

DECLARATION OF PERFORMANCE



DoP: 0157

for fischer injection system FIS EM Plus (Bonded anchor for use in concrete) - EN

1. Unique identification code of the product-type: DoP: 0157

2. Intended use/es: Post-installed fastening in cracked or uncracked concrete, see appendix, especially Annexes B 1 to B 13

3. Manufacturer: fischerwerke GmbH & Co. KG, Otto-Hahn-Straße 15, 79211 Denzlingen, Germany

4. Authorised representative: --

5. System/s of AVCP: 1

6. European Assessment Document: EAD 330499-01-0601

European Technical Assessment: ETA-17/0979; 2018-12-06

Technical Assessment Body: DIBt

Notified body/ies: 1343 - MPA Darmstadt

7. Declared performance/s:

Mechanical resistance and stability (BWR 1)

Characteristic resistance for static and quasi static action, displacements:
 See appendix, especially Annexes C 1 to C 10

Characteristic resistance for Seismic performance categories C1 and C2, displacements:
 See appendix, especially Annexes C 11 to C 14

Hygiene, health and the environment (BWR 3)

• Content, emission and/or release of dangerous substances: NPD

8. Appropriate Technical Documentation and/or Specific Technical Documentation: ---

The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

1. V. A. Bull i. V. W. Mylal

Signed for and on behalf of the manufacturer by:

Andreas Bucher, Dipl.-Ing.

Wolfgang Hengesbach, Dipl.-Ing., Dipl.-Wirtsch.-Ing.

Tumlingen, 2018-12-14

- This DoP has been prepared in different languages. In case there is a dispute on the interpretation the english version shall always prevail.

- The Appendix includes voluntary and complementary information in English language exceeding the (language-neutrally specified) legal requirements.

Specific Part

1 Technical description of the product

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

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

The product description is given in Annex A.

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

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

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 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 values under static and quasi-static action, displacements	See Annex C 1 to C 10
Characteristic values for seismic performance categories C1 and C2, displacements	See Annex C 11 to C 14

3.2 Hygiene, health and the environment (BWR 3)

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

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

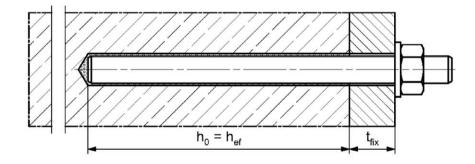
In accordance with EAD 330499-01-0601 according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

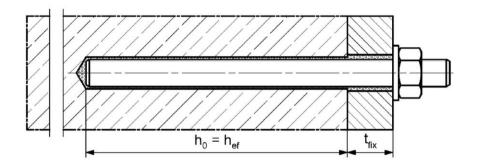
Installation conditions part 1

fischer anchor rod

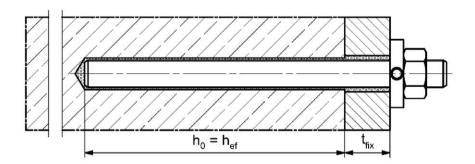
Pre positioned installation



Push through installation (annular gap filled with mortar)



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



Figures not to scale

 h_0 = drill hole depth

hef = effective embedment depth

tfix = thickness of fixture

fischer injection system FIS EM Plus

Product description

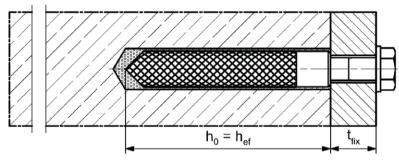
Installation conditions part 1

Annex A 1

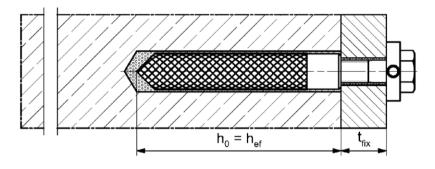
Installation conditions part 2

fischer internal threaded anchor RG MI

Pre positioned installation



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



Figures not to scale

 h_0 = drill hole depth

hef = effective embedment depth

 t_{fix} = thickness of fixture

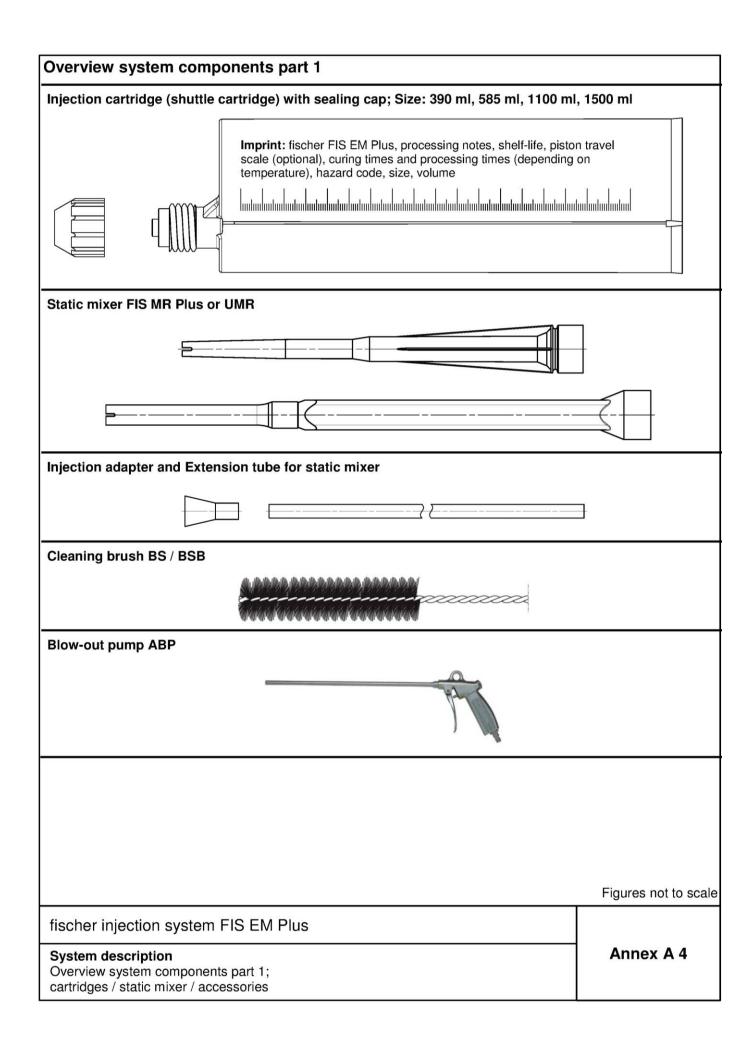
fischer injection system FIS EM Plus

Product description

Installation conditions part 2

Annex A 2

Installation conditions part 3 Reinforcing bar $h_0 = h_{ef}$ fischer rebar anchor FRA Pre positioned installation h_0 Push through installation (annular gap filled with mortar) h_0 Figures not to scale h_0 = drill hole depth h_{ef} = effective embedment depth t_{fix} = thickness of fixture fischer injection system FIS EM Plus Annex A 3 **Product description** Installation conditions part 3



Overview system components part 2 fischer anchor rod Size: M8, M10, M12, M14, M16, M20, M22, M24, M27, M30 fischer internal threaded anchor RG MI Size: M8, M10, M12, M16, M20 Screw / threaded rod / washer / hexagon nut fischer filling disk FFD with injection adapter Reinforcing bar Nominal diameter: \$\phi 8\$, \$\phi 10\$, \$\phi 12\$, \$\phi 14\$, \$\phi 16\$, \$\phi 18\$, \$\phi 20\$, \$\phi 22\$, \$\phi 24\$, \$\phi 25\$, \$\phi 26\$, \$\phi 28\$, \$\phi 30\$, \$\phi 32\$, \$\phi 34\$, \$\phi 36\$, \$\phi 40\$ fischer rebar anchor FRA Size: M12, M16, M20, M24 Figures not to scale fischer injection system FIS EM Plus Annex A 5 System description

Overview system components part 2;

steel components

Part	Designation		Material			
1	Injection cartridge		Mortar, hardener, filler			
	Steel grade	Steel, zinc plated	Stainless steel A4	High corrosion resistant steel C		
2	Anchor rod		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 $f_{uk} \le 1000 \text{ N/mm}^2$ $A_5 > 12\%$ fracture elongation A5 > 8 %, for applications wite eismic performance category			
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 \geq 5 μ m, 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 f_{yk} and k according to NDP of $f_{uk} = f_{tk} = k \cdot f_{yk}$	ss B or C with r NCL of EN 1992-1-1:2004+.	AC:2010		
9	Rebar part: Rebar part: Bars and de-coiled rods class B or C with FN ISO 3506-1:2009					
	ner injection system duct description erials	FIS EM Plus		Annex A 6		

Specifications of intended use (part 1) Table B1.1: Overview use and performance categories FIS EM Plus with ... Anchorages subject to Anchor rod fischer internal Reinforcing bar fischer rebar threaded anchor anchor **FRA** RG MI KKKKKKKKKKKKKKK HARRAMANAKANAMANAKANAKANA Hammer drilling with standard drill all sizes bit Hammer drilling with hollow drill bit (fischer "FHD", Nominal drill bit diameter (d₀) Heller "Duster 12 mm to 35 mm Expert"; Bosch "Speed Clean"; Hilti "TE-CD, TE-YD") Diamond drilling all sizes Tables: Tables: Tables: Tables: uncracked C3.2 C1.1 C2.1 C3.1 concrete Static and quasi C4.1 all sizes C4.1 all sizes C4.1 C4.1 all sizes all sizes static load, in cracked C5.1 C6.1 C7.1 C8.1 concrete C9.1 C9.2 C10.1 C10.2 Tables: Tables: M10 φ10 C11.1 C12.1 Seismic C1 to to C12.2 C12.2 performance M30 ф32 C13.1 C13.2 category (only hammer drilling with M12 Tables: standard / hollow M16 C11.1 C2 drill bits) M20 C12.2 M24 C14.1 dry or wet 11 all sizes concrete Use category water filled 12 all sizes hole D3 Installation direction (downward and horizontal and upwards (e.g. overhead) installation) Installation $T_{i,min} = -5$ °C to $T_{i,max} = +40$ °C temperature Temperature (max. short term temperature +60 °C; -40 °C to +60 °C max. long term temperature +35 °C) range I In-service temperature Temperature (max. short term temperature +72 °C; -40 °C to +72 °C range II max. long term temperature +50 °C) fischer injection system FIS EM Plus Annex B 1

Intended use

Specifications (part 1)

Specifications of intended use (part 2)

Base materials:

 Compacted reinforced or unreinforced normal weight concrete without fibres of strength classes C20/25 to C50/60 according to EN 206-1:2013

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (zinc coated steel, stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure, to permanently damp internal conditions or in other particular aggressive conditions (high corrosion resistant steel)

Note: Particular aggressive conditions are e. g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used)

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 under seismic loading are designed in accordance with:
 EN 1992-4:2018 and EOTA Technical Report TR 055.

 Anchorages shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure.
 Fastening in stand-off installation or with a grout layer under seismic action are not covered in this European Technical Assessment (ETA).

Installation:

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

fischer injection system FIS EM Plus	
Intended use Specifications (part 2)	Annex B 2

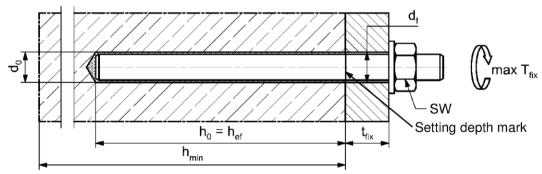
Table B3.1: Installation parameters for anchor rods													
Anchor rods			Thread	М8	M10	M12	M14	M16	M20	M22	M24	M27	M30
Width across flats		SW		13	17	19	22	24	30	32	36	41	46
Nominal drill hole dia	ameter	d_0		10	12	14	16	18	24	25	28	30	35
Drill hole depth		h ₀						h ₀ =	h _{ef}				
Effective		h _{ef, min}		60	60	70	75	80	90	93	96	108	120
embedment depth		h _{ef, max}]	160	200	240	280	320	400	440	480	540	600
Diameter of the	pre positioned installation	df	[mm]	9	12	14	16	18	22	24	26	30	33
clearance hole of the fixture	push through installation	df		12	14	16	18	20	26	28	30	33	40
Minimum thickness of concrete member h _{min}				n _{ef} + 30 (≥ 100)				h	lef + 2d	l _o			
Maximum torque mo attachment of the fix		max T _{fix}	[Nm]	10	20	40	50	60	120	135	150	200	300



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

	T
fischer injection system FIS EM Plus	
Intended use	Annex B 3
Installation parameters anchor rods	

Table B4.1: Minimum spacing and minimum edge distance for anchor rods and reinforcing bars											
Anchor rods			М8	M10	M12	M14	M16	-	M20	M22	M24
Reinforcing bars (nominal diame	ter)	ф	8	10	12	14	16	18	20	22	24
Minimum edge distance											
Uncracked / cracked concrete	Cmin	[mm]	40	45	45	45	50	55	55	55	60
Minimum spacing	Smin	[mm]				accordi	ng to Ar	nnex B5	5		
Minimum spacing											
Uncracked / cracked concrete	Smin	[mm]	40	45	55	60	65	85	85	95	105
Minimum edge distance	Cmin	[mm]				accordi	ng to Ar	nnex B5	5		
Required projecting area											
			8	13	22	23	24	38,5	38,5	39,5	40
Uncracked concrete	Λ	[1000)					-			
Uncracked concrete Cracked concrete	A _{sp,req}	[1000 mm²]	6,5	10	16,5	17,5	18,5	29,5	29,5	30	30,5
	A _{sp,req}					17,5	18,5 M30	29,5	29,5	30	30,5
Cracked concrete Anchor rods		mm²]		10	16,5 M27				29,5 - 34	30 - 36	,
Cracked concrete			6,5	10	M27	-	M30	-	-	-	-
Anchor rods Reinforcing bars (nominal diame		mm²]	6,5	10	M27	-	M30	-	-	-	-
Anchor rods Reinforcing bars (nominal diame Minimum edge distance	eter)	mm²]	6,5 - 25	10 - 26	M27 - 75	- 28	M30 30	- 32	- 34	- 36	- 40
Anchor rods Reinforcing bars (nominal diame Minimum edge distance Uncracked / cracked concrete	eter)	mm²]	6,5 - 25	10 - 26	M27 - 75	- 28	M30 30	- 32	- 34	- 36	- 40
Anchor rods Reinforcing bars (nominal diame Minimum edge distance Uncracked / cracked concrete Minimum spacing	eter)	ф [mm]	6,5 - 25	10 - 26	M27 - 75	- 28	M30 30	- 32	- 34	- 36	- 40
Anchor rods Reinforcing bars (nominal diame Minimum edge distance Uncracked / cracked concrete Minimum spacing Minimum spacing	cter) C _{min} S _{min}	mm²]	- 25	- 26	M27 - 75	- 28 80 accordi	M30 30 80 ng to Ar	- 32 120 nnex B5	- 34 120 5	- 36	- 40
Anchor rods Reinforcing bars (nominal diame Minimum edge distance Uncracked / cracked concrete Minimum spacing Minimum spacing Uncracked / cracked concrete	Cmin Smin	ф [mm]	- 25	- 26	M27 - 75	- 28 80 accordi	M30 30 80 ng to Ar	- 32 120 nnex B5	- 34 120 5	- 36	- 40
Anchor rods Reinforcing bars (nominal diame Minimum edge distance Uncracked / cracked concrete Minimum spacing Minimum spacing Uncracked / cracked concrete Minimum edge distance	Cmin Smin	ф [mm]	- 25	- 26	M27 - 75	- 28 80 accordi	M30 30 80 ng to Ar	- 32 120 nnex B5	- 34 120 5	- 36	- 40

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

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

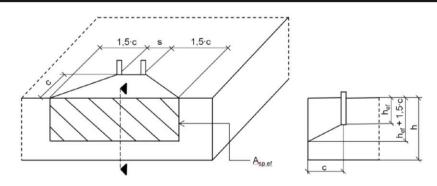
$$A_{sp,req} < A_{sp,t}$$

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

 $A_{sp,t} = A_{sp,ef} = effective projecting area (according to Annex B5)$

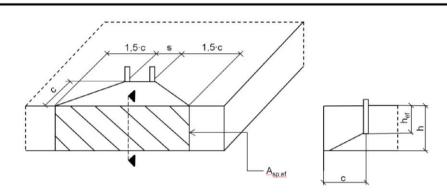
fischer injection system FIS EM Plus	
Intended use Minimum spacing and edge distance for anchor rods and reinforcing bars	Annex B 4

Table B5.1: Effective projecting area $A_{sp,t}$ with concrete member thickness $h > h_{ef} + 1,5 \cdot c$ and $h \ge h_{min}$



		<u>V </u>		v.
Single anchor		$A_{sp,t} = (3 \cdot c) \cdot (h_{ef} + 1, 5 \cdot c)$	[mm²]	with c ≥ c _{min}
Group of anchors with	s > 3 · c	$A_{sp,t} = (6 \cdot c) \cdot (h_{ef} + 1, 5 \cdot c)$	[mm²]	WILLI C Z Cmin
Group of anchors with	s ≤ 3 · c	$A_{sp,t} = (3 \cdot c + s) \cdot (h_{ef} + 1, 5 \cdot c)$	[mm²]	with $c \ge c_{min}$ and $s \ge s_{min}$

Table B5.2: Effektive projecting area $A_{sp,t}$ with concrete member thickness $h \le h_{ef} + 1,5 \cdot c$ and $h \ge h_{min}$



Single anchor		$A_{sp,t} = 3 \cdot c \cdot existing \ h$	[mm²]	with c ≥ c _{min}
Group of anchors with	s > 3 · c	$A_{sp,t} = 6 \cdot c \cdot existing h$	[mm²]	WILLI C Z Cmin
Group of anchors with	s ≤ 3 · c	$A_{sp,t} = (3 \cdot c + s) \cdot existing h$	[mm²]	with $c \ge c_{min}$ and $s \ge s_{min}$

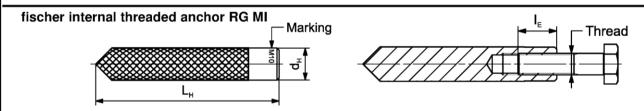
Edge distance and axial spacing shall be rounded to at least 5 mm

Figures not to scale

fischer injection system FIS EM Plus	
Intended use Minimum thickness of concrete member for anchor rods, minimum spacing and edge distance	Annex B 5

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

Internal threaded anchors R	G MI	Thread	М8	M10	M12	M16	M20
Diameter of anchor	$d_{nom} = d_H$		12	16	18	22	28
Nominal drill hole diameter	do		14	18	20	24	32
Drill hole depth	h ₀				$h_0 = h_{\text{ef}} = L_{\text{H}}$		
Effective embedment depth $(h_{ef} = L_H)$	h _{ef}		90	90	125	160	200
Minimum spacing and minimum edge distance	Smin = Cmin	[mm]	55	65	75	95	125
Diameter of clearance hole in the fixture	df		9	12	14	18	22
Minimum thickness of concrete member	h _{min}		120	125	165	205	260
Maximum screw-in depth	I _{E,max}		18	23	26	35	45
Minimum screw-in depth	I _{E,min}		8	10	12	16	20
Maximum torque moment for attachment of the fixture	max T _{fix}	[Nm]	10	20	40	80	120



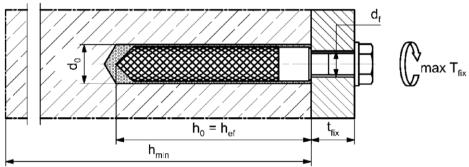
Marking: Anchor size e. g.: M10

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

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

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

Installation conditions:



Figures not to scale

fischer injection system FIS EM Plus

Intended use

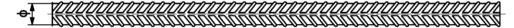
Installation parameters internal threaded anchors RG MI

Annex B 6

Table B7.1: Installation	parame	eters fo	or reint	forcing	bars							
Nominal diameter of the bar		ф	8 ¹⁾	10 ¹⁾	12 ¹⁾	14	16	18	20	22	24	
Nominal drill hole diameter	d ₀		10 12	12 14	14 16	18	20	25	25	30	30	
Drill hole depth	h ₀]					$h_0 = h_{ef}$					
Effective	h _{ef,min}	[mm]	60	60	70	75	80	85	90	94	98	
embedment depth	h _{ef,max}	[!!!!!!]	160	200	240	280	320	360	400	440	480	
Minimum thickness of concrete member	h _{min}		ı	ef + 30 : 100)		h _{ef} + 2d ₀						
Nominal diameter of the bar		ф	25	26	28	30	32	34	36	40	-	
Nominal drill hole diameter	d_0		30	35	35	40	40	40	45	55	-	
Drill hole depth	h ₀						$h_0 = h_{ef}$					
Effective	h _{ef,min}	[mm]	100	104	112	120	128	136	144	160	-	
embedment depth	h _{ef,max}	[!!!!!]	500	520	560	600	640	680	720	800	-	
Minimum thickness of concrete member	h _{min}						h _{ef} + 2d	0				

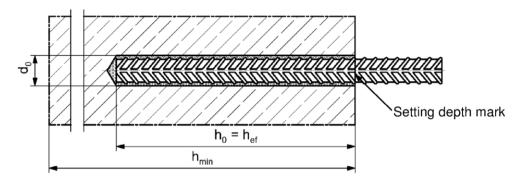
¹⁾ Both drill hole diameters can be used

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: $0.05 \cdot \phi \le h_{rib} \le 0.07 \cdot \phi$ (ϕ = Nominal diameter of the bar , h_{rib} = rib height)

Installation conditions:



Figures not to scale

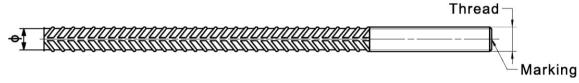
fischer injection system FIS EM Plus	
Intended use Installation parameters reinforcing bars	Annex B 7

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

Rebar anchor F	FRA		Thread	M1	2 ¹⁾	M16	M20	M24	
Nominal diamet	er of the bar	ф		1:	2	16	20	25	
Width across fla	its	SW		19	9	24	30	36	
Nominal drill hol	le diameter	d₀		14	16	20	25	30	
Drill hole depth		h ₀				h _{ef}	+ le		
Effective embes	lmont donth	h _{ef,min}		7	0	80	90	96	
Effective embed	тен аерт	$h_{\text{ef},\text{max}}$		14	-0	220	300	380	
Distance concre welded joint	ete surface to	le	[]	100					
Minimum spacir minimum edge d		Smin = Cmin	[mm]	55		65	85	105	
Diameter of clearance hole	pre positioned anchorage	≤ d _f		1.	4	18	22	26	
in the fixture	push through anchorage	≤ d _f		18		22	26	32	
Minimum thicknoof concrete men		h _{min}		$h_0 + 30$ (≥ 100) $h_0 + 2d_0$					
Maximum torque attachment of the		max T _{fix}	[Nm]	4	0	60	120	150	

¹⁾ Both drill hole diameters can be used

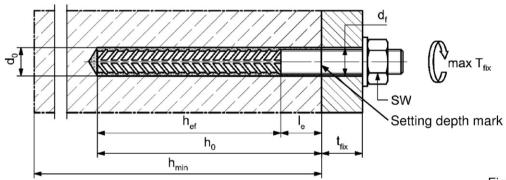




Marking frontal e. g:

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

Installation conditions:



Figures not to scale

fischer injection system FIS EM Plus

Intended use

Installation parameters rebar anchor FRA

Annex B 8

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

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

Nominal drill hole diameter	d ₀	[mm]	10	12	14	16	18	20	24	25	28	30	32	35	40	45	55
Steel brush diameter	dь	[mm]	11	14	16	2	0	25	26	27	30		40		42	47	58



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

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

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

fischer injection system FIS EM Plus	
Intended use	Annex B 9
Cleaning brush (steel brush)	
Processing time and curing time	

Installation instructions part 1 Drilling and cleaning the hole (hammer drilling with standard drill bit) Drill the hole. Nominal drill hole diameter \textbf{d}_0 and drill hole depth \textbf{h}_0 1 see tables B3.1, B6.1, B7.1, B8.1 Cleaning the drill hole: 2 Blow out the drill hole twice, with oil free compressed air (p ≥ 6 bar) Brush the drill hole twice. For drill hole diameter ≥ 30 mm use a power drill. 3 For deep holes use an extension. Corresponding brushes see table B9.1 Cleaning the drill hole: 4 Blow out the drill hole twice, with oil free compressed air (p ≥ 6 bar) Go to step 6 Drilling and cleaning the hole (hammer drilling with hollow drill bit) Check a suitable hollow drill (see table B1.1) 1 for correct operation of the dust extraction Use a suitable dust extraction system, e. g. Bosch GAS 35 M AFC or a comparable dust extraction system with equivalent performance data 2 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 do and drill hole depth ho see tables B3.1, B6.1, B7.1, B8.1 Go to step 6 fischer injection system FIS EM Plus Annex B 10 Intended use Installation instructions part 1

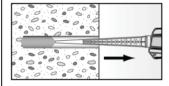
Installation instructions part 2 Drilling and cleaning the hole (wet drilling with diamond drill bit) Drill the hole. Drill hole diameter do and Break the drill core 1 nominal drill hole depth ho and remove it see tables B3.1, B6.1, B7.1, B8.1 2 Flush the drill hole with clean water until it flows clear 3 Blow out the drill hole twice, using oil-free compressed air (p > 6 bar) Brush the drill hole twice using a power drill. 4 Corresponding brushes see table B9.1 5 Blow out the drill hole twice, using oil-free compressed air (p > 6 bar) Preparing the cartridge Remove the sealing cap 6 Screw on the static mixer (the spiral in the static mixer must be clearly visible) 7 Place the cartridge into the dispenser Extrude approximately 10 cm of material out until 8 the resin is evenly grey in colour. Do not use mortar that is not uniformly grey fischer injection system FIS EM Plus Annex B 11 Intended use

Installation instructions part 2

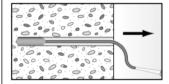
Installation instructions part 3

Injection of the mortar

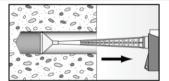
9



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



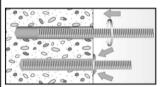
For drill hole depth ≥ 150 mm use an extension tube

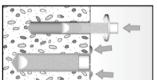


For overhead installation, deep holes ($h_0 > 250$ mm) or drill hole diameter ($d_0 \ge 40$ mm) use an injection-adapter

Installation of anchor rods or fischer internal threaded anchors RG MI

10



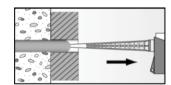


Only use clean and oil-free anchor elements. Mark the setting depth of the anchor. Push the anchor rod or fischer internal threaded RG MI anchor down to the bottom of the hole, turning it slightly while doing so.

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



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



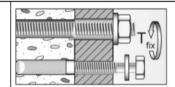
For push through installation fill the annular gap with mortar

11



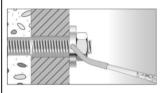
Wait for the specified curing time t_{cure} see table B9.2

12



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

Option



After the minimum curing time is reached, the gap between anchor and fixture (annular clearance) may be filled with mortar via the fischer filling disc FFD. Compressive strength ≥ 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)

fischer injection system FIS EM Plus

Intended use

Installation instructions part 3

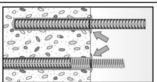
Annex B 12

Installation instructions part 4

Installation reinforcing bars and fischer rebar anchor FRA

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

10



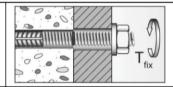
When the setting depth mark is reached, excess mortar must be emerged from the mouth of the drill hole.

11



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

12



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

fischer injection system FIS EM Plus

Intended use

Installation instructions part 4

Annex B 13

	ntial charad of fischer a						_	-	-		ensile	/ she	ar
Anchor rod / standard t	hreaded rod			М8	M10	M12	M14	M16	M20	M22	M24	M27	M30
Bearing capacity under	tensile load	, stee	l fail	ure									
Steel zinc plated		5.8		19(17)	29(27)	43	58	79	123	152	177	230	281
N O Steel Sluc blaten	Droporty	8.8		29(27)	47(43)	68	92	126	196	243	282	368	449
Characterstic Sisteman Stainless Steel A4 and high corrosion resistant steel C	Property class	50	[kN]	19	29	43	58	79	123	152	177	230	281
ল and high corrosion resistant steel C		70		26	41	59	81	110	172	212	247	322	393
2 resistant steer c		80		30	47	68	92	126	196	243	282	368	449
Partial factors 1)		5 0		I				4.5					
ਨੂ Steel zinc plated		5.8						1,5					
Steel zinc plated West and high corrosion And high corrosion And high corrosion And high corrosion	Property	8.8 50	[]					1,5					
Stainless steel A4	class	70	[-]					2,8 1,50 ²⁾ /					
and high corrosion resistant steel C		80						1,50-7					
Bearing capacity under	shear load	_	failu	ro				1,0	10				
without lever arm	Silear load,	31001	Tarra										
δ		5.8		9(8)	15(13)	21	29	39	61	76	89	115	141
Steel zinc plated		8.8		15(13)	23(21)	34	46	63	98	122	141	184	225
Steel zinc plated Stainless steel A4 and high corrosion Steel zinc plated	Property class	50	[kN]	9	15	21	29	39	61	76	89	115	141
		70		13	20	30	40	55	86	107	124	161	197
resistant steel C		80		15	23	34	46	63	98	122	141	184	225
Ductility factor		k ₇	[-]					1,	0				
with lever arm				I									
Steel zinc plated Stainless steel A4		5.8	┥		37(33)	65	104	166	324	447	560	833	112
Stainless steel A4	Property	8.8	FN 1 7	, ,	60(53)	105	167	266	519	716	896	1333	179
	class		[Nm]		37	65	104	166	324	447	560	833	112
and high corrosion resistant steel C		70 80		26 30	52	92 105	146 167	232	454 519	626 716	784 896	1167 1333	157
Partial factors 1)		00		30	60	100	107	200	519	/ 10	090	1333	179
		5.8						1,2	25				
Steel zinc plated		8.8						1,2					
g Stainless steel A4	Property	50	[-]					2,3					
and high corrosion	class	70	•					1,25 ²⁾ /					
resistant steel C		80						1,3	3				
 In absence of other n Only admissible for s Values in brackets are standard threaded roc 	eel C, with fyle valid for und	k / f _{uk} dersiz	≥ 0,8 zed th	readed	rods wi	th sma	aller st				dip ga	lvanize	ed
fischer injection syst	em FIS EM	1 Plu	S								Anne	ex C 1	 I
Performance Essential characteristics standard threaded rods	for the steel	beari	ng ca	pacity o	of fische	r anch	nor rod	s and			Anne	ex C	•

Table C2.1:						el bearing nchors RG		nder tensile	/ shear		
fischer internal	threade	ed anchors	RG MI		М8	M10	M12	M16	M20		
Bearing capacit	y unde	r tensile loa	ad, stee	el failu	ıre						
		Property	5.8		19	29	43	79	123		
Charact. resistance with	N _{Rk,s}	class	8.8	[kN]	29	47	68	108	179		
screw	INRK,S	Property	A4	ואואן	26	41	59	110	172		
		class 70	С		26	41	59	110	172		
Partial factors ¹⁾											
		Property	5.8				1,50				
Partial factors	2/5.4 - 5.1	class	8.8	[-]			1,50				
artial factors	γMs,N	Property	_A4	ן נ־ז			1,87				
		class 70	С				1,87				
Bearing capacit	y unde	r shear load	d, steel	failu	re						
Without lever ar	m										
01		Property	5.8		9,2	14,5	21,1	39,2	62,0		
Charact. resistance with	$V^0_{Rk,s}$	class	8.8	[kN]	14,6	23,2	33,7	54,0	90,0		
screw	V HK,S	Property	_A4	ן ניייז	12,8	20,3	29,5	54,8	86,0		
		class 70	С		12,8	20,3	29,5	54,8	86,0		
Ductility factor			k ₇	[-]			1,0				
With lever arm											
Olassasat		Property	5.8		20	39	68	173	337		
Charact. resistance with	M ⁰ Rk,s	class	8.8	[Nm]	30	60	105	266	519		
screw	IVI HK,S	Property	_A4	[[,,,,,]	26	52	92	232	454		
		class 70	С		26	52	92	232	454		
Partial factors ¹⁾											
		Property	5.8				1,25				
Partial factors	7/Ma 1/	class	8.8	— [-] <u> </u>							
artial lactors	γMs,V	Property	A4	4 1,56							
		class 70	С				1,56				
1) In absence of	other r	national requ	ulations								

¹⁾ In absence of other national regulations
2) Only for steel failure without lever arm

fischer injection system FIS EM Plus	
Performance Essential characteristics for the steel bearing capacity of fischer internal threaded anchor RG MI	Annex C 2

	ential characteri			stee	l bea	ring cap	acit	y und	der te	nsile	e / she	ar
Nominal diameter of the	ne bar	ф	8 10	12 1	4 16	18 20 22	24	25 26	6 28	30 3	2 34 3	36 40
Bearing capacity unde	er tensile load, stee	el fail	ure									
Characterstic resistance	e N _{Rk,s}	[kN]				Α	s · fuk	1)				
Bearing capacity unde	er shear load, stee	l failu	re									
Without lever arm												
Characterstic resistance	e V ⁰ Rk,s	[kN]				0,5	· As ·	f uk ¹⁾				
Ductility factor	k ₇	[-]					0,8					
With lever arm												
Characteristic resistance	e Mo _{Rk,s}	[Nm]				1,2 ·	W _{el}	f uk ¹)				
	ential characteri d of fischer reb a				el bea	iring cap	acit	y und	der te	ensile	ə / she	ar
fischer rebar anchor F	RA		N	112		M16		M	20	$oxed{oxed}$	M24	
Bearing capacity unde	r tensile load, ste	el failı	ure									
Characterstic resistance	e N _{Rk,s}	[kN]		63		111		17	73		270	ļ
Partial factor ¹⁾												
Partial factor	γMs,N	[-]					1,4					
Bearing capacity unde	r shear load, stee	l failu	re									
Without lever arm												
Characterstic resistance	e V ⁰ Rk,s	[kN]	,	30		55		8	6		124	,

1,0

1,56

454

785

233

1) In abse	nce of	other	national	regulations
------------	--------	-------	----------	-------------

 k_7

 $\gamma_{\text{Ms,V}}$

M⁰Rk,s [Nm]

[-]

[-]

Ductility factor

With lever arm

Partial factor¹⁾
Partial factor

Characteristic resistance

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

92

Tensile load Uncracked concrete Cracked concrete Factors for the compression Increasing factor for τ _{Rk} Splitting failure	C25/30 C30/37 C35/45 C40/50	$\frac{k_{\text{ucr,N}}}{k_{\text{cr,N}}}$	[-]	ete	>	C20	0/25					All	11,(
Uncracked concrete Cracked concrete Factors for the compress Increasing factor for the compress Increasing	C25/30 C30/37 C35/45 C40/50	k _{cr,N}	concr	ete	>	C20	0/25						11/							
Cracked concrete Factors for the compress Increasing factor for τ _{Rk}	C25/30 C30/37 C35/45 C40/50	k _{cr,N}	concr	ete	>	C20	0/25)						
Factors for the compress Increasing factor for τ _{Rk}	C25/30 C30/37 C35/45 C40/50	gth of		ete	>	C20	0/25						7,7							
Increasing factor for τ_{Rk}	C25/30 C30/37 C35/45 C40/50												. ,.							
factor for TRK	C30/37 C35/45 C40/50	Ψ_{c}	[.]										1,02	2						
factor for TRK	C35/45 C40/50	Ψс	[-1										1,04							
factor for TRK	C40/50	Ψ_{c}	l r_1										1,06							
Splitting failure			[-]										1,0							
Splitting failure													1,08							
Splitting failure	C50/60												1,09							
													.,							
	/ h _{ef} ≥ 2,0											1	,0 h	l ef						
Edge distance $\phantom{00000000000000000000000000000000000$		C _{cr,sp}										4,6 h	_		1					
	/ h _{ef} ≤ 1,3	- 31,00	[mm]										26							
Spacing		S _{cr,sp}	1										Ccr							
Concrete cone failure		- 31,100	1										201	-P						
Edge distance		Ccr,N	Ī									1	,5 h	lef						
Spacing		Scr.N	[mm]										Ccr							
Shear load		,												, -						
Installation factor		γinst	[-]										1,0							
Concrete pry-out failure	<u> </u>	711100											.,-							
Factor for pry-out failure		k ₈	[-]										2,0							
Concrete edge failure		- 10											_,-							
The value of h_{ef} (= l_f)			.,				1	4.			u al!		40	00.4	-004	0.0	4		7.40	
under shear load			[-]			C	ona	tion	is a	acco	raii	ng to	19	92-4	:201	8; 8	ecti	ion	7.43	i
Calculation diameters																				
Size				М	8	М	110	М1	2	M	14	M16	3	M20	M	22	M2	4	M27	Ma
fischer anchor rods and standard threaded rods		d _{nom}		8	3	1	10	12	2	1	4	16		20	2	2	24		27	30
fischer internal threaded anchors	RG MI	d _{nom}	[mm]	12	2	1	16	18	В	-		22		28			-		-	-
fischer rebar anchor FRA		d _{nom}	1	_		\top	_	12	2	Ι.		16	$^{+}$	20	Τ.		25		_	-
Size (nominal diameter o	f the bar)		ф	8	1	0 1	2 1	4 1	6	18	20	22	24	25	26	28	30	32	34	36 4
Reinforcing bar	,	d _{nom}	[mm]	8	10	-	_	-	$\overline{}$	18		-	24	-			$\overline{}$		_	36

stan	ential charac Idard threac racked or c	ded rods	s in ha	amme						or ro	ds ar	ıd
Anchor rod / standard	threaded rod		M8	M10	M12	M14	M16	M20	M22	M24	M27	M30
Combined pullout and	concrete con	e failure										
Calculation diameter	d	[mm]	8	10	12	14	16	20	22	24	27	30
Uncracked concrete												
Characteristic bond res	sistance in un	cracked (concre	te C20)/25							
Hammer-drilling with sta	ndard drill bit o	r hollow d	rill bit (dry or	wet co	ncrete)						
Tem- I: 35 °C / 60		5N.1/	18	18	18	17	17	16	15	15	15	14
perature II: 50 °C / 72	τ _{Rk,ucr}	[N/mm ²]	18	17	17	16	16	15	14	14	14	13
Hammer-drilling with sta	ndard drill bit o	r hollow d	rill bit (water i	l filled he	LLL ole)			<u> </u>		<u> </u>	
Tem- I: 35 °C / 60			16	16	15	13	13	11	11	10	10	9
perature	TBk.ucr	[N/mm ²]										
range II: 50 °C / 72		<u> </u>	15	14	14	13	12	11	10	10	9	9
Diamond-drilling (dry or		<u>s well as v</u> I									_	
Tem- I: 35 °C / 60	O °C τ _{Rk,ucr}	[N/mm²]	16	15	13	12	12	10	10	10	9	9
range II: 50 °C / 72	2 °C	[[]	15	14	12	11	11	10	9	9	8	8
Installation factors												
Dry or wet concrete		r 1					1	,0				
Water filled hole	γinst	[-]					1	,4				
Cracked concrete												
Characteristic bond res	sistance in cra	acked co	ncrete	C20/2	5							
<u>Hammer-drilling with sta</u>	ndard drill bit o	r hollow d	rill bit (dry or	wet co	ncrete)						
Tem- I: 35 °C / 60	O °C	5N.1/	7,5	7,5	9	8,5	8,5	8,5	8,5	8,5	8,5	8,5
perature II: 50 °C / 72	TRk,cr 2 °C	[N/mm ²]	7,5	7,5	9	8,5	8,5	8,5	8,5	8,5	8,5	8,5
Diamond - drilling (dry or	r wet concrete)		,			,	,	,				
Tem- I: 35 °C / 60			7	7	7	7	6	6	7	7	7	7
perature	τ _{Bk.cr}	[N/mm ²]			-							
range II: 50 °C / 72		L	7	7	7	7	6	6	7	7	7	7
Hammer-drilling with sta		<u>r hollow d</u> I	l e	l e				Ι			I	
Tem- I: 35 °C / 60 perature	0 °C —— τ _{Rk,cr}	[N/mm²]	6	7,5	7,5	7	6	6	6	6	6	6
range II: 50 °C / 72	2 °C	[[6	7	7	7	6	6	6	6	6	6
Installation factors								•	•			
Dry or wet concrete		r 1					1	,0				
Water filled hole	γinst	[-]			1,2					1,4		
fischer injection sys			r flack	ا د سم س	الدعد بال	ond -4	ande "			Anne	ex C (<u> </u>
Essential characteristic threaded rods	s of tensile res	istance fo	rtische	er anch	or rod	and sta	andard					

		RG MI					r internal th racked or c	
Internal threaded	anchor RG	МІ		М8	M10	M12	M16	M20
Combined pullou	t and concr	ete con	e failure					
Calculation diamet	ter	d	[mm]	12	16	18	22	28
Uncracked concr	ete							
Characteristic bo	nd resistan	ce in un	cracked o	concrete C20)/25			
<u>Hammer-drilling w</u>	ith standard	<u>drill bit c</u>	r hollow d	rill bit (dry or	wet concrete)	<u> </u>		
	°C / 60 °C	_	[N1/mm2]	15	14	14	13	12
perature ———— range II: 50 °	°C / 72 °C	τRk,ucr	[N/mm²]	14	13	13	12	11
Hammer-drilling w	ith standard	drill bit c	r hollow d	rill bit (water	filled hole)			
	°C / 60 °C			14	12	12	11	10
perature II: 50	°C / 72 °C	τ _{Rk,ucr}	[N/mm²]	13	12	11	10	9
range II: 50 Diamond-drilling (d		ncrete a	l <u> </u>					
	°C / 60 °C	noroto a		13	12	11	10	9
perature	°C / 72 °C	τ _{Rk,ucr}	[N/mm²]					
ango				12	11	10	9	8
Installation factor Dry or wet concret						1,0		
Water filled hole	<u>e</u>	γinst	[-]			1,0		
Cracked concrete						1,4		
Characteristic bo		ce in cr	acked cor	crete C20/2	 5			
Hammer-drilling w						(dry or wet c	oncrete)	
	°C / 60 °C			7	6	6	7	7
perature II: 50	°C / 72 °C	$\tau_{\text{Rk,cr}}$	[N/mm²]	7	6	6	7	7
range II: 50 ° Hammer-drilling w		drill hit c	r hollow d				,	,
	°C / 60 °C	ariii bit c	THOROW G	7	6,5	6	6	6
perature ———		τ _{Rk,cr}	[N/mm²]		-			
ango	°C / 72 °C			7	6	6	6	6
Installation factor						4.0		
Dry or wet concret Water filled hole	<u>e</u>	γinst	[-]		1.0	1,0	1	4
water filled flole					1,2		1,	4

RG MI

	Essential hammer c														_					
Nominal diameter	of the bar		Φ	8	10	12	14	16	18	20	22	24	25	26	28	30	32	34	36	40
Combined pullout	and concre	ete con	e failure																	
Calculation diameter	ər	d	[mm]	8	10	12	14	16	18	20	22	24	25	26	28	30	32	34	36	40
Uncracked concre	ete																			
Characteristic bor	nd resistand	ce in un	cracked	con	cre	ete C	20/2	25												
Hammer-drilling wit	th standard	drill bit o	r hollow c	rill l	oit (dry c	r we	et cc	ncre	ete)										
	C / 60 °C			16	15	15	14	14	13	13	13	12	12	12	12	12	12	11	11	11
perature II: 50 °C	C / 72 °C	TRk,ucr	[N/mm ²]	15	14	14	13	13	12	12	12	12	11	11	11	11	11	11	10	10
Hammer-drilling wit	th standard	drill bit o	r hollow d	rill l	bit (wate	r fill	ed h	ole)											
_	C / 60 °C			16		14		12		11	11	10	10	10	10	9	9	9	8	8
perature	C / 72 °C	τ _{Rk,ucr}	[N/mm ²]	15	14	+	12		11				9	9	9	9	8	8	8	8
range II: 50 °C Diamond-drilling (dr		ncrete a	e well as y						'''	• •	10	10	<u> </u>	3		<u> </u>	0	0		
	C / 60 °C	ilciete a	s well as		$\overline{}$	13			11	10	10	10	9	9	9	9	8	8	8	7
perature		τ _{Rk,ucr}	[N/mm ²]	_		+														7
range	C / 72 °C			15	14	12	11	11	10	10	9	9	9	8	8	8	8	7	7	\sqcup'
Installation factors												1.0								-
Dry or wet concrete Water filled hole		γinst	[-]									1,0 1,4								_
												1,4								
Cracked concrete Characteristic bor	ad recietan	oo in or	okod co	201	ot o	Can	25													
Hammer-drilling wit								at co	ner	ate)										-
	C / 60 °C	ariii bit o	1 HOHOW C	7	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
perature		τ _{Rk,cr}	[N/mm ²]		ŀ.	+	_	_	_								_			
range	C / 72 °C			7	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Diamond-drilling (di		ncrete)				_														\vdash
Tem- I: 35 °C	C / 60 °C	τ _{Rk,cr}	[N/mm ²]	7	7	7	7	6	6	6	7	7	7	7	7	7	5	5	5	5
range II: 50 °C	C / 72 °C	VIII,O	[]	7	7	7	7	6	6	6	7	7	7	7	7	7	5	5	5	5
Hammer-drilling wit	th standard	drill bit o	r hollow d	rill l	oit a	and d	liam	ond-	-drill	ing	(wat	er fi	lled	hole	<u>e)</u>					
	C / 60 °C			6	7,5	6,5	6,5	6,5	6	6	6	6	6	6	6	6	5	5	5	5
perature II: 50 °C	C / 72 °C	τ _{Rk,cr}	[N/mm ²]	6	6,5	6,5	6	6	6	6	6	6	6	6	6	6	5	5	5	5
Installation factors	 S																			
Dry or wet concrete												1,0								
Water filled hole		γinst	[-]			1	,2								1,4					
fischer injection	n system F	IS EM	Plus																	
Performance Essential characte	eristics of ter	nsile res	istance fo	r re	info	orcing	j bai	'S								An	nex	(C	7	

			of tensile res ond drilled hol				
fischer rebar anchor FRA			M12	M16	M2	20	M24
Combined pullout and conc	rete con	e failure					
Calculation diameter	d	[mm]	12	16	20)	25
Uncracked concrete							
Characteristic bond resistan	ce in un	cracked	concrete C20/25	•			
Hammer-drilling with standard	drill bit o	r hollow o	Irill bit (dry or wet	concrete)			
Tem- I: 35 °C / 60 °C		[[] [] [] [] [] [] [] [] [] [15	14	13	3	12
perature II: 50 °C / 72 °C	TRk,ucr	[N/mm²]	14	13	12	2	12
Hammer-drilling with standard	drill bit o	r hollow o	Irill bit (water fille	d hole)			
Tem- I: 35 °C / 60 °C			14	12	11	1	10
perature ————————————————————————————————————	TRk,ucr	[N/mm²]	13	12	11	1	9
Diamond-drilling (dry or wet co	ncrete a	s well as	water filled hole)				
Tem- I: 35 °C / 60 °C		FN 1/ 23	13	12	10)	9
perature	τRk,ucr	[N/mm²]	12	11	10)	9
Installation factors						•	
Dry or wet concrete		[-]		1,	,0		
Water filled hole	γinst	[-]		1,	4		
Cracked concrete							
Characteristic bond resistan							
Hammer-drilling with standard	drill bit o	<u>r hollow d</u>	<u>Irill bit and diamo</u>	<u>nd-drilling (dry o</u>	wet con	<u>crete)</u>	
Tem- I: 35 °C / 60 °C perature	- τ _{Rk,cr}	 [N/mm²]	8	8	8		8
range II: 50 °C / 72 °C	UHK,Cr	[[4/11111]	8	8	8		8
Hammer-drilling with standard	drill bit o	r hollow o	Irill bit and diamo	nd-drilling (water	filled hol	<u>e)</u>	
Tem- I: 35 °C / 60 °C		 [N/mm²]	7	6	6		6
perature II: 50 °C / 72 °C	TRk,cr	[14/11111-]	7	6	6		6
Installation factors							
Dry or wet concrete	- 00	[-]		1,	0		
Water filled hole	γinst	[-]	1,	,2		1,4	
fischer injection system	FIS EM	Plus					
Performance Essential characteristics of te	nsile res	istance fo	r fischer rebar ar	ichors FRA		Ann	ex C 8

Table C	9.1: Disp	olacem	ents for	ancho	r rods						
Anchor i	od	M8	M10	M12	M14	M16	M20	M22	M24	M27	M30
Displace	ment-Factors	for tensi	le load ¹⁾								
Uncrack	ed or cracked	concrete	; Tempe	rature ra	nge I, II						
δ _{N0-Factor}	[mm/(N/mm²)]	0,07	0,08	0,09	0,09	0,10	0,11	0,11	0,12	0,12	0,13
δ _{N∞-Factor}	[[[]]]]/([N/]]]]]	0,11	0,12	0,13	0,14	0,15	0,16	0,17	0,18	0,19	0,19
Displace	ment-Factors	for shea	r load ²⁾								
Uncrack	ed or cracked	concrete	; Tempe	rature ra	nge I, II						
δvo-Factor	[mm/kN]	0,18	0,15	0,12	0,10	0,09	0,07	0,07	0,06	0,05	0,05
δv∞-Factor	[mm/kN]	0,27	0,22	0,18	0,16	0,14	0,11	0,10	0,09	0,08	0,07

1) Calculation of effective displacement:

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

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

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

²⁾ Calculation of effective displacement:

 $\delta v_0 = \delta v_{0\text{-Factor}} \cdot V_{Ed}$

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

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

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

Internal f anchor F		M8	M10	M12	M16	M20
Displace	ment-Factors	for tensile load1)				
Uncrack	ed or cracked	concrete; Tempe	rature range I, II			
$\delta_{\text{N0-Factor}}$	[-[mm/(N/mm²)]	0,09	0,10	0,10	0,11	0,13
δ _{N∞-Factor}	[[[]]]] []	0,13	0,15	0,16	0,17	0,19
Displace	ment-Factors	for shear load ²⁾				
Uncrack	ed or cracked	concrete; Tempe	rature range I, II			
δ vo-Factor	[mm/kNI]	0,12	0,09	0,08	0,07	0,05
δv∞-Factor	[mm/kN]	0,18	0,14	0,12	0,10	0,08
1) Calcu	lation of effecti	ve displacement:		2) Calculation of e	effective displacem	ent:

1) Calculation of effective displacement:

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

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

(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

of the ba	l diameter ar Φ	8	10	12	14	16	18	20	22	24	25	26	28	30	32	34	36	40
	ement-Factors	for te	ensile	load	1)													
Jncrack	ed or cracked	conc	rete;	Tem	perat	ure r	ange	I, II										
N0-Factor	 - [mm/(N/mm²)]	0,07	0,08	0,09	0,09	0,10	0,10	0,11	0,11	0,12	0,12	0,12	0,13	0,13	0,13	0,14	0,14	0,1
N∞-Factor	[[[[[[]]]	0,11	0,12	0,13	0,14	0,15	0,16	0,16	0,17	0,18	0,18	0,18	0,19	0,19	0,20	0,20	0,21	0,2
	ement-Factors																	
	ced or cracked															I	I	
/0-Factor	[mm/kN]																0,04	_
∞-Factor						0,14	0,12									0,06	0,06	0,0
$\delta_{N0} = \delta_{N\infty} = 0$	ulation of effecti = $\delta_{\text{NO-Factor}} \cdot \tau_{\text{Ed}}$ = $\delta_{\text{N}\infty\text{-Factor}} \cdot \tau_{\text{Ed}}$ Design value of					ress)		8	$\delta = 0$ $\delta_{V\infty} = \delta$	ÖV0-Fact ÖV∞-Fac	of effe tor · V _E ctor · V n valu	Ed Ed	·			r forc	e)	
scher i	C10.2: Dis	place			or fis	sche			nch	ors I	FRA	M20					24	
RA			IV	112				M16				M20				IVI	24	
splace	ement-Factors																	
				T														
ncrack	ced or cracked	conc			perat	ure ra												
N0-Factor	[mm/(N/mm²)]		0	,09	perat	ure ra		0,10		—		0,11				0,1		
N0-Factor	[mm/(N/mm²)]		0	,09 ,13		ure ra						0,11				0,1		
N0-Factor N∞-Factor	[mm/(N/mm²)] ement-Factors	for s	0 hear	,09 ,13 load ²)			0,10										
N0-Factor N∞-Factor Pisplace Incrack	[mm/(N/mm²)]	for s	0 hear rete;	,09 ,13 load² Tem)		ange	0,10 0,15 I, II				0,16				0,1	18	
N0-Factor N∞-Factor isplace ncrack /0-Factor	[mm/(N/mm²)] ement-Factors	for s	0 hear rete;	,09 ,13 load² Tem ,12)		ange	0,10 0,15 I, II 0,09		 		0,16				0,1	06	
N0-Factor N∞-Factor V0-Factor N∞-Factor N∞-Factor	ement-Factors ked or cracked [mm/kN]	for si	0 0 hear rete;	,09 ,13 load² Tem ,12 ,18	perat		ange	0,10 0,15 I, II 0,09 0,14	2) 0 -		ion of	0,16	,	ionla		0,0	06	
No-Factor N∞-Factor Isplace ncrack /o-Factor /∞-Factor 1) Calcu	ement-Factors ked or cracked [mm/kN]	for si	0 0 hear rete;	,09 ,13 load² Tem ,12 ,18	perat		ange	0,10 0,15 I, II 0,09 0,14			ion of	0,16 0,07 0,11 effec	,	isplac	ceme	0,0	06	
N0-Factor N∞-Factor Displace Incrack V0-Factor V∞-Factor 1) Calcu δN0 =	ement-Factors red or cracked [mm/kN] ulation of effecti δN0-Factor · τEd	for si	0 0 hear rete;	,09 ,13 load² Tem ,12 ,18	perat		ange	0,10 0,15 I, II 0,09 0,14	δνο	$=\delta_{V0}$)-Factor	0,16 0,07 0,11 effec	,	isplac	ceme	0,0	06	
NO-Factor Nω-Factor Displace Jncrack VO-Factor 1) Calcu δNo = δN∞ =	ement-Factors ked or cracked [mm/kN]	for si	o hear rete; o o	,09 ,13 load² Tem ,12 ,18	perat	ure ra	ange	0,10 0,15 I, II 0,09 0,14	δνο	$=\delta v_0$ $=\delta v_0$		0,16 0,07 0,11 effec · V _{Ed}	tive d	·		0,0 0,0 0,0	06	
N0-Factor N∞-Factor Displace Jncrack V0-Factor V∞-Factor 1) Calcu δN0 = δN∞ =	[mm/(N/mm²)] ement-Factors ked or cracked [mm/kN] ulation of effecti δN0-Factor · τEd εδNω-Factor · τEd	for si	o hear rete; o o	,09 ,13 load² Tem ,12 ,18	perat	ure ra	ange	0,10 0,15 I, II 0,09 0,14	δνο	$=\delta v_0$ $=\delta v_0$)-Factor ∞-Factor	0,16 0,07 0,11 effec · V _{Ed}	tive d	·		0,0 0,0 0,0	06	

Table C11.1: Essential characteristics 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

Anab	ov vod / otomdovd the	*******************			B410	Man	BA 1 4	MAG	B400	MOO	N/10/4	MOZ	Mag
	or rod / standard th		-4	. 4-: .	M10	M12	M14	M16	M20	M22	M24	M27	M30
	ng capacity under to					6		C					
. 5	er anchor rods and	standard th		ea ro						450	4 77	000	004
erstic re- N _{Rk,s,eq,C1}	Steel zinc plated		5.8		29(27)	43	58	79	123	152	177	230	281
rstic I _{RK,s}		Property	8.8		47(43)	68	92	126	196	243	282	368	449
acte	Stainless steel A4	class	50	[kN]	29	43	58	79	123	152	177	230	281
Characterstic resistance NRK,s,eq,C	and high corrosion resistant steel C		70		41	59	81	110	172	212	247	322	393
0,			80		47	68	92	126	196	243	282	368	449
	er anchor rods and	standard th	read	ed ro	ds, per	forman	ce cate	egory C	2				\longrightarrow
re -	Steel zinc plated		5.8		-	39	-	72	108	-	177	-	-
'stic re- Rk,s,eq,C2	Steel zille plated		8.8		-	61	-	116	173	-	282	•	-
 	Stainless steel A4	Property class	50	[-]	-	39	-	72	108	-	177	-	-
Characterstic resistance NRK,s,eq.C.	and high corrosion	Ciass	70		-	53	-	101	152	-	247	-	-
Ch Sista	resistant steel C		80		-	61	-	116	173	-	282	-	-
Beari	ng capacity under s	hear load,	steel	failu	re with	out leve	er arm ¹)					
	er anchor rods, perf												\neg
. 5			5.8		15(13)	21	29	39	61	76	89	115	141
erstic re- V ⁰ Rk,s,eq,C1	Steel zinc plated		8.8		23(21)	34	46	63	98	122	141	184	225
	Ctainless steel A4	Property	50	[kN]	15	21	29	39	61	76	89	115	141
Characterstic restance V ⁰ Rk,s,eq,C	Stainless steel A4 and high corrosion	class	70		20	30	40	55	86	107	124	161	197
Charact sistance	resistant steel C		80		23	34	46	63	98	122	141	184	225
	lard threaded rods,	performand		teaoi									
	· · · · · · · · · · · · · · · · · · ·		5.8	- 3 -	11(9)	15	20	27	43	53	62	81	99
erstic re- V ⁰ Rk,s,eq,C1	Steel zinc plated		8.8		16(14)	24	32	44	69	85	99	129	158
erst V ⁰ RI		Property	50	[kN]	11	15	20	27	43	53	62	81	99
ract	Stainless steel A4 and high corrosion	class	70	[14.14]	14	21	28	39	60	75	87	113	138
Characterstic resistance V ⁰ Rk,s,eq,C	resistant steel C		80		16	24	32	44	69	85	99	129	158
S	or anchor rode and	standard th		od ro						00	33	123	130
	er anchor rods and	Standard tii		eu io	us, per	14	lce cale	27			62		
s,eq,(Steel zinc plated		5.8		-		-		43	-		-	-
Characterstic resistance V ⁰ Rk,s,eq,c2		Property	8.8		-	22	-	44	69	-	99	-	-
acte ie V	Stainless steel A4	class	50	[-]	-	14	-	27	43	-	62	-	-
hars tanc	and high corrosion resistant steel C		70		-	20	-	39	60	-	87	-	-
Sis	resistant steer C		80		-	22	-	44	69	-	99	-	-

¹⁾ Partial factors for performance category C1 or C2 see table C12.2; for fischer anchor rods FIS A / RGM the factor for steel ductility is 1,0

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Essential characteristics for the steel bearing capacity for fischer anchor rods and standard threaded rods under seismic action (performance category C1 / C2)

²⁾ Values in brackets are valid for undersized threaded rods with smaller stress area As for hotdip galvanized standard threaded rods according to EN ISO 10684:2004+AC:2009.

Table C12.1: Essential characteristics for the **steel bearing capacity** under tensile / shear load of **reinforcing bars (B500B)** under seismic action performance category

Nominal diameter of the bar φ 10 12 14 16 18 20 22 24 25 26 28 30 32

Bearing capacity under tensile load, steel failure¹⁾

Reinforcing bar B500B acc. to DIN 488-2:2009-08, performance category C1

Characterstic resistance N_{Rk,s,eq,C1} [kN] 44 63 85 111 140 173 209 249 270 292 339 389 443

Bearing capacity under shear load, steel failure without lever arm1)

Reinforcing bar B500B acc. to DIN 488-2:2009-08, performance category C1

Characterstic resistance V⁰Rk,s,eq,C1 [kN] 15 22 30 39 49 61 74 88 95 102 119 137 155

Table C12.2: Partial factors for fischer anchor rods, standard threaded rods and reinforcing bars (B500B) under seismic action performance category C1 or C2

Anch	or rod / standard th	readed roc	1		M10) N	/ 112	M14	М	16	M20	M2	22	M24	M2	7	M30
Nom	inal diameter of the	bar		ф	10	12	14	16	18	20	22	24	25	26	28	30	32
Tens	ile load, steel failure	,1)															
	Stool zing plated		5.8								1,50						
γMs,I	Steel zinc plated		8.8								1,50						
ctor	Stainless steel A4	Property class	50								2,86						
al fa	and high corrosion	Olass	70	[-]						1,5	0 ²⁾ / 1	,87					
Partial factor y _{Ms,N}	resistant steel C		80								1,60						
<u> </u>	Reinforcing bar	В	500B								1,40						
Shea	r load, steel failure1)																
>	Ctool zine plated		5.8								1,25						
γMs,	Steel zinc plated		8.8								1,25						
ctor	Stainless steel A4	Property class	50	. 1							2,38						
al fa	and high corrosion	Oldoo	70	[-]						1,2	.5 ²⁾ / 1	,56					
Partial factor y _{Ms,v}	resistant steel C		80								1,33						
<u> </u>	Reinforcing bar	В	500B								1,50						

¹⁾ In absence of other national regulations

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

¹⁾ Partial factors for performance category C1 see table C12.2

²⁾ Only admissible for steel C, with f_{yk} / $f_{uk} \ge 0.8$ and $A_5 > 12$ % (e.g. fischer anchor rods)

Table C13.1:	Essential standard performa	thread	led rods	in ha											
Anchor rod / star	ndard threa	ded rod		M10	M12	M14	M1	16	M20	M	22	M24	M2	27	M30
Characteristic bo	nd resistan	ice, com	bined pu	llout an	d conc	rete c	one f	failu	re						
Hammer-drilling	with standa	ırd drill b	it or holl	ow drill	bit (dr	y or w	et co	ncre	ete)						
	°C / 60 °C			7,0	7,0	6,7	6,	0	5,7	6,	7	6,7	6,	7	6,7
perature II: 50	°C / 72 °C	TRk,eq,C1	[N/mm ²]	7,0	7,0	6,7	5,	7	5,7	6,	7	6,7	6,	7	6,7
Hammer-drilling	with standa	rd drill b	it or holl	ow drill	bit (wa	ater fill	ed h	ole)							
	°C / 60 °C			7,5	7,5	6,5	5,	7	5,7	5,	7	5,7	5,	7	5,7
perature II: 50	°C / 72 °C	TRk,eq,C1	[N/mm²]	6,8	6,8	6,5	5,	7	5,7	5,	7	5,7	5,	7	5,7
Installation factor	rs														
tensile load															
Dry or wet concret	te								1,0						
Water filled hole		- γinst	[-]		1,	,2						1,4			
shear load															
All installation con-	ditions	γinst	[-]						1,0						
Table C13.2:	Essential drilled ho	les und	er seism	nic acti	on per	forma	ance	cat	tego	ry C	1				
Table C13.2: Nominal diamete Characteristic bo	drilled ho r of the bar	les und	er seism Φ	nic acti	on per 2 14	forma	ance 18	cat 20	tegoi			ham 26	mer 28	30	32
Nominal diamete	drilled ho r of the bar and resistan	les und	er seism Φ bined pu	ic acti	on per 2 14 d conc	16 rete c	18 one f	cat 20 failu	22 re	ry C	1				32
Nominal diamete Characteristic bo Hammer-drilling Tem- I: 35	drilled hor of the bar ond resistant with standar °C / 60 °C	nce, com	er seism φ bined pu oit or holl	10 1 llout an ow drill	on per 2 14 d conc	16 rete co	18 one f	cat 20 failu	22 re ete)	ry C	25		28	30	
Nominal diamete Characteristic bo Hammer-drilling Tem- perature 1: 35	drilled hor of the bar ond resistant with standar °C / 60 °C	nce, com	er seism Φ bined pu	10 1 10 1 10 t an 10 drill 7,0 7	on per 2 14 d conc bit (dr ,0 6,7	16 rete coy or w	18 one 1 et co	20 failu	22 re ete)	24 6,7	1 25 6,7	26	28 6,7	6,7	4,8
Nominal diamete Characteristic bo Hammer-drilling Temperature I: 35 perature II: 50	drilled hor of the bar ond resistant with standa °C / 60 °C °C / 72 °C	nce, com ard drill b	φ bined pu bit or holl [N/mm²]	10 1	on per 2 14 d conc bit (dr ,0 6,7 ,0 6,7	16 rete coy or w	18 one 1 et co	20 failu 5,7 5,7	22 re ete) 6,7 6,7	24 6,7	1 25 6,7	26	28 6,7	6,7	1 '
Nominal diamete Characteristic bo Hammer-drilling Tem- perature range II: 50 Hammer-drilling	drilled hor of the bar ond resistant with standa °C / 60 °C °C / 72 °C	nce, com ard drill b	φ bined pulit or hollo	10 1	on per 2 14 d conc bit (dr ,0 6,7 ,0 6,7 bit (wa	16 crete coy or w 5,7 5,7 crete fill	18 one 1 et co 5,7 ed h	20 failu oncre 5,7 5,7	22 re ete) 6,7	6,7 6,7	6,7 6,7	6,7 6,7	6,7 6,7	6,7 6,7	4,8
Nominal diamete Characteristic bo Hammer-drilling Tem- I: 35 perature range II: 50 Hammer-drilling Tem- I: 35 perature II: 35	drilled hor of the bar ond resistant with standa °C / 60 °C °C / 72 °C with standa °C / 60 °C	nce, com ard drill b	φ bined pu bit or holl [N/mm²]	10 1	on per 2 14 d conc bit (dr ,0 6,7 ,0 6,7 bit (wa ,5 6,5	16 crete coy or w 5,7 5,7 ster fill 5,7	18 one 1 et co 5,7 5,7 ed h	20 failu 5,7 5,7 ole)	22 re ete) 6,7 6,7	6,7 6,7	6,7 6,7 5,7	6,7 6,7 5,7	6,7 6,7 5,7	6,7 6,7 5,7	4,8
Nominal diamete Characteristic bo Hammer-drilling Temperature range I: 35 Hammer-drilling Temperature range I: 35 II: 50 III	drilled hor of the bar ond resistant with standa °C / 60 °C °C / 72 °C with standa °C / 60 °C °C / 72 °C	nce, coming drill b	φ bined pulit or hollo	10 1	on per 2 14 d conc bit (dr ,0 6,7 ,0 6,7 bit (wa	16 crete coy or w 5,7 5,7 ster fill 5,7	18 one 1 et co 5,7 5,7 ed h	20 failu oncre 5,7 5,7	22 re ete) 6,7	6,7 6,7	6,7 6,7	6,7 6,7	6,7 6,7	6,7 6,7	4,8
Nominal diamete Characteristic bo Hammer-drilling Tem- I: 35 perature range II: 50 Hammer-drilling Tem- I: 35 perature II: 35	drilled hor of the bar ond resistant with standa °C / 60 °C °C / 72 °C with standa °C / 60 °C °C / 72 °C	nce, coming drill b	φ bined pulit or hollo	10 1	on per 2 14 d conc bit (dr ,0 6,7 ,0 6,7 bit (wa ,5 6,5	16 crete coy or w 5,7 5,7 ster fill 5,7	18 one 1 et co 5,7 5,7 ed h	20 failu 5,7 5,7 ole)	22 re ete) 6,7 6,7	6,7 6,7	6,7 6,7 5,7	6,7 6,7 5,7	6,7 6,7 5,7	6,7 6,7 5,7	4,8 4,8 4,8
Nominal diamete Characteristic both Hammer-drilling value Tempression II: 35 perature range II: 35 perature range II: 35 perature range III: 50 Installation factor	drilled hor of the bar ond resistant with standa °C / 60 °C °C / 72 °C with standa °C / 60 °C °C / 72 °C rs	nce, coming drill b	er seism φ bined pu it or holl [N/mm²] it or holl [N/mm²]	10 1	on per 2 14 d conc bit (dr ,0 6,7 ,0 6,7 bit (wa ,5 6,5	16 crete coy or w 5,7 5,7 ster fill 5,7	18 one 1 et co 5,7 5,7 ed h	20 failu 5,7 5,7 ole)	22 re ete) 6,7 6,7	6,7 6,7	6,7 6,7 5,7	6,7 6,7 5,7	6,7 6,7 5,7	6,7 6,7 5,7	4,8 4,8 4,8
Nominal diamete Characteristic both Hammer-drilling Temperature range I: 35 Hammer-drilling Temperature range I: 35 perature range II: 50 Installation factor Tensile load	drilled hor of the bar ond resistant with standa °C / 60 °C °C / 72 °C with standa °C / 60 °C °C / 72 °C rs	nce, coming drill b	φ bined pulit or hollo	10 1	on per 2 14 d conc bit (dr ,0 6,7 ,0 6,7 bit (wa ,5 6,5	16 crete coy or w 5,7 5,7 ster fill 5,7	18 one 1 et co 5,7 5,7 ed h	20 failu 5,7 5,7 ole)	22 re ete) 6,7 6,7 5,7	6,7 6,7	6,7 6,7 5,7	6,7 6,7 5,7	6,7 6,7 5,7	6,7 6,7 5,7	4,8
Nominal diamete Characteristic both Hammer-drilling value Temperature range I: 35 Hammer-drilling value Temperature range I: 35 II: 50 Installation factor Tensile load Dry or wet concret	drilled hor of the bar ond resistant with standa °C / 60 °C °C / 72 °C with standa °C / 60 °C °C / 72 °C rs	nce, combined drill b	er seism φ bined pu it or holl [N/mm²] it or holl [N/mm²]	10 1	on per 2 14 d conc bit (dr ,0 6,7 bit (wa ,5 6,5 ,5 5,8	16 crete coy or w 5,7 5,7 ster fill 5,7	18 one 1 et co 5,7 5,7 ed h	20 failu 5,7 5,7 ole)	22 re ete) 6,7 6,7 5,7	6,7 6,7	6,7 6,7 5,7	6,7 6,7 5,7	6,7 6,7 5,7	6,7 6,7 5,7	4,8 4,8 4,8
Nominal diamete Characteristic bo Hammer-drilling Tem- I: 35 perature range II: 50 Hammer-drilling Tem- I: 35 perature range II: 50 Installation factor Tensile load Dry or wet concret Water filled hole	drilled hor of the bar ond resistant with standa °C / 60 °C °C / 72 °C with standa °C / 60 °C °C / 72 °C rs	nce, combined drill b	er seism φ bined pu it or holl [N/mm²] it or holl [N/mm²]	10 1	on per 2 14 d conc bit (dr ,0 6,7 bit (wa ,5 6,5 ,5 5,8	16 crete coy or w 5,7 5,7 ster fill 5,7	18 one 1 et co 5,7 5,7 ed h	20 failu 5,7 5,7 ole)	22 re ete) 6,7 6,7 5,7	6,7 6,7	6,7 6,7 5,7	6,7 6,7 5,7	6,7 6,7 5,7	6,7 6,7 5,7	4,8

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 r	od / standard threa	ded rod		M12	M16	M20	M24
	eristic bond resistar		bined pu	1000.00	111.13	(42000=15)	*****
	-drilling with standa						
Tem-	I: 35 °C / 60 °C		[N.1/ 2]	3,5	5,8	5,0	3,1
perature [.] range	II: 50 °C / 72 °C	TRk,eq,C2	[N/mm²]	3,3	5,5	4,7	2,9
Hammer-	drilling with standa	rd drill b	it or holl	ow drill bit (wat	er filled hole)		
Tem-	I: 35 °C / 60 °C		[N1/ma ma 2]	3,5	5,8	5,0	3,1
perature · range	II: 50 °C / 72 °C	TRk,eq,C2	[N/mm²]	3,3	5,5	4,7	2,9
Installati	on factors						
Tensile l	oad						
Dry or we	et concrete	- ••	r 1		1	,0	
Water fille	ed hole	γinst	[-]	1	,2	1,	4
Shear loa	ad						
All installa	ation conditions	γ inst	[-]		1	,0	
Displace	ment-Factors for te	nsile loa	d ¹⁾				
δ N,(DLS)-Fac	tor	[mm/	(N/mm2\1	0,09	0,10	0,11	0,12
δN,(ULS)-Fac	tor	7 [111111/	(N/mm ²)]	0,15	0,17	0,17	0,18
Displace	ment-Factors for sh	ear load	2)				
δ v,(DLS)-Fac	tor	- Free	um/kNI1	0,18	0,10	0,07	0,06
δv,(ULS)-Fac	tor		ım/kN]	0,25	0,14	0,11	0,09

¹⁾ Calculation of effective displacement:

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

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

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

2) Calculation of effective displacement:

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

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

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

fischer injection system FIS EM Plus

Essential characteristics under seismic action (performance category C2) for fischer anchor rods and standard threaded rods