DECLARATION OF PERFORMANCE

DoP 0353

for fischer Highbond-Anchor FHB / FHB dyn / FDA (Bonded expansion fastener for use in concrete) EN

1. Unique identification code of the product-type: **DoP 0353**

2. Intended use/es: **Post-installed fastening for use in cracked or uncracked concrete, see appendix, especially annexes B1 - B19.**

3. Manufacturer: **fischerwerke GmbH & Co. KG, Klaus-Fischer-Str. 1, 72178 Waldachtal, Germany**

4. Authorised representative: **–**

5. System/s of AVCP: **1**

6. European Assessment Document: **EAD 330499-02-0601, Edition 12/2023**
   European Technical Assessment: **ETA-06/0171; 2024-02-15**
   Technical Assessment Body: **DIBt- Deutsches Institut für Bautechnik**
   Notified body/ies: **2873 TU Darmstadt**

7. Declared performance/s:

Mechanical resistance and stability (BWR 1)

Characteristic resistance to tension load (static and quasi-static loading):

1) Resistance to steel failure: see appendix, especially annex C1
2) Resistance to pull-out failure: see appendix, especially annexes C2,C3
3) Resistance to concrete cone failure: see appendix, especially annex C2
4) Edge distance to prevent splitting under load: see appendix, especially annex C2
5) Robustness: see appendix, especially annexes C2, C3
6) Installation torque: see appendix, especially annexes B5-B8
7) Minimum edge distance and spacing, member thickness: see appendix, especially annexes B5-B8

Characteristic resistance to shear load (static and quasi-static loading):

8) Resistance to steel failure: see appendix, especially annex C1
9) Resistance to pry-out failure: see appendix, especially annex C2
10) Resistance to concrete edge failure: see appendix, especially annex C2

Displacements under short-term and long-term loading:

11) Displacements under short-term and long-term loading: see appendix, especially annex C4
12) Resistance in steel fibre reinforced concrete: see appendix, especially annexes B3, B4, C1-C4

Characteristic resistance and displacements for seismic performance categories C1 and C2:

13) Resistance to tension for seismic performance category C1: NPD
14) Resistance to tension for seismic performance category C2: NPD
15) Resistance to shear for seismic performance category C1: NPD
16) Resistance to shear for seismic performance category C2: NPD

Safety in case of fire (BWR 2)

17) Reaction to fire: Class (A1)

Resistance to fire:

18) Fire resistance to steel failure (tension load): NPD
19) Bond resistance under fire conditions: NPD
20) Fire resistance to steel failure under shear loading: NPD

Hygiene, health and the environment (BWR 3)

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

8. Appropriate Technical Documentation and/or Specific Technical Documentation: **–**

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

Signed for and on behalf of the manufacturer by:

Dr.-Ing. Oliver Geibig, Managing Director Business Units & Engineering

Jürgen Grün, Managing Director Chemistry & Quality

Tumlingen, 2024-02-23

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.

Translation guidance Essential Characteristics and Performance Parameters for Annexes

Mechanical resistance and stability (BWR 1)		
Characteristic resistance to tension load (static and quasi-static loading):		
1	Resistance to steel failure:	$N_{Rk,s}$ [kN]
2	Resistance to combined pull- out and concrete cone failure:	τ_{Rk} and/or $\tau_{Rk,100}$ [N/mm^2], ψ_c, ψ^0_{sus},$\psi_{sus,100}$ [-] (BF)
	Resistance to pull-out failure:	$N_{Rk,p}$ and/or $N_{Rk,p,100}$ [kN], ψ_c [-] (BEF)
3	Resistance to concrete cone failure:	$c_{cr,N}$ [mm], $k_{cr,N}$, $k_{ucr,N}$ [-]
4	Edge distance to prevent splitting under load:	$c_{cr,sp}$ [mm]
5	Robustness:	γ_{inst} [-]
6	Maximum installation torque:	max T_{inst} [Nm] (BF)
	Installation torque:	T_{inst} [Nm] (BEF)
7	Minimum edge distance,spacing and member thickness:	c_{min}, s_{min}, h_{min} [mm]
Characteristic resistance to shear load (static and quasi-static loading):		
8	Resistance to steel failure:	$V^0_{Rk,s}$ [kN], $M^0_{Rk,s}$ [Nm], k_7 [-]
9	Resistance to pry-out failure:	k_8 [-]
10	Resistance to concrete edge failure:	d_{nom}, l_f [mm]
Displacements under short-term and long-term loading:		
11	Displacements under short-term and long-term loading:	δ_0, δ_∞ [mm or mm/(N/mm^2)]
12	Resistance in steel fibre reinforced concrete:	Description
Characteristic resistance and displacements for seismic performance categories C1 and C2:		
13	Resistance to tension for seismic performance category C1	$N_{Rk,s,C1}$ [kN] (all) $\tau_{Rk,C1}$ [N/mm^2] (BF) $N_{Rk,p,C1}$ [kN] (BEF)
14	Resistance to tension for seismic performance category C2	$N_{Rk,s,C2}$ [kN] (all) $\tau_{Rk,C2}$ [N/mm^2] (BF) $N_{Rk,p,C2}$ [kN] (BEF) $\delta_{N,C2}$ [mm] (all)
15	Resistance to shear for seismic performance category C1	$V_{Rk,s,C1}$ [kN] (all)
16	Resistance to shear for seismic performance category C2	$V_{Rk,s,C2}$ [kN] (all) $\delta_{V,C2}$ [mm] (all)
Safety in case of fire (BWR 2)		
17	Reaction to fire	Class
Resistance to fire		
18	Fire resistance to steel failure (tension load):	$N_{Rk,s,fi}$ [kN]
19	Bond resistance under fire conditions:	$k_{fi,p}$ (θ) [-], $\tau_{Rk,fi}$ (θ) [N/mm^2] (BF)
20	Fire resistance to steel failure under shear loading:	$V_{Rk,s,fi}$ [kN], $M^0_{Rk,s,fi}$ [Nm]
Hygiene, health and the environment (BWR 3)		
21	Content, emission and/or release of dangerous substances:	Description/Level

Specific Part

1 Technical description of the product

The fischer Highbond-Anchor FHB / FHB dyn / FDA is a bonded expansion fastener consisting of an injection cartridge FIS HB and a steel element. The steel element is made of zinc plated or stainless steel.

The load transfer is realized by mechanical interlock of several cones in the bonding mortar and a combination of bonding and friction forces in the 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 C1 to C3, B5 to B8
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C1 and C2
Displacements under short-term and long-term loading	See Annex C4
Characteristic resistance and displacements for seismic performance categories C1 and C2	No performance assessed

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1

3.3 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

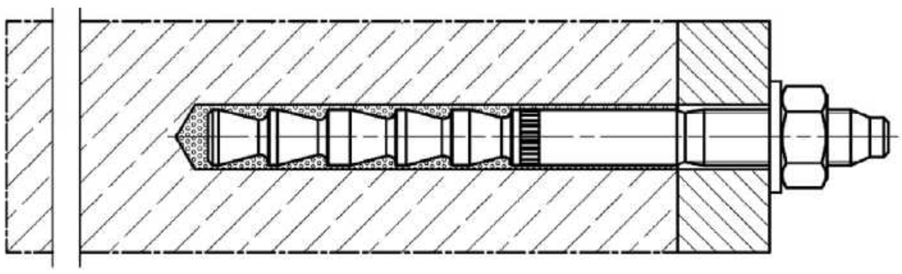
In accordance with the European Assessment Document EAD 330499-02-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

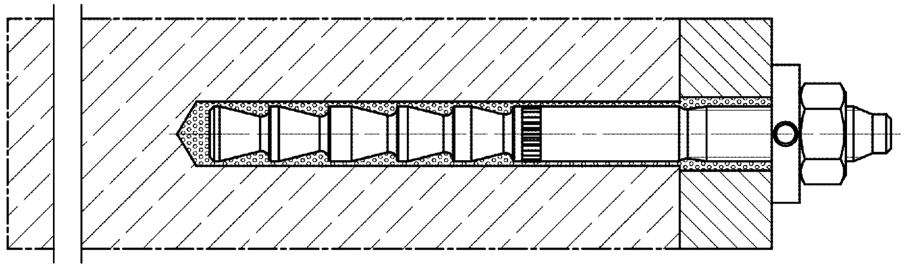
Installation conditions part 1, FHB / FHB N

fischer Highbond-Anchor FHB / FHB N with fischer injection system FIS HB

Pre-positioned installation



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

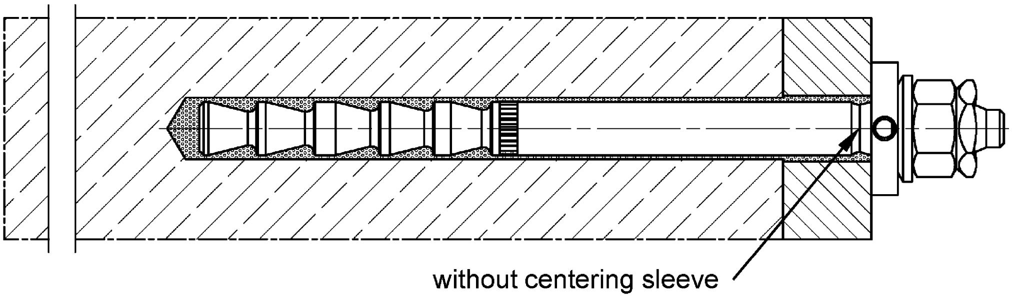


Figures not to scale

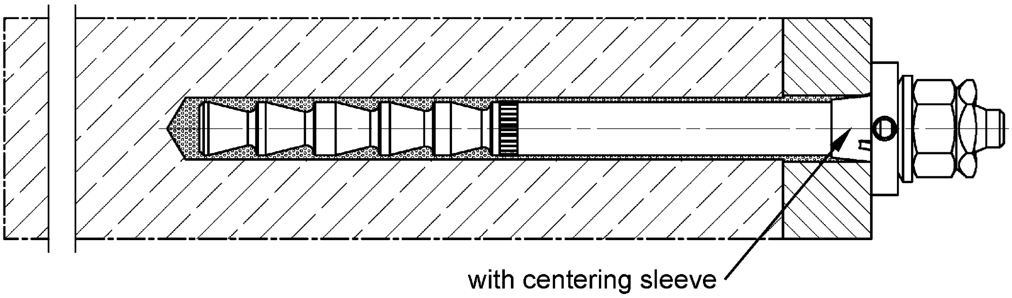
Installation conditions part 2, FHB dyn

fischer Highbond-Anchor dynamic FHB dyn with fischer injection system FIS HB

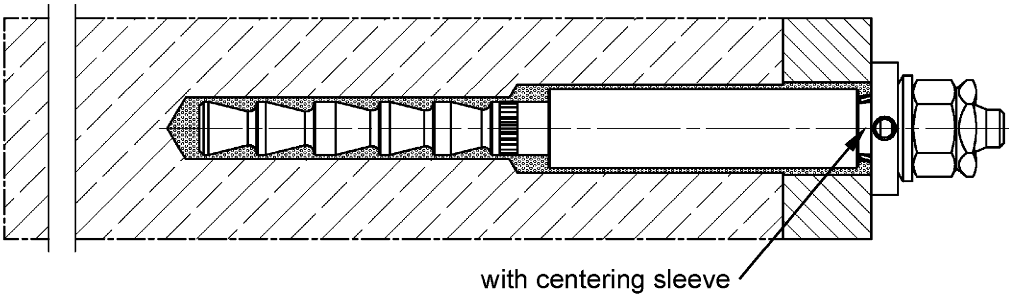
Pre-positioned installation without shear force sleeve, FHB dyn (annular gap filled with mortar)



Push through installation without shear force sleeve, FHB dyn (annular gap filled with mortar)



Push through installation with shear force sleeve, FHB dyn V (annular gap filled with mortar)

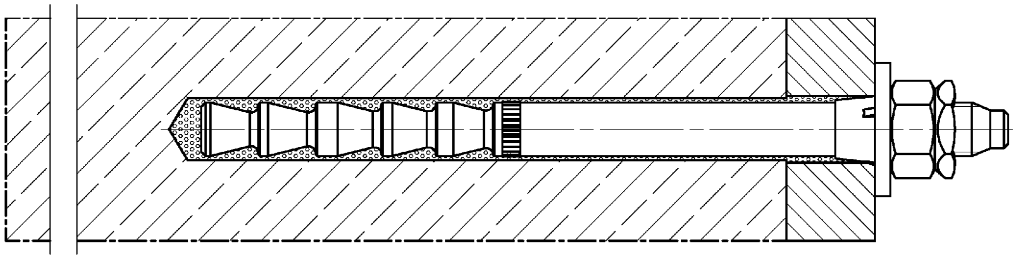


Figures not to scale

Installation conditions part 3, FDA

fischer Dynamic-Anchor FDA with fischer injection system FIS HB

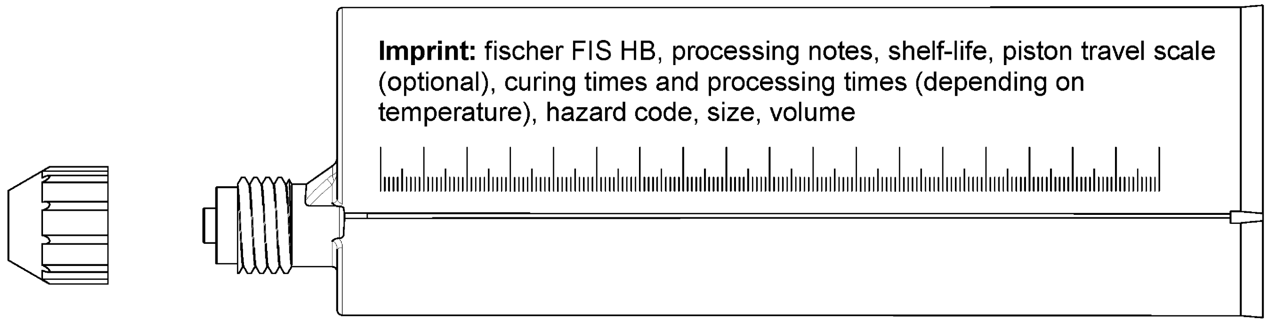
Push through installation (annular gap filled with mortar)



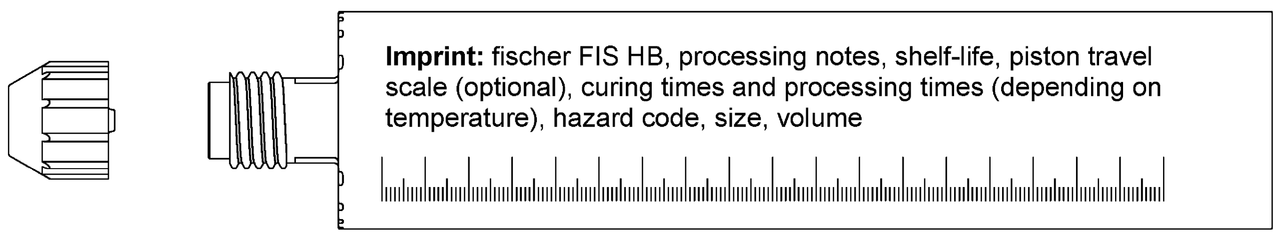
Figures not to scale

Overview system components part 1

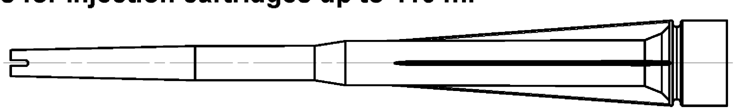
Injection cartridge (shuttle cartridge) with sealing cap
Size: 360 ml, 825 ml



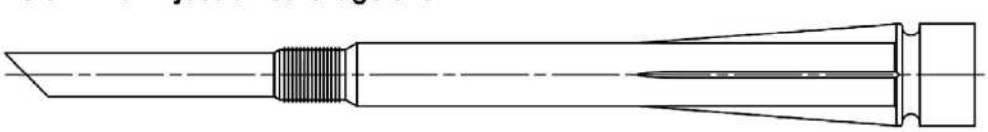
Injection cartridge (coaxial cartridge) with sealing cap
Size: 150 ml, 300 ml, 380 ml, 400 ml, 410 ml



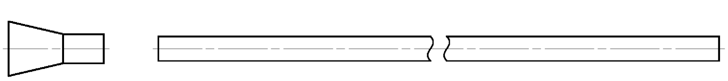
Static mixer FIS MR Plus for injection cartridges up to 410 ml



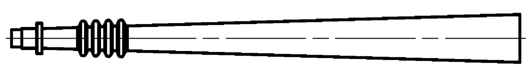
Static mixer FIS JMR for injection cartridge 825 ml



Injection adapter and extension tube Ø 9 for static mixer FIS MR Plus;
Injection adapter and extension tube Ø 9 or Ø 15 for static mixer FIS JMR



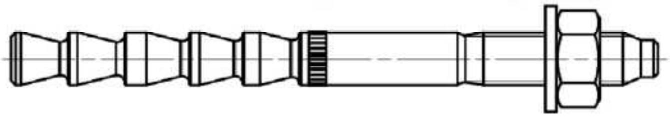
Injection adapter

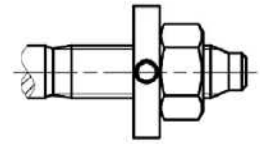


Figures not to scale

Overview system components part 2

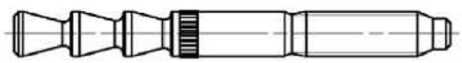
fischer Highbond-Anchor FHB / FHB N (alternative designation)



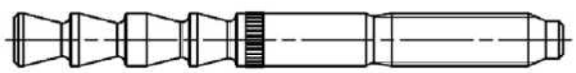


alternative version

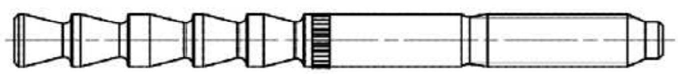
fischer anchor rod FHB-A / FHB-A N; Size: M10x60



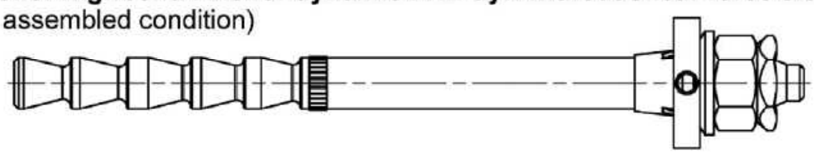
fischer anchor rod FHB-A / FHB-A N; Size: M12x80

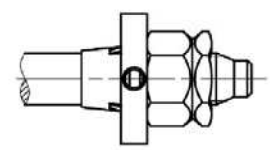


fischer anchor rod FHB-A / FHB-A N; Size: M12x100, M16x125, M20x170, M24x220



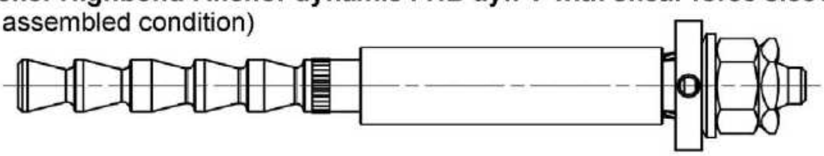
fischer Highbond-Anchor dynamic FHB dyn without shear force sleeve
(in assembled condition)

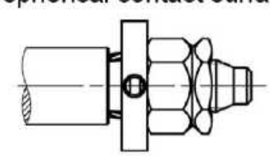




alternative version:
hexagonal nut with
spherical contact surface

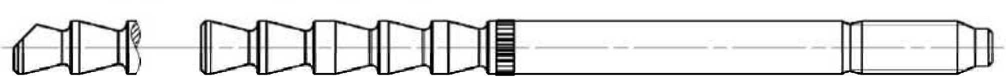
fischer Highbond-Anchor dynamic FHB dyn V with shear force sleeve
(in assembled condition)



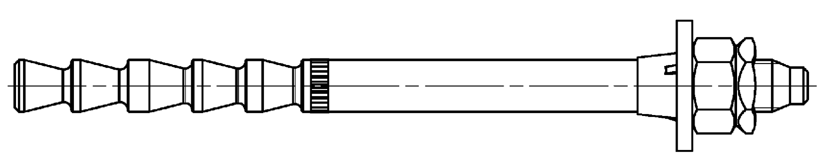


fischer anchor rod FHB-A dyn; Size: M12, M16, M20, M24

alternative

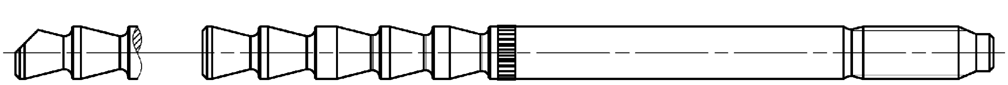


fischer Dynamic-Anchor FDA



fischer anchor rod FDA-A; Size: M12, M16

alternative



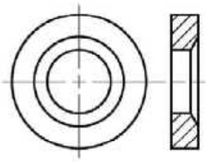
Figures not to scale

fischer Highbond-Anchor FHB / FHB dyn / FDA	
Product description Overview system components part 2 Metal parts	**Annex A5** Appendix 7 / 38

Overview system components part 3

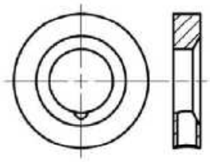
conical washer

without drill hole

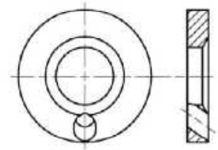


fischer filling disc (various versions)

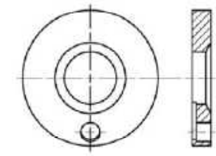
radial



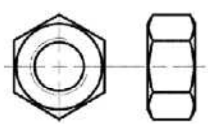
angular



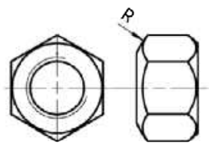
axial



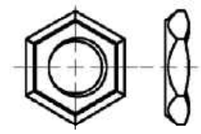
hexagon nut



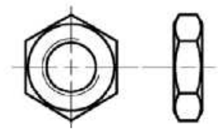
hexagonal nut with spherical contact surface



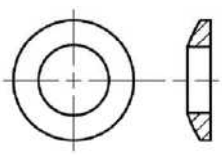
lock nut



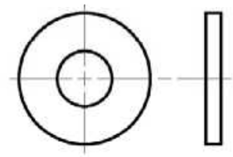
hexagon nut, flat



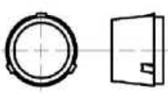
spherical washer



washer

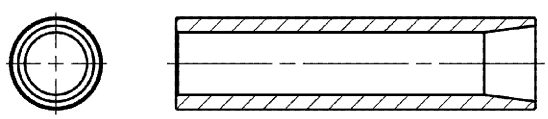


centering sleeve

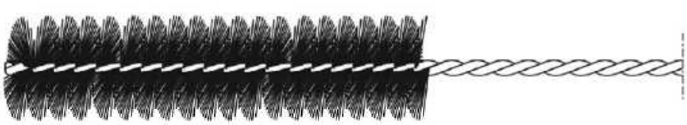


only push through installation; FHB dyn and FDA

shear force sleeve (only FHB dyn V)



cleaning brush BS



blow-out pump ABP with cleaning nozzle or ABG

Figures not to scale

fischer Highbond-Anchor FHB / FHB dyn / FDA

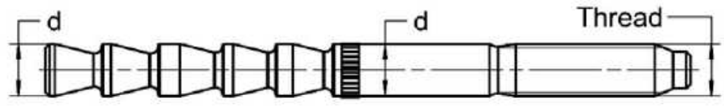
Product description
Overview system components part 3
Metal parts / cleaning brush / blow-out pump

Annex A6

Table A7.1: Dimensions system components, FHB / FHB N

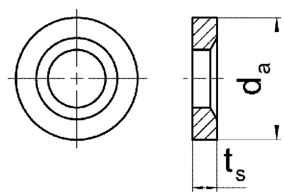
Designation			FHB 10x60	FHB 12x80	FHB 12x100	FHB 16x125	FHB 20x170	FHB 24x220
Thread		[-]	M10	M12	M12	M16	M20	M24
Anchor rod	d	[mm]	10	12	12	16,5	22	24,5
Conical washer / fischer filling disc	≥ d_a	[mm]	26	30	30	38	46	54
	t_s	[mm]	6	6	6	7	8	10

Anchor rod:



Conical washer / fischer filling disc:

(various versions see Annex A6)

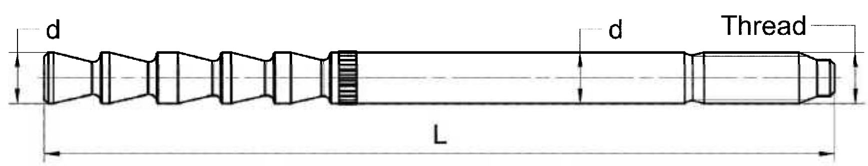


Figures not to scale

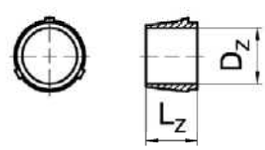
Table A8.1: Dimensions system components, FHB dyn / FHB dyn V

Designation			FHB dyn without shear force sleeve				FHB dyn V with shear force sleeve	
			FHB dyn 12x100	FHB dyn 16x125	FHB dyn 20x170	FHB dyn 24x220	FHB dyn 12x100 V	FHB dyn 16x125 V
Thread		[-]	M12	M16	M20	M24	M12	M16
Anchor rod	d	[mm]	12	16,5	22	24,5	12	16,5
	L_{min}		135	168	220	280	140	173
	L_{max}		467	530	575	475	337	367
Centering sleeve	D_z		11,8	16,3	21,8	24,3	11,8	16,3
	L_z		11	13	15	15	11	13
Conical washer / fischer filling disc	$\geq d_a$		30	38	46	54	30	38
	t_s		6	7	8	10	6	7
Shear force sleeve	$L_{Q,min}$		-	-	-	-	40	55
	$L_{Q,max}$		-	-	-	-	230	245
	D_Q		-	-	-	-	17,5	23,5

Anchor rod:

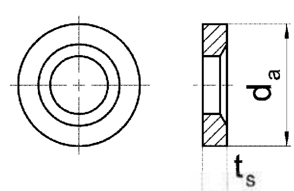


Centering sleeve:
(only push through installation)

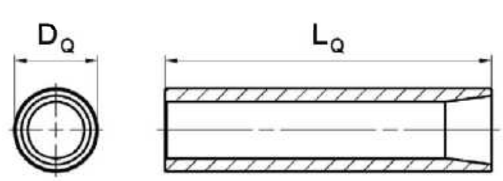


Conical washer / fischer filling disc:

(various versions see Annex A6)



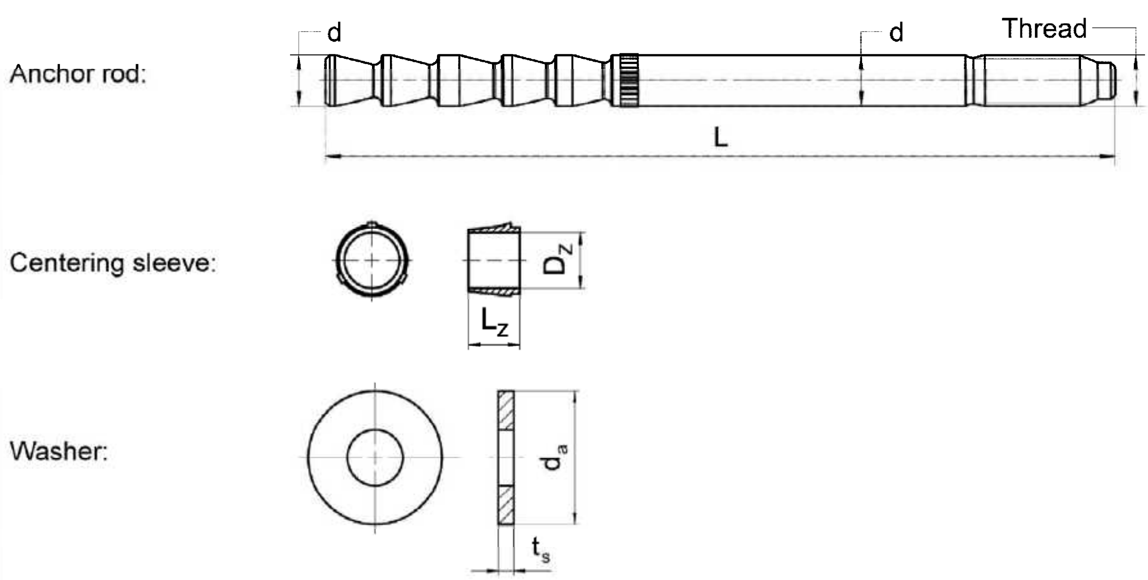
Shear force sleeve:
(only FHB dyn V)



Figures not to scale

Table A9.1: Dimensions system components, FDA

Designation			FDA 12x100	FDA 16x125
Thread		[-]	M12	M16
Anchor rod	d	[mm]	12	16,5
	L_{min}		135	168
	L_{max}		467	530
Centering sleeve	D_z		11,8	16,3
	L_z		11	13
Washer	$\geq d_a$		30	40
	$t_{s,min}$		3,5	4
	$t_{s,max}$		7	8



Figures not to scale

Table A10.1: Materials, FHB / FHB N zinc plated (zp; hdg)

Part	Designation	Material		
1	Injection cartridge	Mortar, hardener, filler		
	Steel grade	Steel		
		zinc plated (zp)		hot dip galvanised (hdg)
		M10 to M16	M20 to M24	M10 to M24
2	fischer anchor rod FHB-A and FHB-A N	Property class 5.8 Property class 8.8 EN ISO 898-1:2013 zinc plated ≥ 5 µm ISO 4042:2022 A_5 > 12% fracture elongation coated	f_{uk} = 550 N/mm^2 f_{yk} = 440 N/mm^2 EN ISO 898-1:2013 zinc plated ≥ 5 µm ISO 4042:2022 A_5 > 12% fracture elongation coated	Property class 8.8 EN ISO 898-1:2013 hot dip galvanised ≥ 40 µm EN ISO 10684:2004+AC:2009 A_5 > 12% fracture elongation varnish layer coated (M16 to M24)
3	Washer ISO 7089:2000	zinc plated ≥ 5 µm ISO 4042:2022		hot dip galvanised ≥ 40 µm EN ISO 10684:2004+AC:2009
4	Conical washer or fischer filling disc similar to DIN 6319-G	zinc plated ≥ 5 µm ISO 4042:2022		hot dip galvanised ≥ 40 µm EN ISO 10684:2004+AC:2009
5	Hexagon nut	Property class 8 EN ISO 898-2:2012 zinc plated ≥ 5 µm ISO 4042:2022		Property class 8 EN ISO 898-2:2012 hot dip galvanised ≥ 40 µm EN ISO 10684:2004+AC:2009

Table A11.1: Materials, FHB / FHB N stainless steel

Part	Designation	Material		
1	Injection cartridge	Mortar, hardener, filler		
	Steel grade	Stainless steel R		High corrosion resistant steel HCR
		acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4:2006+A1:2015		acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4:2006+A1:2015
		M10 to M16	M20 to M24	M10 to M24
2	fischer anchor rod FHB-A and FHB-A N	Property class 80 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062, 1.4662, 1.4462; EN 10088-1:2014 A_5 > 12% fracture elongation coated	Property class 70 with f_{yk} = 560 N/mm² EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062, 1.4662, 1.4462; EN 10088-1:2014 A_5 > 12% fracture elongation coated	Property class 70 with f_{yk} = 560 N/mm² EN ISO 3506-1:2020 1.4565; 1.4529 EN 10088-1:2014 A_5 > 12% fracture elongation coated
3	Washer ISO 7089:2000	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	Conical washer or fischer filling disc similar to DIN 6319-G	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 70 or 80 EN ISO 3506-2:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014		Property class 70 or 80 EN ISO 3506-2:2020 1.4565; 1.4529; EN 10088-1:2014

Table A12.1: Materials, FHB dyn

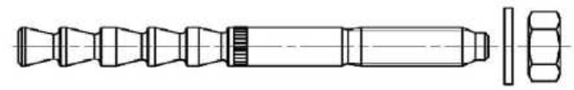
Part	Designation	Material	
1	Injection cartridge	Mortar, hardener, filler	
	Steel grade	Steel	High corrosion resistant steel HCR
		zinc plated (zp)	acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4:2006+A1:2015
		M12 to M24	M12 to M16
2	fischer anchor rod FHB-A dyn	Property class 8.8 EN ISO 898-1:2013 zinc plated ≥ 5 µm ISO 4042:2022 A_5 > 12% fracture elongation coated	Property class 70 with f_{yk} = 560 N/mm² EN ISO 3506-1:2020 1.4529 EN 10088-1:2014 A_5 > 12 % fracture elongation coated
3	Centering sleeve	Plastic	
4	Conical washer or fischer filling disc similar to DIN 6319-G	zinc plated ≥ 5 µm ISO 4042:2022	1.4529 EN 10088-1:2014
5	Spherical washer	zinc plated ≥ 5 µm ISO 4042:2022	1.4529 EN 10088-1:2014
6a	Hexagon nut	Property class 8 EN ISO 898-2:2012 zinc plated ≥ 5 µm ISO 4042:2022	Property class 70 or 80 EN ISO 3506-2:2020 1.4529 EN 10088-1:2014
6b	hexagonal nut with spherical contact surface		
7a	Lock nut	zinc plated ≥ 5 µm ISO 4042:2022	1.4529 EN 10088-1:2014
7b	hexagon nut, flat		
8	Shear force sleeve	zinc plated ≥ 5 µm ISO 4042:2022	---

Table A13.1: Materials, FDA

Part	Designation	Material
1	Injection cartridge	Mortar, hardener, filler
	Steel grade	Steel
		zinc plated (zp)
		M12 to M16
2	fischer anchor rod FDA-A	Property class 8.8 EN ISO 898-1:2013 zinc plated ≥ 5 µm ISO 4042:2022 A_5 > 12 % fracture elongation coated
3	Centering sleeve	Plastic
4	Washer	zinc plated ≥ 5 µm ISO 4042:2022
5	Hexagon nut	Property class 8 EN ISO 898-2:2012 zinc plated ≥ 5 µm ISO 4042:2022
6	Lock nut	zinc plated ≥ 5 µm ISO 4042:2022

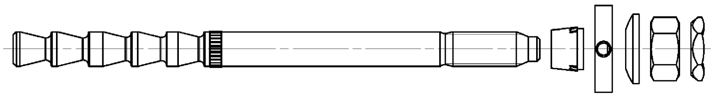
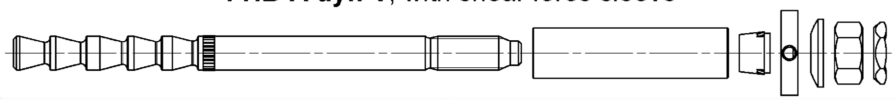
Specifications of intended use (part 1), FHB / FHB N

Table B1.1: Overview use and performance categories, FHB / FHB N

		fischer Highbond-Anchor FHB / FHB N with FIS HB	
			
Hammer drilling with standard drill bit		all sizes; Nominal drill bit diameter (d_0) 12 mm to 28 mm	
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“)			
Static and quasi static loading, in concrete without fibers	uncracked concrete	all sizes; M10 to M24	Tables: C1.1 C2.1 C3.1
	cracked concrete		
Static and quasi static loading, in concrete with fibers	uncracked concrete	sizes: M12x100 M16x125	Tables: C1.1 C2.1 C3.2
	cracked concrete		
Use category	I1 dry or wet concrete	all sizes; M10 to M24	
	I2 water filled hole	all sizes; M10 to M24	
Installation direction		D3 Downwards, horizontal and upwards (overhead) installation	
Installation method		pre-positioned or push through installation	
Installation temperature		FIS HB: $T_{i,min}$ = -5 °C to $T_{i,max}$ = +40 °C for the standard variation of temperature after installation	
In-service temperature	Temperature range I:	-40 °C to +40 °C	(max. short term temperature +40 °C; max. long term temperature +24 °C)
	Temperature range II:	-40 °C to +80 °C	(max. short term temperature +80 °C; max. long term temperature +50 °C)

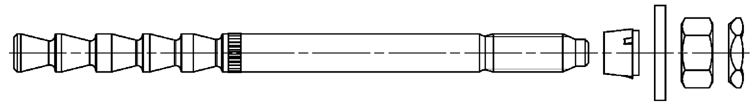
Specifications of intended use (part 2), FHB dyn

Table B2.1: Overview use and performance categories, FHB dyn

	fischer Highbond-Anchor dynamic FHB dyn with FIS HB			
	FHB-A dyn, without shear force sleeve (picture with centering sleeve; use only for push through installation) 			
	FHB-A dyn V, with shear force sleeve 			
	FHB dyn		**FHB dyn V**	
Hammer drilling with standard drill bit	all sizes; Nominal drill bit diameter (d_0) 14 mm to 28 mm		all sizes; Nominal drill bit diameter (d_0) 14 mm and 18 mm; Nominal drill bit diameter (d_1) 20 mm and 28 mm	
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")				
Static and quasi static loading, in concrete without fibers – uncracked concrete / cracked concrete	all sizes; M12 to M24	Tables: C1.1 C2.1 C3.1	all sizes; M12 and M16	Tables: C1.1 C2.1 C3.1
Static and quasi static loading, in concrete with fibers – uncracked concrete / cracked concrete	sizes: M12x100 M16x125	Tables: C1.1 C2.1 C3.2	sizes: M12x100 M16x125	Tables: C1.1 C2.1 C3.2
Use category – I1 dry or wet concrete	all sizes; M12 to M24		all sizes; M12 and M16	
Use category – I2 water filled hole	all sizes; M12 to M24		all sizes; M12 and M16	
Installation direction	D3 Downwards, horizontal and upwards (overhead) installation			
Installation method	pre-positioned or push through installation		push through installation	
Installation temperature	FIS HB: $T_{i,min}$ = -5 °C to $T_{i,max}$ = +40 °C for the standard variation of temperature after installation			
In-service temperature – Temperature range I:	-40 °C to +40 °C	(max. short term temperature +40 °C; max. long term temperature +24 °C)		
In-service temperature – Temperature range II:	-40 °C to +80 °C	(max. short term temperature +80 °C; max. long term temperature +50 °C)		

Specifications of intended use (part 3), FDA

Table B3.1: Overview use and performance categories, FDA

		fischer Dynamic-Anchor FDA with FIS HB	
			
Hammer drilling with standard drill bit		all sizes; Nominal drill bit diameter (d_0) 14 mm and 18 mm	
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")			
Static and quasi static loading, in concrete without fibers	uncracked concrete	all sizes; M12 and M16	Tables: C1.1 C2.1 C3.1
	cracked concrete		
Static and quasi static loading, in concrete with fibers	uncracked concrete	sizes: M12x100 M16x125	Tables: C1.1 C2.1 C3.2
	cracked concrete		
Use category	I1 dry or wet concrete	all sizes; M12 and M16	
	I2 water filled hole	all sizes; M12 and M16	
Installation direction		D3 Downwards, horizontal and upwards (overhead) installation	
Installation method		push through installation	
Installation temperature		FIS HB: $T_{i,min}$ = -5 °C to $T_{i,max}$ = +40 °C for the standard variation of temperature after installation	
In-service temperature	Temperature range I:	-40 °C to +40 °C	(max. short term temperature +40 °C; max. long term temperature +24 °C)
	Temperature range II:	-40 °C to +80 °C	(max. short term temperature +80 °C; max. long term temperature +50 °C)

Specifications of intended use (part 4)

Base materials:

- Compacted reinforced or unreinforced normal weight concrete of strength classes C20/25 to C50/60 according to EN 206:2013+A2:2021.
- For steel fibre reinforced concrete according to EN 206:2013+A2:2021 with steel fibers in accordance to EN 14889-1:2006, clause 5, group I. The maximum content of steel fibres is 80 kg/m³.

Use conditions (Environmental conditions):

- Fastener intended for use in structures subject to dry internal conditions (all materials).
- For all other conditions according to EN 1993-1-4: 2006 + A1:2015 corresponding to corrosion resistance classes to Annex A11 table A11.1 (FHB / FHB N) or Annex A12 table A12.1 (FHB dyn).

Design:

- Fastenings 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.)
- Fastenings are designed in accordance with:
  - EN 1992-4:2018 and
  - EOTA Technical Report TR 055, Edition February 2018.
- Fastenings in steel fibre reinforced concrete can be designed according to EN 1992-4:2018. The performance for normal weight concrete of strength classes C20/25 to C50/60 without fibres applies.

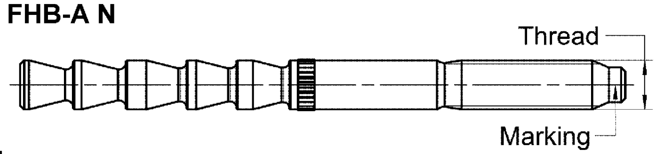
Installation:

- Fastener installation is to be carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Overhead installation is allowed. (necessary equipment see installation instruction).

Table B5.1: Installation parameters for fischer Highbond-Anchor FHB / FHB N

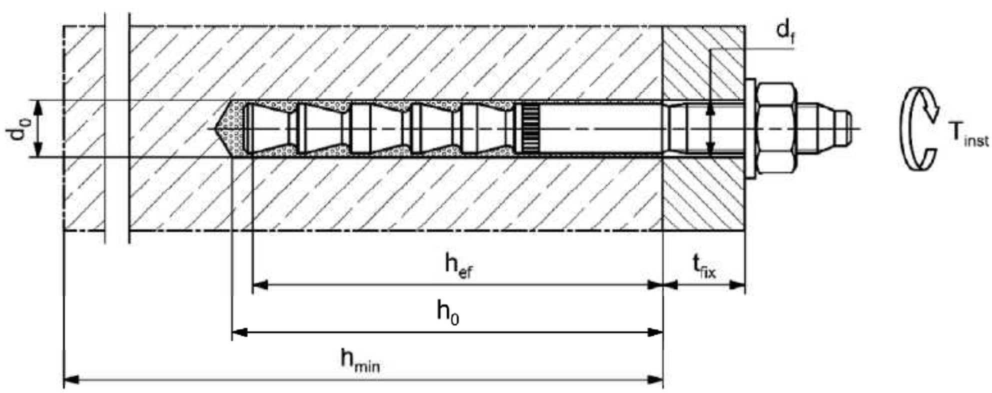
Designation			FHB 10x60	FHB 12x80	FHB 12x100	FHB 16x125	FHB 20x170	FHB 24x220
Thread		[-]	M10	M12	M12	M16	M20	M24
Nominal drill hole diameter	d_0	[mm]	12	14	14	18	24	28
Drill hole depth	h_0	[mm]	$h_{ef} + 5$					
Effective embedment depth	h_{ef}	[mm]	60	80	100	125	170	220
Minimum thickness of concrete member	h_{min}	[mm]	120	160	130	160	220	440
Minimum spacing	s_{min}	[mm]	60	80	100 / 100	100 / 100	80	180
Minimum edge distance	c_{min}	[mm]			200 / 100	200 / 100		
Thickness of concrete member	h	[mm]	≥ 120	≥ 160	≥ 130 / ≥ 200	≥ 160 / ≥ 250	≥ 220	≥ 440
$h_{min} \leq h \leq 2h_{ef}$:	$s_1 \geq s_{min} = 100$ mm; $c_1 \geq c_{min} = 100$ mm	[mm]	-		$[(3 \cdot c_1 + s_1) \cdot h] \geq 88000$		-	
Calculation c_{req}: s_1 and h available		[mm]			$c_{req} \geq (88000/h - s_1) / 3$			
Calculation s_{req}: c_1 and h available		[mm]			$s_{req} \geq 88000/h - 3 \cdot c_1$			
Diameter of clearance hole of the fixture: pre-positioned installation	d_f	[mm]	12	14	14	18	22	26
Diameter of clearance hole of the fixture: push through installation	d_f	[mm]	14	16	16	20	26	30
Installation torque	T_{inst}	[Nm]	20	40	40	60	100	120

fischer anchor rod FHB-A / FHB-A N



Marking fischer anchor rod:
work symbol, thread diameter, embedment depth e.g.: [fish symbol] 16 x 125
For anchor rod property class 5.8 additional "5.8"
For stainless steel additional "R" and for high corrosion resistant steel additional "HCR".

Installation conditions:



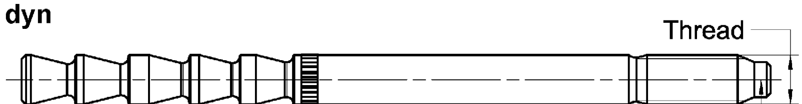
Figures not to scale

Table B6.1: Installation parameters for fischer Highbond-Anchor dynamic without shear force sleeve FHB dyn

Designation			FHB dyn 12x100		FHB dyn 16x125		FHB dyn 20x170	FHB dyn 24x220
Thread		[-]	M12		M16		M20	M24
Nominal drill hole diameter	d_0	[mm]	14		18		24	28
Drill hole depth	$h_{0,min}$		h_{ef} + 5					
Effective embedment depth	$h_{ef,min}$		100		125		170	220
	$h_{ef,max}$		235		290		330	-
Minimum thickness of concrete member	h_{min}		h_{ef} + 30		$h_{ef} + 2d_0$ (160)[1)]		$h_{ef} + 2d_0$	440
Minimum spacing	s_{min}		100	100	100	100	80	180
Minimum edge distance	c_{min}		200	100	200	100	80	180
Thickness of concrete member	h		≥ 130	≥ 200	≥ 160	≥ 250	≥ 220	≥ 440
$h_{min} \le h \le 2\,h_{ef,min}$:	$s_1 \ge s_{min}$ = 100 mm $c_1 \ge c_{min}$ = 100 mm		$[(3 \cdot c_1 + s_1) \cdot h] \ge 88000$				-	
Calculation c_{req} : (s_1 and h available)			$c_{req} \ge (88000/h - s_1) / 3$					
Calculation s_{req} : (c_1 and h available)			$s_{req} \ge 88000/h - 3 \cdot c_1$					
Diameter of the clearance hole of the fixture	d_f		15		19		25	29
Thickness of fixture	$t_{fix,min}$		8		10		12	14
	$t_{fix,max}$		200					
Minimum projection length	$h_{p,min}$		30 + t_{fix}		35 + t_{fix}		40 + t_{fix}	50 + t_{fix}
Installation torque	T_{inst}	[Nm]	40		60		100	120

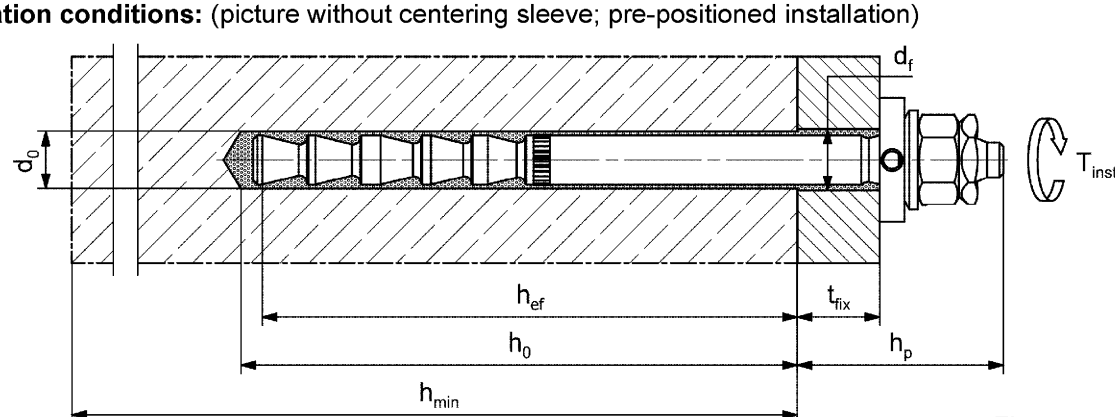
1) Only valid for h_{ef} = 125 mm

fischer anchor rod FHB-A dyn



Marking fischer anchor rod:
work symbol, thread diameter, embedment depth, intended use e.g: 16 x 125 dyn
For high corrosion resistant steel additional "HCR".

Installation conditions: (picture without centering sleeve; pre-positioned installation)

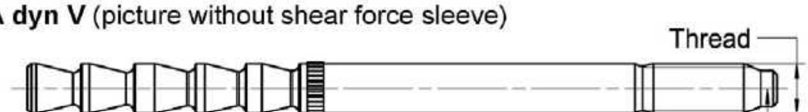


Figures not to scale

Table B7.1: Installation parameters for **fischer Highbond-Anchor dynamic** with shear force sleeve **FHB dyn V**

Designation			**FHB dyn 12x100 V**		**FHB dyn 16x125 V**	
Thread		[-]	M12		M16	
Nominal drill hole diameter	d_0	[mm]	14		18	
Drill hole depth	$h_{0,min}$	[mm]	110		135	
Nominal drill hole diameter	d_1	[mm]	20		28	
Drill hole depth	$h_{1,min}$	[mm]	35		50	
Effective embedment depth	$h_{ef,}$	[mm]	105		130	
Minimum thickness of concrete member	h_{min}	[mm]	130		160	
Minimum spacing	s_{min}	[mm]	100	100	100	100
Minimum edge distance	c_{min}	[mm]	200	100	200	100
Thickness of concrete member	h	[mm]	≥ 130	≥ 200	≥ 160	≥ 250
$h_{min} \le h \le 2h_{ef}$:	$s_1 \ge s_{min}$ = 100 mm $c_1 \ge c_{min}$ = 100 mm	[mm]	$[(3 \cdot c_1 + s_1) \cdot h] \ge 88000$			
Calculation c_{req} : s_1 and h available		[mm]	$c_{req} \ge (88000/h - s_1) / 3$			
Calculation s_{req} : c_1 and h available		[mm]	$s_{req} \ge 88000/h - 3 \cdot c_1$			
Diameter of the clearance hole of the fixture	d_f	[mm]	21		29	
Thickness of fixture	$t_{fix,min}$	[mm]	8		10	
	$t_{fix,max}$	[mm]	200			
Installation torque	T_{inst}	[Nm]	40		60	

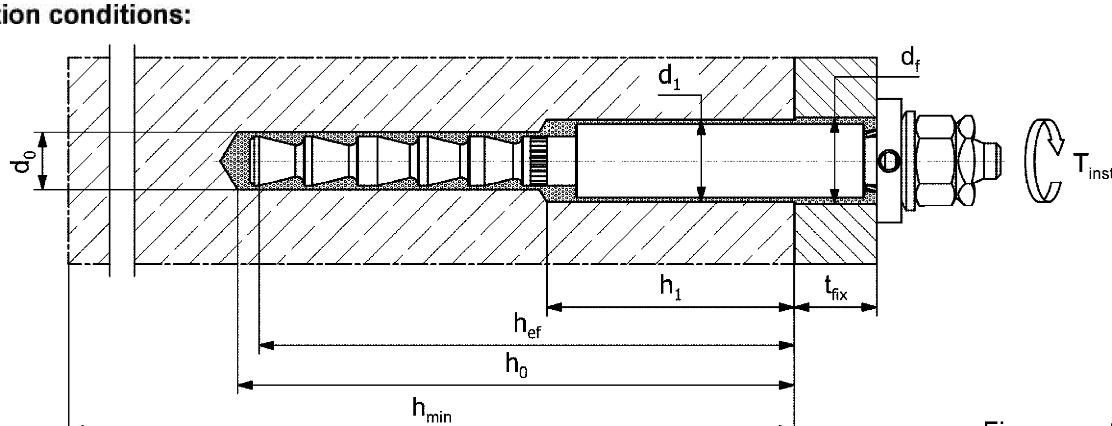
fischer anchor rod FHB-A dyn V (picture without shear force sleeve)



Marking fischer anchor rod:

work symbol, thread diameter, embedment depth, intended use e.g.: 16 x 125 dyn V

Installation conditions:



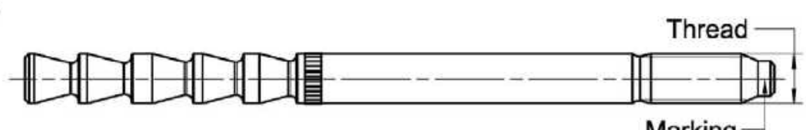
Figures not to scale

Table B8.1: Installation parameters for fischer Dynamic-Anchor FDA

Designation			**FDA 12x100**		**FDA 16x125**	
Thread		[-]	M12		M16	
Nominal drill hole diameter	d_0	[mm]	14		18	
Drill hole depth	$h_{0,min}$	[mm]	h_{ef} + 5			
Effective embedment depth	$h_{ef,min}$	[mm]	100		125	
	$h_{ef,max}$	[mm]	235		290	
Minimum thickness of concrete member	h_{min}	[mm]	h_{ef} + 30		h_{ef} + 2d_0 (160)[1]	
Minimum spacing	s_{min}	[mm]	100	100	100	100
Minimum edge distance	c_{min}	[mm]	200	100	200	100
Thickness of concrete member	h	[mm]	≥ 130	≥ 200	≥ 160	≥ 250
$h_{min} \le h \le 2h_{ef,min}$:	$s_1 \ge s_{min}$ = 100 mm $c_1 \ge c_{min}$ = 100 mm	[mm]	$[(3 \cdot c_1 + s_1) \cdot h] \ge 88000$			
Calculation c_{req}: s_1 and h available		[mm]	$c_{req} \ge (88000/h - s_1) / 3$			
Calculation s_{req}: c_1 and h available		[mm]	$s_{req} \ge 88000/h - 3 \cdot c_1$			
Diameter of the clearance hole of the fixture	d_f	[mm]	15		19	
Thickness of fixture	$t_{fix,min}$	[mm]	12		16	
	$t_{fix,max}$	[mm]	200			
Installation torque	T_{inst}	[Nm]	40		60	

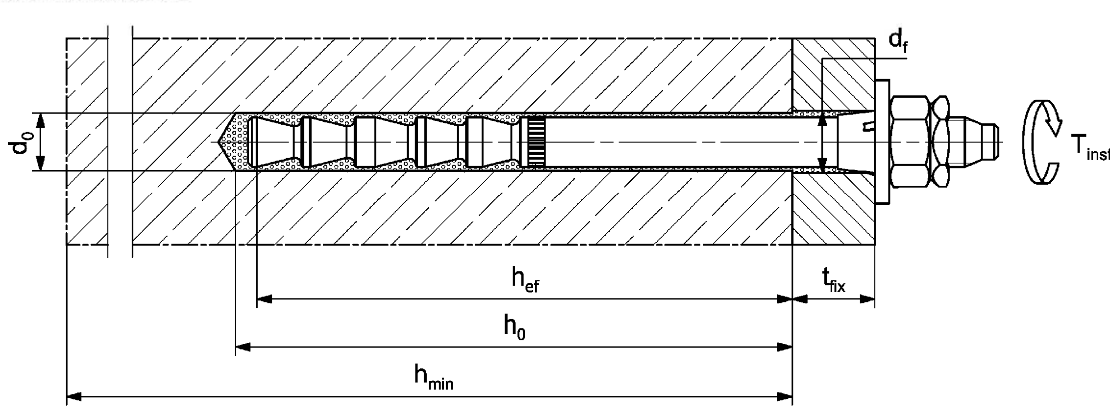
[1] Only valid for h_{ef} = 125 mm

fischer anchor rod FDA-A



Marking fischer anchor rod:
work symbol, thread diameter, embedment depth, intended use e.g.: 16 x 125 dyn

Installation conditions:



Figures not to scale

Table B9.1: Paramet
ers of the cleaning brush BS (steel brush with steel bristles)

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

Nominal drill hole diameter	d_0	[mm]	12	14	18	24	28
Steel brush diameter	d_b		14	16	20	26	30

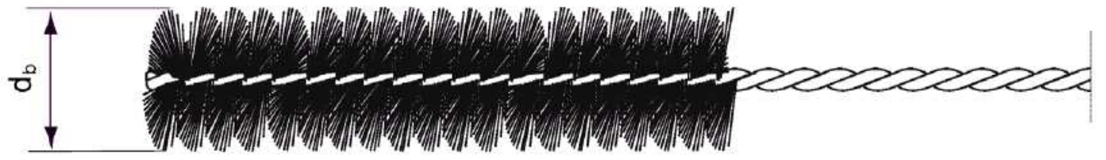


Table B9.2: **Maximum processing time** of the mortar FIS HB and **minimum curing time** (During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature)

Temperature at anchoring base [°C]	Maximum processing time t_{work}	Minimum curing time [1] t_{cure}
-5 to 0 [2]	15 min	6 h
> 0 to 5 [2]	15 min	3 h
> 5 to 10	15 min	90 min
> 10 to 20	6 min	35 min
> 20 to 30	4 min	20 min
> 30 to 40	2 min	12 min

[1] In wet concrete or water filled holes the curing time must be doubled.
[2] Minimal cartridge temperature +5 °C.

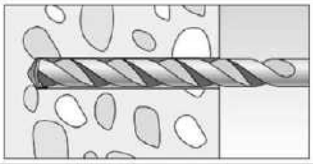
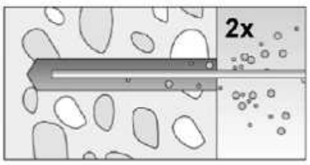
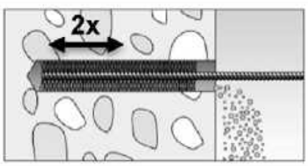
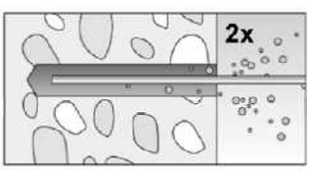
Figures not to scale

Overview installation instructions

	Anchor type			
	FHB / FHB N	FHB dyn	FHB dyn V	FDA
Drilling and cleaning hammer drilling with standard drill bit	Annex B11 Step 1a to 4a	Annex B11 Step 1a to 4a	Annex B12 Step 1c to 4c	Annex B11 Step 1a to 4a
Drilling and cleaning hammer drilling with hollow drill bit	Annex B11 Step 1b to 2b	Annex B11 Step 1b to 2b	Annex B12 Step 1d to 2d	Annex B11 Step 1b to 2b
Preparing the cartridge	Annex B13 Step 5a to 7a			
Pre-positioned installation	Annex B14 Step 8a to 12a	Annex B16 Step 8c to 12c	-	-
Push through installation	Annex B15 Step 8b to 11b	Annex B17 Step 8d to 11d	Annex B18 Step 8e to 11e	Annex B19 Step 8f to 11f

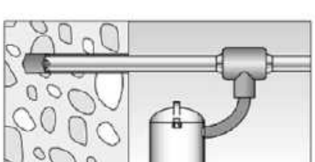
Installation instructions part 1; Drilling and cleaning FHB, FHB N, FHB dyn and FDA

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

1a		Drill the hole. Nominal drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see tables: FHB / FHB N → **Table B5.1** FHB dyn → **Table B6.1** FDA → **Table B8.1**
2a		Clean the drill hole. Blow out the drill hole twice For drill hole diameter $\mathbf{d_0}$ **< 24 mm** and drill hole depth $\mathbf{h_0}$ **< 10d** blow out the hole by hand or oil-free compressed air (≥ 6 bar). For drill hole diameter $\mathbf{d_0}$ **≥ 24 mm** or drill hole depth $\mathbf{h_0}$ **≥ 10d** blow out the hole with oil-free compressed air (≥ 6 bar). Use a cleaning nozzle. 
3a		Brush the drill hole twice with steel brush. Corresponding brushes see **Table B9.1**
4a		Clean the drill hole. Blow out the drill hole twice For drill hole diameter $\mathbf{d_0}$ **< 24 mm** and drill hole depth $\mathbf{h_0}$ **< 10d** blow out the hole by hand or oil-free compressed air (≥ 6 bar). For drill hole diameter $\mathbf{d_0}$ **≥ 24 mm** or drill hole depth $\mathbf{h_0}$ **≥ 10d** blow out the hole with oil-free compressed air (≥ 6 bar). Use a cleaning nozzle. 

Go to step 5a (Annex B13)

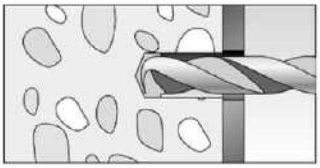
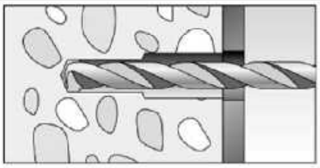
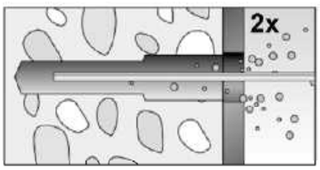
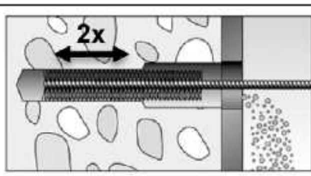
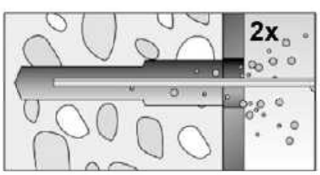
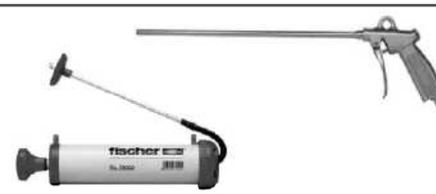
Drilling and cleaning the drill hole (hammer drilling with hollow drill bit)

1b		Check a suitable hollow drill (see **Table B1.1, B2.1 resp. B3.1**) for correct operation of the dust extraction
2b		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: FHB / FHB N → **Table B5.1** FHB dyn → **Table B6.1** FDA → **Table B8.1**

Go to step 5a (Annex B13)

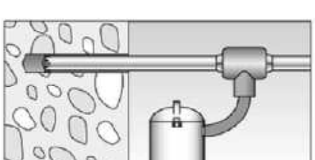
Installation instructions part 2; Drilling and cleaning FHB dyn V

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

1c		Drill hole 1 of the stepped borehole. Nominal drill hole diameter **d_1** and drill hole depth **h_1** see **Table B7.1**
		Drill hole 2 of the stepped borehole. Nominal drill hole diameter **d_0** and drill hole depth **h_0** see **Table B7.1**
2c		Clean the drill hole. Blow out the drill hole twice by hand or oil-free compressed air (≥ 6 bar). 
3c		Brush the drill hole 2 of the borehole twice with a steel brush. Corresponding brushes see **Table B9.1**
4c		Clean the drill hole. Blow out the drill hole twice by hand or oil-free compressed air (≥ 6 bar). 

Go to step 5a (Annex B13)

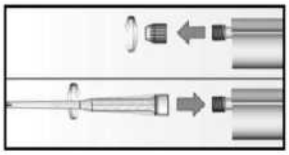
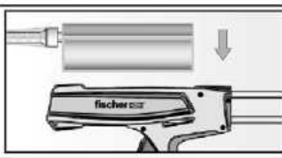
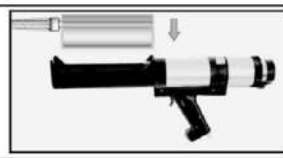
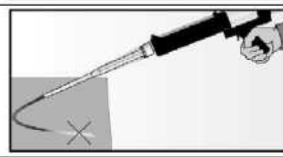
Drilling and cleaning the hole (hammer drilling with hollow drill bit)

1d		Check a suitable hollow drill (see **Table B2.1**) for correct operation of the dust extraction.
2d		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. First drill hole 1 of the stepped borehole with nominal drill hole diameter **d_1** and drill hole depth **h_1** (see **Table B7.1**). Then drill hole 2 of the stepped borehole with nominal drill hole diameter **d_0** and drill hole depth **h_0** (see **Table B7.1**).

Go to step 5a (Annex B13)

Installation instructions part 3; injection mortar system FIS HB

Preparing the cartridge

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

Go to step:

8a: FHB / FHB N - Pre-positioned installation see Annex B14
8b: FHB / FHB N - Push through installation see Annex B15

8c: FHB dyn - Pre-positioned installation see Annex B16
8d: FHB dyn - Push through installation see Annex B17

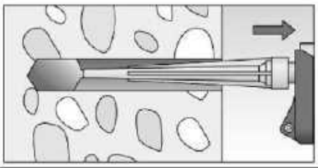
8e: FHB dyn V - Push through installation see Annex B18

8f: FDA - Push through installation see Annex B19

Installation instructions part 4; Pre-positioned installation FHB / FHB N

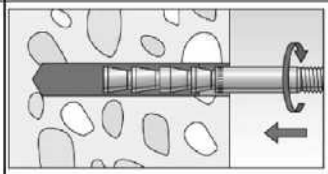
Pre-positioned installation FHB / FHB N

8a

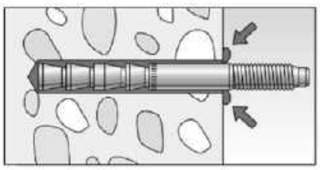


Fill approximately 2/3 of the drill hole with mortar. Always begin from the bottom of the hole and avoid bubbles. For drill hole depth $h_0 \geq 150$ mm use an extension tube. For overhead installation or deep holes ($h_0 > 250$ mm) use an injection adapter.

9a

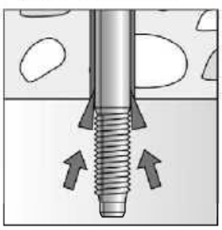


Push the anchor rod down to the bottom of the hole, turning it slightly while doing so. Only use clean and oil-free metal parts.



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

If not, pull out the anchor rod immediately and reinject mortar.

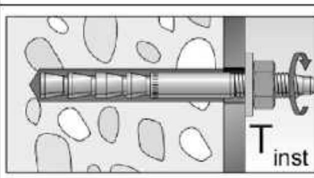


For overhead installations support the anchor rod with wedges.
(e.g. fischer centering wedges).

10a

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

11a

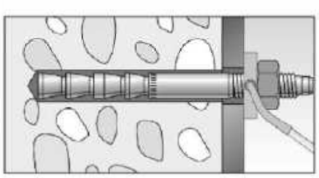


Attach the fixture and install the washer and hexagon nut.

Ensure the correct position of the metal parts.

Tighten the hexagon nut with installation torque T_{inst} (see **Table B5.1**).

12a Option

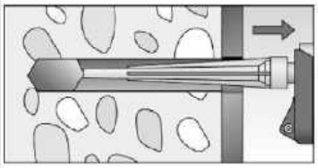
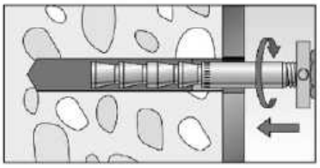
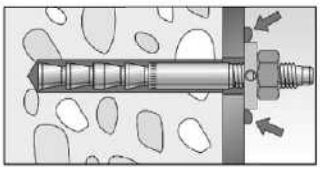
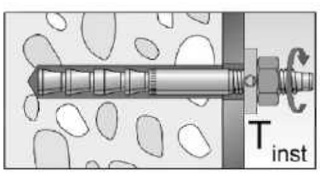


The gap between metal parts and fixture (annular gap) may be filled with mortar (FIS HB) via the fischer filling disc.

ATTENTION: Using fischer filling disc reduces t_{fix} (usable length of the anchor)

Installation instructions part 5; Push through installation FHB / FHB N

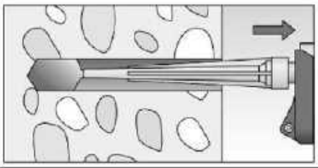
Push through installation FHB / FHB N

8b		Fill approximately 2/3 of the drill hole incl. fixture with mortar. Always begin from the bottom of the hole and avoid bubbles. For drill hole depth $h_0 \geq 150$ mm use an extension tube. For overhead installation or deep holes ($h_0 > 250$ mm) use an injection adapter.
9b		Push the pre-assembled fischer anchor rod (with washer and hexagon nut) into the drill hole until the fischer filling disc is in full contact with the surface, turning it slightly while doing so. Ensure the correct position of the metal parts. Only use clean and oil-free metal parts.
		After inserting the pre-assembled anchor rod, excess mortar has to emerge under the washer. If not, pull out the assembled anchor rod immediately and reinject mortar.
10b		Wait for the specified curing time t_{cure} see **Table B9.2**.
11b		Tighten the hexagon nut with installation torque T_{inst} (see **Table B5.1**).

Installation instructions part 6; Pre-positioned installation FHB dyn

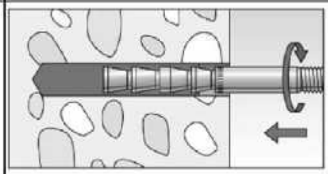
Pre-positioned installation FHB dyn

8c



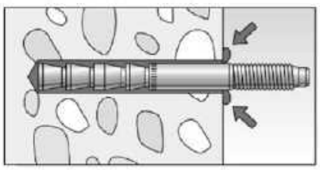
Fill approximately 2/3 of the drill hole with mortar. Always begin from the bottom of the hole and avoid bubbles. For drill hole depth $h_0 \geq 150$ mm use an extension tube. For overhead installation or deep holes ($h_0 > 250$ mm) use an injection adapter.

9c



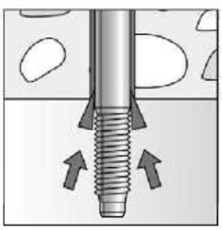
Push the anchor rod down to the bottom of the hole, turning it slightly while doing so. Observe projection length h_p (see **Table B6.1**)

Only use clean and oil-free metal parts.



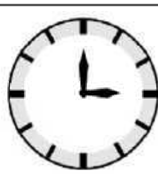
After inserting the anchor rod, excess mortar must be emerged around the anchor element.

If not, pull out the anchor rod immediately and reinject mortar.



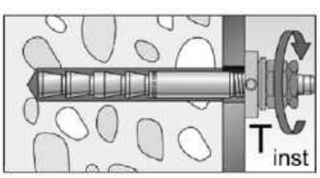
For overhead installations support the anchor rod with wedges.
(e.g. fischer centering wedges)

10c



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

11c



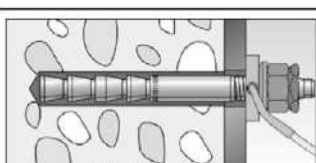
Attach the fixture and install the fischer filling disc, the spherical washer and nuts **(without centering sleeve)**.

Ensure the correct position of the metal parts.

Tighten the hexagon nut with installation torque T_{inst} (see **Table B6.1**).
Tighten lock nut manually, then use wrench to give another quarter or half turn.

In the high corrosion resistant steel version, the lock nut is a thin nut. Tighten it with a torque of ¼ T_{inst}.

12c

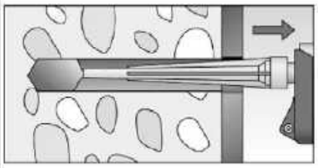
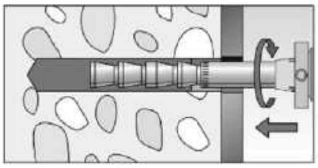
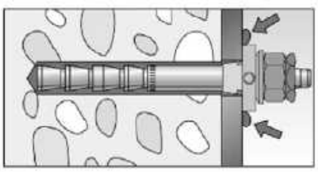
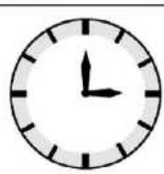
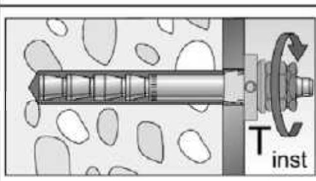


The gap between metal parts and fixture (annular gap) has to be filled with mortar (FIS HB) via the fischer filling disc.

This installation step can be omitted for anchors with pure tension loading.

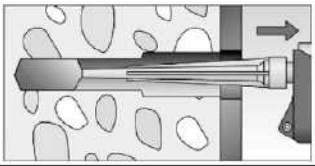
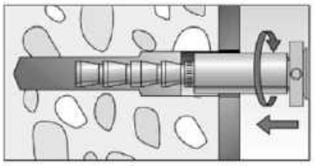
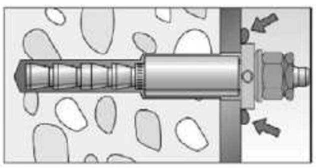
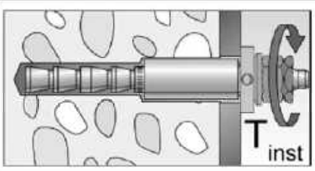
Installation instructions part 7; Push through installation FHB dyn

Push through installation FHB dyn

8d		Fill approximately 2/3 of the drill hole incl. fixture with mortar. Always begin from the bottom of the hole and avoid bubbles. For drill hole depth $h_0 \geq 150$ mm use an extension tube. For overhead installation or deep holes ($h_0 > 250$ mm) use an injection-adapter.
9d		Push the pre-assembled fischer anchor rod (with centering sleeve, fischer filling disc, spherical washer, hexagon nut and lock nut) into the drill hole until the fischer filling disc is in full contact with the surface, turning it slightly while doing so. Ensure the correct position of the metal parts and the centering sleeve. Only use clean and oil-free metal parts.
		After inserting the pre-assembled anchor rod, excess mortar must be emerged around the fischer filling disc (minimum on one point). If not, pull out the assembled anchor rod immediately and reinject mortar.
10d		Wait for the specified curing time t_{cure} see **Table B9.2**.
11d		Tighten the hexagon nut with installation torque T_{inst} (see **Table B6.1**). Tighten lock nut manually, then use wrench to give another quarter to half turn. In the high corrosion resistant steel version, the lock nut is a thin nut. Tighten it with a torque of ¼ T_{inst}.

Installation instructions part 8; Push through installation FHB dyn V

Push through installation FHB dyn V

8e		Fill approximately 2/3 of the drill hole incl. fixture with mortar. Always begin from the bottom of the hole and avoid bubbles. For drill hole depth $h_0 \geq 150$ mm use an extension tube. For overhead installation or deep holes ($h_0 > 250$ mm) use an injection adapter.
9e		Push the pre-assembled fischer anchor rod (with shear force sleeve, centering sleeve, fischer filling disc, spherical washer, hexagon nut and lock nut) into the drill hole until the fischer filling disc is in full contact with the surface, turning it slightly while doing so. Ensure the correct position of the metal parts and the centering sleeve. Only use clean and oil-free metal parts.
		After inserting the pre-assembled anchor rod, excess mortar must be emerged around the fischer filling disc (minimum on one point). If not, pull out the assembled anchor rod immediately and reinject mortar.
10e		Wait for the specified curing time t_{cure} see **Table B9.2**.
11e		Tighten the hexagon nut with installation torque T_{inst} (see **Table B7.1**). Tighten lock nut manually, then use wrench to give another quarter to half turn.

Installation instructions part 9; Push through installation FDA

Push through installation FDA

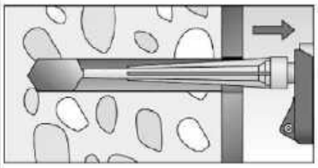
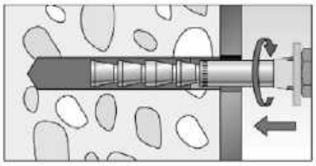
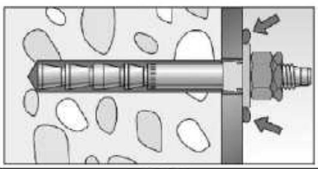
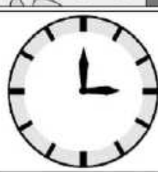
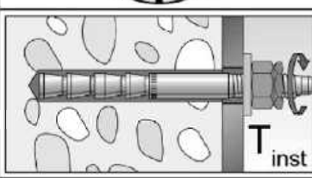
8f		Fill approximately 2/3 of the drill hole incl. fixture with mortar. Always begin from the bottom of the hole and avoid bubbles. For drill hole depth $h_0 \geq 150$ mm use an extension tube. For overhead installation or deep holes ($h_0 > 250$ mm) use an injection adapter.
9f		Push the pre-assembled fischer anchor rod (with centering sleeve, washer, hexagon nut and lock nut) into the drill hole until the washer is in full contact with the surface, turning it slightly while doing so. Gently hammer the anchor to the setting depth. Ensure the correct position of the metal parts and the centering sleeve. Only use clean and oil-free metal parts.
		After inserting the pre-assembled anchor rod, excess mortar must be emerged under the entire washer. If not, pull out the assembled anchor rod immediately and reinject mortar.
10f		Wait for the specified curing time t_{cure} see **Table B9.2**.
11f		Tighten the hexagon nut with installation torque T_{inst} (see **Table B8.1**). Tighten lock nut manually, then use wrench to give another quarter to half turn.

Table C1.1: Characteristic resistance to steel failure under tension / shear loading for fischer anchor rods FHB-A / FHB-A N / FHB-A dyn (V) / FDA

Anchor rod size					10x60	12x80	12x100	16x125	20x170	24x220
Characteristic resistance to steel failure under tension loading										
Characteristic resistance $N_{Rk,s}$	FHB-A / FHB-A N	zp	8.8	[kN]	25,8	44,3	44,3	81,7	130,8 [2]	179,8 [2]
		zp	5.8		16,1	27,7	27,7	51,1	- [3]	- [3]
		hdg	8.8		25,8	44,3	44,3	81,7	190,2	261,5
		R	80		25,8	44,3	44,3	81,7	166,5 [4]	228,8 [4]
		HCR	70		22,5	38,8	38,8	71,5	166,5	228,8
	FHB-A dyn	zp	8.8		- [3]	- [3]	44,3	81,7	190,2	261,5
		HCR	70		- [3]	- [3]	38,8	71,5	- [3]	- [3]
	FHB-A dyn V	zp	8.8		- [3]	- [3]	44,3	81,7	- [3]	- [3]
	FDA	zp	8.8		- [3]	- [3]	44,3	81,7	- [3]	- [3]
Partial factors [1]										
Partial factor		$\gamma_{Ms,N}$		[-]	1,50					
Characteristic resistance to steel failure under shear loading										
without lever arm										
Characteristic resistance $V^0_{Rk,s}$	FHB-A / FHB-A N	zp	8.8	[kN]	16,6	28,1	28,1	52,2	61,1 [2]	90,8 [2]
		zp	5.8		10,4	17,6	17,6	32,7	- [3]	- [3]
		hdg	8.8		16,6	28,1	28,1	52,2	98,0	141,2
		R	80		24,8	32,8	32,8	62,8	85,8 [4]	152,6 [4]
		HCR	70		25,1	36,9	36,9	55,0	85,8	141,1
	FHB-A dyn	zp	8.8		- [3]	- [3]	28,1	52,2	98,0	141,2
		HCR	70		- [3]	- [3]	36,9	55,0	- [3]	- [3]
	FHB-A dyn V	zp	8.8		- [3]	- [3]	56,9	96,2	- [3]	- [3]
	FDA	zp	8.8		- [3]	- [3]	28,1	52,2	- [3]	- [3]
Ductility factor		k_7		[-]	1,0					
with lever arm										
Characteristic resistance $M^0_{Rk,s}$	FHB-A / FHB-A N	zp	8.8	[Nm]	59,8	104,8	104,8	266,4	357,0 [2]	617,4 [2]
		zp	5.8		37,4	65,5	65,5	166,5	- [3]	- [3]
		hdg	8.8		59,8	104,8	104,8	266,4	519,3	898,0
		R	80		59,8	104,8	104,8	266,4	454,4 [4]	785,8 [4]
		HCR	70		52,3	91,7	91,7	233,1	454,4	785,8
	FHB-A dyn	zp	8.8		- [3]	- [3]	104,8	266,4	519,3	898,0
		HCR	70		- [3]	- [3]	91,7	233,1	- [3]	- [3]
	FHB-A dyn V	zp	8.8		- [3]	- [3]	104,8	266,4	- [3]	- [3]
	FDA	zp	8.8		- [3]	- [3]	104,8	266,4	- [3]	- [3]
Partial factors [1]										
Partial factor		$\gamma_{Ms,V}$		[-]	1,25					

[1] In absence of other national regulations
[2] f_{yk} = 440 N/mm² / f_{uk} = 550 N/mm²
[3] No performance assessed
[4] f_{yk} = 560 N/mm² / f_{uk} = 700 N/mm²

Table C2.1: Characteristic resistance to concrete failure under tension / shear loading

				FHB / FHB N / FHB dyn (V) / FDA
Size				**All sizes**
Tension loading				
Installation factor		γ_{inst}	[-]	See Annex C3
Factors for the compressive strength of concrete > C20/25				
Increasing factor ψ_c for concrete $N_{Rk,p\,(X,Y)} = \psi_c \cdot N_{Rk,p\,(C20/25)}$	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
Splitting failure				
Edge distance		$c_{cr,sp}$	[mm]	2 h_{ef}
Spacing		$s_{cr,sp}$		2 $c_{cr,sp}$
Concrete 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		$s_{cr,N}$		2 $c_{cr,N}$
Shear loading				
Installation factor		γ_{inst}	[-]	1,0
Concrete pry-out failure				
Factor for pry-out failure		k_8	[-]	2,0

Concrete edge failure										
Anchor size			10x60	12x80	12x100	12x100 V	16x125	16x125 V	20x170	24x220
Effective length of anchor	l_f	[mm]	60	80	100	105	125	130	170	220
Effective diameter of the fastener	d_{nom}		12	14	14	20	18	28	24	28

Table C3.1: Characteristic resistance to pull-out failure for fischer anchor rods FHB-A / FHB-A N / FHB-A dyn (V) / FDA in compacted reinforced or unreinforced normal weight concrete **without** fibers

Anchor rod size				10x60	12x80	12x100	16x125	20x170	24x220
Pull-out failure									
Calculation diameter		d	[mm]	10	12	12	16	20	24
Uncracked concrete									
Characteristic resistance in uncracked concrete C20/25									
Temperature range	I: 24 °C / 40 °C	$N_{Rk,p}$	[kN]	26,9	41,3	42,1	70,5	113,6	122,2
	II: 50 °C / 80 °C			23,7	36,3	37,0	62,0	100,0	107,5
Cracked concrete									
Characteristic resistance in cracked concrete C20/25									
Temperature range	I: 24 °C / 40 °C	$N_{Rk,p}$	[kN]	15,5	25,0	30,0	47,8	58,9	89,4
	II: 50 °C / 80 °C			13,6	22,0	26,4	42,1	51,8	78,7
Installation factors									
Dry or wet concrete		γ_{inst}	[-]	1,0					
Water filled hole				1,0	1,0	1,0	1,2	1,0	1,0

Table C3.2: Characteristic resistance to pull-out failure for fischer anchor rods FHB-A / FHB-A N / FHB-A dyn (V) / FDA in compacted reinforced or unreinforced normal weight concrete **with** fibers

Anchor rod size				12x100	16x125
Pull-out failure					
Calculation diameter		d	[mm]	12	16
Uncracked concrete					
Characteristic resistance in uncracked concrete C20/25					
Temperature range	I: 24 °C / 40 °C	$N_{Rk,p}$	[kN]	42,1	70,5
	II: 50 °C / 80 °C			37,0	62,0
Cracked concrete					
Characteristic resistance in cracked concrete C20/25					
Temperature range	I: 24 °C / 40 °C	$N_{Rk,p}$	[kN]	30,0	47,8
	II: 50 °C / 80 °C			26,4	42,1
Installation factors					
Dry or wet concrete		γ_{inst}	[-]	1,0	
Water filled hole				1,0	1,2

Table C4.1: Displacements for fischer anchor rods FHB-A / FHB-A N / FHB-A dyn (V) / FDA

Anchor rod size			10x60	12x80	12x100	16x125	20x170	24x220
Displacement-Factors for tension loading [1)]								
Uncracked concrete; Temperature range I, II								
Displacements	δ_{N0}	[mm/kN]	0,025	0,010	0,010	0,007	0,006	0,006
	$\delta_{N\infty}$		0,050	0,020	0,020	0,014	0,012	0,012
Cracked concrete; Temperature range I, II								
Displacements	δ_{N0}	[mm/kN]	0,040	0,020	0,020	0,020	0,020	0,020
	$\delta_{N\infty}$		0,060	0,030	0,030	0,030	0,030	0,030
Displacement-Factors for shear loading [2)]								
Uncracked or cracked concrete; Temperature range I, II								
Displacements	δ_{V0}	[mm/kN]	0,025	0,010	0,010	0,007	0,006	0,006
	$\delta_{V\infty}$		0,050	0,020	0,020	0,014	0,012	0,012

[1)] Calculation of effective displacement:

$\delta_{N0} = \delta_{N0\text{-Factor}} \cdot N$

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

(N: acting tension loading)

[2)] Calculation of effective displacement:

$\delta_{V0} = \delta_{V0\text{-Factor}} \cdot V$

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

(V: acting shear loading)