Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Member of EOTA
www.eota.eu

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

European Technical Assessment ETA-05/0164 of 24 January 2017

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	fischer Highbond-Anchor FHB II
Product family to which the construction product belongs	Torque controlled bonded anchor for use in concrete
Manufacturer	fischerwerke GmbH & Co. KG Klaus-Fischer-Straße 1 72178 Waldachtal DEUTSCHLAND
Manufacturing plant	fischerwerke
This European Technical Assessment contains	22 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	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.
This version replaces	ETA-05/0164 issued on 22 November 2016

Deutsches Institut für Bautechnik
Kolonnenstraße 30 B | 10829 Berlin | GERMANY | Phone: +49 30 78730-0 | Fax: +49 30 78730-320 | Email: dibt@dibt.de | www.dibt.de

The European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and shall be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may only be made with the written consent of the issuing Technical Assessment Body. Any partial reproduction shall be identified as such.

This European Technical Assessment may be withdrawn by the issuing Technical Assessment Body, in particular pursuant to information by the Commission in accordance with Article 25(3) of Regulation (EU) No 305/2011.

Specific Part

1 Technical description of the product

The fischer Highbond-Anchor FHB II is a torque controlled bonded anchor consisting of a mortar cartridge with mortar fischer FIS HB or fischer mortar capsule FHB II–P(F) and an anchor rod FHB II - A L or FHB II - A S with hexagon nut and washer.

The glass capsule is set into a drilled hole in the concrete. The special formed anchor rod is driven into the glass capsule by machine with simultaneous hammering and turning. For the injection system the anchor rod is placed into a drilled hole filled with injection mortar. The load transfer is realised by mechanical interlock of several cones in the bonding mortar and then via a combination of bonding and friction forces in the anchorage ground (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 tension and shear load	See Annex C 1 to C 4
Displacements under tension and shear loads	See Annex C 5 and C 6

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.

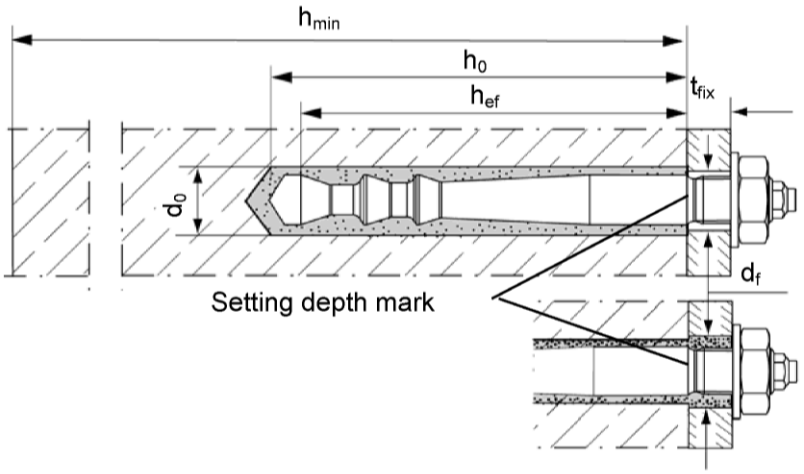
Issued in Berlin on 24 January 2017 by Deutsches Institut für Bautechnik

Andreas Kummerow
p.p. Head of Department

beglaubigt:
Baderschneider

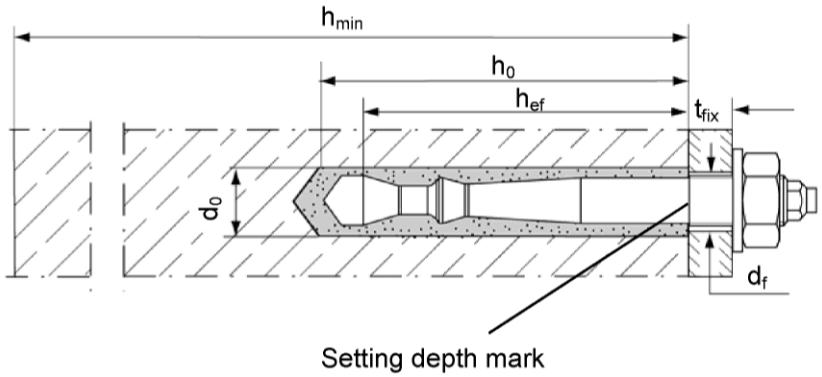
Deutsches Institut für Bautechnik DIBt

Installation conditions



Highbond-Anchor
FHB II - A L
Pre-positioned anchor

Highbond-Anchor
FHB II - A L
Push through anchor
(not with mortar capsule)
annular gap filled with mortar



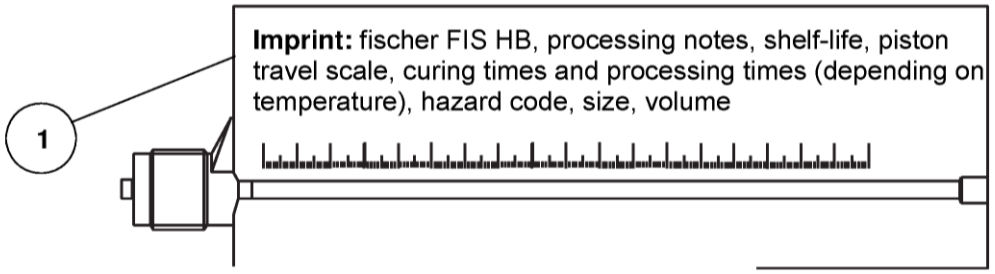
Highbond-Anchor
FHB II - A S
Pre-positioned anchor
and push through anchor

fischer Highbond-Anchor FHB II	
Product description Installation condition	**Annex A 1**

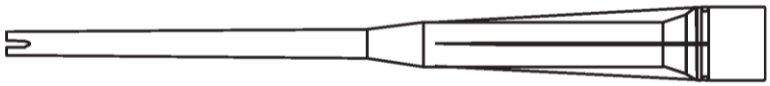
Deutsches Institut für Bautechnik DIBt

Cartridge sizes 150 ml, 300 ml (Coaxial cartridge)
360 ml, 950 ml (Shuttle cartridge)

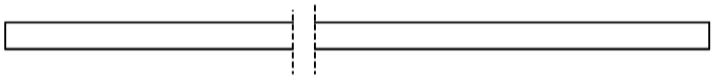
Sealing cap



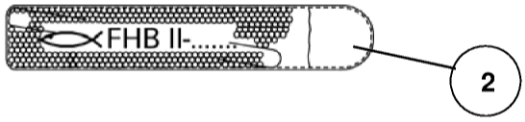
Static mixer FIS MR or FIS UMR



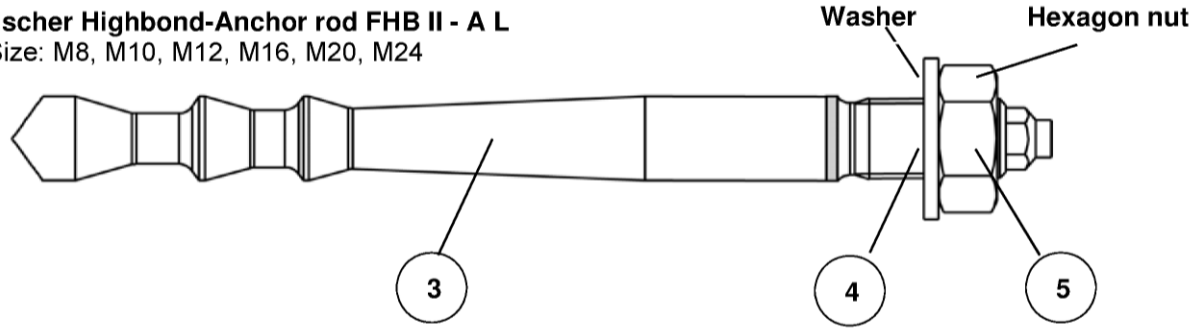
Extension tube



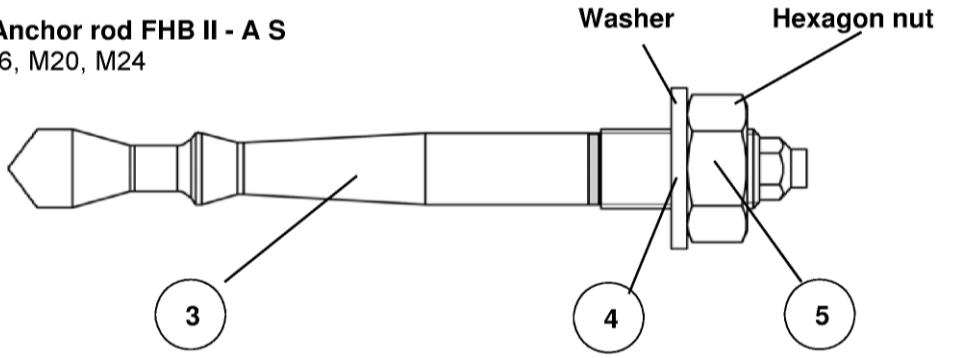
fischer mortar capsule FHB II-P or FHB II-PF



fischer Highbond-Anchor rod FHB II - A L
Size: M8, M10, M12, M16, M20, M24



fischer Highbond-Anchor rod FHB II - A S
Size: M10, M12, M16, M20, M24



fischer Highbond-Anchor FHB II	**Annex A 2**
Product description Cartridges / Static mixer / Mortar capsule / Steel elements	

Deutsches Institut für Bautechnik DIBt

Table A1: Materials

Part	Designation	Material		
1	Mortar cartridge	Mortar, hardener, filler		
2	Mortar capsule	Mortar, hardener, filler		
	Steel grade	Steel, zinc plated	Stainless steel A4	High corrosion resistant steel C
3	fischer Highbond-Anchor rod FHB II - A L or FHB II - A S	Property class 8.8; EN ISO 898-1:2013 zinc plated ≥ 5 µm, EN ISO 4042:1999 A2K $f_{uk} \leq 1000$ N/mm² $A_5 > 12$ % fracture elongation	Property class 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 $f_{uk} \leq 1000$ N/mm² $A_5 > 12$ % fracture elongation	Property class 80 EN ISO 3506-1:2009 1.4565; 1.4529 EN 10088-1:2014 $f_{uk} \leq 1000$ N/mm² $A_5 > 12$ % fracture elongation
4	Washer ISO 7089:2000	zinc plated ≥ 5 µm, EN ISO 4042:1999 A2K	1.4401; 1.4404; 1.4578;1.4571; 1.4439; 1.4362 EN 10088-1:2014	1.4565;1.4529 EN 10088-1:2014
5	Hexagon nut	Property class 8; EN ISO 898-2:2012 zinc plated ≥ 5 µm, ISO 4042:1999 A2K	Property class 70 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088-1:2014	Property class 70 EN ISO 3506-1:2009 1.4565; 1.4529 EN 10088-1:2014

fischer Highbond-Anchor FHB II

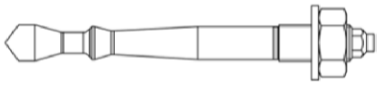
Product description
Materials

Annex A 3

Deutsches Institut für Bautechnik DIBt

Specifications of intended use (part 1)

Table B1: Overview use and performance categories

Anchorages subject to		fischer Injection mortar FIS HB or fischer mortar capsule FHB II-P or FHB II-PF with …	
		FHB II – A L 	**FHB II – A S** 
Hammer drilling with standard drill bit		All sizes	
Static or quasi static load, in	uncracked concrete	all sizes Tables: C1, C3, C5	all sizes Tables: C2, C4, C6
	cracked concrete		
Use category	dry or wet concrete	all sizes	
	flooded hole	all sizes (only with mortar capsule allowed)	
Kind of intallation	Pre-positioned anchor	all sizes	
	Push through anchor	all sizes (only with injection mortar FIS HB allowed)	all sizes
Installation temperature		-5 C to +40 C	
In-service temperature		-40°C to +80°C	(max. long term temperature +50°C and max. short term temperature +80°C)

Deutsches Institut für Bautechnik DIBt

Specifications of intended use (part 2)

Base materials:

- Reinforced or unreinforced normal weight concrete Strength classes C20/25 to C50/60 according to EN 206-1:2000

Use conditions (Environmental conditions):

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

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

Design:

- Anchorages have to be designed by a responsible engineer with experience of concrete anchor design
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.)
- Anchorages under static or quasi-static actions are designed in accordance with
- EOTA ETAG 001 Annex C, 08/2010 or CEN/TS 1992-4:2009

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
- Observe the effective anchorage depth
- Overhead installation is allowed

fischer Highbond-Anchor FHB II	**Annex B 2**
Intended Use Specifications (part 2)	

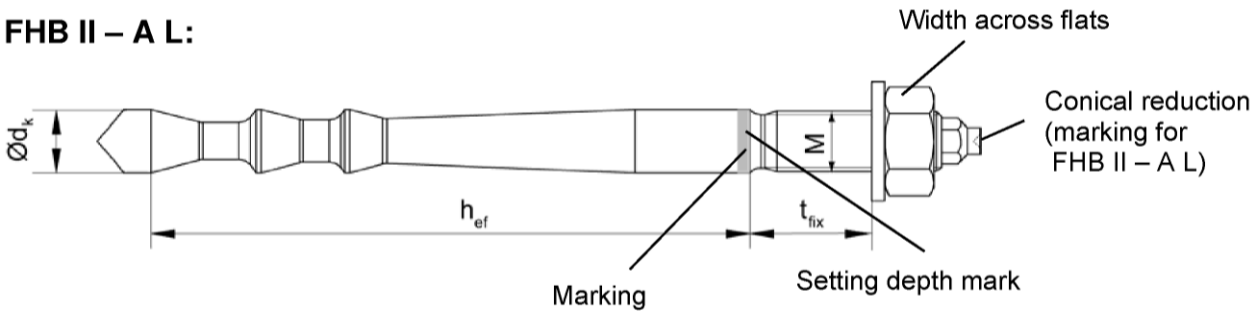
Deutsches Institut für Bautechnik DIBt

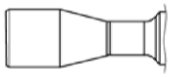
Table B2: Installation parameters for fischer Highbond-Anchor rods FHB II – A L

Size FHB II – A L			**M8x**	**M10x**	**M12x**		**M16x**			**M20x**	**M24x**
			60	**95**	**100**	**120**	**125**	**145**	**160**	**210**	**210**
Correspondending mortar capsules **FHB II-P** or **FHB II-PF**		[-]	8x60	10x95	12x 100	12x 120	16x 125	16x 145	16x 160	20x 210	24x 210
Cone diameter	d_k	[mm]	9,4	10,7	12,5		16,8			23,0	
Width across flats	SW		13	17	19		24			30	36
Nominal drill bit diameter	d_0		10	12	14		18			25	
Drill hole depth	h_0		75	110	115	135	140	160	175	235	
Effective anchorage depth	h_{ef}		60	95	100	120	125	145	160	210	
Minimum spacing and minimum edge distance	$s_{min} = c_{min}$		40		50		55	60	70	90	
Diameter of clearance hole in the fixture[1] pre-positioned anchorage	$d_f \leq$		9	12	14		18			22	
Diameter of clearance hole in the fixture[1] push through anchorage[2]	$d_f \leq$		11	14	16		20			26	
Minimum thickness of concrete member	h_{min}		100	140		170		190	220	280	
Installation torque	T_{inst}	[Nm]	15	20	40		60			100	
Thickness of fixure	$t_{Fix} \leq$	[mm]	1500								

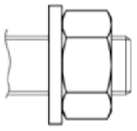
[1] For larger clearance holes in the fixture see EOTA ETAG 001 Annex C, 08/2010 or CEN/TS 1992-4-:2009
[2] Only with mortar capsule system

FHB II – A L:





Alternative point version
(only with injection mortar FIS HB)



Alternative head version

Marking:
Work symbol, size of anchor, setting depth. e. g.: M10x95

For stainless steel additional **A4**. For high corrosion resistant steel additional **C.**
For high corrosion resistant steel additional marking **C** also on the face.

fischer Highbond-Anchor FHB II	**Annex B 3**
Intended Use Installation parameters fischer Highbond-Anchor rod FHB II – A L	

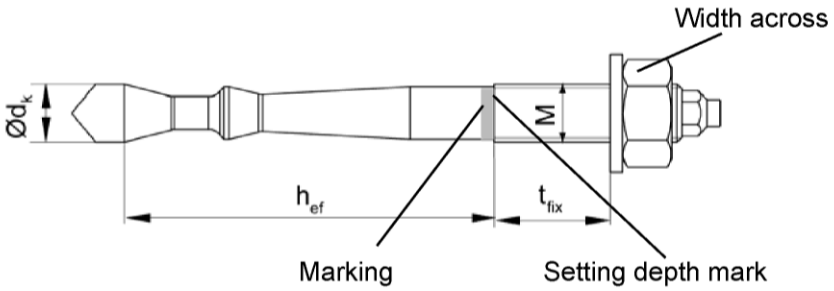
Deutsches Institut für Bautechnik DIBt

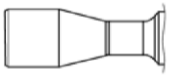
Table B3: Installation parameters for fischer Highbond-Anchor rods FHB II – A S

Size FHB II – A S				**M10x**		**M12x**	**M16x**	**M20x**	**M24x**
				60	**75**	**75**	**95**	**170**	**170**
Correspondending mortar capsules **FHB II-P** or. **FHB II-PF**			[-]	10x60	10x75	12x75	16x95	20x170	24x170
Cone diameter		d_k	[mm]	9,4		11,3	16,8	23,0	
Width across flats		SW		17		19	24	30	36
Nominal drill bit diameter		d_0		10		12	16	25	
Drill hole depth		h_0		75	90	90	110	190	
Effective anchorage depth		h_{ef}		60	75	75	95	170	
Minimum spacing and minimum edge distance		$s_{min} = c_{min}$		40			50	80	
Diameter of clearance hole in the fixture[1)]	pre-positioned anchorage	$d_f \leq$		12		14	18	22	26
	push through anchorage	$d_f \leq$		12		14	18	26	
Minimum thickness of concrete member		h_{min}		100	120		150	240	
Installation torque		T_{inst}	[Nm]	15		30	50	100	
Thickness of fixure		$t_{Fix} \leq$	[mm]	1500					

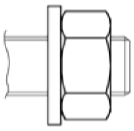
[1)] For larger clearance holes in the fixture see EOTA ETAG 001 Annex C, 08/2010 or CEN/TS 1992-4-:2009

FHB II – A S:





Alternative point version
(only with injection mortar FIS HB)



Alternative head version

Marking:
Work symbol, size of anchor, setting depth. e. g.: M10x75

For stainless steel additional **A4**. For high corrosion resistant steel additional **C.**
For high corrosion resistant steel additional marking **C** also on the face.

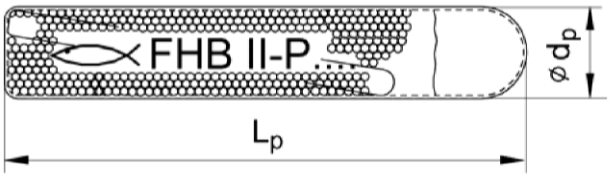
fischer Highbond-Anchor FHB II	**Annex B 4**
Intended Use Installation parameters fischer Highbond-Anchor rod FHB II – A S	

Deutsches Institut für Bautechnik DIBt

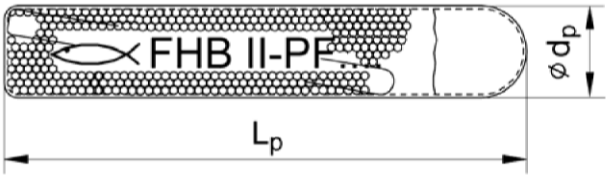
Table B4: Dimensions of mortar capsules FHB II-P and FHB II-PF

Capsule			8x	10x			12x			16x				20x		24x	
			60	60	75	95	75	100	120	95	125	145	160	170	210	170	210
Length of capsule	L_p	[mm]	85		90	115	95	120			150	155		185	210	185	210
Diameter of capsule	Ø d_p		9			11		12,5		14,5	17			21,5			

FHB II-P (standard)



FHB II-PF (fast curing)



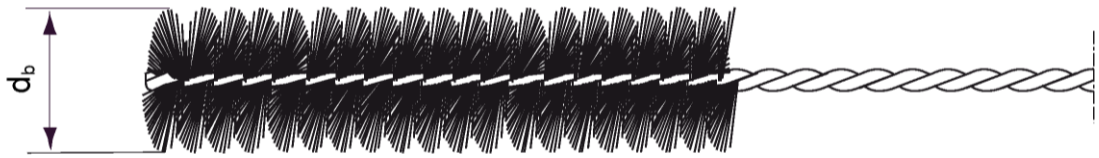
Imprint: work symbol, marking, anchor size and effective anchorage depth.

e.g : FHB II-P 12x100 or.

FHB II-PF 12x100

Table B5: Parameters of steel brush FIS BS Ø (only when using injection mortar)

Drill bit diameter	d_0	[mm]	10	12	14	16	18	25
Steel brush diameter	d_b		11	14	16	20		27



fischer Highbond-Anchor FHB II	**Annex B 5**
Intended Use Dimensions of mortar capsules Parameters of steel brush	

Deutsches Institut für Bautechnik DIBt

Table B6: Maximum processing time of the mortar **FIS HB** and minimum curing time
(During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature)

System temperature [°C]	Maximum processing time t_{work} [minutes]	Minimum curing time[1] t_{cure} [minutes]
-5 to ±0	----	6 hours
> +1 to +5	----	3 hours
> +6 to +10	15	90
> +11 to +20	6	35
> +21 to +30	4	20
> +31 to +40	2	12

[1] In wet concrete the curing times must be doubled

Table B7: Minimum curing time for mortar capsules FHB II-P and FHB II-PF
(During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature)

Mortar capsule FHB II-P (standard)	
System temperature [°C]	Minimum curing time[1] t_{cure} [minutes]
-5 to ±0	4 Stunden
> +1 to +10	45
> +11 to +20	20
> +20	10

Mortar capsule FHB II-PF (fast curing)	
System temperature [°C]	Minimum curing time[1] t_{cure} [minutes]
-5 to ±0	8
> +1 to +10	6
> +11 to +20	4
> +20	2

[1] In wet concrete or flooded holes the curing times must be doubled

fischer Highbond-Anchor FHB II

Intended Use
Processing times and curing times

Annex B 6

Deutsches Institut für Bautechnik DIBt

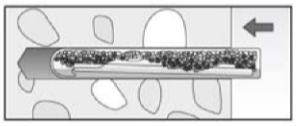
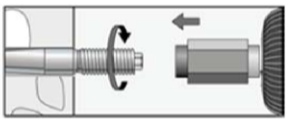
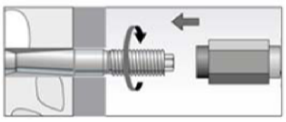
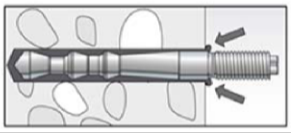
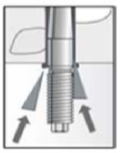
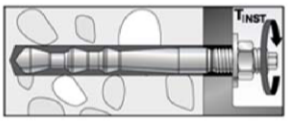
Installation instruction part 1

Installation with mortar capsule FHB II-P or FHB II-PF

Drilling the hole

1		Drill the hole with hammer drill. Drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see **Tables B2, B3** Cleaning of the bore hole is not necessary

Installation Highbond-Anchor rod FHB II – A L and FHB II – A S

2		Put the mortar capsule FHB II-P or FHB II-PF into the bore hole
3		**Pre-positioned anchor**: Only use Highbond-Anchor rods FHB II - A L or FHB II – A S with **roof-shaped point.** Drive in the Anchor rod using a hammer drill or impact drill. When reaching the setting depth mark stop the drill immediately.
		**Push through anchor**: Only use Highbond-Anchor rods **FHB II – A S** with **roof-shaped point.** Drive in the anchor rod using a hammer drill or impact drill. When reaching the setting depth mark stop the drill immediately.
4		After inserting the anchor, excess mortar must be emerged around the anchor.
		For overhead installations support the anchor rod with wedges. (e.g. fischer centering wedges) 
5		Wait for the specified curing time t_{cure} see **Table B7**
6		Mounting the fixture T_{inst} see **Tables B2 and B3**

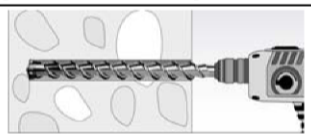
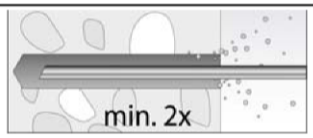
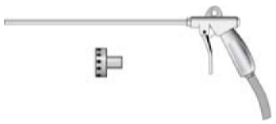
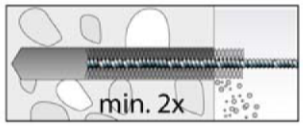
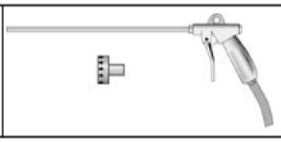
fischer Highbond-Anchor FHB II	**Annex B 7**
Intended use Installation instruction part 1	

Deutsches Institut für Bautechnik DIBt

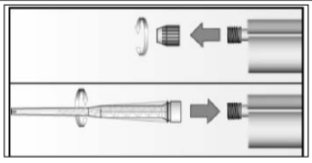
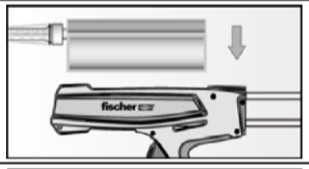
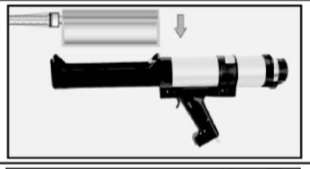
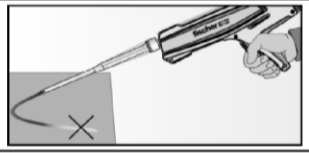
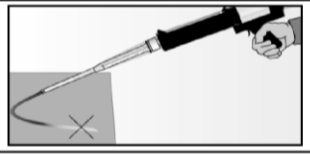
Installation instruction part 2

Installation with injection mortar FIS HB

Drilling and cleaning the hole

1		Drill the hole with hammer drill. Drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see **Tables B2, B3** .	
2		Blow out the drill hole twice. If necessary, remove standing water out of the bore hole.	
		For drill hole diameter $\mathbf{d_0}$ < 25 mm with hand-blowout or oil-free compressed air	 For drill hole diameter $\mathbf{d_0}$ = 25 mm with oil-free compressed air (p ≥ 6 bar) Use a cleaning nozzle.
3		Brush the bore hole twice. Corresponding brushes see **Table B5**	
4		Blow out the drill hole twice.	
		For drill hole diameter $\mathbf{d_0}$ < 25 mm with hand-blowout or oil-free compressed air	 For drill hole diameter $\mathbf{d_0}$ = 25 mm with oil-free compressed air (p ≥ 6 bar) Use a cleaning nozzle.

Preparing the cartridge

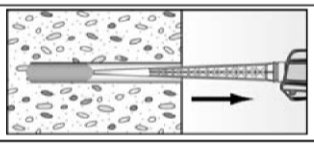
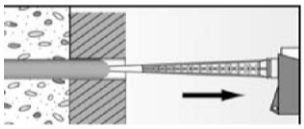
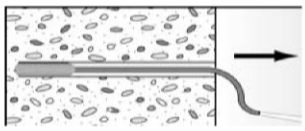
5		Remove the sealing cap Screw on the static mixer (the spiral in the static mixer must be clearly visible)	
6			Place the cartridge into the dispenser
7			Extrude approximately 10 cm of material until the resin is evenly grey in colour. Do not use mortar that is not uniformly grey
		Observe the processing time, t_{work} see **Table B6**	If the processing time is exceeded, use a new static mixer and if necessary remove encrusted material in the cartridge mouth.

fischer Highbond-Anchor FHB II	**Annex B 8**
Intended use Installation instruction part 2	

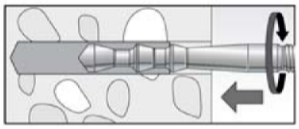
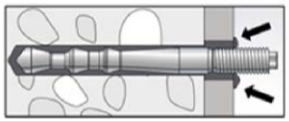
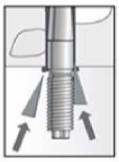
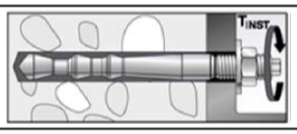
Deutsches Institut für Bautechnik DIBt

Installation instruction part 3

Injection of the mortar

8		Fill approximately 2/3 of the drill hole with mortar. Exact quantity of mortar (travel scale on the cartridge) see instruction sheet. Fill the drill hole with mortar, always begin from the bottom of the hole to avoid bubbles
		**Push-through installation:** By using Highbond-Anchor rods **FHB II-A L** the drill hole in the fixture must be also filled with mortar. **FHB II–A S** is this not necessary.
		For drill hole depth ≥ 170 mm use an extension tube

Installation Highbond-Anchor rod FHB II – A L and FHB II – A S

9		Only use clean and oil-free anchor rods. Push the anchor rod down to the bottom of the hole, turning it slightly while doing so.		
10		After inserting the anchor rod, excess mortar must be emerged around the anchor rod		
		For overhead installations support the anchor rod with wedges. (e.g. fischer centering wedges) 		
11		Wait for the specified curing time t_{cure} see **Table B6**	12	 Mounting the fixture T_{inst} see **Tables B2 and B3**

fischer Highbond-Anchor FHB II	**Annex B 9**
Intended use Installation instruction part 3	

Deutsches Institut für Bautechnik DIBt

Table C1: Characteristic values under static or quasi-static **tension load** for **fischer Highbond-Anchor FHB II – A L**

Size FHB II – A L				**M8x**	**M10x**	**M12x**		**M16x**			**M20x**	**M24x**
				60	**95**	**100**	**120**	**125**	**145**	**160**	**210**	**210**
Bearing capacity under tensile load, steel failure												
Characteristic resistance $N_{Rk,s}$	Steel, zinc plated		[kN]	25,1	34,4	49,8		96,6			137,6	
	Stainless steel A4			25,1	34,4	49,8		96,6			137,6	
	High corrosion resistant steel C											
Partial safety factors[1]												
Partial safety factor $\gamma_{Ms,N}$	Steel, zinc plated		[-]	1,5[1]								
	Stainless steel A4			1,5[1]								
	High corrosion resistant steel C			1,5[1]								
Pullout failure in cracked concrete C20/25												
Characteristic resistance		$N_{Rk,p}$	[kN]	---[3]								
Pullout and splitting failure in uncracked concrete C20/25												
Characteristic resistance		$N_{Rk,p}$	[kN]	---[3]								
Edge distance		$c_{cr,sp}$	[mm]	300	476	380	600	375	500	580	630	
Spacing		$s_{cr,sp}$		150	238	190	300	188	250	290	315	
Pullout and splitting failure in uncracked concrete C20/25												
Characteristic resistance		$N_{Rk,p}$[2]	[kN]	20	35	40	50	---[3]	75	95	---[3]	
Edge distance		$c_{cr,sp}$	[mm]	$1{,}5h_{ef}$								
Spacing		$s_{cr,sp}$		$3{,}0h_{ef}$								
Factors for the compressive strength of concrete > C20/25												
Increasing factor for $N_{Rk,p}$	C25/30	Ψ_c	[-]	1,10								
	C30/37			1,22								
	C35/45			1,34								
	C40/50			1,41								
	C45/55			1,48								
	C50/60			1,55								
Factors acc. to CEN/TS 1992-4:2009 Section 6.2.2.3												
Uncracked concrete		k_{ucr}	[-]	10,1								
Cracked concrete		k_{cr}		7,2								
Concrete cone failure												
Effective anchorage depth		h_{ef}	[mm]	60	95	100	120	125	145	160	210	
Partial safety factor[1) 5)]		γ_{Mc}	[-]	1,5[4]	1,5							

[1] In absence of other national regulations
[2] Proof of splitting failure acc. ETAG 001, Annex C, (Section 5.3). Instead of $N^0_{Rk,c}$ use $N_{Rk,p}$.
[3] Not decisive (proof of splitting failure acc. ETAG 001, Annex C)
[4] With mortar capsule: $\gamma_{Mc} = 1{,}8$
[5] $\gamma_2 = 1{,}0$ is included

Deutsches Institut für Bautechnik DIBt

Table C2: Characteristic values under static or quasi-static **tension load** for **fischer Highbond-Anchor FHB II – A S**

Size FHB II – A S				**M10x**		**M12x**	**M16x**	**M20x**	**M24x**
				60	**75**	**75**	**95**	**170**	**170**
Bearing capacity under tensile load, steel failure									
Characteristic resistance $N_{Rk,s}$	Steel, zinc plated		[kN]	25,1		34,4	61,6	128,5	
	Stainless steel A4			25,1		34,4	61,6	128,5	
	High corrosion resistant steel C								
Partial safety factors[1]									
Partial safety factor $\gamma_{Ms,N}$	Steel, zinc plated		[-]	1,5[1]					
	Stainless steel A4			1,5[1]					
	High corrosion resistant steel C			1,5[1]					
Pullout failure in cracked concrete C20/25									
Characteristic resistance		$N_{Rk,p}$	[kN]	---[3]					
Pullout and splitting failure in uncracked concrete C20/25									
Characteristic resistance		$N_{Rk,p}$	[kN]	---[3]					
Edge distance		$c_{cr,sp}$	[mm]	300			340	510	
Spacing		$s_{cr,sp}$		150			170	255	
Pullout and splitting failure in uncracked concrete C20/25									
Characteristic resistance		$N_{Rk,p}$[2]	[kN]	20	25		40	---[3]	
Edge distance		$c_{cr,sp}$	[mm]	$1{,}5h_{ef}$					
Spacing		$s_{cr,sp}$		$3{,}0h_{ef}$					
Factors for the compressive strength of concrete > C20/25									
Increasing factor for $N_{Rk,p}$	C25/30	Ψ_c	[-]	1,10					
	C30/37			1,22					
	C35/45			1,34					
	C40/50			1,41					
	C45/55			1,48					
	C50/60			1,55					
Factors acc. to CEN/TS 1992-4:2009 Section 6.2.2.3									
Uncracked concrete		k_{ucr}	[-]	10,1					
Cracked concrete		k_{cr}		7,2					
Concrete cone failure									
Effective anchorage depth		h_{ef}	[mm]	60	75		95	170	
Partial safety factor[1]		γ_{Mc}	[-]	1,5[4]	1,5				

[1] In absence of other national regulations
[2] Proof of splitting failure acc. ETAG 001, Annex C, (Section 5.3). Instead of $N^0_{Rk,c}$ use $N_{Rk,p}$.
[3] Not decisive (proof of splitting failure acc. ETAG 001, Annex C)
[4] With mortar capsule: $\gamma_{Mc} = 1{,}8$
[5] $\gamma_2 = 1{,}0$ is included

fischer Highbond-Anchor FHB II

Performances
Characteristic values under static or quasi-static tension load for fischer Highbond-Anchor FHB II – A S (uncracked or cracked concrete)

Annex C 2

Deutsches Institut für Bautechnik DIBt

Table C3: Characteristic values under static or quasi-static **shear load** for **fischer Highbond-Anchor FHB II – A L** (uncracked and cracked concrete)

Size FHB II – A L				**M8x**	**M10x**	**M12x**		**M16x**			**M20x**	**M24x**
				60	**95**	**100**	**120**	**125**	**145**	**160**	**210**	**210**
Bearing capacity under tensile load, steel failure												
without lever arm												
Characteristic resistance	Steel, zinc plated	$V_{Rk,s}$	[kN]	13,7	20,8	30,3		56,3			87,9	126,9
	Stainless steel A4 and High corrosion resistant steel C			15,2	23,2	33,7		62,7			97,9	141
with lever arm												
Characteristic bending moment	Steel, zinc plated	$M^0_{Rk,s}$	[Nm]	31	62	105		266			519	896
	Stainless steel A4 and High corrosion resistant steel C			31	62	105		266			519	896
Partial safety factors[1)]												
Partial safety factor		$\gamma_{Ms,V}$	[-]	1,25								
Ductility factor acc. to CEN/TS 1992-4-5:2009 Section 6.3.2.1		k_2	[-]	1,0								
Concrete pry-out failure												
Factor k acc. TR029 Section 5.2.3.3 or. k_3 acc.CEN/TS 1992-4-5:2009 Section 6.3.3		$k_{(3)}$	[-]	2,0								
Partial safety factors[1)]		γ_{Mcp}	[-]	1,5								
Concrete edge failure												
Effective length of anchor		l_f	[mm]	60	95	100	112	125	144		200	
Calculation diameter		d		10	12	14		18			25	
Partial safety factor[1)]		γ_{Mc}	[-]	1,5								

[1)] In absence of other national regulations

Deutsches Institut für Bautechnik DIBt

Table C4: Characteristic values under static or quasi-static **shear load** for **fischer Highbond-Anchor FHB II – A S** (uncracked and cracked concrete)

Size FHB II – A S				**M10x**		**M12x**	**M16x**	**M20x**	**M24x**
				60	**75**	**75**	**95**	**170**	**170**
Bearing capacity under tensile load, steel failure									
Without lever arm									
Characteristic resistance	Steel, zinc plated	$V_{Rk,s}$	[kN]	19,7		27,3	50,8	80,3	114,2
	Stainless steel A4			24,1		33,7	62,7	97,9	124,5
	High corrosion resistant steel C			24,1		33,7	62,7	97,9	141
With lever arm									
Characteristic bending moment	Steel, zinc plated	$M^0_{Rk,s}$	[Nm]	62		105	266	519	896
	Stainless steel A4 and High corrosion resistant steel C			62		105	266	519	896
Partial safety factors[1)]									
Partial safety factor		$\gamma_{Ms,V}$	[-]	1,25					
Ductility factor acc. to CEN/TS 1992-4-5:2009 Section 6.3.2.1		k_2	[-]	1,0					
Concrete pryout failure									
Factor k acc. TR029 Section 5.2.3.3 or. k_3 acc.CEN/TS 1992-4-5:2009 Section 6.3.3		$k_{(3)}$	[-]	2,0					
Partial safety factor [1)]		γ_{Mcp}	[-]	1,5					
Concrete edge failure									
Effective length of anchor		l_f	[mm]	60	75		95	170	
Calculation diameter		d		10		12	16	25	
Partial safety factor[1)]		γ_{Mc}	[-]	1,5					

[1)] In absence of other national regulations

Deutsches Institut für Bautechnik DIBt

Table C5: Displacement for fischer Highbond-Anchor FHB II – A L

Size FHB II – A L		M8x	M10x	M12x		M16x			M20x	M24x
		60	95	100	120	125	145	160	210	210
Displacement under tension load										
Cracked concrete										
Tension load	[kN]	6,6	15,9	17,1	22,5	24,0	30,0	34,7	52,2	52,2
δ_{N0}	[mm]	0,8				0,6				
$\delta_{N\infty}$	[mm]	1,7								
Uncracked concrete										
Tension load	[kN]	9,3	22,3	24,0	31,6	33,6	42,0	48,7	73,2	73,2
δ_{N0}	[mm]	0,2	0,4						0,6	
$\delta_{N\infty}$	[mm]	1,7								
Displacement under shear load										
Uncracked or cracked concrete										
Steel zinc plated										
Shear load	[kN]	7,8	11,9	17,3		32,2			50,2	72,5
δ_{V0}	[mm]	1,2		1,3					3,5	
$\delta_{V\infty}$	[mm]	1,8		2,0					5,3	
Stainless steel A4										
Shear load	[kN]	8,7	13,3	19,3		35,8			55,9	80,6
δ_{V0}	[mm]	1,0		1,1		2,2			3,5	
$\delta_{V\infty}$	[mm]	1,5		1,7		3,3			5,3	
High corrosion resistant steel C										
Shear load	[kN]	8,7	13,3	19,3		35,8			55,9	80,6
δ_{V0}	[mm]	1,2		1,3		2,4			3,7	5,0
$\delta_{V\infty}$	[mm]	1,8		2,0		3,6			5,6	7,5

fischer Highbond-Anchor FHB II

Performances
Displacement for fischer Highbond-Anchor FHB II – A L

Annex C 5

Deutsches Institut für Bautechnik DIBt

Table C6: Displacement for fischer Highbond-Anchor FHB II – A S

Size FHB II – A S		M10x 60	M10x 75	M12x 75	M16x 95	M20x 170	M24x 170
Displacement under tension load							
Cracked concrete							
Tension load	[kN]	6,6	11,1		15,9	38,0	
δ_{N0}	[mm]	0,8	0,3		0,4	0,6	
$\delta_{N\infty}$	[mm]	1,7					
Uncracked concrete							
Tension load	[kN]	9,3	15,6		22,3	53,3	
δ_{N0}	[mm]	0,2				0,5	
$\delta_{N\infty}$	[mm]	1,7					
Displacement under shear load							
Cracked or uncracked concrete							
Steel zinc plated							
Shear load	[kN]	11,3		12,7	29,0	45,9	65,3
δ_{V0}	[mm]	1,2		1,5		2,8	
$\delta_{V\infty}$	[mm]	1,8		2,3		4,2	
Stainless steel A4							
Shear load	[kN]	13,8		19,3	35,8	55,9	71,1
δ_{V0}	[mm]	1,0		1,1	2,2	3,5	
$\delta_{V\infty}$	[mm]	1,5		1,7	3,3	5,3	
High corrosion resistant steel C							
Shear load	[kN]	13,8		19,3	35,8	55,9	80,6
δ_{V0}	[mm]	1,2		1,3	2,4	3,7	5,0
$\delta_{V\infty}$	[mm]	1,8		2,0	3,6	5,6	7,5