

# MFPA Leipzig GmbH

Testing, inspection and certification body for  
building materials, building products and building systems

**Division III - Structural Fire Protection**

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## Advisory opinion no. GS 3.2/18-404-1

3<sup>rd</sup> December 2018

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Subject matter: fischer Highbond-Anchor FHB II  
Summarising evaluation of the test results with fire exposure according to the temperature time curve of ZTV-ING:2003-01 for anchor rods made of high corrosion resistant steel C.

Client: fischerwerke GmbH & Co. KG  
Klaus-Fischer-Straße 1  
D-72178 Waldachtal

Date of order: 9<sup>th</sup> November 2018

Person in charge: Dipl.-Ing. S. Bauer

Validity: The validity of the expert opinion is unlimited and ends as soon as technical regulations change or the reference documents become invalid.

This document consists of 3 text pages and 1 enclosure.

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## 1 Objective and request

On 9<sup>th</sup> November 2018, MFPA Leipzig GmbH was commissioned by fischerwerke GmbH & Co. KG with the assessment of the resistance to fire of the fischer Highbond-Anchor FHB II with anchor rods made of high corrosion resistant steel C with fire exposure from one side according to the temperature time curve of ZTV-ING:2003-01 and anchored to a reinforced concrete base in order to determine the characteristic parameters for a load under tensile stress.

## 2 Description of the tested structure

The fischer Highbond-Anchor FHB II is a torque controlled bonded anchor consisting of a mortar cartridge with mortar fischer FIS HB or fischer mortar capsule FHB II-P(F) and an anchor rod FHB II - A L C or FHB II - A S C with hexagon nut and washer. The glass capsule is set into a drilled hole in the concrete. The special formed anchor rod is driven into the glass capsule by machine with simultaneous hammering and turning. For the injection system the anchor rod is placed into a drilled hole filled with injection mortar. The load transfer is realised by mechanical interlock of several cones in the bonding mortar and then via a combination of bonding and friction forces in the anchorage ground. Anchoring may be carried out under static and quasi-static load in reinforced and unreinforced normal concrete of stability class between C20/25 minimum and C50/60 maximum in accordance with DIN EN 206: 2014-07 [1]. No further description of the product will be provided here and reference is made to the European Technical Assessment ETA-05/0164 [2] of 14<sup>th</sup> December 2017.

Details of the tests, the test configuration and the results of the test series for the fischer Highbond-Anchor FHB II are given in Test Report No. PB III/B-06-139 [3] and its additions.

## 3 Evaluation

Based on the test results, for the fischer Highbond-Anchor FHB II with anchor rod FHB II-AL C or FHB II-AS C made of high corrosion resistant steel, loaded on centric tension and installed in reinforced and non-reinforced normal concrete of strength class C 20/25 minimum and C 50/60 maximum according to DIN EN 206: 2014-07 [1], the following permissible loads per anchor under fire load can be specified according to the temperature time curve of ZTV-ING:2003-01.

To determine the permissible load for size M8, a steel stress of 27.3 N/mm<sup>2</sup> (<29 N/mm<sup>2</sup>) was used as a basis, on the safe side.

Table 1 permissible tensile load per anchor of the fischer Highbond-Anchor FHB II - AL C / AS C with centric tensile load under fire load of the ZTV-ING:2003-01

fischer Highbond-Anchor FHB II – AL C / AS C		M8	M10	M12	M16	M20	M24
Effective anchorage depth $h_{ef}$	[mm]	60	75	100	125	170	210
			95	120	145	210	
					160		
Permissible load per anchor	[kN]	1.0	1.7	2.8	5.0	7.2	7.2

## 4 Special notes

The evaluation above only applies to fischer Highbond-Anchor FHB II, using the two-component composite mortar FIS HB or the cartridge system FHB II-P(F), with anchor rod FHB II-AL C or FHB II-AS C made of high corrosion resistant steel, which is installed in compliance with the installation regulations of fischerwerke GmbH & Co. KG and the European Technical Assessment ETA-05/0164 dated 14<sup>th</sup> December 2017.





On the safe side, the tensile loads in Table 1 can also be taken into account for shear load.

The assessment applies in general to a one-sided fire exposure of the structural elements. In the event of a fire load on several sides, the verification procedure can only be applied if the distance to the outer edge of the bolt anchor is  $c \geq 300$  mm and  $\geq 2 h_{ef}$ .

The assessment only applies in conjunction with concrete members of strength class  $\geq C 20/25$  and  $\leq C 50/60$  acc. to DIN EN 206:2014-07 [1] that have at least the same fire resistance rating as the fire-resistance period of the anchors. The requirements of DIN EN 1992-2:2010-12 [4], section 4.5, to avoid concrete spalling have to be taken into account. The moisture content must be less than three % by weight, if there are no different specifications in the national annex.

This document does not replace any certificate of conformity or usability as defined by the building regulations (national/European).

Leipzig, 3<sup>rd</sup> November 2018

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Head of Division



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Head of Work Group

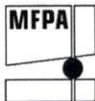
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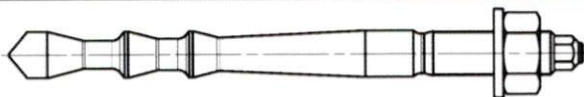
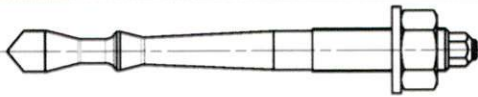
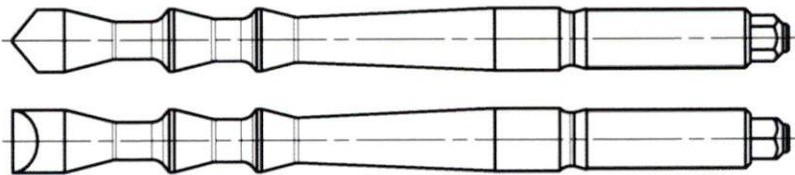
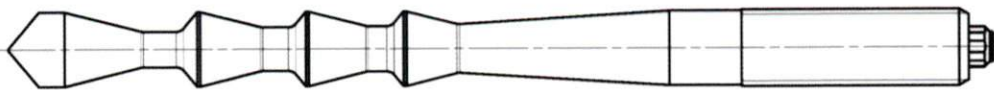

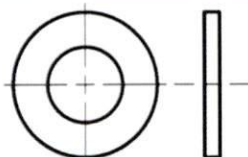
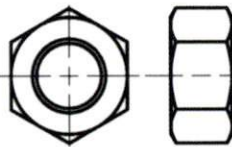

Annex 1 Installation parameters of the fischer Highbond-Anchor FHB II


#### Corresponding documents

- [1] DIN EN 206:2014-07 *Concrete - Specification, performance, production and conformity*
- [2] European Technical Assessment ETA-05/0164 dated 14<sup>th</sup> December 2017 of the DIBt Berlin: "fischer Highbond-Anchor FHB II"
- [3] Test report PB III/B-06-139 *fischer Highbond-Anchor FHB II - AL C - Testing and evaluation of fire behaviour under fire loading according to the temperature-time curve of ZTV-ING:2003-01 of anchors placed in the tensile zone of reinforced concrete ceiling sections and subjected to centric tensile loading*, MFPA Leipzig GmbH of 20/06/2006 and the additions to the test report of 27/01/2009 and 11/05/2010, the supplement to the test report of 20/06/2006 and the extension of validity of 12/06/2008 and 19/11/2013, fischerwerke
- [4] DIN EN 1992-1-2:2010-12 *Design of concrete structures - Part 1-2: General rules - Structural fire design*
- [5] Manufacturer's declaration on the fischer Highbond-Anchor FHB II product by fischerwerke GmbH & Co. KG dated 29<sup>th</sup> October 2018



Annex 1 Installation parameters of the fischer Highbond-Anchor FHB II

fischer Highbond - Anchor rod; pre-assembled condition		
fischer Highbond - Anchor rod FHB II - A L		fischer Highbond - Anchor rod FHB II - A S
		
Anchor rod FHB II - A L Size: M8, M10, M12, M16, M20		
		
Anchor rod FHB II - A L Size: M24		
		
Anchor rod FHB II - A S Size: M10, M12, M16, M20, M24		
		
Washer		
Hexagon nut		
fischer filling disk FFD		



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Pictures not to scale





**Table B3.1:** Installation parameters for fischer Highbond - Anchor rods FHB II – A L

Anchor rod FHB II – A L		Thread	M8x 60	M10x 95	M12x 100 120		M16x 125 145 160			M20x 210	M24x 210	
Correspondending mortar capsules FHB II-P or FHB II-PF		[-]	8x 60	10x 95	12x 100	12x 120	16x 125	16x 145	16x 160	20x 210	24x 210	
Cone diameter	d <sub>k</sub>		9,4	10,7	12,5		16,8			23,0		
Width across flats	SW		13	17	19		24			30	36	
Nominal drill hole diameter	d <sub>0</sub>		10	12	14		18			25		
Drill hole depth	h <sub>0</sub>		75	110	115	135	140	160	175	235		
Effective anchorage depth	h <sub>ef</sub>		60	95	100	120	125	145	160	210		
Minimum spacing and minimum edge distance		s <sub>min</sub> = c <sub>min</sub>	[mm]		40		50		55	60	70	90
Diameter of clearance hole in the fixture <sup>1)</sup>	pre-positioned anchorage	d <sub>f</sub> ≤	9	12	14		18			22	26	
	push through anchorage <sup>2)</sup>	d <sub>f</sub> ≤	11	14	16		20			26		
Min. thickness of concrete member		h <sub>min</sub>	100	140		170		190	220	280		
Installation torque		T <sub>inst</sub>	[Nm]	15	20	40		60			100	
Thickness of fixure		t <sub>fix</sub> ≤	[mm]	1500								
fischer filling disk FFD <sup>3)</sup>	≥ d <sub>a</sub>			-	26	30		38			46	54
	t <sub>s</sub>			-	6	6		7			8	10

<sup>1)</sup> For larger clearance holes in the fixture see EOTA ETAG 001 Annex C, 08/2010 or CEN/TS 1992-4:2009  
<sup>2)</sup> Only with mortar cartridge system FIS HB  
<sup>3)</sup> Using fischer filling disk FFD reduces t<sub>fix</sub> (usable length of the anchor)

**Table B4.1:** Installation parameters for fischer Highbond – Anchor rods FHB II – A S

Anchor rod FHB II – A S		Thread	M10x		M12x	M16x	M20x	M24x	
			60	75	75	95	170	170	
Correspondending mortar capsules FHB II-P or FHB II-PF		[-]	10x60	10x75	12x75	16x95	20x170	24x170	
Cone diameter	d <sub>k</sub>	[mm]	9,4		11,3	14,5	23,0		
Width across flats	SW		17		19	24	30	36	
Nominal drill hole diameter	d <sub>0</sub>		10		12	16	25		
Drill hole depth	h <sub>0</sub>		75	90	90	110	190		
Effective anchorage depth	h <sub>ef</sub>		60	75	75	95	170		
Minimum spacing and minimum edge distance	s <sub>min</sub> = c <sub>min</sub>		40				50	80	
Diameter of clearance hole in the fixture <sup>1)</sup>	pre-positioned anchorage d <sub>l</sub> ≤ push through anchorage d <sub>l</sub> ≤		12		14	18	22	26	
			12		14	18	26		
Min. thickness of concrete member	h <sub>min</sub>		100	120		150	240		
Installation torque	T <sub>inst</sub>	[Nm]	15		30	50	100		
Thickness of fixure	t <sub>fix</sub> ≤	[mm]	1500						
fischer filling disk FFD <sup>2)</sup>	≥ d <sub>a</sub>		26		30	38	46	54	
	t <sub>s</sub>		6		6	7	8	10	

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

<sup>2)</sup> Using fischer filling disk FFD reduces t<sub>fix</sub> (usable length of the anchor)



Provided by the client.

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