



MFGPA Leipzig GmbH

Testing, Inspection and Certification Authority for
Construction Products and Construction Types

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Work Group 3.2 - Fire Behaviour of Building Components and special
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Advisory Opinion No. GS 3.2/16-368-2

Draft by 27 January 2017

No. Copy 1

Subject matter: Index MTH
Fire protection assessment of the characteristic steel strength under tensile load according to EAD 330232-00-0601 „Mechanical fasteners for use in concrete“ (October 2016).

Client: INDEX Fixing Systems
Técnicas Expansivas S.L.
Segador 13
26006 Logroño (La Rioja) - SPAIN

Date of order: 15. December 2016

Person in charge: Dipl.-Wirtsch.-Ing. S. Kramer

Validity: 26. January 2022

This advisory opinion consists of 3 pages of text and 2 Enclosures.

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1 Objective and request

MFPA Leipzig GmbH was commissioned on 15. December 2016 by INDEX Fixing Systems to prepare an advisory opinion on the Index MTH with a one-side exposure to fire and anchoring in a reinforced concrete surface in order to determine the characteristic values for stressing under centric tension load.

2 Description of the tested construction

The Index MTH is a torque controlled expansion anchor of electrogalvanized steel or stainless steel of the sizes M6 to M20. The Index MTH is anchored by torque-controlled expansion after been placed in a drilled hole in uncracked concrete.

The system should be used under static or quasi-static loading in reinforced or unreinforced normal concrete of strength class $\geq C 20/25$ and $\leq C 50/60$ in accordance with DIN EN 206: 2014-07 [1]. No further description of the anchor will be provided here and reference is made to the ETA-05/0242 [2].

The present tests of Index MTH were performed in the sizes M8 and M12 in electrogalvanized steel of the strength class 5.8. The details of how the test was performed and the individual test results are described in the test report PB 3.2/16-368-1 [3].

3 Test evaluation and conclusions

The test evaluation for steel failure was carried out according to EAD 330232-00-0601: 2016-10 [4]. A graphical analysis of the test results is given in Enclosure 2.

To determine the characteristic tension stress the values for M8 and M12 were interpreted based on the test results. The values for M10 result from the interpolation of the values for M8 and M12 based on the steel cross section. For anchors $> M12$ the tension of the cross section size M12 was used.

On this basis, the following characteristic values for stressing under centric tension can be given for the Index MTH (Table 1). To design also the characteristic steel stress under normal temperature have to be considered, the smaller stress is decisive.

Determination of the characteristic values for other types of failure (e.g. „pull-out“ and „concrete cone failure“) was not object of the test; they can be determined according to the simplified verification method of TR 020: 2004-05 [5] or by experiments according to the method described in the TR 020: 2004-05 [5].

Table 1 Characteristic tensile loading of the Index MTH (electrogalvanised, strength class ≥ 5.8)

Index MTH			M6	M8	M10	M12	M14	M16	M20
Min embedment depth	h_{nom}	[mm]	49.5	59.5	66.5	77	91	103.5	125
30 min	$N_{Rk,s,fi(30)}$	[kN]	-	0.80	1.53	2.42	3.30	4.50	7.03
60 min	$N_{Rk,s,fi(60)}$	[kN]	-	0.66	1.24	1.95	2.65	3.62	5.65
90 min	$N_{Rk,s,fi(90)}$	[kN]	-	0.52	0.95	1.47	2.01	2.74	4.28
120 min	$N_{Rk,s,fi(120)}$	[kN]	-	0.45	0.80	1.24	1.69	2.30	3.59



4 Special notes

The assessment above applies for the Index MTH, when installed in accordance with the installation regulations of the firm of INDEX Fixing Systems or a general building inspectorate approval or European Technical Assessment.

The assessment further applies only for anchors of electrogalvanised steel from strength classes ≥ 5.8 in uncracked reinforced concrete. On account of the better high-temperature behaviour the results also apply for stainless steel A4.

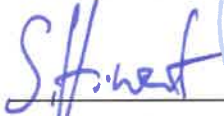
The assessment applies in general to a one-sided fire loading of the structural elements. In the event of a fire loading on several sides, the verification procedure can only be applied if the distance to the outer edge of the anchor is $c \geq 300$ mm und $\geq 2 h_{ef}$ beträgt.

Based on this the quoted loads also apply to lateral tension and/or diagonal tension.

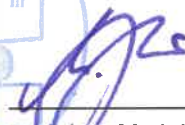
The assessment only applies in combination with reinforced concrete ceilings of strength class $\geq C 20/25$ and $\leq C 50/60$ according to DIN EN 206: 2014-07 [1], that can be classified in at least the fire-resistance class corresponding to that of the anchors. In addition, the notes contained in DIN EN 1992-1-2: 2010-12 [6] (see section 4.5) on the avoidance of concrete spalling also apply. According to this, the moisture content must be less than three (or four according to the National Annex) -% by weight.

This document does not replace a certificate of conformity or suitability according to national and European building codes.

Leipzig, 27 January 2017



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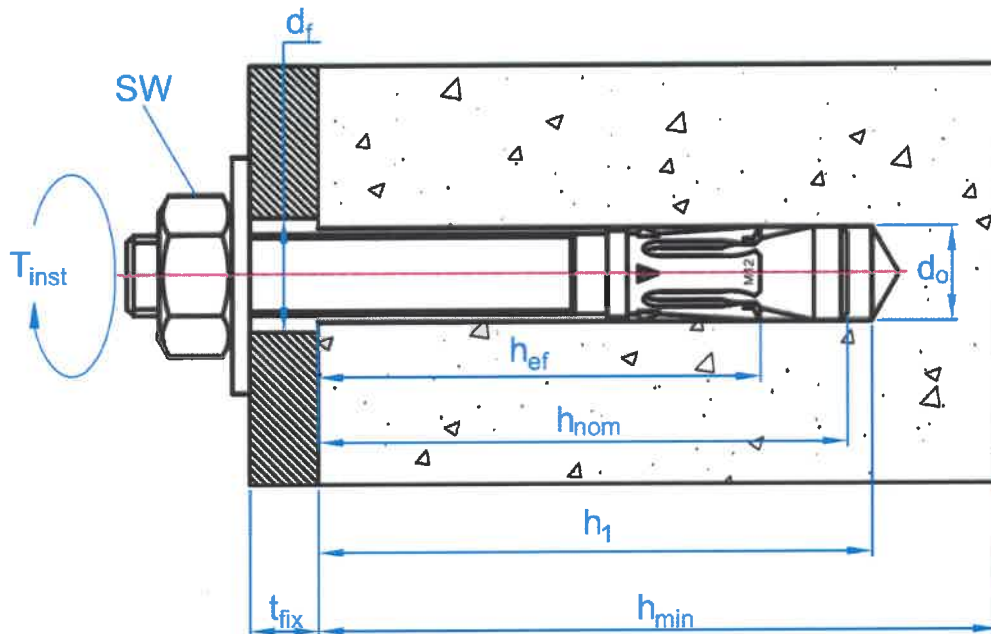
List of Enclosures

- Enclosure 1 Installation parameters of Index MTH
- Enclosure 2 Graphical analysis of the test results according to TR 020: 2004-05 [4]

Belonging documents

- [1] DIN EN 206: 2014-07 *Concrete - Specification, performance, production and conformity*
- [2] European Technical Assessment ETA-05/0242 *Trade name: Anchor MTH; product family: Torque controlled expansion anchor made of galvanised steel or stainless steel of sizes M6, M8, M10, M12, M14, M16 and M20 for use in non-cracked concrete, IETcc: 7. December 2016*
- [3] Test report PB 3.2/16-368-1 *Test according to EAD 330232-00-0601 to determine the characteristic steel strength under tensile load and under thermal exposure, MFPA Leipzig GmbH: 27. January 2017, INDEX Fixing Systems*
- [4] EAD 330232-00-0601: 2016-10 *Mechanical fasteners for use in concrete*
- [5] TR 020: 2004-05 *Evaluation of Anchorages in Concrete concerning Resistance to Fire*
- [6] DIN EN 1992-1-2: 2010-12 *Eurocode 2: Design of concrete structures - Part 1-2: General rules - Structural fire design*

Enclosure 1 Installation parameters of Index MTH



MTH: galvanized anchor Installation parameters			M6	M8	M10	M12	M14	M16	M20
d _o	Nominal diameter of drill bit:	[mm]	6	8	10	12	14	16	20
d _f	Fixture clearance hole diameter:	[mm]	7	9	12	14	16	18	22
T _{inst}	Nominal installation torque:	[Nm]	7	20	35	60	90	120	240
Standard embedment depth									
L _{min}	Total length of the bolt:	[mm]	60	75	85	100	120	125	160
L _{max}		[mm]	180	155	230	250	250	280	270
h _{min}	Minimum thickness of concrete member:	[mm]	100	100	110	130	150	168	206
h ₁	Depth of drilled hole:	[mm]	55	65	75	85	100	110	135
h _{nom}	Overall anchor embed depth in concrete:	[mm]	49,5	59,5	66,5	77	91	103,5	125
h _{ef, std}	Effective anchorage depth:	[mm]	40	48	55	65	75	84	103
t _{fix}	Thickness of fixture for DIN 125 washer**	[mm]	L-58	L-70	L-80	L-92	L-108	L-122	L-147
t _{fix}	Thickness of fixture for DIN 9021 and 440 washers**	[mm]	L-58	L-71	L-80	L-94	L-108	L-124	L-149
s _{min}	Minimum allowable spacing:	[mm]	50	65	70	85	100	110	135
c _{min}	Minimum allowable distance:	[mm]	50	65	70	85	100	110	135



MTH: galvanized anchor Installation parameters			M6	M8	M10	M12	M14	M16	M20
d_o	Nominal diameter of drill bit:	[mm]	6	8	10	12	14	16	20
d_f	Fixture clearance hole diameter:	[mm]	7	9	12	14	16	18	22
T_{inst}	Nominal installation torque:	[Nm]	7	20	35	60	90	120	240
Reduced embedment depth									
L_{min}	Total length of the bolt:	[mm]	-	60	70	80	-	-	-
L_{max}		[mm]	-	155	230	250	-	-	-
h_{min}	Minimum thickness of concrete member:	[mm]	-	100	100	100	-	-	-
h_1	Depth of drilled hole:	[mm]	-	50	60	70	-	-	-
h_{nom}	Overall anchor embed depth in concrete:	[mm]	-	46,5	53,5	62	-	-	-
$h_{ef,red}$	Effective anchorage depth:	[mm]	-	35*	42	50	-	-	-
t_{fix}	Thickness of fixture:	[mm]	-	L-57	L-67	L-77	-	-	-
s_{min}	Minimum allowable spacing:	[mm]	-	65	70	85	-	-	-
c_{min}	Minimum allowable distance:	[mm]	-	65	70	85	-	-	-

*Use restricted to anchoring of structural components which are statically indeterminate

**L = total anchor length



Enclosure 2 Graphical analysis of the test results according to TR 020: 2004-05 [5]

Diagram A2.1 Graphical analysis of the anchor MTH size M8

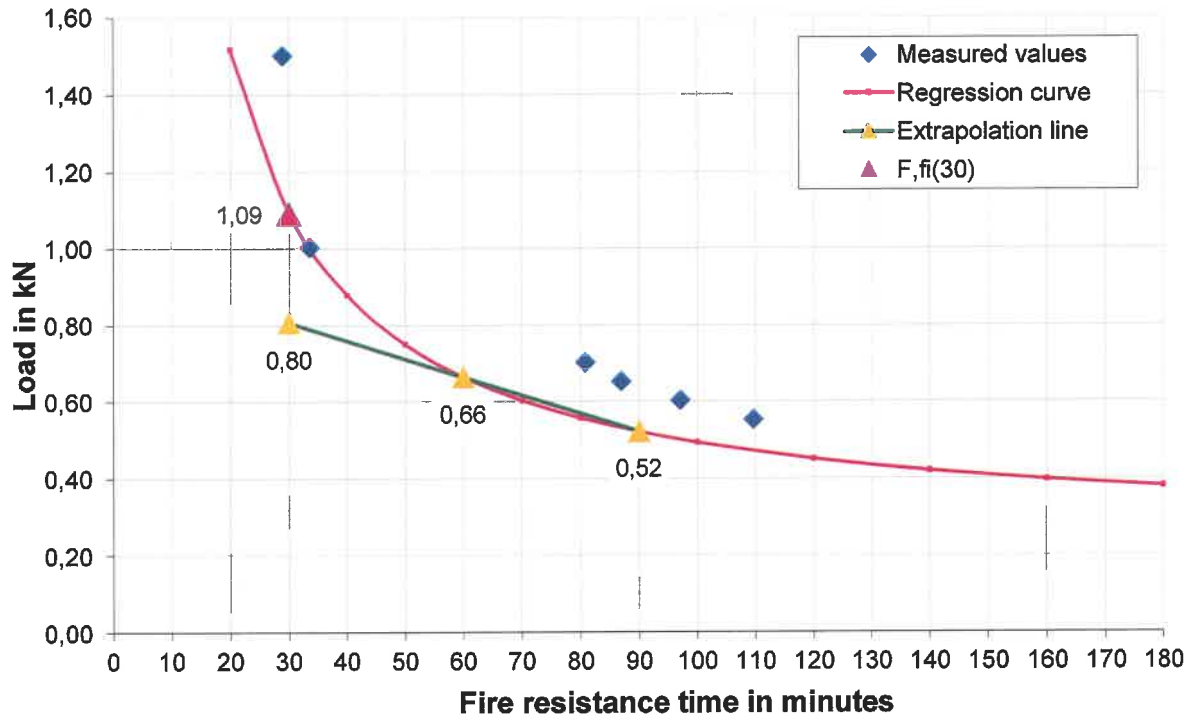


Diagram A2.2 Graphical analysis of the anchor MTH size M12

