DECLARATION OF PERFORMANCE

DoP 0191

for fischer Superbond (Bonded fastener for use in concrete) EN

1. Unique identification code of the product-type:	**DoP 0191**	
2. Intended use/es:	**Post-installed fastening in cracked or uncracked concrete.**	
	See appendix, especially annexes	**B1- B15**
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-12/0258; 2020-06-17**	
Technical Assessment Body:	**DIBt- Deutsches Institut für Bautechnik**	
Notified body/ies:	**1343 MPA Darmstadt / 2873 TU Darmstadt**	

7. Declared performance/s:

Mechanical resistance and stability (BWR 1)

Characteristic resistance to tension load (static and quasi-static loading):	Resistance to steel failure:	Annexes C1- C3	
	Resistance to combined pull- out and concrete cone failure:	Annexes C4- C10	$\tau_{Rk,100}$= NPD
	Resistance to concrete cone failure:	Annex C4	
	Edge distance to prevent splitting under load:	Annexes C4	
	Robustness:	Annex C4-C10, C15, C16	
	Maximum installation torque:	Annexes B4- B8	
	Minimum edge distance and spacing:	Annexes B4- B8	
Characteristic resistance to shear load (static and quasi-static loading):	Resistance to steel failure:	Annexes C1- C3	
	Resistance to pry-out failure:	Annex C4	
	Resistance to concrete edge failure:	Annex C4	
Characteristic resistance and displacements for seismic performance categories C1 and C2:	Resistance to tension load, displacements, category C1:	Annexes C13, C14, C15	
	Resistance to tension load, displacements, category C2:	Annexes C13, C14, C16	
	Resistance to shear load, displacements, category C1:	Annexes C13, C14	
	Resistance to shear load, displacements, category C2:	Annexes C13, C14, C16	
	Factor annular gap:	Annex C13	
Displacements under short-term and long-term loading:	Displacements under short-term and long-term loading:	Annexes C11- C12	

Hygiene, health and the environment (BWR 3)

Content, emission and/or release of dangerous substances:	NPA	

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.

Signed for and on behalf of the manufacturer by:

Thilo Pregartner, Dr.-Ing.

Peter Schillinger, Dipl.-Ing.

Tumlingen, 2020-07-01

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 injection system fischer Superbond is a bonded anchor for use in concrete consisting of a cartridge with injection mortar fischer FIS SB or a resin capsule fischer RSB and a steel element according to Annex A 5.

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 resin capsule is placed into the hole and the steel element is driven by machine with simultaneous hammering and turning. The anchor rod is anchored via the bond between steel element, chemical mortar and concrete

The product description is given in Annex A.

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

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

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

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

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading)	See Annex B 4 to B 8, C 1 to C 10
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1 to C 4
Displacements under short-term and long-term loading	See Annex C 11 and C 12
Characteristic resistance and displacements for seismic performance categories C1 and C2	See Annex C 13 to C 16

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

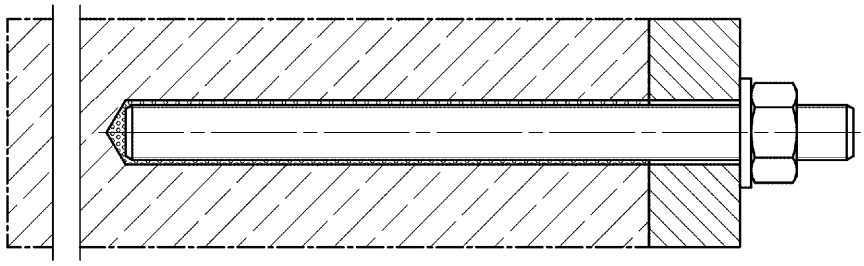
In accordance with the European Assessment Document EAD 330499-01-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

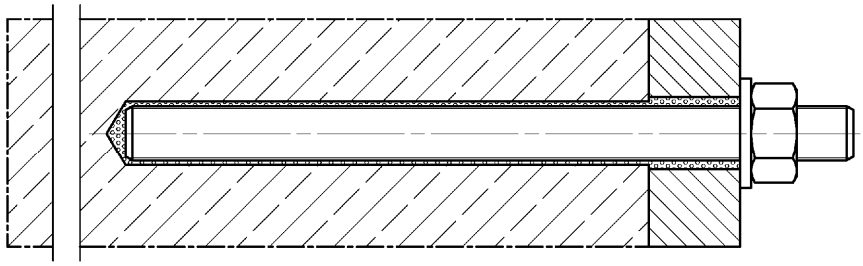
Installation conditions part 1

anchor rod or fischer anchor rod RG M with fischer injection system FIS SB

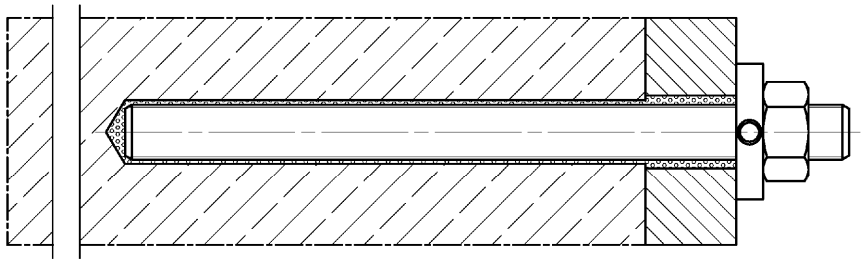
Pre-positioned installation



Push through installation (annular gap filled with mortar)



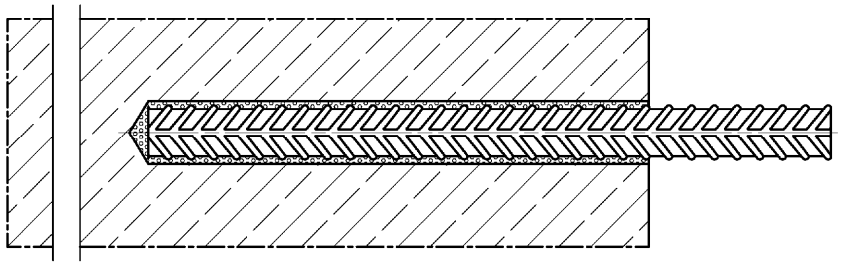
Pre-positioned or push through installation with subsequently injected fischer filling disc
(annular gap filled with mortar)



Figures not to scale

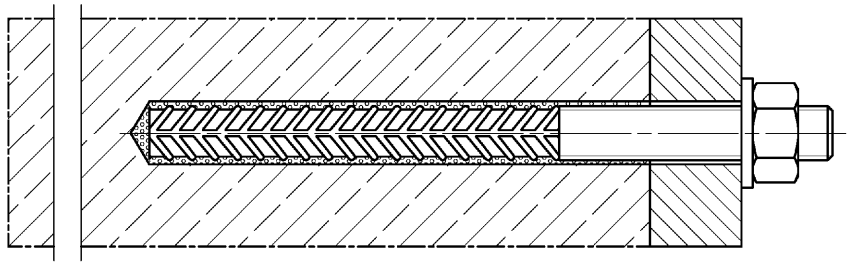
Installation conditions part 2

Reinforcing bar with fischer injection system FIS SB

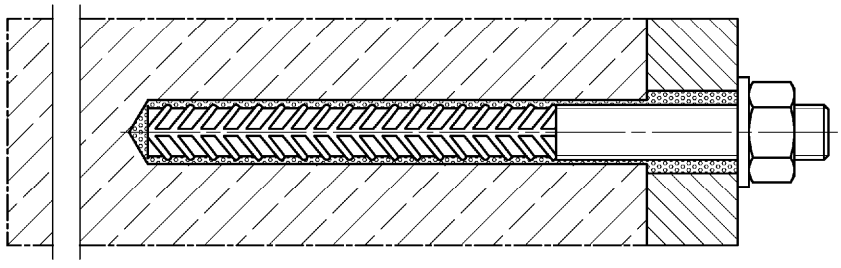


fischer rebar anchor FRA with fischer injection system FIS SB

Pre-positioned installation



Push through installation (annular gap filled with mortar)

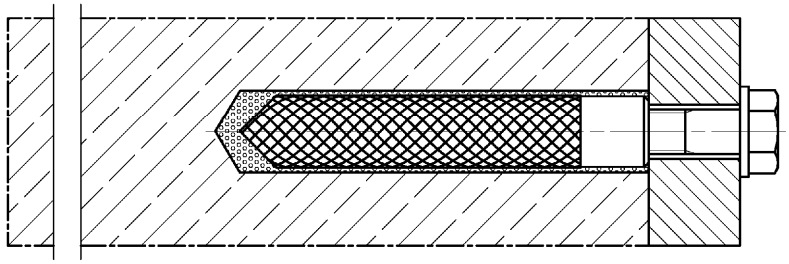


Figures not to scale

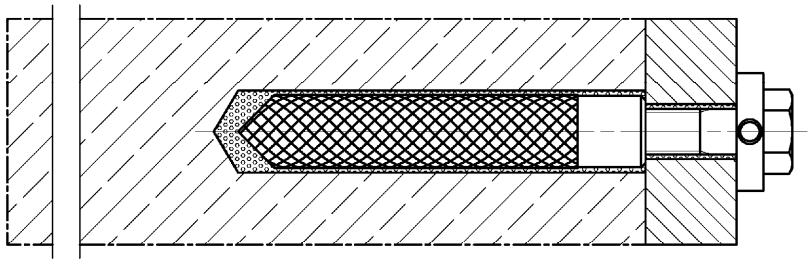
Installation conditions part 3

fischer internal threaded anchor RG MI with fischer resin capsule system RSB or fischer injection system FIS SB

Pre-positioned installation

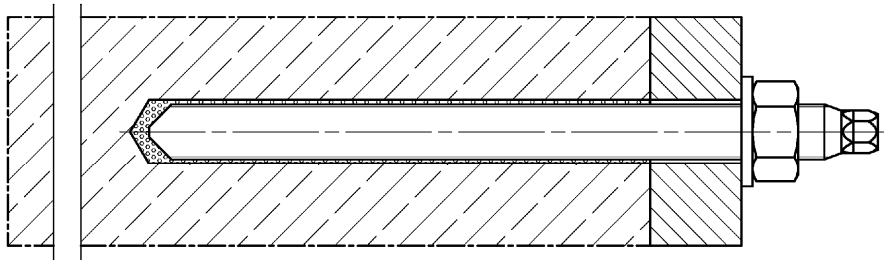


Pre-positioned installation with subsequently injected fischer filling disc (annular gap filled with mortar)

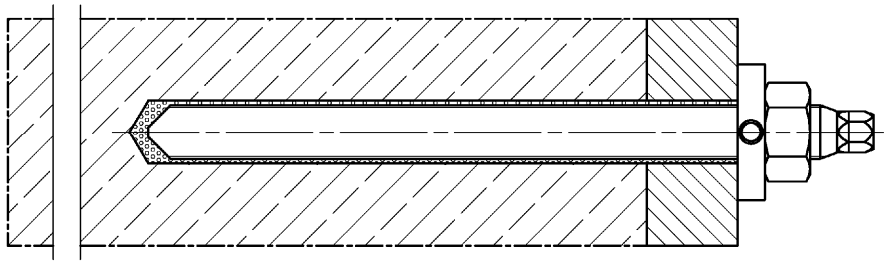


fischer anchor rod RG M with fischer resin capsule system RSB

Pre-positioned installation



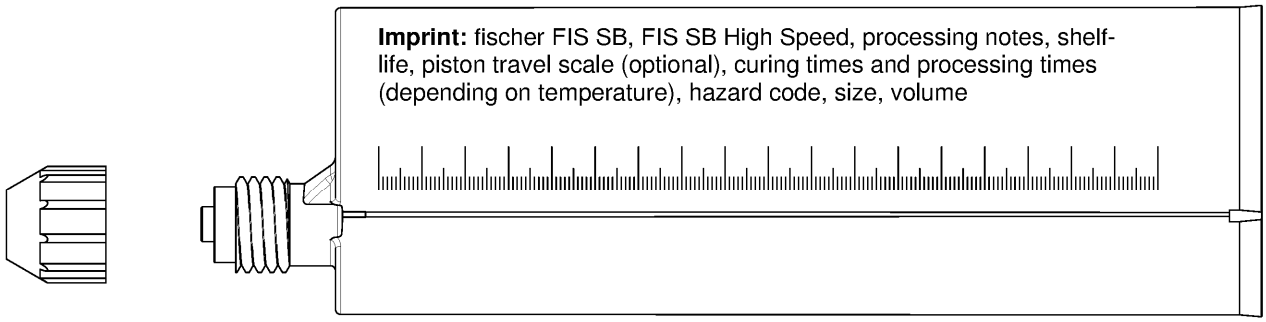
Pre-positioned installation with subsequently injected fischer filling disc (annular gap filled with mortar)



Figures not to scale

Overview system components Part 1

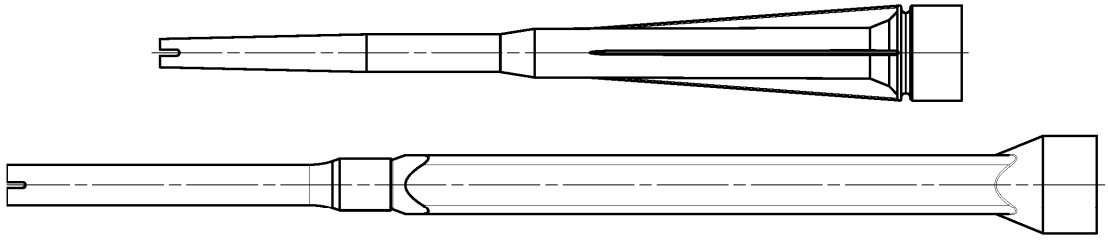
Mortar cartridge (shuttle cartridge) with sealing cap; Sizes: 390 ml, 585 ml, 1100 ml, 1500 ml



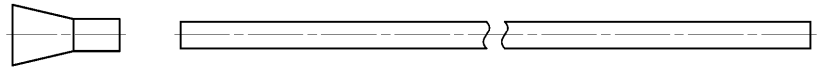
Resin capsule

Sizes: 8, 10 mini, 10, 12 mini, 12, 16 mini, 16, 16 E, 20, 20 E / 24, 30

Static mixer FIS MR Plus or UMR



Injection adapter / extension tube for static mixer

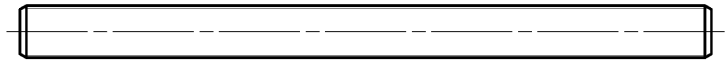


Figures not to scale

Overview system components Part 2

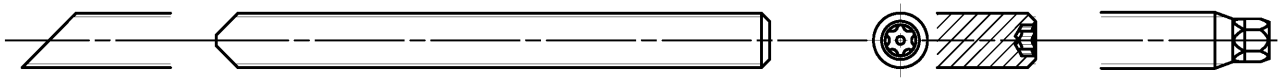
anchor rod

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



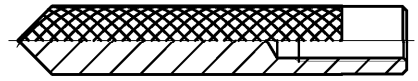
fischer anchor rod RG M

Sizes: M8, M10, M12, M16, M20, M24, M30

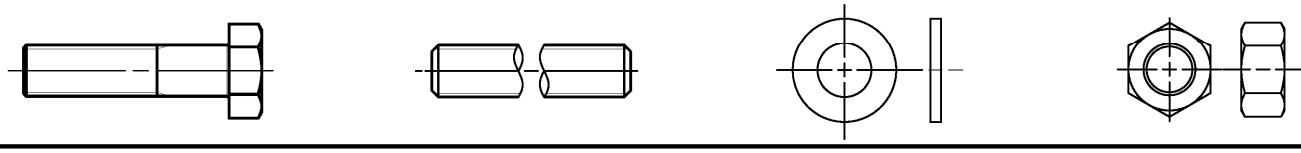


fischer internal threaded anchor RG MI

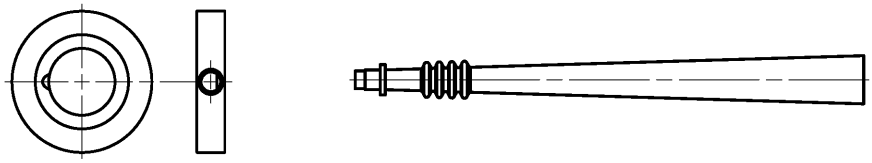
Size: M8, M10, M12, M16, M20



Screw / threaded rod / washer / hexagon nut

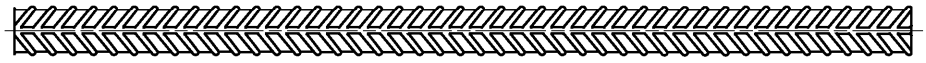


fischer filling disc with injection adapter



Reinforcing bar

Nominal diameters: ϕ8, ϕ10, ϕ12, ϕ14, ϕ16, ϕ20, ϕ25, ϕ28, ϕ32



fischer rebar anchor FRA

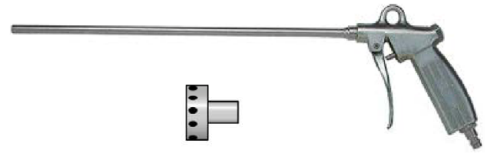
Sizes: M12, M16, M20, M24

Figures not to scale

Overview system components Part 3

Cleaning brush BS / BSB

Blow-out pump ABG or ABP with cleaning nozzle



Figures not to scale

fischer Superbond

Product description
Overview system components part 3;
cleaning brush / blow-out pump / injection adapter

Annex A 6

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Table A7.1: Materials

Part	Designation	Material		
1	Injection cartridge	Mortar, hardener, filler		
	Steel grade	Steel	Stainless steel R	High corrosion resistant steel HCR [2]
		zinc plated	acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4:2015	acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4:2015
2	Anchor rod	Property class 4.8, 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004 f_{uk} ≤ 1000 N/mm² A_5 > 12% fracture elongation	Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062, 1.4662, 1.4462; EN 10088-1:2014 f_{uk} ≤ 1000 N/mm² A_5 > 12% fracture elongation	Property class 50 or 80 EN ISO 3506-1:2009 or property class 70 with f_{yk}= 560 N/mm² 1.4565; 1.4529; EN 10088-1:2014 f_{uk} ≤ 1000 N/mm² A_5 > 12% fracture elongation
		Fracture elongation A_5 > 8 %, for applications without requirements for seismic performance category C2		
3	Washer ISO 7089:2000	zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(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 4042:2018/Zn5/An(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 4042:2018/Zn5/An(A2K)	Property class 70 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	Property class 70 EN ISO 3506-1:2009 1.4565; 1.4529; EN 10088-1:2014
6	Commercial standard screw or threaded rod for fischer internal threaded anchor RG MI	Property class 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K), A_5 > 8 % fracture elongation	Property class 70 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014 A_5 > 8 % fracture elongation	Property class 70 EN ISO 3506-1:2009 1.4565; 1.4529; EN 10088-1:2014 A_5 > 8 % fracture elongation
7	fischer filling disc similar to DIN 6319-G	zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	1.4565;1.4529; EN 10088-1:2014
8	Reinforcing bar EN 1992-1-1:2004 and AC:2010, Annex C	Bars and de-coiled rods, class B or C with f_{yk} and k according to NDP or NCL according to EN 1992-1-1/NA $f_{uk} = f_{tk} = k \cdot f_{yk}$		
9	fischer rebar anchor FRA	Rebar part: Bars and de-coiled rods class B or C with f_{yk} and k according to NDP or NCL of EN 1992-1-1:2004+AC:2010 $f_{uk} = f_{tk} = k \cdot f_{yk}$	Threaded part: Property class 70 or 80 EN ISO 3506-1:2009 1.4401, 1.4404, 1.4571, 1.4578, 1.4439, 1.4362, 1.4062 acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4:2015 1.4565; 1.4529 acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4:2015	

Specifications of intended use (part 1)

Table B1.1: Overview use and performance categories, **injection mortar system FIS SB**

Anchorages subject to		FIS SB with …							
		anchor rod		fischer internal threaded anchor RG MI		Reinforcing bar		fischer rebar anchor FRA	
Hammer drilling with standard drill bit		all sizes							
Hammer drilling with hollow drill bit (fischer "FHD", Heller "Duster Expert"; Bosch „Speed Clean"; Hilti "TE-CD, TE-YD", DreBo „D-Plus", DreBo „D-Max")		Nominal drill bit diameter (d_0) 12 mm to 35 mm							
Diamond drilling		not permitted							
Static and quasi static load, in	uncracked concrete	all sizes	Tables: C1.1 C4.1 C5.1 C11.1	all sizes	Tables: C2.1 C4.1 C7.1 C11.2	all sizes	Tables: C3.1 C4.1 C9.1 C12.1	all sizes	Tables: C3.2 C4.1 C10.1 C12.2
	cracked concrete								
Seismic performance category (only hammer drilling with standard / hollow drill bits)	C1	all sizes	Tables: C13.1 C14.2 C15.1	-[1]		all sizes	Tables: C14.1 C14.2 C15.2	-[1]	
	C2	M12 M16 M20 M24	Tables: C13.1 C14.2 C16.1			-[1]	-[1]		
Use category	I1 dry or wet concrete	all sizes							
	I2 water filled hole	not permitted							
Installation direction		D3 (downward and horizontal and upwards (overhead) installation)							
Installation method		pre-positioned or push through installation							
Installation temperature		FIS SB: $T_{i,min}$ = -15 °C to $T_{i,max}$ = +40 °C FIS SB High Speed: $T_{i,min}$ = -20 °C to $T_{i,max}$ = +40 °C							
In-service temperature	Temperature range I	-40 °C to +40 °C	T_{st} = +40 °C / T_{lt} = +24 °C						
	Temperature range II	-40 °C to +80 °C	T_{st} = +80 °C / T_{lt} = +50 °C						
	Temperature range III	-40 °C to +120 °C	T_{st} = +120 °C / T_{lt} = +72 °C						
	Temperature range IV	-40 °C to +150 °C	T_{st} = +150 °C / T_{lt} = +90 °C						

[1] No performance assessed

Specifications of intended use (part 2)

Table B2.1: Overview use and performance categories, **resin capsule system RSB**

Anchorages subject to			**RSB with …**			
			fischer anchor rod RG M 		fischer internal threaded anchor RG MI 	
Hammer drilling with standard drill bit			all sizes			
Hammer drilling with hollow drill bit (fischer “FHD”, Heller "Duster Expert"; Bosch „Speed Clean“; Hilti "TE-CD, TE-YD", DreBo „D-Plus“, DreBo „D-Max“) 			Nominal drill bit diameter (d_0) 12 mm to 35 mm		all sizes	
Diamond drilling 			all sizes [1]			
Static and quasi static load, in	uncracked concrete		all sizes	Tables: C1.1 C4.1 C6.1 C11.1	all sizes	Tables: C2.1 C4.1 C8.1 C11.2
	cracked concrete		all sizes [1]		all sizes [1]	
Seismic performance category (only hammer drilling with standard / hollow drill bits)	C1		all sizes	Tables: C13.1 C14.2 C15.1	-[2]	
	C2		-[2]			
Use category	I1	dry or wet concrete	all sizes			
	I2	water filled hole	all sizes			
Installation direction			D3 (downward and horizontal and upwards (overhead) installation)			
Installation method			only pre-positioned installation			
Installation temperature			$T_{i,min}$ = -30 °C to $T_{i,max}$ = +40 °C			
In-service temperature	Temperature range I		-40 °C to +40 °C	T_{st} = +40 °C / T_{lt} = +24 °C		
	Temperature range II		-40 °C to +80 °C	T_{st} = +80 °C / T_{lt} = +50 °C		
	Temperature range III		-40 °C to +120 °C	T_{st} = +120 °C / T_{lt} = +72 °C		
	Temperature range IV		-40 °C to +150 °C	T_{st} = +150 °C / T_{lt} = +90 °C		

[1] For diamond drilling in cracked concrete only nominal drill bit diameters (d_0) ≥ 18 mm are permitted
[2] No performance assessed

Specifications of intended use (part 3)

Base materials:

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

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions
  (zinc coated steel, stainless steel or high corrosion resistant steel).
- For all other conditions according to EN1993-1-4:2015 corresponding to corrosion resistance classes to Annex A 7 table A7.1.

Design:

- Anchorages have to be designed by a responsible engineer with experience of concrete anchor design.
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e. g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages are designed in accordance with:
  EN 1992-4:2018 and EOTA Technical Report TR 055, Edition February 2018.

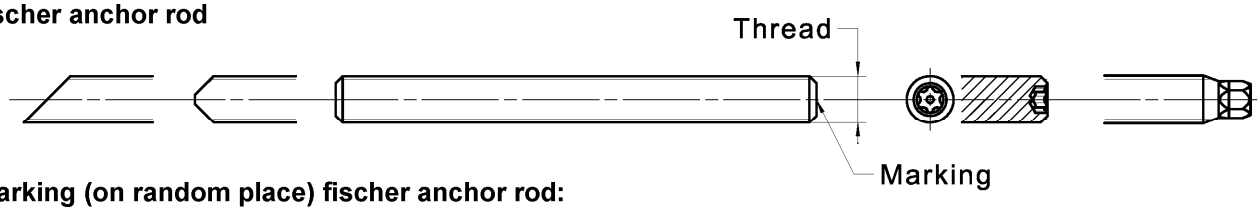
Installation:

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

Table B4.1: Installation parameters for **anchor rods** in combination with **injection mortar system FIS SB**

Anchor rods			**Thread**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Width across flats		SW		13	17	19	24	30	36	41	46
Nominal drill hole diameter		d_0		10	12	14	18	24	28	30	35
Drill hole depth		h_0		$h_0 = h_{ef}$							
Effective embedment depth		$h_{ef,\,min}$		60	60	70	80	90	96	108	120
		$h_{ef,\,max}$		160	200	240	320	400	480	540	600
Minimum spacing and minimum edge distance		s_{min} = c_{min}	[mm]	40	45	55	65	85	105	120	140
Diameter of the clearance hole of the fixture	pre-positioned installation	d_f		9	12	14	18	22	26	30	33
	push through installation	d_f		11	14	16	20	26	30	33	40
Min. thickness of concrete member		h_{min}		h_{ef} + 30 (≥ 100)			h_{ef} + 2d_0				
Maximum setting torque		max T_{inst}	[Nm]	10	20	40	60	120	150	200	300

fischer anchor rod



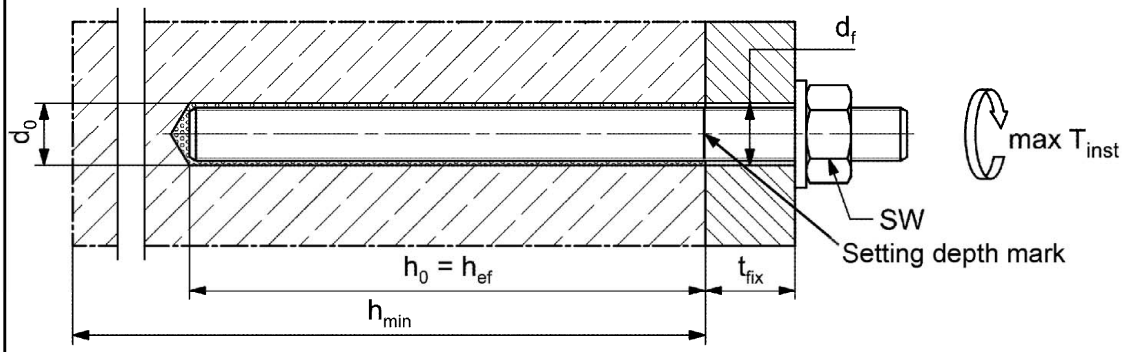
Marking (on random place) fischer anchor rod:

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

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

[1] PC = property class

Installation conditions:



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

- Materials, dimensions and mechanical properties according to Annex A 7, Table A7.1
- Inspection certificate 3.1 according to EN 10204:2004, the documents have to be stored
- Setting depth is marked

Figures not to scale

fischer Superbond

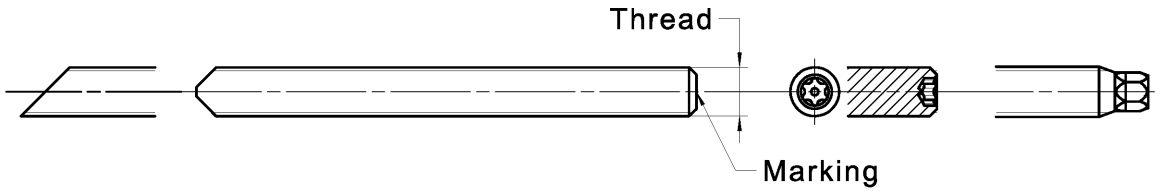
Intended use
Installation parameters for anchor rods in combination with injection mortar system FIS SB

Annex B 4

Table B5.1: Installation parameters for **fischer anchor rods RG M** in combination with **resin capsule system RSB**

Anchor rod RG M		**Thread**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Width across flats	SW		13	17	19	24	30	36	46
Nominal drill hole diameter	d_0		10	12	14	18	25	28	35
Drill hole depth	h_0		$h_0 = h_{ef}$						
Effective embedment depth	$h_{ef,1}$		---	75	75	95	---	---	---
	$h_{ef,2}$		80	90	110	125	170	210	280
	$h_{ef,3}$		---	150	150	190	210	---	---
Minimum spacing and minimum edge distance	s_{min} = c_{min}	[mm]	40	45	55	65	85	105	140
Diameter of the pre-positioned clearance hole of the fixture installation	d_f		9	12	14	18	22	26	33
Min. thickness of concrete member	h_{min}		h_{ef} + 30 (≥ 100)			h_{ef} + 2d_0			
Maximum setting torque	max T_{inst}	[Nm]	10	20	40	60	120	150	300

fischer anchor rod RG M



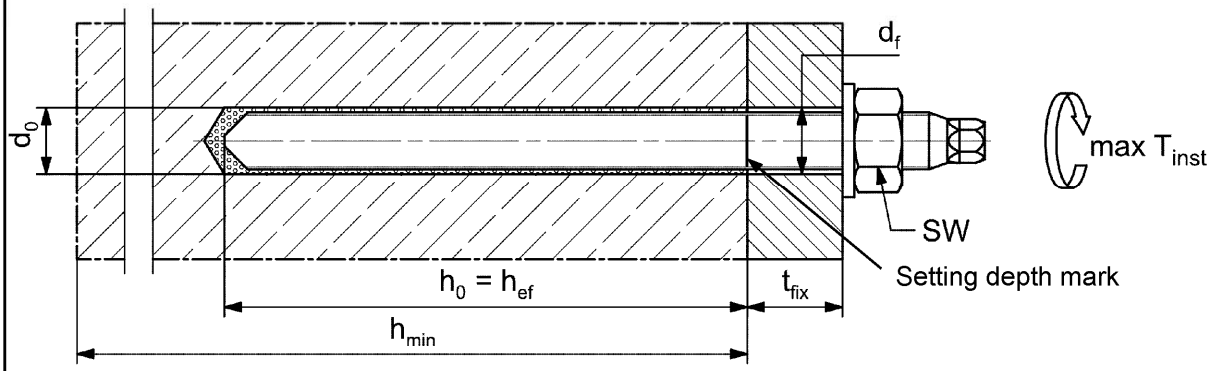
Marking (on random place) fischer anchor rod RG M:

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

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

[1] PC = property class

Installation conditions:



Figures not to scale

fischer Superbond

Intended use
Installation parameters for fischer anchor rods RG M in combination with resin capsule system RSB

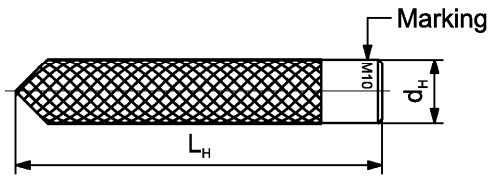
Annex B 5

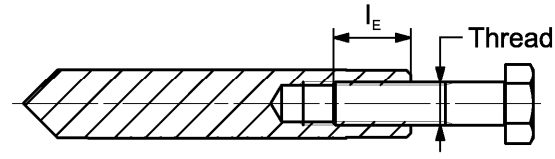
Appendix 14/ 40

Table B6.1: Installation parameters for **fischer internal threaded anchors RG MI**

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

fischer internal threaded anchor RG MI

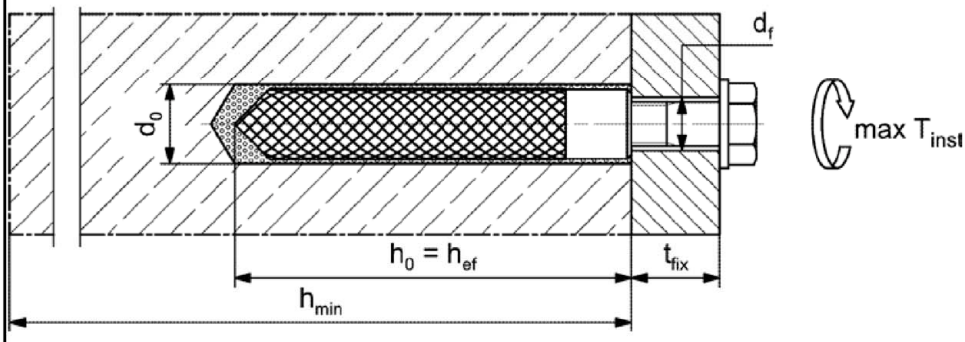




Marking: Anchor size e. g.: **M10**
Stainless steel → additional R; e.g.: **M10 R**
High corrosion resistant steel R→ additional C; e.g.: **M10 HCR**

Retaining bolt or threaded rods (including nut and washer) must comply with the appropriate material and strength class of Annex A 7, Table A7.1

Installation conditions:



Figures not to scale

fischer Superbond

Intended use
Installation parameters for fischer internal threaded anchors RG MI

Annex B 6

Table B7.1: Installation parameters for **reinforcing bars**

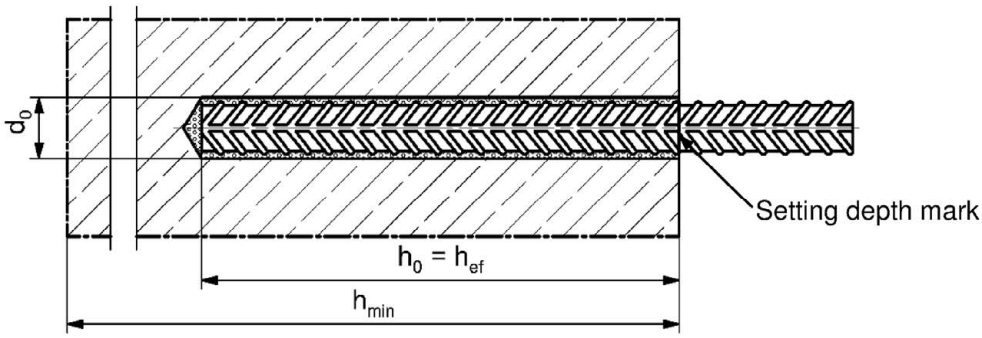
Nominal diameter of the bar		**ϕ**	**8[1)]**	**10[1)]**	**12[1)]**	**14**	**16**	**20**	**25**	**28**	**32**
Nominal drill hole diameter	d_0	[mm]	10 12	12 14	14 16	18	20	25	30	35	40
Drill hole depth	h_0		$h_0 = h_{ef}$								
Effective embedment depth	$h_{ef,min}$		60	60	70	75	80	90	100	112	128
	$h_{ef,max}$		160	200	240	280	320	400	500	560	640
Minimum spacing and minimum edge distance	s_{min} = c_{min}		40	45	55	60	65	85	110	130	160
Minimum thickness of concrete member	h_{min}		h_{ef} + 30 (≥ 100)			h_{ef} + 2d_0					

[1)] Both drill hole diameters can be used

Reinforcing bar

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

Installation conditions:



Figures not to scale

fischer Superbond

Intended use
Installation parameters reinforcing bars

Annex B 7

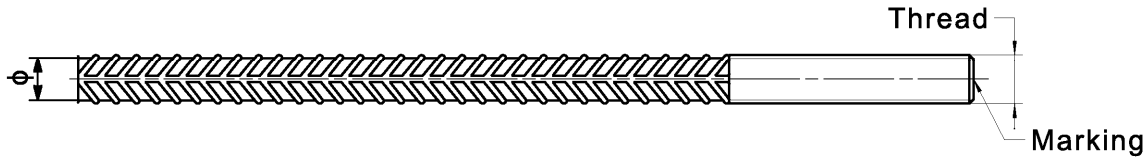
Appendix 16/ 40

Table B8.1: Installation parameters for **fischer rebar anchor FRA**

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

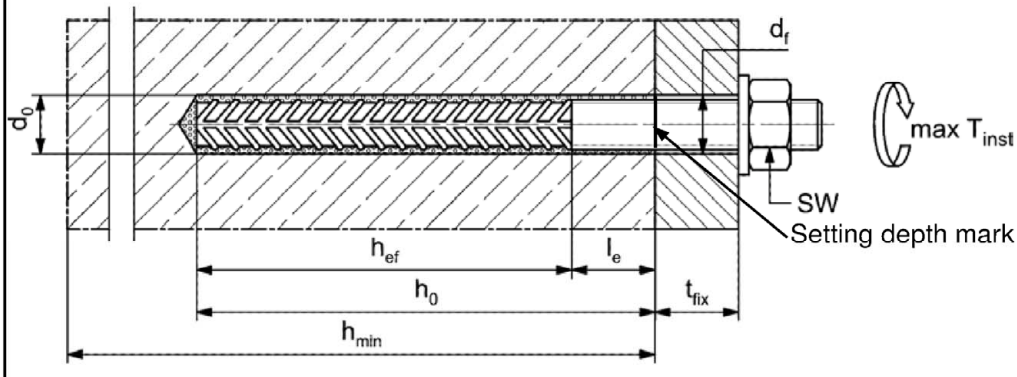
[1] Both drill hole diameters can be used

fischer rebar anchor FRA



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

Installation conditions:



Figures not to scale

fischer Superbond

Intended use
Installation parameters rebar anchor FRA

Annex B 8

Appendix 17/ 40

Table B9.1: Dimension of **resin capsule RSB**

Resin capsule RSB			**RSB 8**	**RSB 10 mini**	**RSB 10**	**RSB 12 mini**	**RSB 12**	**RSB 16 mini**	**RSB 16**	**RSB 16 E**	**RSB 20**	**RSB 20 E / 24**	**RSB 30**
Capsule diameter	d_P	[mm]	9,0	10,5		12,5		16,5			23,0		27,5
Capsule length	L_P		85	72	90	72	97	72	95	123	160	190	260

Table B9.2: Assignment of **resin capsule RSB** to **fischer anchor rod RG M**

Anchor rod RG M			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Effective embedment depth	$h_{ef,1}$	[mm]	---	75	75	95	---	---	---
Related capsule RSB		[-]	---	10 mini	12 mini	16 mini	---	---	---
Effective embedment depth	$h_{ef,2}$	[mm]	80	90	110	125	170	210	280
Related capsule RSB		[-]	8	10	12	16	20	20 E/ 24	30
Effective embedment depth	$h_{ef,3}$	[mm]	---	150	150	190	210	---	---
Related capsule RSB		[-]	---	2 x 10 mini	2 x 12 mini	2 x 16 mini	20 E / 24	---	---

Table B9.3: Assignment of **resin capsule RSB** to **fischer internal threaded anchor RG MI**

Internal threaded anchor RG MI			**M8**	**M10**	**M12**	**M16**	**M20**
Effective embedment depth	h_{ef}	[mm]	90	90	125	160	200
Related capsule RSB		[-]	10	12	16	16 E	20 E / 24

Figures not to scale

fischer Superbond

Intended use
Dimensions of the capsules; Assignment of the capsule to the fischer anchor rod RG M and fischer internal threaded anchor RG MI

Annex B 9

Table B10.1: Parameters of the cleaning brush BS / BSB (steel brush with steel bristles)

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

Nominal drill hole diameter	d_0	[mm]	10	12	14	16	18	20	24	25	28	30	32	35	40
Steel brush diameter BS	d_b		11	14	16	20		25	26	27	30	40			-
Steel brush diameter BSB	d_b		-	-	-	-		-	-	-	-	-			42

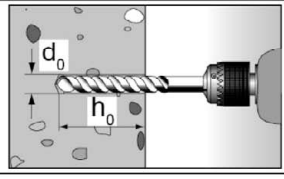
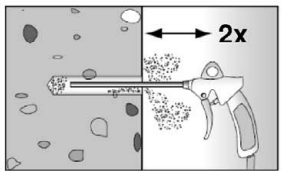
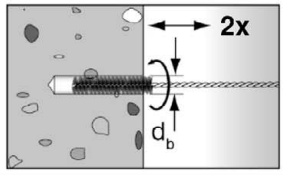
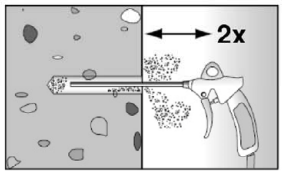
Table B10.2: Maximum **processing time** of the mortar and minimum **curing time** (During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature. Minimal cartridge temperature +5 °C; minimal resin capsule temperature -15 °C)

Temperature at anchoring base [°C]	Maximum processing time t_{work}		Minimum curing time t_{cure}		
	FIS SB	FIS SB High Speed	FIS SB	FIS SB High Speed	RSB
-30 to -20	---	---	---	---	120 h
> -20 to -15	---	60 min	---	24 h	48 h
> -15 to -10	60 min	30 min	36 h	8 h	30 h
> -10 to -5	30 min	15 min	24 h	3 h	16 h
> -5 to 0	20 min	10 min	8 h	2 h	10 h
> 0 to 5	13 min	5 min	4 h	1 h	45 min
> 5 to 10	9 min	3 min	2 h	45 min	30 min
> 10 to 20	5 min	2 min	1 h	30 min	20 min
> 20 to 30	4 min	1 min	45 min	15 min	5 min
> 30 to 40	2 min	---	30 min	---	3 min

Figures not to scale

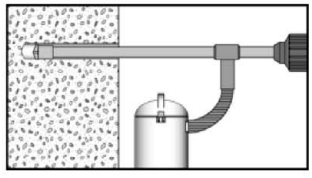
Installation instructions part 1; Injection mortar system FIS SB

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

1		Drill the hole. Nominal drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see **tables B4.1, B6.1, B7.1, B8.1**
2		Clean the drill hole: Blow out the drill hole twice, with oil free compressed air ($p \geq 6$ bar) In uncracked concrete the use of the manual blow-out pump ABG is possible (Installation parameters: $d_0 < 18$ mm and $h_{ef} < 10d$) 
3		Brush the drill hole twice. For drill hole diameter ≥ 30 mm use a power drill. For deep holes use an extension. Corresponding brushes see **table B10.1**
4		Clean the drill hole: Blow out the drill hole twice, with oil free compressed air ($p \geq 6$ bar) In uncracked concrete the use of the manual blow-out pump ABG is possible (Installation parameters: $d_0 < 18$ mm and $h_{ef} < 10d$) 

Go to step 5 (Annex B 12)

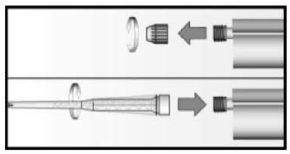
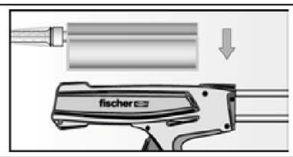
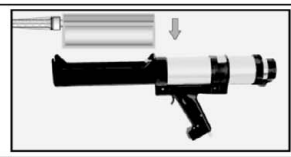
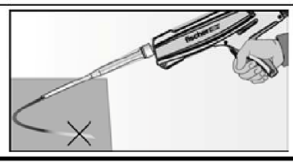
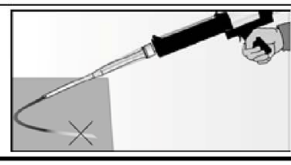
Drilling and cleaning the hole (hammer drilling with hollow drill bit)

1		Check a suitable hollow drill (see **table B1.1**) for correct operation of the dust extraction
2		Use a suitable dust extraction system, e. g. fischer FVC 35 M or a comparable dust extraction system with equivalent performance data. Drill the hole with hollow drill bit. The dust extraction system has to extract the drill dust nonstop during the drilling process and must be adjusted to maximum power. Nominal drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see **tables B4.1, B6.1, B7.1, B8.1**

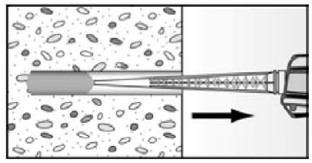
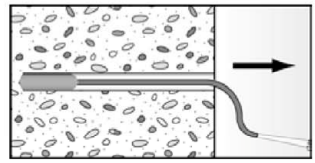
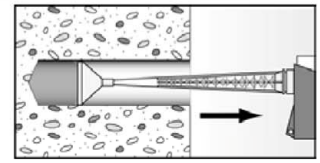
Go to step 5 (Annex B 12)

Installation instructions part 2; injection mortar system FIS SB

Preparing the cartridge

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

Injection of the mortar

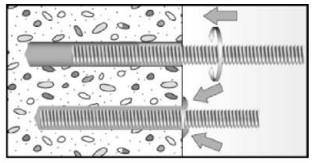
8	 Fill approximately 2/3 of the drill hole with mortar. Always begin from the bottom of the hole and avoid bubbles	 For drill hole depth ≥ 150 mm use an extension tube	 For overhead installation, deep holes (h_0 > 250 mm) or drill hole diameter (d_0 ≥ 40 mm) use an injection-adapter

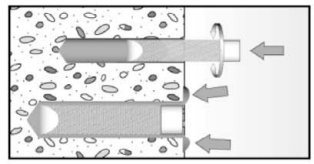
Go to step 9 (Annex B 13)

Installation instructions part 3; injection mortar system FIS SB

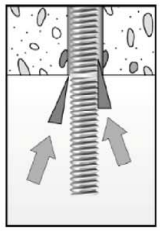
Installation of anchor rods or fischer internal threaded anchors RG MI

9

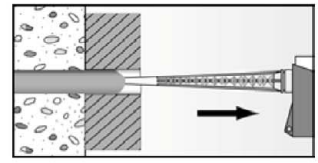




Only use clean and oil-free metal part.
Mark the setting depth of the metal part. Push the anchor rod or fischer internal threaded RG MI anchor down to the bottom of the hole, turning it slightly while doing so.
After inserting the metal part, excess mortar must be emerged around the anchor element. If not, pull out the metal part immediately and reinject mortar.



For overhead installations support the metal part with wedges.
(e. g. fischer centering wedges)

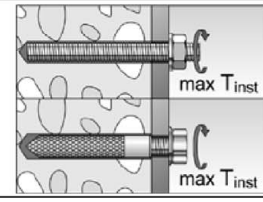


For push through installation fill the annular gap with mortar

11

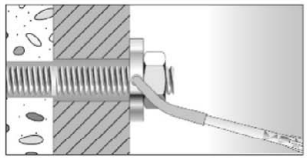
Wait for the specified curing time t_{cure} see **table B10.2**

12



Mounting the fixture max T_{inst} see **tables B4.1** and **B6.1**

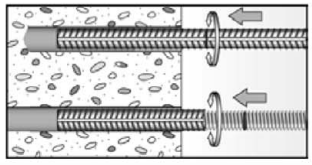
Option



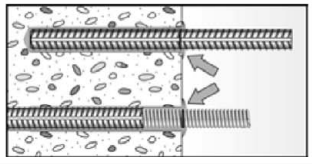
After the minimum curing time is reached, the gap between metal part and fixture (annular clearance) may be filled with mortar via the fischer filling disc.
Compressive strength ≥ 50 N/mm² (e.g. fischer injection mortars FIS HB, FIS SB, FIS V, FIS EM Plus)
ATTENTION: Using fischer filling disc reduces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

Installation reinforcing bars and fischer rebar anchor FRA

10



Only use clean and oil-free reinforcing bars or fischer FRA. Mark the setting depth. Turn while using force to push the reinforcement bar or the fischer FRA into the filled hole up to the setting depth mark

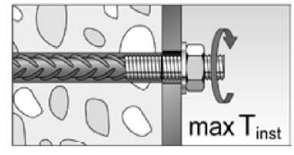


When the setting depth mark is reached, excess mortar must be emerged from the mouth of the drill hole. If not, pull out the anchor element immediately and reinject mortar.

11

Wait for the specified curing time t_{cure} see **table B10.2**

12



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

fischer Superbond

Intended use
Installation instructions part 3; injection mortar system FIS SB

Annex B 13

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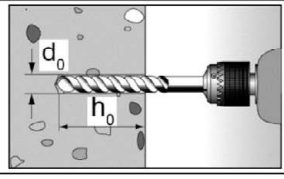
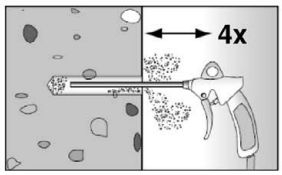
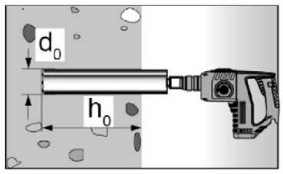
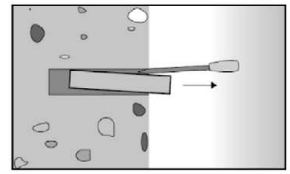
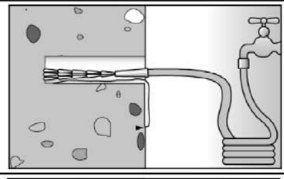
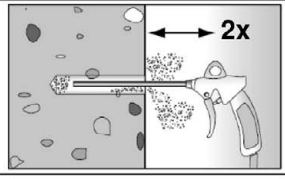
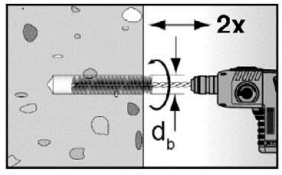
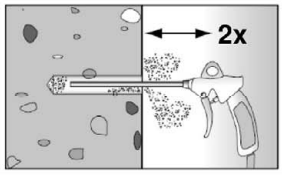
Installation instructions part 4; resin capsule RSB

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

1		Drill the hole. Nominal drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see **tables B5.1** and **B6.1**
2		Clean the drill hole: Blow out the drill hole four times, with oil free compressed air ($p \geq 6$ bar) In uncracked concrete the use of the manual blow-out pump ABG is possible (Installation parameters: $d_0 < 18$ mm and $h_{ef} < 10d$) 

Go to step 6 (Annex B 15)

Drilling and cleaning the hole (wet drilling with diamond drill bit)

1		Drill the hole. Drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see **tables B5.1** and **B6.1**	 Break the drill core and remove it
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)	
4		Brush the drill hole twice using a power drill. Corresponding brushes see **table B10.1**	
5		Blow out the drill hole twice, using oil-free compressed air ($p > 6$ bar)	

Go to step 6 (Annex B 15)

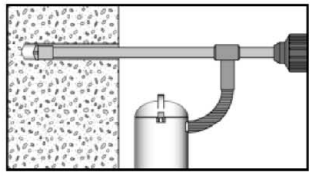
Installation instructions part 5; resin capsule RSB

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

1

Check a suitable hollow drill (see **table B2.1**) for correct operation of the dust extraction

2



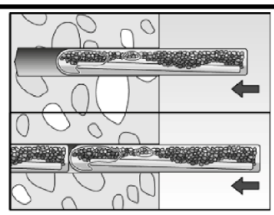
Use a suitable dust extraction system, e. g.
fischer FVC 35 M or a comparable dust extraction system with equivalent performance data.

Drill the hole with hollow drill bit. The dust extraction system has to extract the drill dust nonstop during the drilling process and must be adjusted to maximum power. Nominal drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see **tables B5.1** and **B6.1**

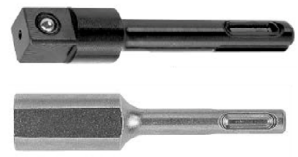
Go to step 6 (Annex B 15)

Installation fischer anchor rod RG M or fischer internal threaded anchor RG MI

6

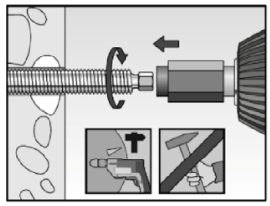


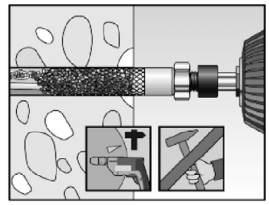
Insert the resin capsule into the drill hole by hand.
Suitable resin capsule RSB or RSB mini see **table B9.2.**



Depending on the metal part being installed, use a suitable setting tool

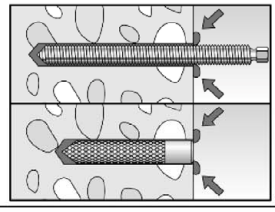
7





Only use clean and grease-free metal parts. Using a suitable adapter, drive the fischer anchor rod RG M or the fischer internal threaded anchor RG MI into the capsule using a hammer drill set on rotary hammer action. Stop when the metal parts reaches the bottom of the hole and is set to the correct embedment depth

8

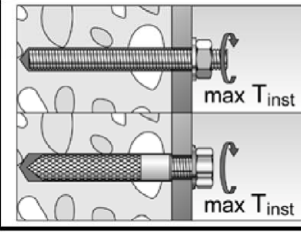


When reaching the correct embedment depth, excess mortar must emerge from the mouth of the drill hole. If not, the metal parts must be pulled out directly and a second resin capsule must be pushed into the drill hole. Setting process must be repeated (Step 7)

9

Wait for the specified curing time, t_{cure} see **table B10.2**

10



Mounting the fixture max T_{inst} see **tables B5.1** and **B6.1**

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

Anchor rod / standard threaded rod				M8	M10	M12	M16	M20	M24	M27	M30
Bearing capacity under tension load, steel failure [3]											
Characteristic resistance $N_{Rk,s}$	Steel zinc plated	Property class	4.8	[kN]	15(13)	23(21)	33	63	98	141	184	224
			5.8		19(17)	29(27)	43	79	123	177	230	281
			8.8		29(27)	47(43)	68	126	196	282	368	449
	Stainless steel R and high corrosion resistant steel HCR		50		19	29	43	79	123	177	230	281
			70		26	41	59	110	172	247	322	393
			80		30	47	68	126	196	282	368	449
Partial factors [1]											
Partial factor $\gamma_{Ms,N}$	Steel zinc plated	Property class	4.8	[-]	1,50							
			5.8		1,50							
			8.8		1,50							
	Stainless steel R and high corrosion resistant steel HCR		50		2,86							
			70		1,50[2] / 1,87							
			80		1,60							
Bearing capacity under shear load, steel failure [3]											
without lever arm											
Characteristic resistance $V^0_{Rk,s}$	Steel zinc plated	Property class	4.8	[kN]	9(8)	14(13)	20	38	59	85	110	135
			5.8		11(10)	17(16)	25	47	74	106	138	168
			8.8		15(13)	23(21)	34	63	98	141	184	225
	Stainless steel R and high corrosion resistant steel HCR		50		9	15	21	39	61	89	115	141
			70		13	20	30	55	86	124	161	197
			80		15	23	34	63	98	141	184	225
Ductility factor			k_7	[-]	1,0							
with lever arm											
Characteristic resistance $M^0_{Rk,s}$	Steel zinc plated	Property class	4.8	[Nm]	15(13)	30(27)	52	133	259	448	665	899
			5.8		19(16)	37(33)	65	166	324	560	833	1123
			8.8		30(26)	60(53)	105	266	519	896	1333	1797
	Stainless steel R and high corrosion resistant steel HCR		50		19	37	65	166	324	560	833	1123
			70		26	52	92	232	454	784	1167	1573
			80		30	60	105	266	519	896	1333	1797
Partial factors [1]											
Partial factor $\gamma_{Ms,V}$	Steel zinc plated	Property class	4.8	[-]	1.25							
			5.8		1.25							
			8.8		1.25							
	Stainless steel R and high corrosion resistant steel HCR		50		2.38							
			70		1.25[2] / 1.56							
			80		1.33							

[1] In absence of other national regulations
[2] Only admissible for high corrosion resistant steel C, with $f_{yk} / f_{uk} \geq 0,8$ and $A_5 > 12$ % (e.g. fischer anchor rods)
[3] Values in brackets are valid for undersized threaded rods with smaller stress area A_s for hotdip galvanized standard threaded rods according to EN ISO 10684:2004+AC:2009

fischer Superbond

Performances
Characteristic values for steel failure capacity of fischer anchor rods and standard threaded rods

Annex C 1

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

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

[1)] In absence of other national regulations

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

Nominal diameter of the bar		**ϕ**	**8**	**10**	**12**	**14**	**16**	**20**	**25**	**28**	**32**
Bearing capacity under tension load, steel failure											
Characteristic resistance	$N_{Rk,s}$	[kN]	$A_s \cdot f_{uk}$[1)]								
Bearing capacity under shear load, steel failure											
Without lever arm											
Characteristic resistance	$V_{Rk,s}$	[kN]	$0,5 \cdot A_s \cdot f_{uk}$[1)]								
Ductility factor	k_7	[-]	1,0								
With lever arm											
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	$1,2 \cdot W_{el} \cdot f_{uk}$[1)]								

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

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

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

[1)] In absence of other national regulations

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

Size			**All sizes**
Tension load			
Installation factor	γ_{inst}	[-]	See annex C 5 to C 10 and C 15 to C16
Factors for the compressive strength of concrete > C20/25			
Increasing factor for τ_{Rk} C25/30	Ψ_c	[-]	1,02
C30/37			1,04
C35/45			1,07
C40/50			1,08
C45/55			1,09
C50/60			1,10
Splitting failure			
Edge distance $h / h_{ef} \geq 2{,}0$	$c_{cr,sp}$	[mm]	$1{,}0\ h_{ef}$
Edge distance $2{,}0 > h / h_{ef} > 1{,}3$	$c_{cr,sp}$	[mm]	$4{,}6\ h_{ef} - 1{,}8\ h$
Edge distance $h / h_{ef} \leq 1{,}3$	$c_{cr,sp}$	[mm]	$2{,}26\ h_{ef}$
Spacing	$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$
Concrete cone failure			
Uncracked concrete	$k_{ucr,N}$	[-]	11,0
Cracked concrete	$k_{cr,N}$	[-]	7,7
Edge distance	$c_{cr,N}$	[mm]	$1{,}5\ h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$2\ c_{cr,N}$
Factors for sustained tension load			
Temperature range		[-]	24 °C / 40 °C | 50 °C / 80 °C | 72 °C / 120 °C | 90 °C / 150 °C
Factor	Ψ^0_{sus}	[-]	0,84 | 0,86 | 0,84 | 0,91
Shear load			
Installation factor	γ_{inst}	[-]	1,0
Concrete pry-out failure			
Factor for pry-out failure	k_8	[-]	2,0
Concrete edge failure			
Effective length of fastener in shear loading	l_f	[mm]	for $d_{nom} \leq 24$ mm: min (h_{ef}; 12 d_{nom}) for $d_{nom} > 24$ mm: min (h_{ef}; 8 d_{nom}; 300 mm)

Calculation diameters										
Size			M8	M10	M12	M16	M20	M24	M27	M30
fischer anchor rods and standard threaded rods	d_{nom}	[mm]	8	10	12	16	20	24	27	30
fischer internal threaded anchors RG MI	d_{nom}	[mm]	12	16	18	22	28	-[1)]	-[1)]	-[1)]
fischer rebar anchor FRA	d_{nom}	[mm]	-[1)]	-[1)]	12	16	20	25	-[1)]	-[1)]

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

[1)] Anchor type not part of the ETA

fischer Superbond

Performances
Characteristic values for concrete failure under tension / shear load

Annex C 4

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

Anchor rod / standard threaded rod				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Combined pullout and concrete cone failure											
Thread diameter		d	[mm]	8	10	12	16	20	24	27	30
Uncracked concrete											
Characteristic bond resistance in uncracked concrete C20/25											
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)											
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	12	13	13	13	13	12	10	10
	II: 50 °C / 80 °C			12	12	12	13	13	12	10	10
	III: 72 °C / 120 °C			10	11	11	11	11	11	9,0	9,0
	IV: 90 °C / 150 °C			10	10	10	11	10	10	8,0	8,0
Installation factors											
Dry or wet concrete		γ_{inst}	[-]	1,0							
Cracked concrete											
Characteristic bond resistance in cracked concrete C20/25											
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)											
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	6,5	7,0	7,5	7,5	7,5	7,5	7,5	7,5
	II: 50 °C / 80 °C			6,0	6,5	7,5	7,5	7,5	7,5	7,0	7,0
	III: 72 °C / 120 °C			5,5	6,0	6,5	6,5	6,5	6,5	6,0	6,0
	IV: 90 °C / 150 °C			5,0	5,5	6,0	6,0	6,0	6,0	5,5	5,5
Installation factors											
Dry or wet concrete		γ_{inst}	[-]	1,0							

Table C6.1: Characteristic values for **combined pull-out** and concrete failure for **fischer anchor rods RG M** in hammer or diamond drilled holes in combination with **resin capsule RSB**; **uncracked or cracked concrete**

Anchor rod RG M				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Combined pullout and concrete cone failure										
Thread diameter		d	[mm]	8	10	12	16	20	24	30
Uncracked concrete										
Characteristic bond resistance in uncracked concrete C20/25										
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete as well as water filled hole)										
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	12	13	13	13	13	12	10
	II: 50 °C / 80 °C			12	12	12	13	13	12	10
	III: 72 °C / 120 °C			10	11	11	11	11	11	9,0
	IV: 90 °C / 150 °C			10	10	10	11	10	10	8,0
Diamond-drilling (dry or wet concrete as well as water filled hole)										
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	13	13	14	14	14	13	11
	II: 50 °C / 80 °C			12	13	13	14	13	13	10
	III: 72 °C / 120 °C			11	12	12	12	12	11	9,5
	IV: 90 °C / 150 °C			10	11	11	11	11	10	8,5
Installation factors										
Dry or wet concrete		γ_{inst}	[-]	1,0						
Water filled hole				1,2		1,0				
Cracked concrete										
Characteristic bond resistance in cracked concrete C20/25										
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete as well as water filled hole)										
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	6,5	7,0	7,5	7,5	7,5	7,5	7,5
	II: 50 °C / 80 °C			6,0	6,5	7,5	7,5	7,5	7,5	7,0
	III: 72 °C / 120 °C			5,5	6,0	6,5	6,5	6,5	6,5	6,0
	IV: 90 °C / 150 °C			5,0	5,5	6,0	6,0	6,0	6,0	5,5
Diamond-drilling (dry or wet concrete as well as water filled hole)										
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	-[1]	-[1]	-[1]	7,5	7,5	7,5	7,5
	II: 50 °C / 80 °C			-[1]	-[1]	-[1]	7,5	7,5	7,5	7,0
	III: 72 °C / 120 °C			-[1]	-[1]	-[1]	6,5	6,5	6,5	6,5
	IV: 90 °C / 150 °C			-[1]	-[1]	-[1]	6,0	6,0	6,0	6,0
Installation factors										
Dry or wet concrete		γ_{inst}	[-]	1,0						
Water filled hole				1,2		1,0				

[1] No performance assessed

Table C7.1: Characteristic values for **combined pull-out** and concrete failure for **fischer internal threaded anchors RG MI** in hammer drilled holes in combination with **injection mortar FIS SB**; **uncracked or cracked concrete**

Internal threaded anchor RG MI				**M8**	**M10**	**M12**	**M16**	**M20**
Combined pullout and concrete cone failure								
Sleeve diameter		d	[mm]	12	16	18	22	28
Uncracked concrete								
Characteristic bond resistance in uncracked concrete C20/25								
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)								
Tem-perature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	12	12	11	11	9,5
	II: 50 °C / 80 °C			12	11	11	10	9,0
	III: 72 °C / 120 °C			11	10	10	9,0	8,0
	IV: 90 °C / 150 °C			10	9,5	9,0	8,5	7,5
Installation factors								
Dry or wet concrete		γ_{inst}	[-]	1,0				
Cracked concrete								
Characteristic bond resistance in cracked concrete C20/25								
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)								
Tem-perature range	I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	5,0				
	II: 50 °C / 80 °C			5,0				
	III: 72 °C / 120 °C			4,5				
	IV: 90 °C / 150 °C			4,0				
Installation factors								
Dry or wet concrete		γ_{inst}	[-]	1,0				

Table C8.1: Characteristic values for **combined pull-out** and concrete failure for **fischer internal threaded anchors RG MI** in hammer or diamond drilled holes in combination with **resin capsule RSB**; **uncracked or cracked concrete**

Internal threaded anchor RG MI				**M8**	**M10**	**M12**	**M16**	**M20**
Combined pullout and concrete cone failure								
Sleeve diameter		d	[mm]	12	16	18	22	28
Uncracked concrete								
Characteristic bond resistance in uncracked concrete C20/25								
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete as well as water filled hole)								
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	12	12	11	11	9,5
	II: 50 °C / 80 °C			12	11	11	10	9,0
	III: 72 °C / 120 °C			11	10	10	9,0	8,0
	IV: 90 °C / 150 °C			10	9,5	9,0	8,5	7,5
Diamond-drilling (dry or wet concrete as well as water filled hole)								
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	13	12	12	11	10
	II: 50 °C / 80 °C			13	12	12	11	9,5
	III: 72 °C / 120 °C			11	11	10	9,5	8,5
	IV: 90 °C / 150 °C			10	10	9,5	9,0	8,0
Installation factors								
Dry or wet concrete		γ_{inst}	[-]	1,0				
Water filled hole				1,2	1,0			
Cracked concrete								
Characteristic bond resistance in cracked concrete C20/25								
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete as well as water filled hole)								
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	5,0				
	II: 50 °C / 80 °C			5,0				
	III: 72 °C / 120 °C			4,5				
	IV: 90 °C / 150 °C			4,0				
Diamond-drilling (dry or wet concrete as well as water filled hole)								
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	-[1)]	5,0			
	II: 50 °C / 80 °C			-[1)]	5,0			
	III: 72 °C / 120 °C			-[1)]	4,5			
	IV: 90 °C / 150 °C			-[1)]	4,0			
Installation factors								
Dry or wet concrete		γ_{inst}	[-]	1,0				
Water filled hole				1,2	1,0			

[1)] No performance assessed

Table C9.1: Characteristic values for **combined pull-out** and concrete failure for **reinforcing bars** in hammer drilled holes in combination with **injection mortar FIS SB**; **uncracked or cracked concrete**

Nominal diameter of the bar		**ϕ**		**8**	**10**	**12**	**14**	**16**	**20**	**25**	**28**	**32**
Combined pullout and concrete cone failure												
Bar diameter		d	[mm]	8	10	12	14	16	20	25	28	32
Uncracked concrete												
Characteristic bond resistance in uncracked concrete C20/25												
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)												
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	8,0	8,5	9,0	9,5	9,5	10	9,5	9,0	7,5
	II: 50 °C / 80 °C			8,0	8,5	9,0	9,0	9,5	9,5	9,0	8,5	7,5
	III: 72 °C / 120 °C			7,0	7,5	8,0	8,0	8,5	8,5	8,0	7,5	6,5
	IV: 90 °C / 150 °C			6,5	7,0	7,0	7,5	7,5	8,0	7,5	7,0	6,0
Installation factors												
Dry or wet concrete		γ_{inst}	[-]	1,0								
Cracked concrete												
Characteristic bond resistance in cracked concrete C20/25												
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)												
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	4,5	6,0	6,0	6,0	7,0	6,0	6,0	6,0	6,0
	II: 50 °C / 80 °C			4,5	5,5	5,5	5,5	6,5	6,0	6,0	6,0	6,0
	III: 72 °C / 120 °C			4,0	5,0	5,0	5,0	6,0	5,5	5,5	5,5	5,5
	IV: 90 °C / 150 °C			3,5	4,5	4,5	4,5	5,5	5,0	5,0	5,0	5,0
Installation factors												
Dry or wet concrete		γ_{inst}	[-]	1,0								

Table C10.1: Characteristic values for **combined pull-out** and concrete failure for **fischer rebar anchors FRA** in hammer drilled holes in combination with **injection mortar FIS SB**; **uncracked or cracked concrete**

fischer rebar anchor FRA				**M12**	**M16**	**M20**	**M24**
Combined pullout and concrete cone failure							
Bar diameter		d	[mm]	12	16	20	25
Uncracked concrete							
Characteristic bond resistance in uncracked concrete C20/25							
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)							
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	9,0	9,5	10	9,5
	II: 50 °C / 80 °C			9,0	9,5	9,5	9,0
	III: 72 °C / 120 °C			8,0	8,5	8,5	8,0
	IV: 90 °C / 150 °C			7,0	7,5	8,0	7,5
Installation factors							
Dry or wet concrete		γ_{inst}	[-]	1,0			
Cracked concrete							
Characteristic bond resistance in cracked concrete C20/25							
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)							
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	6,0	7,0	6,0	6,0
	II: 50 °C / 80 °C			5,5	6,5	6,0	6,0
	III: 72 °C / 120 °C			5,0	6,0	5,5	5,5
	IV: 90 °C / 150 °C			4,5	5,5	5,0	5,0
Installation factors							
Dry or wet concrete		γ_{inst}	[-]	1,0			

Table C11.1: Displacements for anchor rods

Anchor rod		M8	M10	M12	M16	M20	M24	M27	M30
Displacement-Factors for tension load[1)]									
Uncracked or cracked concrete; Temperature range I, II, III, IV									
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,07	0,08	0,09	0,10	0,11	0,12	0,12	0,13
$\delta_{N\infty\text{-Factor}}$		0,13	0,14	0,15	0,17	0,17	0,18	0,19	0,19
Displacement-Factors for shear load[2)]									
Uncracked or cracked concrete; Temperature range I, II, III, IV									
$\delta_{V0\text{-Factor}}$	[mm/kN]	0,18	0,15	0,12	0,09	0,07	0,06	0,05	0,05
$\delta_{V\infty\text{-Factor}}$		0,27	0,22	0,18	0,14	0,11	0,09	0,08	0,07

[1)] Calculation of effective displacement:

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

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

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

[2)] Calculation of effective displacement:

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

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

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

Table C11.2: Displacements for fischer internal threaded anchors RG MI

Internal threaded anchor RG MI		M8	M10	M12	M16	M20
Displacement-Factors for tension load[1)]						
Uncracked or cracked concrete; Temperature range I, II, III, IV						
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,09	0,10	0,10	0,11	0,19
$\delta_{N\infty\text{-Factor}}$		0,13	0,15	0,15	0,17	0,19
Displacement-Factors for shear load[2)]						
Uncracked or cracked concrete; Temperature range I, II, III, IV						
$\delta_{V0\text{-Factor}}$	[mm/kN]	0,12	0,09	0,08	0,07	0,05
$\delta_{V\infty\text{-Factor}}$		0,18	0,14	0,12	0,10	0,08

[1)] Calculation of effective displacement:

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

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

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

[2)] Calculation of effective displacement:

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

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

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

Table C12.1: Displacements for reinforcing bars

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

[1)] Calculation of effective displacement:

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

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

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

[2)] Calculation of effective displacement:

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

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

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

Table C12.2: Displacements for fischer rebar anchors FRA

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

[1)] Calculation of effective displacement:

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

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

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

[2)] Calculation of effective displacement:

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

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

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

Table C13.1: Characteristic values for **steel failure** under tension / shear load of **fischer anchor rods** and **standard threaded rods** under seismic action performance category **C1 or C2**

Anchor rod / standard threaded rod				M8	M10	M12	M16	M20	M24	M27	M30
Bearing capacity under tension load, steel failure[1)]											
fischer anchor rods and standard threaded rods, performance category C1 [2)]											
Characteristic resistance $N_{Rk,s,C1}$	Steel zinc plated	Property class	5.8	[kN]	19(17)	29(27)	43	79	123	177	230	281
			8.8		29(27)	47(43)	68	126	196	282	368	449
	Stainless steel R and high corrosion resistant steel HCR		50		19	29	43	79	123	177	230	281
			70		26	41	59	110	172	247	322	393
			80		30	47	68	126	196	282	368	449
fischer anchor rods and standard threaded rods, performance category C2 [2)]											
Characteristic resistance $N_{Rk,s,C2}$	Steel zinc plated	Property class	5.8	[-]	-[4)]	-[4)]	39	72	108	177	-[4)]	-[4)]
			8.8		-[4)]	-[4)]	61	116	173	282	-[4)]	-[4)]
	Stainless steel R and high corrosion resistant steel HCR		50		-[4)]	-[4)]	39	72	108	177	-[4)]	-[4)]
			70		-[4)]	-[4)]	53	101	152	247	-[4)]	-[4)]
			80		-[4)]	-[4)]	61	116	173	282	-[4)]	-[4)]
Bearing capacity under shear load, steel failure without lever arm[1)]											
fischer anchor rods, performance category C1 [2)]											
Characteristic resistance $V_{Rk,s,C1}$	Steel zinc plated	Property class	5.8	[kN]	11(10)	17(16)	25	47	74	106	138	168
			8.8		15(13)	23(21)	34	63	98	141	184	225
	Stainless steel R and high corrosion resistant steel HCR		50		9	15	21	39	61	89	115	141
			70		13	20	30	55	86	124	161	197
			80		15	23	34	63	98	141	184	225
Standard threaded rods, performance category C1 [2)]											
Characteristic resistance $V_{Rk,s,C1}$	Steel zinc plated	Property class	5.8	[kN]	8(7)	12(11)	17	33	52	74	97	118
			8.8		11	16(14)	24	44	69	99	129	158
	Stainless steel R and high corrosion resistant steel HCR		50		6	11	15	27	43	62	81	99
			70		9	14	21	39	60	87	113	138
			80		11	16	24	44	69	99	129	158
fischer anchor rods and standard threaded rods, performance category C2											
Characteristic resistance $V_{Rk,s,C2}$	Steel zinc plated	Property class	5.8	[-]	-[4)]	-[4)]	14	27	43	62	-[4)]	-[4)]
			8.8		-[4)]	-[4)]	22	44	69	99	-[4)]	-[4)]
	Stainless steel R and high corrosion resistant steel HCR		50		-[4)]	-[4)]	14	27	43	62	-[4)]	-[4)]
			70		-[4)]	-[4)]	20	39	60	87	-[4)]	-[4)]
			80		-[4)]	-[4)]	22	44	69	99	-[4)]	-[4)]
Factor for the annular gap		α_{gap}		[-]	0,5 (1,0)[3)]							

[1)] Partial factors for performance category C1 or C2 see table C14.2;
for fischer anchor rods FIS A / RG M the factor for steel ductility is 1,0

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

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

[4)] No performance assessed

Table C14.1: Characteristic values for **steel failure** under tension / shear load for of **reinforcing bars (B500B)** under seismic action performance category **C1**

Nominal diameter of the bar		**ϕ**	**8**	**10**	**12**	**14**	**16**	**20**	**25**	**28**	**32**
Bearing capacity under tension load, steel failure[1)]											
Reinforcing bar B500B acc. to DIN 488-2:2009-08, performance category C1											
Characteristic resistance	$N_{Rk,s,C1}$	[kN]	28	44	63	85	111	173	270	339	443
Bearing capacity under shear load, steel failure without lever arm[1)]											
Reinforcing bar B500B acc. to DIN 488-2:2009-08, performance category C1											
Characteristic resistance	$V_{Rk,s,C1}$	[kN]	10	15	22	30	39	61	95	119	155

[1)] Partial factors for performance category C1 see table C14.2

Table C14.2: **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			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Nominal diameter of the bar		**ϕ**	**8**	**10**	**12**	**14**	**16**	**20**	**25**	**28**	**32**
Tension load, steel failure[1)]											
Partial factor $\gamma_{Ms,N}$	Steel zinc plated	Property class 5.8	[-]	1,50							
		Property class 8.8		1,50							
	Stainless steel R and high corrosion resistant steel HCR	Property class 50		2,86							
		Property class 70		1,50[2)] / 1,87							
		Property class 80		1,60							
	Reinforcing bar	B500B		1,40							
Shear load, steel failure[1)]											
Partial factor $\gamma_{Ms,V}$	Steel zinc plated	Property class 5.8	[-]	1,25							
		Property class 8.8		1,25							
	Stainless steel R and high corrosion resistant steel HCR	Property class 50		2,38							
		Property class 70		1,25[2)] / 1,56							
		Property class 80		1,33							
	Reinforcing bar	B500B		1,50							

[1)] In absence of other national regulations

[2)] Only admissible for high corrosion resistant steel HCR, with $f_{yk} / f_{uk} \geq 0,8$ and $A_5 > 12$ % (e.g. fischer anchor rods)

Table C15.1: Characteristic values for **combined pull-out** and concrete failure for **fischer anchor rods** and **standard threaded rods** in hammer drilled holes with **injection mortar FIS SB** or **resin capsule RSB** under seismic action performance category **C1**

Anchor rod / standard threaded rod				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**[1]	**M30**
Characteristic bond resistance, combined pullout and concrete cone failure											
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete; resin capsule RSB additional in water filled holes)											
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,C1}$	[N/mm²]	4,6	5,0	5,6	5,6	5,6	5,6	5,6	6,4
	II: 50 °C / 80 °C			4,3	4,6	5,6	5,6	5,6	5,6	5,3	6,0
	III: 72 °C / 120 °C			3,9	4,3	4,9	4,9	4,9	4,9	4,5	5,1
	IV: 90 °C / 150 °C			3,6	3,9	4,5	4,5	4,5	4,5	4,1	4,7
Installation factors											
Dry or wet concrete		γ_{inst}	[-]	1,0							
Water filled hole				1,2 [2]		1,0 [2]					

[1] Only use with injection mortar FIS SB
[2] Only use with resin capsule RSB in water filled hole

Table C15.2: Characteristic values for **combined pull-out** and concrete failure for **reinforcing bars** in hammer drilled holes with **injection mortar FIS SB** under seismic action performance category **C1**

Nominal diameter of the bar				**8**	**10**	**12**	**14**	**16**	**20**	**25**	**28**	**32**
Characteristic bond resistance, combined pullout and concrete cone failure												
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)												
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,C1}$	[N/mm²]	3,2	4,3	4,5	4,5	5,3	4,5	4,5	4,5	5,1
	II: 50 °C / 80 °C			3,2	3,9	4,1	4,1	4,9	4,5	4,5	4,5	5,1
	III: 72 °C / 120 °C			2,8	3,6	3,8	3,8	4,5	4,1	4,1	4,1	4,7
	IV: 90 °C / 150 °C			2,5	3,2	3,4	3,4	4,1	3,8	3,8	3,8	4,3
Installation factors												
Dry or wet concrete		γ_{inst}	[-]	1,0								

Table C16.1: Characteristic values for **combined pull-out** and concrete failure for for **fischer anchor rods** and **standard threaded rods** in hammer drilled holes with **injection mortar FIS SB** under seismic action performance category **C2**

Anchor rod / standard threaded rod				**M12**	**M16**	**M20**	**M24**
Characteristic bond resistance, combined pullout and concrete cone failure							
Hammer-drilling with standard drill bit or hollow drill bit (dry or wet concrete)							
Tem-perature range	I: 24 °C / 40 °C	$\tau_{Rk,C2}$	[N/mm²]	4,5	3,2	2,6	3,0
	II: 50 °C / 80 °C			4,5	3,2	2,6	3,0
	III: 72 °C / 120 °C			3,9	2,7	2,3	2,6
	IV: 90 °C / 150 °C			3,6	2,5	2,1	2,4
Installation factors							
Dry or wet concrete		γ_{inst}	[-]	1,0			
Displacement-Factors for tension load[1)]							
$\delta_{N,C2\ (DLS)}$-Factor		[mm/(N/mm²)]		0,09	0,10	0,11	0,12
$\delta_{N,C2\ (ULS)}$-Factor				0,15	0,17	0,17	0,18
Displacement-Factors for shear load[2)]							
$\delta_{V,C2\ (DLS)}$-Factor		[mm/kN]		0,18	0,10	0,07	0,06
$\delta_{V,C2\ (ULS)}$-Factor				0,25	0,14	0,11	0,09

[1)] Calculation of effective displacement:

$\delta_{N,C2\ (DLS)} = \delta_{N,C2\ (DLS)\text{-Factor}} \cdot \tau_{Ed}$

$\delta_{N,C2\ (ULS)} = \delta_{N,C2\ (ULS)\text{-Factor}} \cdot \tau_{Ed}$

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

[2)] Calculation of effective displacement:

$\delta_{V,C2\ (DLS)} = \delta_{V,C2\ (DLS)\text{-Factor}} \cdot V_{Ed}$

$\delta_{V,C2\ (ULS)} = \delta_{V,C2\ (ULS)\text{-Factor}} \cdot V_{Ed}$

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