Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

# European Technical Assessment ETA-16/0908 of 3 April 2017

English translation prepared by DIBt - Original version in German language

**General Part**

| | |
|---|---|
| Technical Assessment Body issuing the European Technical Assessment: | Deutsches Institut für Bautechnik |
| Trade name of the construction product | fischer RebarConnect |
| Product family to which the construction product belongs | Bonded anchor for use in concrete |
| Manufacturer | fischerwerke GmbH & Co. KG<br>Otto-Hahn-Straße 15<br>79211 Denzlingen<br>DEUTSCHLAND |
| Manufacturing plant | fischerwerke |
| This European Technical Assessment contains | 16 pages including 3 annexes which form an integral part of this assessment |
| This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of | Guideline for European technical approval of "Metal anchors for use in concrete", ETAG 001 Part 5: "Bonded anchors", April 2013,<br>used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011. |



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## Specific Part

### 1 Technical description of the product

The fischer RebarConnect is a bonded anchor for use in concrete consisting of a cartridge with injection mortar fischer FIS RC and a reinforcing bar.

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

The product description is given in Annex A.

### 2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

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

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

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

| Essential characteristic | Performance |
|---|---|
| Characteristic values under static and quasi-static action for design according to TR 029 or CEN/TS 1992-4:2009, Displacements;<br>Seismic performance category C1 for design according to Technical Report TR 045, Displacements | See Annex C 1 to C 5 |

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

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

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

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

### 3.4 Safety in use (BWR 4)

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

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

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

The system to be applied is: 1

## 5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

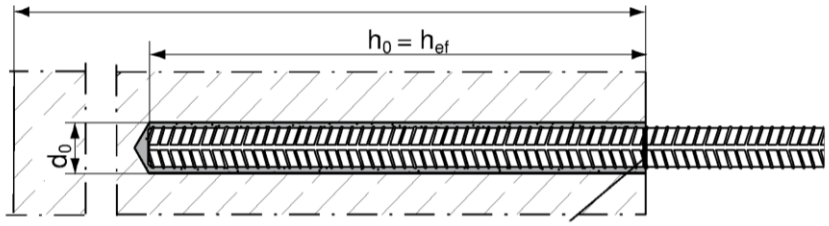
Issued in Berlin on 3 April 2017 by Deutsches Institut für Bautechnik

Andreas Kummerow
p.p. Head of Department

*beglaubigt:*
Baderschneider

Deutsches Institut für Bautechnik DIBt

## Installation conditions

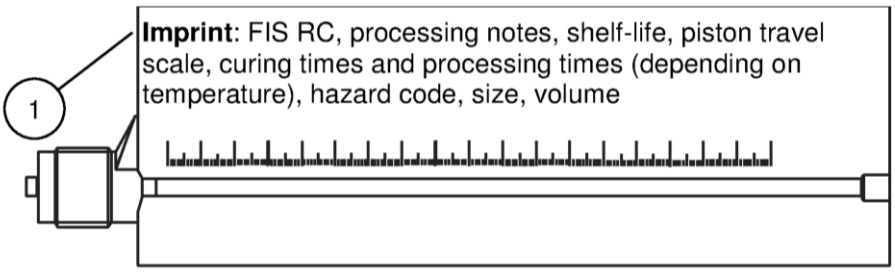



Reinforcing bar

## Product description

### Injection system FIS RC

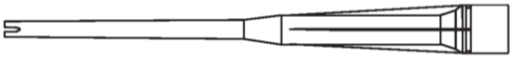
**Cartridge sizes**
**(390 ml, 585 ml, 1100 ml, 1500 ml)**




**Sealing cap**

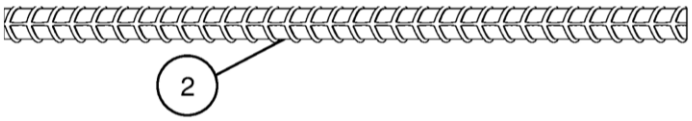
**Injection-adapter**

**Static mixer FIS MR or FIS UMR**



**Extension tube**

**Reinforcing bar**
Size: ϕ8, ϕ10, ϕ12, ϕ14, ϕ16, ϕ20, ϕ25, ϕ28, ϕ32




## Table A1: Materials

| Part | Designation | Material |
|---|---|---|
| 1 | Mortar cartridge | Mortar, hardener, filler |
| | | |
| 2 | Reinforcing bar<br>EN 1992-1-1:2004 and AC:2010, Annex C | Bars and de-coiled rods, class B or C with<br>$f_{yk}$ and k according to NDP or NCL of EN 1992-1-1/NA:2013<br>$f_{uk} = f_{tk} = k \cdot f_{yk}$ |

| | |
|---|---|
| fischer RebarConnect | **Annex A 1** |
| **Product description**<br>Installation conditions, cartdrige, static mixer, reinforcing bar, materials | |

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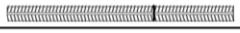
## Specifications of intended use (part 1)

**Table B1:** Overview use and performance categories injection mortar system FIS RC

| Anchorage subject to | | **FIS RC mit …** | |
|---|---|---|---|
| | | Reinforcing bar  | |
| Hammer drilling with standard drill bit  | | all sizes | |
| Hammer drilling with hollow drill bit (Heller "Duster Expert" or Hilti "TE-CD, TE-YD")  | | Nominal drill bit diameter ($d_0$) 12 mm to 35 mm | |
| Static and quasi static load, in | uncracked concrete | all sizes | Tables: C1, C2, C3, C4 |
| | cracked concrete | | |
| Seismic performance category (only hammer drilling with Standard / hollow drill bits) | C1 | all sizes | Tables: C5, C6, C7 |
| Use category | dry or wet concrete | all sizes | |
| Installation temperature | | FIS RC: -15 °C to +40 °C | |
| In-service temperature | Temperature-range I | -40 °C to +40 °C | (max. long term temperature +24 °C and max. short term temperature +40 °C) |
| | Temperature-range II | -40 °C to +80 °C | (max. long term temperature +50 °C and max. short term temperature +80 °C) |
| | Temperature-range III | -40 °C to +120 °C | (max. long term temperature +72 °C and max. short term temperature +120 °C) |

fischer RebarConnect

**Intended Use**
Specifications (part 1)

**Annex B 1**

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## Specifications of intended use (part 2)

**Base materials:**

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

**Design:**

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

**Installation:**

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

| fischer RebarConnect | |
|---|---|
| **Intended Use**<br>Specifications (part 2) | **Annex B 2** |

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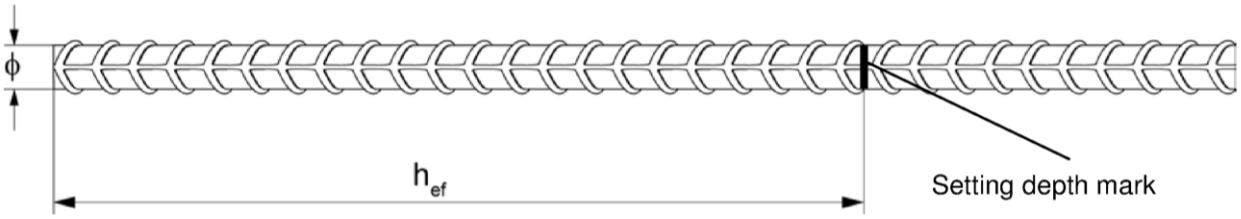
**Table B2:** Installation parameters for reinforcing bars

| **Nominal diameter of the bar** | | **ϕ** | **8**[1] | | **10**[1] | | **12**[1] | | **14** | **16** | **20** | **25** | **28** | **32** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal drill bit diameter | $d_0$ | [mm] | 10 | 12 | 12 | 14 | 14 | 16 | 18 | 20 | 25 | 30 | 35 | 40 |
| Drill hole depth | $h_0$ | | $h_0 = h_{ef}$ | | | | | | | | | | | |
| Effective anchorage depth | $h_{ef,min}$ | | 60 | | 60 | | 70 | | 75 | 80 | 90 | 100 | 112 | 128 |
| | $h_{ef,max}$ | | 160 | | 200 | | 240 | | 280 | 320 | 400 | 500 | 560 | 640 |
| Minimum spacing and minimum edge distance | $s_{min}$ = $c_{min}$ | | 40 | | 45 | | 55 | | 60 | 65 | 85 | 110 | 130 | 160 |
| Minimum thickness of concrete member | $h_{min}$ | | $h_{ef} + 30$ ($\geq 100$) | | | | $h_{ef} + 2d_0$ | | | | | | | |

[1] Both drill bit diameters can be used

## Reinforcing bar




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



fischer RebarConnect

**Intended Use**
Installation parameters reinforcing bars

**Annex B 3**

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**Table B3:** Parameters of steel brush FIS BS Ø

The size from the steelbrush is according to the drill bit diameter

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Drill bit diameter | $d_0$ | [mm] | 10 | 12 | 14 | 16 | 18 | 20 | 24 | 25 | 28 | 30 | 32 | 35 | 40 |
| Steel brush diameter | $d_b$ | | 11 | 14 | 16 | 20 | | 25 | 26 | 27 | 30 | 40 | | | 42 |

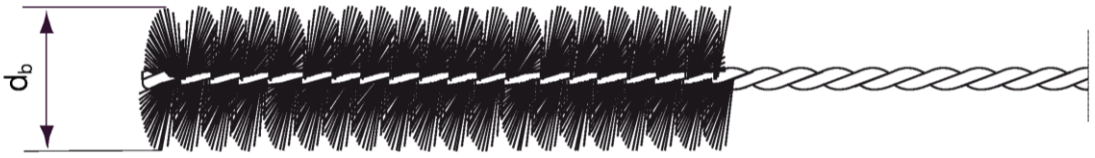


**Table B4:** Maximum processing time of the mortar and minimum curing time

(Minimal cartridge temperature +5 °C)

| System temperature [°C] | Maximum processing time $t_{work}$ [minutes] FIS RC | Minimum curing time[1] $t_{cure}$ [minutes] FIS RC |
|---|---|---|
| > -15 bis -10 | 60 | 36 hours |
| > -10 bis -5 | 30 | 24 hours |
| > -5 bis ±0 | 20 | 8 hours |
| > ±0 bis +5 | 13 | 4 hours |
| > +5 bis +10 | 9 | 2 hours |
| > +10 bis +20 | 5 | 60 |
| > +20 bis +30 | 4 | 45 |
| > +30 bis +40 | 2 | 30 |



fischer RebarConnect

**Intended Use**
Cleaning tools
Processing times and curing times

**Annex B 4**

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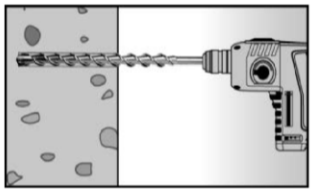
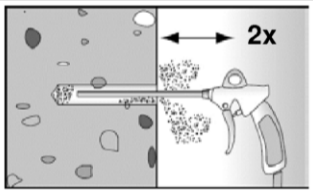
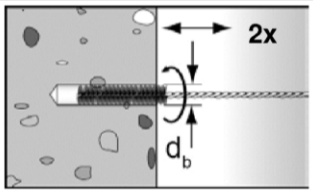
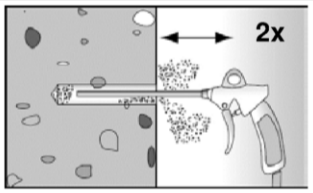
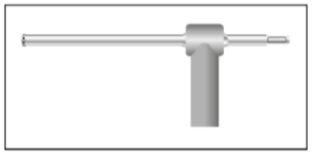
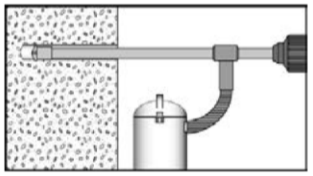
## Installation instructions part 1; Injection mortar system FIS RC

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

| | | |
|---|---|---|
| 1 |  | Drill the hole.<br>Drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see **Tables B2** |
| 2 |  | Blow out the drill hole twice, with oil-free compressed air ($p \geq 6$ bar). In uncracked concrete the use of a manual blow-out pump is possible (Installation parameters: $d_0 < 18$ mm and $h_{ef} < 10d$)  |
| 3 |  | Brush the drill hole twice. For drill hole diameter ≥ 30 mm use a power drill. For deep holes use an extension. Corresponding brushes see **Table B3** |
| 4 |  | Blow out the drill hole twice, with oil-free compressed air ($p \geq 6$ bar). In uncracked concrete the use of a manual blow-out pump is possible (Installation parameters: $d_0 < 18$ mm and $h_{ef} < 10d$)  |

Go to step 5

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

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

Go to step 5

| | |
|---|---|
| fischer RebarConnect | **Annex B 5** |
| **Intended use**<br>Installation instructions part 1 | |

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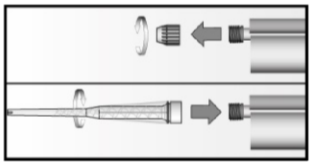
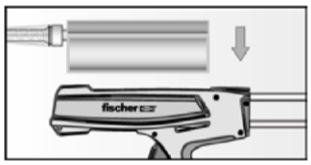
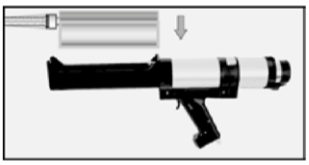
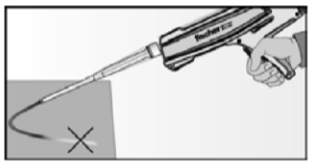
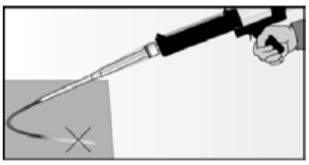
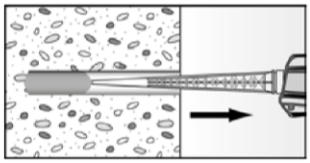
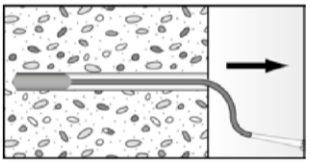
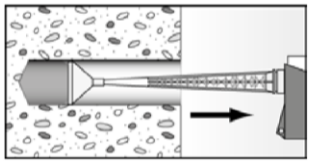
## Installation instructions part 2; Injection mortar system FIS RC

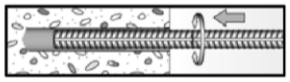
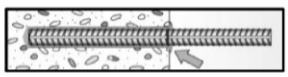
### Preparing the cartridge

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

### Mortar injection

| | | | |
|---|---|---|---|
| 8 |  Fill approximately 2/3 of the drill hole with mortar. Always begin from the bottom of the hole and avoid bubbles |  For drill hole depth ≥ 150 mm use an extension tube |  For overhead installation, deep holes $h_0$ > 250 mm or drill hole diameter $d_0$ ≥ 40 mm use an injection-adapter |

### Installation reinforcing bar

| | | |
|---|---|---|
| 9 |  | Only use clean and oil-free reinforcing bars. Mark the setting depth. Turn while using force to push the reinforcement bar into the filled hole up to the setting depth mark |
| |  | When the setting depth mark is reached, excess mortar must be emerged from the mouth of the drill hole |
| 10 |  | Wait for the specified curing time $t_{cure}$ see **Table B4** |

| | |
|---|---|
| fischer RebarConnect | **Annex B 6** |
| **Intended use**<br>Installation instructions part 2 | |

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

| **Nominal diameter of the bar** | | **ϕ** | **8** | **10** | **12** | **14** | **16** | **20** | **25** | **28** | **32** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bearing capacity under tensile load, steel failure** | | | | | | | | | | | |
| Characteristic bearing capacity | $N_{Rk,s}$ | [kN] | $A_s \cdot f_{uk}$ [1)] | | | | | | | | |
| **Bearing capacity under shear load, steel failure** | | | | | | | | | | | |
| **without lever arm** | | | | | | | | | | | |
| Characteristic bearing capacity | $V_{Rk,s}$ | [kN] | $0,5 \cdot A_s \cdot f_{uk}$ [1)] | | | | | | | | |
| Ductility factor acc. to CEN/TS 1992-4-5:2009 Section 6.3.2.1 | $k_2$ | [-] | 0,8 | | | | | | | | |
| **with lever arm** | | | | | | | | | | | |
| Characteristic bending moment | $M^0_{Rk,s}$ | [Nm] | $1,2 \cdot W_{el} \cdot f_{uk}$ [1)] | | | | | | | | |

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

fischer RebarConnect

**Performances**
Characteristic steel bearing capacity of reinforcing bar

**Annex C 1**

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**Table C2: General design factors** for the bearing capacity under tensile / shear load; **uncracked or cracked concrete**

| **Size** | | | | **All Sizes** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bearing capacity under tensile load** | | | | | | | | | | | | |
| **Factors acc. to CEN/TS 1992-4:2009 Section 6.2.2.3** | | | | | | | | | | | | |
| Uncracked concrete | $k_{ucr}$ | [-] | | 10,1 | | | | | | | | |
| Cracked concrete | $k_{cr}$ | | | 7,2 | | | | | | | | |
| **Factors for the compressive strength of concrete > C20/25** | | | | | | | | | | | | |
| Increasing factor for $\tau_{Rk}$ | C25/30 | $\Psi_c$ | [-] | 1,02 | | | | | | | | |
| | C30/37 | | | 1,04 | | | | | | | | |
| | C35/45 | | | 1,07 | | | | | | | | |
| | C40/50 | | | 1,08 | | | | | | | | |
| | C45/55 | | | 1,09 | | | | | | | | |
| | C50/60 | | | 1,10 | | | | | | | | |
| **Splitting failure** | | | | | | | | | | | | |
| Edge distance | $h / h_{ef} \geq 2,0$ | $c_{cr,sp}$ | [mm] | $1,0\ h_{ef}$ | | | | | | | | |
| | $2,0 > h / h_{ef} > 1,3$ | | | $4,6\ h_{ef} - 1,8\ h$ | | | | | | | | |
| | $h / h_{ef} \leq 1,3$ | | | $2,26\ h_{ef}$ | | | | | | | | |
| Spacing | | $s_{cr,sp}$ | | $2\ c_{cr,sp}$ | | | | | | | | |
| **Concrete cone failure acc. to CEN/TS 1992-4-5:2009 Section 6.2.3.2** | | | | | | | | | | | | |
| Edge distance | | $c_{cr,N}$ | [mm] | $1,5\ h_{ef}$ | | | | | | | | |
| Spacing | | $s_{cr,N}$ | | $2\ c_{cr,N}$ | | | | | | | | |
| **Bearing capacity under shear load** | | | | | | | | | | | | |
| **Installation safety factors** | | | | | | | | | | | | |
| All installation conditions | | $\gamma_2 = \gamma_{inst}$ | [-] | 1,0 | | | | | | | | |
| **Concrete pry-out failure** | | | | | | | | | | | | |
| Factor k acc. to TR029 Section 5.2.3.3 resp. $k_3$ acc. to CEN/TS 1992-4-5:2009 Section 6.3.3 | | $k_{(3)}$ | [-] | 2,0 | | | | | | | | |
| **Concrete edge failure** | | | | | | | | | | | | |
| The value of $h_{ef}$ ($= l_f$) under shear load | | | [mm] | $\min(h_{ef}; 8d)$ | | | | | | | | |
| Calculation diameters | | | | | | | | | | | | |
| Nominal diameter of the bar | | $\phi$ | | 8 | 10 | 12 | 14 | 16 | 20 | 25 | 28 | 32 |
| Reinforcing bar | d | [mm] | | 8 | 10 | 12 | 14 | 16 | 20 | 25 | 28 | 32 |

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**Performances**
General design factors relating to the characteristic bearing capacity under tensile / shear load

**Annex C 2**

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**Table C3:** Characteristic values of **resistance** for **reinforcing bars** in hammer drilled holes in combination with **injection mortar FIS RC**; **uncracked or cracked concrete**

| **Nominal diameter of the bar** | | **ϕ** | **8** | **10** | **12** | **14** | **16** | **20** | **25** | **28** | **32** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Combined pullout and concrete cone failure** | | | | | | | | | | | |
| Calculation diameter | d | [mm] | 8 | 10 | 12 | 14 | 16 | 20 | 25 | 28 | 32 |
| **Uncracked concrete** | | | | | | | | | | | |
| **Characteristic bond resistance in uncracked concrete C20/25** | | | | | | | | | | | |
| Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete) | | | | | | | | | | | |
| Temperature range I: 24 °C / 40 °C | $\tau_{Rk,ucr}$ | [N/mm²] | 8,0 | 8,5 | 9,0 | 9,5 | 9,5 | 10 | 9,5 | 9,0 | 7,5 |
| Temperature range II: 50 °C / 80 °C | $\tau_{Rk,ucr}$ | [N/mm²] | 8,0 | 8,5 | 9,0 | 9,0 | 9,5 | 9,5 | 9,0 | 8,5 | 7,5 |
| Temperature range III: 72 °C / 120 °C | $\tau_{Rk,ucr}$ | [N/mm²] | 7,0 | 7,5 | 8,0 | 8,0 | 8,5 | 8,5 | 8,0 | 7,5 | 6,5 |
| **Cracked concrete** | | | | | | | | | | | |
| **Characteristic bond resistance in cracked concrete C20/25** | | | | | | | | | | | |
| Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete) | | | | | | | | | | | |
| Temperature range I: 24 °C / 40 °C | $\tau_{Rk,cr}$ | [N/mm²] | 4,5 | 6,0 | 6,0 | 6,0 | 7,0 | 6,0 | 6,0 | 6,0 | 6,0 |
| Temperature range II: 50 °C / 80 °C | $\tau_{Rk,cr}$ | [N/mm²] | 4,5 | 5,5 | 5,5 | 5,5 | 6,5 | 6,0 | 6,0 | 6,0 | 6,0 |
| Temperature range III: 72 °C / 120 °C | $\tau_{Rk,cr}$ | [N/mm²] | 4,0 | 5,0 | 5,0 | 5,0 | 6,0 | 5,5 | 5,5 | 5,5 | 5,5 |
| **Installation safety factors** | | | | | | | | | | | |
| Dry and wet concrete | $\gamma_2 = \gamma_{inst}$ | [-] | 1,0 | | | | | | | | |



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**Performances**
Characteristic values for static or quasi-static action under tensile load for reinforcing bars with injection mortar FIS RC (uncracked or cracked concrete)

**Annex C 3**

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## Table C4: Displacements for reinforcing bars

| Nominal diameter of the bar | $\phi$ | 8 | 10 | 12 | 14 | 16 | 20 | 25 | 28 | 32 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Displacement-Factors for tensile load[1)]** | | | | | | | | | | |
| **Uncracked or cracked concrete; Temperature range I, II, III** | | | | | | | | | | |
| $\delta_{N0\text{-Factor}}$ | [mm/(N/mm²)] | 0,07 | 0,08 | 0,09 | 0,09 | 0,10 | 0,11 | 0,12 | 0,13 | 0,13 |
| $\delta_{N\infty\text{-Factor}}$ | | 0,11 | 0,13 | 0,13 | 0,15 | 0,16 | 0,16 | 0,18 | 0,20 | 0,20 |
| **Displacement-Factors for shear load[2)]** | | | | | | | | | | |
| **Uncracked or cracked concrete; Temperature range I, II, III** | | | | | | | | | | |
| $\delta_{V0\text{-Factor}}$ | [mm/kN] | 0,18 | 0,15 | 0,12 | 0,10 | 0,09 | 0,07 | 0,06 | 0,05 | 0,05 |
| $\delta_{V\infty\text{-Factor}}$ | | 0,27 | 0,22 | 0,18 | 0,16 | 0,14 | 0,11 | 0,09 | 0,08 | 0,06 |

[1)] Calculation of effective displacement:

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

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

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

[2)] Calculation of effective displacement:

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

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

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

## Table C5: Characteristic values for the steel bearing capacity under tensile / shear load of reinforcing bars (B500B) under seismic action performance category C1

| Nominal diameter of the bar | $\phi$ | | 8 | 10 | 12 | 14 | 16 | 20 | 25 | 28 | 32 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bearing capacity under tensile load, steel failure[1)]** | | | | | | | | | | | |
| **Reinforcing bar B500B acc. to DIN 488-2:2009-08, performance category C1** | | | | | | | | | | | |
| Characteristic bearing capacity | $N_{Rk,s,C1}$ | [kN] | 28 | 44 | 63 | 85 | 111 | 173 | 270 | 339 | 443 |
| **Bearing capacity under shear load, steel failure without lever arm[1)]** | | | | | | | | | | | |
| **Reinforcing bar B500B acc. to DIN 488-2:2009-08, performance category C1** | | | | | | | | | | | |
| Characteristic bearing capacity | $V_{Rk,s,C1}$ | [kN] | 10 | 15 | 22 | 30 | 39 | 61 | 95 | 119 | 155 |

[1)] Partial safety factors for performance category C1 see Table C6

## Table C6: Partial safety factors of reinforcing bars (B500B) under seismic action performance category C1

| Nominal diameter of the bar | $\phi$ | | | 8 | 10 | 12 | 14 | 16 | 20 | 25 | 28 | 32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bearing capacity under tensile load, steel failure[1)]** | | | | | | | | | | | | |
| Partial safety factor $\gamma_{Ms,N}$ | Reinforcing bar | B500B | [-] | 1,40 | | | | | | | | |
| **Bearing capacity under shear load, steel failure[1)]** | | | | | | | | | | | | |
| Partial safety factor $\gamma_{Ms,V}$ | Betonstahl | B500B | [-] | 1,50 | | | | | | | | |

[1)] In absence of other national regulations

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**Performances**
Displacements for reinforceing bar, Characteristic steel bearing capacity of reinforcing bars under seismic action and partial safety factors (performance category C1)

**Annex C 4**

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**Table C7:** Characteristic values of **resistance** for **reinforcing bars** in hammer drilled holes with **injection mortar FIS SB** under seismic action performance category **C1**

| **Nominal diameter of the bar** | | **ϕ** | **8** | **10** | **12** | **14** | **16** | **20** | **25** | **28** | **32** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Characteristic bond resistance, combined pullout and concrete cone failure** | | | | | | | | | | | |
| **Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete)** | | | | | | | | | | | |
| Tem-perature range | I: 24 °C / 40 °C | $\tau_{Rk,C1}$ [N/mm²] | 3,2 | 4,3 | 4,5 | 4,5 | 5,3 | 4,5 | 4,5 | 4,5 | 5,1 |
| | II: 50 °C / 80 °C | | 3,2 | 3,9 | 4,1 | 4,1 | 4,9 | 4,5 | 4,5 | 4,5 | 5,1 |
| | III: 72 °C / 120 °C | | 2,8 | 3,6 | 3,8 | 3,8 | 4,5 | 4,1 | 4,1 | 4,1 | 4,7 |
| **Installation safety factors** | | | | | | | | | | | |
| **Bearing capacity under tensile load** | | | | | | | | | | | |
| Dry and wet concrete | $\gamma_2 = \gamma_{inst}$ | [-] | 1,0 | | | | | | | | |
| **Bearing capacity under shear load** | | | | | | | | | | | |
| All installation conditions | $\gamma_2 = \gamma_{inst}$ | [-] | 1,0 | | | | | | | | |

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**Performances**
Characteristic values under seismic action (performance category C1) for reinforcing bars

**Annex C 5**