Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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

European Technical Assessment

ETA-12/0160 of 21 April 2016

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	Injection system fischer Powerbond
Product family to which the construction product belongs	Bonded anchor for use in concrete
Manufacturer	fischerwerke GmbH & Co. KG Otto-Hahn-Straße 15 79211 Denzlingen DEUTSCHLAND
Manufacturing plant	fischerwerke
This European Technical Assessment contains	15 pages including 3 annexes
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	Guideline for European technical approval of "Metal anchors for use in concrete", ETAG 001 Part 5: "Bonded anchors", April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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Specific Part

1 Technical description of the product

The injection system fischer Powerbond is a bonded anchor consisting of a cartridge with injection mortar fischer FIS PM or FIS HB, an anchor rod and the corresponding fischer Power Sleeve FIS PS.

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 for design according to TR 029 or CEN/TS 1992-4:2009, Displacements	See Annex C 1 to C 3

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances there may be requirements (e.g. transposed European legislation and national laws, regulations and administrative provisions) applicable to the products falling within the scope of this European Technical Assessment. In order to meet the provisions of Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

The essential characteristics regarding Safety in use are included under the Basic Works Requirement Mechanical resistance and stability.

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

In accordance with guideline for European technical approval ETAG 001, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

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

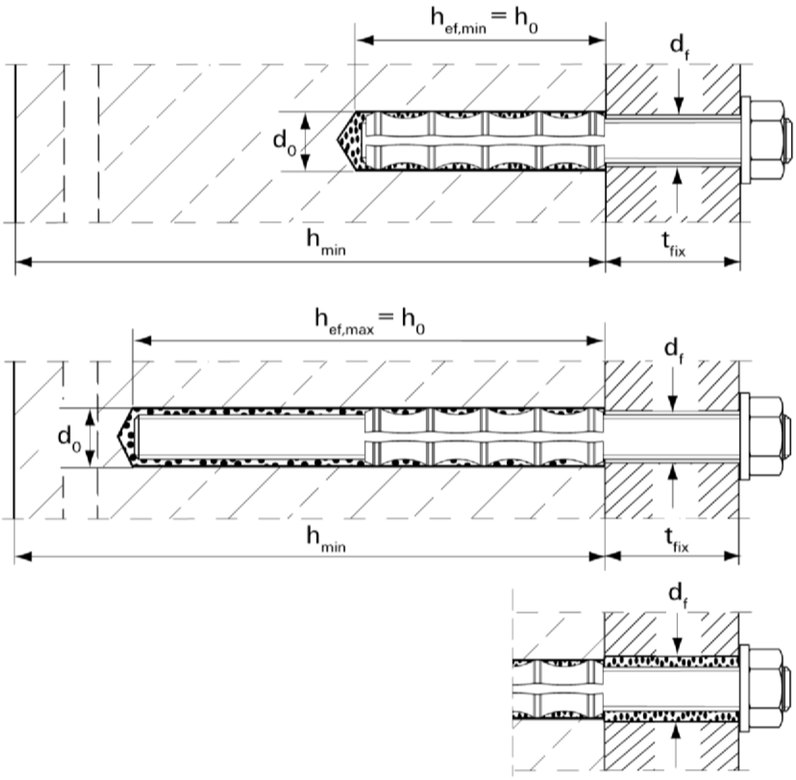
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 21 April 2016 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
Lange

Installation conditions

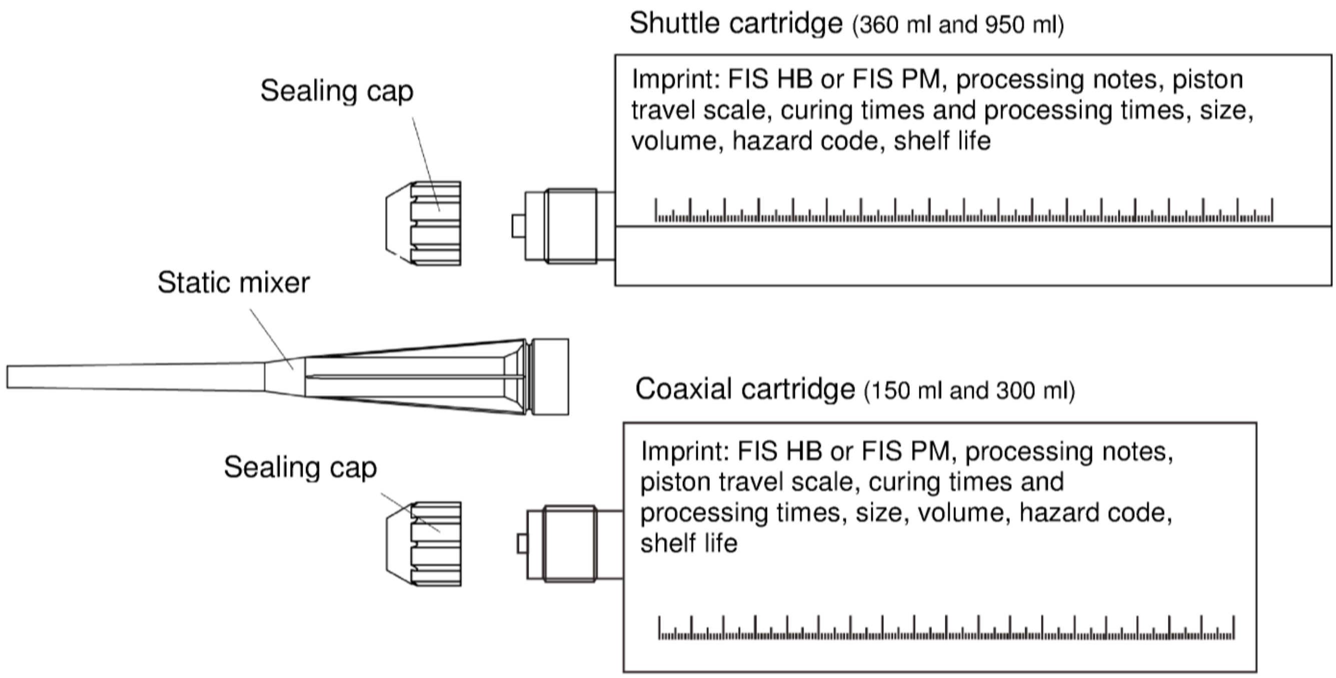


$h_{ef,min}$ = sleeve lenght L_H (see Table B2)

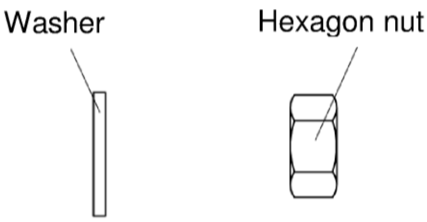
$h_{ef,max}$ = 2 • sleeve length L_H (see Table B2)

Push-through anchorage (annular gap filled with mortar)

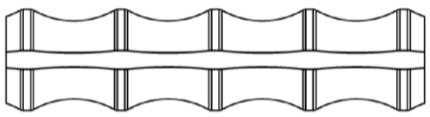
Injection system fischer Powerbond	Annex A 1
Product description Installation conditions	



Anchor rod
Size: M10, M12, M16, M20, M24



fischer Power Sleeve FIS PS
Size: FIS PS M10, FIS PS M12, FIS PS M16, FIS PS M20, FIS PS M24



Injection system fischer Powerbond	**Annex A 2**
Product description Cartridge, static mixer, steel parts	

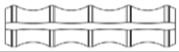
Table A1: Materials

Part	Description	Material		
1	Mortar cartridge	Mortar, hardener, fillers		
		Steel, zinc plated	Stainless steel A4	High corrosion-resistant steel C
2	Anchor rod	Property class 5.8 or 8.8; EN ISO 898-1: 2013 zinc plated ≥ 5µm, EN ISO 4042:1999 A2K or hot-dip galvanised EN ISO 10684:2004 f_{uk} ≤ 1000 N/mm² A_5 > 8% 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 > 8% fracture elongation	Property class 50 or 80 EN ISO 3506:2009 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 > 8% fracture elongation
3	Washer ISO 7089:2000	zinc plated ≥ 5µm, EN ISO 4042:1999 A2K or hot-dip galvanised EN ISO 10684:2004	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4666 EN 10088-1:2014	1.4565;1.4529 EN 10088-1:2014
4	Hexagon nut	Property class 5 or 8; EN ISO 898-2:2013 zinc plated ≥ 5µm, ISO 4042:1999 A2K or hot-dip galvanised EN ISO 10684:2004	Property class 50, 70 or 80 EN ISO 3506:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4666 EN 10088-1:2014	Property class 50, 70 or 80 EN ISO 3506:2009 1.4565; 1.4529 EN 10088-1:2014
5	Power Sleeve	Stainless steel A2 or A4		1.4565; 1.4529

Deutsches Institut für Bautechnik DIBt

Specifications of intended use:

Table B1: Overview use categories and performance categories

Anchorages subject to		**FIS HB or FIS PM with …**	
		Anchor rod with Power Sleeve  	
Hammer drilling		all sizes	
Diamond drilling		Size M10, M12, M16	
Static and quasi static load, in	uncracked concrete	all sizes	Tables B2, C1; C2; C3; C4
	cracked concrete	all sizes	
Use category	Dry or wet concrete	all sizes	
	Flooded hole	all sizes	
Installation temperature		-5°C bis +40°C	
Service temperature	-40°C to +80°C	(max. long term temperature +50°C and max. short term temperature +80°C)	

Base materials:
- Reinforced or unreinforced normal weight concrete according to EN 206:2013
- Strength classes C20/25 to C50/60 according to EN 206:2013

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 and to permanently damp internal condition, if other particular aggressive conditions exist (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 under the responsibility of an engineer experienced in anchorages and concrete work
- Verifiable calculation notes and drawings are 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 static or quasi-static actions are designed in accordance with EOTA Technical Report TR 029 "Design of bonded anchors" Edition September 2010 or CEN/TS 1992-4:2009

Installation:
- Anchor installation 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
- Marking and keeping the effective anchorage depth
- Overhead installation is allowed

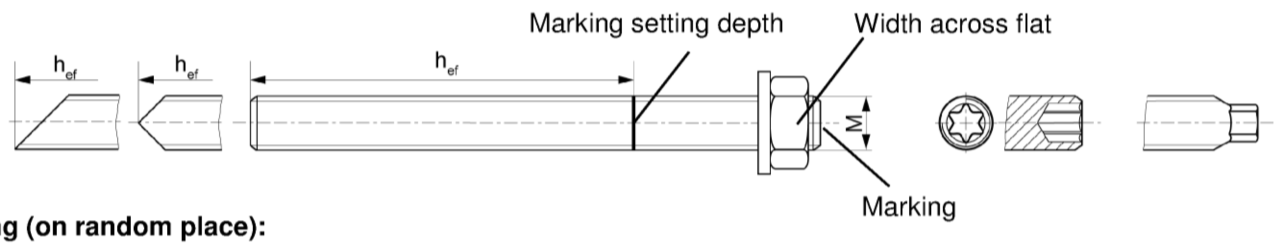
Injection system fischer Powerbond	**Annex B 1**
Intended Use Specifications	

Table B2: Installation parameters

Size (anchor rod)				M10	M12	M16	M20	M24
Width across flat		SW	[mm]	17	19	24	30	36
Nominal drill bit diameter		d_0	[mm]	14	16	20	25	28
Depth of drill hole		h_0	[mm]	$h_0 = h_{ef}$				
Corresponding Power Sleeve		FIS	[-]	PS M10	PS M12	PS M16	PS M20	PS M24
Length of sleeve		L_H	[mm]	60	72	96	120	144
Diameter of sleeve		d_H	[mm]	14	16	20	25	28
Effective anchorage depth[1)] 6 • d to 12 • d		$h_{ef,min}$	[mm]	60	72	96	120	144
		$h_{ef,max}$	[mm]	120	144	192	240	288
Minimum edge distance and minimum spacing for $h_{ef,min} \leq h_{ef} \leq h_{ef,max}$								
Cracked concrete		$s_{min} = c_{min}$	[mm]	50	55	60	80	100
Uncracked concrete		$s_{min} = c_{min}$	[mm]	55	55	65	80	100
Diameter of clearance hole in the fixture[2)]	Pre positioned anchorage	d_f	[mm]	12	14	18	22	26
	Push through anchorage	d_f	[mm]	15	17	21	26	30
Minimum thickness of concrete member		h_{min}	[mm]	h_{ef} + 30 (≥ 100)	$h_{ef} + 2d_0$			
Max. torque moment		$T_{inst,max}$	[Nm]	20	40	60	100	120

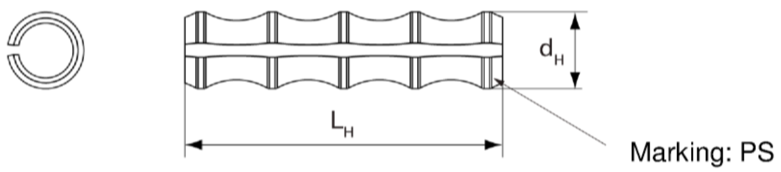
1) $h_{ef,min} \leq h_{ef} \leq h_{ef,max}$ is possible
2) For larger clearance holes in the fixture see TR 029, 4.2.2.1 or CEN/TS 1992-4-1:2009, 5.2.3.1

fischer anchor rods



Marking (on random place):
Property class 8.8, stainless steel, property class 80 or high corrosion-resistant steel, property class 80: •
Stainless steel A4, property class 50 and high corrosion-resistant steel, property class 50: ••
Commercial standard threaded rods, washers and hexagon nuts may also be used if the following requirements are fulfilled:
- Materials, dimensions and mechanical properties according Annex A 3, Table A1
- Inspection certificate 3.1 according to EN 10204:2004, the documents have to be stored
- Marking of embedment depth

fischer Power Sleeve



TableB3: Parameters of steel brush FIS BS Ø

Drill bit diameters	[mm]	14	16	20	25	28
Steel brush diameters d_b	[mm]	16	20	25	27	30

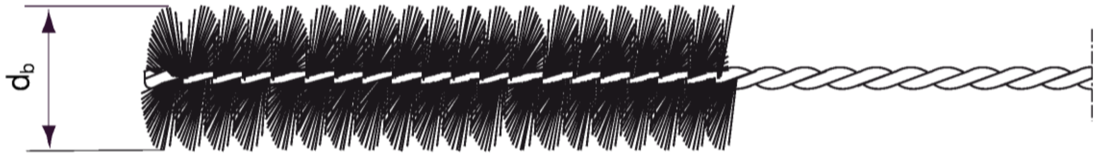


Table B4: Maximum processing times of the mortar and minimum curing times

Concrete temperature[3)] [°C]			Minimum curing time[1)] t_{cure} [Minutes]	Maximum processing time[2)] t_{work} [Minutes]
			FIS HB / FIS PM	FIS HB / FIS PM
-5	to	±0	360	--
>±0	to	+5	180	--
>+5	to	+10	90	15
>+10	to	+20	35	6
>+20	to	+30	20	4
>+30	to	+40	12	2

[1)] In wet concrete or flooded holes the curing times must be doubled.
[2)] The working temperature of the mortar must be at least +5 °C
[3)] The base temperature during the curing time must not fall below -5 °C.

Injection system fischer Powerbond

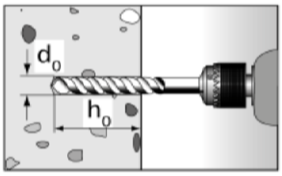
Intended Use
Cleaning tools
Processing times and curing times

Annex B 3

Installation instructions part1

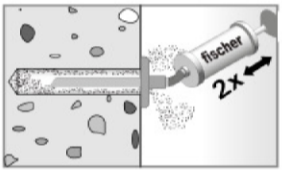
Drilling and cleaning the hole (hammer drill)

1

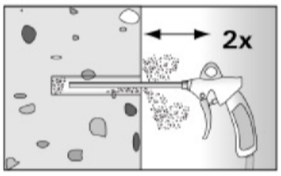


Drill the hole. Drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see Table **B2**

2

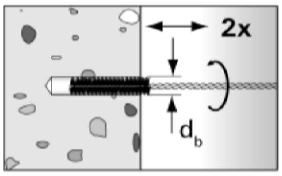


Size M10, M12, M16
Blow out the drill hole two times with manual pump



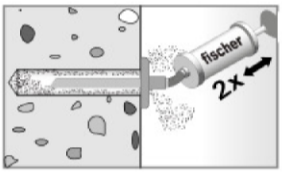
All sizes
Blow out the drill hole two times, using oil-free compressed air ($p > 6$ bar).

3

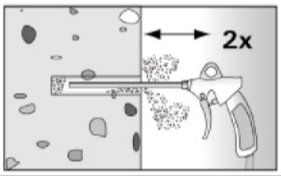


Brush the drill hole two times with corresponding steel brush, beginning from the bottom of the hole. If needed with extension. The brush must produce natural resistance while entering the bore hole. If not, the brush is too small and must be replaced with a proper brush.
Diameters of brushes d_b see Table **B3.**

4



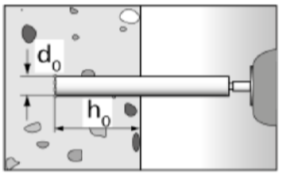
Size M10, M12, M16
Blow out the drill hole two times with manual pump



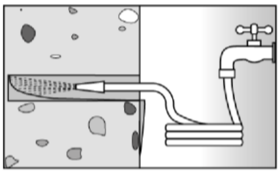
All sizes
Blow out the drill hole two times, using oil-free compressed air ($p > 6$ bar).

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

1

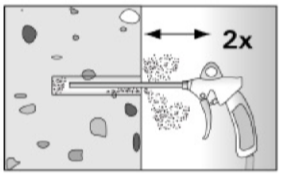


Drill the hole.
Drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see Table **B2**



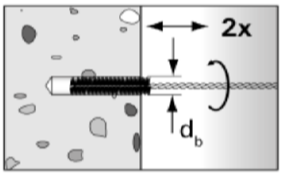
Break the drill core and draw it out.
Flush the drill hole until the water comes clear.

2



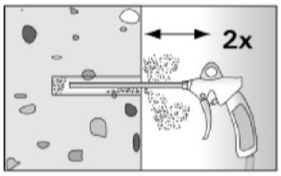
Blow out the drill hole two times, using oil-free compressed air ($p > 6$ bar).

3



Brush the drill hole two times with corresponding steel brush, beginning from the bottom of the hole. If needed with extension. The brush must produce natural resistance while entering the bore hole. If not, the brush is too small and must be replaced with a proper brush.
Diameters of brushes d_b see Table **B3.**

4



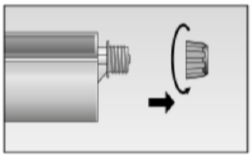
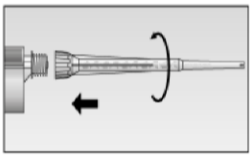
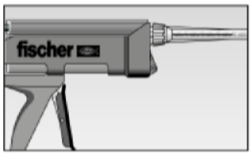
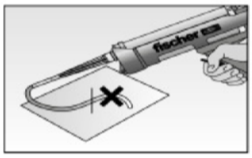
Blow out the drill hole two times, using oil-free compressed air ($p > 6$ bar).

Injection system fischer Powerbond

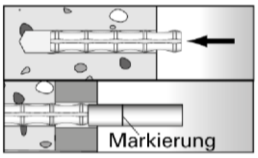
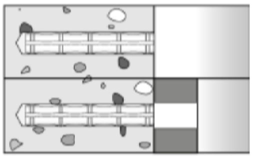
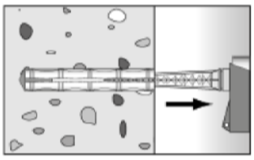
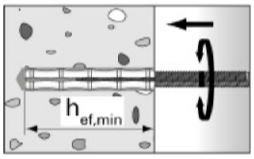
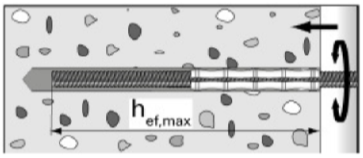
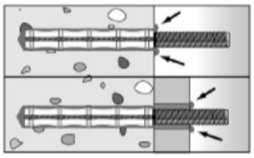
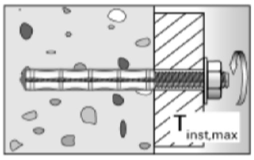
Intended use
Installation instructions part 1

Annex B 4

Installation instructions part 2;
Preparing the cartridge

5		Twist off the sealing cap		Twist on the static mixer (the spiral in the static mixer must be clearly visible).
6		Place the cartridge into the dispenser.		Press approximately 10 cm of material out until the resin is evenly grey in colour. Don`t use mortar that is not uniformly grey.

Installation Power Sleeve and anchor rod

7		Insert the Power Sleeve into the clean drill hole. For push through anchorage use a suitable tool with marking for setting depth.		The Power Sleeve must be flush with the surface of the concrete.
8		Fill approx. 2/3 of the hole through the Power Sleeve with injection mortar FIS HB or FIS PM beginning from the back of the hole, slowly withdrawing the mixer with each trigger pull. If necessary use an extension.		
9	 	Press the anchor rod down ti the bottom of the hole, turning it slightly while doing so. $h_{ef,min}$ and $h_{ef,max}$ see Table **B2**		
10		For correct installation excess mortar must emerge from the drill hole after reaching the setting depth mark. Otherwise remove the anchor rod immediately and re-inject additional amount of FIS PM mortar. For push-through installation the annular gap has to be filled with mortar.		Wait for the specified curing time t_{cure} see Table **B4**
11		Mounting the fixture $T_{inst,max}$ see Table **B2**		

Injection system fischer Powerbond	**Annex B 5**
Intended use Installation instructions part 2	

Table C1: Characteristic values under tension load

Size					M10	M12	M16	M20	M24
Steel failure									
Characteristic resistance $N_{Rk,s}$	Steel zinc plated	Property class	5.8	[kN]	29	43	79	123	177
			8.8	[kN]	47	68	126	196	282
	Stainless steel A4	Property class	50	[kN]	29	43	79	123	177
			70	[kN]	41	59	110	172	247
			80	[kN]	47	68	126	196	282
	High corrosion resistance steel C	Property class	50	[kN]	29	43	79	123	177
			70[2)]	[kN]	41	59	110	172	247
			80	[kN]	47	68	126	196	282
Partial safety factor $\gamma_{Ms,N}$ [1)]	Steel zinc plated	Property class	5.8	[-]	1,50				
			8.8	[-]	1,50				
	Stainless steel A4	Property class	50	[-]	2,86				
			70	[-]	1,87				
			80	[-]	1,50				
	High corrosion resistand steel C	Property class	50	[-]	2,86				
			70[2)]	[-]	1,50				
			80	[-]	1,60				
Pullout and concrete cone failure in cracked concrete C20/25									
Diameter for calculation			d	[mm]	10	12	16	20	24
Characteristic resistance			$\tau_{Rk,p}$	[N/mm²]	10	10	10	10	8
Factor acc. CEN/TS 1992-4:2009 Section 6.2.2.3			k_{cr}	[-]	7,2				
Pullout and concrete cone failure in uncracked concrete C20/25									
Characteristic resistance			$\tau_{Rk,p}$	[N/mm²]	13	13	13(12)[3)]	11,5	11
Factor acc. CEN/TS 1992-4:2009 Section 6.2.2.3			k_{ucr}	[-]	10,1				
Increasing factor for $\tau_{Rk,p}$		ψ_c	C25/30	[-]	1,06				
			C30/37	[-]	1,12				
			C35/45	[-]	1,19				
			C40/50	[-]	1,23				
			C45/55	[-]	1,27				
			C50/60	[-]	1,30				
Edge distance	$h_{ef} / d \leq 8$		$c_{cr,sp}$	[mm]	1,75 • h_{ef}	1,85 • h_{ef}	1,95 • h_{ef}	2 • h_{ef}	2 • h_{ef}
	$h_{ef} / d > 8$		$c_{cr,sp}$	[mm]	1,5 • h_{ef}				
Spacing			$s_{cr,sp}$	[mm]	2 • $c_{cr,sp}$				
Installation safety factors									
Dry and wet concrete			$\gamma_2 = \gamma_{inst}$	[-]	1,0				
Flooded hole			$\gamma_2 = \gamma_{inst}$	[-]	1,2				

[1)] In absence of other national regulations
[2)] f_{uk} = 700 N/mm²; f_{yk} = 560 N/mm²
[3)] $h_{ef} > 9d$

Table C2: Characteristic values under shear load

Size					M10	M12	M16	M20	M24
Steel failure without lever arm									
Characteristic resistance $V_{Rk,s}$	Steel zinc plated	Property class	5.8	[kN]	15	21	39	61	89
			8.8	[kN]	23	34	63	98	141
	Stainless steel A4	Property class	50	[kN]	15	21	39	61	89
			70	[kN]	20	30	55	86	124
			80	[kN]	23	34	63	98	141
	High corrosion resistance steel C	Property class	50	[kN]	15	21	39	61	89
			70[2]	[kN]	20	30	55	86	124
			80	[kN]	23	34	63	98	141
Steel failure with lever arm									
Characteristic bending moment $M^0_{Rk,s}$	Steel zinc plated	Property class	5.8	[Nm]	37	65	167	324	561
			8.8	[Nm]	60	105	266	519	898
	Stainless steel A4	Property class	50	[Nm]	37	65	166	324	561
			70	[Nm]	52	92	233	454	785
			80	[Nm]	60	105	266	519	898
	High corrosion resistance steel C	Property class	50	[Nm]	37	65	166	324	561
			70[2]	[Nm]	52	92	233	454	785
			80	[Nm]	60	105	266	519	898
Partial safety factor steel failure									
$\gamma_{Ms,V}$[1]	Steel zinc plated	Property class	5.8	[-]	1,25				
			8.8	[-]	1,25				
	Stainless steel A4	Property class	50	[-]	2,38				
			70	[-]	1,56				
			80	[-]	1,25				
	High corrosion resistance steel C	Property class	50	[-]	2,38				
			70[2]	[-]	1,25				
			80	[-]	1,33				
Concrete pryout failure									
Factor k acc. to TR029 Section 5.2.3.3 resp. k_3 acc. to CEN/TS 1992-4-5:2009 Section 6.3.3			$k_{(3)}$	[-]	2,0				
Installation safety factors									
All installation conditions			$\gamma_2 = \gamma_{inst}$	[-]	1,0				

[1] In absence of other national regulations
[2] $f_{uk} = 700\ N/mm^2$; $f_{yk} = 560\ N/mm^2$

Injection system fischer Powerbond

Performances
Characteristic values under shear load

Annex C 2

Table C3.1: Displacements under tension load in uncracked concrete

Displacement-Factors for tension[1)]						
Size		M10	M12	M16	M20	M24
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,03	0,04	0,05	0,07	0,09
$\delta_{N\infty\text{-Factor}}$	[mm/(N/mm²)]	0,05	0,06	0,08	0,10	0,13

Table C3.2: Displacements under tension load in cracked concrete

Displacement-Factors for tension[1)]						
Size		M10	M12	M16	M20	M24
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,07	0,09	0,11	0,14	0,18
$\delta_{N\infty\text{-Factor}}$	[mm/(N/mm²)]	0,10	0,13	0,17	0,21	0,27

[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)

Table C4: Displacements under shear load

Displacement-Factors for shear load[1)]						
Size		M10	M12	M16	M20	M24
$\delta_{V0\text{-Factor}}$	[mm/kN]	0,15	0,12	0,09	0,07	0,06
$\delta_{N\infty\text{-Factor}}$	[mm/kN]	0,22	0,18	0,14	0,11	0,09

[1)] 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)