



# 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 3.2/18-082-1-r1**

*Replacement for: GS 3.2/18-082-1 from 28<sup>th</sup> May 2018*

3<sup>rd</sup> July 2018

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Subject matter: fischer bolt anchor FBN II  
Summarising evaluation of the test results.

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

Date of order: 27<sup>th</sup> February 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 27<sup>th</sup> February 2018, MFPA Leipzig GmbH was commissioned by fischerwerke GmbH & Co. KG with the assessment of the resistance to fire of the fischer bolt anchor FBN II with fire exposure from one side 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 bolt anchor FBN II is an anchor made of galvanised, hot-dip galvanised or stainless steel, which is placed in a drilled hole and anchored by force-controlled expansion. Anchoring may be carried out in non-cracked reinforced concrete and 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 Assessments ETA-07/0211 of 19<sup>th</sup> May 2016 and ETA-18/0101 of 16<sup>th</sup> July 2018.

Details of the tests, the test configuration and the results of the test series for the fischer bolt anchor FBN II are given in Test Report No. PB III/B-07-444 [2] and its additions.

## 3 Test analysis and evaluation

The test evaluation for steel failure was conducted in accordance with TR 020:2004-05 [3]. In order to determine the characteristic tensile stresses, the values were evaluated on the basis of the test results.

The following characteristic parameters for the load under central tension (table 1) and lateral tension (table 2) can be quoted for the fischer bolt anchor FBN II on this basis. The characteristic steel stress at normal temperature also has to be taken into account for the assessment; the smaller stress value is decisive in each case.

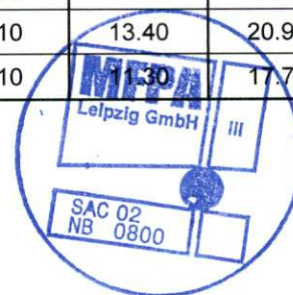
The determination of the characteristic parameters for other failure types (e.g. "pulling out", or "concrete break-out") was not the subject of the tests; they can be determined according to the simplified verification procedure described in TR 020:2004-05 [3], or experimentally according to the method described in TR 048:2016-08 [4].

Table 1 characteristic values for the fischer bolt anchor FBN II under central tensile load

Thread diameter [M]			M6	M8	M10	M12	M16	M20
30 min	$N_{Rk,s,fi(30)}$	[kN]	0.35	1.40	4.20	9.50	17.70	27.60
60 min	$N_{Rk,s,fi(60)}$	[kN]	0.30	1.10	3.10	6.80	12.70	19.90
90 min	$N_{Rk,s,fi(90)}$	[kN]	0.30	0.70	2.00	4.20	7.80	12.20
120 min	$N_{Rk,s,fi(120)}$	[kN]	0.25	0.60	1.40	2.80	5.30	8.40

Table 2 characteristic values for the fischer bolt anchor FBN II under lateral tensile load

Thread diameter [M]			M6	M8	M10	M12	M16	M20
30 min	$N_{Rk,s,fi(30)}$	[kN]	0.35	4.70	7.70	9.80	21.50	33.60
60 min	$N_{Rk,s,fi(60)}$	[kN]	0.30	3.20	5.70	7.90	17.40	27.20
90 min	$N_{Rk,s,fi(90)}$	[kN]	0.30	1.80	3.80	6.10	13.40	20.90
120 min	$N_{Rk,s,fi(120)}$	[kN]	0.25	1.10	2.80	5.10	11.30	17.70





#### 4 Special notes

The evaluation above only applies to fischer bolt anchor FBN II which is installed in compliance with the installation regulations of fischerwerke GmbH & Co. KG and the European Technical Assessments ETA-07/0211 dated 19<sup>th</sup> May 2016 and ETA-18/0101 dated 16<sup>th</sup> July 2018.

The assessment is still only valid for non-cracked concrete.

The results of the tests for anchors made of galvanised steel may also be transferred to anchors made of stainless steel A4 and made of hot-dip galvanised steel (HDG).

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. In addition, the notes contained in DIN EN 1992-1-2:2010-12 [5] (see section 4.5) on the avoidance of concrete spalling apply. This means that the moisture content must be less than three % by weight (or four according to 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> July 2018



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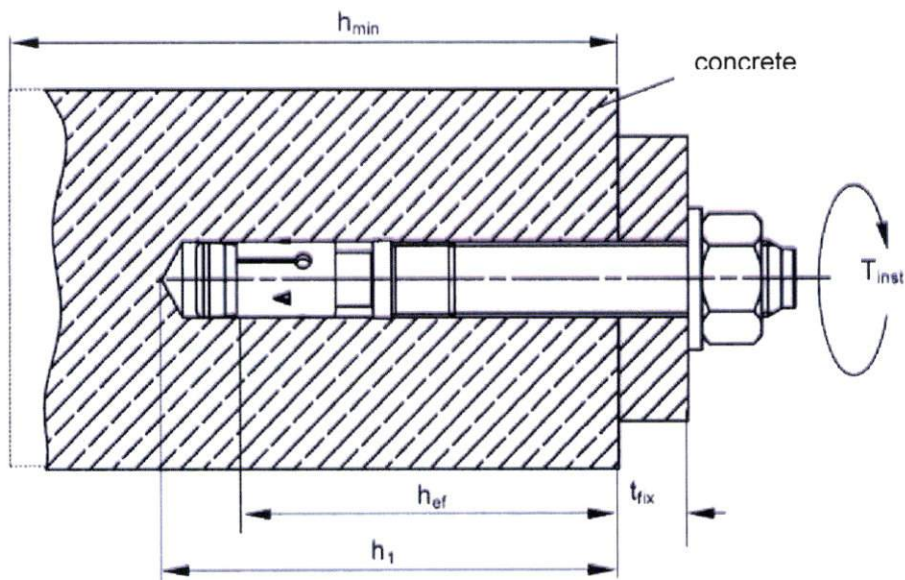
#### List of enclosures

Annex 1 Installation parameters of the fischer bolt anchor FBN II

#### Corresponding documents

- [1] DIN EN 206:2014-07 *Concrete - Specification, performance, production and conformity*
- [2] Test report PB III/B-07-444 *fischer FBN II - Test according to DIN EN 1363-1:1999-10 to determine the fire resistance duration under shear load and tensile stress in accordance with TR 020, MFPALeipzig GmbH of 29/11/2007 and the additions to the test report of 15/03/2010 and 19/05/2010 and the extension of validity of 29/11/2012, fischerwerke*
- [3] TR 020:2004-05 *Evaluation of Anchorages in Concrete concerning Resistance to Fire*
- [4] TR 048:2016-08 *Details of tests for post-installed fasteners in concrete*
- [5] DIN EN 1992-1-2:2010-12 *Design of concrete structures - Part 1-2: General rules - Structural fire design*

Annex 1 Installation parameters of the fischer bolt anchor FBN II



$h_{ef}$  = Effective anchorage depth  
 $t_{fix}$  = Thickness of the fixture  
 $h_1$  = Depth of the drill hole in concrete  
 $h_{min}$  = Thickness of the concrete member  
 $T_{inst}$  = Installation torque

Type of anchor / size <b>FBN II, FBN II HDG, FBN II A4</b>	<b>M6</b>	<b>M8</b>	<b>M10</b>	<b>M12</b>	<b>M16</b>	<b>M20</b>
Nominal drill hole diameter $d_0 =$ [mm]	6	8	10	12	16	20
Cutting diameter of drill bit $d_{cut} \leq$ [mm]	6,45	8,45	10,45	12,5	16,5	20,55
Effective anchorage depth $h_{ef} =$ [mm]	30 <sup>2)</sup>	40 (30 <sup>1) 2)</sup>	50 (40 <sup>1)</sup> )	65 (50 <sup>1)</sup> )	80 (65 <sup>1)</sup> )	105 (80 <sup>1)</sup> )
Depth of drill hole in concrete $h_1 \geq$ [mm]	40	56 (46 <sup>1) 2)</sup>	68 (58 <sup>1)</sup> )	85 (70 <sup>1)</sup> )	104 (89 <sup>1)</sup> )	135 (110 <sup>1)</sup> )
Diameter of clearance hole in the fixture $d_f \leq$ [mm]	7	9	12	14	18	22
Required torque moment FBN II (zinc plated) $T_{inst} =$ [Nm]	4	15	30	50	100	200
Required torque moment FBN II HDG (hot-dip galvanized) $T_{inst} =$ [Nm]	-	15	30	40	70	200
Required torque moment FBN II A4 (stainless steel) $T_{inst} =$ [Nm]	4	10	20	35	80	150

<sup>1)</sup> Values for reduced anchorage depth

<sup>2)</sup> Use restricted to anchoring of structural components which are statically indeterminate

