

## DÉCLARATION DES PERFORMANCES

### DoP 0309

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

FR

1. Code d'identification unique du type de produit: **DoP 0309**
2. Usage(s) prévu(s): **Fixation dans du béton fissuré ou non fissuré, voir annexes, en particulier les annexes B1 - B10.**
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 330499-01-0601, Edition 04/2020**  
Evaluation Technique Européenne: **ETA-22/0501; 2022-09-20**  
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):**  
Résistance à la rupture de l'acier (charge de traction): Annexe C1  
Résistance à la rupture par extraction glissement: et rupture du cône béton: Annexes C2 - C4  
Résistance à la rupture du cône béton: Annexe C2  
Distance au bord pour éviter la rupture par fendage sous charge: Annexe C2  
Robustesse: Annexes C2 - C4  
Couple de serrage maxi: Annexes B4  
Distance au bord et entraxe mini: Annexes B3 - B5  
**Résistance caractéristique à la charge de cisaillement (charge statique et quasi-statique):**  
Résistance à la rupture de l'acier: Annexe C1  
Résistance à la rupture par effet de levier: Annexe C2  
Résistance à la rupture du béton en bord de dalle: Annexe C2  
**Déplacements sous charge à court et long terme:**  
Déplacements sous charge à court et long terme: Annexe C5  
**Résistance caractéristique et déplacements pour les catégories de performance sismique C1 et C2:**  
Résistance à la charge de traction, catégorie C1: NPD  
Résistance à la charge de traction, catégorie C2: NPD  
Résistance à la charge de cisaillement, catégorie C1: NPD  
Résistance à la charge de cisaillement, catégorie C2: NPD  
Facteur espace annulaire: NPD  
**Hygiène, santé et environnement (BWR 3)**  
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.-Ing. Oliver Geibig, Directeur Général Business Units & Ingénierie  
Tumlingen, 2022-10-24



Jürgen Grün, Directeur Général Chimie & Qualité

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).

## Specific Part

### 1 Technical description of the product

The "fischer injection system FIS RC II" is a bonded fastener consisting of a cartridge with injection mortar fischer FIS RC II and a steel element according to Annex A3.

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

The product description is given in Annex A.

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

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

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

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

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

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading)	See Annex B 3 to B 6, C 1 to C 4
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1 and C 2
Displacements under short-term and long-term loading	See Annex C 5
Characteristic resistance and displacements for seismic performance categories C1 and C2	No performance assessed

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

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

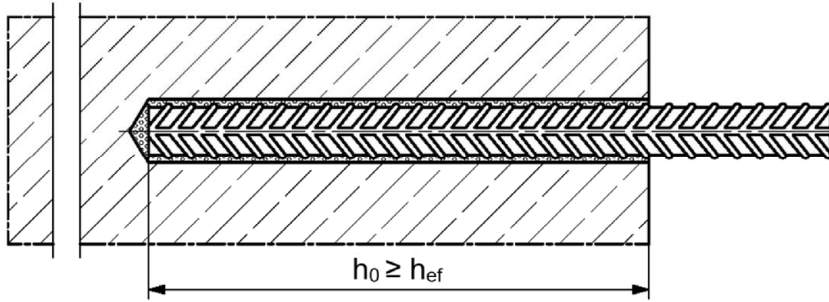
**4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base**

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

The system to be applied is: 1

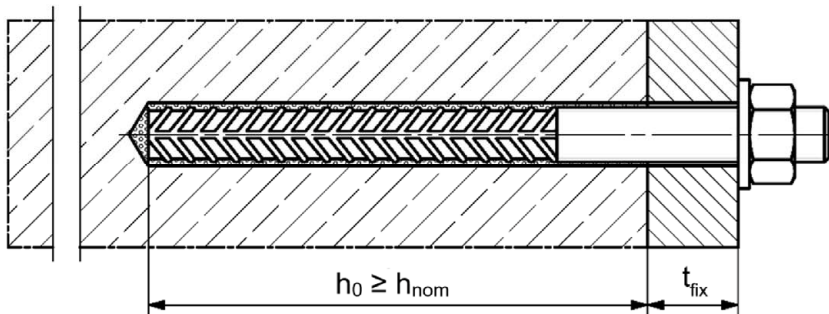
# Installation conditions part 1

## Reinforcing bar

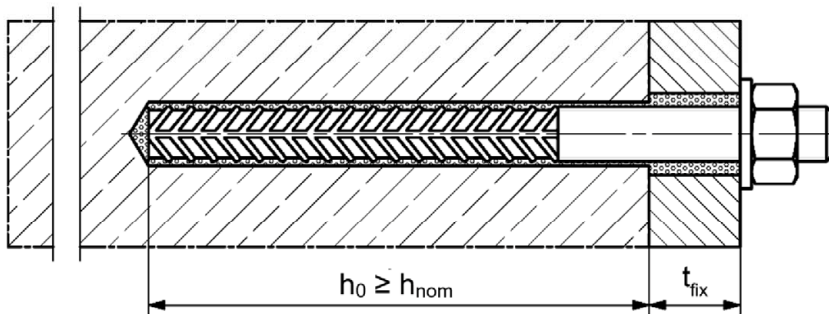


## fischer rebar anchor FRA

### Pre-positioned installation



### Push through installation (annular gap filled with mortar)



Figures not to scale

$h_0$  = drill hole depth

$h_{ef}$  = effective embedment depth

$t_{fix}$  = thickness of fixture

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

## fischer injection system FIS RC II

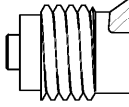
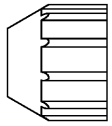
**Product description**  
Installation conditions part 1

**Annex A 1**

Appendix 3 / 21

# Overview system components part 1

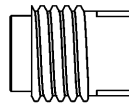
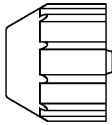
## Injection cartridge (shuttle cartridge) with sealing cap; Sizes: 360 ml, 825 ml



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



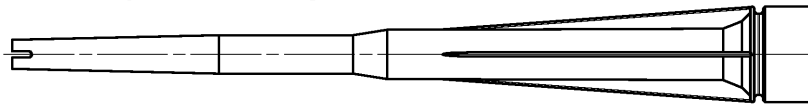
## Injection cartridge (coaxial cartridge) with sealing cap; Sizes: 300 ml, 380 ml, 400 ml, 410 ml



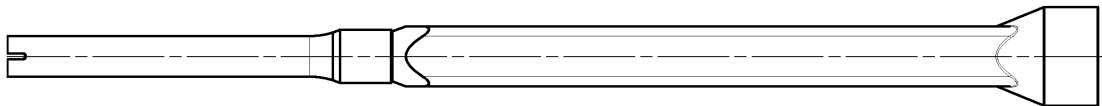
**Imprint:** fischer FIS RC II, processing notes, shelf-life, piston travel scale (optional), curing times and processing times (depending on temperature), hazard code, size, volume/weight



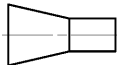
## Static mixer FIS MR Plus for injection cartridges up to 410 ml



## Static mixer FIS JMR for injection cartridges with 825 ml



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



## fischer cleaning brush BS



## Blow-out pump AB G



or

## Compressed-air cleaning tool:



Figures not to scale

## fischer injection system FIS RC II

### System description

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

## Annex A 2

Appendix 4 / 21

## Overview system components part 2

### Reinforcing bar

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

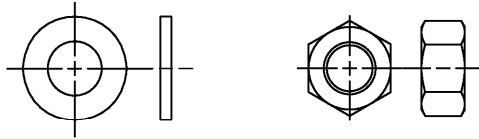


### fischer rebar anchor FRA

Size: M12, M16, M20, M24



### washer / hexagon nut



Figures not to scale

fischer injection system FIS RC II

### System description

Overview system components part 2; steel components

**Annex A 3**

Appendix 5 / 21

**Table A4.1: Materials**

Part	Designation	Material	
1	Injection cartridge	Mortar, hardener, filler	
	Steel grade	Stainless steel R	High corrosion resistant steel HCR
		acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4: 2006+A1:2015	acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4: 2006+A1:2015
2	Washer ISO 7089:2000 for fischer rebar anchor FRA	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	1.4565; 1.4529; EN 10088-1:2014
3	Hexagon nut for fischer rebar anchor FRA	Property class 80 acc. to fischer specification for fischer rebar anchor FRA or EN ISO 3506-2:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	Property class 80 acc. to fischer specification for fischer rebar anchor FRA or EN ISO 3506-2:2020 1.4565; 1.4529 EN 10088-1:2014
4	Reinforcing bar EN 1992-1-1:2004 and AC:2010, Annex C	Bars and de-coiled rods, class B or C with $f_{yk}$ and $k$ according to NDP or NCI according to EN 1992-1-1/NA $f_{uk} = f_{tk} = k \cdot f_{yk}$	
5	fischer rebar anchor FRA	Rebar part: Bars and de-coiled rods class B or C with $f_{yk}$ and $k$ according to NDP or NCI of EN 1992-1-1:2004+AC:2010 $f_{uk} = f_{tk} = k \cdot f_{yk}$	Threaded part: Property class PC 80, EN ISO 3506-1:2020 1.4401, 1.4404, 1.4571, 1.4578, 1.4439, 1.4362, 1.4062 acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4:2006+A1:2015 1.4565; 1.4529 acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4: 2006+A1:2015

fischer injection system FIS RC II





**Product description**  
Materials

**Annex A 4**

Appendix 6 / 21

# Specifications of intended use part 1

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

Anchorages subject to		FIS RC II with ...			
		Reinforcing bar 	fischer rebar anchor FRA 		
Hammer drilling with standard drill bit 		all sizes			
Hammer drilling with hollow drill bit (fischer „FHD“, Heller „Duster Expert“; Bosch „Speed Clean“; Hilti „TE-CD, TE-YD“, DreBo „D-Plus“, DreBo „D-Max“) 		Nominal drill bit diameter ( $d_0$ ) 12 mm to 35 mm			
Static and quasi static loading, in	uncracked concrete	all sizes	Tables: C1.1 C2.1 C3.1 C5.1	all sizes	Tables: C1.2 C2.1 C4.1 C5.2
	cracked concrete				
Use category	I1 dry or wet concrete	all sizes			
	I2 water filled hole	- <sup>1)</sup>		- <sup>1)</sup>	
Seismic performance category	C1 <sup>1)</sup>		- <sup>1)</sup>		- <sup>1)</sup>
	C2 <sup>1)</sup>		- <sup>1)</sup>		- <sup>1)</sup>
Installation direction		D3 (downward and horizontal and upwards installation)			
Installation temperature		$T_{i,min} = -5\text{ °C}$ to $T_{i,max} = +40\text{ °C}$			
In-service temperature	Temperature range I	-40 °C to +80 °C	(max. short term temperature +80 °C ; max. long term temperature +50 °C)		
	Temperature range II	-40 °C to +120°C	(max. short term temperature +120 °C ; max. long term temperature +72 °C)		

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

fischer injection system FIS RC II

**Intended use**  
Specifications part 1

**Annex B 1**

Appendix 7 / 21



## Specifications of intended use part 2

### Base materials:

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

### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions ( 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 have to be designed under the responsibility of an engineer with 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 anchor is indicated on the design drawings (e. g. position of the anchor relative to reinforcement or to supports, etc.).
- Fastenings are designed in accordance with:  
EN 1992-4:2018 and EOTA Technical Report TR 055, Edition February 2018.

### Installation:

- Fastener installation is to be carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Fastenings depth should be marked and adhered to installation.

fischer injection system FIS RC II

**Intended use**  
Specifications part 2

**Annex B 2**  
Appendix 8 / 21

**Table B3.1: Installation parameters for reinforcing bars**

Nominal diameter of the bar		$\phi$	8 <sup>1)</sup>		10 <sup>1)</sup>		12 <sup>1)</sup>		14	16	20	25	28
Nominal drill hole diameter	$d_0$	[mm]	10	12	12	14	14	16	18	20	25	30	35
Drill hole depth	$h_0$		$h_0 = h_{ef}$										
Effective embedment depth	$h_{ef,min}$		60	60	70	75	80	90	100	112			
	$h_{ef,max}$		160	200	240	280	320	400	500	560			
Simplified spacing and edge distance <sup>2)</sup>	$s = c$		40	45	55	60	65	85	110	130			
Minimum thickness of concrete member	$h_{min}$	$h_{ef} + 30$ ( $\geq 100$ )					$h_{ef} + 2d_0$						

1) Both drill hole diameters can be used

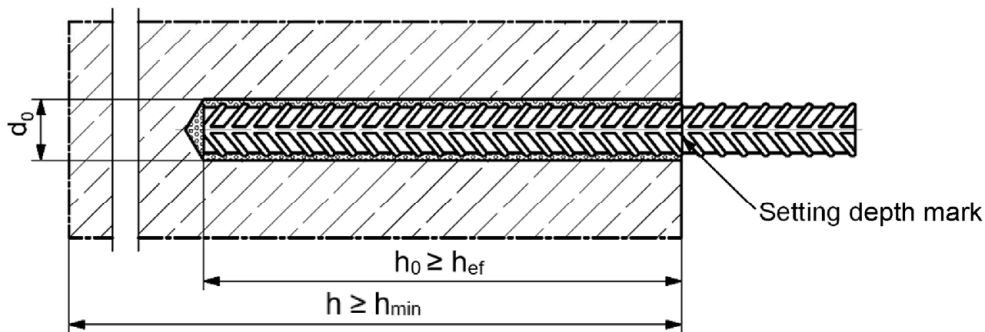
2) Detailed calculation according to Annex B 5 and B 6

**Reinforcing bar**



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

**Installation conditions:**



Figures not to scale

fischer injection system FIS RC II

**Intended use**  
Installation parameters reinforcing bars

**Annex B 3**

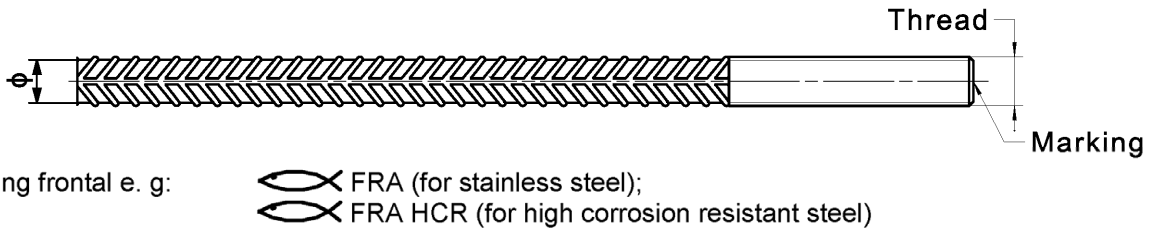
Appendix 9 / 21

**Table B4.1: Installation parameters for fischer rebar anchor FRA**

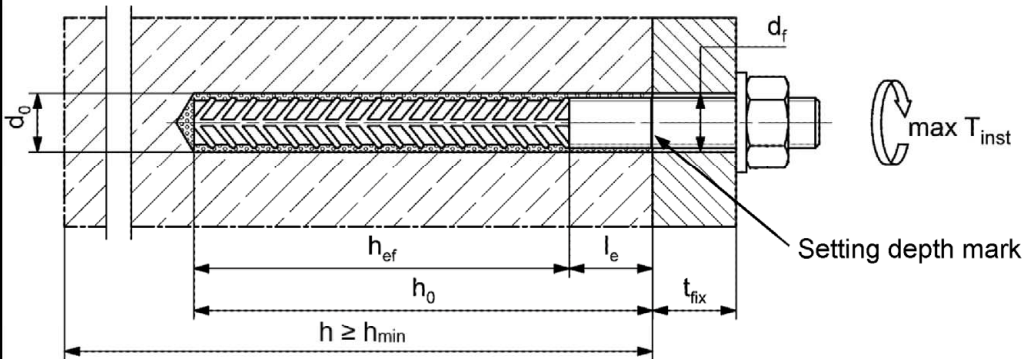
Rebar anchor FRA		Thread	M12 <sup>1)</sup>	M16	M20	M24		
Nominal diameter of the bar	$\phi$	[mm]	12	16	20	25		
Nominal drill hole diameter	$d_0$		14	16	20	25	30	35
Drill hole depth	$h_0$		$h_{ef} + l_e$					
Effective embedment depth	$h_{ef,min}$		70	80	90	96		
	$h_{ef,max}$		140	220	300	380		
Distance concrete surface to welded joint	$l_e$		100					
Simplified spacing and edge distance <sup>2)</sup>	$s = c$		55	65	85	105		
Maximum Diameter of clearance hole in the fixture	pre-positioned anchorage $d_f$		14	18	22	26		
	push through anchorage $d_f$		18	22	26	32	<sub>-3)</sub>	
Minimum thickness of concrete member	$h_{min}$		$h_0 + 30$	$h_0 + 2d_0$				
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 B 5 and B 6
- 3) Performance not assessed

**fischer rebar anchor FRA**



**Installation conditions:**



Figures not to scale

fischer injection system FIS RC II

**Intended use**  
Installation parameters rebar anchor FRA

**Annex B 4**  
Appendix 10 / 21

**Table B5.1: Minimum spacing and minimum edge distance for reinforcing bars and fischer rebar anchor FRA**

Reinforcing bars / FRA (Nominal diameter)		$\phi$	8	10	12	14	16	20	25	28
<b>Minimum edge distance</b>										
Uncracked / cracked concrete	$c_{min}$	[mm]	40	45	45	45	50	55	75	80
Minimum spacing	s		according to Annex B 6							
<b>Minimum spacing</b>										
Uncracked / cracked concrete	$s_{min}$	[mm]	40	45	55	60	65	85	120	140
Minimum edge distance	c		according to Annex B 6							
<b>Required projecting area</b>										
Uncracked concrete	$A_{sp,req}$	[1000	8,0	13,0	22,0	23,0	24,0	38,5	47,5	64,0
Cracked concrete		mm <sup>2</sup> ]	6,5	10,0	16,5	17,5	18,5	29,5	36,5	49,0

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

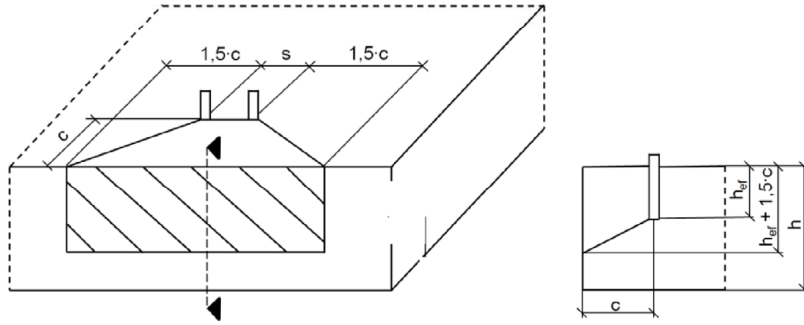
For the calculation of minimum spacing and minimum edge distance of anchors in combination with different embedment depths and thicknesses of concrete members the following equation shall be fulfilled:

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

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

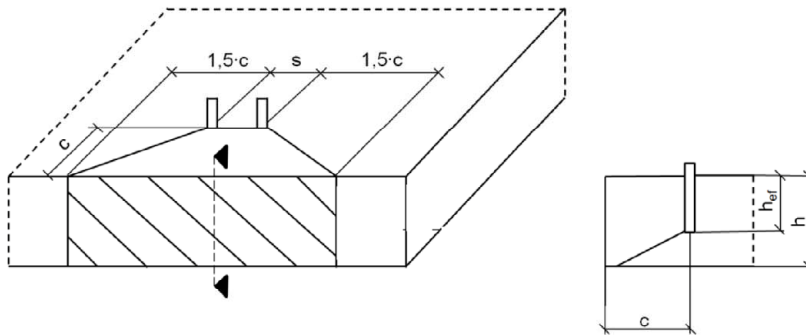
$A_{sp,t} = A_{sp,ef}$  = effective projecting area (according to Annex B 6)

**Table B6.1:** Effective projecting area  $A_{sp,t}$  with concrete member thickness  $h > h_{ef} + 1,5 \cdot c$  and  $h \geq h_{min}$



Single anchor	$A_{sp,t} = (3 \cdot c) \cdot (h_{ef} + 1,5 \cdot c)$	[mm <sup>2</sup> ]	with $c \geq c_{min}$
Group of anchors with $s > 3 \cdot c$	$A_{sp,t} = (6 \cdot c) \cdot (h_{ef} + 1,5 \cdot c)$	[mm <sup>2</sup> ]	
Group of anchors 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 B6.2:** Effektive projecting area  $A_{sp,t}$  with concrete member thickness  $h \leq h_{ef} + 1,5 \cdot c$  and  $h \geq h_{min}$



Single anchor	$A_{sp,t} = 3 \cdot c \cdot \text{existing } h$	[mm <sup>2</sup> ]	with $c \geq c_{min}$
Group of anchors with $s > 3 \cdot c$	$A_{sp,t} = 6 \cdot c \cdot \text{existing } h$	[mm <sup>2</sup> ]	
Group of anchors 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 smooth 5 mm-steps

Figures not to scale

fischer injection system FIS RC II

**Intended use**  
Minimum thickness of concrete member for anchor rods,  
minimum spacing and edge distance

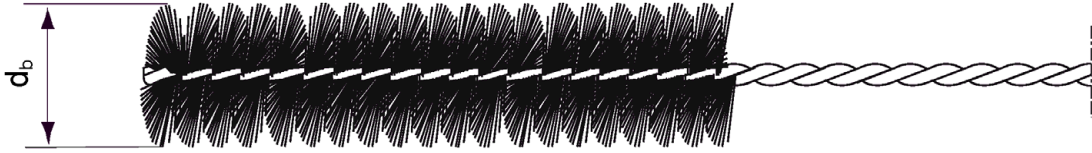
**Annex B 6**

Appendix 12 / 21

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

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

Nominal drill hole diameter	$d_0$	[mm]	10	12	14	16	18	20	25	35
Steel brush diameter BS	$d_b$		11	14	16	20		25	27	40



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

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

**Table B7.3 Maximum processing time of the mortar and minimum curing time**  
(During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature)

Temperature at anchoring base [°C]	Maximum processing time $t_{work}$	Minimum curing time $t_{cure}$ <sup>1)</sup>
	FIS RC II	FIS RC II
-5 to 0 <sup>2)</sup>	-	24 h
> 0 to 5 <sup>2)</sup>	13 min	3 h
> 5 to 10	9 min	90 min
> 10 to 20	5 min	60 min
> 20 to 30	4 min	45 min
> 30 to 40	2 min	35 min

1) In wet concrete or water filled holes the curing times must be doubled

2) Minimal cartridge temperature +5°C

fischer injection system FIS RC II

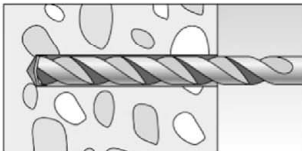
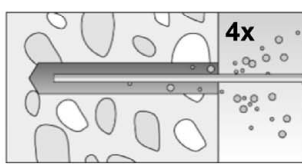
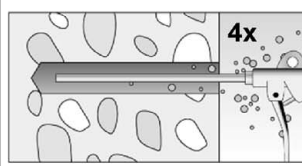
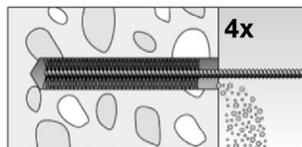
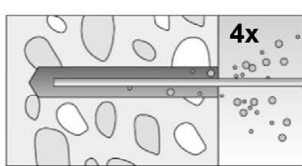
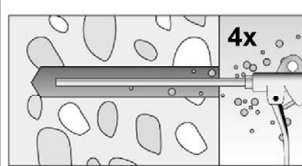
**Intended use**  
Cleaning brush (steel brush)  
Processing time and curing time

**Annex B 7**

Appendix 13 / 21


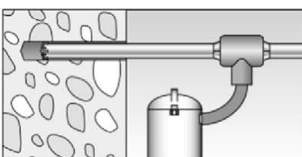
# Installation instructions part 1

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

1		<p>Drill the hole. Nominal drill hole diameter <math>d_0</math> and drill hole depth <math>h_0</math> see tables <b>B3.1</b>, <b>B4.1</b>.</p>	
2		<p>Clean the drill hole: For <math>h_{ef} \leq 12d</math> and <math>d_0 &lt; 18</math> mm blow out the hole four times by hand.</p>	 <p>For <math>h_{ef} &gt; 12d</math> and / or <math>d_0 \geq 18</math> mm blow out the hole four times with oil-free compressed air (<math>p \geq 6</math> bar). Use suitable compressed-air nozzle.</p>
3		<p>Brush the drill hole four times. For drill hole diameter <math>\geq 30</math> mm use a power drill. For deep holes use an extension. Use suitable brushes (see table <b>B7.1</b>)</p>	
4		<p>Clean the drill hole: For <math>h_{ef} \leq 12d</math> and <math>d_0 &lt; 18</math> mm blow out the hole four times by hand.</p>	 <p>For <math>h_{ef} &gt; 12d</math> and / or <math>d_0 \geq 18</math> mm blow out the hole four times with oil-free compressed air (<math>p \geq 6</math> bar). Use suitable compressed-air nozzle.</p>

Go to step 5

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

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

Go to step 5

fischer injection system FIS RC II

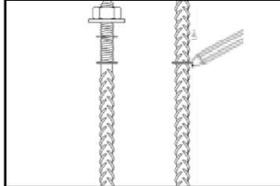
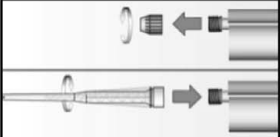

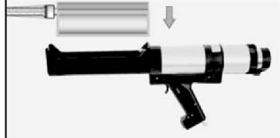


**Intended use**  
Installation instructions part 1

**Annex B 8**

Appendix 14 / 21

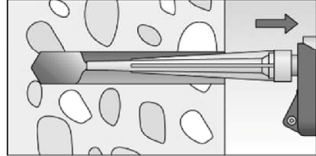
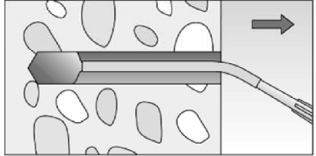
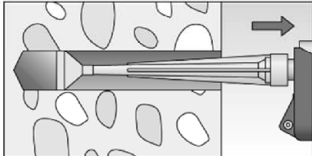
## Installation instructions part 2

### Preparing the cartridge

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

Go to step 9

### Injection of the mortar

9	 <p>For <math>h_0 = h_{ef}</math> fill approximately 2/3 of the drill hole with mortar. For <math>h_0 &gt; h_{ef}</math> more mortar is needed. Always begin from the bottom of the hole and avoid bubbles.</p>	 <p>The conditions for mortar injection without extension tube can be found in <b>table B7.2</b>. For deeper drill holes, than those mentioned in <b>table B7.2</b>, use a suitable extension tube.</p>	 <p>For deep holes (<math>h_0 &gt; 250</math> mm) use an injection adapter.</p>
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Go to step 10

fischer injection system FIS RC II

**Intended use**  
Installation instructions part 2

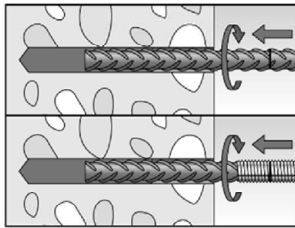
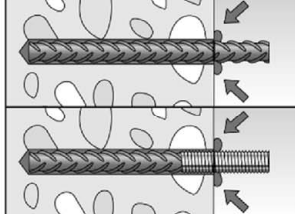

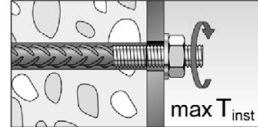
**Annex B 9**

Appendix 15 / 21



# Installation instructions part 3

## Installation reinforcing bars and fischer rebar anchor FRA

10		<p>Only use clean and oil-free reinforcing bars or fischer FRA. Insert the rebar / fischer rebar anchor FRA slowly twisted into the borehole until the embedment mark is reached.</p> <p>Recommendation: Rotation back and forth of the reinforcement bar or the fischer rebar anchor FRA makes pushing easy.</p>		
10		<p>When the setting depth mark is reached, excess mortar must be emerged from the mouth of the drill hole.</p>		
11	 <p>Wait for the specified curing time <math>t_{cure}</math> see <b>table B7.3</b></p>	12		<p>Mounting the fixture <math>max T_{inst}</math> for fischer rebar anchor FRA see <b>table B4.1</b></p>

fischer injection system FIS RC II

**Intended use**  
Installation instructions part 3

**Annex B 10**  
Appendix 16 / 21

**Table C1.1: Characteristic resistance to steel failure under tension / shear loading of reinforcing bars**

Nominal diameter of the bar	$\phi$	8	10	12	14	16	20	25	28
<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]	$1,2 \cdot W_{el} \cdot f_{uk}^{(2)}$						

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

**Table C1.2: Characteristic resistance to steel failure under tension / shear loading of fischer rebar anchors FRA**

fischer rebar anchor FRA		M12	M16	M20	M24	
<b>Characteristic resistance to steel failure under tension loading</b>						
Characteristic resistance	$N_{Rk,s}$	[kN]	62	111	173	263
<b>Partial factor<sup>1)</sup></b>						
Partial factor	$\gamma_{Ms,N}$	[-]	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	63	98	141
Ductility factor	$k_7$	[-]	1,0			
<b>With lever arm</b>						
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	105	266	519	898
<b>Partial factor<sup>1)</sup></b>						
Partial factor	$\gamma_{Ms,V}$	[-]	1,25			

- 1) In absence of other national regulations

fischer injection system FIS RC II

**Performance**

Characteristic resistance to steel failure under tension / shear loading of reinforcing bars and fischer rebar anchors FRA

**Annex C 1**

Appendix 17 / 21

**Table C2.1: Characteristic resistance to concrete failure under tension / shear loading**

Size		All sizes									
<b>Characteristic resistance to concrete failure under tension loading</b>											
Installation factor		$\gamma_{inst}$	[-]		See annex C 3 to C 4						
<b>Factors for the compressive strength of concrete &gt; C20/25</b>											
Increasing factor $\psi_c$ for cracked or uncracked concrete $\tau_{Rk(X,Y)} = \psi_c \cdot \tau_{Rk(C20/25)}$	C25/30		[-]	1,05							
	C30/37			1,10							
	C35/45			1,15							
	C40/50			1,19							
	C45/55			1,22							
	C50/60			1,26							
<b>Splitting failure</b>											
Edge distance	$h / h_{ef} \geq 2,0$		[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 $C_{cr,sp}$								
<b>Concrete cone failure</b>											
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 $C_{cr,N}$							
<b>Factors for sustained tension loading</b>											
Temperature range			[°C]	50 / 80			72 / 120				
Factor		$\Psi_{sus}^0$	[-]		0,74			0,87			
<b>Characteristic resistance to concrete failure under shear loading</b>											
Installation factor		$\gamma_{inst}$	[-]		1,0						
<b>Concrete pry-out failure</b>											
Factor for pry-out failure		$k_8$	[-]		2,0						
<b>Concrete edge failure</b>											
Effective length of fastener in shear loading		$l_f$	[mm]	for $d_{nom} \leq 24$ mm: min ( $h_{ef}$ ; 12 $d_{nom}$ ) for $d_{nom} > 24$ mm: min ( $h_{ef}$ ; 8 $d_{nom}$ ; 300 mm)							
<b>Calculation diameters</b>											
Size				M12		M16		M20		M24	
fischer rebar anchor FRA		$d_{nom}$	[mm]	12		16		20		25	
Size (nominal diameter of the bar)		$\phi$	[mm]	8		10		12		14	
Reinforcing bar		$d_{nom}$		8		10		12		14	

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

fischer injection system FIS RC II

**Performance**  
Characteristic resistance to concrete failure under tension / shear loading

**Annex C 2**

Appendix 18 / 21

**Table C3.1: Characteristic resistance to combined pull-out and concrete failure for reinforcing bars in hammer drilled holes; uncracked or cracked concrete**

Nominal diameter of the bar		$\phi$	8	10	12	14	16	20	25	28	
<b>Combined pull-out and concrete cone failure</b>											
Calculation diameter		d	[mm]	8	10	12	14	16	20	25	28
<b>Uncracked concrete</b>											
<b>Characteristic bond resistance in uncracked concrete C20/25</b>											
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)											
Temperature range	I: 50 °C / 80 °C	$\tau_{Rk,ucr}$	[N/mm <sup>2</sup> ]	11,0	11,0	11,0	10,0	10,0	9,5	9,0	8,5
	II: 72 °C / 120 °C			9,5	9,5	9,0	8,5	8,5	8,0	7,5	7,0
<b>Installation factor</b>											
Dry or wet concrete		$\gamma_{inst}$	[-]	1,0							
<b>Cracked concrete</b>											
<b>Characteristic bond resistance in cracked concrete C20/25</b>											
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)											
Temperature range	I: 50 °C / 80 °C	$\tau_{Rk,cr}$	[N/mm <sup>2</sup> ]	- <sup>1)</sup>	3,0	5,0	5,0	5,0	4,5	4,0	4,0
	II: 72 °C / 120 °C			- <sup>1)</sup>	3,0	4,5	4,5	4,5	4,0	3,5	3,5
<b>Installation factor</b>											
Dry or wet concrete		$\gamma_{inst}$	[-]	1,0							

1) Performance not assessed

fischer injection system FIS RC II

**Performance**

Characteristic resistance to combined pull-out and concrete failure for reinforcing bars

**Annex C 3**

Appendix 19 / 21

<b>Table C4.1: Characteristic resistance to combined pull-out and concrete failure for fischer rebar anchors FRA in hammer drilled holes; uncracked or cracked concrete</b>							
<b>fischer rebar anchor FRA</b>		<b>M12</b>	<b>M16</b>	<b>M20</b>	<b>M24</b>		
<b>Combined pull-out 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 or hollow drill bit (dry or wet concrete)</u>							
Temperature range	I: 50 °C / 80 °C		$\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ]	11,0	10,0	9,5	9,5
	II: 72 °C / 120 °C			9,0	8,5	8,0	7,5
<b>Installation factors</b>							
Dry or wet concrete	$\gamma_{inst}$	[-]	1,0				
<b>Cracked concrete</b>							
<b>Characteristic bond resistance in cracked concrete C20/25</b>							
<u>Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)</u>							
Temperature range	I: 50 °C / 80 °C		$\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]	5,0	5,0	4,5	4,0
	II: 72 °C / 120 °C			4,5	4,5	4,0	3,5
<b>Installation factors</b>							
Dry or wet concrete	$\gamma_{inst}$	[-]	1,0				

fischer injection system FIS RC II

**Performance**

Characteristic resistance to combined pull-out and concrete failure for fischer rebar anchor FRA

**Annex C 4**

Appendix 20 / 21

<b>Table C5.1: Displacements for reinforcing bars</b>									
Nominal diameter of the bar $\phi$		8	10	12	14	16	20	25	28
<b>Displacement-Factors for tension loading<sup>1)</sup></b>									
<b>Uncracked concrete; Temperature range I, II</b>									
$\delta_{N0}$ -Factor	[mm/(N/mm <sup>2</sup> )]	0,09	0,09	0,10	0,10	0,10	0,10	0,10	0,11
$\delta_{N\infty}$ -Factor		0,10	0,10	0,12	0,12	0,12	0,12	0,12	0,13
<b>Cracked concrete; Temperature range I, II</b>									
$\delta_{N0}$ -Factor	[mm/(N/mm <sup>2</sup> )]	- <sup>3)</sup>	0,12	0,13	0,13	0,13	0,13	0,13	0,14
$\delta_{N\infty}$ -Factor		- <sup>3)</sup>	0,27	0,30	0,30	0,30	0,30	0,30	0,35
<b>Displacement-Factors for shear loading<sup>2)</sup></b>									
<b>Uncracked or cracked concrete; Temperature range I, II</b>									
$\delta_{V0}$ -Factor	[mm/kN]	0,11	0,11	0,10	0,10	0,10	0,09	0,09	0,08
$\delta_{V\infty}$ -Factor		0,12	0,12	0,11	0,11	0,11	0,10	0,10	0,09
<sup>1)</sup> Calculation of effective displacement: $\delta_{N0} = \delta_{N0}\text{-Factor} \cdot \tau$ $\delta_{N\infty} = \delta_{N\infty}\text{-Factor} \cdot \tau$ $\tau$ : acting bond strength under tension loading					<sup>2)</sup> Calculation of effective displacement: $\delta_{V0} = \delta_{V0}\text{-Factor} \cdot V$ $\delta_{V\infty} = \delta_{V\infty}\text{-Factor} \cdot V$ $V$ : acting shear loading				
<sup>3)</sup> Performance not assessed									

**Table C5.2: Displacements for fischer rebar anchors FRA**

fischer rebar anchor FRA		M12	M16	M20	M24
<b>Displacement-Factors for tension loading<sup>1)</sup></b>					
<b>Uncracked concrete; Temperature range I, II</b>					
$\delta_{N0}$ -Factor	[mm/(N/mm <sup>2</sup> )]	0,10	0,10	0,10	0,10
$\delta_{N\infty}$ -Factor		0,12	0,12	0,12	0,13
<b>Cracked concrete; Temperature range I, II</b>					
$\delta_{N0}$ -Factor	[mm/(N/mm <sup>2</sup> )]	0,12	0,13	0,13	0,13
$\delta_{N\infty}$ -Factor		0,30	0,30	0,30	0,35
<b>Displacement-Factors for shear loading<sup>2)</sup></b>					
<b>Uncracked or cracked concrete; Temperature range I, II</b>					
$\delta_{V0}$ -Factor	[mm/kN]	0,10	0,10	0,09	0,09
$\delta_{V\infty}$ -Factor		0,11	0,11	0,10	0,10
<sup>1)</sup> Calculation of effective displacement: $\delta_{N0} = \delta_{N0}\text{-Factor} \cdot \tau$ $\delta_{N\infty} = \delta_{N\infty}\text{-Factor} \cdot \tau$ $\tau$ : acting bond strength under tension loading			<sup>2)</sup> Calculation of effective displacement: $\delta_{V0} = \delta_{V0}\text{-Factor} \cdot V$ $\delta_{V\infty} = \delta_{V\infty}\text{-Factor} \cdot V$ $V$ : acting shear loading		

fischer injection system FIS RC II

**Performance**  
Displacements for reinforcing bars and fischer rebar anchors FRA

**Annex C 5**

Appendix 21 / 21