                            |                    |                 |                         |      |      |      |      |      |      |      |      |
| Characteristic bond resistance in uncracked concrete C20/25   |                    |                 |                         |      |      |      |      |      |      |      |      |
| Hammer-drilling with standard drill bit (dry or wet concrete) |                    |                 |                         |      |      |      |      |      |      |      |      |
| Temperature range                                             | I: 24 °C / 43 °C   |                 | $\tau_{Rk,ucr}$ [N/mm²] | 14,0 | 14,0 | 14,0 | 14,0 | 14,0 | 13,0 | 12,0 | 12,0 |
|                                                               | II: 43 °C / 60 °C  |                 |                         | 14,0 | 13,0 | 13,0 | 12,0 | 11,0 | 10,0 | 8,5  | 8,5  |
|                                                               | III: 50 °C / 72 °C |                 |                         | 9,0  | 9,0  | 9,0  | 9,0  | 9,0  | 8,5  | 8,0  | 7,5  |
| Hammer-drilling with standard drill bit (water filled hole)   |                    |                 |                         |      |      |      |      |      |      |      |      |
| Temperature range                                             | I: 24 °C / 43 °C   |                 | $\tau_{Rk,ucr}$ [N/mm²] | 14,0 | 14,0 | 14,0 | 14,0 | 14,0 | 12,0 | 12,0 | 12,0 |
|                                                               | II: 43 °C / 60 °C  |                 |                         | 12,0 | 11,0 | 11,0 | 10,0 | 9,5  | 8,5  | 8,5  | 8,5  |
|                                                               | III: 50 °C / 72 °C |                 |                         | 9,0  | 9,0  | 9,0  | 8,5  | 8,0  | 7,5  | 7,0  | 6,5  |
| Installation factors                                          |                    |                 |                         |      |      |      |      |      |      |      |      |
| Dry or wet concrete                                           |                    | $\gamma_{inst}$ | [-]                     | 1,2  |      |      |      |      |      |      |      |
| Water filled hole                                             |                    |                 |                         | 1,4  |      |      |      |      |      |      |      |
| Cracked concrete                                              |                    |                 |                         |      |      |      |      |      |      |      |      |
| Characteristic bond resistance in cracked concrete C20/25     |                    |                 |                         |      |      |      |      |      |      |      |      |
| Hammer-drilling with standard drill bit (dry or wet concrete) |                    |                 |                         |      |      |      |      |      |      |      |      |
| Temperature range                                             | I: 24 °C / 43 °C   |                 | $\tau_{Rk,cr}$ [N/mm²]  | 7,0  | 7,0  | 7,0  | 6,5  | 6,0  | 6,0  | 5,5  | 5,5  |
|                                                               | II: 43 °C / 60 °C  |                 |                         | 6,5  | 6,5  | 6,5  | 6,0  | 6,0  | 6,0  | 5,5  | 5,5  |
|                                                               | III: 50 °C / 72 °C |                 |                         | 6,0  | 6,0  | 6,0  | 5,5  | 5,5  | 5,5  | 5,0  | 5,0  |
| Hammer-drilling with standard drill bit (water filled hole)   |                    |                 |                         |      |      |      |      |      |      |      |      |
| Temperature range                                             | I: 24 °C / 43 °C   |                 | $\tau_{Rk,cr}$ [N/mm²]  | 7,0  | 7,0  | 7,0  | 6,5  | 6,0  | 6,0  | 5,5  | 5,5  |
|                                                               | II: 43 °C / 60 °C  |                 |                         | 5,5  | 5,5  | 5,5  | 5,0  | 4,5  | 4,5  | 4,0  | 4,0  |
|                                                               | III: 50 °C / 72 °C |                 |                         | 5,5  | 5,5  | 5,5  | 5,0  | 4,0  | 4,0  | 4,0  | 4,0  |
| Installation factors                                          |                    |                 |                         |      |      |      |      |      |      |      |      |
| Dry or wet concrete                                           |                    | $\gamma_{inst}$ | [-]                     | 1,2  |      |      |      |      |      |      |      |
| Water filled hole                                             |                    |                 |                         | 1,4  |      |      |      |      |      |      |      |

fischer injection system FIS EB II

## Performance

Characteristic resistance to combined pull-out and concrete failure for Anchor rod and Threaded rods

## Annex C4

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**Table C5.1:** Characteristic resistance to **combined pull-out and concrete failure** for **Rebars** in hammer drilled holes; **uncracked or cracked concrete**

| Rebars                                                                                        | $\phi$             | 8                                    | 10   | 12   | 14   | 16   | 20   | 25   | 26   | 28   | 30   | 32   |      |
|-----------------------------------------------------------------------------------------------|--------------------|--------------------------------------|------|------|------|------|------|------|------|------|------|------|------|
| Combined pullout and concrete cone failure                                                    |                    |                                      |      |      |      |      |      |      |      |      |      |      |      |
| Calculation diameter                                                                          | d                  | [mm]                                 | 8    | 10   | 12   | 14   | 16   | 20   | 25   | 26   | 28   | 30   | 32   |
| Uncracked concrete                                                                            |                    |                                      |      |      |      |      |      |      |      |      |      |      |      |
| Characteristic bond resistance in uncracked concrete C20/25                                   |                    |                                      |      |      |      |      |      |      |      |      |      |      |      |
| Hammer-drilling with standard drill bit (dry or wet concrete)                                 |                    |                                      |      |      |      |      |      |      |      |      |      |      |      |
| Temperature range                                                                             | I: 24 °C / 43 °C   | $\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ] | 14,0 | 14,0 | 14,0 | 13,0 | 13,0 | 12,0 | 11,0 | 11,0 | 11,0 | 11,0 | 11,0 |
|                                                                                               | II: 43 °C / 60 °C  |                                      | 14,0 | 13,0 | 13,0 | 12,0 | 11,0 | 10,0 | 10,0 | 9,0  | 8,5  | 8,0  | 8,0  |
|                                                                                               | III: 50 °C / 72 °C |                                      | 9,0  | 9,0  | 9,0  | 9,0  | 9,0  | 9,0  | 8,5  | 8,5  | 8,0  | 8,0  | 7,5  |
| Hammer-drilling with standard drill bit (water filled hole)                                   |                    |                                      |      |      |      |      |      |      |      |      |      |      |      |
| Temperature range                                                                             | I: 24 °C / 43 °C   | $\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ] | 14,0 | 14,0 | 14,0 | 12,0 | 12,0 | 12,0 | 11,0 | 11,0 | 11,0 | 11,0 | 11,0 |
|                                                                                               | II: 43 °C / 60 °C  |                                      | 11,0 | 11,0 | 10,0 | 9,5  | 9,5  | 9,0  | 8,5  | 8,5  | 8,5  | 7,5  | 7,5  |
|                                                                                               | III: 50 °C / 72 °C |                                      | 9,0  | 9,0  | 9,0  | 8,5  | 8,0  | 7,5  | 7,0  | 6,5  | 6,5  | 6,0  | 6,0  |
| Installation factors                                                                          |                    |                                      |      |      |      |      |      |      |      |      |      |      |      |
| Dry or wet concrete                                                                           | $\gamma_{inst}$    | [-]                                  | 1,2  |      |      |      |      |      |      |      |      |      |      |
| Water filled hole                                                                             |                    |                                      | 1,4  |      |      |      |      |      |      |      |      |      |      |
| Cracked concrete                                                                              |                    |                                      |      |      |      |      |      |      |      |      |      |      |      |
| Characteristic bond resistance in cracked concrete C20/25                                     |                    |                                      |      |      |      |      |      |      |      |      |      |      |      |
| Hammer-drilling with standard drill bit (dry or wet concrete)                                 |                    |                                      |      |      |      |      |      |      |      |      |      |      |      |
| Temperature range                                                                             | I: 24 °C / 43 °C   | $\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]  | 7,0  | 7,0  | 7,0  | 6,5  | 6,5  | 6,0  | 6,0  | 5,5  | 5,5  | 5,5  | 5,5  |
|                                                                                               | II: 43 °C / 60 °C  |                                      | 6,5  | 6,5  | 6,5  | 6,0  | 6,0  | 6,0  | 5,5  | 5,5  | 5,5  | 5,0  | 5,0  |
|                                                                                               | III: 50 °C / 72 °C |                                      | 6,0  | 6,0  | 6,0  | 6,0  | 5,5  | 5,5  | 5,5  | 5,0  | 5,0  | 5,0  | 4,5  |
| Hammer-drilling with standard drill bit (water filled hole)                                   |                    |                                      |      |      |      |      |      |      |      |      |      |      |      |
| Temperature range                                                                             | I: 24 °C / 43 °C   | $\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]  | 7,0  | 7,0  | 7,0  | 7,0  | 6,5  | 6,0  | 6,0  | 5,5  | 5,5  | 5,5  | 5,5  |
|                                                                                               | II: 43 °C / 60 °C  |                                      | 5,5  | 5,5  | 5,5  | 5,0  | 5,0  | 4,5  | 4,0  | 4,0  | 4,0  | 4,0  | 3,5  |
|                                                                                               | III: 50 °C / 72 °C |                                      | 5,5  | 5,5  | 5,5  | 5,0  | 5,0  | 4,0  | 4,0  | 4,0  | 4,0  | 4,0  | 3,5  |
| Installation factors                                                                          |                    |                                      |      |      |      |      |      |      |      |      |      |      |      |
| Dry or wet concrete                                                                           | $\gamma_{inst}$    | [-]                                  | 1,2  |      |      |      |      |      |      |      |      |      |      |
| Water filled hole                                                                             |                    |                                      | 1,4  |      |      |      |      |      |      |      |      |      |      |
| fischer injection system FIS EB II                                                            |                    |                                      |      |      |      |      |      |      |      |      |      |      |      |
| Performance<br>Characteristic resistance to combined pull-out and concrete failure for Rebars |                    |                                      |      |      |      |      |      |      |      |      |      |      |      |
| Annex C5<br>Appendix 23 / 34                                                                  |                    |                                      |      |      |      |      |      |      |      |      |      |      |      |

**Table C6.1:** Characteristic resistance for **combined pull-out and concrete failure** for **fischer FRA** in hammer drilled holes; **uncracked or cracked concrete**

| fischer FRA                                                                                                |                    |                                      | M12  | M16  | M20                                 | M24  |
|------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------------|------|------|-------------------------------------|------|
| <b>Combined pullout and concrete cone failure</b>                                                          |                    |                                      |      |      |                                     |      |
| Calculation diameter                                                                                       | d                  | [mm]                                 | 12   | 16   | 20                                  | 25   |
| <b>Uncracked concrete</b>                                                                                  |                    |                                      |      |      |                                     |      |
| <b>Characteristic bond resistance in uncracked concrete C20/25</b>                                         |                    |                                      |      |      |                                     |      |
| <u>Hammer-drilling with standard drill bit (dry or wet concrete)</u>                                       |                    |                                      |      |      |                                     |      |
| Temperature range                                                                                          | I: 24 °C / 43 °C   | $\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ] | 14,0 | 13,0 | 12,0                                | 11,0 |
|                                                                                                            | II: 43 °C / 60 °C  |                                      | 13,0 | 11,0 | 10,0                                | 10,0 |
|                                                                                                            | III: 50 °C / 72 °C |                                      | 9,0  | 9,0  | 9,0                                 | 8,5  |
| <u>Hammer-drilling with standard drill bit (water filled hole)</u>                                         |                    |                                      |      |      |                                     |      |
| Temperature range                                                                                          | I: 24 °C / 43 °C   | $\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ] | 14,0 | 12,0 | 12,0                                | 11,0 |
|                                                                                                            | II: 43 °C / 60 °C  |                                      | 10,0 | 9,5  | 9,0                                 | 8,5  |
|                                                                                                            | III: 50 °C / 72 °C |                                      | 9,0  | 8,0  | 7,5                                 | 7,0  |
| <b>Installation factors</b>                                                                                |                    |                                      |      |      |                                     |      |
| Dry or wet concrete                                                                                        | $\gamma_{inst}$    | [-]                                  | 1,2  |      |                                     |      |
| Water filled hole                                                                                          |                    |                                      | 1,4  |      |                                     |      |
| <b>Cracked concrete</b>                                                                                    |                    |                                      |      |      |                                     |      |
| <b>Characteristic bond resistance in cracked concrete C20/25</b>                                           |                    |                                      |      |      |                                     |      |
| <u>Hammer-drilling with standard drill bit (dry or wet concrete)</u>                                       |                    |                                      |      |      |                                     |      |
| Temperature range                                                                                          | I: 24 °C / 43 °C   | $\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]  | 7,0  | 6,5  | 6,0                                 | 6,0  |
|                                                                                                            | II: 43 °C / 60 °C  |                                      | 6,5  | 6,0  | 6,0                                 | 5,5  |
|                                                                                                            | III: 50 °C / 72 °C |                                      | 6,0  | 5,5  | 5,5                                 | 5,5  |
| <u>Hammer-drilling with standard drill bit (water filled hole)</u>                                         |                    |                                      |      |      |                                     |      |
| Temperature range                                                                                          | I: 24 °C / 43 °C   | $\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]  | 7,0  | 6,5  | 6,0                                 | 6,0  |
|                                                                                                            | II: 43 °C / 60 °C  |                                      | 5,5  | 5,0  | 4,5                                 | 4,0  |
|                                                                                                            | III: 50 °C / 72 °C |                                      | 5,5  | 5,0  | 4,0                                 | 4,0  |
| <b>Installation factors</b>                                                                                |                    |                                      |      |      |                                     |      |
| Dry or wet concrete                                                                                        | $\gamma_{inst}$    | [-]                                  | 1,2  |      |                                     |      |
| Water filled hole                                                                                          |                    |                                      | 1,4  |      |                                     |      |
|                                                                                                            |                    |                                      |      |      |                                     |      |
| fischer injection system FIS EB II                                                                         |                    |                                      |      |      | <b>Annex C6</b><br>Appendix 24 / 34 |      |
| <b>Performance</b><br>Characteristic resistance for combined pull-out and concrete failure for fischer FRA |                    |                                      |      |      |                                     |      |

**Table C7.1: Displacements for Anchor rods and Threaded rods**

| Anchor rod                                                                                                                                                                                                                             |                           | M8   | M10  | M12  | M16                                                                                                                                                                                                     | M20  | M24  | M27  | M30  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------|------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| Displacement-Factors for tension loading <sup>1)</sup>                                                                                                                                                                                 |                           |      |      |      |                                                                                                                                                                                                         |      |      |      |      |
| Uncracked or cracked concrete; Temperature range I, II, III                                                                                                                                                                            |                           |      |      |      |                                                                                                                                                                                                         |      |      |      |      |
| $\delta_{N0}$ -Factor                                                                                                                                                                                                                  | [mm/(N/mm <sup>2</sup> )] | 0,08 | 0,08 | 0,09 | 0,10                                                                                                                                                                                                    | 0,11 | 0,12 | 0,12 | 0,13 |
| $\delta_{N\infty}$ -Factor                                                                                                                                                                                                             |                           | 0,11 | 0,12 | 0,13 | 0,15                                                                                                                                                                                                    | 0,16 | 0,17 | 0,18 | 0,19 |
| Displacement-Factors for shear loading <sup>2)</sup>                                                                                                                                                                                   |                           |      |      |      |                                                                                                                                                                                                         |      |      |      |      |
| Uncracked or cracked concrete; Temperature range I, II, III                                                                                                                                                                            |                           |      |      |      |                                                                                                                                                                                                         |      |      |      |      |
| $\delta_{V0}$ -Factor                                                                                                                                                                                                                  | [mm/kN]                   | 0,19 | 0,15 | 0,13 | 0,10                                                                                                                                                                                                    | 0,08 | 0,07 | 0,06 | 0,05 |
| $\delta_{V\infty}$ -Factor                                                                                                                                                                                                             |                           | 0,28 | 0,22 | 0,19 | 0,14                                                                                                                                                                                                    | 0,11 | 0,10 | 0,09 | 0,08 |
| 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 |      |      |      |      |

**Table C7.2: Displacements for Rebars and fischer FRA**

| Nominal diameter of the rebar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | φ                         | 8               | 10              | 12   | 14              | 16   | 20   | 25   | 26              | 28              | 30              | 32              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------|-----------------|------|-----------------|------|------|------|-----------------|-----------------|-----------------|-----------------|
| fischer FRA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                           | - <sup>1)</sup> | - <sup>1)</sup> | M12  | - <sup>1)</sup> | M16  | M20  | M24  | - <sup>1)</sup> | - <sup>1)</sup> | - <sup>1)</sup> | - <sup>1)</sup> |
| Displacement-Factors for tension loading <sup>2)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                           |                 |                 |      |                 |      |      |      |                 |                 |                 |                 |
| Uncracked or cracked concrete; Temperature range I, II, III                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                           |                 |                 |      |                 |      |      |      |                 |                 |                 |                 |
| δ <sub>N0</sub> -Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | [mm/(N/mm <sup>2</sup> )] | 0,08            | 0,08            | 0,09 | 0,10            | 0,10 | 0,11 | 0,12 | 0,12            | 0,13            | 0,13            | 0,13            |
| δ <sub>N∞</sub> -Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                           | 0,11            | 0,12            | 0,13 | 0,14            | 0,15 | 0,16 | 0,18 | 0,18            | 0,19            | 0,19            | 0,20            |
| Displacement-Factors for shear loading <sup>3)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                           |                 |                 |      |                 |      |      |      |                 |                 |                 |                 |
| Uncracked or cracked concrete; Temperature range I, II, III                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                           |                 |                 |      |                 |      |      |      |                 |                 |                 |                 |
| δ <sub>V0</sub> -Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | [mm/kN]                   | 0,19            | 0,15            | 0,13 | 0,11            | 0,10 | 0,08 | 0,06 | 0,06            | 0,06            | 0,05            | 0,05            |
| δ <sub>V∞</sub> -Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                           | 0,28            | 0,22            | 0,19 | 0,16            | 0,14 | 0,11 | 0,09 | 0,09            | 0,08            | 0,08            | 0,07            |
| <div><div><div>1) Anchor type not part of the assessment</div><div>2) Calculation of effective displacement:</div><div>δ<sub>N0</sub> = δ<sub>N0</sub>-Factor · τ</div><div>δ<sub>N∞</sub> = δ<sub>N∞</sub>-Factor · τ</div><div>τ = acting bond strength under tension loading</div></div><div><div>3) Calculation of effective displacement:</div><div>δ<sub>V0</sub> = δ<sub>V0</sub>-Factor · V</div><div>δ<sub>V∞</sub> = δ<sub>V∞</sub>-Factor · V</div><div>V = acting shear loading</div></div></div> |                           |                 |                 |      |                 |      |      |      |                 |                 |                 |                 |

fischer injection system FIS EB II

**Performance**

Displacements for Anchor rods, Threaded rods, Rebars and fischer FRA

**Annex C7**

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**Table C8.1:** Characteristics resistance to **steel failure** under tension / shear loading of **Anchor rods and Threaded rods** under seismic action performance category **C1 or C2**

| Anchor rod / Threaded rod                                                                      |                                                                |                   |     | M12  | M14  | M16             | M20   | M22   | M24             | M27   | M30             |                 |
|------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-------------------|-----|------|------|-----------------|-------|-------|-----------------|-------|-----------------|-----------------|
| Characteristic resistance to steel failure under tension loading <sup>1)</sup>                 |                                                                |                   |     |      |      |                 |       |       |                 |       |                 |                 |
| Anchor rods and Threaded rods, performance category C1                                         |                                                                |                   |     |      |      |                 |       |       |                 |       |                 |                 |
| Characteristic re-<br>sistance $N_{Rk,s,C1}$                                                   | Steel zinc plated                                              | Property<br>class | 4.8 | [kN] | 33,7 | 46,0            | 62,8  | 98,0  | 121,2           | 141,2 | 183,6           | 224,4           |
|                                                                                                |                                                                |                   | 5.8 |      | 42,1 | 57,5            | 78,5  | 122,5 | 151,5           | 176,5 | 229,5           | 280,5           |
|                                                                                                | Stainless steel R and<br>high corrosion<br>resistant steel HCR |                   | 8.8 |      | 67,4 | 92,0            | 125,6 | 196,0 | 242,4           | 282,4 | 367,2           | 448,8           |
|                                                                                                |                                                                |                   | 50  |      | 42,1 | 57,5            | 78,5  | 122,5 | 151,5           | 176,5 | 229,5           | 280,5           |
|                                                                                                |                                                                |                   | 70  |      | 59,0 | 80,5            | 109,9 | 171,5 | 212,1           | 247,1 | 321,3           | 392,7           |
|                                                                                                |                                                                |                   | 80  |      | 67,4 | 92,0            | 125,6 | 196,0 | 242,4           | 282,4 | 367,2           | 448,8           |
| Anchor rods and Threaded rods, performance category C2                                         |                                                                |                   |     |      |      |                 |       |       |                 |       |                 |                 |
| Characteristic re-<br>sistance $N_{Rk,s,C2}$                                                   | Steel zinc plated                                              | Property<br>class | 4.8 | [-]  | 30,3 | - <sup>2)</sup> | 56,5  | 88,2  | - <sup>2)</sup> | 141,2 | - <sup>2)</sup> | - <sup>2)</sup> |
|                                                                                                |                                                                |                   | 5.8 |      | 37,9 | - <sup>2)</sup> | 70,6  | 110,2 | - <sup>2)</sup> | 176,5 | - <sup>2)</sup> | - <sup>2)</sup> |
|                                                                                                | Stainless steel R and<br>high corrosion<br>resistant steel HCR |                   | 8.8 |      | 60,6 | - <sup>2)</sup> | 113,0 | 176,4 | - <sup>2)</sup> | 282,4 | - <sup>2)</sup> | - <sup>2)</sup> |
|                                                                                                |                                                                |                   | 50  |      | 37,9 | - <sup>2)</sup> | 70,6  | 110,2 | - <sup>2)</sup> | 176,5 | - <sup>2)</sup> | - <sup>2)</sup> |
|                                                                                                |                                                                |                   | 70  |      | 53,1 | - <sup>2)</sup> | 98,9  | 154,3 | - <sup>2)</sup> | 247,1 | - <sup>2)</sup> | - <sup>2)</sup> |
|                                                                                                |                                                                |                   | 80  |      | 60,6 | - <sup>2)</sup> | 113,0 | 176,4 | - <sup>2)</sup> | 282,4 | - <sup>2)</sup> | - <sup>2)</sup> |
| Characteristic resistance to steel failure under shear loading without lever arm <sup>1)</sup> |                                                                |                   |     |      |      |                 |       |       |                 |       |                 |                 |
| Anchor rods, performance category C1                                                           |                                                                |                   |     |      |      |                 |       |       |                 |       |                 |                 |
| Characteristic re-<br>sistance $V_{Rk,s,C1}^0$                                                 | Steel zinc plated                                              | Property<br>class | 4.8 | [kN] | 20,2 | 27,6            | 37,6  | 58,8  | 72,7            | 84,7  | 110,1           | 134,6           |
|                                                                                                |                                                                |                   | 5.8 |      | 25,2 | 34,5            | 47,1  | 73,5  | 90,9            | 105,9 | 137,7           | 168,3           |
|                                                                                                | Stainless steel R and<br>high corrosion<br>resistant steel HCR |                   | 8.8 |      | 33,7 | 46,0            | 62,8  | 98,0  | 121,2           | 141,2 | 183,6           | 224,4           |
|                                                                                                |                                                                |                   | 50  |      | 21,0 | 28,7            | 39,2  | 61,2  | 75,7            | 88,2  | 114,7           | 140,2           |
|                                                                                                |                                                                |                   | 70  |      | 29,5 | 40,2            | 54,9  | 85,7  | 106,0           | 123,5 | 160,6           | 196,3           |
|                                                                                                |                                                                |                   | 80  |      | 33,7 | 46,0            | 62,8  | 98,0  | 121,2           | 141,2 | 183,6           | 224,4           |
| Threaded rods, performance category C1                                                         |                                                                |                   |     |      |      |                 |       |       |                 |       |                 |                 |
| Characteristic re-<br>sistance $V_{Rk,s,C1}^0$                                                 | Steel zinc plated                                              | Property<br>class | 4.8 | [kN] | 14,1 | 19,3            | 26,3  | 41,1  | 50,9            | 59,3  | 77,1            | 94,2            |
|                                                                                                |                                                                |                   | 5.8 |      | 17,7 | 24,1            | 32,9  | 51,4  | 63,6            | 74,1  | 96,3            | 117,8           |
|                                                                                                | Stainless steel R and<br>high corrosion<br>resistant steel HCR |                   | 8.8 |      | 23,6 | 32,2            | 43,9  | 68,6  | 84,8            | 98,8  | 128,5           | 157,0           |
|                                                                                                |                                                                |                   | 50  |      | 14,7 | 20,1            | 27,4  | 42,8  | 53,0            | 61,7  | 80,3            | 98,1            |
|                                                                                                |                                                                |                   | 70  |      | 20,6 | 28,1            | 38,4  | 60,0  | 74,2            | 86,4  | 112,4           | 137,4           |
|                                                                                                |                                                                |                   | 80  |      | 23,6 | 32,2            | 43,9  | 68,6  | 84,8            | 98,8  | 128,5           | 157,0           |
| Anchor rods and Threaded rods, performance category C2                                         |                                                                |                   |     |      |      |                 |       |       |                 |       |                 |                 |
| Characteristic re-<br>sistance $V_{Rk,s,C2}^0$                                                 | Steel zinc plated                                              | Property<br>class | 4.8 | [-]  | 13,3 | - <sup>2)</sup> | 28,2  | 45,2  | - <sup>2)</sup> | 77,0  | - <sup>2)</sup> | - <sup>2)</sup> |
|                                                                                                |                                                                |                   | 5.8 |      | 16,6 | - <sup>2)</sup> | 35,3  | 56,5  | - <sup>2)</sup> | 96,3  | - <sup>2)</sup> | - <sup>2)</sup> |
|                                                                                                | Stainless steel R and<br>high corrosion<br>resistant steel HCR |                   | 8.8 |      | 22,2 | - <sup>2)</sup> | 47,1  | 75,4  | - <sup>2)</sup> | 128,4 | - <sup>2)</sup> | - <sup>2)</sup> |
|                                                                                                |                                                                |                   | 50  |      | 13,9 | - <sup>2)</sup> | 29,4  | 47,1  | - <sup>2)</sup> | 80,3  | - <sup>2)</sup> | - <sup>2)</sup> |
|                                                                                                |                                                                |                   | 70  |      | 19,4 | - <sup>2)</sup> | 41,2  | 66,0  | - <sup>2)</sup> | 112,4 | - <sup>2)</sup> | - <sup>2)</sup> |
|                                                                                                |                                                                |                   | 80  |      | 22,2 | - <sup>2)</sup> | 47,1  | 75,4  | - <sup>2)</sup> | 128,4 | - <sup>2)</sup> | - <sup>2)</sup> |

<sup>1)</sup> Partial factors for performance category C1 or C2 see **Table C10.1**;  
for anchor rods the factor for steel ductility is 1,0

<sup>2)</sup> No performance assessed

fischer injection system FIS EB II

#### Performance

Characteristic resistance to steel failure for Anchor rods and Threaded rods under seismic action (performance category C1 / C2)

#### Annex C8

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**Table C9.1:** Characteristic resistance to **steel failure** under tension / shear loading of **Rebars (B500B)** under seismic action performance category **C1 or C2**

| Nominal diameter of the rebar                                                                   | $\phi$          | 12   | 14   | 16              | 20    | 25    | 26              | 28              | 30              |                 |
|-------------------------------------------------------------------------------------------------|-----------------|------|------|-----------------|-------|-------|-----------------|-----------------|-----------------|-----------------|
| Characteristic resistance to steel failure under tension loading <sup>1)</sup>                  |                 |      |      |                 |       |       |                 |                 |                 |                 |
| Rebar B500B acc. to DIN 488-2:2009-08, performance category C1                                  |                 |      |      |                 |       |       |                 |                 |                 |                 |
| Characteristic resistance                                                                       | $N_{Rk,s,C1}$   | [kN] | 61,0 | 83,1            | 108,5 | 169,5 | 265,1           | 286,2           | 332,6           | 381,2           |
| Rebar B500B acc. to DIN 488-2:2009-08, performance category C2                                  |                 |      |      |                 |       |       |                 |                 |                 |                 |
| Characteristic resistance                                                                       | $N_{Rk,s,C2}$   | [kN] | 54,9 | - <sup>2)</sup> | 97,6  | 152,6 | - <sup>2)</sup> | - <sup>2)</sup> | - <sup>2)</sup> | - <sup>2)</sup> |
| Characteristic resistance to steel failure under shear loading, without lever arm <sup>1)</sup> |                 |      |      |                 |       |       |                 |                 |                 |                 |
| Rebar B500B acc. to DIN 488-2:2009-08, performance category C1                                  |                 |      |      |                 |       |       |                 |                 |                 |                 |
| Characteristic resistance                                                                       | $V^0_{Rk,s,C1}$ | [kN] | 21,3 | 29,1            | 37,9  | 59,3  | 92,7            | 100,1           | 116,4           | 133,4           |
| Rebar B500B acc. to DIN 488-2:2009-08, performance category C2                                  |                 |      |      |                 |       |       |                 |                 |                 |                 |
| Characteristic resistance                                                                       | $V^0_{Rk,s,C2}$ | [kN] | 20,1 | - <sup>2)</sup> | 40,7  | 65,2  | - <sup>2)</sup> | - <sup>2)</sup> | - <sup>2)</sup> | - <sup>2)</sup> |

<sup>1)</sup> Partial factors for performance category C1 or C2 see **Table C10.1**

<sup>2)</sup> No performance assessed

**Table C9.2:** Characteristic resistance to **steel failure** under tension / shear loading of **fischer FRA** under seismic action performance category **C1 or C2**

| fischer FRA                                                                                     |                                   |      | M12  | M16   | M20   | M24             |
|-------------------------------------------------------------------------------------------------|-----------------------------------|------|------|-------|-------|-----------------|
| Characteristic resistance to steel failure under tension loading <sup>1)</sup>                  |                                   |      |      |       |       |                 |
| fischer FRA, performance category C1                                                            |                                   |      |      |       |       |                 |
| Characteristic resistance                                                                       | N <sub>Rk,s,C1</sub>              | [kN] | 62,1 | 110,5 | 172,7 | 263,0           |
| fischer FRA, performance category C2                                                            |                                   |      |      |       |       |                 |
| Characteristic resistance                                                                       | N <sub>Rk,s,C2</sub>              | [kN] | 55,8 | 99,4  | 155,4 | - <sup>2)</sup> |
| Characteristic resistance to steel failure under shear loading, without lever arm <sup>1)</sup> |                                   |      |      |       |       |                 |
| fischer FRA, performance category C1                                                            |                                   |      |      |       |       |                 |
| Characteristic resistance                                                                       | V <sup>0</sup> <sub>Rk,s,C1</sub> | [kN] | 33,7 | 62,8  | 98,0  | 141,2           |
| fischer FRA, performance category C2                                                            |                                   |      |      |       |       |                 |
| Characteristic resistance                                                                       | V <sup>0</sup> <sub>Rk,s,C2</sub> | [kN] | 22,2 | 47,1  | 75,4  | - <sup>2)</sup> |

<sup>1)</sup> Partial factors for performance category C1 or C2 see **Table C10.1**

<sup>2)</sup> No performance assessed

fischer injection system FIS EB II

**Performance**

Characteristic resistance to steel failure under tension / shear loading of Rebars and fischer FRA under seismic action performance category C1 or C2

**Annex C9**

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**Table C10.1: Partial factors for Anchor rods, Threaded rods, Rebars (B500B) and fischer FRA under seismic action performance category C1 or C2**

|                                      |     |    |     |    |     |    |     |    |     |  |     |  |
|--------------------------------------|-----|----|-----|----|-----|----|-----|----|-----|--|-----|--|
| Anchor rod / Threaded rod            | M12 |    | M16 |    | M20 |    | M24 |    | M27 |  | M30 |  |
| Nominal diameter of the rebar $\phi$ | 12  | 14 | 16  | 20 | 25  | 26 | 28  | 30 |     |  |     |  |
| fischer FRA                          | M12 |    | M16 |    | M20 |    | M24 |    | _3) |  | _3) |  |

**Tension loading, steel failure<sup>1)</sup>**

|                              |                                                          |       |     |                                        |
|------------------------------|----------------------------------------------------------|-------|-----|----------------------------------------|
| Partial factor $\gamma_{Ms}$ | Steel zinc plated                                        | 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    |     | 1,87 / fischer HCR: 1,50 <sup>2)</sup> |
|                              |                                                          | 80    |     | 1,60                                   |
|                              |                                                          | Rebar |     | B500B                                  |
|                              | fischer                                                  | FRA   |     | 1,40                                   |

Shear loading, steel failure<sup>1)</sup>

|                              |                                                          |       |     |                                        |
|------------------------------|----------------------------------------------------------|-------|-----|----------------------------------------|
| Partial factor $\gamma_{Ms}$ | Steel zinc plated                                        | 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    |     | 1,56 / fischer HCR: 1,25 <sup>2)</sup> |
|                              |                                                          | 80    |     | 1,33                                   |
|                              | Rebar                                                    | B500B |     | 1,50                                   |
|                              | fischer                                                  | FRA   |     | 1,50                                   |

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

<sup>2)</sup> Only admissible for high corrosion resistant steel HCR, acc to **Table A5.1**.

3) Anchor type not part of the assessment

fischer injection system FIS EB II

## Performance

Partial factors for Anchor rods, Threaded rods, Rebars and fischer FRA under seismic action performance category C1 or C2

## Annex C10

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**Table C11.1: Characteristics resistance for combined pull-out and concrete failure for Anchor rods and Threaded rods in hammer drilled holes under seismic action performance category C1**

| Anchor rod / Threaded rod                                                         |                    |                 | M12                  | M16 | M20 | M24 | M27 | M30 |     |
|-----------------------------------------------------------------------------------|--------------------|-----------------|----------------------|-----|-----|-----|-----|-----|-----|
| Characteristic bond resistance, combined pull-out and concrete cone failure       |                    |                 |                      |     |     |     |     |     |     |
| Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete) |                    |                 |                      |     |     |     |     |     |     |
| Temperature range                                                                 | I: 24 °C / 43 °C   | $\tau_{Rk,C1}$  | [N/mm <sup>2</sup> ] | 6,5 | 5,6 | 5,0 | 5,5 | 5,5 | 5,5 |
|                                                                                   | II: 43 °C / 60 °C  |                 |                      | 6,5 | 5,6 | 5,0 | 5,5 | 5,5 | 5,5 |
|                                                                                   | III: 50 °C / 72 °C |                 |                      | 5,7 | 5,5 | 5,0 | 5,0 | 5,0 | 5,0 |
| Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)   |                    |                 |                      |     |     |     |     |     |     |
| Temperature range                                                                 | I: 24 °C / 43 °C   | $\tau_{Rk,C1}$  | [N/mm <sup>2</sup> ] | 6,5 | 5,0 | 4,7 | 4,7 | 4,7 | 4,7 |
|                                                                                   | II: 43 °C / 60 °C  |                 |                      | 6,5 | 5,0 | 4,7 | 4,7 | 4,7 | 4,7 |
|                                                                                   | III: 50 °C / 72 °C |                 |                      | 5,7 | 5,5 | 5,0 | 5,0 | 5,0 | 5,0 |
| Installation factors                                                              |                    |                 |                      |     |     |     |     |     |     |
| Tension loading                                                                   |                    |                 |                      |     |     |     |     |     |     |
| Dry or wet concrete                                                               |                    | $\gamma_{inst}$ | [-]                  | 1,2 |     |     |     |     |     |
| Water filled hole                                                                 |                    |                 |                      | 1,4 |     |     |     |     |     |

**Table C11.2: Characteristics resistance for combined pull-out and concrete failure for Rebars and fischer FRA in hammer drilled holes under seismic action performance category C1**

| Nominal diameter of the rebar                                                     |                    | $\phi$          | 12                   | 14              | 16  | 20  | 25  | 26              | 28              | 30              |     |
|-----------------------------------------------------------------------------------|--------------------|-----------------|----------------------|-----------------|-----|-----|-----|-----------------|-----------------|-----------------|-----|
| fischer FRA                                                                       |                    |                 | M12                  | - <sup>1)</sup> | M16 | M20 | M24 | - <sup>1)</sup> | - <sup>1)</sup> | - <sup>1)</sup> |     |
| Characteristic bond resistance, combined pull-out and concrete cone failure       |                    |                 |                      |                 |     |     |     |                 |                 |                 |     |
| Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete) |                    |                 |                      |                 |     |     |     |                 |                 |                 |     |
| Temperature range                                                                 | I: 24 °C / 43 °C   | $\tau_{Rk,C1}$  | [N/mm <sup>2</sup> ] | 6,5             | 6,0 | 6,0 | 6,0 | 5,5             | 5,5             | 5,5             | 5,5 |
|                                                                                   | II: 43 °C / 60 °C  |                 |                      | 6,5             | 6,0 | 6,0 | 6,0 | 5,5             | 5,5             | 5,5             | 5,5 |
|                                                                                   | III: 50 °C / 72 °C |                 |                      | 5,7             | 5,5 | 5,5 | 5,0 | 5,0             | 5,0             | 5,0             | 5,0 |
| Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)   |                    |                 |                      |                 |     |     |     |                 |                 |                 |     |
| Temperature range                                                                 | I: 24 °C / 43 °C   | $\tau_{Rk,C1}$  | [N/mm <sup>2</sup> ] | 6,5             | 6,0 | 5,0 | 4,7 | 4,7             | 4,7             | 4,7             | 4,7 |
|                                                                                   | II: 43 °C / 60 °C  |                 |                      | 6,5             | 6,0 | 5,0 | 4,7 | 4,7             | 4,7             | 4,7             | 4,7 |
|                                                                                   | III: 50 °C / 72 °C |                 |                      | 5,7             | 5,5 | 5,5 | 4,7 | 4,7             | 4,7             | 4,7             | 4,7 |
| Installation factors                                                              |                    |                 |                      |                 |     |     |     |                 |                 |                 |     |
| Tension loading                                                                   |                    |                 |                      |                 |     |     |     |                 |                 |                 |     |
| Dry or wet concrete                                                               |                    | $\gamma_{inst}$ | [-]                  | 1,2             |     |     |     |                 |                 |                 |     |
| Water filled hole                                                                 |                    |                 |                      | 1,4             |     |     |     |                 |                 |                 |     |

<sup>1)</sup> Anchor type not part of the assessment

|                                                                                                                                                        |                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| fischer injection system FIS EB II                                                                                                                     | <b>Annex C11</b><br>Appendix 29 / 34 |
| <b>Performance</b><br>Characteristics resistance under seismic action (performance category C1) for Anchor rods, Threaded rods, Rebars and fischer FRA |                                      |

**Table C12.1: Characteristics resistance for combined pull-out and concrete failure for Anchor rods and Threaded rods in hammer drilled holes under seismic action performance category C2**

| Anchor rod / Threaded rod                                                                                                |                    | M12                                 | M16                                                           | M20  | M24                           |      |
|--------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------------------|---------------------------------------------------------------|------|-------------------------------|------|
| Characteristic bond resistance, combined pull-out and concrete cone failure                                              |                    |                                     |                                                               |      |                               |      |
| Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)                                        |                    |                                     |                                                               |      |                               |      |
| Temperature range                                                                                                        | I: 24 °C / 43 °C   | $\tau_{Rk,C2}$ [N/mm <sup>2</sup> ] | 3,5                                                           | 5,0  | 3,5                           | 3,5  |
|                                                                                                                          | II: 43 °C / 60 °C  |                                     | 3,5                                                           | 5,0  | 3,5                           | 3,5  |
|                                                                                                                          | III: 50 °C / 72 °C |                                     | 2,7                                                           | 3,8  | 2,6                           | 2,9  |
| Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)                                          |                    |                                     |                                                               |      |                               |      |
| Temperature range                                                                                                        | I: 24 °C / 43 °C   | $\tau_{Rk,C2}$ [N/mm <sup>2</sup> ] | 3,5                                                           | 5,6  | 3,8                           | 3,0  |
|                                                                                                                          | II: 43 °C / 60 °C  |                                     | 3,5                                                           | 5,2  | 3,6                           | 3,0  |
|                                                                                                                          | III: 50 °C / 72 °C |                                     | 2,7                                                           | 3,8  | 2,6                           | 2,8  |
| Installation factors                                                                                                     |                    |                                     |                                                               |      |                               |      |
| Tension loading                                                                                                          |                    |                                     |                                                               |      |                               |      |
| Dry or wet concrete                                                                                                      |                    | $\gamma_{inst}$ [-]                 | 1,2                                                           |      |                               |      |
| Water filled hole                                                                                                        |                    |                                     | 1,4                                                           |      |                               |      |
| Displacement-Factors for tension loading <sup>1)</sup>                                                                   |                    |                                     |                                                               |      |                               |      |
| $\delta_{N,(DLS)}\text{-Factor}$                                                                                         |                    | [mm/(N/mm <sup>2</sup> )]           | 0,06                                                          | 0,11 | 0,08                          | 0,12 |
| $\delta_{N,(ULS)}\text{-Factor}$                                                                                         |                    |                                     | 0,13                                                          | 0,14 | 0,09                          | 0,18 |
| Displacement-Factors for shear loading <sup>2)</sup>                                                                     |                    |                                     |                                                               |      |                               |      |
| $\delta_{V,(DLS)}\text{-Factor}$                                                                                         |                    | [mm/kN]                             | 0,18                                                          | 0,10 | 0,07                          | 0,06 |
| $\delta_{V,(ULS)}\text{-Factor}$                                                                                         |                    |                                     | 0,25                                                          | 0,14 | 0,11                          | 0,09 |
| 1) Calculation of effective displacement:                                                                                |                    |                                     | 2) Calculation of effective displacement:                     |      |                               |      |
| $\delta_{N,C2(DLS)} = \delta_{N,(DLS)\text{-Factor}} \cdot \tau$                                                         |                    |                                     | $\delta_{V,C2(DLS)} = \delta_{V,(DLS)\text{-Factor}} \cdot V$ |      |                               |      |
| $\delta_{N,C2(ULS)} = \delta_{N,(ULS)\text{-Factor}} \cdot \tau$                                                         |                    |                                     | $\delta_{V,C2(ULS)} = \delta_{V,(ULS)\text{-Factor}} \cdot V$ |      |                               |      |
| $\tau$ = acting bond strength under tension loading                                                                      |                    |                                     | $V$ = acting shear loading                                    |      |                               |      |
| fischer injection system FIS EB II                                                                                       |                    |                                     |                                                               |      | Annex C12<br>Appendix 30 / 34 |      |
| Performance<br>Characteristics resistance under seismic action (performance category C2) for Anchor rods, Threaded rods. |                    |                                     |                                                               |      |                               |      |

**Table C13.1: Characteristics resistance for combined pull-out and concrete failure for Rebars and fischer FRA in hammer drilled holes under seismic action performance category C2**

| Nominal diameter of the rebar                                                     |                    | $\phi$                    | 12                                                            | 16   | 20   |     |
|-----------------------------------------------------------------------------------|--------------------|---------------------------|---------------------------------------------------------------|------|------|-----|
| fischer FRA                                                                       |                    |                           | M12                                                           | M16  | M20  |     |
| Characteristic bond resistance, combined pull-out and concrete cone failure       |                    |                           |                                                               |      |      |     |
| Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete) |                    |                           |                                                               |      |      |     |
| Temperature range                                                                 | I: 24 °C / 43 °C   | $\tau_{RK,C2}$            | [N/mm <sup>2</sup> ]                                          | 3,5  | 5,0  | 3,5 |
|                                                                                   | II: 43 °C / 60 °C  |                           |                                                               | 3,5  | 5,0  | 3,5 |
|                                                                                   | III: 50 °C / 72 °C |                           |                                                               | 2,7  | 3,8  | 2,6 |
| Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)   |                    |                           |                                                               |      |      |     |
| Temperature range                                                                 | I: 24 °C / 43 °C   | $\tau_{RK,C2}$            | [N/mm <sup>2</sup> ]                                          | 3,5  | 5,6  | 3,8 |
|                                                                                   | II: 43 °C / 60 °C  |                           |                                                               | 3,5  | 5,2  | 3,6 |
|                                                                                   | III: 50 °C / 72 °C |                           |                                                               | 2,7  | 3,8  | 2,6 |
| Installation factors                                                              |                    |                           |                                                               |      |      |     |
| Tension loading                                                                   |                    |                           |                                                               |      |      |     |
| Dry or wet concrete                                                               |                    | $\gamma_{inst}$           | [-]                                                           | 1,2  |      |     |
| Water filled hole                                                                 |                    |                           |                                                               | 1,4  |      |     |
| Displacement-Factors for tension loading <sup>1)</sup>                            |                    |                           |                                                               |      |      |     |
| $\delta_{N,(DLS)}\text{-Factor}$                                                  |                    | [mm/(N/mm <sup>2</sup> )] | 0,06                                                          | 0,11 | 0,08 |     |
| $\delta_{N,(ULS)}\text{-Factor}$                                                  |                    |                           | 0,13                                                          | 0,14 | 0,09 |     |
| Displacement-Factors for shear loading <sup>2)</sup>                              |                    |                           |                                                               |      |      |     |
| $\delta_{V,(DLS)}\text{-Factor}$                                                  |                    | [mm/kN]                   | 0,18                                                          | 0,10 | 0,07 |     |
| $\delta_{V,(ULS)}\text{-Factor}$                                                  |                    |                           | 0,25                                                          | 0,14 | 0,11 |     |
| 1) Calculation of effective displacement:                                         |                    |                           | 2) Calculation of effective displacement:                     |      |      |     |
| $\delta_{N,C2(DLS)} = \delta_{N,(DLS)\text{-Factor}} \cdot \tau$                  |                    |                           | $\delta_{V,C2(DLS)} = \delta_{V,(DLS)\text{-Factor}} \cdot V$ |      |      |     |
| $\delta_{N,C2(ULS)} = \delta_{N,(ULS)\text{-Factor}} \cdot \tau$                  |                    |                           | $\delta_{V,C2(ULS)} = \delta_{V,(ULS)\text{-Factor}} \cdot V$ |      |      |     |
| $\tau$ = acting bond strength under tension loading                               |                    |                           | $V$ = acting shear loading                                    |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
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|                                                                                   |                    |                           |                                                               |      |      |     |
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|                                                                                   |                    |                           |                                                               |      |      |     |
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|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
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|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
|                                                                                   |                    |                           |                                                               |      |      |     |
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**Table C14.1: Fire resistance to steel failure under tension and shear loading of Anchor rods and Threaded rods**

**Fire resistance to steel failure under tension and shear loading**

| <b>Anchor rod / Threaded rod</b>                            | <b>R30</b>               |                          |                            | <b>R60</b>                |                           |                             |
|-------------------------------------------------------------|--------------------------|--------------------------|----------------------------|---------------------------|---------------------------|-----------------------------|
| Steel zinc plated                                           | $N_{Rk,s,fi,30}$<br>[kN] | $V_{Rk,s,fi,30}$<br>[kN] | $M^0_{Rk,s,fi,30}$<br>[Nm] | $N_{Rk,s,fi,60}$<br>[kN]  | $V_{Rk,s,fi,60}$<br>[kN]  | $M^0_{Rk,s,fi,60}$<br>[Nm]  |
| M8                                                          | 0,4                      | 0,4                      | 0,4                        | 0,3                       | 0,3                       | 0,3                         |
| M10                                                         | 0,9                      | 0,9                      | 1,1                        | 0,8                       | 0,8                       | 1,0                         |
| M12                                                         | 1,7                      | 1,7                      | 2,6                        | 1,3                       | 1,3                       | 2,0                         |
| M16                                                         | 3,1                      | 3,1                      | 6,7                        | 2,4                       | 2,4                       | 5,0                         |
| M20                                                         | 4,9                      | 4,9                      | 13,0                       | 3,7                       | 3,7                       | 9,7                         |
| M24                                                         | 7,1                      | 7,1                      | 22,5                       | 5,3                       | 5,3                       | 16,8                        |
| M27                                                         | 9,2                      | 9,2                      | 33,3                       | 6,9                       | 6,9                       | 25,0                        |
| M30                                                         | 11,2                     | 11,2                     | 45,0                       | 8,4                       | 8,4                       | 33,7                        |
| <b>Anchor rod / Threaded rod</b>                            | <b>R90</b>               |                          |                            | <b>R120</b>               |                           |                             |
| Steel zinc plated                                           | $N_{Rk,s,fi,90}$<br>[kN] | $V_{Rk,s,fi,90}$<br>[kN] | $M^0_{Rk,s,fi,90}$<br>[Nm] | $N_{Rk,s,fi,120}$<br>[kN] | $V_{Rk,s,fi,120}$<br>[kN] | $M^0_{Rk,s,fi,120}$<br>[Nm] |
| M8                                                          | 0,3                      | 0,3                      | 0,3                        | 0,2                       | 0,2                       | 0,2                         |
| M10                                                         | 0,6                      | 0,6                      | 0,7                        | 0,5                       | 0,5                       | 0,6                         |
| M12                                                         | 1,1                      | 1,1                      | 1,7                        | 0,8                       | 0,8                       | 1,3                         |
| M16                                                         | 2,0                      | 2,0                      | 4,3                        | 1,6                       | 1,6                       | 3,3                         |
| M20                                                         | 3,2                      | 3,2                      | 8,4                        | 2,5                       | 2,5                       | 6,5                         |
| M24                                                         | 4,6                      | 4,6                      | 14,6                       | 3,5                       | 3,5                       | 11,2                        |
| M27                                                         | 6,0                      | 6,0                      | 21,6                       | 4,6                       | 4,6                       | 16,6                        |
| M30                                                         | 7,3                      | 7,3                      | 29,2                       | 5,6                       | 5,6                       | 22,5                        |
| <b>Anchor rod / Threaded rod</b>                            | <b>R30</b>               |                          |                            | <b>R60</b>                |                           |                             |
| Stainless steel R and<br>high corrosion resistant steel HCR | $N_{Rk,s,fi,30}$<br>[kN] | $V_{Rk,s,fi,30}$<br>[kN] | $M^0_{Rk,s,fi,30}$<br>[Nm] | $N_{Rk,s,fi,60}$<br>[kN]  | $V_{Rk,s,fi,60}$<br>[kN]  | $M^0_{Rk,s,fi,60}$<br>[Nm]  |
| M8                                                          | 0,7                      | 0,7                      | 0,7                        | 0,6                       | 0,6                       | 0,6                         |
| M10                                                         | 1,5                      | 1,5                      | 1,9                        | 1,2                       | 1,2                       | 1,5                         |
| M12                                                         | 2,5                      | 2,5                      | 3,9                        | 2,1                       | 2,1                       | 3,3                         |
| M16                                                         | 4,7                      | 4,7                      | 10,0                       | 3,9                       | 3,9                       | 8,3                         |
| M20                                                         | 7,4                      | 7,4                      | 19,5                       | 6,1                       | 6,1                       | 16,2                        |
| M24                                                         | 10,6                     | 10,6                     | 33,7                       | 8,8                       | 8,8                       | 28,1                        |
| M27                                                         | 13,8                     | 13,8                     | 49,9                       | 11,5                      | 11,5                      | 41,6                        |
| M30                                                         | 16,8                     | 16,8                     | 67,5                       | 14,0                      | 14,0                      | 56,2                        |
| <b>Anchor rod / Threaded rod</b>                            | <b>R90</b>               |                          |                            | <b>R120</b>               |                           |                             |
| Stainless steel R<br>and high corrosion resistant steel HCR | $N_{Rk,s,fi,90}$<br>[kN] | $V_{Rk,s,fi,90}$<br>[kN] | $M^0_{Rk,s,fi,90}$<br>[Nm] | $N_{Rk,s,fi,120}$<br>[kN] | $V_{Rk,s,fi,120}$<br>[kN] | $M^0_{Rk,s,fi,120}$<br>[Nm] |
| M8                                                          | 0,4                      | 0,4                      | 0,4                        | 0,4                       | 0,4                       | 0,4                         |
| M10                                                         | 0,9                      | 0,9                      | 1,2                        | 0,8                       | 0,8                       | 1,0                         |
| M12                                                         | 1,7                      | 1,7                      | 2,6                        | 1,3                       | 1,3                       | 2,1                         |
| M16                                                         | 3,1                      | 3,1                      | 6,7                        | 2,5                       | 2,5                       | 5,3                         |
| M20                                                         | 4,9                      | 4,9                      | 13,0                       | 3,9                       | 3,9                       | 10,4                        |
| M24                                                         | 7,1                      | 7,1                      | 22,5                       | 5,6                       | 5,6                       | 18,0                        |
| M27                                                         | 9,2                      | 9,2                      | 33,3                       | 7,3                       | 7,3                       | 26,6                        |
| M30                                                         | 11,2                     | 11,2                     | 45,0                       | 9,0                       | 9,0                       | 36,0                        |

fischer injection system FIS EB II

**Performance**

Fire resistance to steel failure under tension and shear loading of Anchor rods and Threaded rods

**Annex C14**

Appendix 32 / 34

**Table C15.1: Fire resistance to steel failure under tension and shear loading of Rebars and fischer FRA**

**Fire resistance to steel failure under tension and shear loading**

| Rebar                                                       | R30                      |                          |                            | R60                       |                           |                             |
|-------------------------------------------------------------|--------------------------|--------------------------|----------------------------|---------------------------|---------------------------|-----------------------------|
| Bars and de-coiled rods                                     | $N_{Rk,s,fi,30}$<br>[kN] | $V_{Rk,s,fi,30}$<br>[kN] | $M^0_{Rk,s,fi,30}$<br>[Nm] | $N_{Rk,s,fi,60}$<br>[kN]  | $V_{Rk,s,fi,60}$<br>[kN]  | $M^0_{Rk,s,fi,60}$<br>[Nm]  |
| φ 8                                                         | 0,5                      | 0,5                      | 0,6                        | 0,5                       | 0,5                       | 0,5                         |
| φ 10                                                        | 1,2                      | 1,2                      | 1,8                        | 1,0                       | 1,0                       | 1,5                         |
| φ 12                                                        | 2,3                      | 2,3                      | 4,1                        | 1,7                       | 1,7                       | 3,0                         |
| φ 14                                                        | 3,1                      | 3,1                      | 6,5                        | 2,3                       | 2,3                       | 4,9                         |
| φ 16                                                        | 4,0                      | 4,0                      | 9,6                        | 3,0                       | 3,0                       | 7,2                         |
| φ 20                                                        | 6,3                      | 6,3                      | 18,8                       | 4,7                       | 4,7                       | 14,1                        |
| φ 25                                                        | 9,8                      | 9,8                      | 36,8                       | 7,4                       | 7,4                       | 27,6                        |
| φ 26                                                        | 10,6                     | 10,6                     | 41,4                       | 8,0                       | 8,0                       | 31,1                        |
| φ 28                                                        | 12,3                     | 12,3                     | 51,8                       | 9,2                       | 9,2                       | 38,8                        |
| φ 30                                                        | 14,1                     | 14,1                     | 63,6                       | 10,6                      | 10,6                      | 47,7                        |
| φ 32                                                        | 16,1                     | 16,1                     | 77,2                       | 12,1                      | 12,1                      | 57,9                        |
| Rebar                                                       | R90                      |                          |                            | R120                      |                           |                             |
| Bars and de-coiled rods                                     | $N_{Rk,s,fi,90}$<br>[kN] | $V_{Rk,s,fi,90}$<br>[kN] | $M^0_{Rk,s,fi,90}$<br>[Nm] | $N_{Rk,s,fi,120}$<br>[kN] | $V_{Rk,s,fi,120}$<br>[kN] | $M^0_{Rk,s,fi,120}$<br>[Nm] |
| φ 8                                                         | 0,4                      | 0,4                      | 0,4                        | 0,3                       | 0,3                       | 0,3                         |
| φ 10                                                        | 0,8                      | 0,8                      | 1,2                        | 0,6                       | 0,6                       | 0,9                         |
| φ 12                                                        | 1,5                      | 1,5                      | 2,6                        | 1,1                       | 1,1                       | 2,0                         |
| φ 14                                                        | 2,0                      | 2,0                      | 4,2                        | 1,5                       | 1,5                       | 3,2                         |
| φ 16                                                        | 2,6                      | 2,6                      | 6,3                        | 2,0                       | 2,0                       | 4,8                         |
| φ 20                                                        | 4,1                      | 4,1                      | 12,2                       | 3,1                       | 3,1                       | 9,4                         |
| φ 25                                                        | 6,4                      | 6,4                      | 23,9                       | 4,9                       | 4,9                       | 18,4                        |
| φ 26                                                        | 6,9                      | 6,9                      | 26,9                       | 5,3                       | 5,3                       | 20,7                        |
| φ 28                                                        | 8,0                      | 8,0                      | 33,6                       | 6,2                       | 6,2                       | 25,9                        |
| φ 30                                                        | 9,2                      | 9,2                      | 41,4                       | 7,1                       | 7,1                       | 31,8                        |
| φ 32                                                        | 10,5                     | 10,5                     | 50,2                       | 8,0                       | 8,0                       | 38,6                        |
| fischer FRA                                                 | R30                      |                          |                            | R60                       |                           |                             |
| Stainless steel R<br>and high corrosion resistant steel HCR | $N_{Rk,s,fi,30}$<br>[kN] | $V_{Rk,s,fi,30}$<br>[kN] | $M^0_{Rk,s,fi,30}$<br>[Nm] | $N_{Rk,s,fi,60}$<br>[kN]  | $V_{Rk,s,fi,60}$<br>[kN]  | $M^0_{Rk,s,fi,60}$<br>[Nm]  |
| M12                                                         | 2,5                      | 2,5                      | 3,9                        | 2,1                       | 2,1                       | 3,3                         |
| M16                                                         | 4,7                      | 4,7                      | 10,0                       | 3,9                       | 3,9                       | 8,3                         |
| M20                                                         | 7,4                      | 7,4                      | 19,5                       | 6,1                       | 6,1                       | 16,2                        |
| M24                                                         | 10,6                     | 10,6                     | 33,7                       | 8,8                       | 8,8                       | 28,1                        |
| fischer FRA                                                 | R90                      |                          |                            | R120                      |                           |                             |
| Stainless steel R<br>and high corrosion resistant steel HCR | $N_{Rk,s,fi,90}$<br>[kN] | $V_{Rk,s,fi,90}$<br>[kN] | $M^0_{Rk,s,fi,90}$<br>[Nm] | $N_{Rk,s,fi,120}$<br>[kN] | $V_{Rk,s,fi,120}$<br>[kN] | $M^0_{Rk,s,fi,120}$<br>[Nm] |
| M12                                                         | 1,7                      | 1,7                      | 2,6                        | 1,3                       | 1,3                       | 2,1                         |
| M16                                                         | 3,1                      | 3,1                      | 6,7                        | 2,5                       | 2,5                       | 5,3                         |
| M20                                                         | 4,9                      | 4,9                      | 13,0                       | 3,9                       | 3,9                       | 10,4                        |
| M24                                                         | 7,1                      | 7,1                      | 22,5                       | 5,6                       | 5,6                       | 18,0                        |

fischer injection system FIS EB II

**Performance**

Fire resistance to steel failure under tension and shear loading of Rebars an fischer FRA

**Annex C15**

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**Characteristic bond resistance for cracked concrete under fire conditions for Anchor rods, Threaded rods, Rebars and fischer FRA for hammer drilled holes**

The characteristic bond resistance for cracked concrete under fire conditions for a given temperature

$\tau_{Rk,fi}(\theta)$  has to be calculated by the following equation:

$$\tau_{Rk,fi}(\theta) = k_{fi,p}(\theta) \cdot \tau_{Rk,cr,C20/25}$$

|                               |                                                                            |                                                                                                                                                                          |  |                  |
|-------------------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------|
| $\theta$                      | =                                                                          | Temperature in °C in the mortar layer                                                                                                                                    |  |                  |
| $\tau_{Rk,fi}(\theta)$        | =                                                                          | Characteristic bond resistance for cracked and uncracked concrete under fire exposure for a given temperature in N/mm <sup>2</sup> for concrete classes C20/25 to C50/60 |  |                  |
| $k_{fi,p}(\theta)$            | =                                                                          | Reduction factor under fire conditions                                                                                                                                   |  |                  |
| $\tau_{Rk,cr,C20/25}$         | =                                                                          | Characteristic bond resistance for cracked concrete C20/25 in N/mm <sup>2</sup> , given in Table C4.1, Table C5.1 or Table C6.1, respectively                            |  |                  |
| Anchor rods and Threaded rods | If: $\theta > 20\text{ °C}$<br>If: $\theta > \theta_{max} = 373\text{ °C}$ | $k_{fi,p}(\theta) = 61,573 \cdot \theta^{-1,400} \geq 1,0$<br>$k_{fi,p}(\theta) = 0$                                                                                     |  | see Figure C16.1 |
| Rebars and fischer FRA        | If: $\theta > 23\text{ °C}$<br>If: $\theta > \theta_{max} = 236\text{ °C}$ | $k_{fi,p}(\theta) = 252,678 \cdot \theta^{-1,777} \geq 1,0$<br>$k_{fi,p}(\theta) = 0$                                                                                    |  | see Figure C16.2 |

**Figure C16.1:** Graph of reduction factor  $k_{fi,p}(\theta)$  for anchor rods threaded rods

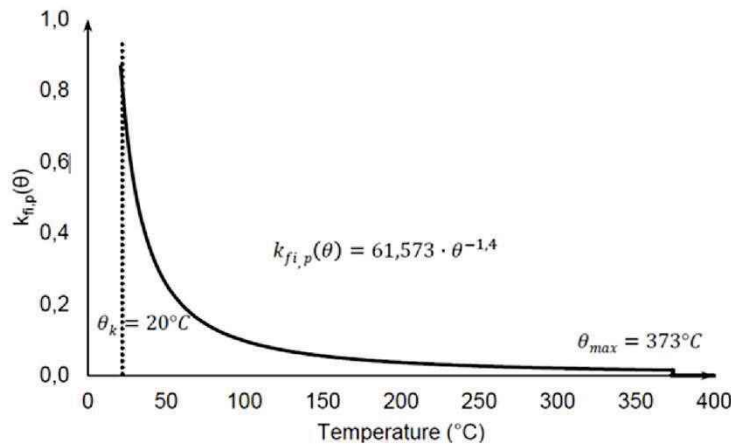
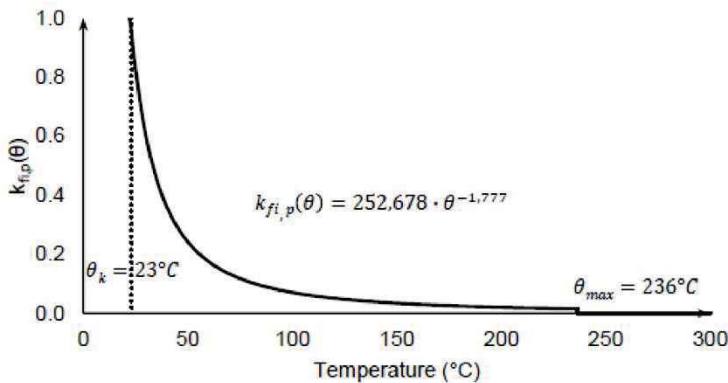


**Figure C16.2:** Graph of reduction factor  $k_{fi,p}(\theta)$  for rebars and fischer FRA



fischer injection system FIS EB II

**Performance**  
Characteristic bond resistance under fire conditions