Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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

European Technical Assessment ETA-21/0469 of 9 December 2021

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	fischer injection system FIS EB II
Product family to which the construction product belongs	Bonded fastener for use in concrete
Manufacturer	fischerwerke GmbH & Co. KG Otto-Hahn-Straße 15 79211 Denzlingen DEUTSCHLAND
Manufacturing plant	fischerwerke
This European Technical Assessment contains	28 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 330499-01-0601 Edition 04/2020

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Specific Part

1 Technical description of the product

The fischer injection system FIS EB II is a bonded fastener consisting of a cartridge with injection mortar fischer FIS EB II and a steel element according to Annex A4.

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

The product description is given in Annex A.

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

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

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

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

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading)	See Annex C1 to C6, B3 to B6
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C1 to C3
Displacements under short-term and long-term loading	See Annex C7 to C8
Characteristic resistance and displacements for seismic performance categories C1 and C2	No performance assessed

3.2 Hygiene, health and the environment (BWR 3)

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

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

In accordance with EAD 330499-01-0601 the applicable European legal act is: [96/582/EC].
The system to be applied is: 1

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

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

Issued in Berlin on 13. Dezember 2021 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Lange

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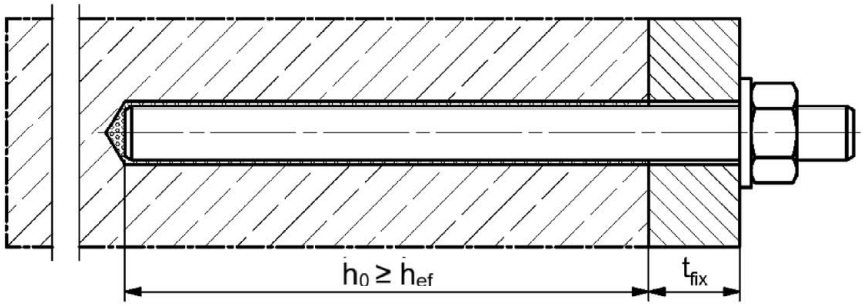
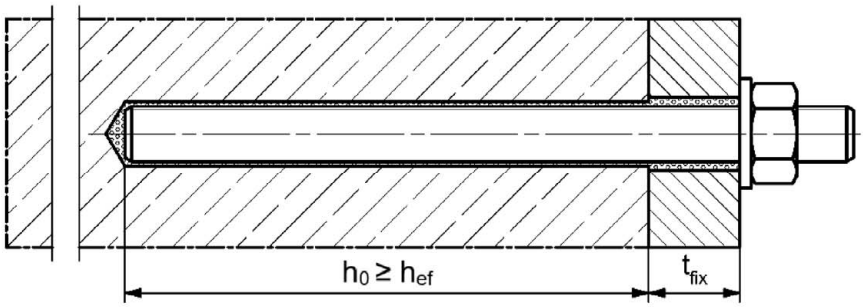
Installation conditions part 1

fischer anchor rod

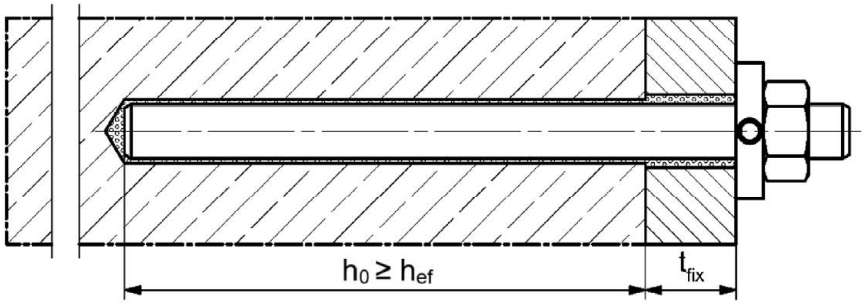
Pre-positioned installation



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_{ef} = effective embedment depth
t_{fix} = thickness of fixture

fischer injection system FIS EB II

Product description
Installation conditions part 1

Annex A 1

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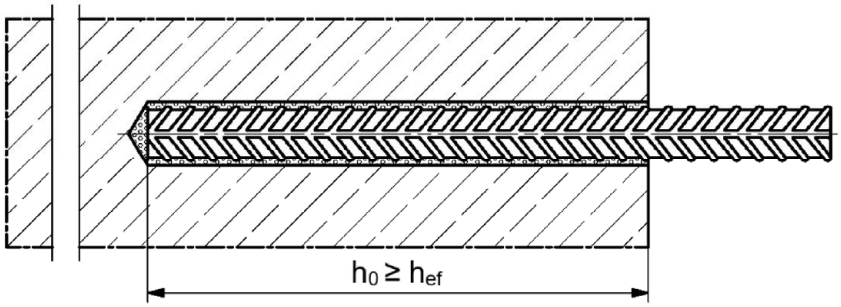
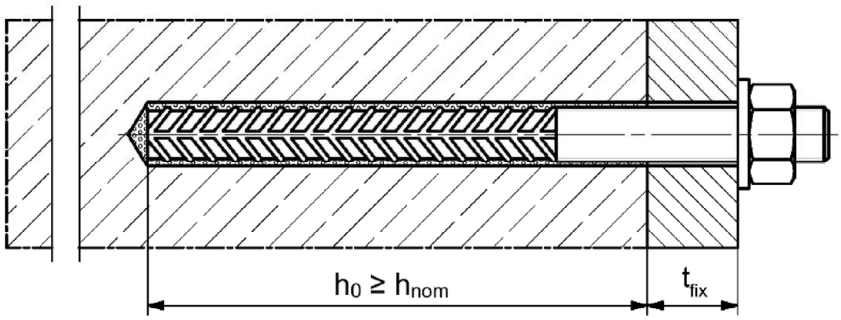
Installation conditions part 2

Reinforcing bar

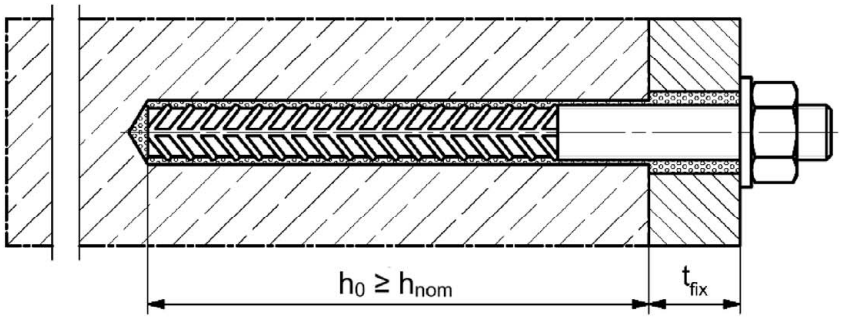


fischer rebar anchor

Pre-positioned installation



Push through installation (annular gap filled with mortar)



Figures not to scale

h_0 = drill hole depth

h_{ef} = effective embedment depth

t_{fix} = thickness of fixture

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

fischer injection system FIS EB II

Product description
Installation conditions part 2

Annex A 2

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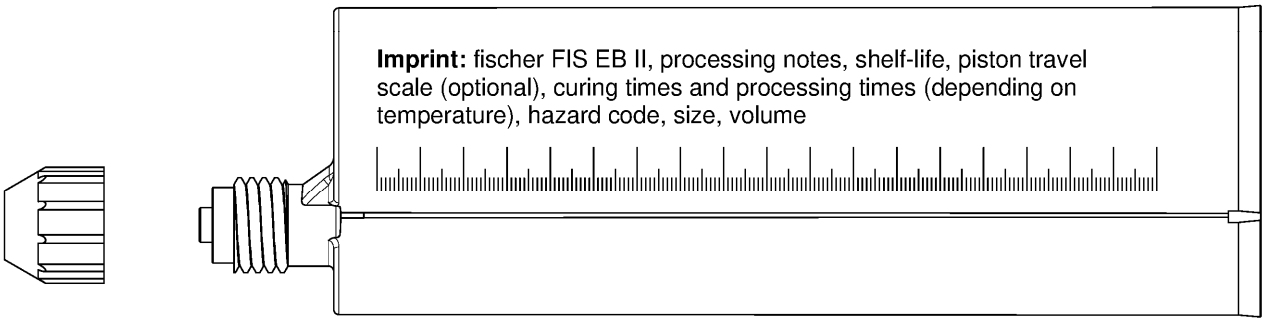
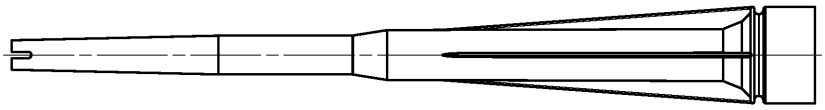
Overview system components part 1

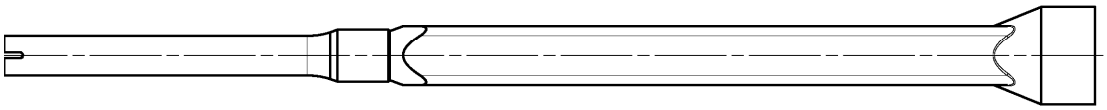
Injection cartridge (shuttle cartridge) with sealing cap; Size: 390 ml, 585 ml, 1100 ml, 1500 ml



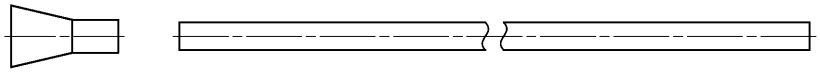
Static mixer FIS MR Plus for Injection cartridge 390 ml



Static mixer FIS UMR Injection cartridges ≥ 585 ml



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



Cleaning brush BS

Blow-out pump AB G

Compressed-air cleaning tool ABP

Figures not to scale

fischer injection system FIS EB II	**Annex A 3**
Product description Overview system components part 1; cartridges / static mixer / accessories	

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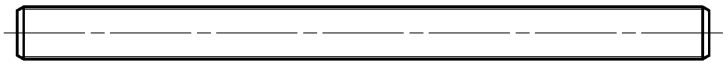
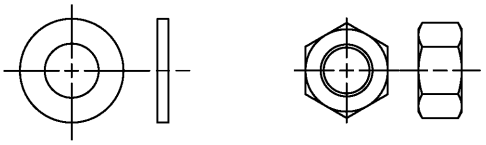
Overview system components part 2

fischer anchor rod

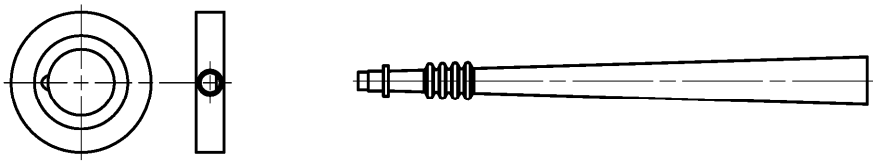
Size: M8, M10, M12, M16, M20, M24, M27, M30



washer / hexagon nut



fischer filling disk with injection adapter



Reinforcing bar

Nominal diameter: ϕ8, ϕ10, ϕ12, ϕ14, ϕ16, ϕ20, ϕ25, ϕ26, ϕ28, ϕ30, ϕ32

fischer rebar anchor FRA, FRA HCR

Size: M12, M16, M20, M24

Figures not to scale

fischer injection system FIS EB II

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

Annex A 4

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Table A5.1: Materials

Part	Designation	Material		
1	Injection cartridge	Mortar, hardener, filler		
	Steel grade	Steel zinc plated	Stainless steel R acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4: 2006+A1:2015	High corrosion resistant steel HCR acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4: 2006+A1:2015
2	Anchor rod	Property class 4.8, 5.8 or 8.8; EN ISO 898-1:2013 electroplated ≥ 5 µm, EN ISO 4042:2018 Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004+AC:2009 f_{uk} ≤ 1000 N/mm² A_5 > 8% fracture elongation	Property class 50, 70 or 80 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062, 1.4662, 1.4462; EN 10088-1:2014 f_{uk} ≤ 1000 N/mm² A_5 > 8% fracture elongation	Property class 50 or 80 EN ISO 3506-1:2020 or property class 70 with f_{yk}= 560 N/mm² 1.4565; 1.4529; EN 10088-1:2014 f_{uk} ≤ 1000 N/mm² A_5 > 8% fracture elongation
3	Washer ISO 7089:2000	electroplated ≥ 5 µm, EN ISO 4042:2018 Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004+AC:2009	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 acc. EN ISO 898-2:2012 electroplated ≥ 5 µm, EN ISO 4042:2018 Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004+AC:2009	Property class 50, 70 or 80 acc. EN ISO 3506-2:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	Property class 50, 70 or 80 acc. EN ISO 3506-2:2020 1.4565; 1.4529 EN 10088-1:2014
5	fischer filling disk	electroplated ≥ 5 µm, EN ISO 4042:2018 Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004+AC:2009	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	1.4565;1.4529; EN 10088-1:2014
6	Reinforcing bar EN 1992-1-1:2004 and AC:2010, Annex C	Bars and de-coiled rods, class B or C with f_{yk} and k according to NDP or NCI according to EN 1992-1-1/NA $f_{uk} = f_{tk} = k \cdot f_{yk}$ (A_5 > 8%)		
7	fischer rebar anchor	Rebar part: Bars and de-coiled rods class B or C with f_{yk} and k according to NDP or NCI of EN 1992-1-1:2004+AC:2010 $f_{uk} = f_{tk} = k \cdot f_{yk}$	Threaded part: Property class 70 or for M24 PC 80, EN ISO 3506-1:2020 1.4401, 1.4404, 1.4571, 1.4578, 1.4439, 1.4362, 1.4062 acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4:2006+A1:2015 1.4565; 1.4529 acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4: 2006+A1:2015	

fischer injection system FIS EB II

Product description
Materials

Annex A 5

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Specifications of intended use part 1

Table B1.1: Overview use and performance categories

Anchorages subject to			FIS EB II with …			
			Anchor rod 	Reinforcing bar 	fischer rebar anchor 	
Hammer drilling with standard drill bit			all sizes			
Static and quasi static loading, in	uncracked concrete		all sizes	Tables: C1.1 C3.1 C4.1 C7.1	all sizes	Tables: C2.1 C3.1 C5.1 C7.2	all sizes	Tables: C2.2 C3.1 C6.1 C8.1
	cracked concrete							
Use category	I1	dry or wet concrete	all sizes			
	I2	water filled hole	all sizes			
Seismic performance category		C1	-[1]		-[1]		-[1]	
		C2						
Installation direction			D3 (downward and horizontal and upwards (e.g. overhead))			
Installation temperature			$T_{i,min}$ = +5 °C to $T_{i,max}$ = +40 °C			
Service temperature		Temperature range I	-40 °C to +43 °C	(max. short term temperature +43 °C; max. long term temperature +24 °C)		
		Temperature range II	-40 °C to +60 °C	(max. short term temperature +60 °C; max. long term temperature +43 °C)		
		Temperature range III	-40 °C to +72 °C	(max. short term temperature +72 °C; max. long term temperature +50 °C)		

[1] No performance assessed

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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 EN1993-1-4:2006+A1:2015 corresponding to corrosion resistance classes to Annex A 5 Table 5.1.

Design:

- Fastenings are designed under the responsibility of an engineer experienced in fastenings and concrete work.
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the fastener is indicated on the design drawings (e. g. position of the fastener relative to reinforcement or to supports, etc.).
- Fastenings are designed in accordance with:
  EN 1992-4:2018 and EOTA Technical Report TR 055, Edition February 2018.

Installation:

- Fastener installation is to be carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- Fastening depth should be marked and adhered to installation
- Overhead installation is allowed (necessary equipment see installation instruction)

fischer injection system FIS EB II	**Annex B 2**
Intended use Specifications part 2	

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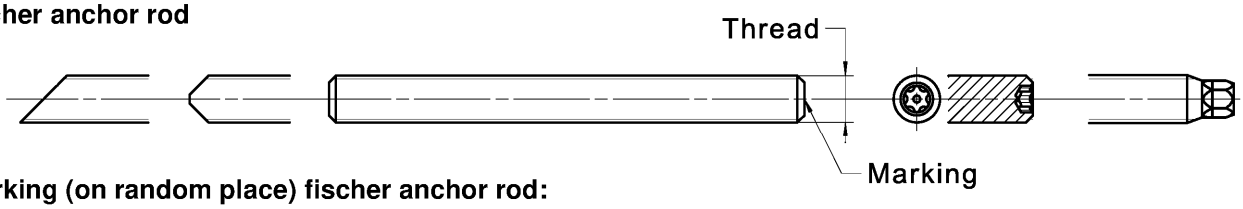
Table B3.1: Installation parameters for **anchor rods**

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

[1] Detailed calculation according to Annex B 6 and B 7

fischer anchor rod



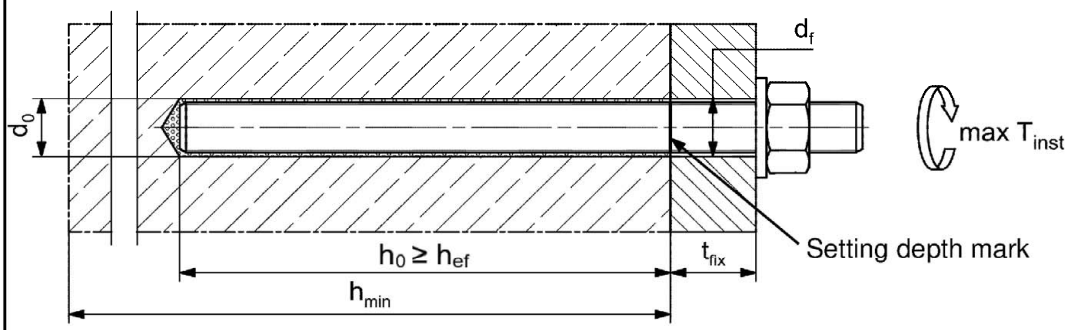
Marking (on random place) fischer anchor rod:

Steel electroplated PC[1] 8.8	• or +	Steel hot-dip PC[1] 8.8	•
High corrosion resistant steel HCR PC[1] 50	•	High corrosion resistant steel HCR PC[1] 70	-
High corrosion resistant steel HCR PC[1] 80	(	Stainless steel R property class 50	~
Stainless steel R property class 80	*		

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

[1] 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 5, Table A5.1
- 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 EB II

Intended use
Installation parameters anchor rods

Annex B 3

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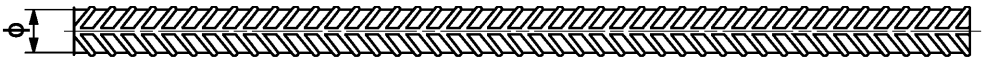
Table B4.1: Installation parameters for **reinforcing bars**

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

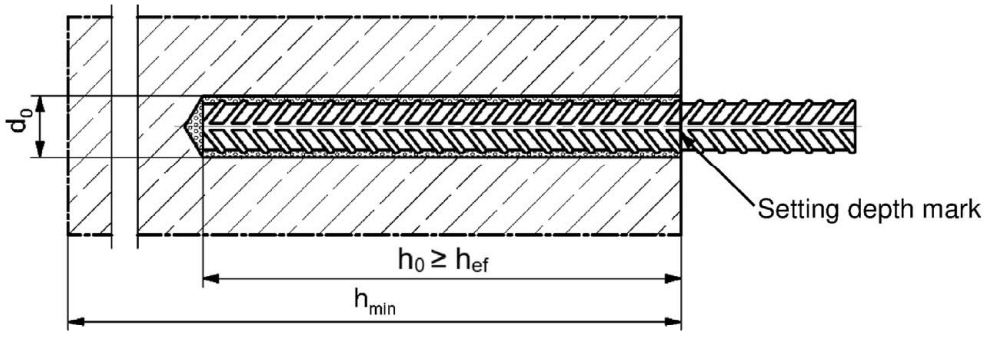
[1] Both drill hole diameters can be used
[2] Detailed calculation according to Annex B 6 und B 7

Reinforcing bar



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

Installation conditions:



Figures not to scale

fischer injection system FIS EB II

Intended use
Installation parameters reinforcing bars

Annex B 4

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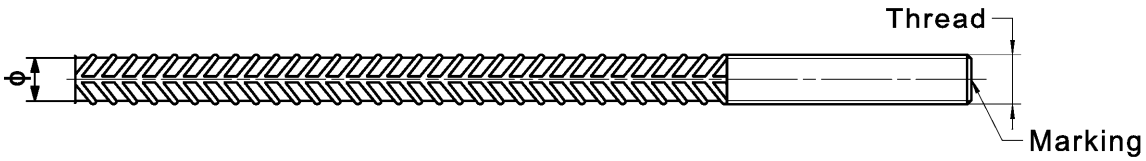
Table B5.1: Installation parameters for **fischer rebar anchor**

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

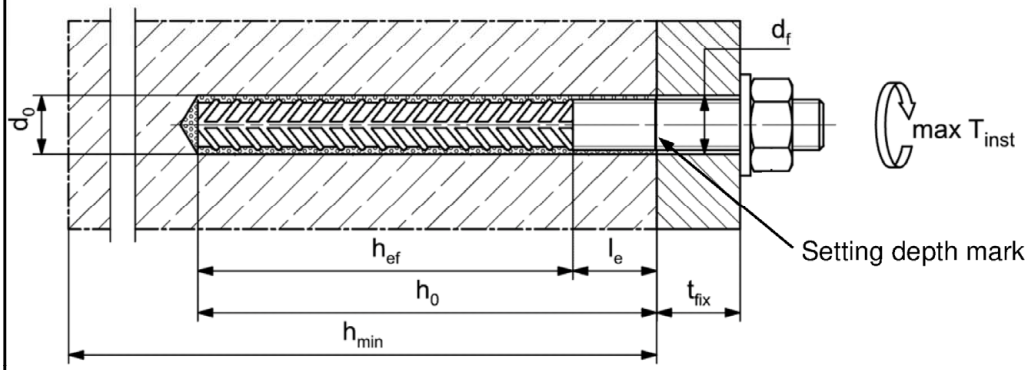
[1] Both drill hole diameters can be used
[2] Detailed calculation according to Annex B 6 and B 7

fischer rebar anchor



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

Installation conditions:



Figures not to scale

fischer injection system FIS EB II

Intended use
Installation parameters fischer rebar anchor

Annex B 5

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Table B6.1: Minimum spacing and minimum edge distance for **anchor rods, reinforcing bars and fischer rebar anchor**

Anchor rods			**M8**	**M10**	**M12**	**-**	**M16**	**M20**
Reinforcing bars, fischer rebar anchor (nominal diameter)		**ϕ**	**8**	**10**	**12**	**14**	**16**	**20**
Minimum edge distance								
Uncracked / cracked concrete	c_{min}	[mm]	40	45	45	45	50	55
Spacing	s		according to Annex B 7					
Minimum spacing								
Uncracked / cracked concrete	s_{min}	[mm]	40	45	55	60	65	85
Edge distance	c		according to Annex B 7					
Required projecting area								
Uncracked concrete	$A_{sp,req}$	[1000 mm²]	8,0	13,0	22,0	23,0	24,0	38,5
Cracked concrete			6,5	10,0	16,5	17,5	18,5	29,5

Anchor rods			**M24**	**-**	**-**	**M27**	**-**	**M30**	**-**
Reinforcing bars, fischer rebar anchor (nominal diameter)		**ϕ**	**-**	**25**	**26**	**-**	**28**	**30**	**32**
Minimum edge distance									
Uncracked / cracked concrete	c_{min}	[mm]	60	75	75	75	80	80	120
Spacing	s		according to Annex B 7						
Minimum spacing									
Uncracked / cracked concrete	s_{min}	[mm]	105	120	120	120	140	140	160
Edge distance	c		according to Annex B 7						
Required projecting area									
Uncracked concrete	$A_{sp,req}$	[1000 mm²]	40,0	47,5	47,5	47,5	64,0	64,0	64,0
Cracked concrete			30,5	36,5	36,5	36,5	49,0	49,0	49,0

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

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

$$\mathbf{A_{sp,req} < A_{sp}}$$

$A_{sp,req}$ = required projecting area
$A_{sp} = A_{sp,ef}$ = effective projecting area (according to Annex B 7)

fischer injection system FIS EB II

Intended use
Minimum spacing and edge distance for anchor rods, reinforcing bars and fischer rebar anchor

Annex B 6

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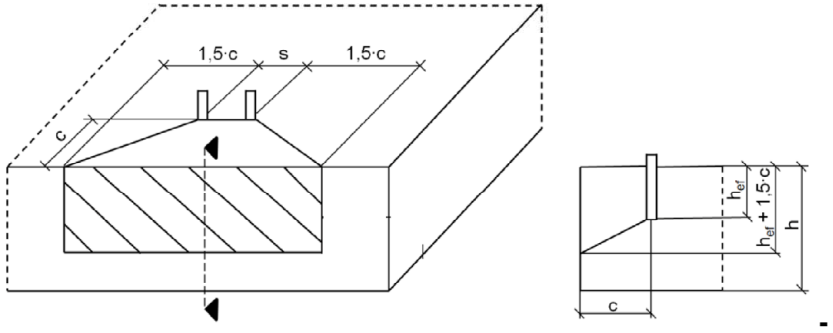
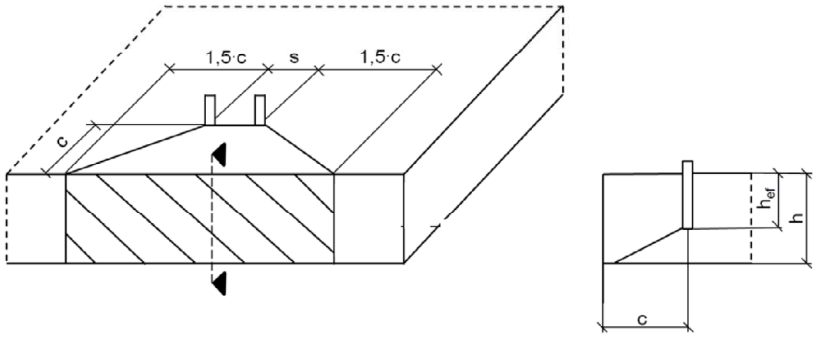
Table B7.1: Effective projecting area A_{sp} with concrete member thickness $h > h_{ef} + 1{,}5 \cdot c$ and $h \geq h_{min}$



Single fastener	$A_{sp} = (3 \cdot c) \cdot (h_{ef} + 1{,}5 \cdot c)$	[mm²]	with $c \geq c_{min}$
Group of fastener with $s > 3 \cdot c$	$A_{sp} = (6 \cdot c) \cdot (h_{ef} + 1{,}5 \cdot c)$	[mm²]	with $c \geq c_{min}$
Group of fastener with $s \leq 3 \cdot c$	$A_{sp} = (3 \cdot c + s) \cdot (h_{ef} + 1{,}5 \cdot c)$	[mm²]	with $c \geq c_{min}$ and $s \geq s_{min}$

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



Single fastener	$A_{sp} = 3 \cdot c \cdot$ existing h	[mm²]	with $c \geq c_{min}$
Group of fastener with $s > 3 \cdot c$	$A_{sp} = 6 \cdot c \cdot$ existing h	[mm²]	with $c \geq c_{min}$
Group of fastener with $s \leq 3 \cdot c$	$A_{sp} = (3 \cdot c + s) \cdot$ existing h	[mm²]	with $c \geq c_{min}$ and $s \geq s_{min}$

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

Figures not to scale

fischer injection system FIS EB II

Annex B 7

Intended use
Minimum thickness of concrete member for anchor rods, reinforcing bar, fischer rebar anchor and minimum spacing and edge distance

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

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

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

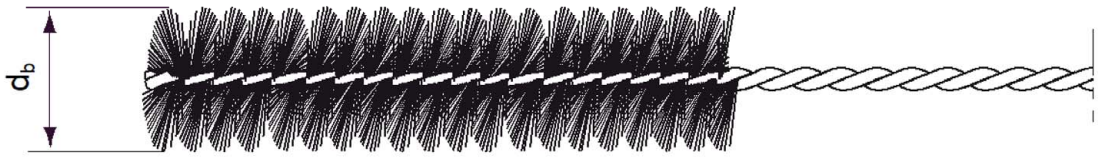


Table B8.2: Conditions for use **static mixer** without an **extension tube**

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

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

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

fischer injection system FIS EB II

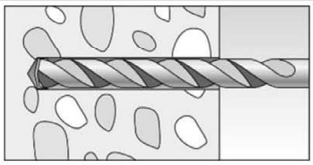
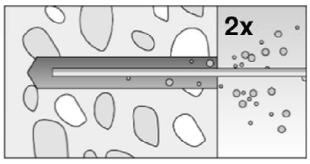
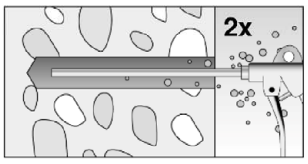
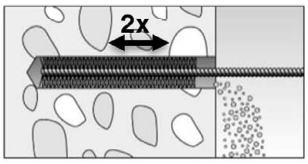
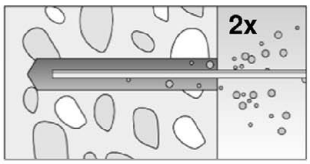
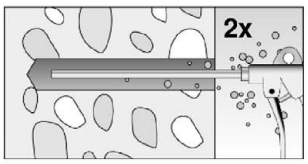
Intended use
Cleaning brush (steel brush)
Processing time and curing time

Annex B 8

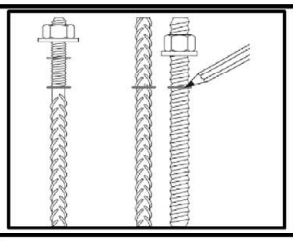
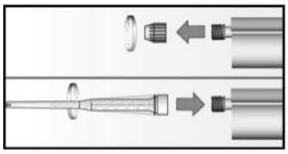
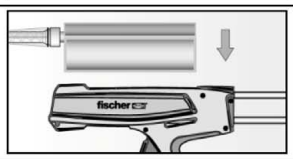
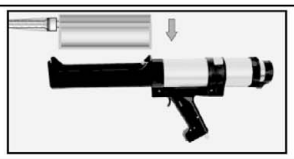
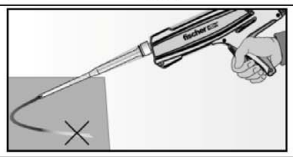
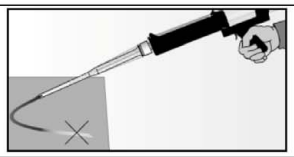
Deutsches Institut für Bautechnik DIBt

Installation instructions part 1

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

1		Drill the hole. Nominal drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see **Tables B3.1, B4.1, B5.1**		
2		Clean the drill hole: For $h_{ef} \leq 12d$ and $d_0 < 18$ mm blow out the hole twice by hand		For $h_{ef} > 12d$ and / or $d_0 \geq 18$ mm blow out the hole twice with oil-free compressed air ($p \geq 6$ bar)
3		Brush the drill hole twice. For drill hole diameter $d_0 \geq 18$ mm and / or $h_{ef} > 12d$ use a power drill. For deep holes use an extension. Corresponding brushes see **Table B8.1**		
4		Clean the drill hole: For $h_{ef} \leq 12d$ and $d_0 < 18$ mm blow out the hole twice by hand		For $h_{ef} > 12d$ and / or $d_0 \geq 18$ mm blow out the hole twice with oil-free compressed air ($p \geq 6$ bar)

Preparing

5		Mark the setting depth of the steel element	
6		Remove the sealing cap 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

Go to Step 9

fischer injection system FIS EB II	**Annex B 9**
Intended use Installation instructions part 1	

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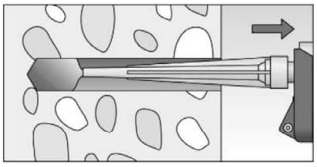
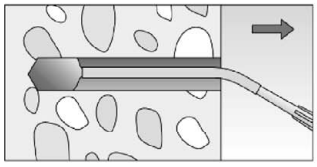
Installation instructions part 2

Injection of the mortar

9

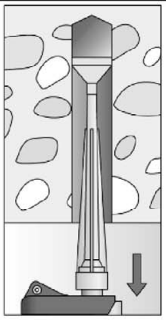


Fill approximately 2/3 of the drill hole with mortar. Always begin from the bottom of the hole and avoid bubbles



The conditions for mortar injection without extension tube can be found in **Table B8.2**

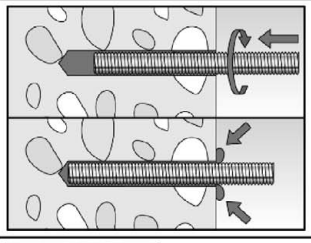
For deeper drill holes, than those mentioned in **Table B8.2,** use a suiTable extension tube



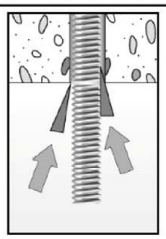
For overhead installation, deep holes (h_0 > 250 mm) or drill hole diameter (d_0 ≥ 30 mm) use an injection-adapter

Installation of anchor rods

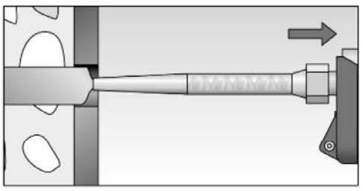
10



Only use clean and oil-free anchor elements.
Push the anchor rod with the setting depth mark 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.

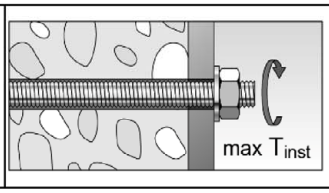


For push through installation fill the annular gap with mortar

11

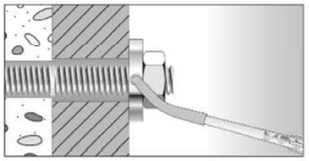
Wait for the specified curing time t_{cure} see **Table B8.3**

12



Mounting the fixture max T_{inst} see **Table B3.1**

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.
Compressive strength ≥ 50 N/mm² (e.g. fischer injection mortars FIS EB II, FIS SB, FIS V Plus, FIS EM Plus)
ATTENTION:
Using fischer filling disk reduces t_{fix} (usable length of the anchor)

fischer injection system FIS EB II

Intended use
Installation instructions part 2

Annex B 10

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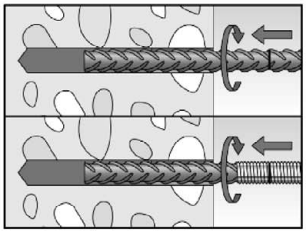
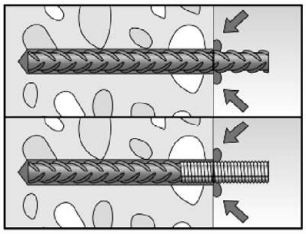
Installation instructions part 3

Installation reinforcing bars and fischer rebar anchor

9



Only use clean and oil-free reinforcing bars or fischer rebar anchor. Push the reinforcement bar or the fischer rebar anchor with the setting depth mark into the filled hole up to the setting depth mark.
Recommendation:
Rotation back and forth of the reinforcement bar or the fischer rebar anchor makes pushing easy

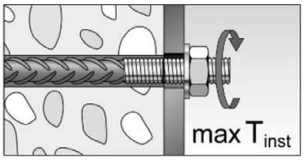


When the setting depth mark is reached, excess mortar must be emerged from the mouth of the drill hole.

10

Wait for the specified curing time t_{cure} see **Table B8.3**

11



Mounting the fixture
max T_{inst}
see **Table B5.1**

fischer injection system FIS EB II

Intended use
Installation instructions part 3

Annex B 11

Deutsches Institut für Bautechnik DIBt

Table C1.1: Characteristic resistance to **steel failure** under **tension / shear loading** of **fischer anchor rods** and **standard threaded rods**

Anchor rod / standard threaded rod				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Characteristic resistance to steel failure under tension loading [3]											
Characteristic resistance $N_{Rk,s}$	Steel zinc plated	Property class	4.8	15(13)	23(21)	33	63	98	141	184	224
			5.8	19(17)	29(27)	43	79	123	177	230	281
			8.8	29(27)	47(43)	68	126	196	282	368	449
	Stainless steel R and high corrosion resistant steel HCR		50	19	29	43	79	123	177	230	281
			70	26	41	59	110	172	247	322	393
			80	30	47	68	126	196	282	368	449
		[kN]									
Partial factors [1]											
Partial factor $\gamma_{Ms,N}$	Steel zinc plated	Property class	4.8	1,50							
			5.8	1,50							
			8.8	1,50							
	Stainless steel R and high corrosion resistant steel HCR		50	2,86							
			70	1,50[2] / 1,87							
			80	1,60							
		[-]									
Characteristic resistance to steel failure under shear loading [3]											
without lever arm											
Characteristic resistance $V^0_{Rk,s}$	Steel zinc plated	Property class	4.8	9(8)	14(13)	20	38	59	85	110	135
			5.8	11(10)	17(16)	25	47	74	106	138	168
			8.8	15(13)	23(21)	34	63	98	141	184	225
	Stainless steel R and high corrosion resistant steel HCR		50	9	15	21	39	61	89	115	141
			70	13	20	30	55	86	124	161	197
			80	15	23	34	63	98	141	184	225
		[kN]									
Ductility factor		k_7	[-]	1,0							
with lever arm											
Characteristic resistance $M^0_{Rk,s}$	Steel zinc plated	Property class	4.8	15(13)	30(27)	52	133	259	448	665	899
			5.8	19(16)	37(33)	65	166	324	560	833	1123
			8.8	30(26)	60(53)	105	266	519	896	1333	1797
	Stainless steel R and high corrosion resistant steel HCR		50	19	37	65	166	324	560	833	1123
			70	26	52	92	232	454	784	1167	1573
			80	30	60	105	266	519	896	1333	1797
		[Nm]									
Partial factors [1]											
Partial factor $\gamma_{Ms,V}$	Steel zinc plated	Property class	4.8	1,25							
			5.8	1,25							
			8.8	1,25							
	Stainless steel R and high corrosion resistant steel HCR		50	2,38							
			70	1,25[2] / 1,56							
			80	1,33							
		[-]									

[1] In absence of other national regulations
[2] 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)
[3] Values in brackets are valid for hot dip galvanised standard threaded rods

fischer injection system FIS EB II

Performance
Characteristic resistance to steel failure under tension / shear loading of fischer anchor rods and standard threaded rods

Annex C 1

Deutsches Institut für Bautechnik DIBt

Table C2.1: Characteristic restistance to **steel failure** under tension / shear loading of **reinforcing bars**

Nominal diameter of the bar		**ϕ**	**8**	**10**	**12**	**14**	**16**	**20**	**25**	**26**	**28**	**30**	**32**
Characteristic resistance to steel failure under tension loading													
Characterstic resistance	$N_{Rk,s}$	[kN]	$A_s \cdot f_{uk}$ [2)]										
Characteristic resistance to steel failure under shear loading													
Without lever arm													
Characterstic resistance	$V^0_{Rk,s}$	[kN]	k_6 [1)] $\cdot A_s \cdot f_{uk}$ [2)]										
Ductility factor	k_7	[-]	1,0										
With lever arm													
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	$1,2 \cdot W_{el} \cdot f_{uk}$ [2)]										

1) In accordance with EN 1992-4:2018 section 7.2.2.3.1
k_6 =0,6 for fasteners made of carbon steel with $f_{uk} \leq 500$ N/mm²
=0,5 for fasteners made of carbon steel with $500 < f_{uk} \leq 1000$ N/mm²
=0,5 for fasteners made of stainless steel

2) f_{uk} respectively shall be taken from the specifications of the reinforcing bar

Table C2.2: Characteristic restistance to **steel failure** under tension / shear loading of **fischer rebar anchors**

fischer rebar anchor			**M12**	**M16**	**M20**	**M24**
Characteristic resistance to steel failure under tension loading						
Characterstic resistance	$N_{Rk,s}$	[kN]	59	110	172	270
Partial factor[1)]						
Partial factor	$\gamma_{Ms,N}$	[-]	1,4			
Characteristic resistance to steel failure under shear loading						
Without lever arm						
Characterstic resistance	$V^0_{Rk,s}$	[kN]	30	55	86	141
Ductility factor	k_7	[-]	1,0			
With lever arm						
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	92	233	454	898
Partial factor[1)]						
Partial factor	$\gamma_{Ms,V}$	[-]	1,56			

1) In absence of other national regulations

fischer injection system FIS EB II

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

Annex C 2

Deutsches Institut für Bautechnik DIBt

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

Size			**All sizes**							
Tension loading										
Installation factor	γ_{inst}	[-]	See annex C 4 to C 6							
Factors for the compressive strength of concrete > C20/25										
			Uncracked concrete					Cracked concrete		
Increasing factor ψ_c for cracked or uncracked concrete $\tau_{Rk} = \psi_c \cdot \tau_{Rk}$ (C20/25)	C25/30	[-]	1,05					1,02		
	C30/37		1,10					1,04		
	C35/45		1,13					1,06		
	C40/50		1,17					1,07		
	C45/55		1,20					1,09		
	C50/60		1,23					1,10		
Splitting failure										
Edge distance	$h / h_{ef} \geq 2,0$	$c_{cr,sp}$ [mm]	$1,0\ h_{ef}$							
	$2,0 > h / h_{ef} > 1,3$		$4,6\ h_{ef} - 1,8\ h$							
	$h / h_{ef} \leq 1,3$		$2,26\ h_{ef}$							
Spacing	$s_{cr,sp}$		$2\ c_{cr,sp}$							
Concrete cone failure										
Uncracked concrete	$k_{ucr,N}$	[-]	11,0							
Cracked concrete	$k_{cr,N}$		7,7							
Edge distance	$c_{cr,N}$	[mm]	$1,5\ h_{ef}$							
Spacing	$s_{cr,N}$		$2\ c_{cr,N}$							
Factors for sustained tension loading										
Temperature range		[-]	24 °C / 43 °C			43 °C / 60 °C			50 °C / 72 °C	
Factor	ψ^0_{sus}	[-]	0,68			0,60			0,68	
Shear loading										
Installation factor	γ_{inst}	[-]	1,0							
Concrete pry-out failure										
Factor for pry-out failure	k_8	[-]	2,0							
Concrete edge failure										
Effective length of fastener for shear loading	l_f	[mm]	for $d_{nom} \leq 24$ mm: min (h_{ef}; 12 d_{nom}) for $d_{nom} > 24$ mm: min (h_{ef}; 8 d_{nom}; 300 mm)							
Calculation diameters										
Size			M8	M10	M12	M16	M20	M24	M27	M30
fischer anchor rods and standard threaded rods	d_{nom}	[mm]	8	10	12	16	20	24	27	30
fischer rebar anchor	d_{nom}		-[1)]	-[1)]	12	16	20	25	-[1)]	-[1)]

Size (nominal diameter of the bar)	ϕ	8	10	12	14	16	20	25	26	28	30	32
Reinforcing bar	d_{nom} [mm]	8	10	12	14	16	20	25	26	28	30	32

[1)] Anchor type not part of the assessment

fischer injection system FIS EB II

Performance
Characteristic resistance to concrete failure under tension / shear loading

Annex C 3

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

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

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Performance
Characteristic resistance to combined pull-out and concrete failure for fischer anchor rod and standard threaded rods

Annex C 4

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

Reinforcing bars		**ϕ**	**8**	**10**	**12**	**14**	**16**	**20**	**25**	**26**	**28**	**30**	**32**
Combined pullout and concrete cone failure													
Calculation diameter	d	[mm]	8	10	12	14	16	20	25	26	28	30	32
Uncracked concrete													
Characteristic bond resistance in uncracked concrete C20/25													
Hammer-drilling with standard drill bit (dry or wet concrete)													
Temperature range I: 24 °C / 43 °C	$\tau_{Rk,ucr}$	[N/mm²]	14	14	14	13	13	12	11	11	11	11	11
Temperature range II: 43 °C / 60 °C	$\tau_{Rk,ucr}$	[N/mm²]	14	13	13	12	11	10	10	9	8,5	8	8
Temperature range III: 50 °C / 72 °C	$\tau_{Rk,ucr}$	[N/mm²]	9	9	9	9	9	9	8,5	8,5	8	8	7,5
Hammer-drilling with standard drill bit (water filled hole)													
Temperature range I: 24 °C / 43 °C	$\tau_{Rk,ucr}$	[N/mm²]	14	14	14	12	12	12	11	11	11	11	11
Temperature range II: 43 °C / 60 °C	$\tau_{Rk,ucr}$	[N/mm²]	11	11	10	9,5	9,5	9	8,5	8,5	8,5	7,5	7,5
Temperature range III: 50 °C / 72 °C	$\tau_{Rk,ucr}$	[N/mm²]	9	9	9	8,5	8	7,5	7	6,5	6,5	6	6
Installation factors													
Dry or wet concrete	γ_{inst}	[-]	1,2										
Water filled hole	γ_{inst}	[-]	1,4										
Cracked concrete													
Characteristic bond resistance in cracked concrete C20/25													
Hammer-drilling with standard drill bit (dry or wet concrete)													
Temperature range I: 24 °C / 43 °C	$\tau_{Rk,cr}$	[N/mm²]	7	7	7	6,5	6,5	6	6	5,5	5,5	5,5	5,5
Temperature range II: 43 °C / 60 °C	$\tau_{Rk,cr}$	[N/mm²]	6,5	6,5	6,5	6	6	6	5,5	5,5	5,5	5	5
Temperature range III: 50 °C / 72 °C	$\tau_{Rk,cr}$	[N/mm²]	6	6	6	6	5,5	5,5	5,5	5	5	5	4,5
Hammer-drilling with standard drill bit (water filled hole)													
Temperature range I: 24 °C / 43 °C	$\tau_{Rk,cr}$	[N/mm²]	7	7	7	7	6,5	6	6	5,5	5,5	5,5	5,5
Temperature range II: 43 °C / 60 °C	$\tau_{Rk,cr}$	[N/mm²]	5,5	5,5	5,5	5	5	4,5	4	4	4	4	3,5
Temperature range III: 50 °C / 72 °C	$\tau_{Rk,cr}$	[N/mm²]	5,5	5,5	5,5	5	5	4	4	4	4	4	3,5
Installation factors													
Dry or wet concrete	γ_{inst}	[-]	1,2										
Water filled hole	γ_{inst}	[-]	1,4										

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

Annex C 5

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

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

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Table C7.1: Displacements for anchor rods

Anchor rod		M8	M10	M12	M16	M20	M24	M27	M30
Displacement-Factors for tension loading[1)]									
Uncracked or cracked concrete; Temperature range I, II, III									
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,07	0,08	0,09	0,10	0,11	0,12	0,12	0,13
$\delta_{N\infty\text{-Factor}}$		0,11	0,12	0,13	0,15	0,16	0,18	0,18	0,19
Displacement-Factors for shear loading[2)]									
Uncracked or cracked concrete; Temperature range I, II, III									
$\delta_{V0\text{-Factor}}$	[mm/kN]	0,18	0,15	0,12	0,09	0,07	0,06	0,06	0,05
$\delta_{V\infty\text{-Factor}}$		0,27	0,22	0,18	0,14	0,11	0,09	0,08	0,07

[1)] Calculation of effective displacement:

$\delta_{N0} = \delta_{N0\text{-Factor}} \cdot \tau$

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

τ = acting bond strength under tension loading

[2)] Calculation of effective displacement:

$\delta_{V0} = \delta_{V0\text{-Factor}} \cdot V$

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

V = acting shear loading

Table C7.2: Displacements for reinforcing bars

Nominal diameter of the bar	ϕ	8	10	12	14	16	20	25	26	28	30	32
Displacement-Factors for tension loading[1)]												
Uncracked or cracked concrete; Temperature range I, II, III												
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,07	0,08	0,09	0,09	0,10	0,11	0,12	0,12	0,13	0,13	0,13
$\delta_{N\infty\text{-Factor}}$		0,11	0,12	0,13	0,14	0,15	0,16	0,18	0,18	0,19	0,19	0,20
Displacement-Factors for shear loading[2)]												
Uncracked or cracked concrete; Temperature range I, II, III												
$\delta_{V0\text{-Factor}}$	[mm/kN]	0,18	0,15	0,12	0,10	0,09	0,07	0,06	0,06	0,05	0,05	0,05
$\delta_{V\infty\text{-Factor}}$		0,27	0,22	0,18	0,16	0,14	0,11	0,09	0,08	0,08	0,07	0,07

[1)] Calculation of effective displacement:

$\delta_{N0} = \delta_{N0\text{-Factor}} \cdot \tau$

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

τ = acting bond strength under tension loading

[2)] Calculation of effective displacement:

$\delta_{V0} = \delta_{V0\text{-Factor}} \cdot V$

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

V = acting shear loading

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Performance
Displacements for anchor rods and reinforcing bars

Annex C 7

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Table C8.1: Displacements for fischer rebar anchors

fischer rebar anchor		M12	M16	M20	M24
Displacement-Factors for tension loading[1)]					
Uncracked or cracked concrete; Temperature range I, II, III					
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,09	0,10	0,11	0,12
$\delta_{N\infty\text{-Factor}}$		0,13	0,15	0,16	0,18
Displacement-Factors for shear loading[2)]					
Uncracked or cracked concrete; Temperature range I, II, III					
$\delta_{V0\text{-Factor}}$	[mm/kN]	0,12	0,09	0,07	0,06
$\delta_{V\infty\text{-Factor}}$		0,18	0,14	0,11	0,09

[1)] Calculation of effective displacement:

$\delta_{N0} = \delta_{N0\text{-Factor}} \cdot \tau$

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

τ = acting bond strength under tension loading

[2)] Calculation of effective displacement:

$\delta_{V0} = \delta_{V0\text{-Factor}} \cdot V$

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

V = acting shear loading

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Performance
Displacements for fischer rebar anchors

Annex C 8