



Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments



European Technical Assessment

ETA-17/0979 of 6 December 2018

English translation prepared by DIBt - Original version in German language

General Part

Deutsches Institut für Bautechnik Technical Assessment Body issuing the **European Technical Assessment:** Trade name of the construction product fischer injection system FIS EM Plus Product family Bonded fastener for use in concrete to which the construction product belongs fischerwerke GmbH & Co. KG Manufacturer Otto-Hahn-Straße 15 79211 Denzlingen DEUTSCHLAND Manufacturing plant fischerwerke This European Technical Assessment 37 pages including 3 annexes which form an integral part contains of this assessment EAD 330499-01-0601 This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of This version replaces ETA-17/0979 issued on 6 April 2018



European Technical Assessment ETA-17/0979 English translation prepared by DIBt

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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

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



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

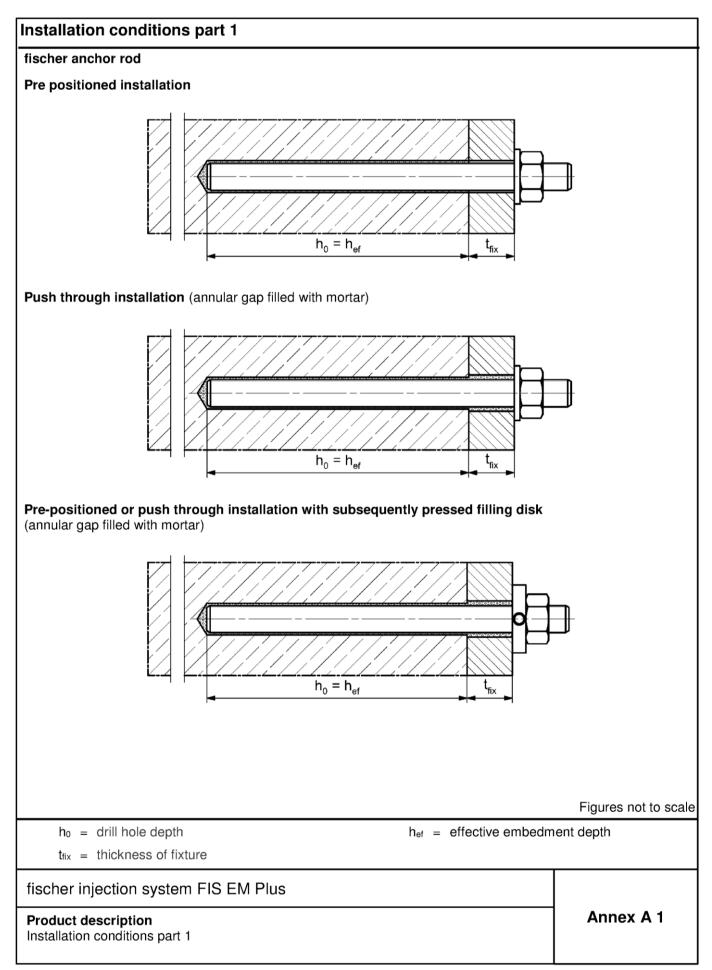
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 6 December 2018 by Deutsches Institut für Bautechnik

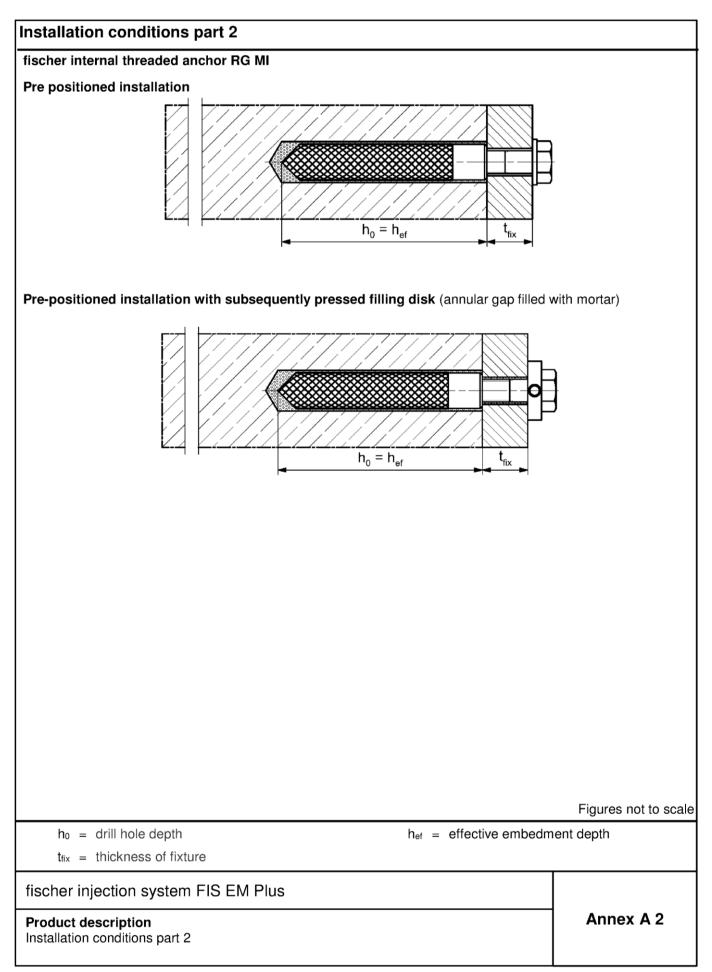
BD Dipl.-Ing. Andreas Kummerow Head of Department

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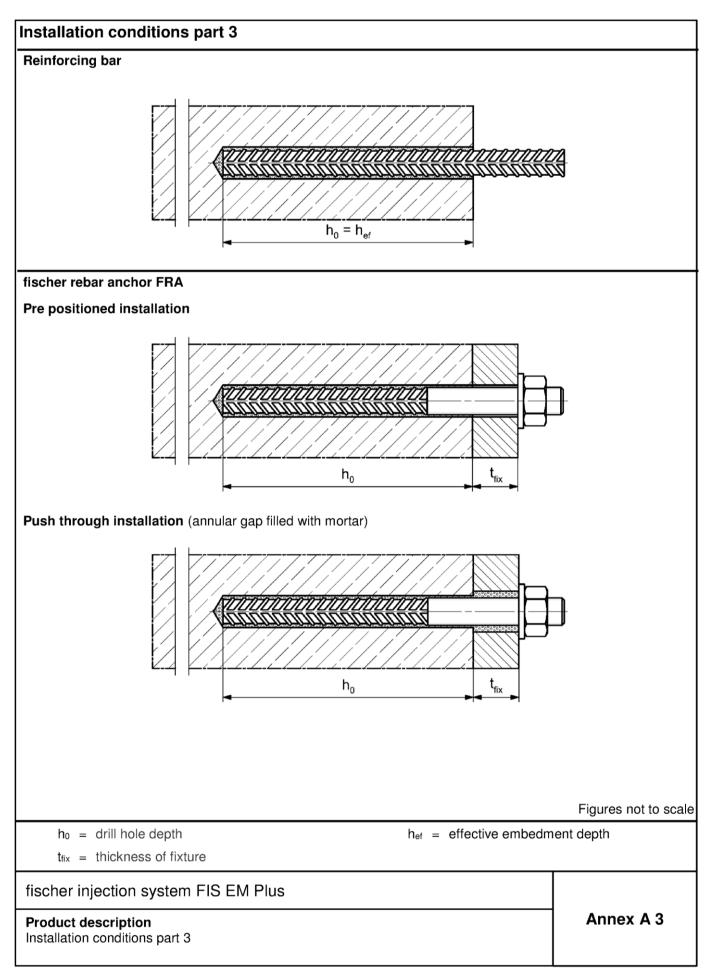














Overview system components part 1	
Injection cartridge (shuttle cartridge) with sealing cap; Size: 390 ml, 585 ml, 1100 ml	, 1500 ml
Imprint: fischer FIS EM Plus, processing notes, shelf-life, pisto scale (optional), curing times and processing times (depending temperature), hazard code, size, volume	on la
Static mixer FIS MR Plus or UMR	
Injection adapter and Extension tube for static mixer	
	∃
Cleaning brush BS / BSB	
Statistististististista kaika kai Taka kaika	
Blow-out pump ABP	
P2	
	Figures not to scale
fischer injection system FIS EM Plus	Ammon A 4
System description Overview system components part 1; cartridges / static mixer / accessories	Annex A 4



Overview system components part 2	
fischer anchor rod	
Size: M8, M10, M12, M14, M16, M20, M22, M24, M27, M30	
بر المراجع الم المراجع المراجع	
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: \$\$, \$10, \$12, \$14, \$16, \$18, \$20, \$22, \$24, \$25, \$26, \$28, \$30, \$32, \$3	34, \$ 36, \$ 40
fischer rebar anchor FRA	
Size: M12, M16, M20, M24	
	Figures not to scale
fischer injection system FIS EM Plus	
System description Overview system components part 2; steel components	Annex A 5



Part	Designation		Mate	erial	
1	Injection cartridge		Mortar, hard	dener, filler	
	Steel grade	Steel, zinc plated		ss steel A	High corrosion resistant steel C
2	Anchor rod	Property class 5.8 or 8.8; EN ISO 898-1:2013 zinc plated \geq 5 µm, EN ISO 4042:1999 A2K or hot-dip galvanized \geq 40 µm EN ISO 10684:2004 $f_{uk} \leq$ 1000 N/mm ² $A_5 > 12\%$ fracture elongation	ÉN ISO 35 1.4401; 1.4 1.4571; 1.4 1.4062, 1.4 EN 1008 f _{uk} ≤ 100 A₅ > fracture € A5 > 8 %, for a	s 50, 70 or 80 506-1:2009 404; 1.4578; 439; 1.4362; 662, 1.4462; 8-1:2014 0 N/mm ² 12% elongation applications wit	
		zinc plated ≥ 5 µm,			
3	Washer ISO 7089:2000	EN ISO 4042:1999 A2K or hot-dip galvanised ≥ 40 μm EN ISO 10684:2004	1.4578 1.4439;	1.4404; ;1.4571; 1.4362; ;8-1:2014	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	50, 70 EN ISO 35 1.4401; 1.4 1.4571; 1.4	ty class) or 80 506-1:2009 404; 1.4578; 439; 1.4362; 8-1:2014	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	EN ISO 35 1.4401; 1.4 1.4571; 1.4	v class 70 506-1:2009 404; 1.4578; 439; 1.4362; 8-1:2014	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 µm, ISO 4042:1999 A2K A ₅ > 8 % fracture elongation	EN ISO 35 1.4401; 1.4 1.4571; 1.4 EN 1008	v class 70 506-1:2009 404; 1.4578; 439; 1.4362; 8-1:2014 ure 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	1.4571; 1.4	404; 1.4578; 439; 1.4362; 8-1:2014	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, clas f_{yk} and k according to NDP o $f_{uk} = f_{tk} = k \cdot f_{yk}$		992-1-1:2004+/	AC:2010
9	fischer rebar anchor FRA	Rebar part: Bars and de-coiled rods clas f _{yk} and k according to NDP o 1992-1-1:2004+AC:2010 f _{uk} = f _{tk} = k · f _{yk}	r NCL of EN		70 or 80 :2009), 1.4401, 1.4404, 1.4571), 1.4362, 1.4062
fisch	ner injection system	FIS EM Plus			
Dred	luct description				Annex A 6



Table B1.1:	Overview use	e and pe	rformand	ce catego	ories				
Anchorages subject	to				FIS EI	VI Plus wit	:h		
		Ancho		fischer threaded RG	anchor	Reinford	cing bar	and FF	r rebar chor RA
Hammer drilling with standard drill bit	######################################			4000000000	all s	izes			
Hammer drilling with hollow drill bit (fischer "FHD", Heller "Duster Expert"; Bosch "Speed Clean"; Hilti "TE-CD, TE-YD")	Ī			Nom		it diameter o 35 mm	r (d ₀)		
Diamond drilling	-				all s	izes			
Static and quasi	uncracked concrete	all sizes	Tables: C1.1 C4.1	all sizes	Tables: C2.1 C4.1	all sizes	Tables C3.1 C4.1	: all sizes	Tables: C3.2 C4.1
static load, in	cracked concrete		C5.1 C9.1		C6.1 C9.2		C7.1 C10.1		C8.1 C10.2
Seismic performance category (only	C1	M10 to M30	Tables: C11.1 C12.2 C13.1			φ10 to φ32	Tables C12.1 C12.2 C13.2		
hammer drilling with standard / hollow drill bits)	C2	M12 M16 M20 M24	Tables: C11.1 C12.2 C14.1	-		-	-		-
l1 Use	dry or wet concrete				all s	izes		·	
category I2	water filled hole				all s	izes			
Installation direction	l	(dov	wnward ar	nd horizont)3 wards (e.g	. overhe	ad) installat	ion)
Installation temperature				T _{i,min}	= -5 °C to	$T_{i,max} = +4$	l0 °C		
In-service	Temperature range I	-40	°C to +60	0°C		ort term ter g term terr		re +60 °C; ə +35 °C)	
temperature	Temperature range II	-40	°C to +72	2°C		ort term ter g term terr		re +72 °C ; e +50 °C)	
fischer injection	system FIS	EM Plus							
Intended use Specifications (par	t 1)							Annex	В 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

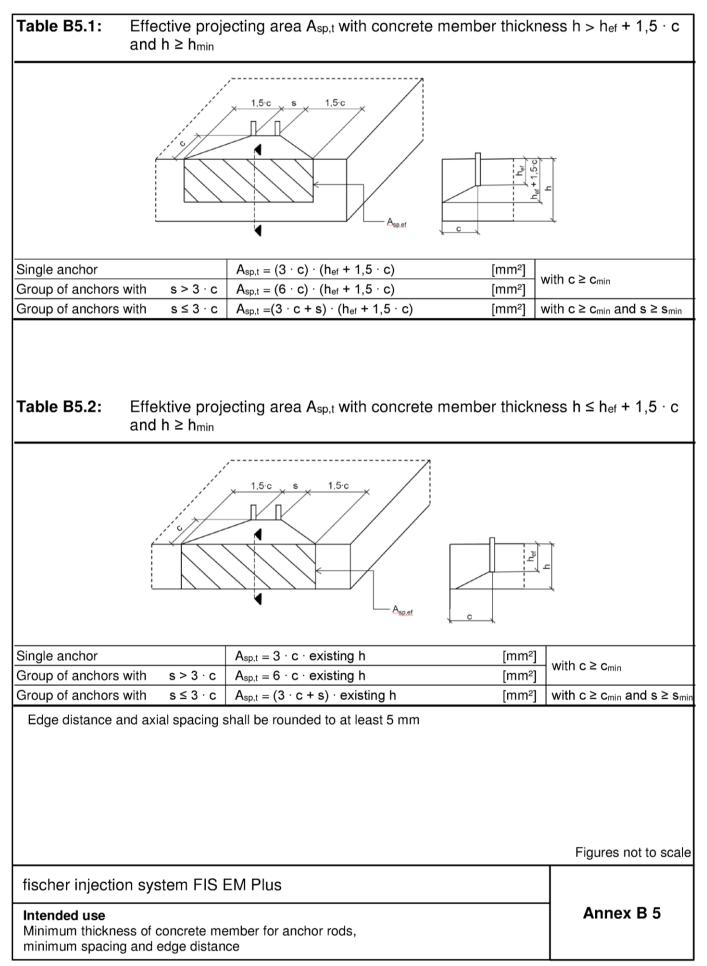


Anchor rods			Thread	M8	M10	M12	M14	M16	M20	M22	M24	M27	M30
Width across flats		SW		13	17	19	22	24	30	32	36	41	46
Nominal drill hole d	iameter	do		10	12	14	16	18	24	25	28	30	35
Drill hole depth		h₀						h ₀ =	h _{ef}				
Effective		h _{ef, min}		60	60	70	75	80	90	93	96	108	120
embedment depth		h _{ef, max}	[mm]	160	200	240	280	320	400	440	480	540	600
Diameter of the clearance hole of	pre positioned installation	df	[]	9	12	14	16	18	22	24	26	30	33
the fixture	push through installation	df		12	14	16	18	20	26	28	30	33	40
Minimum thickness member		h _{min}			h _{ef} + 30 (≥ 100) I				h	l _{ef} + 20	do I		
Maximum torque m attachment of the fi		$max \; T_{\text{fix}}$	[Nm]	10	20	40	50	60	120	135	150	200	300
fischer anchor	rod					Thr	ead-]					
								6	\$ <i>77</i>				B
							_ r _		9				В
Marking (on ran Property class 8. Stainless steel A Alternatively: Col	8, stainless steel 4, property class	, property 50 and h	y class 8 high corro	osion				istant			ty clas	s 80: •	
Property class 8. Stainless steel A Alternatively: Col Installation con	8, stainless steel 4, property class lour coding accor ditions: h h min	, property 50 and h ding to D	y class 8 high corre DIN 976-1			nt stee	d _f	istant s berty c	max 7	0: •• T _{fix} k			
Property class 8. Stainless steel A Alternatively: Col Installation con	8, stainless steel 4, property class lour coding accor ditions: h h h h min ndard threaded re fulfilled hensions and med rtificate 3.1 accor	, property 50 and h ding to D $h_0 = h_{ef}$ rods, wa	y class 8 high corre DIN 976- Ashers a propertie	and he	resista	nt stee	d _f Sw Settin	istant s perty c / g dept also b 6, Tab	max max max dh mar e used	0: •• T _{fix} k d if the 1 pred		wing	
Property class 8. Stainless steel A Alternatively: Col Installation con	8, stainless steel 4, property class lour coding accor nditions:	, property 50 and h ding to D $h_0 = h_{ef}$ rods, wa chanical p rding to E	y class 8 nigh corro NN 976- Ashers a propertie	and he	resista	nt stee	d _f Sw Settin	istant s perty c / g dept also b 6, Tab	max max max dh mar e used	0: •• T _{fix} k d if the 1 pred	e follo	wing	



Anchor rods			M8	M10	M12	M14	M16	-	M20	M22	M2 4
Reinforcing bars (nominal diame	ter)	φ	8	10	12	14	16	18	20	22	24
Minimum edge distance		Ψ	•	10		17	10	10	20		
Uncracked / cracked concrete	Cmin		40	45	45	45	50	55	55	55	60
Minimum spacing	Smin	[mm]	40			accordii	•••			00	00
Minimum spacing	Jinin								,		
Uncracked / cracked concrete	Smin		40	45	55	60	65	85	85	95	105
Minimum edge distance	Cmin	[mm]	-10			accordi				00	100
Required projecting area	Unim					accordin	ig to A		,		
Uncracked concrete		[1000	8	13	22	23	24	38,5	38,5	39,5	40
Cracked concrete	A _{sp,req}	mm ²]	6,5	10	16,5	17,5	18,5	29,5	29,5	30	30,5
Anchor rods			-	-	M27	-	M30	-	-	-	-
Reinforcing bars (nominal diame	eter)	φ	25	26	-	28	30	32	34	36	40
Minimum edge distance	,										
Uncracked / cracked concrete	Cmin		75	75	75	80	80	120	120	135	175
Minimum spacing	Smin	[mm]				accordi	na to Ai	nex B5	5		
Minimum spacing							0				
Uncracked / cracked concrete	Smin		120	120	120	140	140	160	160	160	160
Minimum edge distance	Cmin	[mm]				accordi	na to Ai	nex B5	5		
Required projecting area							0				
Uncracked concrete		[1000	47,5	47,5	47,5	64	64	64	64	64	64
Cracked concrete	A _{sp,req}	_ mm²]	36,5	36,5	36,5	49	49	49	49	49	49
Splitting failure for minimum edge depth h _{ef} . For the calculation of minimum sp embedment depths and thickness	pacing a	and mi	nimum e meml	edge di	stance	of anch	ors in c	ombina	ition wit		ent
depth h _{ef} . For the calculation of minimum sp	pacing a ses of c	and min oncret	nimum e meml A sp,req	edge di bers the < A _{sp,t}	stance followi	of anch	ors in c	ombina	ition wit		ent





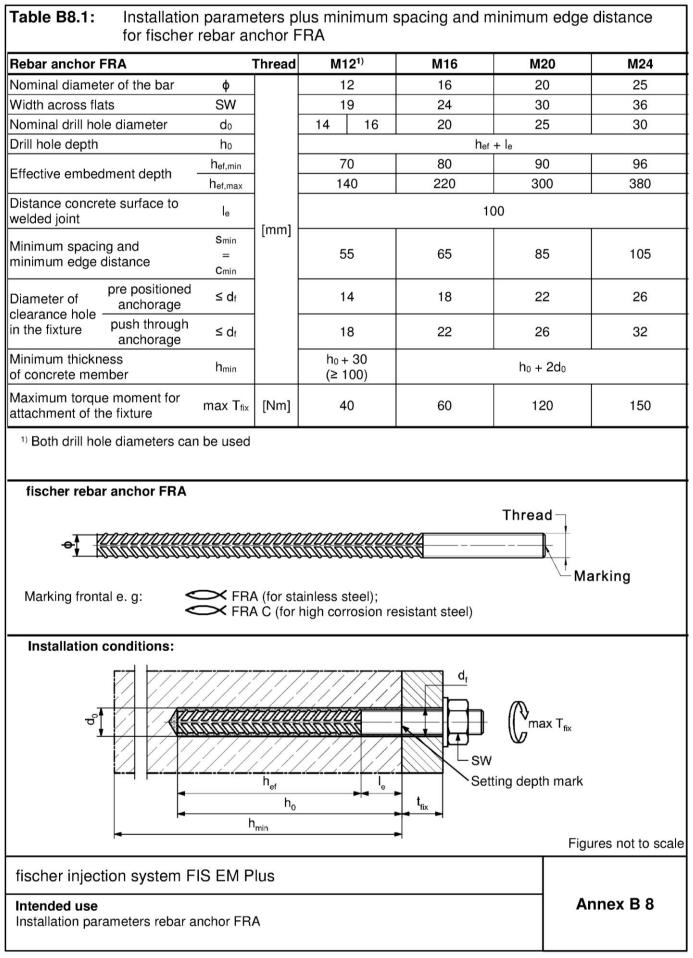


memai inreaueu anche	ors RG MI	Thread	M8	M10	M12	M16	M20
Diameter of anchor	$d_{nom} = d_H$		12	16	18	22	28
Nominal drill hole diameter	do		14	18	20	24	32
Drill hole depth	ho			ŕ	$n_0 = h_{ef} = L_H$		
Effective embedment de $h_{ef} = L_H$)	oth h _{ef}		90	90	125	160	200
Minimum spacing and ninimum edge distance	Smin = Cmin	[mm]	55	65	75	95	125
Diameter of clearance ho he fixture			9	12	14	18	22
Minimum thickness of concrete member	h _{min}		120	125	165	205	260
Maximum screw-in deptr			18	23	26	35	45
Minimum screw-in depth	I _{E,min}		8	10	12	16	20
Maximum torque momer attachment of the fixture	It for max T _{fix}	[Nm]	10	20	40	80	120
High co Retaining bolt or threa strength class of Anne		ing nut an		-	th the appro	priate materia	al and
Installation conditio	1	h _o = h,			(Cmax -	T _{fix}	
	h _{min}						
						Figures	not to sca



Nominal diameter of the bar		φ	8 ¹⁾	10 ¹⁾	12 ¹⁾	14	16	18	20	22	24
Nominal drill hole diameter	do		10 12	12 14	14 16	18	20	25	25	30	30
Drill hole depth	ho						$h_0 = h_{ef}$				
Effective	$\mathbf{h}_{ef,min}$	[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}			ef + 30 2 100)				h _{ef} + 2	2do		
Nominal diameter of the bar		φ	25	26	28	30	32	34	36	40	-
Nominal drill hole diameter	do		30	35	35	40	40	40	45	55	-
Drill hole depth	h₀						$h_0 = h_{ef}$				
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			
 The minimum value of re The rib height must be with the rib height m	lated rib a ithin the ra	rea f _{R,m} ange: 0,	_{in} must f 05 · φ ≤	fulfil the $h_{rib} \leq 0$	require	ments		992-1-	1:2004+	AC:201	0
The minimum value of rel	lated rib a ithin the ra	rea f _{R,m} ange: 0,	in must f 05 · φ ≤ 0 height)	fulfil the $h_{\rm rib} \leq 0$	e require	ments		992-1-	1:2004+	AC:201	0
 The minimum value of ref. The rib height must be with (φ = Nominal diameter of Installation conditions: 	lated rib a ithin the ra	rea f _{R,m} ange: 0, n _{rib} = rib	in must f 05 · φ ≤ 0 height)	fulfil the $h_{\rm rib} \leq 0$	require					AC:201	0
 The minimum value of relation of the minimum value of relation (φ = Nominal diameter of Installation conditions: 	lated rib a ithin the rather bar , h	rea $f_{R,m}$ ange: 0, $h_{rib} = rib$	in must f $05 \cdot \phi \le 0$ height)	fulfil the $h_{\rm rib} \leq 0$	e require		of EN 1		ark	AC:201	
 The minimum value of ref. The rib height must be with (φ = Nominal diameter of Installation conditions: 	lated rib a ithin the rather bar , h	rea $f_{R,m}$ ange: 0, $h_{rib} = rib$	in must f $05 \cdot \phi \le 0$ height)	fulfil the $h_{\rm rib} \leq 0$	e require		of EN 1		ark		

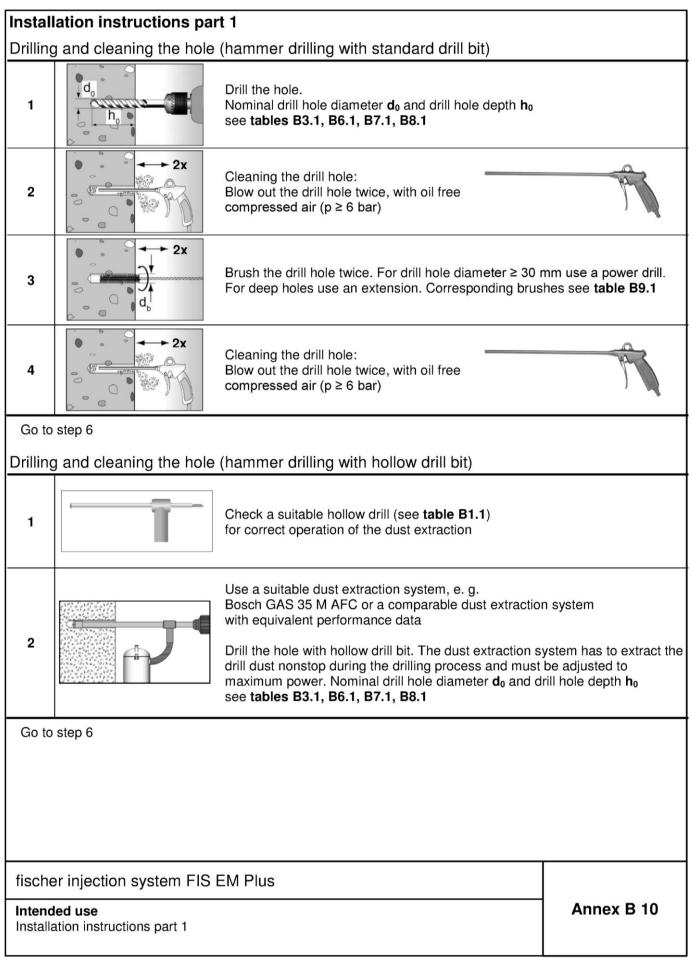






$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Nominal drill hole		brush re	efers	to the	drill h	nole d	iamet	er									
Side Drush liameterdb11141620252627304042475Table B9.2Maximum processing time of the mortar and minimum curing time (During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature)Minimum curing time torkTemperature at anchoring base [°C]Maximum processing time tworkMinimum curing time tcureTemperature at anchoring base (°C]Maximum processing time tworkMinimum curing time toureTemperature at anchoring base (°C)Maximum processing time tworkMinimum curing time toureTemperature at anchoring base (°C)Maximum processing time tworkMinimum curing time toureTemperature at anchoring base (°C)Maximum processing time two theMinimum curing time toureTemperature at anchoring base (°C)Maximum processing time two theMinimum curing time toureTemperature at anchoring base (°C) <td>diameter</td> <td>do</td> <td>[mm]</td> <td>10</td> <td>12</td> <td>14</td> <td>16</td> <td>18</td> <td>20</td> <td>24</td> <td>25</td> <td>28</td> <td>30</td> <td>32</td> <td>35</td> <td>40</td> <td>45</td> <td>5</td>	diameter	do	[mm]	10	12	14	16	18	20	24	25	28	30	32	35	40	45	5
Fable B9.2Maximum 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 tworkMinimum curing time tcure-5to -1240 min200 h-5to +4150 min90 h+5to +9120 min40 h+10to +1930 min18 h+20to +2914 min10 h+30to +407 min5 h	Steel brush Jiameter	db	[,,,,,]	11	14	16	2	0	25	26	27	30		40		42	47	5
Temperature at anchoring base $[^{\circ}C]$ Maximum processing time t_{work} Minimum curing time 	ారీ	(Duri	ng the	e cur	ing ti	me c	of the	mor	tar th	ne co						ly not	t fall	
anchoring base [°C]Maximum processing time tworkMinimum curing time tcure-5 to -1240 min200 h ± 0 to +4150 min90 h ± 0 to +9120 min40 h+10 to +1930 min18 h+20 to +2914 min10 h+30 to +407 min5 h			v the	listec	nım t	Imur	n ten	npera	ature)								
±0 to +4150 min90 h+5 to +9120 min40 h+10 to +1930 min18 h+20 to +2914 min10 h+30 to +407 min5 h	anchoring bas			Ma	ıximur	•		ng tim	е				Minir		-	time		
+5 to +9120 min40 h+10 to +1930 min18 h+20 to +2914 min10 h+30 to +407 min5 h	-5 to -1					240 ı	min							200) h			
+10 to +1930 min18 h+20 to +2914 min10 h+30 to +407 min5 h																		
+20 to +29 14 min 10 h +30 to +40 7 min 5 h																		
+30 to +40 7 min 5 h																		
	o in wet concrete							55 mu	SUDE									







1		Drill the hole. Drill hole diameter d ₀ and nominal drill hole depth h see tables B3.1, B6.1, B7.1, B8.1		Break the drill core and remove it
2		Flush the drill hole with cl	ean water until it flows clear	
3	→ 2x	Blow out the drill hole twic	e, using oil-free compresse	d air (p > 6 bar)
4		Brush the drill hole twice a Corresponding brushes se		
5		Blow out the drill hole twic	e, using oil-free compresse	d air (p > 6 bar)
Prepa	ring the cartridge			
) = ← =	Remove the sealing cap		
6	→ =	Screw on the static mixer (the spiral in the static mix	er must be clearly visible)	
7	Fischer EX		Place the cartridge into the	e dispenser
8	X	×	Extrude approximately 10 the resin is evenly grey in mortar that is not uniformly	colour. Do not use
fisch	er injection system FIS	EM Plus		
Inten	ded use			Annex B 11



	lation instructions part 3			
Injectio	on 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	th ≥ 150 mm tube	For overhead installa holes ($h_0 > 250 \text{ mm}$) diameter ($d_0 \ge 40 \text{ mm}$ injection-adapter	or drill hole
Installa	ation of anchor rods or fischer internal threade	ed anchors RG N	/1	
10		Mark the setting of anchor rod or fisc anchor down to the slightly while doin After inserting the	nd oil-free anchor ele depth of the anchor. I her internal threaded he bottom of the hole g so. anchor element, ex around the anchor e	Push the d RG MI e, turning it cess mortar
	For overhead installations support the anchor rod with wedges. (e. g. fischer centering wedges)		throwins the	r push bugh tallation fill annular ga h mortar
11	Wait for the specified curing time t _{cure} see table B9.2	12	fix) fixing fixi	ounting the ture ax T _{fix} see bles B3.1 d B6.1
Option	After the minimum curing (annular clearance) may I Compressive strength ≥ 5 FIS SB, FIS V, FIS EM PI ATTENTION: Using fischer anchor)	be filled with mortar 0 N/mm ² (e.g. fisch us)	via the fischer filling er injection mortars	disc FFD. FIS HB,
fische	er injection system FIS EM Plus			
	led use ation instructions part 3		Anne	ex B 12
2.18				8.06.01-730/18



Instal	lation instructions par	t 4			
	ation reinforcing bars a		Inchor	FRA	
10		depth. Turn while u	ising for	e reinforcing bars or fischer l ce to push the reinforcemer e setting depth mark	FRA. Mark the setting ht bar or the fischer FRA
		When the setting d from the mouth of t	epth ma he drill	urk is reached, excess mortanole.	ar must be emerged
11	Wait for the time t _{cure} set	specified curing e table B9.2	12		Mounting the fixture max T _{fix} see table B8.1
fische	er injection system FIS	EM Plus			
	led use ation instructions part 4				Annex B 13



Tabl		tial charac f fischer a						-	-	-		ensile	/ she	ar
Anch	or rod / standard th	readed rod			M8	M10	M12	M14	M16	M20	M22	M24	M27	M30
Beari	ng capacity under t	ensile load	, stee	el fail	ure				_					
C X,s	Steel zinc plated		5.8		19(17)	29(27)	43	58	79	123	152	177	230	281
erstic e N _{Rk,s}	Steel zinc plated		8.8		29(27)	47(43)	68	92	126	196	243	282	368	449
laracter stance	Stainless steel A4	Property class	50	[kN]	19	29	43	58	79	123	152	177	230	281
Characterstic esistance N _{Rk}	and high corrosion		70		26	41	59	81	110	172	212	247	322	393
C G	resistant steel C		80		30	47	68	92	126	196	243	282	368	449
Partia	al factors ¹⁾													
5	Steel zinc plated		5.8						1,5	0				
Partial factor ^{YMs,N}		Property	8.8						1,5					
tial f γ _{Ms} ,	Stainless steel A4	class	50	[-]					2,8					
Parl	and high corrosion resistant steel C		70						1,50 ²⁾ /	,				
	-		80						1,6	0				
	ng capacity under s	hear load,	steel	failu	re									
(0	out lever arm	1	5.0		0(0)	15(10)	01	00	20	61	70	00	115	1 4 1
rstic V ^{0_{Rk,s}}	Steel zinc plated		5.8		9(8)	15(13)	21	29	39	61	76	89	115	141
Characterstic ssistance V ^{0_{Rk}}		Property	8.8	TLA IT	· , ,	23(21) 15	34	46	63	98	122 76	141	184	225 141
naracte stance	Stainless steel A4	class	50	[kN]	9		21 30	29	39 55	61	107	89 124	115 161	197
Ch: esis	and high corrosion resistant steel C		70 80		13 15	20 23	30	40 46	63	86 98	107	141	184	225
 Ductili	ity factor		60 k7	[-]	15	23	34	40	1,0		122	141	104	225
	ever arm		Ν/							,				
			5.8		19(16)	37(33)	65	104	166	324	447	560	833	1123
¶°.:	Steel zinc plated		8.8		. ,	60(53)	105	167	266	519	716	896	1333	1797
Charact. stance M ⁰ _{Rk,s}	Stainless steel A4	Property class	50	[Nm]	19	37	65	104	166	324	447	560	833	1123
	and high corrosion	Class	70		26	52	92	146	232	454	626	784	1167	1573
resi	resistant steel C		80		30	60	105	167	266	519	716	896	1333	1797
Partia	al factors ¹⁾													
-	Steel zinc plated		5.8						1,2	5				
acto		Duanantu	8.8						1,2	5				
ial fi Y _{Ms,}	Stainless steel A4	Property class	50	[-]					2,3	8				
Partial factor	and high corrosion		70						1,25 ²⁾ /	1,56				
_	resistant steel C		80						1,3	3				
²⁾ O ³⁾ Va	absence of other na nly admissible for ste alues in brackets are andard threaded rods	el C, with fyl valid for une	k / f _{uk} dersiz	≥ 0,8 zed th	readed	rods wi	th sma	aller st	ancho ress ar	r rods) ea As	for hot	dip ga	lvanize	d
fiscl	her injection syste	m FIS EM	1 Plu	IS										
Esse	ormance ential characteristics f dard threaded rods	or the steel	beari	ng ca	pacity o	of fische	r ancł	nor rod	s and			Anne	ex C 1	



19 29 26 26	29 47 41 41	43 68 59 59 1,50 1,50	M16 79 108 110 110	M20 123 179 172 172
19 29 26	47 41	68 59 59 1,50 1,50	108 110	179 172
26	41	59 59 1,50 1,50	110	172
		59 1,50 1,50		
26	41	1,50 1,50	110	172
	· · · · · ·	1,50		
		1,50		
		1,87		
		1,87		
9,2	14,5	21,1	39,2	62,0
14,6	23,2	33,7	54,0	90,0
12,8	20,3	29,5	54,8	86,0
12,8	20,3	29,5	54,8	86,0
		1,0		
			r	
				337
				519
				454
26	52	92	232	454
		4.05		
		,		
		,		
		1,56		
	14,6 12,8	14,6 23,2 12,8 20,3 12,8 20,3 12,8 20,3 20 39 30 60 26 52	14,6 23,2 33,7 12,8 20,3 29,5 12,8 20,3 29,5 12,8 20,3 29,5 12,8 20,3 29,5 12,8 20,3 29,5 1,0 1,0 20 39 68 30 60 105 26 52 92	14,6 23,2 33,7 54,0 12,8 20,3 29,5 54,8 12,8 20,3 29,5 54,8 12,8 20,3 29,5 54,8 12,8 20,3 29,5 54,8 12,8 20,3 29,5 54,8 1,0 1,0 1,0 20 39 68 173 30 60 105 266 26 52 92 232 26 52 92 232 1,25 1,25 1,25 1,56 1,56 1,56

Performance

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

Annex C 2



Table C3.1:Essential chaload of reinfo				the	steel	bea	arin	g c	ap	aci	ity ı	und	er	ter	sile	/ s	nea	r
Nominal diameter of the bar		φ	8	10	12 14	16	18	20	22	24	25	26	2	8 3	0 32	2 34	36	40
Bearing capacity under tensile lo	oad, ste	el failu	ure	·				<u> </u>			-							
Characterstic resistance	N _{Rk,s}	[kN]							ŀ	∖ _s · f	uk ¹⁾							
Bearing capacity under shear loa	ad, stee	l failu	re															
Without lever arm																		
Characterstic resistance	V ⁰ Rk,s	[kN]						0),5	· As	• f uk	1)						
Ductility factor	k ₇	[-]								0,8	}							
With lever arm																		
Characteristic resistance	M ⁰ Rk,s	[Nm]						1,	,2	· We	ı · f ul	(1)						
Table C3.2: Essential cha						bea	arin	g c	ap	aci	ity ı	und	er	ter	sile	/ sl	nea	r
fischer rebar anchor FRA				M	12		Ν	116				М2	0			Μ	24	
Bearing capacity under tensile lo	oad, ste	el failı	ure															
Characterstic resistance	N _{Rk,s}	[kN]		6	3	Τ	1	11				17	3			2	70	
Partial factor ¹⁾																		
Partial factor	γMs,N	[-]								1,4	ŀ							
Bearing capacity under shear loa	ad, stee	l failu	re															
Without lever arm																		
Characterstic resistance	V ⁰ Rk,s	[kN]		3	0			55				86	3			1	24	
Ductility factor	k 7	[-]								1,0)							
With lever arm																		
Characteristic resistance	Mº _{Rk,s}	[Nm]		9	2		2	33				45	4			7	85	
Partial factor ¹⁾						_												
Partial factor	γMs,V	[-]								1,5	6							
¹⁾ In absence of other national reg	gulations	i																
fischer injection system FIS Performance Essential characteristics for the st rebar anchors FRA			ipac	ity of	reinfo	rcing	bar	s an	nd 1	isch	er			A	nne	ex C	: 3	

Deutsches Institut für Bautechnik

Table C4.1:	Essential char	racter	istics	unc	le	er te	ens	sile	e / s	hea	ar l	oad	k									
Size												A	ll s	izes								_
Tensile load																						
Uncracked cond	crete	k _{ucr,N}											11	,0								
Cracked concre	te	k _{cr,N}	[-]											7								
Factors for the	compressive stren	ngth of	concr	ete	>	C2	20/2	5														
	C25/30												1,0	02								
-	C30/37												1,0	04								
Increasing -	C35/45												1,0	06								
factor for TRK	C40/50	$\Psi_{\rm C}$	[-]										1,0	07								
-	C45/55												1,0	08								
-	C50/60												1,0	09								
Splitting failure	e																					
	h / h _{ef} ≥ 2,0												1,0	h _{ef}								
Edge distance	2,0 > h / h _{e f} > 1,3	Ccr,sp	[4,6	h _{ef}	- 1,8	h							
-	h / h _{ef} ≤ 1,3		[mm]									:	2,26	3 h _{ef}								
Spacing		Scr,sp	1										2 c	cr,sp								
Concrete cone	failure																					_
Edge distance		Ccr,N	[]										1,5	h _{ef}								
Spacing		Scr,N	[mm]										2 c	cr,N								
Shear load																						
Installation facto	or	γinst	[-]										1	,0								
Concrete pry-o	out failure																					
Factor for pry-o	ut failure	k ₈	[-]										2	,0								
Concrete edge	failure																					
The value of h _{ef} under shear loa			[-]			C	Cond	diti	ons a	acco	ordi	ng	to 1	992-	4:20	18;	Sec	ctio	n 7.4	.3		
Calculation dia	meters																					
Size				Μ	8	N	/ 10	T	M12	M	14	М	16	M2	0 N	122	М	24	M2	7	M	30
fischer anchor r standard thread		d _{nom}		8	;		10	T	12	1	4	1	6	20		22	2	24	27	,	3	0
fischer internal threade	d anchors RG MI	d _{nom}	[mm]	12	2		16		18		-	2	2	28		-		-	-		-	
fischer rebar an	chor FRA	d_{nom}		-			-		12		-	1	6	20		-	2	25	-		-	
Size (nominal d	iameter of the bar)		ф	8	1	0	12	14	16	18	20) 22	2 2	4 2	5 26	28	3 30	3	2 34	4 36	6	40
Reinforcing bar		dnom	[mm]	8	1	0	12	14	16	18	20) 22	2 2	4 2	5 26	28	3 30) 3	2 34	1 30	6	40
fischer injec	tion system FIS E	EM Pl	us																			

Performance

Essential characteristics under tensile / shear load

Annex C 4



Table C5.1:	Essential standard uncracke	thread	ded rods	s in ha	amme						or ro	ds an	d
Anchor rod / stan	dard thread	ed rod		M8	M10	M12	M14	M16	M20	M22	M24	M27	M30
Combined pullou			e failure		mite			inite	III 20	IVIZZ	1112-1	10127	moo
Calculation diamet		d	[mm]	8	10	12	14	16	20	22	24	27	30
Uncracked concr	ete												
Characteristic bo	nd resistand	ce in un	cracked o	concre	ete C20)/25							
Hammer-drilling w	ith standard o	drill bit o	r hollow d	rill bit (dry or	wet co	ncrete)						
Tem- I: 35	°C / 60 °C			18	18	18	17	17	16	15	15	15	14
perature II: 50	°C / 72 °C	$\tau_{Rk,ucr}$	[N/mm ²]	18	17	17	16	16	15	14	14	14	13
Hammer-drilling w	ith standard o	drill bit o	r hollow d	rill bit (water f	filled h	<u>ole)</u>						
	°C / 60 °C			16	16	15	13	13	11	11	10	10	9
perature II: 50	°C / 72 °C	$\tau_{Rk,ucr}$	[N/mm²]	15	14	14	13	12	11	10	10	9	9
Diamond-drilling (d	dry or wet cor	ncrete a	s well as v	water f	illed ho	le)							
	°C / 60 °C			16	15	13	12	12	10	10	10	9	9
perature	°C / 72 °C	$\tau_{Rk,ucr}$	[N/mm ²]	15	14	12	11	11	10	9	9	8	8
Installation factor										•		•	-
Dry or wet concret								1.	,0				
Water filled hole		γinst	[-]					1,	,4				
Cracked concrete	•												
Characteristic bo	nd resistand	ce in cra	acked cor	ncrete	C20/2	5							
<u>Hammer-drilling w</u>	ith standard o	drill bit o	r hollow d	rill bit (dry or	wet co	ncrete)						
	°C / 60 °C		[NI/mm2]	7,5	7,5	9	8,5	8,5	8,5	8,5	8,5	8,5	8,5
perature II: 50	°C / 72 °C	$ au_{Rk,cr}$	[N/mm²]	7,5	7,5	9	8,5	8,5	8,5	8,5	8,5	8,5	8,5
Diamond - drilling	(dry or wet co	oncrete)											
	°C / 60 °C			7	7	7	7	6	6	7	7	7	7
perature range II: 50	°C / 72 °C	$\tau_{\rm Rk,cr}$	[N/mm²]	7	7	7	7	6	6	7	7	7	7
Hammer-drilling w	ith standard o	drill bit o	r hollow d	rill bit a	and dia	mond-	drilling	(water	filled h	nole)			
Tem- I: 35	°C / 60 °C			6	7,5	7,5	7	6	6	6	6	6	6
perature — range II: 50	°C / 72 °C	$\tau_{\rm Rk,cr}$	[N/mm²]	6	7	7	7	6	6	6	6	6	6
Installation factor													
Dry or wet concret								1,	,0				
Water filled hole		γinst	[-]			1,2					1,4		
fischer injectio Performance Essential charact threaded rods	-			r fische	er anch	or rod	and sta	andard			Anne	ex C 5	5



Table C6.1:		RG MI				for fischer holes; unc r		
Internal threaded	d anchor RG	МІ		M8	M10	M12	M16	M20
Combined pullo	ut and concr	ete con	e failure					
Calculation diame	eter	d	[mm]	12	16	18	22	28
Uncracked conc	rete							
Characteristic be	ond resistan	ce in un	cracked	concrete C20)/25			
Hammer-drilling v	with standard	drill bit o	r hollow d	rill bit (dry or	wet concrete)			
	°C / 60 °C			15	14	14	13	12
perature range II: 50	°C / 72 °C	$\tau_{Rk,ucr}$	[N/mm ²]	14	13	13	12	11
Hammer-drilling v	with standard	drill bit o	r hollow d	rill bit (water	filled hole)			
	°C / 60 °C			14	12	12	11	10
perature	°C / 72 °C	$\tau_{Rk,ucr}$	[N/mm ²]	13	12	11	10	9
range II: 50 Diamond-drilling (noroto a				11	10	5
	6 °C / 60 °C	ncrete a		13	12	11	10	9
perature		$\tau_{\rm Rk,ucr}$	[N/mm ²]					
range	°C / 72 °C			12	11	10	9	8
Installation facto								
Dry or wet concre	ete	γinst	[-]			1,0		
Water filled hole						1,4		
Cracked concret								
Characteristic be						(dry or wat or	anarata)	
Hammer-drilling v Tem- 1.35			 	7				7
perature	°C / 60 °C	τ _{Rk,cr}	[N/mm ²]	-	6	6	7	7
rango	°C / 72 °C	-		7	6	6	7	7
Hammer-drilling v	vith standard	drill bit o	r hollow d	rill bit and dia	mond-drilling	(water filled h	<u>nole)</u>	
	°C / 60 °C		[N1/mm2]	7	6,5	6	6	6
perature	°C / 72 °C	τRk,cr	[N/mm ²]	7	6	6	6	6
Installation facto	ors							
Dry or wet concre	ete					1,0		
Water filled hole		γinst	[-]		1,2		1,	,4
fischer injection Performance Essential charac	-			r fischer inter	nal threaded	anchors	Anne	ex C 6

RG MI



Table C7.1:Essentialhammer														•					
Nominal diameter of the bar		ф	8	10	12	14	16	18	20	22	24	25	26	28	30	32	34	36	40
Combined pullout and conci	rete con	e failure						-	-			-							
Calculation diameter	d	[mm]	8	10	12	14	16	18	20	22	24	25	26	28	30	32	34	36	40
Uncracked concrete																			
Characteristic bond resistan	ice in un	cracked	cond	cret	e C	20/2	25												
Hammer-drilling with standard	drill bit o	r hollow c	<u>drill b</u>	<u>it (d</u>	ry o	r we	et co	oncre	<u>ete)</u>										
Tem- I: 35 °C / 60 °C			16	15	15	14	14	13	13	13	12	12	12	12	12	12	11	11	11
perature range II: 50 °C / 72 °C	τRk,ucr	[N/mm ²]	15	14	14	13	13	12	12	12	12	11	11	11	11	11	11	10	10
Hammer-drilling with standard	drill bit o	r hollow c	drill b	it (w	vate	r fill	ed h	ole)											
Tem- I: 35 °C / 60 °C				<u> </u>		13			11	11	10	10	10	10	9	9	9	8	8
perature	τRk,ucr	[N/mm ²]			13	12	12		11	10	10	9	9	9	9	8	8	8	8
lange										10	10	9	9	9	9	0	0	0	0
Diamond-drilling (dry or wet co Tem-	nicrete a	s well as '					_		10	10	10	~		~			~		_
perature	- τRk,ucr	[N/mm ²]	\vdash			12	12	11	10	10	10	9	9	9	9	8	8	8	7
range II: 50 °C / 72 °C	,	. ,	15	14	12	11	11	10	10	9	9	9	8	8	8	8	7	7	7
Installation factors																			
Dry or wet concrete	Yinst	[-]									1,0								
Water filled hole											1,4								
Cracked concrete																			
Characteristic bond resistan																			_
Hammer-drilling with standard	drill bit o	<u>r hollow c</u>	<u>drill b</u>	<u>it (d</u>	ry o	r we	et co	oncre	<u>ete)</u>										
Tem- I: 35 °C / 60 °C	TO	[N/mm²]	7	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
range II: 50 °C / 72 °C	τRk,cr		7	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Diamond-drilling (dry or wet co	oncrete)																		
Tem- I: 35 °C / 60 °C			7	7	7	7	6	6	6	7	7	7	7	7	7	5	5	5	5
perature range II: 50 °C / 72 °C	τRk,cr	[N/mm ²]	7	7	7	7	6	6	6	7	7	7	7	7	7	5	5	5	5
Hammer-drilling with standard	drill bit o	r hollow c												-		0	•	Ū	-
Tem- I: 35 °C / 60 °C				7,5					6	6	6	6	6	6	6	5	5	5	5
perature —	τ _{Rk,cr}	[N/mm ²]	\vdash		_														
range II: 50 °C / 72 °C			6	6,5	6,5	6	6	6	6	6	6	6	6	6	6	5	5	5	5
Installation factors																			
Dry or wet concrete	γinst	[-]									1,0								
Water filled hole					1,	,2								1,4					_
fischer injection system	FIS EM	Plus													۸	n		7	
Performance Essential characteristics of te	nsile res	istance fo	or rei	nfor	cing	bai	ſS								An	nex	CC	1	



			of tensile res ond drilled hol				
fischer rebar anchor FRA			M12	M16	M2	0	M24
Combined pullout and concre	te cone	e failure					
Calculation diameter	d	[mm]	12	16	20		25
Uncracked concrete							
Characteristic bond resistanc	e in un	cracked (concrete C20/25	5			
Hammer-drilling with standard d	rill bit o	r hollow d	Irill bit (dry or wet	<u>concrete)</u>			
Tem- I: 35 °C / 60 °C		FN 1 /	15	14	13		12
perature	τRk,ucr	[N/mm ²]	14	13	12		12
Hammer-drilling with standard d	rill bit o	r hollow d	Irill bit (water fille	<u>d hole)</u>			
Tem- I: 35 °C / 60 °C			14	12	11		10
perature II: 50 °C / 72 °C	τRk,ucr	[N/mm ²]	13	12	11		9
Diamond-drilling (dry or wet con	crete as	s well as v	water filled hole)			I	
Tem- I: 35 °C / 60 °C		[N] /	13	12	10		9
perature II: 50 °C / 72 °C	τRk,ucr	[N/mm²]	12	11	10		9
Installation factors							
Dry or wet concrete		r ı		1,	0		
Water filled hole	γinst	[-]		1,	4		
Cracked concrete							
Characteristic bond resistanc	e in cra	cked co	ncrete C20/25				
Hammer-drilling with standard d	rill bit o	r hollow d	Irill bit and diamo	<u>nd-drilling (dry or</u>	wet conc	<u>crete)</u>	
Tem- I: 35 °C / 60 °C		[N/mm²]	8	8	8		8
perature	τRk,cr	[14/11111-]	8	8	8		8
Hammer-drilling with standard d	rill bit o	r hollow d	Irill bit and diamo	nd-drilling (water	filled hole	<u>e)</u>	
Tem- I: 35 °C / 60 °C		[N] /	7	6	6		6
perature II: 50 °C / 72 °C	τRk,cr	[N/mm ²]	7	6	6		6
Installation factors							
Dry or wet concrete	201	[-]		1,	0		
Water filled hole	γinst	[-]	1,	,2		1,4	
fischer injection system F Performance						Ann	ex C 8
Essential characteristics of ten	sile resi	stance fo	r fischer rebar an	chors FRA			



Displacement-Factors for tensile load ¹⁾ Uncracked or cracked concrete; Temperature range I, II SNO-Factor [mm/(N/mm ²)] 0,09 0,10 0,10 0,11 0,1	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	0,19
$ \frac{1}{N_{0} - Factor} \left[mm/(N/mm^{2}) \right] \underbrace{\begin{array}{c} 0,07 & 0,08 & 0,09 & 0,09 & 0,09 & 0,10 & 0,11 & 0,11 & 0,12 & 0,12 \\ 0,11 & 0,12 & 0,13 & 0,14 & 0,15 & 0,16 & 0,17 & 0,18 & 0,19 \\ \hline \end{tabular} \end{tabuar} \end{tabular} \end{tabuar} \end{tabular} $	$ \frac{[mm/(N/mm^2)]}{N_{N_{o}}-F_{actor}} \frac{[mm/(N/mm^2)]}{[0,11]} \frac{0,07}{0,12} \frac{0,08}{0,09} \frac{0,09}{0,09} \frac{0,10}{0,11} \frac{0,11}{0,11} \frac{0,12}{0,12} \frac{0,12}{0,12} \frac{0,12}{0,13} \frac{0,14}{0,15} \frac{0,16}{0,16} \frac{0,17}{0,17} \frac{0,18}{0,18} \frac{0,18}{0,18} \frac{0,18}{0,18} \frac{0,19}{0,27} \frac{0,12}{0,22} \frac{0,10}{0,18} \frac{0,19}{0,14} \frac{0,09}{0,07} \frac{0,07}{0,07} \frac{0,06}{0,09} \frac{0,09}{0,07} \frac{0,09}{0,09} \frac{0,09}{0,08} \frac{0,09}{0,08} \frac{0,09}{0,08} \frac{0,09}{0,08} \frac{0,09}{0,09} \frac{0,09}{0,07} \frac{0,09}{0,07} \frac{0,06}{0,09} \frac{0,09}{0,08} \frac{0,09}{0,08} \frac{0,09}{0,08} \frac{0,09}{0,08} \frac{0,09}{0,08} \frac{0,09}{0,08} \frac{0,09}{0,08} \frac{0,09}{0,09} \frac{0,09}{0,07} \frac{0,06}{0,09} \frac{0,09}{0,08} 0,09$	0,19
$\frac{[mm/(N/mm^2)]}{0,11} 0,12 0,13 0,14 0,15 0,16 0,17 0,18 0,19} 0,19$ Displacement-Factors for shear load ²⁾ Discracked or cracked concrete; Temperature range I, II $\frac{[mm/kN]}{Vo.Factor} [mm/kN] 0,18 0,15 0,12 0,10 0,09 0,07 0,07 0,06 0,05 0,27 0,22 0,18 0,16 0,14 0,11 0,10 0,09 0,08]$ 1) Calculation of effective displacement: $\frac{3N0 = \delta_{N0}.F_{actor} \cdot TEd}{\delta_{N0} = \delta_{N0}.F_{actor} \cdot TEd} 0,00 = \delta_{V0}.F_{actor} \cdot VEd \delta_{V0} = \delta_{V0}.F_{actor} \delta_{V0} = \delta_{V0}$	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	0,19
Non-Factor 0,11 0,12 0,13 0,14 0,15 0,16 0,17 0,18 0,19 Displacement-Factors for shear load?) Jncracked or cracked concrete; Temperature range I, II	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0,0
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	V0-Factor [mm/kN] 0,18 0,15 0,12 0,10 0,09 0,07 0,07 0,06 0,05 V∞-Factor 0,27 0,22 0,18 0,16 0,14 0,11 0,10 0,09 0,07 1) Calculation of effective displacement: 2) Calculation of effective displacement: 2) Calculation of effective displacement: 2) Calculation of effective displacement:	
Wow-Factor[mm/kN]0,270,220,180,160,140,110,100,090,081) Calculation of effective displacement: $\delta_{N0} = \delta_{N0}$ -Factor · Ted $\delta_{V0} = \delta_{V0}$ -Factor · VEd $\delta_{V0} = \delta_{V0}$ -Factor	[mm/kN]0,270,220,180,160,140,110,100,090,081) Calculation of effective displacement:2) Calculation of effective displacement:	
Nww-Factor10,270,220,180,160,140,110,100,090,081) Calculation of effective displacement: $\delta_{N0} = \delta_{N0}$ -Factor · TEd $\delta_{N0} = \delta_{N0}$ -Factor · TEd $\delta_{N0} = \delta_{N0}$ -Factor · TEd $\delta_{N0} = \delta_{N0}$ -Factor · TEd $(\tau_{Ed}: Design value of the applied tensile stress)2) Calculation of effective displacement:\delta_{V0} = \delta_{V0}-Factor · VEd(V_{Ed}: Design value of the applied shear force)Table C9.2:Displacements for fischer internal threaded anchors RG MIInternal threadedinchor RG MIM8M10M12M16M2Displacement-Factors for tensile load1)Jona (0,09)(0,13)0,10)0,110,110,11Joncracked or cracked concrete; Temperature range I, IIII0,090,0160,170,11Important factorinvo-Factor(mm/(N/mm2))0,120,090,080,070,000,180,140,120,100,000,000,001) Calculation of effective displacement:2) Calculation of effective displacement:2) Calculation of effective displacement:$	IVxx-Factor Image: Constraint of the sector 0,27 0,22 0,18 0,16 0,14 0,11 0,10 0,09 0,08 1) Calculation of effective displacement: 2) Calculation of effective displacement: 2) Calculation of effective displacement:	0,07
$ \begin{split} & \delta_{N0} = \delta_{N0}\text{-Factor} \cdot \text{TEd} & \delta_{V0} = \delta_{V0}\text{-Factor} \cdot \text{VEd} \\ & \delta_{N\infty} = \delta_{N\infty}\text{-Factor} \cdot \text{TEd} & \delta_{V\infty} = \delta_{V\infty}\text{-Factor} \cdot \text{VEd} \\ & \delta_{V\infty} = \delta_{V} + \delta_{V} + \delta_{V} + \delta_{V} + \delta_{V} \\ & \delta_{V\infty} = \delta_{V} + \delta_{V} + \delta_{V} + \delta_{V} + \delta_{V} + \delta_{V} + \delta_{V} \\ & \delta_{V\infty} = \delta_{V} + \delta_{V} \\ & \delta_{V\infty} = \delta_{V} + \delta$		
$\begin{split} & \delta_{N\infty} = \delta_{N\infty} \cdot Factor \cdot \tau_{Ed} & \delta_{V\infty} = \delta_{V\infty} \cdot Factor \cdot V_{Ed} \\ & (\tau_{Ed}: Design value of the applied tensile stress) & (V_{Ed}: Design value of the applied shear force) \\ \hline \textbf{Table C9.2: Displacements for fischer internal threaded anchors RG MI} \\ \hline \textbf{mernal threaded nchor RG MI} & M8 & M10 & M12 & M16 & M2 \\ \hline \textbf{mernal threaded or cracked concrete; Temperature range I, II \\ \hline \textbf{Mo} \cdot Factor & [mm/(N/mm^2)] & 0,09 & 0,10 & 0,10 & 0,11 & 0,1 \\ \hline \textbf{Mo} \cdot Factor & [mm/(N/mm^2)] & 0,09 & 0,15 & 0,16 & 0,17 & 0,1 \\ \hline \textbf{Displacement-Factors for shear load^{2}} \\ \hline \textbf{Displacement-Factors for shear load^{2}} \\ \hline \textbf{Displacement-Factors for shear load^{2}} \\ \hline \textbf{Mo} \cdot Factor & [mm/kN] & 0,12 & 0,09 & 0,08 & 0,07 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/kN] & 0,12 & 0,09 & 0,08 & 0,07 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/kN] & 0,12 & 0,09 & 0,08 & 0,07 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/kN] & 0,12 & 0,09 & 0,08 & 0,07 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/kN] & 0,12 & 0,09 & 0,08 & 0,07 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/kN] & 0,12 & 0,09 & 0,08 & 0,07 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/kN] & 0,12 & 0,09 & 0,08 & 0,07 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/kN] & 0,12 & 0,10 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/kN] & 0,12 & 0,09 & 0,08 & 0,07 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/kN] & 0,12 & 0,10 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/kN] & 0,12 & 0,09 & 0,08 & 0,07 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/kN] & 0,12 & 0,09 & 0,08 & 0,07 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/kN] & 0,12 & 0,10 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/kN] & 0,12 & 0,10 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/k] & 0,12 & 0,10 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/k] & [mm/k] & 0,12 & 0,09 & 0,08 & 0,07 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/k] & [mm/k] & 0,12 & 0,10 & 0,0 \\ \hline \textbf{V}_{0} \cdot Factor & [mm/k] & [mm/$	$\delta v_0 = \delta v_$	
(VEd: Design value of the applied tensile stress)(VEd: Design value of the applied shear force)Table C9.2: Displacements for fischer internal threaded anchors RG MIM10M12M16M2Internal threaded nchor RG MIM8M10M12M16M2Displacement-Factors for tensile load ¹⁾ M12M16M2Incracked or cracked concrete; Temperature range I, II0,090,100,110,11No-Factor (mm/(N/mm²))0,090,100,160,170,11Operator Vor-Factor(mm/kN]0,120,090,080,070,00Vol-Factor Vor-Factor0,120,090,080,070,001) Calculation of effective displacement:2) Calculation of effective displacement:2) Calculation of effective displacement:	ONU = ONU-Factor VEd	
Table C9.2: Displacements for fischer internal threaded anchors RG MIInternal threaded unchor RG MIM8M10M12M16M2Displacement-Factors for tensile load ¹)Jncracked or cracked concrete; Temperature range I, II $NO-Factor$ $[mm/(N/mm^2)]$ $0,09$ $0,10$ $0,10$ $0,11$ $0,11$ $No-Factor$ $[mm/(N/mm^2)]$ $0,09$ $0,15$ $0,16$ $0,17$ $0,11$ Displacement-Factors for shear load ²)Jncracked or cracked concrete; Temperature range I, II $NO-Factor$ $[mm/kN]$ $0,12$ $0,09$ $0,08$ $0,07$ $0,0$ $No-Factor$ $[mm/kN]$ $0,12$ $0,09$ $0,08$ $0,07$ $0,0$ $No-Factor$ $[mm/kN]$ $0,18$ $0,14$ $0,12$ $0,10$ $0,0$	$\delta_{N\infty} = \delta_{N\infty} \text{-Factor} \cdot \tau_{Ed} \qquad \qquad \delta_{V\infty} = \delta_{V\infty} \text{-Factor} \cdot V_{Ed}$	
Internal threaded nchor RG MIM8M10M12M16M2Displacement-Factors for tensile load1)Uncracked or cracked concrete; Temperature range I, IINo-Factor No-Factor $[mm/(N/mm^2)]$ $0,09$ $0,10$ $0,10$ $0,11$ $0,11$ On-Factor No-Factor $[mm/(N/mm^2)]$ $0,09$ $0,15$ $0,16$ $0,17$ $0,11$ Displacement-Factors for shear load2) $0,12$ $0,09$ $0,08$ $0,07$ $0,00$ Displacement-Factors for shear load2) $0,12$ $0,09$ $0,08$ $0,07$ $0,00$ Vo-Factor Vo-Factor $[mm/kN]$ $0,12$ $0,09$ $0,08$ $0,07$ $0,00$ 1) Calculation of effective displacement:2) Calculation of effective displacement:2) Calculation of effective displacement:	$(\tau_{Ed}: Design value of the applied tensile stress)$ (V _{Ed} : Design value of the applied shear for	e)
$\begin{array}{c c c c c c c c } \hline \text{ncracked or cracked concrete; Temperature range I, II} \\ \hline \text{NO-Factor} & [mm/(N/mm^2)] & 0,09 & 0,10 & 0,10 & 0,11 & 0,1 \\ \hline \text{NO-Factor} & [mm/(N/mm^2)] & 0,09 & 0,15 & 0,16 & 0,17 & 0,1 \\ \hline \text{isplacement-Factors for shear load}^{2)} \\ \hline \text{ncracked or cracked concrete; Temperature range I, II} \\ \hline \hline \text{NO-Factor} & [mm/kN] & 0,12 & 0,09 & 0,08 & 0,07 & 0,0 \\ \hline \text{O-Factor} & [mm/kN] & 0,12 & 0,14 & 0,12 & 0,10 & 0,0 \\ \hline \text{I}) \text{ Calculation of effective displacement:} \end{array}$	M8 M10 M12 M16	M20
$\frac{\text{NO-Factor}}{\text{No-Factor}} [mm/(\text{N/mm}^2)] \frac{0,09}{0,10} 0,10 0,10 0,11 0,1}{0,13 0,15 0,16 0,17 0,1} 0,11 0,1$ $\frac{\text{No-Factor}}{\text{Displacement-Factors for shear load}^{2}}$ $\frac{\text{Incracked or cracked concrete; Temperature range I, II}}{0,12 0,09 0,08 0,07 0,0} 0,08 0,07 0,0 0,08 0,07 0,0 0,08 0,014 0,12 0,10 0,00 0,00 0,08 0,014 0,12 0,10 0,00 0,00 0,00 0,00 0,00 0,00$	Displacement-Factors for tensile load ¹⁾	
Imm/(N/mm²)] 0,13 0,15 0,16 0,17 0,1 Displacement-Factors for shear load²) Uncracked or cracked concrete; Temperature range I, II Uncracked or cracked concrete; Temperature range I, II Uncracked or cracked concrete; Temperature range I, II Vo-Factor [mm/kN] 0,12 0,09 0,08 0,07 0,0 V∞-Factor [mm/kN] 0,18 0,14 0,12 0,10 0,0 1) Calculation of effective displacement: 2) Calculation of effective displacement: 2) Calculation of effective displacement:	Incracked or cracked concrete; Temperature range I, II	
INVO-Factor 0,13 0,15 0,16 0,17 0,1 Displacement-Factors for shear load ²⁾ Jacracked or cracked concrete; Temperature range I, II 0,12 0,09 0,08 0,07 0,0 WO-Factor [mm/kN] 0,12 0,09 0,08 0,07 0,0 Wo-Factor [1) Calculation of effective displacement: 2) Calculation of effective displacement: 2) Calculation of effective displacement:	N0-Factor [mm/(N/mm ²)] 0,09 0,10 0,10 0,11	0,13
Jncracked or cracked concrete; Temperature range I, IIVO-Factor V \odot -Factor0,120,090,080,070,01) Calculation of effective displacement:2) Calculation of effective displacement:	N∞-Factor 0,13 0,15 0,16 0,17	0,19
V0-Factor [mm/kN] 0,12 0,09 0,08 0,07 0,0 V∞-Factor 0,18 0,14 0,12 0,10 0,0 1) Calculation of effective displacement: 2) Calculation of effective displacement: 2) Calculation of effective displacement:	•	
[mm/kN] 0,18 0,14 0,12 0,10 0,0 1) Calculation of effective displacement: 2) Calculation of effective displacement:		0.05
¹⁾ Calculation of effective displacement: ²⁾ Calculation of effective displacement:	[mm/kN]	
		0,08
$\delta_{N0} = \delta_{N0}$ -Factor · τ_{Ed} $\delta_{V0} = \delta_{V0}$ -Factor · V_{Ed}		
$\delta_{N\infty} = \delta_{N\infty-Factor} \cdot \tau_{Ed} \qquad \qquad \delta_{V\infty} = \delta_{V\infty-Factor} \cdot V_{Ed}$ (τ_{Ed} : Design value of the applied tensile stress) (V _{Ed} : Design value of the applied shear force		force
(τ_{Ed} : Design value of the applied tensile stress) (V _{Ed} : Design value of the applied shear force		10100)



of the b	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)			-										-
	ked or cracked					ure ra	ange	I, II										
N0-Factor		0.07	0,08	_					0,11	0,12	0,12	0,12	0,13	0,13	0,13	0,14	0,14	0,1
N∞-Factor	[mm/(N/mm²)]	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
Displac	ement-Factors	for s	hear	oad ²)		•											
Jncrack	ked or cracked	conc	rete;	Tem	perat	ure ra	ange	I, II										
V0-Factor	[mm/kN]	0,18	0,15	0,12	0,10	0,09	0,08	0,07	0,07	0,06	0,06	0,06	0,05	0,05	0,05	0,04	0,04	0,0
δv∞-Factor		0,27	0,22	0,18	0,16	0,14	0,12	0,11	0,10	0,09	0,09	0,08	0,08	0,07	0,07	0,06	0,06	0,0
1) Calc	ulation of effecti	ve dis	splace	ement	:			2) (Calcu	ation	of eff	ective	disp	lacem	nent:			
δno =	= δ N0-Factor \cdot τ Ed							ä	5vo =	δV0-Fac	tor · Ve	Ed						
δ _{N∞} =	= δ _{N∞-Factor} ・τ _{Ed}							ä	δv∞ =	δv∞-Fac	_{ctor} · V	Ed						
(τ _{Ed} :	Design value of	the a	applie	d tens	sile st	ress)		((V _{Ed} :	Desigi	n valu	e of t	he ap	plied	shea	r forc	e)	
ischer RA	rebar anchor		м	12				M16				M20)			M2	24	
	ement-Factors	for te	ensile	load	1)	_												
-	ked or cracked					ure ra	ange	1, 11										
JIICIACI				,09			-	0,10				0,11				0,1	2	
			0,	00				0,10										
N0-Factor	[mm/(N/mm²)]		,	,13				0,10				0,16				0,1		
ÒN0-Factor ÒN∞-Factor	[mm/(N/mm ²)] ement-Factors	for s	0,	,13)			,				0,16				,		
ຽັN0-Factor ວັN∞-Factor Displac			0, hear l	13 oad ²		ure ra		0,15				0,16				,		
ຽັN0-Factor ວັN∞-Factor Displac	ement-Factors ked or cracked		0, hear l rete;	13 oad ²		ure ra	ange	0,15				0,16				,	18	
ĎN0-Factor ĎN∞-Factor Displac Uncrac I	ement-Factors		0, hear arete; 0,	,13 I oad ² Tem		ure ra	ange	0,15 I, II								0,1	06	
N0-Factor DN∞-Factor Displace Jncrack DV0-Factor	ement-Factors ked or cracked	conc	0, hear rete; 0, 0,	,13 oad ² Tem ,12 ,18	perat		ange	0,15 I, II 0,09	²⁾ Ca	lculat	ion of	0,07	,	lisplac	ceme	0,1	06	
δN0-Factor δN∞-Factor Displac Uncracl δV0-Factor δV∞-Factor 1) Calc	ement-Factors ked or cracked [mm/kN]	conc	0, hear rete; 0, 0,	,13 oad ² Tem ,12 ,18	perat		ange	0,15 I, II 0,09		$lculation = \delta v c$		0,07 0,11 effec	,	lisplac	ceme	0,1	06	
δN0-Factor δN∞-Factor Displac Uncrac Uncrac O Uncrac O O O O O O O O	ement-Factors ked or cracked [mm/kN] ulation of effecti	conc	0, hear rete; 0, 0,	,13 oad ² Tem ,12 ,18	perat		ange	0,15 I, II 0,09	δνα δνα	$\delta = \delta v_0$ $\delta = \delta v_0$)-Factor ∞-Factor	0,07 0,11 effec · V _{Ed} · V _{Ed}	tive d	-		0,1 0,0 0,0 nt:)9	
5N0-Factor 5N∞-Factor Displac Jncracl 5V0-Factor 1) Calc δN0 = δN0 =	ement-Factors ked or cracked [mm/kN] ulation of effecti = δ _{N0-Factor} · τ _{Ed}	conc	0, hear l rete; 0, 0, splace	13 Ioad² Temj 12 18 ement	perati		ange	0,15 I, II 0,09	δνα δνα	$\delta = \delta v \delta$)-Factor ∞-Factor	0,07 0,11 effec · V _{Ed} · V _{Ed}	tive d	-		0,1 0,0 0,0 nt:)9	
N0-Factor Displace Jncracl Jncracl V 0-Factor 1) Calc δ _{N0} = δ _{N∞} =	ement-Factors ked or cracked [mm/kN] ulation of effecti = δ _{N0-Factor} · τ _{Ed}	conc	0, hear l rete; 0, 0, splace	13 Ioad² Temj 12 18 ement	perati		ange	0,15 I, II 0,09	δνα δνα	$\delta = \delta v_0$ $\delta = \delta v_0$)-Factor ∞-Factor	0,07 0,11 effec · V _{Ed} · V _{Ed}	tive d	-		0,1 0,0 0,0 nt:)9	
5N0-Factor 5N∞-Factor Displac Jncracl 5V0-Factor 1) Calc δN0 = δN0 =	ement-Factors ked or cracked [mm/kN] ulation of effecti = δ _{N0-Factor} · τ _{Ed}	conc	0, hear l rete; 0, 0, splace	13 Ioad² Temj 12 18 ement	perati		ange	0,15 I, II 0,09	δνα δνα	$\delta = \delta v_0$ $\delta = \delta v_0$)-Factor ∞-Factor	0,07 0,11 effec · V _{Ed} · V _{Ed}	tive d	-		0,1 0,0 0,0 nt:)9	
5N0-Factor 5N∞-Factor Displac Jncracl 5V0-Factor 1) Calc δN0 = δN0 =	ement-Factors ked or cracked [mm/kN] ulation of effecti = δ _{N0-Factor} · τ _{Ed}	conc	0, hear l rete; 0, 0, splace	13 Ioad² Temj 12 18 ement	perati		ange	0,15 I, II 0,09	δνα δνα	$\delta = \delta v_0$ $\delta = \delta v_0$)-Factor ∞-Factor	0,07 0,11 effec · V _{Ed} · V _{Ed}	tive d	-		0,1 0,0 0,0 nt:)9	
δN0-Factor δN∞-Factor Displac Jncracl δV0-Factor 1) Calc δN0 = δN0 =	ement-Factors ked or cracked [mm/kN] ulation of effecti = δ _{N0-Factor} · τ _{Ed}	conc	0, hear l rete; 0, 0, splace	13 Ioad² Temj 12 18 ement	perati		ange	0,15 I, II 0,09	δνα δνα	$\delta = \delta v_0$ $\delta = \delta v_0$)-Factor ∞-Factor	0,07 0,11 effec · V _{Ed} · V _{Ed}	tive d	-		0,1 0,0 0,0 nt:)9	
δN0-Factor δN∞-Factor Displac Jncracl δV0-Factor 1) Calc δN0 = δN0 =	ement-Factors ked or cracked [mm/kN] ulation of effecti = δ _{N0-Factor} · τ _{Ed}	conc	0, hear l rete; 0, 0, splace	13 Ioad² Temj 12 18 ement	perati		ange	0,15 I, II 0,09	δνα δνα	$\delta = \delta v_0$ $\delta = \delta v_0$)-Factor ∞-Factor	0,07 0,11 effec · V _{Ed} · V _{Ed}	tive d	-		0,1 0,0 0,0 nt:)9	
δN0-Factor δN∞-Factor Displac Jncracl δV0-Factor 1) Calc δN0 = δN0 =	ement-Factors ked or cracked [mm/kN] ulation of effecti = δ _{N0-Factor} · τ _{Ed}	conc	0, hear l rete; 0, 0, splace	13 Ioad² Temj 12 18 ement	perati		ange	0,15 I, II 0,09	δνα δνα	$\delta = \delta v_0$ $\delta = \delta v_0$)-Factor ∞-Factor	0,07 0,11 effec · V _{Ed} · V _{Ed}	tive d	-		0,1 0,0 0,0 nt:)9	
δN0-Factor δN∞-Factor Displac Jncracl δV0-Factor 1) Calc δN0 = δN0 =	ement-Factors ked or cracked [mm/kN] ulation of effecti = δ _{N0-Factor} · τ _{Ed}	conc	0, hear l rete; 0, 0, splace	13 Ioad² Temj 12 18 ement	perati		ange	0,15 I, II 0,09	δνα δνα	$\delta = \delta v_0$ $\delta = \delta v_0$)-Factor ∞-Factor	0,07 0,11 effec · V _{Ed} · V _{Ed}	tive d	-		0,1 0,0 0,0 nt:)9	
δΝ0-Factor δΝ∞-Factor Displac Uncracl δV0-Factor δV∞-Factor 1) Calc δN0 = δN∞ =	ement-Factors ked or cracked [mm/kN] ulation of effecti = δ _{N0-Factor} · τ _{Ed}	conc	0, hear l rete; 0, 0, splace	13 Ioad² Temj 12 18 ement	perati		ange	0,15 I, II 0,09	δνα δνα	$\delta = \delta v_0$ $\delta = \delta v_0$)-Factor ∞-Factor	0,07 0,11 effec · V _{Ed} · V _{Ed}	tive d	-		0,1 0,0 0,0 nt:)9	
δN0-Factor δN∞-Factor Displac Jncracl δV0-Factor 1) Calc δN0 = δN0 =	ement-Factors ked or cracked [mm/kN] ulation of effecti = δ _{N0-Factor} · τ _{Ed}	conc	0, hear l rete; 0, 0, splace	13 Ioad² Temj 12 18 ement	perati		ange	0,15 I, II 0,09	δνα δνα	$\delta = \delta v_0$ $\delta = \delta v_0$)-Factor ∞-Factor	0,07 0,11 effec · V _{Ed} · V _{Ed}	tive d	-		0,1 0,0 0,0 nt:)9	
N0-Factor $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ $\overline{Displac}$ 	ement-Factors ked or cracked [mm/kN] ulation of effecti = δ _{N0-Factor} · τ _{Ed}	ve dis	0, hear I o, 0, splace	13 Ioad ² Tem 12 18 ement	sile st		ange	0,15 I, II 0,09	δνα δνα	$\delta = \delta v_0$ $\delta = \delta v_0$)-Factor ∞-Factor	0,07 0,11 effec · V _{Ed} · V _{Ed}	tive d	-		0,1 0,0 0,0 nt:)9	



load	ntial charac of fischer a n performar	anch	nor r	ods ar	nd sta	ndard	-					əar
Anchor rod / standard th	nreaded rod			M10	M12	– M14	M16	M20	M22	M24	M27	M30
Bearing capacity under	-				formor		a a ru C	<u>`1</u>				
fischer anchor rods and		5.8	ea ro	29(27)	43	58	gory C 79	123	152	177	230	281
في تقليم Steel zinc plated		8.8		47(43)	68	92	126	196	243	282	368	449
	Property	50	[kN]	29	43	58	79	123	152	177	230	281
Stainless steel A4	class	70		41	59	81	110	172	212	247	322	393
C Unaracterstic de C Unaracterstic de Steel zinc plated Stainless steel A4 and high corrosion resistant steel C		80		47	68	92	126	196	243	282	368	449
fischer anchor rods and	standard th		ed ro									
5		5.8		-	39	-	72	108	-	177	-	-
Steel zinc plated		8.8		-	61	-	116	173	-	282	-	-
تَعَدَّ ع ع ک ک ک ک ک ک ک ک ک ک ک ک ک ک ک ک ک	Property	50	[-]	-	39	-	72	108	-	177	-	-
Construction of the second sec	class	70		-	53	-	101	152	-	247	-	-
G ig resistant steel C		80	1	-	61	-	116	173	-	282	-	-
Bearing capacity under	shear load, s	steel	failu	re with	out lev	er arm ¹)		<u> </u>	<u>l</u>		
fischer anchor rods, per												
		5.8		15(13)	21	29	39	61	76	89	115	141
Steel zinc plated		8.8	1	23(21)	34	46	63	98	122	141	184	225
Stainless steel A4	Property class	50	[kN]	15	21	29	39	61	76	89	115	141
and high corrosion	01233	70]	20	30	40	55	86	107	124	161	197
ප <u>හ</u> resistant steel C		80		23	34	46	63	98	122	141	184	225
Standard threaded rods	, performanc	ce ca	tegoi	ry C1								
Steel zinc plated		5.8		11(9)	15	20	27	43	53	62	81	99
Steel zinc plated		8.8		16(14)	24	32	44	69	85	99	129	158
	Property class	50	[kN]	11	15	20	27	43	53	62	81	99
and high corrosion		70		14	21	28	39	60	75	87	113	138
resistant steel C		80		16	24	32	44	69	85	99	129	158
fischer anchor rods and	standard th		ed ro	ds, per	formar	ce cate	egory C	2				
b Steel zinc plated		5.8		-	14	-	27	43	-	62	-	-
	Bronortu	8.8		-	22	-	44	69	-	99	-	-
$\frac{1}{2} \stackrel{>}{_{0}}$ Stainless steel A4	Property class	50	[-]	-	14	-	27	43	-	62	-	-
C Used Steel zinc plated		70		-	20	-	39	60	-	87	-	-
ප <u>හ</u> resistant steel C		80		-	22	-	44	69	-	99	-	-
 Partial factors for perf for fischer anchor rods Values in brackets are standard threaded roc 	s FIS A / RGM valid for und	d the	facto zed th	r for ste readed	el duct rods wi	ility is 1 th smal	ler stres	ss area	As for	hotdip g	alvaniz	ed
fischer injection syst Performance Essential characteristics				pacity f	or fisch	er anch	or rods	and		Ann	ex C 1	1

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



Table C12.1:Essential characteristics for the steel bearing capacity under tensile / shear
load of reinforcing bars (B500B) under seismic action performance category
C1

Nominal diameter of the bar ϕ 10 12 14 16 18 20 22 24 25 26 28 30 32 Bearing capacity under tensile load, steel failure¹

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

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

Characterstic resistance V⁰_{Rk,s,eq,C1} [kN] 15 22 30 39 49 61 74 88 95 102 119 137 155

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

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

Anchor rod / standard threaded rod		M1	0 1	/ 12	M14	M	16	M20	M2	22	M24	M2	7	M30
Nominal diameter of the bar	φ	10	12	14	16	18	20	22	24	25	26	28	30	32
Tensile load, steel failure ¹⁾														-

10113	ne load, steel landre				
z	Stool zing plated		5.8		1,50
γMs,I	Steel zinc plated		8.8		1,50
ctor	Stainless steel A4	Property class	50	r 1	2,86
al fa	and high corrosion	oluoo	70	[-]	1,50 ²⁾ / 1,87
Partial factor y _{Ms,N}	resistant steel C		80		1,60
	Reinforcing bar	B	500B		1,40
Shea	r load, steel failure ¹⁾				
>	Steel zinc plated		5.8		1,25
γMs,			8.8		1,25
ctor	Stainless steel A4	Property class	50	r 1	2,38
al fa	and high corrosion		70	[-]	1,25 ²⁾ / 1,56
Partial factor y _{Ms,v}	resistant steel C		80		1,33
	Reinforcing bar	B	500B		1,50

¹⁾ In absence of other national regulations

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

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Performance

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

Annex C 12



Table C13.1: Essential standard performa	I thread	led rods	s in h												
Anchor rod / standard threa	ded rod		M10) N	112	M14	M	16	M20	M	22	M24	M2	7 1	мзо
Characteristic bond resistan	ice, com	bined pu	llout	and o	conc	rete o	one	failu	re						
Hammer-drilling with standa	rd drill b	it or holl	ow dı	ʻill bi	t (dry	or w	vet c	oncre	ete)						
Tem- I: 35 °C / 60 °C			7,0	7	7,0	6,7	6	,0	5,7	6,	7	6,7	6,7	7	6,7
perature	⁻ τ _{Rk,eq,C1}	[N/mm²]	7,0	7	7,0	6,7	5	,7	5,7	6,	7	6,7	6,7	7	6,7
Hammer-drilling with standa	rd drill b	it or holl	ow dı	ʻill bi	t (wa	ter fi	lled h	nole)							
Tem- I: 35 °C / 60 °C		IN 1 /	7,5	7	7,5	6,5	5	,7	5,7	5,	7	5,7	5,7	7	5,7
perature	⁻ τRk,eq,C1	[N/mm²]	6,8	6	6,8	6,5	5	,7	5,7	5,	7	5,7	5,7	7	5,7
Installation factors															
tensile load															
Dry or wet concrete									1,0						
Water filled hole	- γinst	[-]			1,	2						1,4			
shear load															
All installation conditions	γinst	[-]							1,0						
Table C13.2: Essential drilled ho			nic ad	ction	per	form		e cat	tego	ry C '	1				
Nominal diameter of the bar		<u>ф</u>	10	12	14	16	18	20	22	24	25	26	28	30	32
Characteristic bond resistan	-														
Hammer-drilling with standa	rd drill b	oit or holl	ow dı						, 						
Tem- I: 35 °C / 60 °C	TBk eq C1	[N/mm²]	7,0	7,0	6,7	5,7	5,7	5,7	6,7	6,7	6,7	6,7	6,7	6,7	4,8
range II: 50 °C / 72 °C			7,0	7,0	6,7	5,7	5,7	5,7	6,7	6,7	6,7	6,7	6,7	6,7	4,8
Hammer-drilling with standa	rd drill b	it or holl	ow di	ʻill bi	t (wa	ter fi	lled ł	iole)							
Tem- I: 35 °C / 60 °C		[N]//may reg 21	7,5	6,5	6,5	5,7	5,7	5,7	5,7	5,7	5,7	5,7	5,7	5,7	4,8
perature range II: 50 °C / 72 °C	⁻ τRk,eq,C1	[N/mm²]	6,5	6,5	5,8	5,8	5,7	5,7	5,7	5,7	5,7	5,7	5,7	5,7	4,8
Installation factors															
Tensile load															
Dry or wet concrete		1							1,0						
Water filled hole	- γinst	[-]			1,2						1	,4			
Shear load															
All installation conditions	γinst	[-]							1,0						
fischer injection system Performance Essential characteristics under			perfor	mano		regory	v C1)	for fi	scher		-	Anr	nex (C 13	
anchor rods, standard thread							,							\$ 01-73	



ange II: 50 °C / 72 °C Hammer-drilling with standard of Tem- I: 35 °C / 60 °C berature II: 50 °C / 72 °C III: 50 °C / 72 °C TRK Stallation factors TRK Value rille load Y Shear load Y Shear load Y Displacement-Factors for tensil Y	drill bit or hollo	ow drill bit (dry 3,5 3,3	y or wet concrete 5,8 5,5) 5,0 4,7 5,0 4,7	3,1 2,9 3,1		
Tem-I: $35 \circ C / 60 \circ C$ peratureII: $50 \circ C / 72 \circ C$ TRKangeII: $50 \circ C / 72 \circ C$ TRKammer-drilling with standard ofTRKperatureII: $35 \circ C / 60 \circ C$ peratureII: $50 \circ C / 72 \circ C$ mstallation factorsrensile loadDry or wet concreteVater filled holeVater filled holeNII installation conditionsYDisplacement-Factors for tensile	, _{eq,C2} [N/mm ²] drill bit or hollo	3,5 3,3 ow drill bit (wa 3,5	5,8 5,5 Iter filled hole) 5,8	5,0 4,7 5,0	2,9		
ange II 50 °C / 72 °C τRk Iammer-drilling with standard of em- II 35 °C / 60 °C berature II 50 °C / 72 °C TRk ange II 50 °C / 72 °C TRk ange II 50 °C / 72 °C TRk ange II 50 °C / 72 °C TRk Installation factors Trak Trak Tensile load Y Trak Ory or wet concrete Y Y Vater filled hole Y Y Shear load Y Y Displacement-Factors for tensil Y	drill bit or hollo	3,3 ow drill bit (wa 3,5	5,5 ter filled hole) 5,8	4,7	2,9 3,1		
ange II: 50 °C / 72 °C Hammer-drilling with standard of Tem- I: 35 °C / 60 °C berature II: 50 °C / 72 °C III: 50 °C / 72 °C TRK Stallation factors TRK Value rille load Y Shear load Y Shear load Y Displacement-Factors for tensil Y	drill bit or hollo	ow drill bit (wa 3,5	ter filled hole) 5,8	5,0	3,1		
Hammer-drilling with standard of the standard	_{x,eq,C2} [N/mm ²]	3,5	5,8	-			
Perature ange II: 50 °C / 72 °C II: 50 °C / 72 °C Installation factors Tensile load Dry or wet concrete Vater filled hole Shear load NII installation conditions γ Displacement-Factors for tensil		-		-			
ange II: 50 °C / 72 °C nstallation factors ensile load Dry or wet concrete Vater filled hole Shear load MI installation conditions γ Displacement-Factors for tensil		3,3	5,5	4,7			
nstallation factors ensile load Dry or wet concrete Vater filled hole Shear load Il installation conditions pisplacement-Factors for tensil	/inst [-]				2,9		
Ory or wet concrete γ Vater filled hole γ Shear load γ Ill installation conditions γ Displacement-Factors for tensil	/inst [-]						
Vater filled hole γ Shear load γ Ill installation conditions γ Displacement-Factors for tensil	/inst [-]						
Vater filled hole Shear load MI installation conditions γ Displacement-Factors for tensil	/inst [-]		1,	,0			
All installation conditions γ Displacement-Factors for tensil			1,2		1,4		
Displacement-Factors for tensil							
-	/inst [-]		1,	.0			
	e load ¹⁾						
N,(DLS)-Factor	[mm/(N/mm ²)]	0,09	0,10	0,11	0,12		
N,(ULS)-Factor		0,15	0,17	0,17	0,18		
Displacement-Factors for shear	load ²⁾						
V,(DLS)-Factor	[mm/kN]	0,18	0,10	0,07	0,06		
V,(ULS)-Factor		0,25	0,14	0,11	0,09		
1) Calculation of effective displac	ement:		Calculation of effe		nt:		
$\delta_{N,(DLS)} = \delta_{N,(DLS)}$ -Factor · τ_{Ed}			$\delta V_{,(DLS)} = \delta V_{,(DLS)}$ -Fac				
$\delta_{N,(ULS)} = \delta_{N,(ULS)}$ -Factor · τ_{Ed}	ad taxaila atraa		$\delta V_{,(ULS)} = \delta V_{,(ULS)}$ -Fac		haar faraa)		
$(\tau_{Ed}$: Design value of the applie	ed tensile stress	5)	(V _{Ed} : Design value	or the applied s	near lorce)		

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Performance

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

Annex C 14