



## European Technical Approval ETA-06/0171

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung <i>Trade name</i>	fischer Highbond-Anker FHB <i>fischer Highbond anchor FHB</i>	
Zulassungsinhaber <i>Holder of approval</i>	fischerwerke GmbH & Co. KG Weinhalde 14 -18 72178 Waldachtal DEUTSCHLAND	
Zulassungsgegenstand und Verwendungszweck  <i>Generic type and use of construction product</i>	Kraftkontrolliert spreizender Verbunddübel aus galvanisch verzinktem Stahl in den Größen M10, M12, M16, M20 und M24 zur Verankerung im Beton  <i>Torque controlled bonded anchor made of galvanised steel of sizes M10, M12, M16, M20 and M24 for use in concrete</i>	
Geltungsdauer: <i>Validity:</i>	vom <i>from</i>	21 August 2006
	bis <i>to</i>	18 April 2011
verlängert <i>extended</i>	vom <i>from</i>	19 April 2011
	bis <i>to</i>	19 April 2016
Herstellwerke <i>Manufacturing plants</i>	fischer Herstellwerke 1 und 2, Deutschland fischer Herstellwerk 3, Tschechien	

Diese Zulassung umfasst  
*This Approval contains*

13 Seiten einschließlich 6 Anhänge  
*13 pages including 6 annexes*

## I LEGAL BASES AND GENERAL CONDITIONS

- 1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:
  - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products<sup>1</sup>, modified by Council Directive 93/68/EEC<sup>2</sup> and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council<sup>3</sup>;
  - Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998<sup>4</sup>, as amended by law of 31 October 2006<sup>5</sup>;
  - Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC<sup>6</sup>;
  - Guideline for European technical approval of "Metal anchors for use in concrete - Part 5: Bonded anchors", ETAG 001-05.
- 2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plants. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.
- 3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.
- 4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.
- 5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Deutsches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.
- 6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

<sup>1</sup> Official Journal of the European Communities L 40, 11 February 1989, p. 12

<sup>2</sup> Official Journal of the European Communities L 220, 30 August 1993, p. 1

<sup>3</sup> Official Journal of the European Union L 284, 31 October 2003, p. 25

<sup>4</sup> *Bundesgesetzblatt Teil I 1998*, p. 812

<sup>5</sup> *Bundesgesetzblatt Teil I 2006*, p. 2407, 2416

<sup>6</sup> Official Journal of the European Communities L 17, 20 January 1994, p. 34

## II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

### 1 Definition of product and intended use

#### 1.1 Definition of the construction product

The Fischer Highbond anchor FHB of sizes M10, M12, M16, M20 and M24 is a torque controlled bonded anchor consisting of a mortar cartridge with FIS HB and an anchor rod with hexagon nut and washer. The anchor rod (including nut and washer) is made of galvanised steel.

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).

An illustration of the product and intended use is given in Annex 1.

#### 1.2 Intended use

The anchor is intended to be used for anchorages for which requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 of Council Directive 89/106 EEC shall be fulfilled and failure of anchorages made with these products would cause risk to human life and/or lead to considerable economic consequences. Safety in case of fire (Essential Requirement 2) is not covered in this European technical approval. The anchor is to be used only for anchorages subject to static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes C20/25 at minimum and C50/60 at most according to EN 206:2000-12.

The anchor may be used in cracked and non-cracked concrete.

The anchor may only be used in structures subject to dry internal conditions.

The anchor may be set in dry or wet concrete.

The anchor may be used in the following temperature range:

Temperature range: -40 °C to +80 °C (max. short term temperature +80 °C  
and max. long term temperature +50 °C)

The provisions made in this European technical approval are based on an assumed working life of the anchor of 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.

### 2 Characteristics of the product and methods of verification

#### 2.1 Characteristics of product

The anchor corresponds to the drawings and provisions given in Annexes 1 to 4. The characteristic material values, dimensions and tolerances of the anchor not indicated in Annexes 1 to 4 shall correspond to the respective values laid down in the technical documentation<sup>7</sup> of this European technical approval.

The characteristic values for the design of anchorages are given in Annexes 5 and 6.

Each anchor rod shall be marked with the identifying mark of the manufacturer (works symbol), with the anchor size and with the effective anchorage depth in accordance with Annex 3.

<sup>7</sup> The technical documentation of this European technical approval is deposited at the Deutsches Institut für Bautechnik and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over to the approved bodies.

Each mortar cartridge shall be marked with the imprint FIS HB, the size of the cartridge, processing notes, shelf life, hazard code, curing time and processing time in accordance with Annex 1.

The two components of the injection mortar FIS HB are delivered in unmixed condition in mortar cartridges according to Annex 1.

## **2.2 Methods of verification**

The assessment of fitness of the anchor for the intended use in relation to the requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 has been made in accordance with the "Guideline for European technical approval of Metal Anchors for use in concrete", Part 1 "Anchors in general" and Part 5 "Bonded anchors" as well as the Technical Report TR 018 "Torque-controlled bonded anchors", on the basis of Option 1.

In addition to the specific clauses relating to dangerous substances contained in this European technical approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

## **3 Evaluation and attestation of conformity and CE marking**

### **3.1 System of attestation of conformity**

According to the decision 96/582/EG of the European Commission<sup>8</sup> the system 2(i) (referred to as system 1) of attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 1: Certification of the conformity of the product by an approved certification body on the basis of:

(a) Tasks for the manufacturer:

- (1) factory production control;
- (2) further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan;

(b) Tasks for the approved body:

- (3) initial type-testing of the product;
- (4) initial inspection of factory and of factory production control;
- (5) continuous surveillance, assessment and approval of factory production control.

Note: Approved bodies are also referred to as "notified bodies".

### **3.2 Responsibilities**

#### **3.2.1 Tasks of the manufacturer**

##### **3.2.1.1 Factory production control**

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use initial / raw / constituent materials stated in the technical documentation of this European technical approval.

<sup>8</sup> Official Journal of the European Communities L 254 of 08/10/1996

The factory production control shall be in accordance with the control plan which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited at Deutsches Institut für Bautechnik.<sup>9</sup>

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

#### 3.2.1.2 Other tasks of manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in section 3.1 in the field of anchors in order to undertake the actions laid down in section 3.2.2. For this purpose, the control plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European technical approval.

#### 3.2.2 Tasks of approved bodies

The approved body shall perform the

- initial type-testing of the product,
- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control,

in accordance with the provisions laid down in the control plan this European technical approval.

The approved body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the product stating the conformity with the provisions of this European technical approval.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform Deutsches Institut für Bautechnik without delay.

#### 3.3 CE marking

The CE marking shall be affixed on each packaging of anchors. The letters "CE" shall be followed by the identification number of the approved certification body, where relevant, and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacturer),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate of conformity for the product,
- the number of the European technical approval,
- the number of the guideline for European technical approval,
- use category (ETAG 001-1, Option 1),
- size.

<sup>9</sup> The control plan is a confidential part of the documentation of the European technical approval, but not published together with the European technical approval and only handed over to the approved body involved in the procedure of attestation of conformity. See section 3.2.2.

## **4 Assumptions under which the fitness of the product for the intended use was favourably assessed**

### **4.1 Manufacturing**

The anchor is manufactured in accordance with the provisions of the European technical approval using the automated manufacturing process as identified in the inspection of the plant by the Deutsches Institut für Bautechnik and the approved body and laid down in the technical documentation.

The European technical approval is issued for the product on the basis of agreed data/information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the European technical approval and consequently the validity of the CE marking on the basis of the European technical approval and if so whether further assessment or alterations to the European technical approval shall be necessary.

### **4.2 Installation**

#### **4.2.1 Design of anchorages**

The fitness of the anchor for the intended use is given under the following conditions:

The anchorages are designed in accordance with the "Guideline for European technical approval of Metal Anchors for Use in Concrete", Annex C, Method A, for bonded anchors under the responsibility of an engineer experienced in anchorages and concrete work.

Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored.

The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.).

#### **4.2.2 Installation of anchors**

The fitness for use of the anchor can only be assumed if the anchor is installed as follows:

- anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site,
- use of the anchor only as supplied by the manufacturer without exchanging the components of an anchor,
- anchor installation in accordance with the manufacturer's specifications and drawings using the tools indicated in the technical documentation of this European technical approval,
- checks before placing the anchor to ensure that the strength class of the concrete in which the anchor is to be placed is in the range given and is not lower than that of the concrete to which the characteristic loads apply,
- check of concrete being well compacted, e.g. without significant voids,
- Edge distance and spacing not less than the specified values without minus tolerances,
- positioning of the drill holes without damaging the reinforcement,
- in case of aborted drill hole: the drill hole shall be filled with mortar,
- cleaning the drill hole by at least 2x blowing / 2x brushing / 2x blowing in accordance with the manufacturer's installation instructions.
- the anchor component installation temperature shall be at least +5 °C;
- keeping the effective anchorage depth,

- the temperature of the concrete during installation and curing of the chemical mortar must not fall below -5 °C,
- the curing time according to Annex 4 shall be observed before the anchor may be loaded,
- after the curing time fixing the member to be anchored by using a calibrated torque wrench by not exceeding the torque moment given in Annex 3.

## **5 Indications to the manufacturer**

### **5.1 Responsibility of the manufacturer**

The manufacturer is responsible to ensure that the information on the specific conditions according to section 1 and 2 including Annexes referred to and 4.2.1 and 4.2.2 as well as 5 is given to those who are concerned. This information may be made by reproduction of the respective parts of the European technical approval. In addition all installation data shall be shown clearly on the package and/or on an enclosed instruction sheet, preferably using illustration(s).

The minimum data required are:

- Diameter of drill bit,
- Hole depth,
- Diameter of anchor rod,
- Minimum effective anchorage depth,
- Maximum thickness of the fixture,
- Information on the installation procedure, including cleaning of the hole with the cleaning equipments, preferably by means of an illustration,
- Anchor component installation temperature,
- Ambient temperature of the concrete during installation of the anchor,
- Admissible processing time (open time) of a cartridge,
- Curing time until the anchor may be loaded as a function of the ambient temperature in the concrete during installation,
- max. torque moment,
- Identification of the manufacturing batch.

All data shall be presented in a clear and explicit form.

### **5.2 Packaging, transport and storage**

The injection cartridges shall be protected against sun radiation and shall be stored according to the manufacture's installation instructions in dry condition at temperatures of at least +5 °C to not more than +25 °C.

Mortar cartridges with expired shelf life must no longer be used.

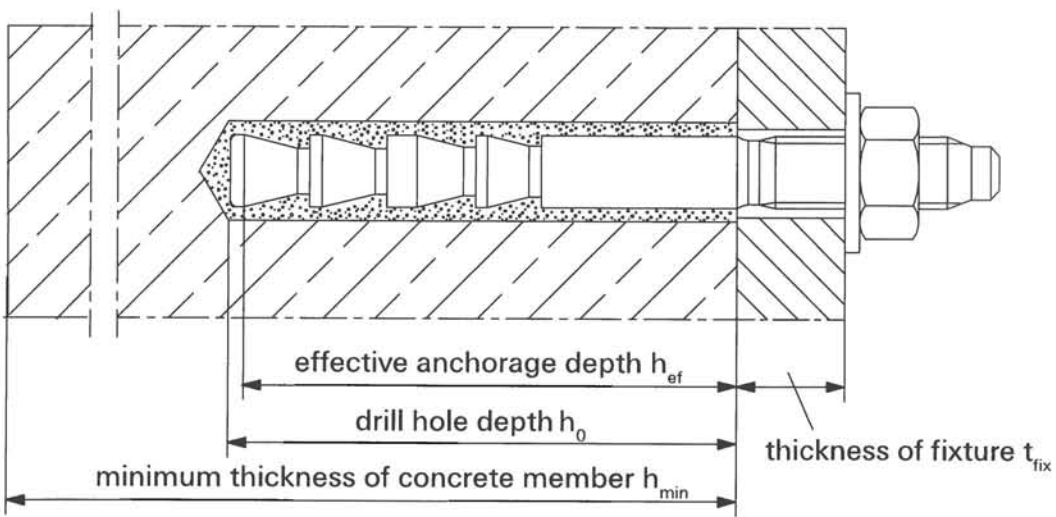
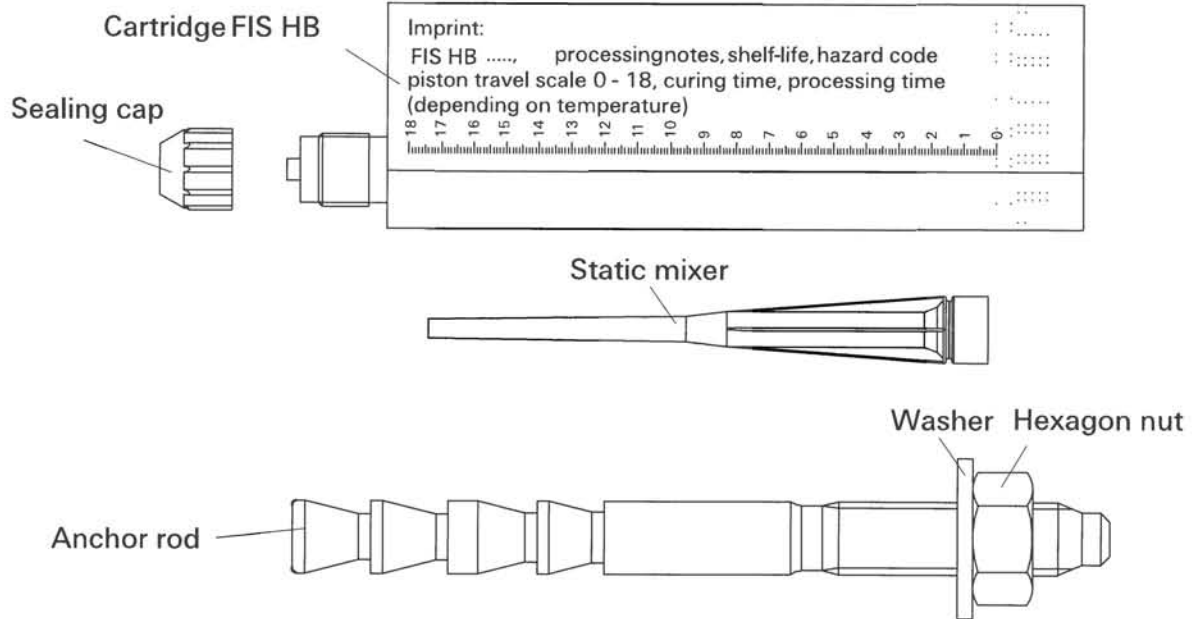
The anchor shall only be packaged and supplied as a complete unit. Mortar cartridges may be packed separately from anchor rods, nuts and washers.

The manufacturer's installation instruction shall indicate that the FIS HB shall be used with the corresponding anchor rods of the manufacturer according to Annex 2.

Georg Feistel  
Abteilungsleiter

*beglaubigt:*  
Wittstock





Temperature range: - 40 °C to + 80 °C (max. short temp. + 80 °C / max. long temp. + 50 °C)

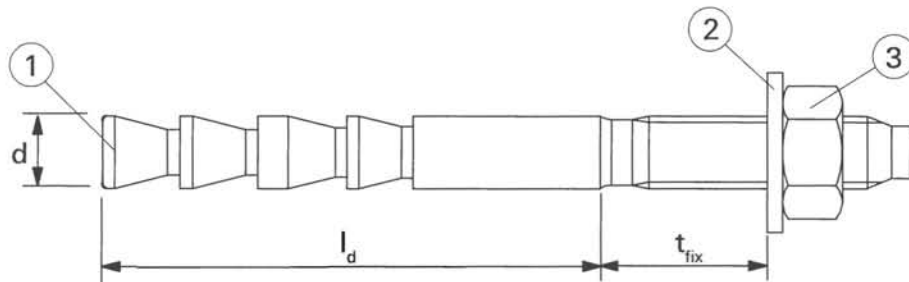
Installation direction	dry concrete	wet concrete	flooded hole
vertical	X	X	X
horizontal	X	X	X
overhead	X	X	

fischer Highbond anchor FHB

Product and intended use

**Annex 1**  
 of European  
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**Table 1:** Anchor dimensions

Size	FHB 10x60	FHB 12x80	FHB 12x100	FHB 16x125	FHB 20x170	FHB 24x220
thread	M 10	M12	M12	M16	M20	M24
$l_d$ [mm]	62	82	102	128	175	225
$d$ [mm]	10	12	12	16,5	22	24,5
$t_{fix}$	min [mm]	0				
	max [mm]	3000				

**Table 2:** Materials

Part	Designation	M 10 to M 16	M 20 to M 24
		1	Anchor rod
2	Washer	Steel, zinc plated $\geq 5 \mu\text{m}$ (EN ISO 4042)	
3	Hexagon nut	Steel, class 8; (EN 20898-2); zinc plated $\geq 5 \mu\text{m}$ (EN ISO 4042)	
	FIS HB Mortar cartridge	Vinylester resin, styrene free	

fischer Highbond anchor FHB

Anchor dimensions  
Materials

**Annex 2**

of European  
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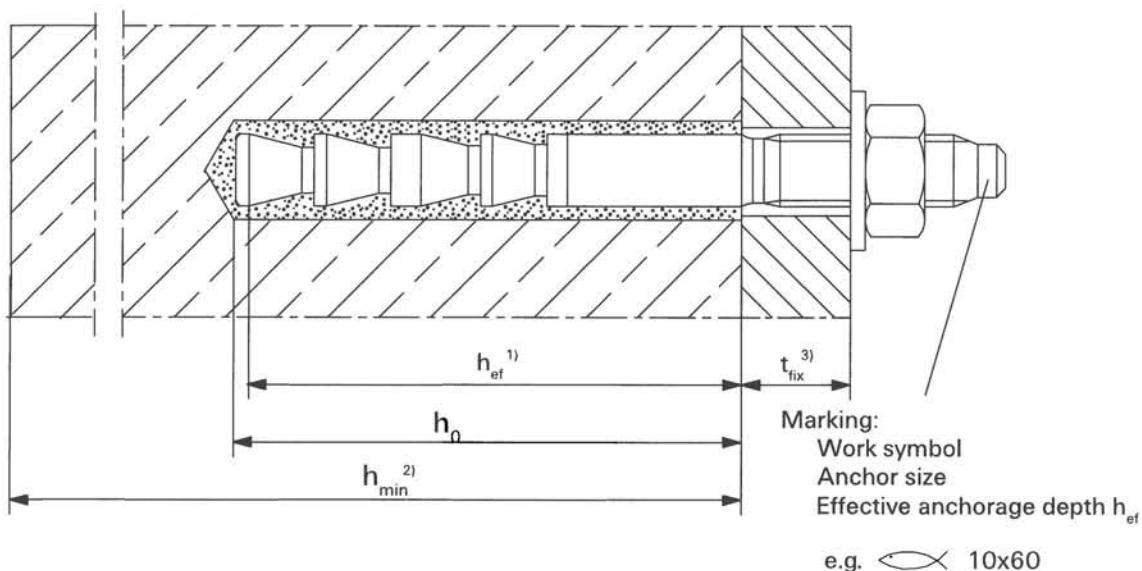
**Table 3:** Installation parameters

Size		FHB 10x60	FHB 12x80	FHB 12x100	FHB 16x125	FHB 20x170	FHB 24x220
nomal drill diameter	$d_o = [mm]$	12	14	14	18	24	28
Cutting diameter of drill bit	$d_{cut} \leq [mm]$	12,5	14,5	14,5	18,5	24,55	28,55
Depth of drill hole	$h_o \geq [mm]$	65	85	105	130	175	225
Maximum torque moment	$T_{inst} = [Nm]$	20	40	40	60	100	120
Diameter of clearance hole in the fixture	$d_f \leq [mm]$	12	14	14	18	22	26
Diameter of steel brush	$d_b = [mm]$	13	16	16	20	26	30

**Steelbrush**



For threaded rod size M20 upwards, the drill hole must be blown out clean using a compressed air blower. For M20 and M24 overhead installation use fixing wedges for the holding time before applying the load.



- 1) effective anchorage depth  $h_{ef}$  see annex 5
- 2) Minimum thickness of concrete member  $h_{min}$  see annex 4
- 3) Thickness of fixture  $t_{fix}$  see annex 2

fischer Highbond anchor FHB

Installation parameters

**Annex 3**  
of European  
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**Table 4:** Minimum distance and minimum member thickness

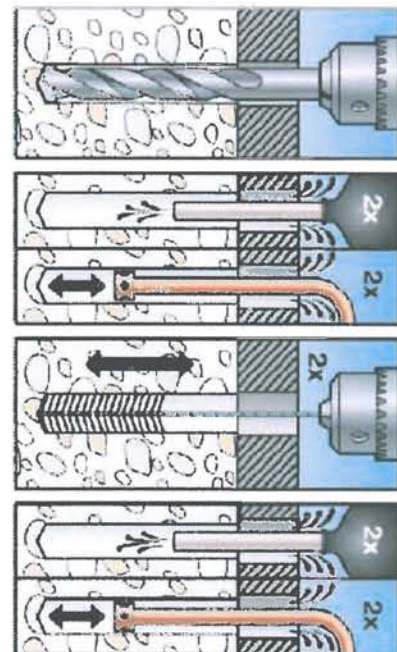
Size	FHB 10x60	FHB 12x80	FHB 12x100	FHB 16x125	FHB 20x170	FHB 24x220
Minimum thickness of concrete member $h_{min}$ [mm]	120	160	200	250	340	440
Minimum free edge distance $c_{min}$ [mm]	60	80	100	100	150	180
Minimum spacing $s_{min}$ [mm]	60	80	100	100	150	180

**Table 5:** Minimum curing time

Concrete temperature	Minimum curing time [minutes] <sup>1)</sup>
- 5 °C	360
0 °C	180
+ 5 °C	90
+ 20 °C	35
+ 30 °C	20
+ 40 °C	12

<sup>1)</sup> For wet concrete the curing time must be doubled

Clean drill hole thoroughly:  
 From the bottom end of the drill hole, blow out 2 times, brush 2 times and finally blow out at least 2 times. The brushing must be done with a special steel brush, see table 3 for recommended brush diameter.  
 For sizes M20 and larger blow out twice with oil-free compressed air, use pressure nozzle Ø 19 mm.



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Distances and member thickness  
 Curing times  
 Cleaning the drill hole

**Annex 4**  
 of European  
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**Table 6:** Design method A  
Characteristic values for tension loads

Size		FHB 10x60	FHB 12x80	FHB 12x100	FHB 16x125	FHB 20x170	FHB 24x220
<b>Steel failure</b>							
characteristic resistance	$N_{Rk,s}$ [kN]	26	44	44	82	131	180
Partial safety factor	$\gamma_{Ms}$	1,5 <sup>1)</sup>					
<b>Pullout failure</b>							
characteristic resistance in cracked concrete	$N_{Rk,p}$ [kN] C 20/25	2)	2)	30	2)	60	95
characteristic resistance in non-cracked concrete	$N_{Rk,p}$ [kN] C 20/25	20	25	35	50	60	115
Increasing factors for the characteristic resistance in cracked and non-cracked concrete	$\psi_c$ C 30/37	1,22					
	C 40/50	1,41					
	C 50/60	1,55					
Partial safety factor <sup>3)</sup>	$\gamma_{Mp}$	1,5 <sup>1)</sup>					
<b>Concrete cone failure / splitting failure</b>							
Effective anchoring depth	$h_{ef}$ [mm]	60	80	100	125	170	220
Spacing	$s_{cr,N} = s_{cr,sp}$ [mm]	$3 h_{ef}$					
Edge distance	$c_{cr,N} = c_{cr,sp}$ [mm]	$1,5 h_{ef}$					
Partial safety factor <sup>3)</sup>	$\gamma_{Mc} = \gamma_{Msp}$	1,5 <sup>1)</sup>					

<sup>1)</sup> If no other national regulations exist

<sup>2)</sup> Pullout failure is not decisive.

<sup>3)</sup> The partial safety factor  $\gamma_2 = 1,0$  is included.

**Table 7:** Displacement under tension loads

Size		FHB 10x60	FHB 12x80	FHB 12x100	FHB 16x125	FHB 20x170	FHB 24x220
Tension load in cracked concrete	$N$ [kN]	7,8	12,0	14,3	23,4	28,6	45,2
Displacements	$\delta_{NO}$ [mm]	0,5	0,5	0,5	0,6	0,6	0,9
	$\delta_{N=}$ [mm]	0,8	0,7	0,7	0,7	0,7	1,1
Tension load in non-cracked concrete	$N$ [kN]	9,5	11,9	16,7	23,8	28,6	54,8
Displacements	$\delta_{NO}$ [mm]	0,2	0,2	0,2	0,3	0,3	0,5
	$\delta_{N=}$ [mm]	0,8	0,7	0,7	0,7	0,7	1,1

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Design method A  
Characteristic values for tension loads  
Displacements

**Annex 5**  
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**Table 8:** Design method A  
Characteristic values for shear loads

Size	FHB 10x60	FHB 12x80	FHB 12x100	FHB 16x125	FHB 20x170	FHB 24x220
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Steel failure without lever arm							
characteristic shear load resistance	$V_{Rk,s}$ [kN]	16	30	30	55	60	85
Partial safety factor	$\gamma_{Ms}$	1,25 <sup>1)</sup>					

Steel failure with lever arm							
characteristic bending moment	$M_{Rk,s}^0$ [Nm]	60	105	105	266	357	617
Partial safety factor	$\gamma_{Ms}$	1,25 <sup>1)</sup>					

Concrete pryout failure						
Factor in equation(5.6) of ETAG Annex C Section 5.23.3	k	2,0				
Partial safety factor	$\gamma_{Mcp}$	1,5 <sup>1)</sup>				

Concrete edge failure							
Effective length of anchor in shear load	$l_f$ [mm]	60	80	100	125	170	220
Effective diameter of anchor	$d_{nom}$ [mm]	12	14	14	18	24	28
Partial safety factor	$\gamma_{Mc}$	1,5 <sup>1)</sup>					

<sup>1)</sup> If no other national regulations exist

**Table 9:** Displacements under shear loads

Size	FHB 10x60	FHB 12x80	FHB 12x100	FHB 16x125	FHB 20x170	FHB 24x220	
Shear load	V [kN]	9,3	17,0	17,0	31,6	33,9	48,8
Displacements	$\delta_{vo}$ [mm]	1,3					
	$\delta_{vs}$ [mm]	2,0					

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Design method A  
Characteristic values for shear loads  
Displacements

**Annex 6**  
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