



## DÉCLARATION DES PERFORMANCES

### DoP 0173

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

FR

1. <u>Code d'identification unique du type de produit:</u>	DoP 0173		
2. <u>Usage(s) prévu(s):</u>	Fixation dans du béton fissuré ou non fissuré. Voir annexes, en particulier les annexes B1- B13		
3. <u>Fabricant:</u>	fischerwerke GmbH & Co. KG, Otto-Hahn-Straße 15, 79211 Denzlingen, Allemagne		
4. <u>Mandataire:</u>	-		
5. <u>Système(s) d'évaluation et de vérification de la constance des performances:</u>	1		
6. <u>Document d'évaluation européen:</u> Evaluation Technique Européenne: Organisme d'évaluation technique: Organisme(s) notifié(s):	EAD 330499-01-0601 ETA-17/0979; 2019-07-22 DIBt- Deutsches Institut für Bautechnik 1343 MPA Darmstadt		
7. <u>Performance(s) déclarée(s):</u> <b>Résistance mécanique et stabilité (BWR 1)</b> Résistance caractéristique à la charge de traction (charge statique et quasi-statique):	Résistance à la rupture de l'acier (charge de Résistance à la rupture par extraction glissement: et rupture du cône béton: Résistance à la rupture du cône béton: Distance au bord pour éviter la rupture par fendage sous charge: Robustesse :	Annexes C1- C3 Annexes C5- C12 Annexes C4 Annexes C4 Annexe C4	$\psi_{sus}^0$ = NPD
	Couple de serrage maxi.: Distance au bord et entraxe mini.:	Annexes B3, B6- B8 Annexes B3- B8	
Résistance caractéristique à la charge de cisaillement (charge statique et quasi-statique):	Résistance à la rupture de l'acier: Résistance à la rupture par effet de levier: Résistance à la rupture du béton en bord de dalle:	Annexes C1- C3 Annexe C4 Annexe C4	
Résistance caractéristique et déplacements pour les catégories de performance sismique C1 et C2:	Résistance à la charge de traction, catégorie C1: Résistance à la charge de traction, catégorie C2: Résistance à la charge de cisaillement, catégorie C1: Résistance à la charge de cisaillement, catégorie C2: Facteur espace annulaire:	Annexes C15- C16, C17 Annexes C15, C16, C18 Annexes C15- C16, C17 Annexes C15, C16, C18 NPD	
Déplacements sous charge à court et long terme :	Déplacements sous charge à court et long terme :	Annexes C13, C14	
 —			
<b>Hygiène, santé et environnement (BWR 3)</b> Contenu, émission et/ou rejet de substances dangereuses:	NPA		

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:

Thilo Pregartner, Dr.-Ing.  
Tumlingen, 2019-08-01

Peter Schillinger, Dipl.-Ing.

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 EM Plus" is a bonded fastener consisting of a cartridge with injection mortar fischer FIS EM Plus and a steel element according to Annex A5.

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

The product description is given in Annex A.

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

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

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 or 100 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)**

<b>Essential characteristic</b>	<b>Performance</b>
Characteristic resistance for static and quasi-static tension load	See Annex C 1 to C 12
Characteristic resistance for static and quasi-static shear load	See Annex C 1 to C 4
Displacements for static and quasi-static loads	See Annex C 13 to C 14
Characteristic resistance for seismic performance categories C1 and C2	See Annex C 15 to C 18
Durability	See Annex B 2

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

<b>Essential characteristic</b>	<b>Performance</b>
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**

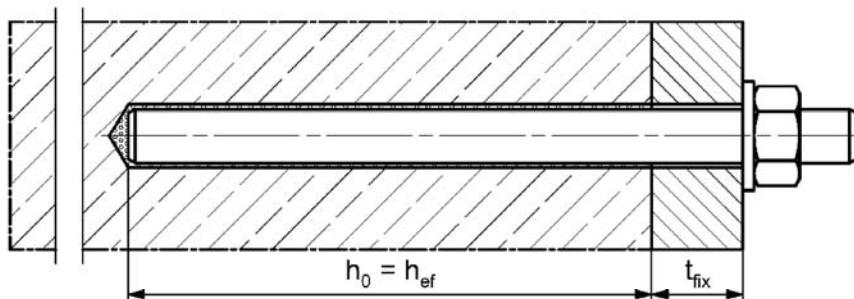
In accordance with EAD 330499-01-0601 according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

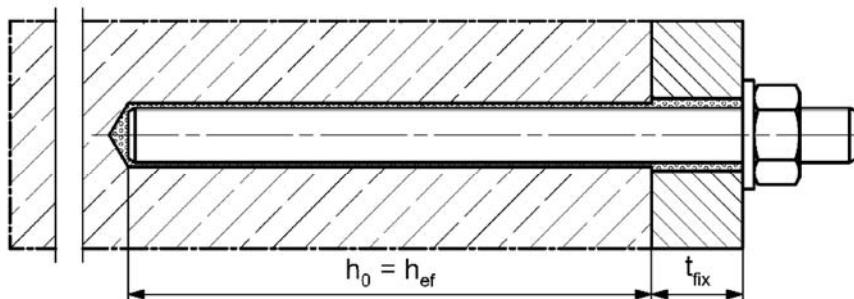
## Installation conditions part 1

**fischer anchor rod**

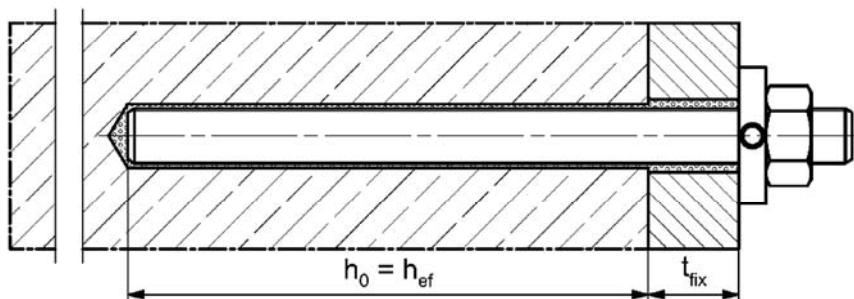
**Pre-positioned installation**



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



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



Figures not to scale

$h_0$  = drill hole depth

$h_{\text{ef}}$  = effective embedment depth

$t_{\text{fix}}$  = thickness of fixture

**fischer injection system FIS EM Plus**

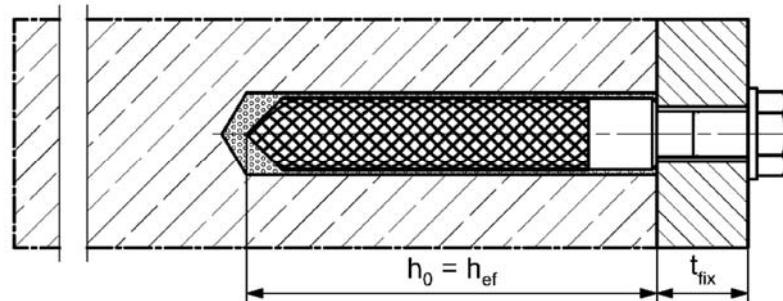
**Product description**  
Installation conditions part 1

**Annex A 1**

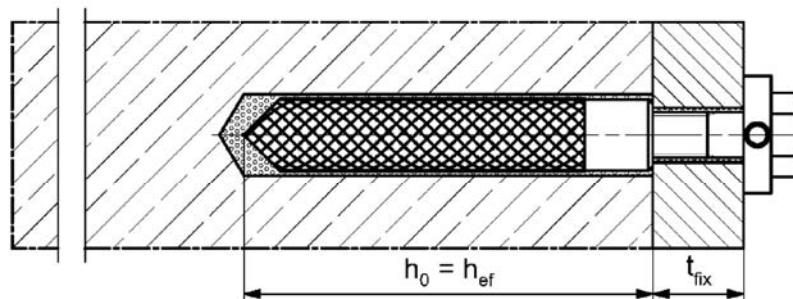
## Installation conditions part 2

fischer internal threaded anchor RG MI

### Pre-positioned installation



### Pre-positioned installation with subsequently injected filling disk (annular gap filled with mortar)



Figures not to scale

$h_0$  = drill hole depth

$h_{\text{ef}}$  = effective embedment depth

$t_{\text{fix}}$  = thickness of fixture

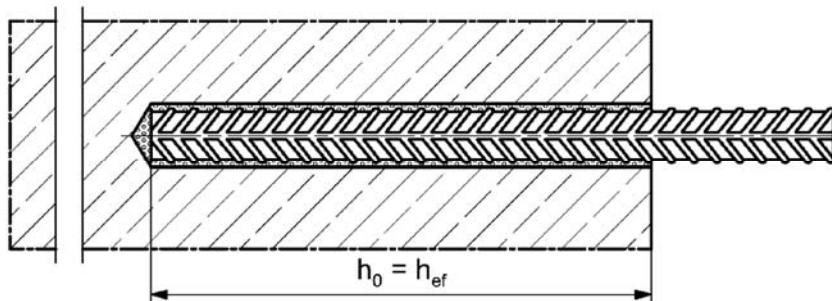
fischer injection system FIS EM Plus

**Product description**  
Installation conditions part 2

**Annex A 2**

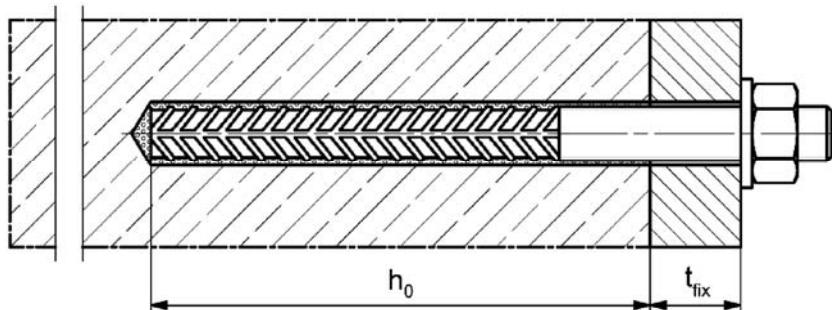
### Installation conditions part 3

#### Reinforcing bar

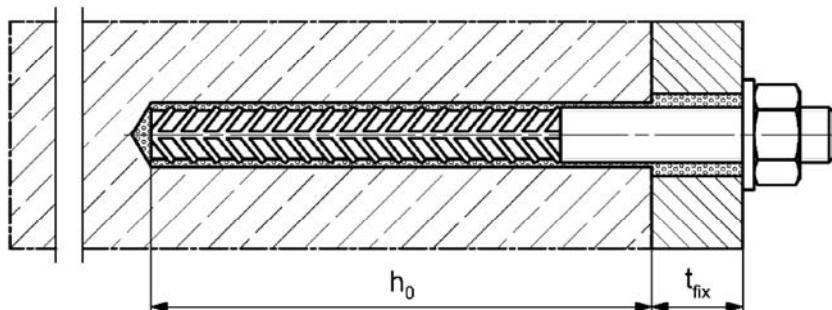


#### fischer rebar anchor FRA

##### Pre-positioned installation



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



Figures not to scale

$h_0$  = drill hole depth

$h_{ef}$  = effective embedment depth

$t_{fix}$  = thickness of fixture

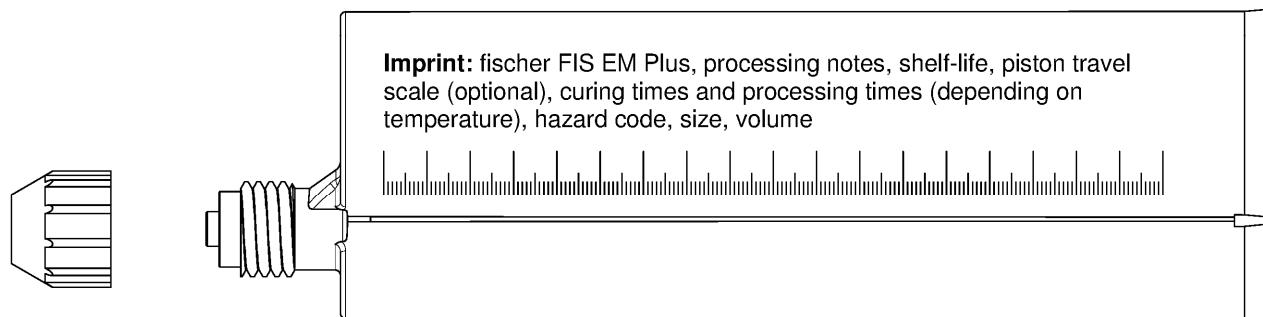
fischer injection system FIS EM Plus

**Product description**  
Installation conditions part 3

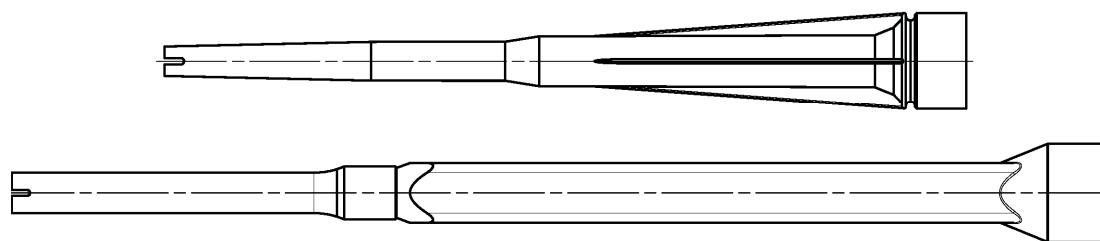
**Annex A 3**

## Overview system components part 1

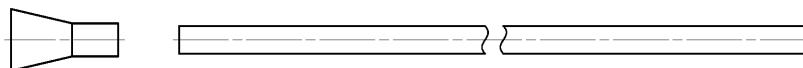
### Injection cartridge (shuttle cartridge) with sealing cap; Size: 390 ml, 585 ml, 1100 ml, 1500 ml



### Static mixer FIS MR Plus or UMR



### Injection adapter and Extension tube for static mixer



### Cleaning brush BS / BSB



### Blow-out pump ABP



Figures not to scale

### fischer injection system FIS EM Plus

#### System description

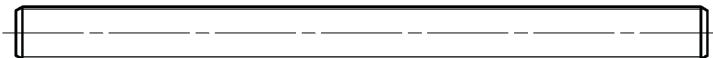
Overview system components part 1;  
cartridges / static mixer / accessories

**Annex A 4**

## Overview system components part 2

### fischer anchor rod

Size: M8, M10, M12, M14, M16, M20, M22, M24, M27, M30

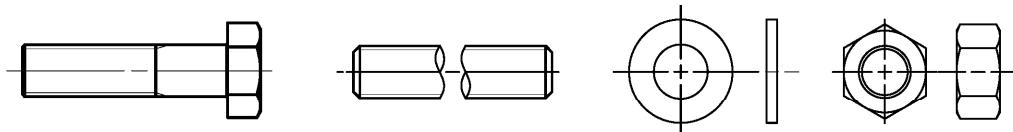


### fischer internal threaded anchor RG MI

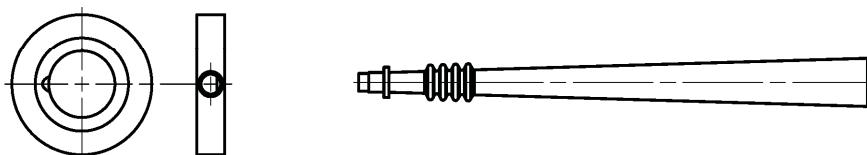
Size: M8, M10, M12, M16, M20



### Screw / threaded rod / washer / hexagon nut



### fischer filling disk FFD with injection adapter



### Reinforcing bar

Nominal diameter:  $\phi 8, \phi 10, \phi 12, \phi 14, \phi 16, \phi 18, \phi 20, \phi 22, \phi 24, \phi 25, \phi 26, \phi 28, \phi 30, \phi 32, \phi 34, \phi 36, \phi 40$



### fischer rebar anchor FRA

Size: M12, M16, M20, M24



Figures not to scale

### fischer injection system FIS EM Plus

#### System description

Overview system components part 2;  
steel components

**Annex A 5**

**Table A6.1:** Materials

Part	Designation	Material				
1	Injection cartridge	Mortar, hardener, filler				
	Steel grade	Steel, zinc plated	Stainless steel A4 <sup>1)</sup>	High corrosion resistant steel C <sup>2)</sup>		
2	Anchor rod	Property class 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5 µm, EN ISO 4042:1999 A2K or hot-dip galvanized ≥ 40 µm EN ISO 10684:2004 $f_{uk} \leq 1000 \text{ N/mm}^2$ $A_5 > 12\%$ fracture elongation	Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062, 1.4662, 1.4462; EN 10088-1:2014 <sup>1)</sup> $f_{uk} \leq 1000 \text{ N/mm}^2$ $A_5 > 12\%$ fracture elongation	Property class 50 or 80 EN ISO 3506-1:2009 or property class 70 with $f_{yk} = 560 \text{ N/mm}^2$ 1.4565; 1.4529; EN 10088-1:2014 $f_{uk} \leq 1000 \text{ N/mm}^2$ $A_5 > 12\%$ fracture elongation		
		Fracture elongation $A_5 > 8\%$ , for applications without requirements for seismic performance category C2				
3	Washer ISO 7089:2000	zinc plated ≥ 5 µm, EN ISO 4042:1999 A2K or hot-dip galvanised ≥ 40 µm EN ISO 10684:2004	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	1.4565; 1.4529; EN 10088-1:2014		
4	Hexagon nut	Property class 5 or 8; EN ISO 898-2:2012 zinc plated ≥ 5 µm, ISO 4042:1999 A2K or hot-dip galvanised ≥ 40 µm EN ISO 10684:2004	Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4565; 1.4529; EN 10088-1:2014		
5	fischer internal threaded anchor RG MI	Property class 5.8 ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:1999 A2K	Property class 70 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	Property class 70 EN ISO 3506-1:2009 1.4565; 1.4529; EN 10088-1:2014		
6	Commercial standard screw or anchor / threaded rod for fischer internal threaded anchor RG MI	Property class 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:1999 A2K $A_5 > 8\%$ fracture elongation	Property class 70 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014 <sup>1)</sup> $A_5 > 8\%$ fracture elongation	Property class 70 EN ISO 3506-1:2009 1.4565; 1.4529; EN 10088-1:2014 $A_5 > 8\%$ fracture elongation		
7	fischer filling disk FFD similar to DIN 6319-G	zinc plated ≥ 5 µm, EN ISO 4042:1999 A2K or hot-dip galvanised ≥ 40 µm EN ISO 10684:2004	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	1.4565; 1.4529; EN 10088-1:2014		
8	Reinforcing bar EN 1992-1-1:2004 and AC:2010, Annex C	Bars and de-coiled rods, class B or C with $f_{yk}$ and k according to NDP or NCL of EN 1992-1-1:2004+AC:2010 $f_{uk} = f_{ik} = k \cdot f_{yk}$				
9	fischer rebar anchor FRA	Rebar part: Bars and de-coiled rods class B or C with $f_{yk}$ and k according to NDP or NCL of EN 1992-1-1:2004+AC:2010 $f_{uk} = f_{ik} = k \cdot f_{yk}$	Threaded part: Property class 70 or 80 EN ISO 3506-1:2009 1.4401, 1.4404, 1.4571, 1.4578, 1.4439, 1.4362, 1.4062 EN 10088-1:2014 <sup>1)</sup> 1.4565; 1.4529 EN 10088-1:2014 <sup>2)</sup>			
<sup>1)</sup> acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4:2015 <sup>2)</sup> acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4:2015						
<b>fischer injection system FIS EM Plus</b>						
<b>Product description</b> Materials			<b>Annex A 6</b>			

**Specifications of intended use (part 1)**
**Table B1.1:** Overview use and performance categories

Anchorage subject to		FIS EM Plus with ...																		
		Anchor rod	fischer internal threaded anchor RG MI	Reinforcing bar		fischer rebar anchor FRA														
Hammer drilling with standard drill bit		all sizes																		
Hammer drilling with hollow drill bit (fischer "FHD", Heller "Duster Expert"; Bosch „Speed Clean“; Hilti "TE-CD, TE-YD")		Nominal drill bit diameter ( $d_0$ ) 12 mm to 35 mm																		
Diamond drilling		all sizes																		
Static and quasi static load, in uncracked concrete	all sizes	Tables: C1.1 C4.1 C5.1 C6.1 C13.1	all sizes	Tables: C2.1 C4.1 C7.1 C8.1 C13.2	all sizes	Tables: C3.1 C4.1 C9.1 C10.1 C14.1	all sizes	Tables: C3.2 C4.1 C11.1 C12.1 C14.2												
Seismic performance category (only hammer drilling with standard / hollow drill bits)	C1	M10 to M30	Tables: C15.1 C16.2 C17.1	-		φ10 to φ32	Tables: C16.1 C16.2 C17.2	-												
Use category	I1	dry or wet concrete	all sizes																	
	I2	water filled hole	all sizes (not permitted in combined with service life time 100 years)																	
Installation direction	D3 (downward and horizontal and upwards (e.g. overhead) installation)																			
Installation temperature	$T_{i,\min} = -5 \text{ }^{\circ}\text{C}$ to $T_{i,\max} = +40 \text{ }^{\circ}\text{C}$																			
In-service temperature	Temperature range I	-40 °C to +60 °C		(max. short term temperature +60 °C ; max. long term temperature +35 °C)																
	Temperature range II	-40 °C to +72 °C		(max. short term temperature +72 °C ; max. long term temperature +50 °C)																
fischer injection system FIS EM Plus																				
Intended use Specifications (part 1)								Annex B 1												

## Specifications of intended use (part 2)

### Base materials:

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

### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (zinc coated steel, stainless steel or high corrosion resistant steel).
- For all other conditions according to EN1993-1-4:2015 corresponding to corrosion resistance classes to Annex A 6 table 6.1.

### Design:

- Anchorages have to be designed by a responsible engineer with experience of concrete anchor design.
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e. g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages are designed in accordance with:  
EN 1992-4:2018 and EOTA Technical Report TR 055.  
Anchorages shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure.  
Fastening in stand-off installation or with a grout layer under seismic action are not covered in this European Technical Assessment (ETA).

### 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 injection system FIS EM Plus

**Intended use**  
Specifications (part 2)

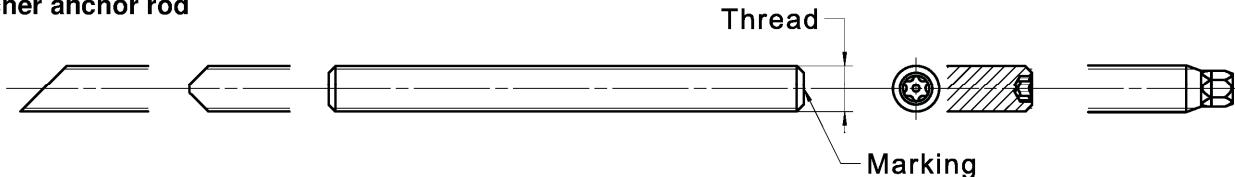
**Annex B 2**

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

Anchor rods	Thread	M8	M10	M12	M14	M16	M20	M22	M24	M27	M30	
Width across flats	SW [mm]	13	17	19	22	24	30	32	36	41	46	
Nominal drill hole diameter		10	12	14	16	18	22 24 <sup>1)</sup>	25	28	30	35	
Drill hole depth		$h_0 = h_{\text{ef}}$										
Effective embedment depth		60	60	70	75	80	90	93	96	108	120	
		160	200	240	280	320	400	440	480	540	600	
Diameter of the clearance hole of the fixture		9	12	14	16	18	22	24	26	30	33	
push through installation		12	14	16	18	20	26	28	30	33	40	
Minimum thickness of concrete member		$h_{\text{ef}} + 30$ ( $\geq 100$ )		$h_{\text{ef}} + 2d_0$								
Maximum torque moment for attachment of the fixture	max $T_{\text{fix}}$ [Nm]	10	20	40	50	60	120	135	150	200	300	

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

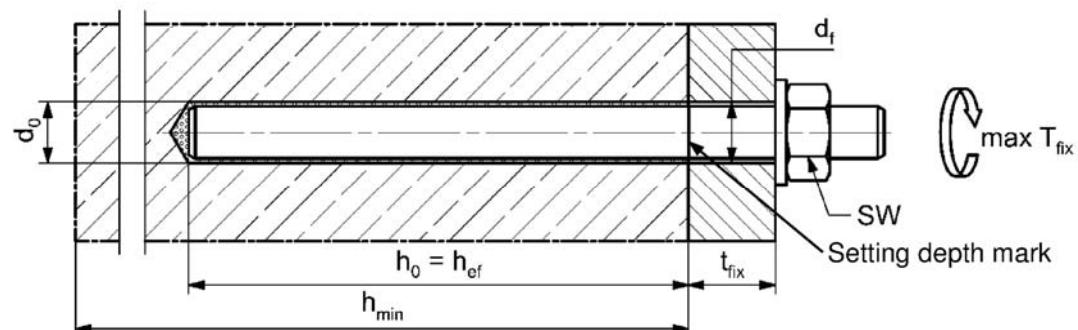
#### fischer anchor rod



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

Property class 8.8, stainless steel, property class 80 and high corrosion resistant steel, property class 80: •  
Stainless steel A4, property class 50 and high corrosion resistant steel, property class 50: ••  
Alternatively: Colour coding according to DIN 976-1

#### Installation conditions:



**Commercial standard threaded rods, washers and hexagon nuts may also be used if the following requirements are fulfilled**

- Materials, dimensions and mechanical properties according to Annex A 6, Table A6.1
- Inspection certificate 3.1 according to EN 10204:2004, the documents have to be stored
- Setting depth is marked

Figures not to scale

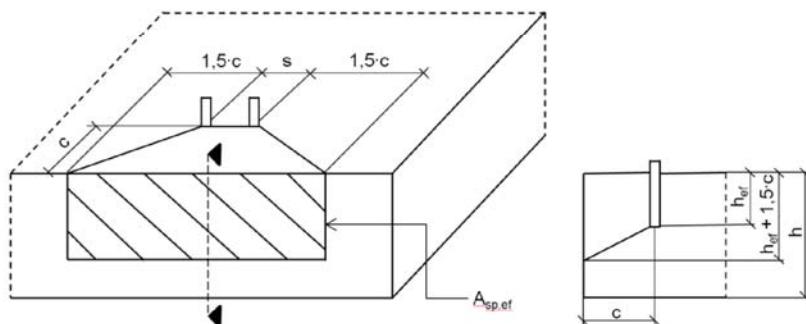
fischer injection system FIS EM Plus

**Intended use**  
Installation parameters anchor rods

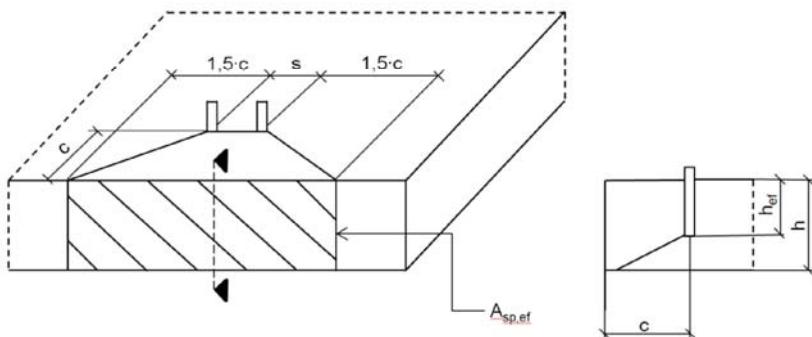
**Annex B 3**

**Table B4.1:** Minimum spacing and minimum edge distance for anchor rods and reinforcing bars

Anchor rods	M8	M10	M12	M14	M16	-	M20	M22	M24
Reinforcing bars (nominal diameter) $\phi$	8	10	12	14	16	18	20	22	24
<b>Minimum edge distance</b>									
Uncracked / cracked concrete $C_{min}$ [mm]	40	45	45	45	50	55	55	55	60
Minimum spacing $S_{min}$	according to Annex B5								
<b>Minimum spacing</b>									
Uncracked / cracked concrete $S_{min}$ [mm]	40	45	55	60	65	85	85	95	105
Minimum edge distance $C_{min}$	according to Annex B5								
<b>Required projecting area</b>									
Uncracked concrete $A_{sp,req}$ [1000 mm <sup>2</sup> ]	8	13	22	23	24	38,5	38,5	39,5	40
Cracked concrete	6,5	10	16,5	17,5	18,5	29,5	29,5	30	30,5
<b>Anchor rods</b>									
Reinforcing bars (nominal diameter) $\phi$	25	26	-	28	30	32	34	36	40
<b>Minimum edge distance</b>									
Uncracked / cracked concrete $C_{min}$ [mm]	75	75	75	80	80	120	120	135	175
Minimum spacing $S_{min}$	according to Annex B5								
<b>Minimum spacing</b>									
Uncracked / cracked concrete $S_{min}$ [mm]	120	120	120	140	140	160	160	160	160
Minimum edge distance $C_{min}$	according to Annex B5								
<b>Required projecting area</b>									
Uncracked concrete $A_{sp,req}$ [1000 mm <sup>2</sup> ]	47,5	47,5	47,5	64	64	64	64	64	64
Cracked concrete	36,5	36,5	36,5	49	49	49	49	49	49
<b>Splitting failure</b> 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 B5)									
fischer injection system FIS EM Plus								<b>Annex B 4</b>	
<b>Intended use</b> Minimum spacing and edge distance for anchor rods and reinforcing bars									

**Table B5.1:** 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 B5.2:** Effective 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 5 mm

Figures not to scale

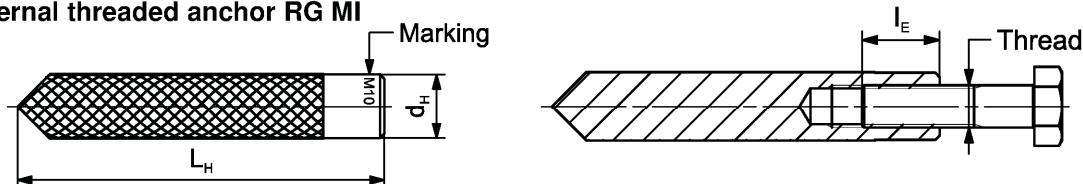
fischer injection system FIS EM Plus

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

**Annex B 5**

**Table B6.1:** Installation parameters plus minimum spacing and minimum edge distance for fischer internal threaded anchors RG MI

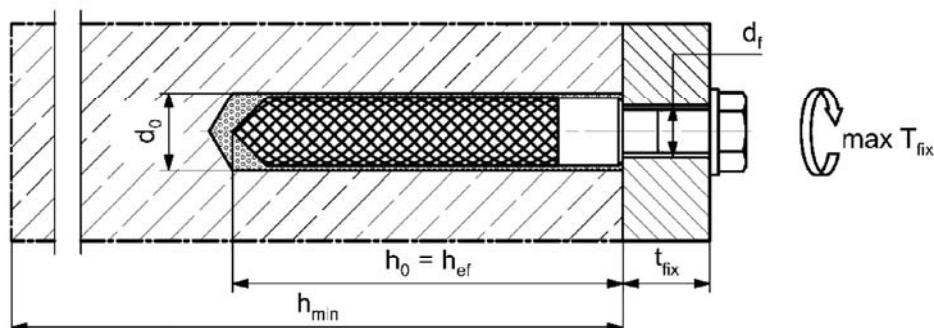
Internal threaded anchors RG MI	Thread	M8	M10	M12	M16	M20
Diameter of anchor	d <sub>nom</sub> = d <sub>H</sub> [mm]	12	16	18	22	28
Nominal drill hole diameter		14	18	20	24	32
Drill hole depth		$h_0 = h_{\text{ef}} = L_H$				
Effective embedment depth ( $h_{\text{ef}} = L_H$ )		90	90	125	160	200
Minimum spacing and minimum edge distance		55	65	75	95	125
Diameter of clearance hole in the fixture		9	12	14	18	22
Minimum thickness of concrete member		120	125	165	205	260
Maximum screw-in depth		18	23	26	35	45
Minimum screw-in depth		8	10	12	16	20
Maximum torque moment for attachment of the fixture	max T <sub>fix</sub> [Nm]	10	20	40	80	120

**fischer internal threaded anchor RG MI****Marking:** Anchor size e. g.: M10

Stainless steel → additional A4; e.g.: M10 A4

High corrosion resistant steel → additional C; e.g.: M10 C

Retaining bolt or threaded rods (including nut and washer) must comply with the appropriate material and strength class of Annex A 6, Table A6.1

**Installation conditions:**

Figures not to scale

**fischer injection system FIS EM Plus****Intended use**  
Installation parameters internal threaded anchors RG MI**Annex B 6**

**Table B7.1:** 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	18	20	22	24
Nominal drill hole diameter	$d_0$ [mm]	10	12	12	14	14	16	18	20	25
Drill hole depth									25	30
Effective embedment depth		60	60	70	75	80	85	90	94	98
h <sub>min</sub>		160	200	240	280	320	360	400	440	480
Minimum thickness of concrete member	$h_{\min}$	$h_{\text{ref}} + 30$ ( $\geq 100$ )		$h_{\text{ref}} + 2d_0$						

Nominal diameter of the bar	$\phi$	25	26	28	30	32	34	36	40	-
Nominal drill hole diameter	$d_0$ [mm]	30	35	35	40	40	40	45	55	-
Drill hole depth										
Effective embedment depth		100	104	112	120	128	136	144	160	-
h <sub>min</sub>		500	520	560	600	640	680	720	800	-
Minimum thickness of concrete member	$h_{\min}$	$h_{\text{ref}} + 2d_0$								

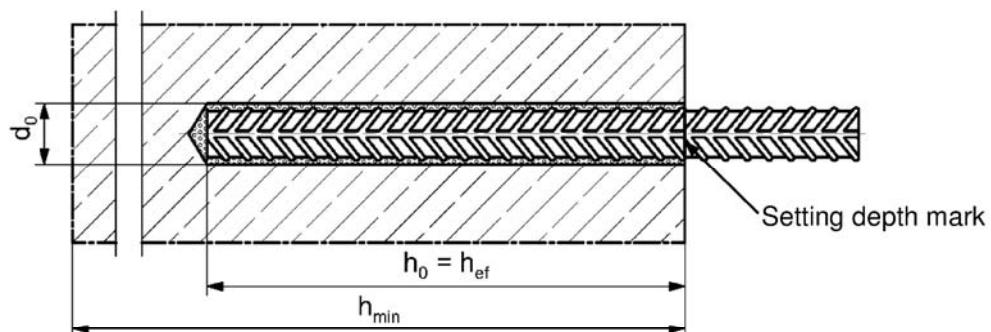
<sup>1)</sup> Both drill hole diameters can be used

#### Reinforcing bar



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

#### Installation conditions:



Figures not to scale

fischer injection system FIS EM Plus

**Intended use**  
Installation parameters reinforcing bars

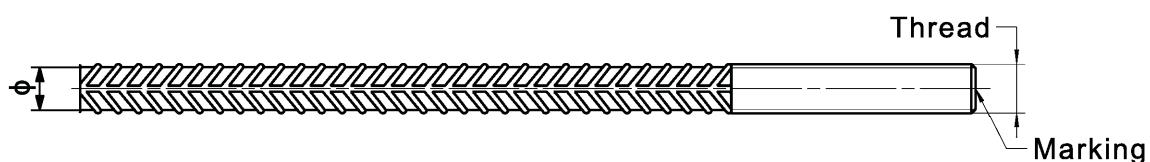
**Annex B 7**

**Table B8.1:** Installation parameters plus minimum spacing and minimum edge distance for fischer rebar anchor FRA

Rebar anchor FRA	Thread	M12 <sup>1)</sup>	M16	M20	M24
Nominal diameter of the bar $\phi$		12	16	20	25
Width across flats SW		19	24	30	36
Nominal drill hole diameter $d_0$	14   16	20	25	30	
Drill hole depth $h_0$		$h_{\text{ef}} + l_e$			
Effective embedment depth $h_{\text{ef},\text{min}}$		70	80	90	96
$h_{\text{ef},\text{max}}$		140	220	300	380
Distance concrete surface to welded joint $l_e$		100			
Minimum spacing and minimum edge distance $s_{\text{min}} = c_{\text{min}}$	[mm]	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 $h_{\text{min}}$		$h_0 + 30$ ( $\geq 100$ )	$h_0 + 2d_0$		
Maximum torque moment for attachment of the fixture $\text{max } T_{\text{fix}}$	[Nm]	40	60	120	150

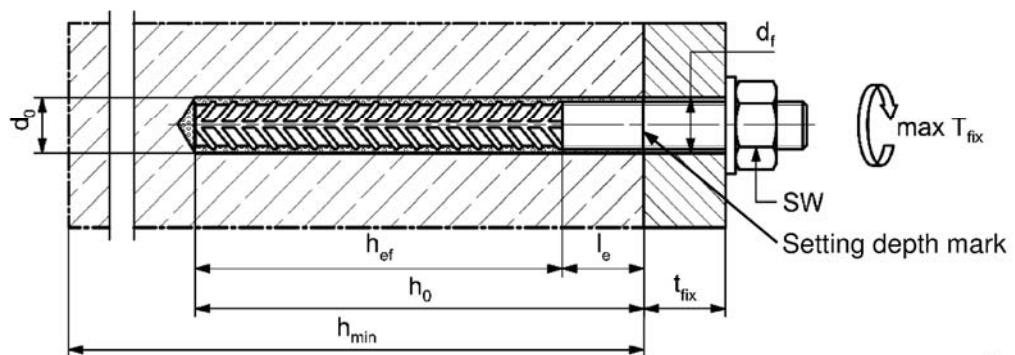
<sup>1)</sup> Both drill hole diameters can be used

#### fischer rebar anchor FRA



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

#### Installation conditions:



Figures not to scale

#### fischer injection system FIS EM Plus

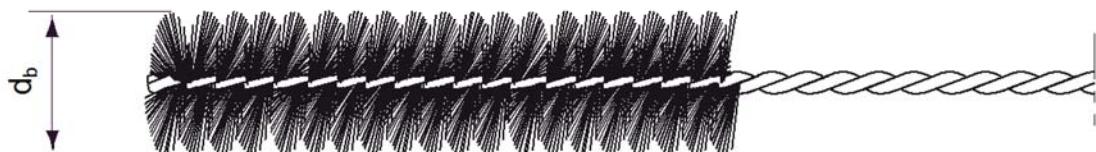
**Intended use**  
Installation parameters rebar anchor FRA

**Annex B 8**

**Table B9.1:** Parameters of the cleaning brush BS / BSB (steel brush)

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	32	35	40	45	55
Steel brush diameter	$d_b$		11	14	16		20	25	26	27	30		40		42	47	58



**Table B9.2** Maximum processing time of the mortar and minimum curing time  
(During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature)

Temperature at anchoring base [°C]	Maximum processing time $t_{work}$	Minimum curing time $t_{cure}$
-5 to -1	240 min	200 h
±0 to +4	150 min	90 h
+5 to +9	120 min	40 h
+10 to +19	30 min	18 h
+20 to +29	14 min	10 h
+30 to +40	7 min	5 h

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

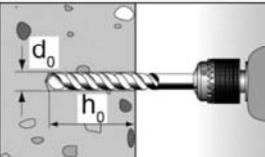
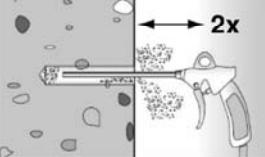
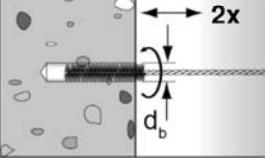
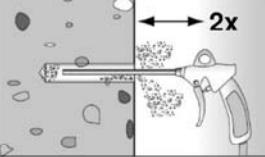
fischer injection system FIS EM Plus

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

**Annex B 9**

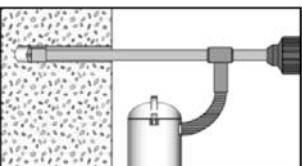
## Installation instructions part 1

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 <b>tables B3.1, B6.1, B7.1, B8.1</b></p>
2	 <p>Cleaning the drill hole: Blow out the drill hole twice, with oil free compressed air (<math>p \geq 6</math> bar)</p>
3	 <p>Brush the drill hole twice. For drill hole diameter <math>\geq 30</math> mm use a power drill. For deep holes use an extension. Corresponding brushes see <b>table B9.1</b></p>
4	 <p>Cleaning the drill hole: Blow out the drill hole twice, with oil free compressed air (<math>p \geq 6</math> bar)</p>

Go to step 6

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

1	 <p>Check a suitable hollow drill (see <b>table B1.1</b>) for correct operation of the dust extraction</p>
2	 <p>Use a suitable dust extraction system, e. g. Bosch GAS 35 M AFC 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 <b>tables B3.1, B6.1, B7.1, B8.1</b></p>

Go to step 6

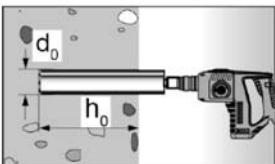
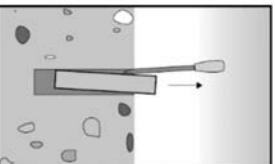
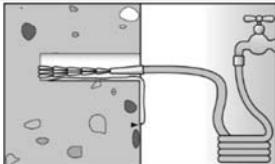
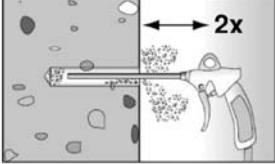
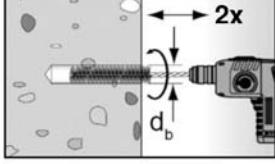
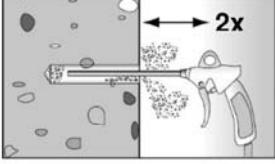
fischer injection system FIS EM Plus

**Intended use**  
Installation instructions part 1

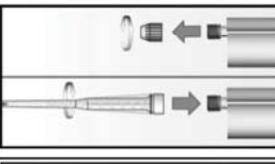
**Annex B 10**

## Installation instructions part 2

### Drilling and cleaning the hole (wet drilling with diamond drill bit)

1		Drill the hole. Drill hole diameter $d_0$ and nominal drill hole depth $h_0$ , see tables B3.1, B6.1, B7.1, B8.1		Break the drill core and remove it
2		Flush the drill hole with clean water until it flows clear		
3		Blow out the drill hole twice, using oil-free compressed air ( $p > 6$ bar)		
4		Brush the drill hole twice using a power drill. Corresponding brushes see table B9.1		
5		Blow out the drill hole twice, using oil-free compressed air ( $p > 6$ bar)		

### Preparing the cartridge

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

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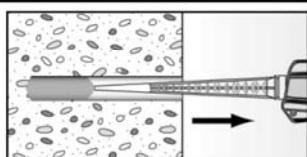
**Intended use**  
Installation instructions part 2

**Annex B 11**

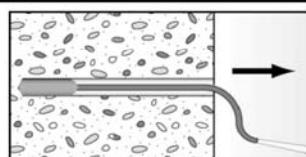
### Installation instructions part 3

#### Injection of the mortar

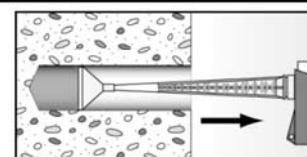
9



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



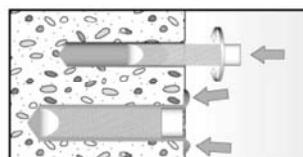
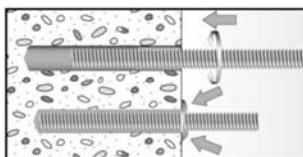
For drill hole depth  $\geq 150$  mm use an extension tube



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

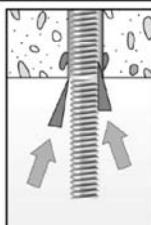
#### Installation of anchor rods or fischer internal threaded anchors RG MI

10

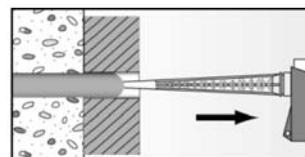


Only use clean and oil-free anchor elements. Mark the setting depth of the anchor. Push the anchor rod or fischer internal threaded RG MI anchor down to the bottom of the hole, turning it slightly while doing so.

After inserting the anchor element, excess mortar must be emerged around the anchor element.



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



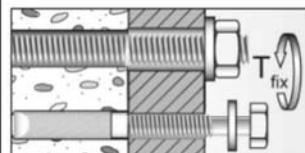
For push through installation fill the annular gap with mortar

11



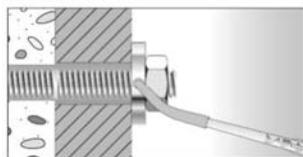
Wait for the specified curing time  $t_{cure}$  see **table B9.2**

12



Mounting the fixture  
max  $T_{fix}$  see  
**tables B3.1**  
**and B6.1**

Option



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 FFD. Compressive strength  $\geq 50$  N/mm $^2$  (e.g. fischer injection mortars FIS HB, FIS SB, FIS V, FIS EM Plus)  
ATTENTION: Using fischer filling disk FFD reduces  $t_{fix}$  (usable length of the anchor)

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**Intended use**

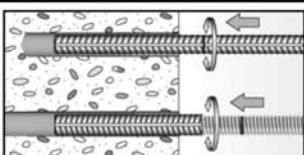
Installation instructions part 3

**Annex B 12**

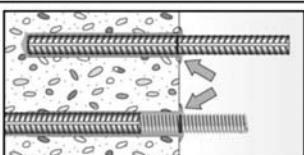
**Installation instructions part 4**

## Installation reinforcing bars and fischer rebar anchor FRA

10



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



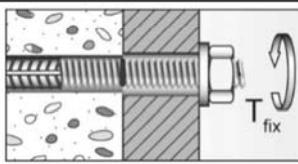
When the setting depth mark is reached, excess mortar must be emerged from the mouth of the drill hole.

11



Wait for the specified curing time  $t_{cure}$  see **table B9.2**

12



Mounting the fixture  
max  $T_{fix}$   
see **table B8.1**

fischer injection system FIS EM Plus

**Intended use**

Installation instructions part 4

**Annex B 13**

**Table C1.1:** Essential characteristics<sup>3)</sup> for the **steel bearing capacity** under tensile / shear load of **fischer anchor rods** and **standard threaded rods**

Anchor rod / standard threaded rod			M8	M10	M12	M14	M16	M20	M22	M24	M27	M30				
<b>Bearing capacity under tensile load, steel failure</b>																
Characteristic resistance $N_{Rk,s}$	Steel zinc plated	Property class	5.8	[kN]	19(17)	29(27)	43	58	79	123	152	177	230	281		
			8.8		29(27)	47(43)	68	92	126	196	243	282	368	449		
			50		19	29	43	58	79	123	152	177	230	281		
			70		26	41	59	81	110	172	212	247	322	393		
			80		30	47	68	92	126	196	243	282	368	449		
	Stainless steel A4 and high corrosion resistant steel C		5.8		1,50											
			8.8		1,50											
			50		2,86											
			70		1,50 <sup>2)</sup> / 1,87											
			80		1,60											
<b>Bearing capacity under shear load, steel failure</b>																
<b>without lever arm</b>																
Characteristic resistance $V_{Rk,s}^0$	Steel zinc plated	Property class	5.8	[kN]	9(8)	15(13)	21	29	39	61	76	89	115	141		
			8.8		15(13)	23(21)	34	46	63	98	122	141	184	225		
			50		9	15	21	29	39	61	76	89	115	141		
			70		13	20	30	40	55	86	107	124	161	197		
			80		15	23	34	46	63	98	122	141	184	225		
	Stainless steel A4 and high corrosion resistant steel C		5.8		19(16)	37(33)	65	104	166	324	447	560	833	1123		
			8.8		30(26)	60(53)	105	167	266	519	716	896	1333	1797		
			50		19	37	65	104	166	324	447	560	833	1123		
			70		26	52	92	146	232	454	626	784	1167	1573		
			80		30	60	105	167	266	519	716	896	1333	1797		
<b>with lever arm</b>																
Characteristic resistance $M_{Rk,s}^0$	Steel zinc plated	Property class	5.8	[Nm]	19(16)	37(33)	65	104	166	324	447	560	833	1123		
			8.8		30(26)	60(53)	105	167	266	519	716	896	1333	1797		
			50		19	37	65	104	166	324	447	560	833	1123		
			70		26	52	92	146	232	454	626	784	1167	1573		
			80		30	60	105	167	266	519	716	896	1333	1797		
	Stainless steel A4 and high corrosion resistant steel C		5.8		1,25											
			8.8		1,25											
			50		2,38											
			70		1,25 <sup>2)</sup> / 1,56											
			80		1,33											
<sup>1)</sup> In absence of other national regulations																
<sup>2)</sup> Only admissible for high corrosion resistant steel C, with $f_{yk} / f_{uk} \geq 0,8$ and $A_5 > 12\%$ (e.g. fischer anchor rods)																
<sup>3)</sup> Values in brackets are valid for undersized threaded rods with smaller stress area $A_s$ for hotdip galvanized standard threaded rods according to EN ISO 10684:2004+AC:2009																
<b>fischer injection system FIS EM Plus</b>										<b>Annex C 1</b>						
<b>Performance</b> Essential characteristics for the steel bearing capacity of fischer anchor rods and standard threaded rods										<b>Annex C 1</b>						

**Table C2.1:** Essential characteristics for the **steel bearing capacity** under tensile / shear load of **fischer internal threaded anchors RG MI**

**Table C3.1:** Essential characteristics for the **steel bearing capacity** under tensile / shear load of **reinforcing bars**

Nominal diameter of the bar	$\phi$	8	10	12	14	16	18	20	22	24	25	26	28	30	32	34	36	40
<b>Bearing capacity under tensile load, steel failure</b>																		
Characteristic resistance $N_{Rk,s}$ [kN]																		
<b>Bearing capacity under shear load, steel failure</b>																		
<b>Without lever arm</b>																		
Characteristic resistance	$V_{Rk,s}^0$	[kN]																0,5 · $A_s \cdot f_{uk}^{1)}$
Ductility factor	$k_7$	[-]																0,8
<b>With lever arm</b>																		
Characteristic resistance	$M_{Rk,s}^0$	[Nm]																1,2 · $W_{el} \cdot f_{uk}^{1)}$

<sup>1)</sup>  $f_{uk}$  or  $f_{yk}$  respectively must be taken from the specifications of the reinforcing bar

**Table C3.2:** Essential characteristics for the **steel bearing capacity** under tensile / shear load of **fischer rebar anchors FRA**

fischer rebar anchor FRA	M12	M16	M20	M24
<b>Bearing capacity under tensile load, steel failure</b>				
Characteristic resistance $N_{Rk,s}$ [kN]	63	111	173	270
<b>Partial factor<sup>1)</sup></b>				
Partial factor $\gamma_{Ms,N}$ [-]			1,4	
<b>Bearing capacity under shear load, steel failure</b>				
<b>Without lever arm</b>				
Characteristic resistance $V_{Rk,s}^0$ [kN]	30	55	86	124
Ductility factor $k_7$ [-]			1,0	
<b>With lever arm</b>				
Characteristic resistance $M_{Rk,s}^0$ [Nm]	92	233	454	785
<b>Partial factor<sup>1)</sup></b>				
Partial factor $\gamma_{Ms,V}$ [-]			1,56	

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

fischer injection system FIS EM Plus	<b>Annex C 3</b>
<b>Performance</b> Essential characteristics for the steel bearing capacity of reinforcing bars and fischer rebar anchors FRA	

**Table C4.1:** Essential characteristics under tensile / shear load

Size		All sizes																	
<b>Tensile load</b>																			
Uncracked concrete	K <sub>ucr,N</sub>	11,0																	
Cracked concrete	K <sub>cr,N</sub>	7,7																	
<b>Factors for the compressive strength of concrete &gt; C20/25</b>																			
Increasing factor for $\tau_{Rk}$	C25/30	$\Psi_c$	[-]	1,02															
	C30/37			1,04															
	C35/45			1,06															
	C40/50			1,07															
	C45/55			1,08															
	C50/60			1,09															
<b>Splitting failure</b>																			
Edge distance	$h / h_{ef} \geq 2,0$ $2,0 > h / h_{ef} > 1,3$ $h / h_{ef} \leq 1,3$	C <sub>cr,sp</sub>	[mm]	1,0 $h_{ef}$															
				4,6 $h_{ef}$ - 1,8 $h$															
				2,26 $h_{ef}$															
Spacing	S <sub>cr,sp</sub>	2 C <sub>cr,sp</sub>																	
<b>Concrete cone failure</b>																			
Edge distance	C <sub>cr,N</sub>	1,5 $h_{ef}$																	
Spacing	S <sub>cr,N</sub>	2 C <sub>cr,N</sub>																	
<b>Shear load</b>																			
Installation factor	$\gamma_{inst}$	1,0																	
<b>Concrete pry-out failure</b>																			
Factor for pry-out failure	k <sub>8</sub>	2,0																	
<b>Concrete edge failure</b>																			
The value of $h_{ef}$ (=l)											Conditions according to 1992-4:2018: chapter 7.2.2.5; Section 6; formular 7.43								
<b>Calculation diameters</b>																			
Size			M8	M10	M12	M14	M16	M20	M22	M24	M27	M30							
fischer anchor rods and standard threaded rods	d <sub>nom</sub>	[mm]	8	10	12	14	16	20	22	24	27	30							
fischer internal threaded anchors RG MI	d <sub>nom</sub>		12	16	18	-	22	28	-	-	-	-							
fischer rebar anchor FRA	d <sub>nom</sub>		-	-	12	-	16	20	-	25	-	-							
Size (nominal diameter of the bar)		Ø	8	10	12	14	16	18	20	22	24	25	26	28	30	32	34	36	40
Reinforcing bar	d <sub>nom</sub>	[mm]	8	10	12	14	16	18	20	22	24	25	26	28	30	32	34	36	40
fischer injection system FIS EM Plus																			
												Annex C 4							
<b>Performance</b>																			
Essential characteristics under tensile / shear load																			

**Table C5.1:** Essential characteristics of **tensile resistance** for **fischer anchor rods** and **standard threaded rods** in hammer or diamond drilled holes; **uncracked or cracked concrete; service life time 50 years**

Anchor rod / standard threaded rod			M8	M10	M12	M14	M16	M20	M22	M24	M27	M30												
<b>Combined pullout and concrete cone failure</b>																								
Calculation diameter	d	[mm]	8	10	12	14	16	20	22	24	27	30												
<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)																								
Tem- pera ture range	I: 35 °C / 60 °C	$\tau_{Rk,ucr}$	[N/mm <sup>2</sup> ]	18	18	18	17	17	16	15	15	15												
	II: 50 °C / 72 °C			18	17	17	16	16	15	14	14	13												
Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)																								
Tem- pera ture range	I: 35 °C / 60 °C	$\tau_{Rk,ucr}$	[N/mm <sup>2</sup> ]	16	16	15	13	13	11	11	10	10												
	II: 50 °C / 72 °C			15	14	14	13	12	11	10	10	9												
Diamond-drilling (dry or wet concrete as well as water filled hole)																								
Tem- pera ture range	I: 35 °C / 60 °C	$\tau_{Rk,ucr}$	[N/mm <sup>2</sup> ]	16	15	13	12	12	10	10	10	9												
	II: 50 °C / 72 °C			15	14	12	11	11	10	9	9	8												
<b>Installation factors</b>																								
Dry or wet concrete	$\gamma_{inst}$	[-]	1,0																					
Water filled hole			1,4																					
<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)																								
Tem- pera ture range	I: 35 °C / 60 °C	$\tau_{Rk,cr}$	[N/mm <sup>2</sup> ]	7,5	7,5	9	8,5	8,5	8,5	8,5	8,5	8,5												
	II: 50 °C / 72 °C			7,5	7,5	9	8,5	8,5	8,5	8,5	8,5	8,5												
Diamond - drilling (dry or wet concrete)																								
Tem- pera ture range	I: 35 °C / 60 °C	$\tau_{Rk,cr}$	[N/mm <sup>2</sup> ]	7	7	7	7	6	6	7	7	7												
	II: 50 °C / 72 °C			7	7	7	7	6	6	7	7	7												
Hammer-drilling with standard drill bit or hollow drill bit and diamond-drilling (water filled hole)																								
Tem- pera ture range	I: 35 °C / 60 °C	$\tau_{Rk,cr}$	[N/mm <sup>2</sup> ]	6	7,5	7,5	7	6	6	6	6	6												
	II: 50 °C / 72 °C			6	7	7	7	6	6	6	6	6												
<b>Installation factors</b>																								
Dry or wet concrete	$\gamma_{inst}$	[-]	1,0																					
Water filled hole			1,2																					
fischer injection system FIS EM Plus																								
<b>Performance</b>										<b>Annex C 5</b>														
Essential characteristics of tensile resistance for fischer anchor rod and standard threaded rods; service life time 50 years																								

**Table C6.1:** Essential characteristics of **tensile resistance** for **fischer anchor rods** and **standard threaded rods** in hammer or diamond drilled holes; **uncracked or cracked concrete; service life time 100 years**

Anchor rod / standard threaded rod		M8	M10	M12	M14	M16	M20	M22	M24	M27	M30		
<b>Combined pullout and concrete cone failure</b>													
Calculation diameter	d [mm]	8	10	12	14	16	20	22	24	27	30		
<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)													
Tem- perature range	I: 35 °C / 60 °C	$\tau_{Rk,ucr}$	[N/mm <sup>2</sup> ]	18	18	18	17	17	16	15	15		
	II: 50 °C / 72 °C			18	17	17	16	16	15	14	14		
Diamond-drilling (dry or wet concrete)													
Tem- perature range	I: 35 °C / 60 °C	$\tau_{Rk,ucr}$	[N/mm <sup>2</sup> ]	16	15	13	12	12	10	10	9		
	II: 50 °C / 72 °C			15	14	12	11	11	10	9	8		
<b>Installation factors</b>													
Dry or wet concrete	$\gamma_{inst}$	[ $\cdot$ ]	1,0										
Service life time 100 years	I: 35 °C / 60 °C	$\alpha_{100 \text{ years}}$	[-]	0,75	0,75	0,75	0,75	0,75	0,75	0,75	0,75		
	II: 50 °C / 72 °C			0,55	0,60	0,60	0,65	0,65	0,65	0,65	0,65		
<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)													
Tem- perature range	I: 35 °C / 60 °C	$\tau_{Rk,cr}$	[N/mm <sup>2</sup> ]	7,5	7,5	9	8,5	8,5	8,5	8,5	8,5		
	II: 50 °C / 72 °C			7,5	7,5	9	8,5	8,5	8,5	8,5	8,5		
Diamond - drilling (dry or wet concrete)													
Tem- perature range	I: 35 °C / 60 °C	$\tau_{Rk,cr}$	[N/mm <sup>2</sup> ]	7	7	7	7	6	6	7	7		
	II: 50 °C / 72 °C			7	7	7	7	6	6	7	7		
<b>Installation factors</b>													
Dry or wet concrete	$\gamma_{inst}$	[ $\cdot$ ]	1,0										
Service life time 100 years	I: 35 °C / 60 °C	$\alpha_{100 \text{ years}}$	[-]	0,60	0,85	0,80	0,65	0,65	0,65	0,65	0,65		
	II: 50 °C / 72 °C			0,60	0,85	0,80	0,65	0,65	0,65	0,65	0,65		
<b>fischer injection system FIS EM Plus</b>													
<b>Performance</b> Essential characteristics of tensile resistance for fischer anchor rod and standard threaded rods; service life time 100 years										<b>Annex C 6</b>			

**Table C7.1:** Essential characteristics of **tensile resistance** for **fischer internal threaded anchors RG MI** in hammer or diamond drilled holes; **uncracked or cracked concrete; service life time 50 years**

**Table C8.1:** Essential characteristics of **tensile resistance** for fischer internal threaded anchors RG MI in hammer or diamond drilled holes; **uncracked or cracked concrete; service life time 100 years**

Internal threaded anchor RG MI		M8	M10	M12	M16	M20	
<b>Combined pullout and concrete cone failure</b>							
Calculation diameter	d [mm]	12	16	18	22	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)							
Tem- pera ture range	I: 35 °C / 60 °C	τ <sub>Rk,ucr</sub> [N/mm <sup>2</sup> ]	15	14	14	13	
	II: 50 °C / 72 °C		14	13	13	12	
Diamond-drilling (dry or wet concrete)							
Tem- pera ture range	I: 35 °C / 60 °C	τ <sub>Rk,ucr</sub> [N/mm <sup>2</sup> ]	13	12	11	10	
	II: 50 °C / 72 °C		12	11	10	9	
<b>Installation factors</b>							
Dry or wet concrete	γ <sub>inst</sub>	[ - ]	1,0				
Service life time 100 years	I: 35 °C / 60 °C	α <sub>100 years</sub> [-]	0,75	0,75	0,75	0,75	
	II: 50 °C / 72 °C		0,55	0,60	0,60	0,65	
<b>Cracked concrete</b>							
<b>Characteristic bond resistance in cracked concrete C20/25</b>							
Hammer-drilling with standard drill bit or hollow drill bit and diamond-drilling (dry or wet concrete)							
Tem- pera ture range	I: 35 °C / 60 °C	τ <sub>Rk,cr</sub> [N/mm <sup>2</sup> ]	7	6	6	7	
	II: 50 °C / 72 °C		7	6	6	7	
<b>Installation factors</b>							
Dry or wet concrete	γ <sub>inst</sub>	[ - ]	1,0				
Service life time 100 years	I: 35 °C / 60 °C	α <sub>100 years</sub> [-]	0,60	0,85	0,80	0,65	
	II: 50 °C / 72 °C		0,60	0,85	0,80	0,65	
fischer injection system FIS EM Plus							
<b>Performance</b>							
Essential characteristics of tensile resistance for fischer internal threaded anchors RG MI; service life time 100 years							
<b>Annex C 8</b>							

**1) Calculation of characteristic bond resistance in uncracked concrete  $\tau_{Rk,100\text{ years},ucr}$  :**

$$\tau_{Rk,100\text{ years},ucr} = \alpha_{100\text{ years}} \cdot \tau_{Rk,ucr}$$

**2) Calculation of characteristic bond resistance in cracked concrete  $\tau_{Rk,100\text{ years},cr}$  :**

$$\tau_{Rk,100\text{ years},cr} = \alpha_{100\text{ years}} \cdot \tau_{Rk,cr}$$

**Table C9.1:** Essential characteristics of **tensile resistance for reinforcing bars** in hammer or diamond drilled holes; **uncracked or cracked concrete;** **service life time 50 years**

**Table C10.1: Essential characteristics of tensile resistance for reinforcing bars in hammer or diamond drilled holes; uncracked or cracked concrete; service life time 100 years**

Nominal diameter of the bar	$\phi$	8	10	12	14	16	18	20	22	24	25	26	28	30	32	34	36	40		
<b>Combined pullout and concrete cone failure</b>																				
Calculation diameter d [mm]																				
<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)																				
Tem- perature range	I: 35 °C / 60 °C	$\tau_{Rk,ucr}$	[N/mm <sup>2</sup> ]	16	15	15	14	14	13	13	13	12	12	12	12	12	11	11	11	
	II: 50 °C / 72 °C			15	14	14	13	13	12	12	12	12	11	11	11	11	10	10	10	
<b>Diamond-drilling (dry or wet concrete)</b>																				
Tem- perature range	I: 35 °C / 60 °C	$\tau_{Rk,ucr}$	[N/mm <sup>2</sup> ]	16	15	13	12	12	11	10	10	10	9	9	9	9	8	8	7	
	II: 50 °C / 72 °C			15	14	12	11	11	10	10	9	9	9	8	8	8	7	7	7	
<b>Installation factors</b>																				
Dry or wet concrete			$\gamma_{inst}$	[-]															1,0	
Service life time 100 years	I: 35 °C / 60 °C	$\alpha_{100 \text{ years}}$	[-]	0,55	0,75	0,60	0,75	0,60	0,75	0,65	0,75	0,65	0,75	0,65	0,75	0,65	0,75	0,65	0,75	
	II: 50 °C / 72 °C			0,55	0,75	0,60	0,75	0,60	0,75	0,65	0,75	0,65	0,75	0,65	0,75	0,65	0,75	0,65	0,75	
<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)																				
Tem- perature range	I: 35 °C / 60 °C	$\tau_{Rk,cr}$	[N/mm <sup>2</sup> ]	7	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
	II: 50 °C / 72 °C			7	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
<b>Diamond-drilling (dry or wet concrete)</b>																				
Tem- perature range	I: 35 °C / 60 °C	$\tau_{Rk,cr}$	[N/mm <sup>2</sup> ]	7	7	7	7	6	6	6	7	7	7	7	7	7	5	5	5	
	II: 50 °C / 72 °C			7	7	7	7	6	6	6	7	7	7	7	7	7	5	5	5	
<b>Installation factors</b>																				
Dry or wet concrete			$\gamma_{inst}$	[-]															1,0	
Service life time 100 years	I: 35 °C / 60 °C	$\alpha_{100 \text{ years}}$	[-]	0,60	0,60	0,85	0,85	0,80	0,80	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	
	II: 50 °C / 72 °C			0,60	0,60	0,85	0,85	0,80	0,80	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	
<b>fischer injection system FIS EM Plus</b>																				
<b>Performance</b> Essential characteristics of tensile resistance for reinforcing bars; service life time 100 years												<b>Annex C 10</b>								

<sup>1)</sup> Calculation of characteristic bond resistance in uncracked concrete  $\tau_{Rk,100 \text{ years},ucr}$  :

$$\tau_{Rk,100 \text{ years},ucr} = \alpha_{100 \text{ years}} \cdot \tau_{Rk,ucr}$$

<sup>2)</sup> Calculation of characteristic bond resistance in cracked concrete  $\tau_{Rk,100 \text{ years},cr}$  :

$$\tau_{Rk,100 \text{ years},cr} = \alpha_{100 \text{ years}} \cdot \tau_{Rk,cr}$$

**Table C11.1: Essential characteristics of tensile resistance for fischer rebar anchors FRA in hammer or diamond drilled holes; uncracked or cracked concrete; service life time 50 years**

fischer rebar anchor 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>				
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)				
Temperature range I: 35 °C / 60 °C II: 50 °C / 72 °C	$\tau_{RK,ucr}$ [N/mm <sup>2</sup> ]	15 14	14 13	13 12
Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)				
Temperature range I: 35 °C / 60 °C II: 50 °C / 72 °C	$\tau_{RK,ucr}$ [N/mm <sup>2</sup> ]	14 13	12 12	11 11
Diamond-drilling (dry or wet concrete as well as water filled hole)				
Temperature range I: 35 °C / 60 °C II: 50 °C / 72 °C	$\tau_{RK,ucr}$ [N/mm <sup>2</sup> ]	13 12	12 11	10 10
<b>Installation factors</b>				
Dry or wet concrete	$\gamma_{inst}$ [-]		1,0	
Water filled hole	$\gamma_{inst}$ [-]		1,4	
<b>Cracked concrete</b>				
<b>Characteristic bond resistance in cracked concrete C20/25</b>				
Hammer-drilling with standard drill bit or hollow drill bit and diamond-drilling (dry or wet concrete)				
Temperature range I: 35 °C / 60 °C II: 50 °C / 72 °C	$\tau_{RK,cr}$ [N/mm <sup>2</sup> ]	8 8	8 8	8 8
Hammer-drilling with standard drill bit or hollow drill bit and diamond-drilling (water filled hole)				
Temperature range I: 35 °C / 60 °C II: 50 °C / 72 °C	$\tau_{RK,cr}$ [N/mm <sup>2</sup> ]	7 7	6 6	6 6
<b>Installation factors</b>				
Dry or wet concrete	$\gamma_{inst}$ [-]		1,0	
Water filled hole	$\gamma_{inst}$ [-]		1,2	1,4
<b>fischer injection system FIS EM Plus</b>				
<b>Performance</b> Essential characteristics of tensile resistance for fischer rebar anchors FRA; service life time 50 years				<b>Annex C 11</b>

**Table C12.1: Essential characteristics of tensile resistance for fischer rebar anchors FRA in hammer or diamond drilled holes; uncracked or cracked concrete; service life time 100 years**

fischer rebar anchor 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>					
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)					
Tem- perature range	I: 35 °C / 60 °C II: 50 °C / 72 °C	$\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ]	15 14	14 13	13 12
Diamond-drilling (dry or wet concrete)					
Tem- perature range	I: 35 °C / 60 °C II: 50 °C / 72 °C	$\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ]	13 12	12 11	10 10
<b>Installation factors</b>					
Dry or wet concrete	$\gamma_{inst}$	[-]	1,0		
Service life time 100 years	I: 35 °C / 60 °C II: 50 °C / 72 °C	$\alpha_{100 \text{ years}}$ [N/mm <sup>2</sup> ]	0,75 0,60	0,75 0,65	0,75 0,65
<b>Cracked concrete</b>					
<b>Characteristic bond resistance in cracked concrete C20/25</b>					
Hammer-drilling with standard drill bit or hollow drill bit and diamond-drilling (dry or wet concrete)					
Tem- perature range	I: 35 °C / 60 °C II: 50 °C / 72 °C	$\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]	8 8	8 8	8 8
<b>Installation factors</b>					
Dry or wet concrete	$\gamma_{inst}$	[-]	1,0		
Service life time 100 years	I: 35 °C / 60 °C II: 50 °C / 72 °C	$\alpha_{100 \text{ years}}$ [-]	0,80 0,80	0,65 0,65	0,65 0,65
fischer injection system FIS EM Plus					
<b>Performance</b> Essential characteristics of tensile resistance for fischer rebar anchors FRA; service life time 100 years					
<b>Annex C 12</b>					

**Table C13.1: Displacements for anchor rods**

Anchor rod	M8	M10	M12	M14	M16	M20	M22	M24	M27	M30
<b>Displacement-Factors for tensile load<sup>1)</sup></b>										
<b>Uncracked or cracked concrete; Temperature range I, II</b>										

$\delta_{N0}$ -Factor	[mm/(N/mm <sup>2</sup> )]	0,07	0,08	0,09	0,09	0,10	0,11	0,11	0,12	0,12
$\delta_{N\infty}$ -Factor		0,11	0,12	0,13	0,14	0,15	0,16	0,17	0,18	0,19
<b>Displacement-Factors for shear load<sup>2)</sup></b>										
<b>Uncracked or cracked concrete; Temperature range I, II</b>										

1) Calculation of effective displacement:

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

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

(τ<sub>Ed</sub>: 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<sub>Ed</sub>: Design value of the applied shear force)**Table C13.2: Displacements for fischer internal threaded anchors RG MI**

Internal threaded anchor RG MI	M8	M10	M12	M16	M20
<b>Displacement-Factors for tensile load<sup>1)</sup></b>					
<b>Uncracked or cracked concrete; Temperature range I, II</b>					

$\delta_{N0}$ -Factor	[mm/(N/mm <sup>2</sup> )]	0,09	0,10	0,10	0,11	0,13
$\delta_{N\infty}$ -Factor		0,13	0,15	0,16	0,17	0,19
<b>Displacement-Factors for shear load<sup>2)</sup></b>						
<b>Uncracked or cracked concrete; Temperature range I, II</b>						

1) Calculation of effective displacement:

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

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

(τ<sub>Ed</sub>: 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<sub>Ed</sub>: Design value of the applied shear force)

fischer injection system FIS EM Plus	Annex C 13
<b>Performance</b> Displacements for anchor rods and fischer internal threaded anchors RG MI	

**Table C14.1: Displacements for reinforcing bars**

Nominal diameter of the bar	$\phi$	8	10	12	14	16	18	20	22	24	25	26	28	30	32	34	36	40
<b>Displacement-Factors for tensile load<sup>1)</sup></b>																		
<b>Uncracked or cracked concrete; Temperature range I, II</b>																		
$\delta_{N0}$ -Factor	[mm/(N/mm <sup>2</sup> )]	0,07	0,08	0,09	0,09	0,10	0,10	0,11	0,11	0,12	0,12	0,12	0,13	0,13	0,13	0,14	0,14	0,15
$\delta_{N\infty}$ -Factor		0,11	0,12	0,13	0,14	0,15	0,16	0,16	0,17	0,18	0,18	0,18	0,19	0,19	0,20	0,20	0,21	0,22
<b>Displacement-Factors for shear load<sup>2)</sup></b>																		
<b>Uncracked or cracked concrete; Temperature range I, II</b>																		
$\delta_{V0}$ -Factor	[mm/kN]	0,18	0,15	0,12	0,10	0,09	0,08	0,07	0,07	0,06	0,06	0,06	0,05	0,05	0,05	0,04	0,04	0,04
$\delta_{V\infty}$ -Factor		0,27	0,22	0,18	0,16	0,14	0,12	0,11	0,10	0,09	0,09	0,08	0,08	0,07	0,07	0,06	0,06	0,05

1) Calculation of effective displacement:

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

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

(τ<sub>Ed</sub>: 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<sub>Ed</sub>: Design value of the applied shear force)**Table C14.2: Displacements for fischer rebar anchors FRA**

fischer rebar anchor FRA	M12	M16	M20	M24	
<b>Displacement-Factors for tensile load<sup>1)</sup></b>					
<b>Uncracked or cracked concrete; Temperature range I, II</b>					
$\delta_{N0}$ -Factor	[mm/(N/mm <sup>2</sup> )]	0,09	0,10	0,11	0,12
$\delta_{N\infty}$ -Factor		0,13	0,15	0,16	0,18
<b>Displacement-Factors for shear load<sup>2)</sup></b>					
<b>Uncracked or cracked concrete; Temperature range I, II</b>					
$\delta_{V0}$ -Factor	[mm/kN]	0,12	0,09	0,07	0,06
$\delta_{V\infty}$ -Factor		0,18	0,14	0,11	0,09

1) Calculation of effective displacement:

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

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

(τ<sub>Ed</sub>: 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<sub>Ed</sub>: Design value of the applied shear force)

fischer injection system FIS EM Plus

**Performance**

Displacements for reinforcing bars and fischer rebar anchors FRA

**Annex C 14**

**Table C15.1:** Essential characteristics<sup>2)</sup> for the **steel bearing capacity** under tensile / shear load of **fischer anchor rods** and **standard threaded rods** under seismic action performance category **C1 or C2**

Anchor rod / standard threaded rod		M10	M12	M14	M16	M20	M22	M24	M27	M30				
<b>Bearing capacity under tensile load, steel failure<sup>1)</sup></b>														
<b>fischer anchor rods and standard threaded rods, performance category C1</b>														
Characteristic resistance $N_{Rk,s,eq,C1}$	Steel zinc plated	Property class	5.8	[kN]	29(27)	43	58	79	123	152				
			8.8		47(43)	68	92	126	196	243				
			50		29	43	58	79	123	152				
			70		41	59	81	110	172	212				
			80		47	68	92	126	196	243				
	Stainless steel A4 and high corrosion resistant steel C		5.8		-	39	-	72	108	-				
			8.8		-	61	-	116	173	-				
			50		-	39	-	72	108	-				
			70		-	53	-	101	152	-				
			80		-	61	-	116	173	-				
<b>fischer anchor rods and standard threaded rods, performance category C2</b>														
Characteristic resistance $N_{Rk,s,eq,C2}$	Steel zinc plated	Property class	5.8	[-]	-	39	-	72	108	-				
			8.8		-	61	-	116	173	-				
			50		-	39	-	72	108	-				
			70		-	53	-	101	152	-				
			80		-	61	-	116	173	-				
	Stainless steel A4 and high corrosion resistant steel C		5.8		-	-	-	-	-	-				
			8.8		-	-	-	-	-	-				
			50		-	-	-	-	-	-				
			70		-	-	-	-	-	-				
			80		-	-	-	-	-	-				
<b>Bearing capacity under shear load, steel failure without lever arm<sup>1)</sup></b>														
<b>fischer anchor rods, performance category C1</b>														
Characteristic resistance $V_{Rk,s,eq,C1}$	Steel zinc plated	Property class	5.8	[kN]	15(13)	21	29	39	61	76				
			8.8		23(21)	34	46	63	98	122				
			50		15	21	29	39	61	76				
			70		20	30	40	55	86	107				
			80		23	34	46	63	98	122				
	Stainless steel A4 and high corrosion resistant steel C		5.8		-	-	-	-	-	-				
			8.8		-	-	-	-	-	-				
			50		-	-	-	-	-	-				
			70		-	-	-	-	-	-				
			80		-	-	-	-	-	-				
<b>Standard threaded rods, performance category C1</b>														
Characteristic resistance $V_{Rk,s,eq,C1}$	Steel zinc plated	Property class	5.8	[kN]	11(9)	15	20	27	43	53				
			8.8		16(14)	24	32	44	69	85				
			50		11	15	20	27	43	53				
			70		14	21	28	39	60	75				
			80		16	24	32	44	69	85				
	Stainless steel A4 and high corrosion resistant steel C		5.8		-	-	-	-	-	-				
			8.8		-	-	-	-	-	-				
			50		-	-	-	-	-	-				
			70		-	-	-	-	-	-				
			80		-	-	-	-	-	-				
<b>fischer anchor rods and standard threaded rods, performance category C2</b>														
Characteristic resistance $V_{Rk,s,eq,C2}$	Steel zinc plated	Property class	5.8	[-]	-	14	-	27	43	-				
			8.8		-	22	-	44	69	-				
			50		-	14	-	27	43	-				
			70		-	20	-	39	60	-				
			80		-	22	-	44	69	-				
	Stainless steel A4 and high corrosion resistant steel C		5.8		-	-	-	-	-	-				
			8.8		-	-	-	-	-	-				
			50		-	-	-	-	-	-				
			70		-	-	-	-	-	-				
			80		-	-	-	-	-	-				
<b>fischer injection system FIS EM Plus</b>														
<b>Performance</b> Essential characteristics for the steel bearing capacity for fischer anchor rods and standard threaded rods under seismic action (performance category C1 / C2)										<b>Annex C 15</b>				

<sup>1)</sup> Partial factors for performance category C1 or C2 see table C16.2; for fischer anchor rods FIS A / RGM the factor for steel ductility is 1,0

<sup>2)</sup> Values in brackets are valid for undersized threaded rods with smaller stress area  $A_s$  for hot dip galvanized standard threaded rods according to EN ISO 10684:2004+AC:2009.

**Table C16.1:** Essential characteristics for the **steel bearing capacity** under tensile / shear load of **reinforcing bars (B500B)** under seismic action performance category **C1**

Nominal diameter of the bar	Φ	10	12	14	16	18	20	22	24	25	26	28	30	32
<b>Bearing capacity under tensile load, steel failure<sup>1)</sup></b>														
<b>Reinforcing bar B500B acc. to DIN 488-2:2009-08, performance category C1</b>														
Characteristic resistance	$N_{Rk,s,eq,C1}$ [kN]	44	63	85	111	140	173	209	249	270	292	339	389	443
<b>Bearing capacity under shear load, steel failure without lever arm<sup>1)</sup></b>														
<b>Reinforcing bar B500B acc. to DIN 488-2:2009-08, performance category C1</b>														
Characteristic resistance	$V_{Rk,s,eq,C1}^0$ [kN]	15	22	30	39	49	61	74	88	95	102	119	137	155

<sup>1)</sup> Partial factors for performance category C1 see table C16.2

**Table C16.2: Partial factors for fischer anchor rods, standard threaded rods and reinforcing bars (B500B) under seismic action performance category C1 or C2**

Anchor rod / standard threaded rod		M10	M12	M14	M16	M20	M22	M24	M27	M30					
Nominal diameter of the bar		Φ	10	12	14	16	18	20	22	24	25	26	28	30	32
<b>Tensile load, steel failure<sup>1)</sup></b>															
Partial factor $\gamma_{Ms,N}$		5,8													
Steel zinc plated		5,8													
		8,8													
	Property class	50													
		70													
		80													
Stainless steel A4 and high corrosion resistant steel C															
Reinforcing bar	B500B														
<b>Shear load, steel failure<sup>1)</sup></b>															
Partial factor $\gamma_{Ms,V}$		5,8													
Steel zinc plated		5,8													
		8,8													
	Property class	50													
		70													
		80													
Stainless steel A4 and high corrosion resistant steel C															
Reinforcing bar	B500B														

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

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

fischer injection system FIS EM Plus

**Performance**

Essential characteristics for the steel bearing capacity for reinforcing bars under seismic action (performance category C1); partial safety factors (performance category C1 / C2)

**Annex C 16**

**Table C17.1:** Essential characteristics of resistance for **fischer anchor rods** and **standard threaded rods** in hammer drilled holes under seismic action performance category **C1; service life time 50 and 100 years**

**Table C17.2:** Essential characteristics of **resistance** for **reinforcing bars** in hammer drilled holes under seismic action performance category **C1; service life time 50 and 100 years**

Nominal diameter of the bar		$\phi$	10	12	14	16	18	20	22	24	25	26	28	30	32							
<b>Characteristic bond resistance, combined pullout and concrete cone failure</b>																						
<b>Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)</b>																						
Tem- peratur range	I: 35 °C / 60 °C	$\tau_{Rk,eq,C1}$ [N/mm <sup>2</sup> ]	7,0	7,0	6,7	5,7	5,7	5,7	6,7	6,7	6,7	6,7	6,7	6,7	4,8							
	II: 50 °C / 72 °C		7,0	7,0	6,7	5,7	5,7	5,7	6,7	6,7	6,7	6,7	6,7	6,7	4,8							
<b>Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)</b>																						
Tem- peratur range	I: 35 °C / 60 °C	$\tau_{Rk,eq,C1}$ [N/mm <sup>2</sup> ]	7,5	6,5	6,5	5,7	5,7	5,7	5,7	5,7	5,7	5,7	5,7	5,7	4,8							
	II: 50 °C / 72 °C		6,5	6,5	5,8	5,8	5,7	5,7	5,7	5,7	5,7	5,7	5,7	5,7	4,8							
<b>Installation factors</b>																						
<b>Tensile load</b>																						
Dry or wet concrete	$\gamma_{inst}$	[-]	1,0																			
Water filled hole			1,2				1,4															
<b>Shear load</b>																						
All installation conditions	$\gamma_{inst}$	[-]	1,0																			
<b>fischer injection system FIS EM Plus</b>																						
<b>Performance</b>										Annex C 17												
Essential characteristics under seismic action (perf. category C1) for fischer anchor rods, standard threaded rods and reinforcing bars; service life time 50 and 100 years										Annex C 17												

**Table C18.1:** Essential characteristics of **resistance for fischer anchor rods** and **standard threaded rods** in hammer drilled holes under seismic action performance category **C2; service life time 50 and 100 years**

Anchor rod / standard threaded rod	M12	M16	M20	M24			
<b>Characteristic bond resistance, combined pullout and concrete cone failure</b>							
<b>Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)</b>							
Tem- perature range	I: 35 °C / 60 °C II: 50 °C / 72 °C	$\tau_{Rk,eq,C2}$ [N/mm <sup>2</sup> ]	3,5 3,3	5,8 5,5	5,0 4,7		
					3,1 2,9		
<b>Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)</b>							
Tem- perature range	I: 35 °C / 60 °C II: 50 °C / 72 °C	$\tau_{Rk,eq,C2}$ [N/mm <sup>2</sup> ]	3,5 3,3	5,8 5,5	5,0 4,7		
					3,1 2,9		
<b>Installation factors</b>							
<b>Tensile load</b>							
Dry or wet concrete	$\gamma_{inst}$	[ $\cdot$ ]	1,0				
Water filled hole			1,2	1,4			
<b>Shear load</b>							
All installation conditions	$\gamma_{inst}$	[ $\cdot$ ]	1,0				
<b>Displacement-Factors for tensile load<sup>1)</sup></b>							
$\delta_{N,(DLS)}$ -Factor		[mm/(N/mm <sup>2</sup> )]	0,09	0,10	0,11		
$\delta_{N,(ULS)}$ -Factor			0,15	0,17	0,17		
<b>Displacement-Factors for shear load<sup>2)</sup></b>							
$\delta_{V,(DLS)}$ -Factor		[mm/kN]	0,18	0,10	0,07		
$\delta_{V,(ULS)}$ -Factor			0,25	0,14	0,11		
1) Calculation of effective displacement: $\delta_{N,(DLS)} = \delta_{N,(DLS)}\text{-Factor} \cdot \tau_{Ed}$ $\delta_{N,(ULS)} = \delta_{N,(ULS)}\text{-Factor} \cdot \tau_{Ed}$ ( $\tau_{Ed}$ : Design value of the applied tensile stress)		2) Calculation of effective displacement: $\delta_{V,(DLS)} = \delta_{V,(DLS)}\text{-Factor} \cdot V_{Ed}$ $\delta_{V,(ULS)} = \delta_{V,(ULS)}\text{-Factor} \cdot V_{Ed}$ ( $V_{Ed}$ : Design value of the applied shear force)					
fischer injection system FIS EM Plus							
<b>Performance</b> Essential characteristics under seismic action (performance category C2) for fischer anchor rods and standard threaded rods; service life time 50 and 100 years							
				<b>Annex C 18</b>			