

## DECLARACIÓN DE PRESTACIONES

### DoP 0188

para el sistema de inyección de fischer FIS V (Anclaje químico para uso en hormigón)

ES

1. <u>Código de identificación única del producto tipo:</u>	<b>DoP 0188</b>	
2. <u>Usos previstos:</u>	<b>Fijación a posteriori en hormigón fisurado y no fisurado.</b> Véase el apéndice, especialmente los anexos B1- B10	
3. <u>Fabricante:</u>	fischerwerke GmbH & Co. KG, Otto-Hahn-Straße 15, 79211 Denzlingen, Alemania	
4. <u>Representante autorizado:</u>	-	
5. <u>Sistemas de evaluación y verificación de la constancia de las prestaciones (EVCP):</u>	1	
6. <u>Documento de evaluación europeo:</u> Evaluación técnica europea: Organismo de evaluación técnica: Organismos notificados:	EAD 330499-01-0601 ETA-02/0024; 2020-05-13 DIBt- Deutsches Institut für Bautechnik 1343 MPA Darmstadt / 2873 TU Darmstadt	
7. <u>Prestaciones declaradas:</u> <b>Resistencia mecánica y estabilidad (BWR 1)</b> Resistencia característica a tracción (carga estática y cuasi-estática):	Resistencia de rotura del acero: Resistencia para la combinación de rotura por cono de hormigón y extracción: Resistencia de rotura por cono de hormigón: Distancia al borde para evitar la rotura del acero sometido a carga: Robustez: Par máximo de montaje: Distancia mínima entre el borde y el centro:	Anexos C1- C3 Anexos C4- C8 $\tau_{Rk,100} = NPD$
Resistencia característica a cortante (carga estática y cuasi-estática):	Resistencia de rotura del acero: Resistencia falla por arrancamiento lateral: Resistencia de rotura del hormigón al borde:	Anexos C1- C3 Anexo C4 Anexo C4

Resistencia y desplazamientos característicos para las categorías sísmicas C1 y C2:	Resistencia a carga de tracción, desplazamientos, categoría C1: Resistencia a carga de tracción, desplazamientos, categoría C2: Resistencia a esfuerzo cortante, desplazamientos, categoría C1: Resistencia a esfuerzo cortante, desplazamientos, categoría C2: Factor espacio anular:	Anexos C11, C13 Anexos C11, C14 Anexo C11 Anexos C11, C14 Anexo C11
Desplazamientos bajo carga a corto y largo plazo:	Desplazamientos bajo carga a corto y largo plazo:	Anexos C9, C10

### Higiene, salud y medio ambiente (BWR 3)

Contenido, emisión y/o desprendimiento de sustancias peligrosas:

NPA



8. Documentación técnica adecuada o documentación técnica específica -

Las prestaciones del producto identificado anteriormente son conformes con el conjunto de prestaciones declaradas. La presente declaración de prestaciones se emite, de conformidad con el Reglamento (UE) no 305/2011, bajo la sola responsabilidad del fabricante arriba identificado.

Firmado por y en nombre del fabricante por:

ppa. Thilo Pregartner

Thilo Pregartner, Dr.-Ing.  
Tumlingen, 2020-05-27

i.V. P. Schillinger

Peter Schillinger, Dipl.-Ing.

Esta DdR se ha preparado en distintos idiomas. En caso de que haya alguna controversia sobre la interpretación prevalecerá siempre la versión inglesa.

El Apéndice incluye información voluntaria y complementaria en idioma inglés que excede los requisitos legales (de idioma neutral).

## **Specific Part**

### **1 Technical description of the product**

The "fischer injection system FIS V" is a bonded fastener consisting of a cartridge with injection mortar fischer FIS V, fischer FIS VW High Speed or fischer FIS VS Low Speed 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 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 to tension load (static and quasi-static loading)	See Annex B 3 to B 6, C 1 to C 8
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1 to C 4
Displacements under short-term and long-term loading	See Annex C 9 and C 10
Characteristic resistance and displacements for seismic performance categories C1 and C2	See Annex C 11 to C 14

#### **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**

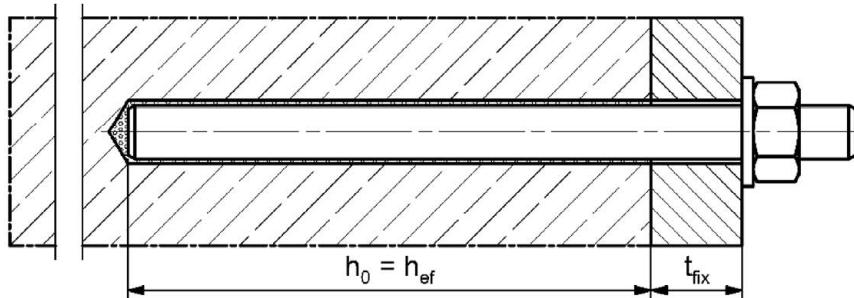
In accordance with the European Assessment Document EAD 330499-01-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

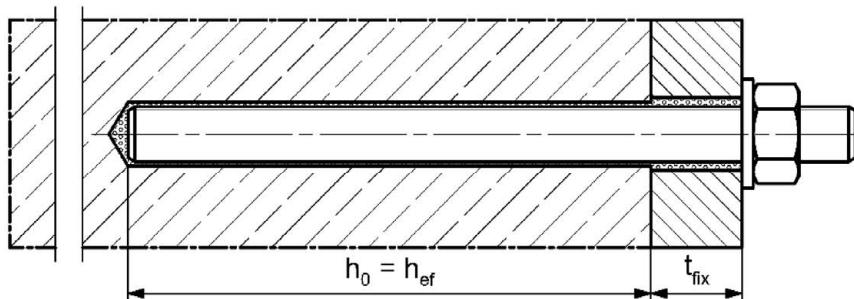
## Installation conditions part 1

fischer anchor rod

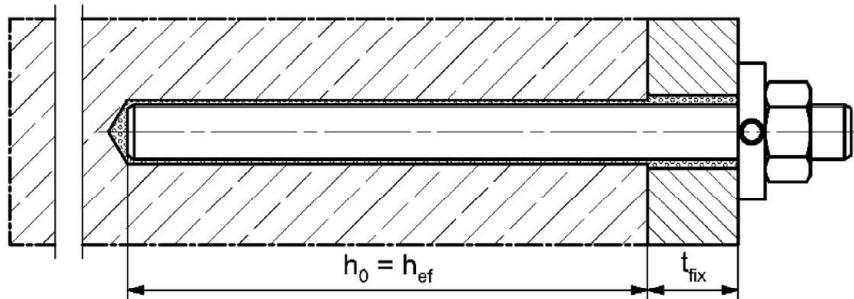
Pre-positioned installation



Push through installation (annular gap filled with mortar)



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



Figures not to scale

$h_0$  = drill hole depth

$h_{ef}$  = effective embedment depth

$t_{fix}$  = thickness of fixture

fischer injection system FIS V

**Product description**

Installation conditions part 1

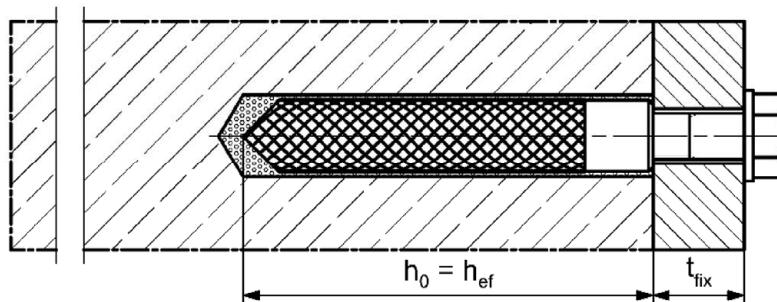
**Annex A 1**

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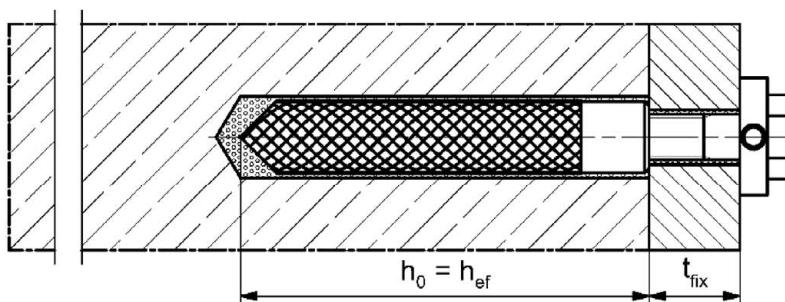
## Installation conditions part 2

fischer internal threaded anchor RG MI

### Pre-positioned installation



### Pre-positioned installation with subsequently injected fischer filling disc (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 V

#### Product description

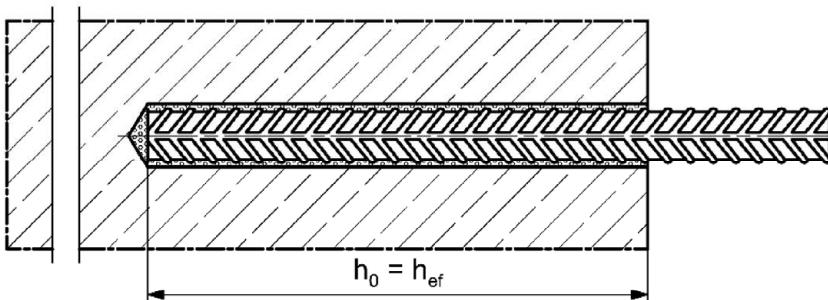
Installation conditions part 2

#### Annex A 2

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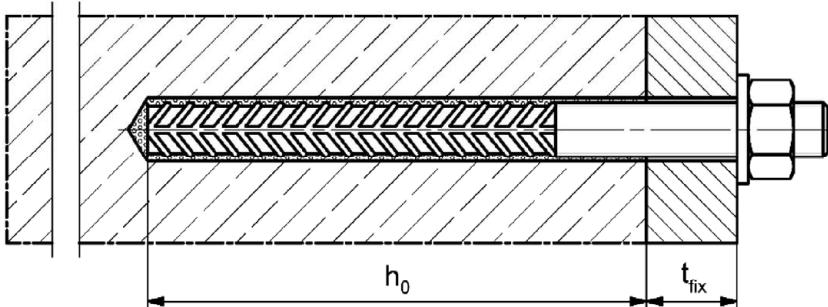
## Installation conditions part 3

### Reinforcing bar

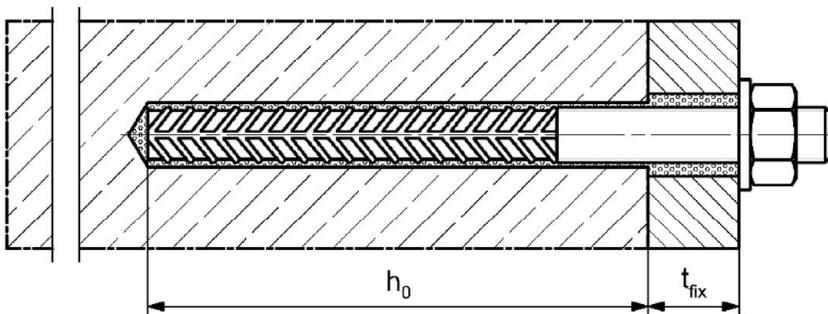


### fischer rebar anchor FRA

#### Pre-positioned installation



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



Figures not to scale

$h_0$  = drill hole depth

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

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

### fischer injection system FIS V

#### Product description

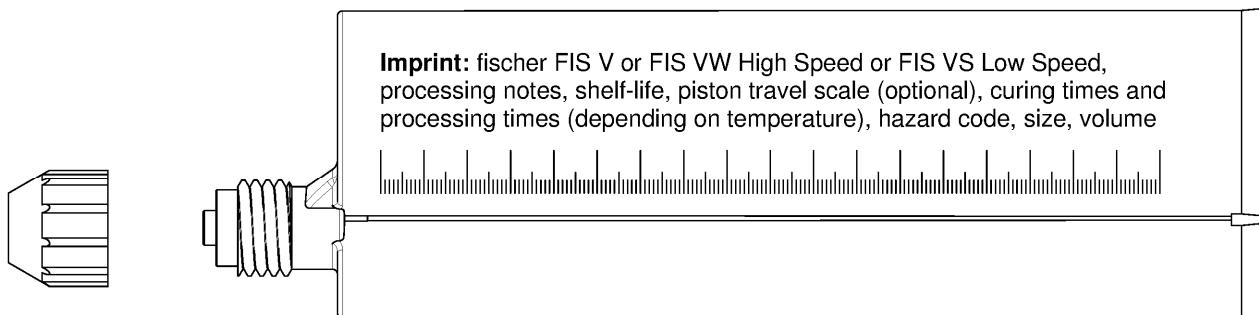
Installation conditions part 3

#### Annex A 3

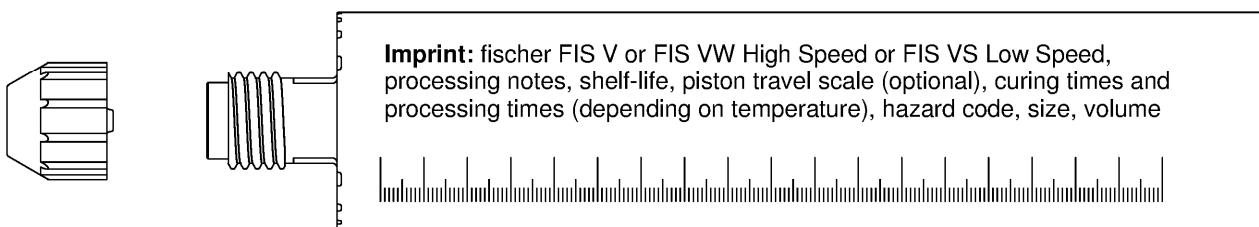
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## Overview system components part 1

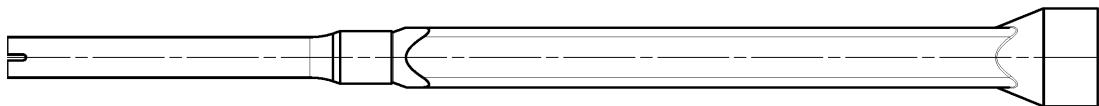
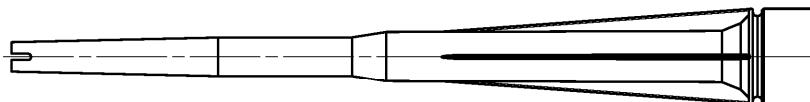
**Injection cartridge (shuttle cartridge) with sealing cap; Sizes: 350 ml, 360 ml, 390 ml, 550 ml, 1100 ml, 1500 ml**



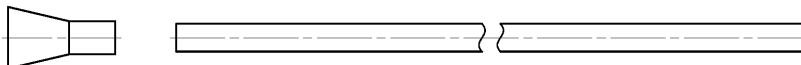
**Injection cartridge (coaxial cartridge) with sealing cap; Sizes: 100 ml, 150 ml, 300 ml, 380 ml, 400 ml, 410 ml**



**Static mixer FIS MR Plus or UMR**



**Injection adapter and Extension tube for static mixer**



**Cleaning brush BS**



**Blow-out pump AB G or ABP**



Figures not to scale

fischer injection system FIS V

### Product description

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

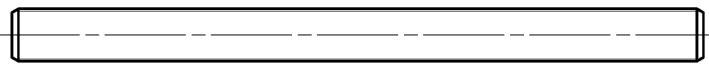
### Annex A 4

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## Overview system components part 2

### fischer anchor rod

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

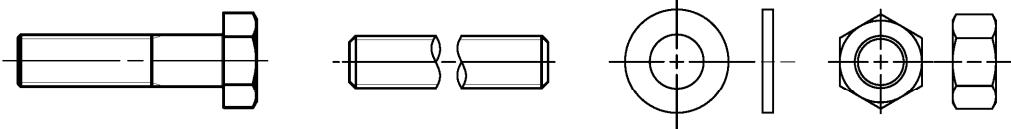


### fischer internal threaded anchor RG MI

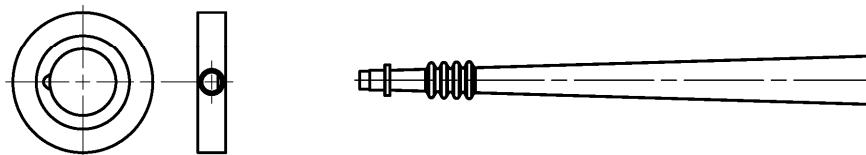
Size: M8, M10, M12, M16, M20



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



### fischer filling disc with injection adapter



### Reinforcing bar

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



### fischer rebar anchor FRA

Size: M12, M16, M20, M24



Figures not to scale

### fischer injection system FIS V

#### Product description

Overview system components part 2;  
steel components

#### Annex A 5

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**Table A6.1:** Materials

Part	Designation	Material		
1	Injection cartridge	Mortar, hardener, filler		
Steel grade	Steel	Stainless steel R	High corrosion resistant steel HCR	
	zinc plated	acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4:2015	acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4:2015	
2	Anchor rod	Property class 4.8, 5.8 or 8.8; EN ISO 898-1:2013 zinc plated $\geq 5 \mu\text{m}$ , ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised $\geq 40 \mu\text{m}$ 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 $f_{uk} \leq 1000 \text{ N/mm}^2$ $A_5 > 12\%$ 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 $\geq 5 \mu\text{m}$ , ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised $\geq 40 \mu\text{m}$ 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 4, 5 or 8; EN ISO 898-2:2012 zinc plated $\geq 5 \mu\text{m}$ , ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised $\geq 40 \mu\text{m}$ 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 $\geq 5 \mu\text{m}$ , ISO 4042:2018/Zn5/An(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 threaded rod for fischer internal threaded anchor RG MI	Property class 5.8 or 8.8; EN ISO 898-1:2013 zinc plated $\geq 5 \mu\text{m}$ , ISO 4042:2018/Zn5/An(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 $A_5 > 8\%$ 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 disc similar to DIN 6319-G	zinc plated $\geq 5 \mu\text{m}$ , ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised $\geq 40 \mu\text{m}$ 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 according to EN 1992-1-1/NA $f_{uk} = f_{ik} = k \cdot f_{yk}$		
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 acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4:2015 1.4565; 1.4529 acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4:2015	

fischer injection system FIS V

**Product description**  
Materials

**Annex A 6**  
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## Specifications of intended use (part 1)

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

Anchorage subject to		FIS V 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"), DreBo D-Plus, DreBo D-Max		Nominal drill bit diameter ( $d_0$ ) 12 mm to 35 mm																
Static and quasi static load, in	uncracked concrete	all sizes	Tables: C1.1 C4.1	all sizes	Tables: C2.1 C4.1	all sizes	Tables: C3.1 C4.1	all sizes	Tables: C3.2 C4.1									
	cracked concrete	M8 to M30	C5.1 C9.1	-2)	C6.1 C9.2	ϕ 10 to ϕ 28	C7.1 C10.1		C8.1 C10.2									
Seismic performance category (only hammer drilling with standard / hollow drill bits)	C1 <sup>1)</sup>	M10 to M30	Tables: C11.1 C12.1 C13.1	-2)	-2)	-2)	-2)	-2)	-2)									
	C2 <sup>1)</sup>	M12 M16 M20 M24	Tables: C11.1 C12.1 C14.1															
Use category	I1 dry or wet concrete	all sizes																
	I2 water filled hole	M 12 to M 30	all sizes		-2)		-2)		-2)									
Installation direction		D3 (downward and horizontal and upwards (e.g. overhead) installation)																
Installation temperature		$T_{i,\min} = -10 \text{ }^{\circ}\text{C}$ to $T_{i,\max} = +40 \text{ }^{\circ}\text{C}$																
In-service temperature	Temperature range I	-40 $\text{ }^{\circ}\text{C}$ to +80 $\text{ }^{\circ}\text{C}$		(max. short term temperature +80 $\text{ }^{\circ}\text{C}$ ; max. long term temperature +50 $\text{ }^{\circ}\text{C}$ )														
	Temperature range II	-40 $\text{ }^{\circ}\text{C}$ to +120 $\text{ }^{\circ}\text{C}$		(max. short term temperature +120 $\text{ }^{\circ}\text{C}$ ; max. long term temperature +72 $\text{ }^{\circ}\text{C}$ )														

<sup>1)</sup> Not for FIS VW High Speed and FIS VS Low Speed

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

fischer injection system FIS V

**Intended use**  
Specifications (part 1)

**Annex B 1**  
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## Specifications of intended use (part 2)

### Base materials:

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

### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (zinc coated steel, stainless steel or high corrosion resistant steel).
- For all other conditions according to EN1993-1-4:2015 corresponding to corrosion resistance classes to Annex A 6 table A6.1.

### 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, Edition February 2018.

### 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 V

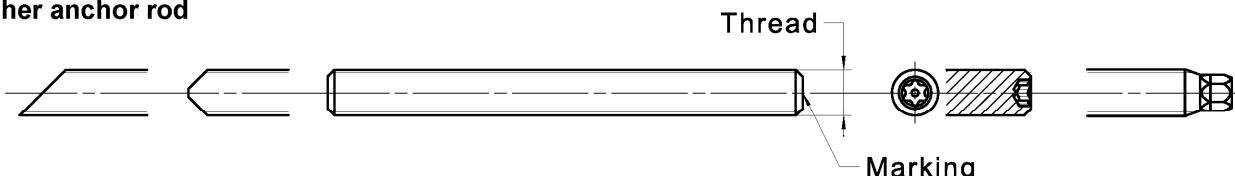
**Intended use**  
Specifications (part 2)

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

Anchor rods	Thread	M6	M8	M10	M12	M16	M20	M24	M27	M30
Width across flats	SW [mm]	10	13	17	19	24	30	36	41	46
Nominal drill hole diameter		8	10	12	14	18	24	28	30	35
Drill hole depth							$h_0 = h_{\text{ef}}$			
Effective embedment depth		50	60	60	70	80	90	96	108	120
embedment depth		72	160	200	240	320	400	480	540	600
Minimum spacing and minimum edge distance		40	40	45	55	65	85	105	125	140
Diameter of the clearance hole of the fixture		pre-positioned installation	d <sub>f</sub>	7	9	12	14	18	22	30
		push through installation	d <sub>f</sub>	9	12	14	16	20	26	33
Minimum thickness of concrete member		h <sub>min</sub>					$h_{\text{ef}} + 30 (\geq 100)$			$h_{\text{ef}} + 2d_0$
Maximum installation torque	max T <sub>inst</sub>	[Nm]	5	10	20	40	60	120	150	200

### fischer anchor rod



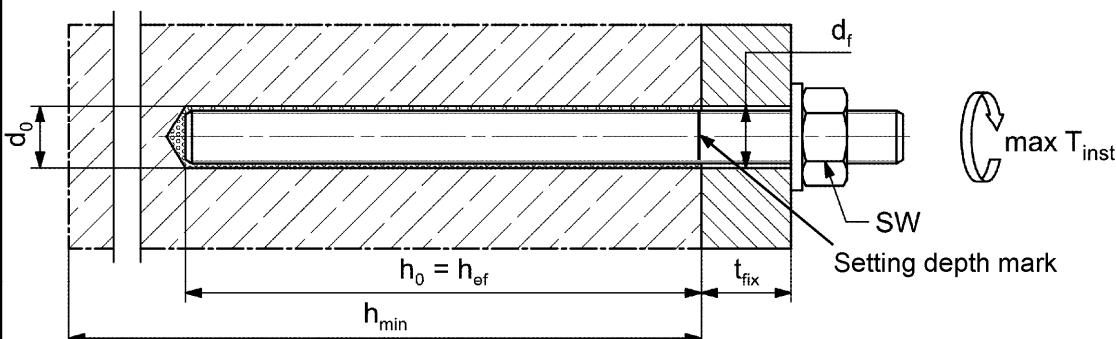
### Marking (on random place) fischer anchor rod:

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

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

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

### Installation conditions:



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

- Materials, dimensions and mechanical properties according to Annex A 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 V

**Intended use**  
Installation parameters anchor rods

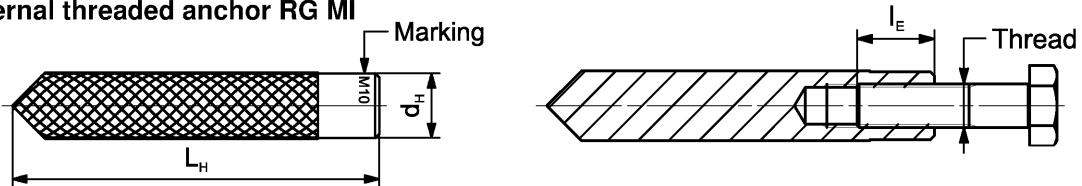
### Annex B 3

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**Table B4.1:** Installation parameters 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 installation torque	max T <sub>inst</sub> [Nm]	10	20	40	80	120

#### fischer internal threaded anchor RG MI



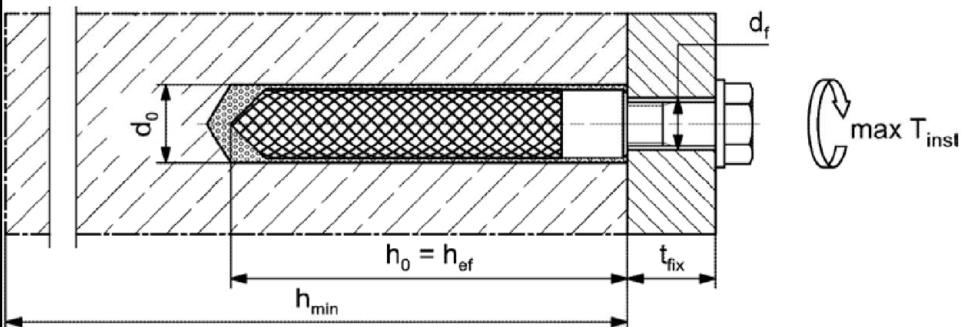
**Marking:** Anchor size e. g.: **M10**

Stainless steel → additional **R**; e.g.: **M10 R**

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

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

#### Installation conditions:



Figures not to scale

fischer injection system FIS V

#### Intended use

Installation parameters internal threaded anchors RG MI

**Annex B 4**

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**Table B5.1:** Installation parameters for **reinforcing bars**

Nominal diameter of the bar	$\phi$	8 <sup>1)</sup>	10 <sup>1)</sup>	12 <sup>1)</sup>	14	16	20	25	28
Nominal drill hole diameter	d <sub>0</sub>	10	12	12	14	14	16	18	20
Drill hole depth								h <sub>0</sub> = h <sub>ef</sub>	35
Effective embedment depth		60	60	70	75	80	90	100	112
		160	200	240	280	320	400	500	560
Minimum spacing and minimum edge distance		40	45	55	60	65	85	110	130
Minimum thickness of concrete member	$h_{\min}$	$h_{\text{ef}} + 30$ ( $\geq 100$ )				$h_{\text{ef}} + 2d_0$			

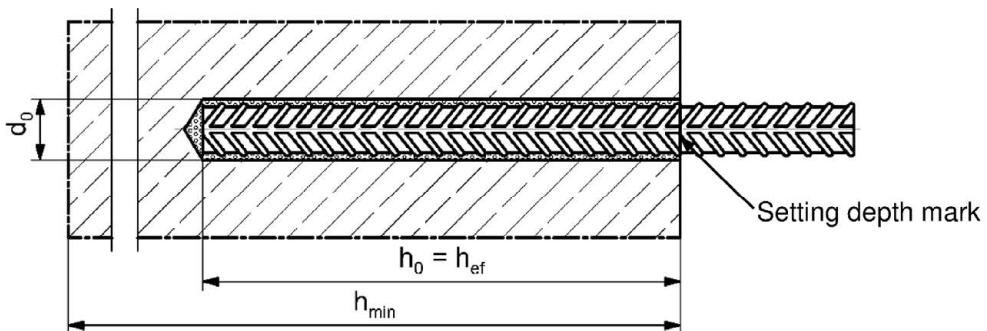
<sup>1)</sup> Both drill hole diameters can be used

### 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 V

**Intended use**  
Installation parameters reinforcing bars

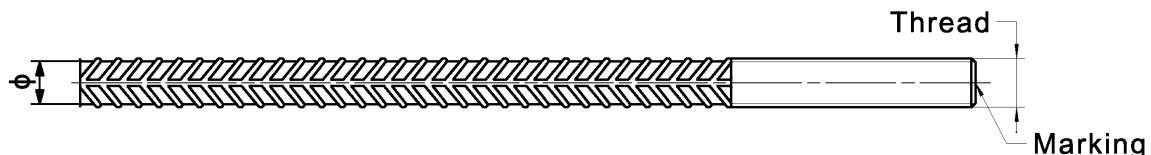
**Annex B 5**  
Appendix 13/32

**Table B6.1:** Installation parameters for **fischer rebar anchor FRA**

Rebar anchor FRA	Thread	M12 <sup>1)</sup>	M16	M20	M24
Nominal diameter of the bar $\phi$		12	16	20	25
Width across flats SW		19	24	30	36
Nominal drill hole diameter $d_0$		14	16	20	25
Drill hole depth $h_0$				$h_{\text{ef}} + l_e$	
Effective embedment depth $h_{\text{ef},\text{min}}$		70	80	90	96
Effective embedment depth $h_{\text{ef},\text{max}}$		140	220	300	380
Distance concrete surface to welded joint $l_e$	[mm]			100	
Minimum spacing and minimum edge distance $s_{\text{min}} = c_{\text{min}}$		55	65	85	105
Diameter of clearance hole in the fixture pre-positioned anchorage $\leq d_f$		14	18	22	26
Diameter of clearance hole in the fixture push through anchorage $\leq d_f$		18	22	26	32
Minimum thickness of concrete member $h_{\text{min}}$		$h_0 + 30$		$h_0 + 2d_0$	
Maximum installation torque max $T_{\text{inst}}$	[Nm]	40	60	120	150

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

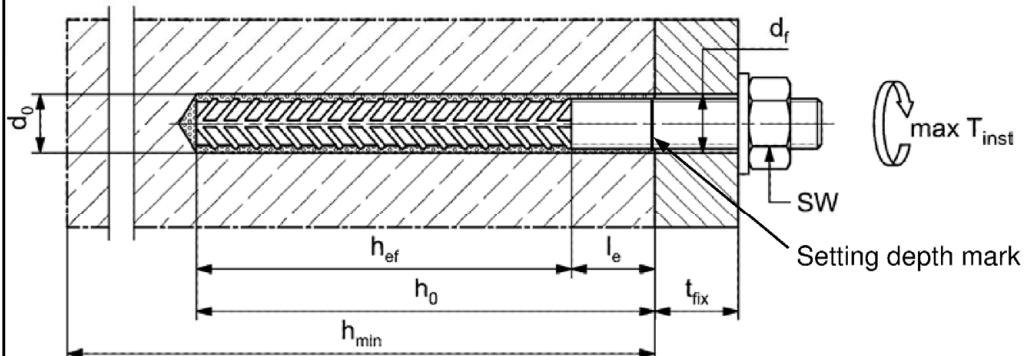
### fischer rebar anchor FRA



Marking frontal e. g.:

FRA (for stainless steel);  
 FRA HCR (for high corrosion resistant steel)

### Installation conditions:



Figures not to scale

### fischer injection system FIS V

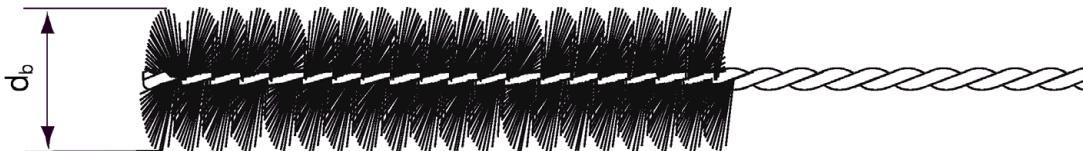
**Intended use**  
Installation parameters rebar anchor FRA

**Annex B 6**  
Appendix 14/32

**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]	8	10	12	14	16	18	20	24	25	28	30	35
Steel brush diameter	$d_b$		9	11	14	16		20		25	26	27	30	40


**Table B7.2 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 <sup>1)</sup> $t_{cure}$		
	FIS VW High Speed	FIS V	FIS VS Low Speed	FIS VW High Speed	FIS V	FIS VS Low Speed
-10 to -5 <sup>2)</sup>	-	-	-	12 h	-	-
> -5 to 0 <sup>2)</sup>	5 min	-	-	3 h	24 h	-
> 0 to 5 <sup>2)</sup>	5 min	13 min	-	3 h	3 h	6 h
> 5 to 10	3 min	9 min	20 min	50 min	90 min	3 h
> 10 to 20	1 min	5 min	10 min	30 min	60 min	2 h
> 20 to 30	-	4 min	6 min	-	45 min	60 min
> 30 to 40	-	2 min	4 min	-	35 min	30 min

<sup>1)</sup> In wet concrete or water filled holes the curing times must be doubled<sup>2)</sup> Minimal cartridge temperature +5°C

fischer injection system FIS V

**Intended use**

Cleaning brush (steel brush)

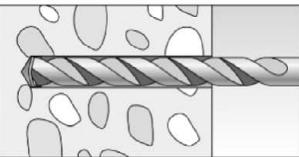
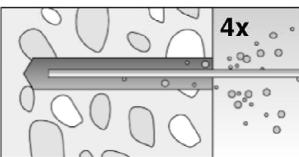
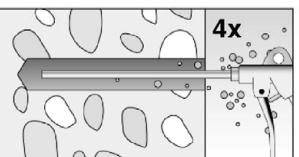
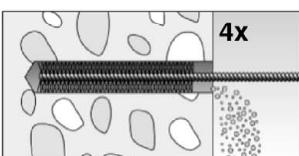
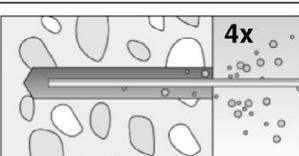
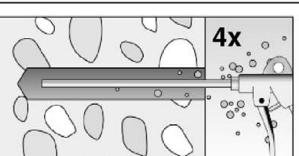
Processing time and curing time

**Annex B 7**

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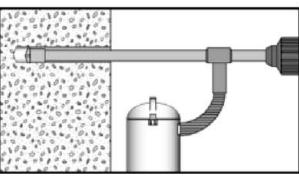
## Installation instructions part 1

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

1		Drill the hole. Nominal drill hole diameter $d_0$ and drill hole depth $h_0$ see <b>tables B3.1, B4.1, B5.1, B6.1</b>		
2		Clean the drill hole: For $h_{ef} \leq 12d$ and $d_0 < 18 \text{ mm}$ blow out the hole four times by hand		For $h_{ef} > 12d$ and / or $d_0 \geq 18 \text{ mm}$ blow out the hole four times with oil-free compressed air ( $p \geq 6 \text{ bar}$ )
3		Brush the drill hole four times. For deep holes use an extension. Corresponding brushes see <b>table B7.1</b>		
4		Clean the drill hole: For $h_{ef} \leq 12d$ and $d_0 < 18 \text{ mm}$ blow out the hole four times by hand		For $h_{ef} > 12d$ and / or $d_0 \geq 18 \text{ mm}$ blow out the hole four times with oil-free compressed air ( $p \geq 6 \text{ bar}$ )

Go to step 5

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

1		Check a suitable hollow drill (see <b>table B1.1</b> ) for correct operation of the dust extraction
2		Use a suitable dust extraction system, e. g. fischer FVC 35 M or a comparable dust extraction system with equivalent performance data  Drill the hole with hollow drill bit. The dust extraction system has to extract the drill dust nonstop during the drilling process and must be adjusted to maximum power. Nominal drill hole diameter $d_0$ and drill hole depth $h_0$ see <b>tables B3.1, B4.1, B5.1, B6.1</b>

Go to step 5

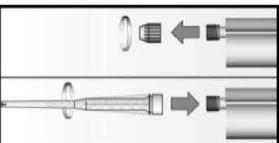
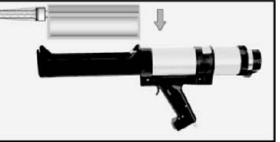
fischer injection system FIS V

**Intended use**  
Installation instructions part 1

**Annex B 8**  
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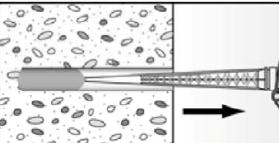
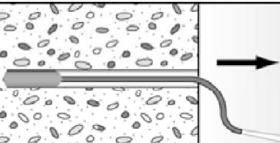
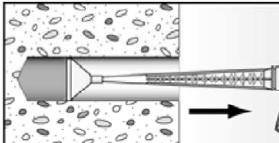
## Installation instructions part 2

### Preparing the cartridge

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

Go to step 8

### Injection of the mortar

8			
	Fill approximately 2/3 of the drill hole with mortar. Always begin from the bottom of the hole and avoid bubbles	For drill hole depth $\geq 150$ 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

Go to step 9

fischer injection system FIS V

#### Intended use

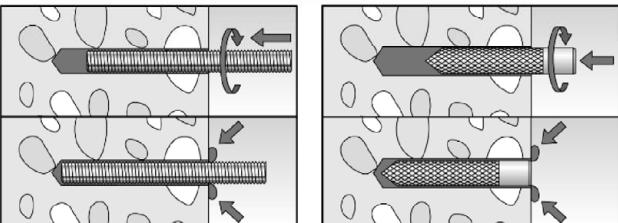
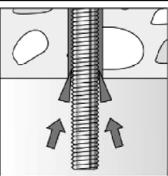
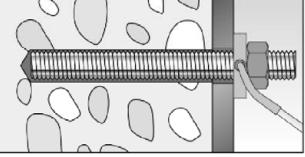
Installation instructions part 2

#### Annex B 9

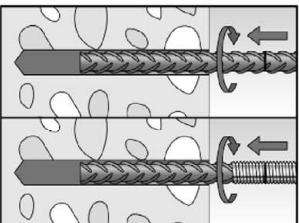
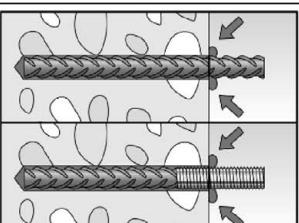
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## Installation instructions part 3

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

9		Only use clean and oil-free metal parts. Mark the setting depth of the metal part. 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 metal parts, excess mortar must be emerged around the anchor element.
		For overhead installations support the metal part with wedges (e.g. fischer centering wedges) or fischer overhead clips.
10		Wait for the specified curing time $t_{cure}$ see <b>table B7.2</b>
Option		
	After the minimum curing time is reached, the gap between metal part and fixture (annular clearance) may be filled with mortar via the fischer filling disc. Compressive strength $\geq 50 \text{ N/mm}^2$ (e.g. fischer injection mortars FIS HB, FIS SB, FIS V, FIS EM Plus). ATTENTION: Using fischer filling disc reduces $t_{fix}$ (usable length of the anchor)	

### Installation reinforcing bars and fischer rebar anchor FRA

9		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.
10		Wait for the specified curing time $t_{cure}$ see <b>table B7.2</b>
		
	Mounting the fixture max $T_{inst}$ see <b>table B6.1</b>	

### fischer injection system FIS V

**Intended use**  
Installation instructions part 3

**Annex B 10**  
Appendix 18/ 32

**Table C1.1: Characteristic values for steel failure under tension / shear load of fischer anchor rods and standard threaded rods**

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

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

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

fischer injection system FIS V

### Performances

Characteristic values for steel failure under tension / shear load of fischer anchor rods and standard threaded rods

Annex C 1

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**Table C2.1: Characteristic values for steel failure under tension / shear load of fischer internal threaded anchors RG MI**

fischer internal threaded anchors RG MI			M8	M10	M12	M16	M20		
<b>Bearing capacity under tension load, steel failure</b>									
Charact. resistance with screw	$N_{Rk,s}$	Property class	5.8	[kN]	19	29	43	79	123
		Property class	8.8		29	47	68	108	179
		Property class	R		26	41	59	110	172
		Property class 70	HCR		26	41	59	110	172
<b>Partial factors<sup>1)</sup></b>									
Partial factors	$\gamma_{Ms,N}$	Property class	5.8	[-]		1,50			
		Property class	8.8			1,50			
		Property class	R			1,87			
		Property class 70	HCR			1,87			
<b>Bearing capacity under shear load, steel failure</b>									
<b>Without lever arm</b>									
Charact. resistance with screw	$V^0_{Rk,s}$	Property class	5.8	[kN]	9,2	14,5	21,1	39,2	62,0
		Property class	8.8		14,6	23,2	33,7	54,0	90,0
		Property class	R		12,8	20,3	29,5	54,8	86,0
		Property class 70	HCR		12,8	20,3	29,5	54,8	86,0
Ductility factor			$k_7$	[-]	1,0				
<b>With lever arm</b>									
Charact. resistance with screw	$M^0_{Rk,s}$	Property class	5.8	[Nm]	20	39	68	173	337
		Property class	8.8		30	60	105	266	519
		Property class	R		26	52	92	232	454
		Property class 70	HCR		26	52	92	232	454
<b>Partial factors<sup>1)</sup></b>									
Partial factors	$\gamma_{Ms,V}$	Property class	5.8	[-]	1,25				
		Property class	8.8		1,25				
		Property class	R		1,56				
		Property class 70	HCR		1,56				

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

fischer injection system FIS V

### **Performances**

Characteristics values for steel failure under tension / shear load of fischer internal threaded anchor RG MI

Annex C 2

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**Table C3.1: Characteristic values for steel failure under tension / shear load of reinforcing bars**

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

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

**Table C3.2: Characteristic values for steel failure under tension / shear load of fischer rebar anchors FRA**

fischer rebar anchor FRA		M12	M16	M20	M24			
<b>Bearing capacity under tension load, steel failure</b>								
Characteristic resistance	$N_{Rk,s}$	[kN]	63	111	173			
<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			
Ductility factor	$k_7$	[-]	1,0					
<b>With lever arm</b>								
Characteristic resistance	$M_{Rk,s}^0$	[Nm]	92	233	454			
<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 V

#### Performances

Characteristic values for steel failure under tension / shear load of reinforcing bars and fischer rebar anchors FRA

#### Annex C 3

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**Table C4.1: Characteristic values for concrete failure under tension / shear load**

Size			All sizes								
<b>Tension load</b>											
Installation factor	$\gamma_{inst}$	[ - ]	See annex C 5 to C 8 and C 13 to C14								
<b>Factors for the compressive strength of concrete &gt; C20/25</b>											
Increasing factor for $\tau_{Rk}$	C25/30	$\Psi_c$	[ - ]	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	$h / h_{ef} \geq 2,0$	$c_{cr,sp}$	[mm]	1,0 $h_{ef}$							
	$2,0 > h / h_{ef} > 1,3$			4,6 $h_{ef}$ - 1,8 $h$							
	$h / h_{ef} \leq 1,3$			2,26 $h_{ef}$							
Spacing	$s_{cr,sp}$			2 $c_{cr,sp}$							
<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 load</b>											
Temperature range	[ - ]	50 °C / 80 °C		72 °C / 120 °C							
Factor	$\Psi_{sus}^0$	[ - ]	0,74	0,87							
<b>Shear load</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		M6	M8	M10	M12	M16	M20	M24	M27	M30	
fischer anchor rods and standard threaded rods	$d_{nom}$	[mm]	6	8	10	12	16	20	24	27	30
fischer internal threaded anchors RG MI	$d_{nom}$		- <sup>1)</sup>	12	16	18	22	28	- <sup>1)</sup>	- <sup>1)</sup>	- <sup>1)</sup>
fischer rebar anchor FRA	$d_{nom}$		- <sup>1)</sup>	- <sup>1)</sup>	- <sup>1)</sup>	12	16	20	25	- <sup>1)</sup>	- <sup>1)</sup>
Size (nominal diameter of the bar)	$\phi$	8	10	12	14	16	20	25	28		
Reinforcing bar	$d_{nom}$	[mm]	8	10	12	14	16	20	25	28	
1) Anchor type not part of the assessment											
fischer injection system FIS V											
<b>Performances</b>											
Characteristic values for concrete failure under tension / shear load					<b>Annex C 4</b>						
					Appendix 22/ 32						

**Table C5.1: Characteristic values for combined pull-out and concrete failure for fischer anchor rods and standard threaded rods in hammer drilled holes; uncracked or cracked concrete**

**Table C6.1: Characteristic values** for combined pull-out and concrete failure for **fischer internal threaded anchors RG MI** in hammer drilled holes; **uncracked concrete**

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- perature range	I: 50 °C / 80 °C	$\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ]	10,5	10,0	9,5	9,0
	II: 72 °C / 120 °C		9,0	8,0	8,0	7,5
Hammer-drilling with standard drill bit or hollow drill bit (water filled hole) <sup>1)</sup>						
Tem- perature range	I: 50 °C / 80 °C	$\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ]	10,0	9,0	9,0	8,5
	II: 72 °C / 120 °C		7,5	6,5	6,5	6,0
<b>Installation factors</b>						
Dry or wet concrete	$\gamma_{inst}$ [-]		1,0			
Water filled hole			1,2 <sup>1)</sup>			

<sup>1)</sup> Only with coaxial cartridges: 380 ml, 400 ml, 410 ml

fischer injection system FIS V

#### Performances

Characterstic values for combined pull-out and concrete failure for fischer internal threaded anchors RG MI

#### Annex C 6

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**Table C7.1: Characteristic values for 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 pullout 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)											
Tem- pera-ture 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

## Installation factor

Dry or wet concrete	$\gamma_{inst}$	[-]	1,0
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### **Cracked concrete**

## Characteristic bond resistance in cracked concrete C20/25

Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)

Tem- perature range	I: 50 °C / 80 °C	$\tau_{Rk,cr}$	[N/mm <sup>2</sup> ]	-1)	3,0	5,0	5,0	5,0	4,5	4,0	4,0
	II: 72 °C / 120 °C			-1)	3,0	4,5	4,5	4,5	4,0	3,5	3,5

## Installation factor

Dry or wet concrete	$\gamma_{inst}$	[-]	1,0
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1) No performance assessed

**Table C8.1: Characteristic values** for combined pull-out and concrete failure for **fischer rebar anchors FRA** in hammer drilled holes; **uncracked or cracked concrete**

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: 50 °C / 80 °C II: 72 °C / 120 °C	$\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ]	11,0 9,0	10,0 8,5	9,5 8,0
<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>					
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)					
Tem- perature range	I: 50 °C / 80 °C II: 72 °C / 120 °C	$\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]	5,0 4,5	5,0 4,5	4,5 4,0
<b>Installation factors</b>					
Dry or wet concrete	$\gamma_{inst}$	[-]		1,0	
fischer injection system FIS V					
<b>Performances</b> Characteristic values for combined pull-out and concrete failure for fischer rebar anchors FRA					
<b>Annex C 8</b> Appendix 26/32					

**Table C9.1: Displacements for anchor rods**

Anchor rod	M6	M8	M10	M12	M16	M20	M24	M27	M30	
<b>Displacement-Factors for tension load<sup>1)</sup></b>										
<b>Uncracked concrete; Temperature range I, II</b>										
$\delta_{N0}$ -Factor	[mm/(N/mm <sup>2</sup> )]	0,09	0,09	0,09	0,10	0,10	0,10	0,10	0,11	0,12
		0,10	0,10	0,10	0,12	0,12	0,12	0,13	0,13	0,14
<b>Cracked concrete; Temperature range I, II</b>										
$\delta_{N0}$ -Factor	[mm/(N/mm <sup>2</sup> )]	- <sup>3)</sup>	0,12	0,12	0,12	0,13	0,13	0,13	0,14	0,15
		- <sup>3)</sup>	0,25	0,27	0,30	0,30	0,30	0,35	0,35	0,40
<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]	0,11	0,11	0,11	0,10	0,10	0,09	0,09	0,08	0,07
		0,12	0,12	0,12	0,11	0,11	0,10	0,10	0,09	0,09

1) Calculation of effective displacement:

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

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

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

2) Calculation of effective displacement:

$$\delta_{v0} = \delta_{v0}\text{-Factor} \cdot V_{Ed}$$

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

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

3) No performance assessed

**Table C9.2: Displacements for fischer internal threaded anchors RG MI**

Internal threaded anchor RG MI	M8	M10	M12	M16	M20	
<b>Displacement-Factors for tension load<sup>1)</sup></b>						
<b>Uncracked concrete; Temperature range I, II</b>						
$\delta_{N0}$ -Factor	[mm/(N/mm <sup>2</sup> )]	0,10	0,11	0,12	0,13	0,14
		0,13	0,14	0,15	0,16	0,18
<b>Displacement-Factors for shear load<sup>2)</sup></b>						
<b>Uncracked concrete; Temperature range I, II</b>						
$\delta_{v0}$ -Factor	[mm/kN]	0,12	0,12	0,12	0,12	0,12
		0,14	0,14	0,14	0,14	0,14

1) Calculation of effective displacement:

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

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

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

2) Calculation of effective displacement:

$$\delta_{v0} = \delta_{v0}\text{-Factor} \cdot V_{Ed}$$

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

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

fischer injection system FIS V

#### Performances

Displacements for anchor rods and fischer internal threaded anchors RG MI

#### Annex C 9

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**Table C10.1: Displacements for reinforcing bars**

Nominal diameter of the bar	$\phi$	8	10	12	14	16	20	25	28
<b>Displacement-Factors for tension load<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	0,13	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	0,13	0,14
$\delta_{N\infty}$ -Factor		<sup>-3)</sup> 0,27	0,30	0,30	0,30	0,30	0,35	0,37	
<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]	0,11	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

1) Calculation of effective displacement:

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

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

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

2) Calculation of effective displacement:

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

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

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

<sup>3)</sup> No performance assessed

**Table C10.2: Displacements for fischer rebar anchors FRA**

fischer rebar anchor FRA	M12	M16	M20	M24	
<b>Displacement-Factors for tension load<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 load<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
1) Calculation of effective displacement:					
$\delta_{N0} = \delta_{N0}\text{-Factor} \cdot \tau_{Ed}$					
$\delta_{N\infty} = \delta_{N\infty}\text{-Factor} \cdot \tau_{Ed}$					
( $\tau_{Ed}$ : Design value of the applied tensile stress)					
2) Calculation of effective displacement:					
$\delta_{V0} = \delta_{V0}\text{-Factor} \cdot V_{Ed}$					
$\delta_{V\infty} = \delta_{V\infty}\text{-Factor} \cdot V_{Ed}$					
( $V_{Ed}$ : Design value of the applied shear force)					
fischer injection system FIS V					
<b>Performances</b>					
Displacements for reinforcing bars and fischer rebar anchors FRA					
<b>Annex C 10</b>					
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**Table C11.1: Characteristic values for steel failure under tension / 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	M16	M20	M24	M27	M30					
<b>Bearing capacity under tension load, steel failure<sup>1)</sup></b>															
<b>fischer anchor rods and standard threaded rods, performance category C1<sup>2)</sup></b>															
Characteristic resistance N <sub>Rk,s,C1</sub>	Steel zinc plated	Property class 5.8 8.8 50 70 80	[kN]	29(27)	43	79	123	177	230	281					
				47(43)	68	126	196	282	368	449					
	Stainless steel R and high corrosion resistant steel HCR			29	43	79	123	177	230	281					
				41	59	110	172	247	322	393					
				47	68	126	196	282	368	449					
<b>fischer anchor rods and standard threaded rods, performance category C2<sup>2)</sup></b>															
Characteristic resistance N <sub>Rk,s,C2</sub>	Steel zinc plated	Property class 5.8 8.8 50 70 80	[kN]	- <sup>4)</sup>	39	72	108	- <sup>4)</sup>	- <sup>4)</sup>	- <sup>4)</sup>					
				- <sup>4)</sup>	61	116	173	- <sup>4)</sup>	- <sup>4)</sup>	- <sup>4)</sup>					
	Stainless steel R and high corrosion resistant steel HCR			- <sup>4)</sup>	39	72	108	- <sup>4)</sup>	- <sup>4)</sup>	- <sup>4)</sup>					
				- <sup>4)</sup>	53	101	152	- <sup>4)</sup>	- <sup>4)</sup>	- <sup>4)</sup>					
				- <sup>4)</sup>	61	116	173	- <sup>4)</sup>	- <sup>4)</sup>	- <sup>4)</sup>					
				- <sup>4)</sup>											
<b>Bearing capacity under shear load, steel failure without lever arm<sup>1)</sup></b>															
<b>fischer anchor rods, performance category C1<sup>2)</sup></b>															
Characteristic resistance V <sub>Rk,s,C1</sub>	Steel zinc plated	Property class 5.8 8.8 50 70 80	[kN]	17(16)	25	47	74	106	138	168					
				23(21)	34	63	98	141	184	225					
	Stainless steel R and high corrosion resistant steel HCR			15	21	39	61	89	115	141					
				20	30	55	86	124	161	197					
				23	34	63	98	141	184	225					
<b>Standard threaded rods, performance category C1<sup>2)</sup></b>															
Characteristic resistance V <sub>Rk,s,C1</sub>	Steel zinc plated	Property class 5.8 8.8 50 70 80	[kN]	12(11)	17	33	52	74	97	118					
				16(14)	24	44	69	99	129	158					
	Stainless steel R and high corrosion resistant steel HCR			11	15	27	43	62	81	99					
				14	21	39	60	87	113	138					
				16	24	44	69	99	129	158					
<b>fischer anchor rods and standard threaded rods, performance category C2</b>															
Characteristic resistance V <sub>Rk,s,C2</sub>	Steel zinc plated	Property class 5.8 8.8 50 70 80	[kN]	- <sup>4)</sup>	14	27	43	- <sup>4)</sup>	- <sup>4)</sup>	- <sup>4)</sup>					
				- <sup>4)</sup>	22	44	69	- <sup>4)</sup>	- <sup>4)</sup>	- <sup>4)</sup>					
	Stainless steel R and high corrosion resistant steel HCR			- <sup>4)</sup>	14	27	43	- <sup>4)</sup>	- <sup>4)</sup>	- <sup>4)</sup>					
				- <sup>4)</sup>	20	39	60	- <sup>4)</sup>	- <sup>4)</sup>	- <sup>4)</sup>					
				- <sup>4)</sup>	22	44	69	- <sup>4)</sup>	- <sup>4)</sup>	- <sup>4)</sup>					
				- <sup>4)</sup>											
Factor for the annular gap	$\alpha_{gap}$	[ $\cdot$ ]						0,5 (1,0) <sup>3)</sup>							

<sup>1)</sup> Partial factors for performance category C1 or C2 see table C12.1; for fischer anchor rods FIS A / RGM the factor for steel ductility is 1

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

<sup>3)</sup> Values in brackets are valid for filled annular gaps between the anchor rod and the through-hole in the attachment. It is necessary to use the fischer filling disc according to Annex A 1

<sup>4)</sup> No performance assessed

fischer injection system FIS V

### Performances

Characteristic values for steel failure under tension / shear load for fischer anchor rods and standard threaded rods under seismic action (performance category C1 / C2)

Annex C 11

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**Table C12.1: Partial factors for fischer anchor rods, standard threaded rods under seismic action performance category C1 or C2**

Anchor rod / standard threaded rod		M10	M12	M16	M20	M24	M27	M30
<b>Tension load, steel failure<sup>1)</sup></b>								
$\gamma_{M_{s,N}}$	Steel zinc plated  Stainless steel R and high corrosion resistant steel HCR	Property class  5.8 8.8 50 [-] 70 80	5.8		1,50			
			8.8		1,50			
			50		2,86			
			70		1,50 <sup>2)</sup> / 1,87			
			80		1,60			

**Shear load, steel failure<sup>1)</sup>**

$\gamma_{M_{s,V}}$	Steel zinc plated  Stainless steel R and high corrosion resistant steel HCR	Property class  5.8 8.8 50 [-] 70 80	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 HCR, with  $f_{yk} / f_{uk} \geq 0,8$  and  $A_5 > 12\%$  (e.g. fischer anchor rods)

fischer injection system FIS V

**Performances**

Partial factors under seismic action (performance category C1 and C2) for fischer anchor rods and standard threaded rods

**Annex C 12**

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**Table C13.1: Characteristic values** for combined pull-out and concrete failure for **fischer anchor rods** and **standard threaded rods** in hammer drilled holes under seismic action performance category **C1**

Anchor rod / standard threaded rod		M10	M12	M16	M20	M24	M27	M30	
<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: 50 °C / 80 °C	$\tau_{RK,C1}$ [N/mm <sup>2</sup> ]	4,5	5,5	5,5	5,5	4,5	4,0	4,0
	II: 72 °C / 120 °C		4,0	4,5	4,5	4,5	4,0	3,5	3,5
<b>Hammer-drilling with standard drill bit or hollow drill bit (water filled hole <sup>1)</sup>)</b>									
Tem- perature range	I: 50 °C / 80 °C	$\tau_{RK,C1}$ [N/mm <sup>2</sup> ]	- <sup>2)</sup>	5,0	5,0	4,5	4,0	3,5	3,5
	II: 72 °C / 120 °C		- <sup>2)</sup>	4,0	4,0	4,0	3,5	3,0	3,0
<b>Installation factors</b>									
Dry or wet concrete	$\gamma_{inst}$ [-]		1,0						
Water filled hole			- <sup>2)</sup>	1,2 <sup>1)</sup>					

<sup>1)</sup> Only with coaxial cartridges: 380ml, 400 ml, 410 ml

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

fischer injection system FIS V

#### Performances

Characteristic values for combined pull-out and concrete failure under seismic action (performance category C1) for fischer anchor rods and standard threaded rods

#### Annex C 13

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**Table C14.1: Characteristic values** for combined pull-out and concrete failure for **fischer anchor rods** and **standard threaded rods** in hammer drilled holes under seismic action performance category **C2**

Anchor rod / standard threaded rod	M12	M16	M20	
<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- pera ture range	I: 50 °C / 80 °C	$\tau_{Rk,C2}$ [N/mm <sup>2</sup> ]	1,5	1,3
	II: 72 °C / 120 °C		1,3	1,2
<b>Hammer-drilling with standard drill bit or hollow drill bit (water filled hole <sup>3)</sup>)</b>				
Tem- pera ture range	I: 50 °C / 80 °C	$\tau_{Rk,C2}$ [N/mm <sup>2</sup> ]	1,3	1,1
	II: 72 °C / 120 °C		1,1	1,0
<b>Installation factors</b>				
Dry or wet concrete	$\gamma_{inst}$ [-]		1,0	
Water filled hole			- <sup>4)</sup> 1,2 <sup>3)</sup>	
<b>Displacement-Factors for tension load<sup>1)</sup></b>				
$\delta_{N,C2}$ (DLS)-Factor		[mm/(N/mm <sup>2</sup> )]	0,20	
$\delta_{N,C2}$ (ULS)-Factor			0,38	
<b>Displacement-Factors for shear load<sup>2)</sup></b>				
$\delta_{V,C2}$ (DLS)-Factor		[mm/kN]	0,18	
$\delta_{V,C2}$ (ULS)-Factor			0,25	
1) Calculation of effective displacement:	2) Calculation of effective displacement:			
$\delta_{N,C2}$ (DLS) = $\delta_{N,C2}$ (DLS)-Factor · $\tau_{Ed}$	$\delta_{V,C2}$ (DLS) = $\delta_{V,C2}$ (DLS)-Factor · $V_{Ed}$			
$\delta_{N,C2}$ (ULS) = $\delta_{N,C2}$ (ULS)-Factor · $\tau_{Ed}$	$\delta_{V,C2}$ (ULS) = $\delta_{V,C2}$ (ULS)-Factor · $V_{Ed}$			
( $\tau_{Ed}$ : Design value of the applied tensile stress)	( $V_{Ed}$ : Design value of the applied shear force)			
3) Only with coaxial cartridges: 380ml, 400 ml, 410 ml				
4) No performance assessed				
fischer injection system FIS V				
<b>Performances</b> Characteristic values for combined pull-out and concrete failure under seismic action (performance category C2) for fischer anchor rods and standard threaded rods	<b>Annex C 14</b> Appendix 32/32			