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-02/0024 of 2 January 2020

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	Injection System fischer FIS V
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	34 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
This version replaces	ETA-02/0024 issued on 13 February 2017

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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 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)

Essential characteristic	Performance
Characteristic resistance for static and quasi-static tension load	See Annex C 1, C 2, C 5 to C 8
Characteristic resistance for static and quasi-static shear load	See Annex C 1 to C 4
Displacements for static and quasi-static loads	See Annex C 9 to C 10
Characteristic resistance for seismic performance categories C1 and C2	See Annex C 11 to C 14
Durability	See Annex B 2

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 according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

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

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

Issued in Berlin 2 January 2019 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

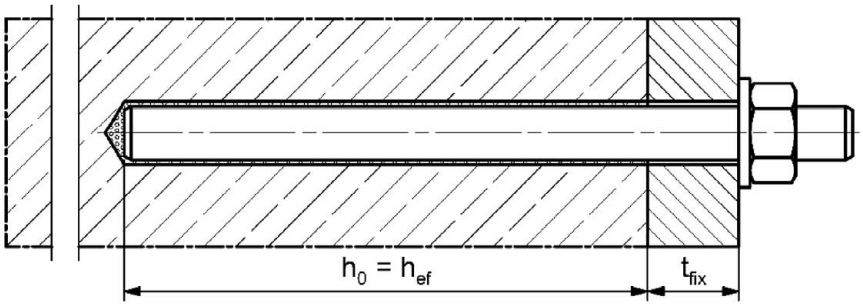
beglaubigt:
Lange

Deutsches Institut für Bautechnik DIBt

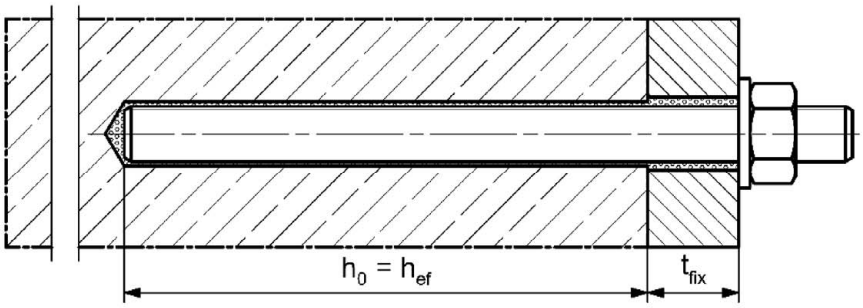
Installation conditions part 1

fischer anchor rod

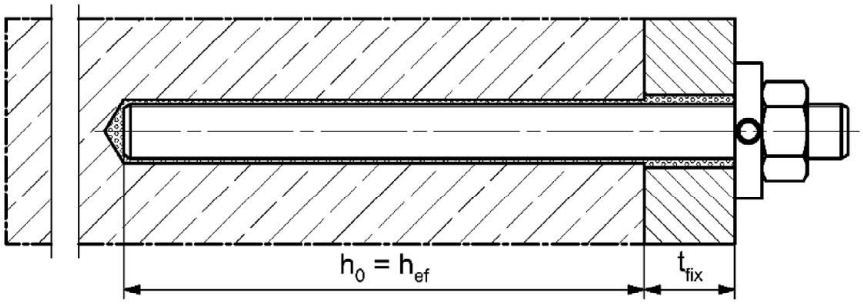
Pre-positioned installation



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 V

Product description
Installation conditions part 1

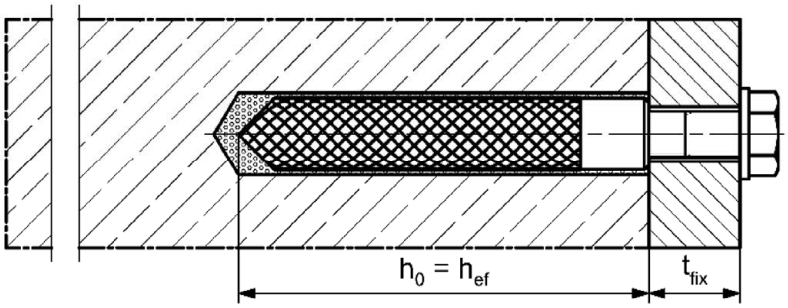
Annex A 1

Deutsches Institut für Bautechnik DIBt

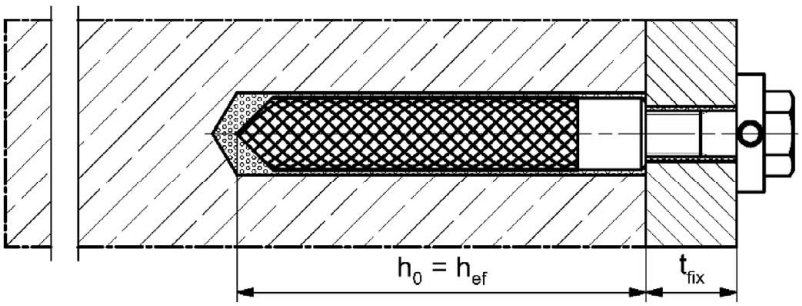
Installation conditions part 2

fischer internal threaded anchor RG MI

Pre-positioned installation



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



Figures not to scale

h_0 = drill hole depth
h_{ef} = effective embedment depth
t_{fix} = thickness of fixture

fischer injection system FIS V

Product description
Installation conditions part 2

Annex A 2

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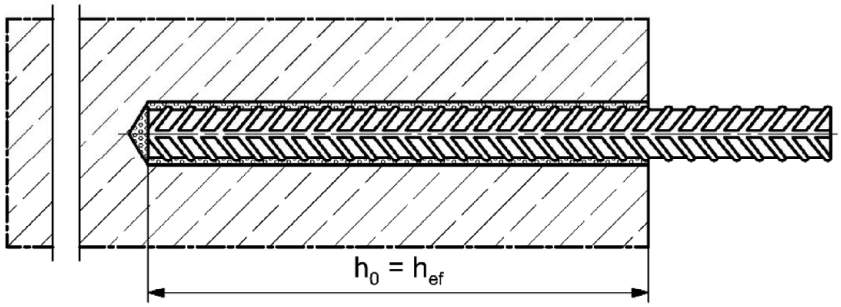
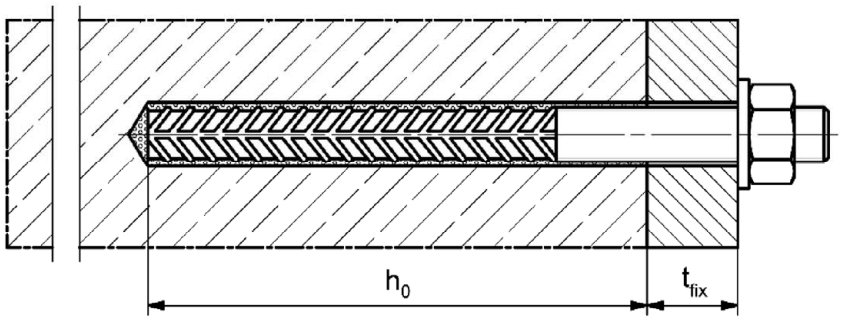
Installation conditions part 3

Reinforcing bar

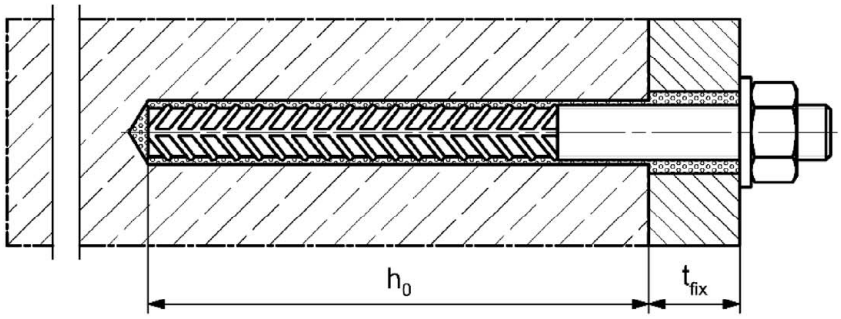


fischer rebar anchor FRA

Pre-positioned installation



Push through installation (annular gap filled with mortar)



Figures not to scale

h_0 = drill hole depth
h_{ef} = effective embedment depth
t_{fix} = thickness of fixture

fischer injection system FIS V

Product description
Installation conditions part 3

Annex A 3

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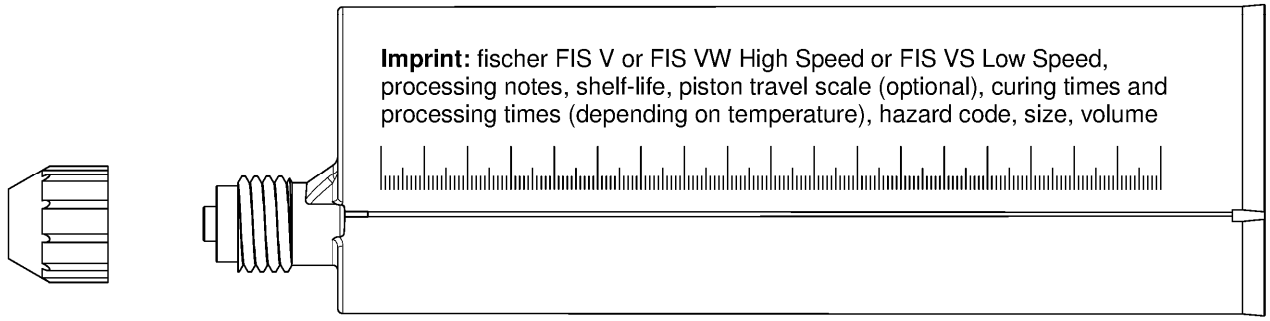
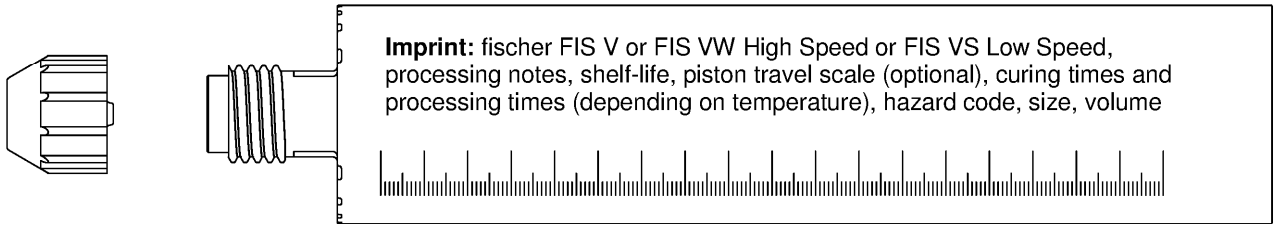
Overview system components part 1

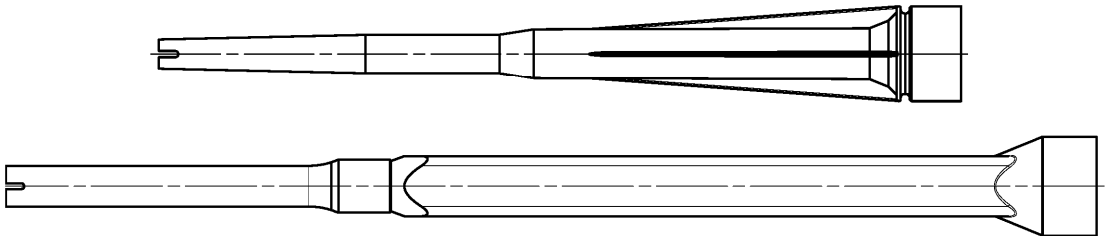
Injection cartridge (shuttle cartridge) with sealing cap; Sizes: 350 ml, 360 ml, 390 ml, 550 ml, 1100 ml, 1500 ml



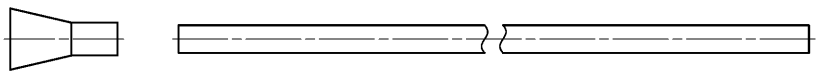
Injection cartridge (coaxial cartridge) with sealing cap; Sizes: 100 ml, 150 ml, 300 ml, 380 ml, 400 ml, 410 ml



Static mixer FIS MR Plus or UMR



Injection adapter and Extension tube for static mixer



Cleaning brush BS / BSB

Blow-out pump ABP

Figures not to scale

fischer injection system FIS V	**Annex A 4**
System description Overview system components part 1; cartridges / static mixer / accessories	

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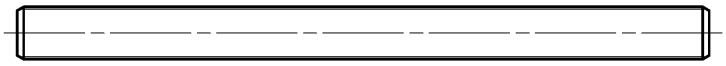
Overview system components part 2

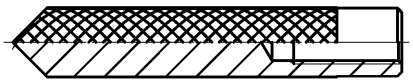
fischer anchor rod

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

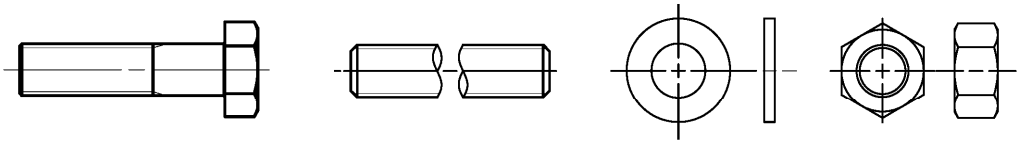


fischer internal threaded anchor RG MI

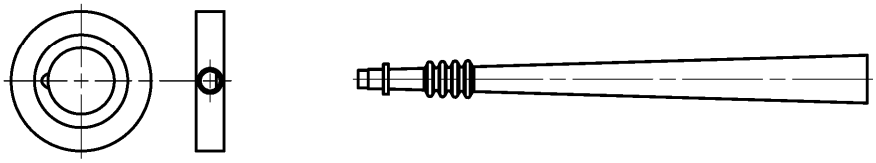
Size: M8, M10, M12, M16, M20



Screw / threaded rod / washer / hexagon nut



fischer filling disk FFD with injection adapter

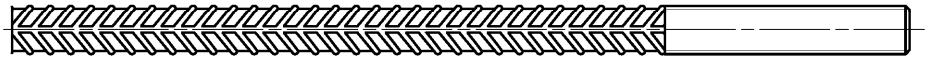


Reinforcing bar

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

fischer rebar anchor FRA

Size: M12, M16, M20, M24



Figures not to scale

fischer injection system FIS V	**Annex A 5**
System description Overview system components part 2; steel components	

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Table A6.1: Materials

Part	Designation	Material		
1	Injection cartridge	Mortar, hardener, filler		
	Steel grade	Steel, zinc plated	Stainless steel[1)]	High corrosion resistant steel C [2)]
2	Anchor rod	Property class 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5 µm, EN ISO 4042:1999 A2K or hot-dip galvanised ≥ 40 µm EN ISO 10684:2004 f_{uk} ≤ 1000 N/mm² 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} ≤ 1000 N/mm² A_5 > 12% fracture elongation	Property class 50 or 80 EN ISO 3506-1:2009 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 > 12% fracture elongation
		Fracture elongation A_5 > 8 %, for applications without requirements for seismic performance category C2		
3	Washer ISO 7089:2000	zinc plated ≥ 5 µm, EN ISO 4042:1999 A2K or hot-dip galvanised ≥ 40 µm EN ISO 10684:2004	1.4401; 1.4404; 1.4578;1.4571; 1.4439; 1.4362; EN 10088-1:2014	1.4565; 1.4529; EN 10088-1:2014
4	Hexagon nut	Property class 5 or 8; EN ISO 898-2:2012 zinc plated ≥ 5 µm, ISO 4042:1999 A2K or hot-dip galvanised ≥ 40 µm EN ISO 10684:2004	Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4565; 1.4529 EN 10088-1:2014
5	fischer internal threaded anchor RG MI	Property class 5.8 ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:1999 A2K	Property class 70 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	Property class 70 EN ISO 3506-1:2009 1.4565; 1.4529; EN 10088-1:2014
6	Commercial standard screw or anchor / threaded rod for fischer internal threaded anchor RG MI	Property class 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:1999 A2K A_5 > 8 % fracture elongation	Property class 70 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014[)] A_5 > 8 % fracture elongation	Property class 70 EN ISO 3506-1:2009 1.4565; 1.4529; EN 10088-1:2014 A_5 > 8 % fracture elongation
7	fischer filling disk FFD similar to DIN 6319-G	zinc plated ≥ 5 µm, EN ISO 4042:1999 A2K or hot-dip galvanised ≥ 40 µm EN ISO 10684:2004	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	1.4565;1.4529; EN 10088-1:2014
8	Reinforcing bar EN 1992-1-1:2004 and AC:2010, Annex C	Bars and de-coiled rods, class B or C with f_{yk} and k according to NDP or NCL of EN 1992-1-1:2004+AC:2010 $f_{uk} = f_{tk} = k \cdot f_{yk}$		
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 $f_{uk} = f_{tk} = k \cdot f_{yk}$	Threaded part: Property class 70 or 80 EN ISO 3506-1:2009 1.4401, 1.4404, 1.4571, 1.4578, 1.4439, 1.4362, 1.4062 EN 10088-1:2014 [1)] 1.4565; 1.4529 EN 10088-1:2014 [2)]	

[1)] acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4:2015
[2)] 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

Deutsches Institut für Bautechnik DIBt

Specifications of intended use (part 1)

Table B1.1: Overview use and performance categories

Anchorages 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")			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 C5.1 C9.1	all sizes	Tables: C2.1 C4.1 C6.1 C9.2	all sizes	Tables: C3.1 C4.1 C7.1 C10.1	all sizes	Tables: C3.2 C4.1 C8.1 C10.2
		cracked concrete	M8 to M30		-		ϕ 10 to ϕ 28			
Seismic performance category (only hammer drilling with standard / hollow drill bits)		C1[1)]	M10 to M30	Tables: C11.1 C12.1 C13.1	-		-		-	
		C2[1)]	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		-		-	
Installation direction			D3 (downward and horizontal and upwards (e.g. overhead) installation)							
Installation temperature			$T_{i,min}$ = -10 °C to $T_{i,max}$ = +40 °C							
In-service temperature		Temperature range I	-40 °C to +80 °C		(max. short term temperature +80 °C; max. long term temperature +50 °C)					
		Temperature range II	-40 °C to +120 °C		(max. short term temperature +120 °C; max. long term temperature +72 °C)					

[1)] Not for FIS VW High Speed and FIS VS Low Speed

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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 6.1.

Design:

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

Installation:

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

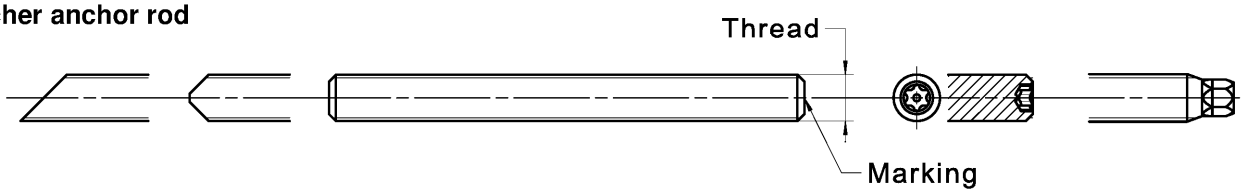
fischer injection system FIS V	**Annex B 2**
Intended use Specifications (part 2)	

Deutsches Institut für Bautechnik DIBt

Table B3.1: Installation parameters for anchor rods

Anchor rods		**Thread**	**M6**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Width across flats	SW		10	13	17	19	24	30	36	41	46
Nominal drill hole diameter	d_0		8	10	12	14	18	24	28	30	35
Drill hole depth	h_0		$h_0 = h_{ef}$								
Effective embedment depth	$h_{ef,\,min}$		50	60	60	70	80	90	96	108	120
	$h_{ef,\,max}$		72	160	200	240	320	400	480	540	600
Minimum spacing and minimum edge distance	s_{min} = c_{min}	[mm]	40	40	45	55	65	85	105	125	140
Diameter of the clearance hole of the fixture – pre-positioned installation	d_f		7	9	12	14	18	22	26	30	33
Diameter of the clearance hole of the fixture – push through installation	d_f		9	12	14	16	20	26	30	33	40
Minimum thickness of concrete member	h_{min}		h_{ef} + 30 (≥100)				h_{ef} + 2d_0				
Maximum torque moment for attachment of the fixture	max T_{fix}	[Nm]	5	10	20	40	60	120	150	200	300

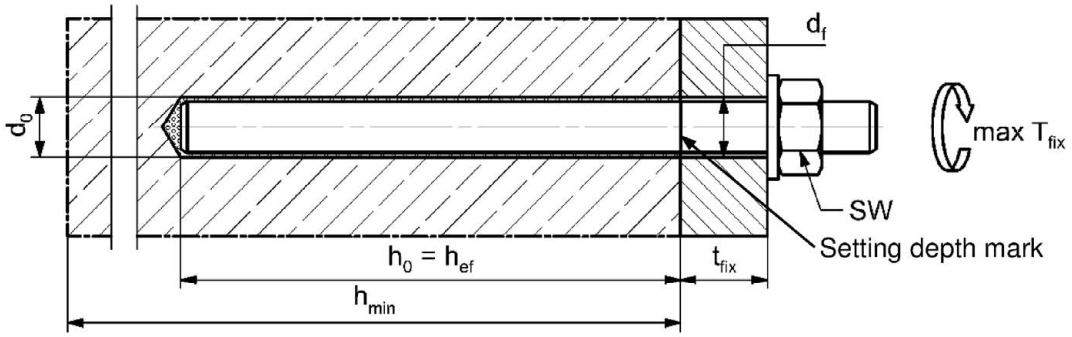
fischer anchor rod



Marking (on random place) fischer anchor rod:

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

Installation conditions:



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

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

Figures not to scale

fischer injection system FIS V

Intended use
Installation parameters anchor rods

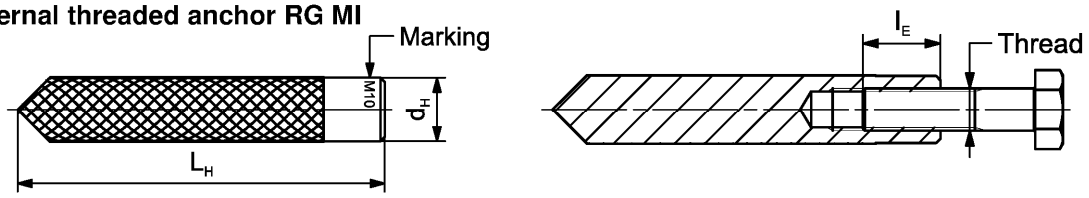
Annex B 3

Deutsches Institut für Bautechnik DIBt

Table B4.1: Installation parameters plus minimum spacing and minimum edge distance for fischer internal threaded anchors RG MI

Internal threaded anchors RG MI		**Thread**	**M8**	**M10**	**M12**	**M16**	**M20**
Diameter of anchor	$d_{nom} = d_H$		12	16	18	22	28
Nominal drill hole diameter	d_0		14	18	20	24	32
Drill hole depth	h_0		$h_0 = h_{ef} = L_H$				
Effective embedment depth ($h_{ef} = L_H$)	h_{ef}		90	90	125	160	200
Minimum spacing and minimum edge distance	s_{min} = c_{min}	[mm]	55	65	75	95	125
Diameter of clearance hole in the fixture	d_f		9	12	14	18	22
Minimum thickness of concrete member	h_{min}		120	125	165	205	260
Maximum screw-in depth	$l_{E,max}$		18	23	26	35	45
Minimum screw-in depth	$l_{E,min}$		8	10	12	16	20
Maximum torque moment for attachment of the fixture	max T_{fix}	[Nm]	10	20	40	80	120

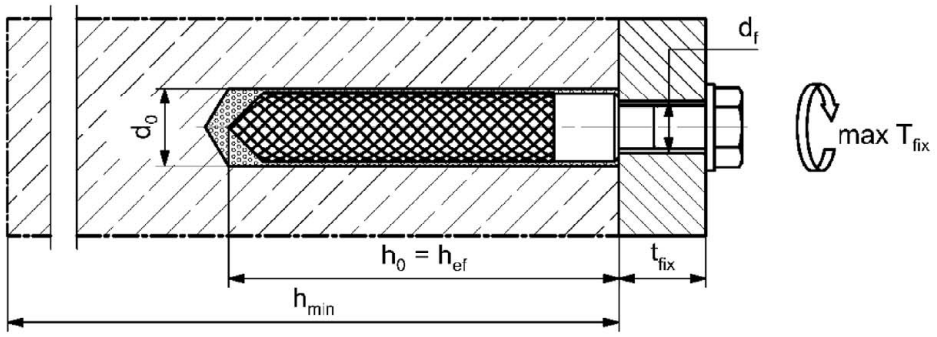
fischer internal threaded anchor RG MI



Marking: Anchor size e. g.: **M10**
Stainless steel → additional **A4**; e.g.: **M10 A4**
High corrosion resistant steel → additional C; e.g.: **M10 C**

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

Installation conditions:



Figures not to scale

fischer injection system FIS 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

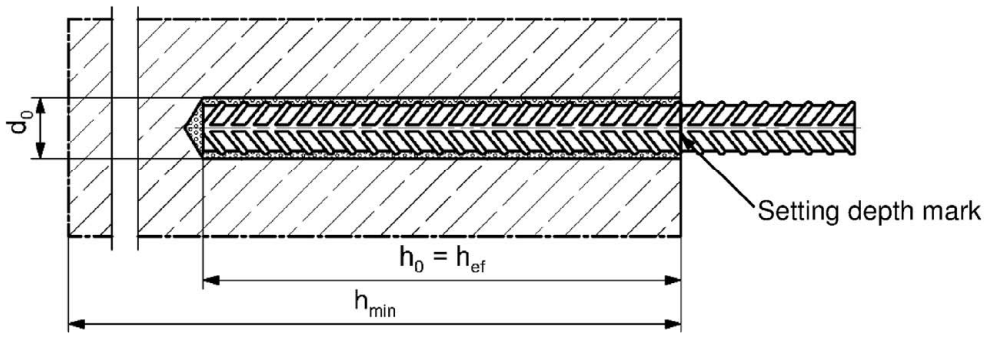
Nominal diameter of the bar		**ϕ**	**8**[1]		**10**[1]		**12**[1]		**14**	**16**	**20**	**25**	**28**
Nominal drill hole diameter	d_0	[mm]	10	12	12	14	14	16	18	20	25	30	35
Drill hole depth	h_0		$h_0 = h_{ef}$										
Effective embedment depth	$h_{ef,min}$		60		60		70		75	80	90	100	112
	$h_{ef,max}$		160		200		240		280	320	400	500	560
Minimum thickness of concrete member	h_{min}		$h_{ef} + 30$ (≥ 100)						$h_{ef} + 2d_0$				

[1] 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: $0{,}05 \cdot \phi \leq h_{rib} \leq 0{,}07 \cdot \phi$
  (ϕ = Nominal diameter of the bar, h_{rib} = rib height)

Installation conditions:



Figures not to scale

fischer injection system FIS V

Intended use
Installation parameters reinforcing bars

Annex B 5

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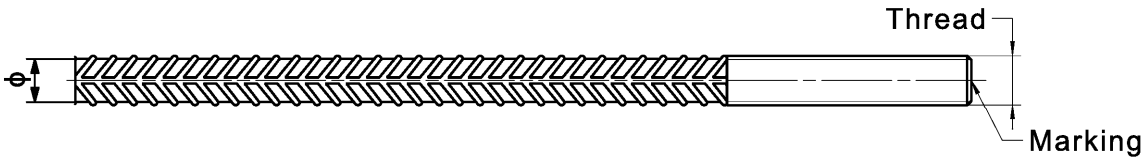
Table B6.1: Installation parameters plus minimum spacing and minimum edge distance for fischer rebar anchor FRA

Rebar anchor FRA		**Thread**	**M12**[1]		**M16**	**M20**	**M24**
Nominal diameter of the bar	ϕ		12		16	20	25
Width across flats	SW		19		24	30	36
Nominal drill hole diameter	d_0		14	16	20	25	30
Drill hole depth	h_0		$h_{ef} + l_e$				
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	[mm]	100				
Minimum spacing and minimum edge distance	s_{min} = c_{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_{min}		$h_0 + 30$ (≥ 100)		$h_0 + 2d_0$		
Maximum torque moment for attachment of the fixture	max T_{fix}	[Nm]	40		60	120	150

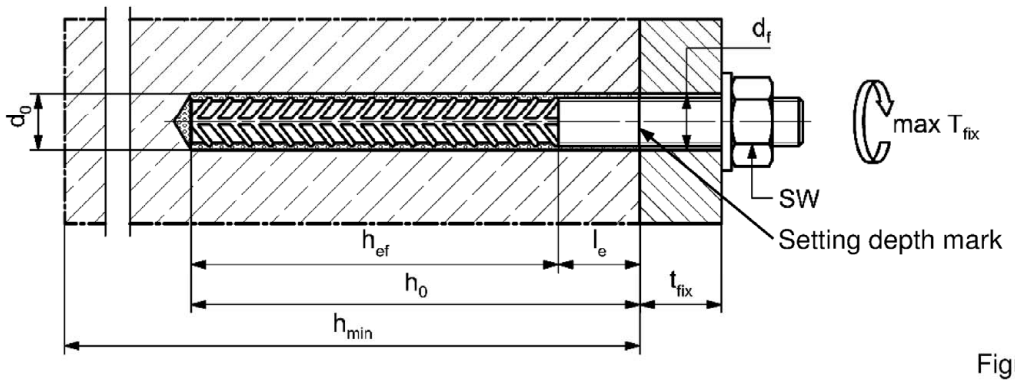
[1] Both drill hole diameters can be used

fischer rebar anchor FRA



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

Installation conditions:



Figures not to scale

fischer injection system FIS V

Intended use
Installation parameters rebar anchor FRA

Annex B 6

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Table B7.1: Parameters of the cleaning brush BS / BSB (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	

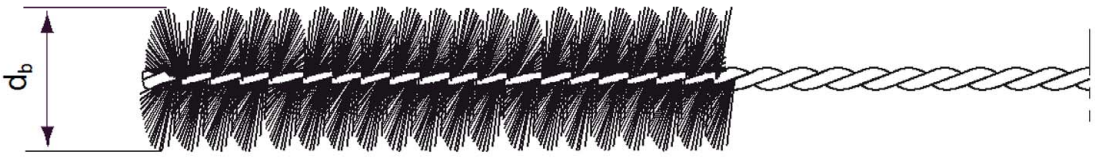


Table B7.2 Maximum processing time of the mortar and minimum curing time (During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature)

Temperature at anchoring base [°C]	Maximum processing time t_{work}			Minimum curing time [1] 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 [2]	-	-	-	12 h	-	-
-5 to -0 [2]	5 min	-	-	3 h	24 h	-
±0 to +5 [2]	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

[1] In wet concrete or water filled holes the curing times must be doubled
[2] Minimal cartridge temperature +5°C

fischer injection system FIS V

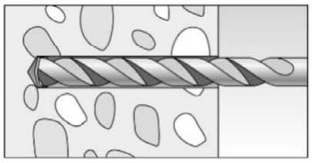
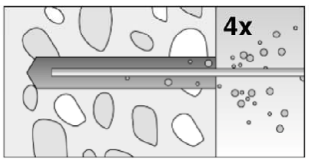
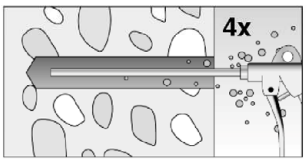
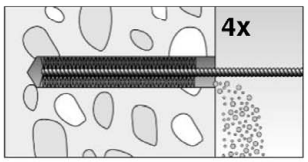
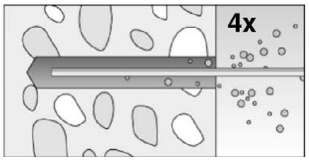
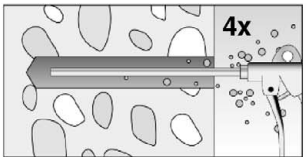
Intended use
Cleaning brush (steel brush)
Processing time and curing time

Annex B 7

Deutsches Institut für Bautechnik DIBt

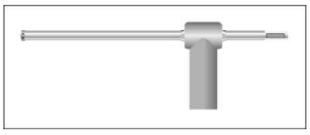
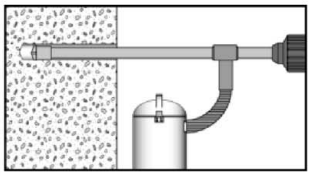
Installation instructions part 1

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

Go to step 5

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

1		Check a suitable hollow drill (see **table B1.1**) 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 $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see **tables B3.1, B4.1, B5.1, B6.1**

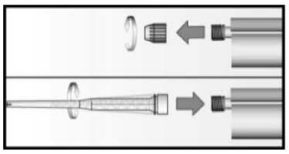
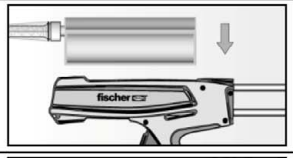
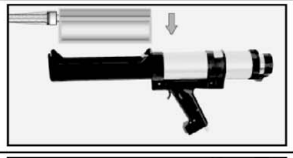
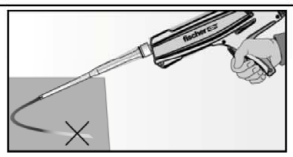
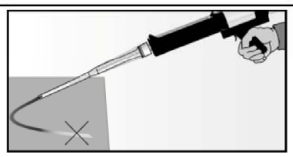
Go to step 5

fischer injection system FIS V	**Annex B 8**
Intended use Installation instructions part 1	

Deutsches Institut für Bautechnik DIBt

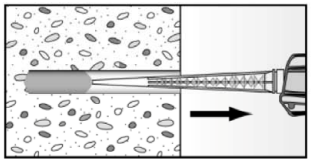
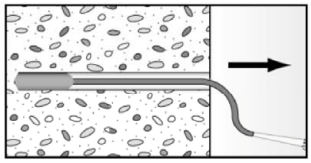
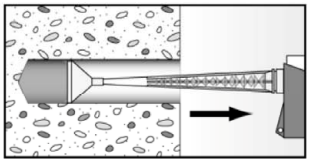
Installation instructions part 2

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 ≥ 150 mm use an extension tube	 For overhead installation, deep holes (h_0 > 250 mm) or drill hole diameter (d_0 ≥ 40 mm) use an injection adapter

Go to step 9

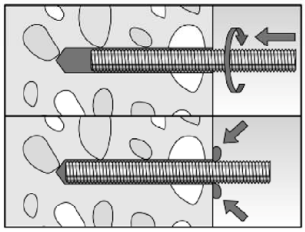
fischer injection system FIS V	**Annex B 9**
Intended use Installation instructions part 2	

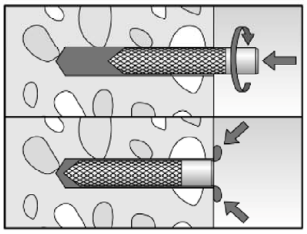
Deutsches Institut für Bautechnik DIBt

Installation instructions part 3

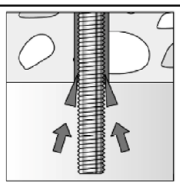
Installation of anchor rods or fischer internal threaded anchors RG MI

9

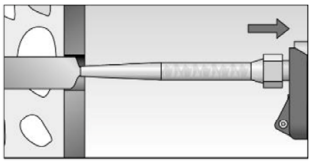




Only use clean and oil-free anchor elements. Mark the setting depth of the anchor. Push the anchor rod or fischer internal threaded RG MI anchor down to the bottom of the hole, turning it slightly while doing so.
After inserting the anchor element, excess mortar must be emerged around the anchor element.



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

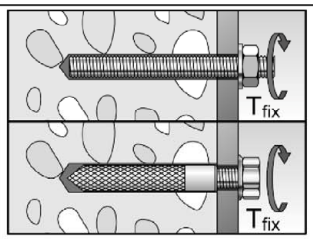


For push through installation fill the annular gap with mortar

10

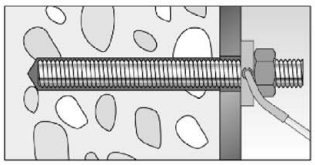
Wait for the specified curing time t_{cure}
see **table B7.2**

11



Mounting the fixture
max T_{fix} see **tables B3.1 and B4.1**

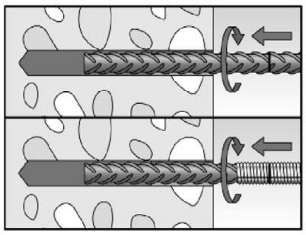
Option



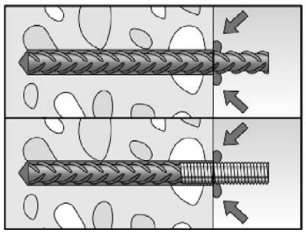
After the minimum curing time is reached, the gap between anchor and fixture (annular clearance) may be filled with mortar via the fischer filling disc FFD. Compressive strength ≥ 50 N/mm² (e.g. fischer injection mortars FIS HB, FIS SB, FIS V, FIS EM Plus). ATTENTION: Using fischer filling disk FFD reduces t_{fix} (usable length of the anchor)

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

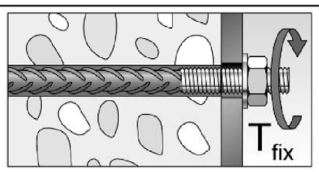


When the setting depth mark is reached, excess mortar must be emerged from the mouth of the drill hole.

10

Wait for the specified curing time t_{cure} see **table B7.2**

11



Mounting the fixture
max T_{fix}
see **table B6.1**

fischer injection system FIS V

Intended use
Installation instructions part 3

Annex B 10

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

Anchor rod / standard threaded rod				**M6**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Bearing capacity under tensile load, steel failure												
Characteristic resistance $N_{Rk,s}$	Steel zinc plated	Property class	5.8	[kN]	10	19(17)	29(27)	43	79	123	177	230	281
			8.8		16	29(27)	47(43)	68	126	196	282	368	449
	Stainless steel A4 and high corrosion resistant steel C		50		10	19	29	43	79	123	177	230	281
			70		14	26	41	59	110	172	247	322	393
			80		16	30	47	68	126	196	282	368	449
Partial factors [1]													
Partial factor $\gamma_{Ms,N}$	Steel zinc plated	Property class	5.8	[-]	1,50								
			8.8		1,50								
	Stainless steel A4 and high corrosion resistant steel C		50		2,86								
			70		1,50[2] / 1,87								
			80		1,60								
Bearing capacity under shear load, steel failure													
without lever arm													
Characteristic resistance $V^0_{Rk,s}$	Steel zinc plated	Property class	5.8	[kN]	5	9(8)	15(13)	21	39	61	89	115	141
			8.8		8	15(13)	23(21)	34	63	98	141	184	225
	Stainless steel A4 and high corrosion resistant steel C		50		5	9	15	21	39	61	89	115	141
			70		7	13	20	30	55	86	124	161	197
			80		8	15	23	34	63	98	141	184	225
Ductility factor			k_7	[-]	1,0								
with lever arm													
Charact. resistance $M^0_{Rk,s}$	Steel zinc plated	Property class	5.8	[Nm]	7	19(16)	37(33)	65	166	324	560	833	1123
			8.8		12	30(26)	60(53)	105	266	519	896	1333	1797
	Stainless steel A4 and high corrosion resistant steel C		50		7	19	37	65	166	324	560	833	1123
			70		10	26	52	92	232	454	784	1167	1573
			80		12	30	60	105	266	519	896	1333	1797
Partial factors [1]													
Partial factor $\gamma_{Ms,V}$	Steel zinc plated	Property class	5.8	[-]	1,25								
			8.8		1,25								
	Stainless steel A4 and high corrosion resistant steel C		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 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

Performance
Essential characteristics for the steel bearing capacity of fischer anchor rods and standard threaded rods

Annex C 1

Deutsches Institut für Bautechnik DIBt

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

fischer internal threaded anchors RG MI					**M8**	**M10**	**M12**	**M16**	**M20**
Bearing capacity under tensile load, steel failure									
Charact. resistance with screw	$N_{Rk,s}$	Property class	5.8	[kN]	19	29	43	79	123
			8.8		29	47	68	108	179
		Property class 70	A4		26	41	59	110	172
			C		26	41	59	110	172
Partial factors[1)]									
Partial factors	$\gamma_{Ms,N}$	Property class	5.8	[-]	1,50				
			8.8		1,50				
		Property class 70	A4		1,87				
			C		1,87				
Bearing capacity under shear load, steel failure									
Without lever arm									
Charact. resistance with screw	$V^0_{Rk,s}$	Property class	5.8	[kN]	9,2	14,5	21,1	39,2	62,0
			8.8		14,6	23,2	33,7	54,0	90,0
		Property class 70	A4		12,8	20,3	29,5	54,8	86,0
			C		12,8	20,3	29,5	54,8	86,0
Ductility factor			k_7	[-]	1,0				
With lever arm									
Charact. resistance with screw	$M^0_{Rk,s}$	Property class	5.8	[Nm]	20	39	68	173	337
			8.8		30	60	105	266	519
		Property class 70	A4		26	52	92	232	454
			C		26	52	92	232	454
Partial factors[1)]									
Partial factors	$\gamma_{Ms,V}$	Property class	5.8	[-]	1,25				
			8.8		1,25				
		Property class 70	A4		1,56				
			C		1,56				

[1)] In absence of other national regulations

fischer injection system FIS V

Performance
Essential characteristics for the steel bearing capacity of fischer internal threaded anchor RG MI

Annex C 2

Deutsches Institut für Bautechnik DIBt

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

Nominal diameter of the bar		**ϕ**	**8**	**10**	**12**	**14**	**16**	**20**	**25**	**28**
Bearing capacity under tensile load, steel failure										
Characterstic resistance	$N_{Rk,s}$	[kN]	$A_s \cdot f_{uk}$ [1)]							
Bearing capacity under shear load, steel failure										
Without lever arm										
Characterstic resistance	$V^0_{Rk,s}$	[kN]	$0,5 \cdot A_s \cdot f_{uk}$ [1)]							
Ductility factor	k_7	[-]	1,0							
With lever arm										
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	$1,2 \cdot W_{el} \cdot f_{uk}$ [1)]							

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

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

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

[1)] In absence of other national regulations

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

Size				**All sizes**								
Tensile load												
Uncracked concrete	$k_{ucr,N}$	[-]		11,0								
Cracked concrete	$k_{cr,N}$	[-]		7,7								
Factors for the compressive strength of concrete > C20/25												
Increasing factor for τ_{Rk}	C25/30	Ψ_c	[-]	1,05								
	C30/37			1,10								
	C35/45			1,15								
	C40/50			1,19								
	C45/55			1,22								
	C50/60			1,26								
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												
Edge distance		$c_{cr,N}$	[mm]	$1,5\ h_{ef}$								
Spacing		$s_{cr,N}$		$2\ c_{cr,N}$								
Factors for sustained tension load												
Temperature range			[-]	50 °C / 80 °C					72 °C / 120 °C			
Factor		Ψ^0_{sus}	[-]	0,74					0,87			
Shear load												
Installation factor		γ_{inst}	[-]	1,0								
Concrete pry-out failure												
Factor for pry-out failure		k_8	[-]	2,0								
Concrete edge failure												
The value of h_{ef} ($=l_f$) under shear load			[-]	Conditions according to 1992-4:2018: chapter 7.2.2.5; Section 6; formular 7.43								
Calculation diameters												
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}		-	12	16	18	22	28	-	-	-
fischer rebar anchor FRA		d_{nom}		-	-	-	12	16	20	25	-	-
Size (nominal diameter of the bar)			ϕ	8	10	12	14	16	20	25	28	
Reinforcing bar		d_{nom}	[mm]	8	10	12	14	16	20	25	28	

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Performance
Essential characteristics under tensile / shear load

Annex C 4

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

Anchor rod / standard threaded rod				**M6**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Combined pullout and concrete cone failure												
Calculation diameter		d	[mm]	6	8	10	12	16	20	24	27	30
Uncracked concrete												
Characteristic bond resistance in uncracked concrete C20/25												
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)												
Temperature range	I: 50 °C / 80 °C	$\tau_{Rk,ucr}$	[N/mm²]	9,0	11,0	11,0	11,0	10,0	9,5	9,0	8,5	8,5
	II: 72 °C / 120 °C			6,5	9,5	9,5	9,0	8,5	8,0	7,5	7,0	7,0
Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)[1]												
Temperature range	I: 50 °C / 80 °C	$\tau_{Rk,ucr}$	[N/mm²]	-	-	-	9,5	8,5	8,0	7,5	7,0	7,0
	II: 72 °C / 120 °C			-	-	-	7,5	7,0	6,5	6,0	6,0	6,0
Installation factors												
Dry or wet concrete		γ_{inst}	[-]	1,0								
Water filled hole				-			1,2 [1]					
Cracked concrete												
Characteristic bond resistance in cracked concrete C20/25												
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)												
Temperature range	I: 50 °C / 80 °C	$\tau_{Rk,cr}$	[N/mm²]	-	5,5	6,0	6,0	6,0	5,5	4,5	4,0	4,0
	II: 72 °C / 120 °C			-	4,5	5,0	6,0	6,0	5,0	4,0	3,5	3,5
Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)[1]												
Temperature range	I: 50 °C / 80 °C	$\tau_{Rk,cr}$	[N/mm²]	-	-	-	5,0	5,0	4,5	4,0	3,5	3,5
	II: 72 °C / 120 °C			-	-	-	4,0	4,0	4,0	3,5	3,0	3,0
Installation factors												
Dry or wet concrete		γ_{inst}	[-]	1,0								
Water filled hole				-			1,2 [1]					

[1] Only with coaxial cartridges: 380ml, 400 ml, 410 ml

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Performance
Essential characteristics of tensile resistance for fischer anchor rod and standard threaded rods

Annex C 5

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Table C6.1: Essential characteristics of **tensile resistance** for **fischer internal threaded anchors RG MI** in hammer drilled holes; **uncracked concrete**

Internal threaded anchor RG MI				**M8**	**M10**	**M12**	**M16**	**M20**
Combined pullout and concrete cone failure								
Calculation diameter		d	[mm]	12	16	18	22	28
Uncracked concrete								
Characteristic bond resistance in uncracked concrete C20/25								
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)								
Temperature range	I: 50 °C / 80 °C	$\tau_{Rk,ucr}$	[N/mm²]	10,5	10,0	9,5	9,0	8,5
	II: 72 °C / 120 °C			9,0	8,0	8,0	7,5	7,0
Hammer-drilling with standard drill bit or hollow drill bit (water filled hole)[1]								
Temperature range	I: 50 °C / 80 °C	$\tau_{Rk,ucr}$	[N/mm²]	10,0	9,0	9,0	8,5	8,0
	II: 72 °C / 120 °C			7,5	6,5	6,5	6,0	6,0
Installation factors								
Dry or wet concrete		γ_{inst}	[-]	1,0				
Water filled hole				1,2[1]				

[1] Only with coaxial cartridges: 380 ml, 400 ml, 410 ml

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Table C7.1: Essential characteristics of **tensile resistance** for **reinforcing bars** in hammer drilled holes; **uncracked or cracked concrete**

Nominal diameter of the bar		**ϕ**	**8**	**10**	**12**	**14**	**16**	**20**	**25**	**28**
Combined pullout and concrete cone failure										
Calculation diameter	d	[mm]	8	10	12	14	16	20	25	28
Uncracked concrete										
Characteristic bond resistance in uncracked concrete C20/25										
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)										
Temperature range I: 50 °C / 80 °C	$\tau_{Rk,ucr}$	[N/mm²]	11,0	11,0	11,0	10,0	10,0	9,5	9,0	8,5
Temperature range II: 72 °C / 120 °C	$\tau_{Rk,ucr}$	[N/mm²]	9,5	9,5	9,0	8,5	8,5	8,0	7,5	7,0
Installation factor										
Dry or wet concrete	γ_{inst}	[-]	1,0							
Cracked concrete										
Characteristic bond resistance in cracked concrete C20/25										
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)										
Temperature range I: 50 °C / 80 °C	$\tau_{Rk,cr}$	[N/mm²]	-	3,0	5,0	5,0	5,0	4,5	4,0	4,0
Temperature range II: 72 °C / 120 °C	$\tau_{Rk,cr}$	[N/mm²]	-	3,0	4,5	4,5	4,5	4,0	3,5	3,5
Installation factor										
Dry or wet concrete	γ_{inst}	[-]	1,0							

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Table C8.1: Essential characteristics of **tensile resistance** for **fischer rebar anchors FRA** in hammer drilled holes; **uncracked or cracked concrete**

fischer rebar anchor FRA				**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 or hollow drill bit (dry or wet concrete)							
Temperature range	I: 50 °C / 80 °C	$\tau_{Rk,ucr}$	[N/mm²]	11,0	10,0	9,5	9,5
	II: 72 °C / 120 °C			9,0	8,5	8,0	7,5
Installation factors							
Dry or wet concrete		γ_{inst}	[-]	1,0			
Cracked concrete							
Characteristic bond resistance in cracked concrete C20/25							
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)							
Temperature range	I: 50 °C / 80 °C	$\tau_{Rk,ucr}$	[N/mm²]	5,0	5,0	4,5	4,0
	II: 72 °C / 120 °C			4,5	4,5	4,0	3,5
Installation factors							
Dry or wet concrete		γ_{inst}	[-]	1,0			

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Table C9.1: Displacements for anchor rods

Anchor rod		M6	M8	M10	M12	M16	M20	M24	M27	M30
Displacement-Factors for tensile load[1)]										
Uncracked concrete; Temperature range I, II										
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,09	0,09	0,09	0,10	0,10	0,10	0,10	0,11	0,12
$\delta_{N\infty\text{-Factor}}$		0,10	0,10	0,10	0,12	0,12	0,12	0,13	0,13	0,14
Cracked concrete; Temperature range I, II										
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	-	0,12	0,12	0,12	0,13	0,13	0,13	0,14	0,15
$\delta_{N0\text{-Factor}}$		-	0,25	0,27	0,30	0,30	0,30	0,35	0,35	0,40
Displacement-Factors for shear load[2)]										
Uncracked or cracked concrete; Temperature range I, II										
$\delta_{V0\text{-Factor}}$	[mm/kN]	0,11	0,11	0,11	0,10	0,10	0,09	0,09	0,08	0,07
$\delta_{V\infty\text{-Factor}}$		0,12	0,12	0,12	0,11	0,11	0,10	0,10	0,09	0,09

1) Calculation of effective displacement:

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

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

(τ_{Ed}: Design value of the applied tensile stress)

2) Calculation of effective displacement:

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

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

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

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

Internal threaded anchor RG MI		M8	M10	M12	M16	M20
Displacement-Factors for tensile load[1)]						
Uncracked concrete; Temperature range I, II						
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,10	0,11	0,12	0,13	0,14
$\delta_{N\infty\text{-Factor}}$		0,13	0,14	0,15	0,16	0,18
Displacement-Factors for shear load[2)]						
Uncracked concrete; Temperature range I, II						
$\delta_{V0\text{-Factor}}$	[mm/kN]	0,12	0,12	0,12	0,12	0,12
$\delta_{V\infty\text{-Factor}}$		0,14	0,14	0,14	0,14	0,14

1) Calculation of effective displacement:

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

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

(τ_{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)

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Performance
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	ϕ	8	10	12	14	16	20	25	28
Displacement-Factors for tensile load[1)]									
Uncracked concrete; Temperature range I, II									
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,09	0,09	0,10	0,10	0,10	0,10	0,10	0,11
$\delta_{N\infty\text{-Factor}}$		0,10	0,10	0,12	0,12	0,12	0,12	0,13	0,13
Cracked concrete; Temperature range I, II									
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	-	0,12	0,13	0,13	0,13	0,13	0,13	0,14
$\delta_{N\infty\text{-Factor}}$		-	0,27	0,30	0,30	0,30	0,30	0,35	0,37
Displacement-Factors for shear load[2)]									
Uncracked or cracked concrete; Temperature range I, II									
$\delta_{V0\text{-Factor}}$	[mm/kN]	0,11	0,11	0,10	0,10	0,10	0,09	0,09	0,08
$\delta_{V\infty\text{-Factor}}$		0,12	0,12	0,11	0,11	0,11	0,10	0,10	0,09

1) Calculation of effective displacement:

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

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

(τ_{Ed}: Design value of the applied tensile stress)

2) Calculation of effective displacement:

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

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

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

Table C10.2: Displacements for fischer rebar anchors FRA

fischer rebar anchor FRA		M12	M16	M20	M24
Displacement-Factors for tensile load[1)]					
Uncracked concrete; Temperature range I, II					
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,10	0,10	0,10	0,10
$\delta_{N\infty\text{-Factor}}$		0,12	0,12	0,12	0,13
Cracked concrete; Temperature range I, II					
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,12	0,13	0,13	0,13
$\delta_{N\infty\text{-Factor}}$		0,30	0,30	0,30	0,35
Displacement-Factors for shear load[2)]					
Uncracked or cracked concrete; Temperature range I, II					
$\delta_{V0\text{-Factor}}$	[mm/kN]	0,10	0,10	0,09	0,09
$\delta_{V\infty\text{-Factor}}$		0,11	0,11	0,10	0,10

1) Calculation of effective displacement:

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

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

(τ_{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)

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Performance
Displacements for reinforcing bars and fischer rebar anchors FRA

Annex C 10

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Table C11.1: Essential characteristics[2] for the **steel bearing capacity** under tensile / shear load of **fischer anchor rods** and **standard threaded rods** under seismic action performance category **C1 or C2**

Anchor rod / standard threaded rod				M10	M12	M16	M20	M24	M27	M30
Bearing capacity under tensile load, steel failure[1]										
fischer anchor rods and standard threaded rods, performance category C1										
Characteristic resistance $N_{Rk,s,eq,C1}$	Steel zinc plated	Property class	5.8	29(27)	43	79	123	177	230	281
			8.8	47(43)	68	126	196	282	368	449
	Stainless steel A4 and high corrosion resistant steel C		50	29	43	79	123	177	230	281
			70	41	59	110	172	247	322	393
			80	47	68	126	196	282	368	449
		[kN]								
fischer anchor rods and standard threaded rods, performance category C2										
Characteristic resistance $N_{Rk,s,eq,C2}$	Steel zinc plated	Property class	5.8	-	39	72	108	-	-	-
			8.8	-	61	116	173	-	-	-
	Stainless steel A4 and high corrosion resistant steel C		50	-	39	72	108	-	-	-
			70	-	53	101	152	-	-	-
			80	-	61	116	173	-	-	-
		[kN]								
Bearing capacity under shear load, steel failure without lever arm[1]										
fischer anchor rods, performance category C1										
Characteristic resistance $V^0_{Rk,s,eq,C1}$	Steel zinc plated	Property class	5.8	15(13)	21	39	61	89	115	141
			8.8	23(21)	34	63	98	141	184	225
	Stainless steel A4 and high corrosion resistant steel C		50	15	21	39	61	89	115	141
			70	20	30	55	86	124	161	197
			80	23	34	63	98	141	184	225
		[kN]								
Standard threaded rods, performance category C1										
Characteristic resistance $V^0_{Rk,s,eq,C1}$	Steel zinc plated	Property class	5.8	11(9)	15	27	43	62	81	99
			8.8	16(14)	24	44	69	99	129	158
	Stainless steel A4 and high corrosion resistant steel C		50	11	15	27	43	62	81	99
			70	14	21	39	60	87	113	138
			80	16	24	44	69	99	129	158
		[kN]								
fischer anchor rods and standard threaded rods, performance category C2										
Characteristic resistance $V^0_{Rk,s,eq,C2}$	Steel zinc plated	Property class	5.8	-	14	27	43	-	-	-
			8.8	-	22	44	69	-	-	-
	Stainless steel A4 and high corrosion resistant steel C		50	-	14	27	43	-	-	-
			70	-	20	39	60	-	-	-
			80	-	22	44	69	-	-	-
		[kN]								

[1] 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 1,0

[2] 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.

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Performance
Essential characteristics for the steel bearing capacity 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
Tensile load, steel failure[1)]										
Partial factor $\gamma_{Ms,N}$	Steel zinc plated	Property class	5.8	[-]	1,50					
			8.8		1,50					
	Stainless steel A4 and high corrosion resistant steel C		50		2,86					
			70		1,50[2)] / 1,87					
			80		1,60					
Shear load, steel failure[1)]										
Partial factor $\gamma_{Ms,V}$	Steel zinc plated	Property class	5.8	[-]	1,25					
			8.8		1,25					
	Stainless steel A4 and high corrosion resistant steel C		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)

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Performance
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: Essential characteristics of **resistance** 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**
Characteristic bond resistance, combined pullout and concrete cone failure									
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)									
Temperature range	I: 50 °C / 80 °C	$\tau_{Rk,eq,C1}$ [N/mm²]	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
Hammer-drilling with standard drill bit or hollow drill bit (water filled hole [1])									
Temperature range	I: 50 °C / 80 °C	$\tau_{Rk,eq,C1}$ [N/mm²]	-	5,0	5,0	4,5	4,0	3,5	3,5
	II: 72 °C / 120 °C		-	4,0	4,0	4,0	3,5	3,0	3,0

[1] Only with coaxial cartridges: 380ml, 400 ml, 410 ml

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Table C14.1: Essential characteristics of **resistance** 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**
Characteristic bond resistance, combined pullout and concrete cone failure					
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)					
Temperature range	I: 50 °C / 80 °C	$\tau_{Rk,eq,C2}$ [N/mm²]	1,5	1,3	2,1
	II: 72 °C / 120 °C		1,3	1,2	1,9
Hammer-drilling with standard drill bit or hollow drill bit (water filled hole [3])					
Temperature range	I: 50 °C / 80 °C	$\tau_{Rk,eq,C2}$ [N/mm²]	1,3	1,1	1,8
	II: 72 °C / 120 °C		1,1	1,0	1,6
Displacement-Factors for tensile load[1]					
$\delta_{N,(DLS)}$-Factor		[mm/(N/mm²)]	0,20	0,13	0,21
$\delta_{N,(ULS)}$-Factor			0,38	0,18	0,24
Displacement-Factors for shear load[2]					
$\delta_{V,(DLS)}$-Factor		[mm/kN]	0,18	0,10	0,07
$\delta_{V,(ULS)}$-Factor			0,25	0,14	0,11

[1] Calculation of effective displacement:

$\delta_{N,(DLS)} = \delta_{N,(DLS)\text{-Factor}} \cdot \tau_{Ed}$

$\delta_{N,(ULS)} = \delta_{N,(ULS)\text{-Factor}} \cdot \tau_{Ed}$

(τ_{Ed}: Design value of the applied tensile stress)

[2] Calculation of effective displacement:

$\delta_{V,(DLS)} = \delta_{V,(DLS)\text{-Factor}} \cdot V_{Ed}$

$\delta_{V,(ULS)} = \delta_{V,(ULS)\text{-Factor}} \cdot V_{Ed}$

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

[3] Only with coaxial cartridges: 380ml, 400 ml, 410 ml