Evaluation Report

Project **21842_3**

Injection System VMU plus for masonry – resistance to fire

Client **MKT Metall-Kunststoff-Technik GmbH & Co. KG**
Auf dem Immel 2
67685 Weilerbach

Date **01.08.2018**

Pages **5**

This Report is an adjustment and amendment to the Evaluation Report 21706_4 from the 10th of March 2017.

Author

INGENIEURBÜRO THIELE
TRAGWERKSPLANUNG GMBH
UNTERER SOMMERWALDWEG 1 66953 PIRMASENS
TRAGWERK@INGENIEURBUEROTHIELE.DE TEL. 06331 55470

Table of contents

1 General information

MKT GmbH & Co. KG authorized the evaluation of the fire resistance of the chemical anchor system VMU plus for axial tension and shear loads. The evaluation concerning steel strength and pullout resistance carried out in dependence on section 2.3 of Technical Report 020 [1]. The evaluation is based on tests that were conducted by the Technical University Kaiserslautern under fire exposure according to DIN EN 1363-1:2012 [2]. The test results are summarized in test reports 16030CT/15511 [3] and 18036MR/15561 [4].

This evaluation provides fire resistances which covers anchors with fire attack from one side only.

2 Reference documents

[1] Evaluation of Anchorages in Concrete Concerning Resistance to fire, EOTA TR 020, Edition May 2004

[2] Feuerwiderstandsprüfungen – Teil 1: Allgemeine Anforderungen, DIN EN 1363-1; Edition Oktober 2012

[3] Report on fire tests according TR020 with MKT VMU plus adhesive in masonry, Test Report 16030CT/15511, March 2017

[4] Report on fire tests according TR020 with MKT VMU plus adhesive in masonry, Test Report 18036MR/15561, August 2018

[5] European Technical Assessment ETA-13/0909 for Injection system VMU plus for masonry, EOTA, December 2016

[6] Guideline for European Technical Approval of Metal Injection Anchors for Use in Masonry, EOTA ETAG 029, April 2013

3 Product description

The VMU plus is a bonded anchor system consisting of a plastic cartridge containing the injection mortar and a steel part. For usage in hollow bricks also a perforated sleeve is part of the system.

The injection system VMU plus is designed for the use masonry according to the European Technical Approval ETA-13/0909.

4 Scope of evaluation

The present evaluation of the fire resistances of the injection system VMU plus in masonry is assessed with respect to its fire resistance properties as anchor applications in walls. The tests which this evaluation refers to, are executed with horizontal arranged anchors and axial load application. Furthermore the anchors were exposed to the standard temperature-time curve (ETK) [2]. In the tests a fixture according to TR020 was used, therefore the following fire resistances cover only anchors protected from fire by attachments similar to the fixture according to TR020 [1].

The assessment is carried out in dependence on TR020 [1]. Divergent test results of all types of failure (steel failure, pullout failure) are assessed together.

a. Steel failure:
   No additional tests for the assessment of steel failure are necessary because the resulting fire resistances are smaller and values with steel failure are assessed together. Threaded rods with a minimum steel grade of 5.8 shall be used. The evaluation covers threaded rods made of stainless steel as well.

b. Pullout failure:
   Most results deliver pullout failure in the fire tests.

c. Brick failure:
   In the fire tests evaluated in this document no absolute brick breakout failure could be observed. Therefore it was suggested that this failure type has no influence on the fire resistances of the anchor system VMU plus.

In hollow bricks the worse position in brick was tested, so that the fire resistances which are given in the following covers all positions in a hollow brick.

The fire resistances which are given in chapter 5 covers axial loads and shear loads as well. The evaluation is performed for the brick types given in ETA-13/0909 [5]. According to ETAG 029 [6], the results in Table 5-1 can also be transferred to solid brick types with higher strength and larger dimensions.

5 Summary

Table 5-1 shows the fire resistances for the use of anchor system VMU plus in the proved undergrounds. The given fire resistances covers axial and radial loads.

Table 5-1: Summary of the characteristic resistance against pullout or steel failure

Characterstic resistance against pullout/steel failure							
Brick type	**Anchor size**	**Minimum anchorage depth**	**Perforated sleeve**	**R30**	**R60**	**R90**	**R120**
[-]	**[mm]**	**[mm]**	**[mm x mm]**	**[kN]**	**[kN]**	**[kN]**	**[kN]**
clay (Mz) solid brick	8	80	-	1,05	0,80	0,55	0,45
	10	90		2,10	1,60	1,05	0,80
	12	100		3,50	2,55	1,60	1,10
	16	100		4,70	3,25	1,80	1,05
sand lime (KS) solid brick	8	80	-	1,05	0,80	0,55	0,45
	10	90		2,10	1,60	1,05	0,80
	12	100		3,50	2,55	1,60	1,10
	16	100		4,70	3,25	1,80	1,05
aerated concrete	8	80	-	1,20 (1,35)[1)]	0,85	0,35	0,10
	10	90		1,70	1,15	0,65	0,35
	12	100		2,05	1,45	0,90	0,60
	16	100		1,70	1,20	0,70	0,45
clay hollow and solid brick (Hlz + Mz)	8	130	SH 16 x 130	0,21	0,13	0,05	0
	10	130	SH 16 x 130	0,21	0,13	0,05	0
	12	130	SH 20 x 130	0,21	0,13	0,05	0
	12	200	SH 20 x 200	0,21	0,13	0,05	0
calcium silicate hollow and solid brick (KSL + KS)	8	130	SH 16 x 130	0,21	0,13	0,05	0
	10	130	SH 16 x 130	0,21	0,13	0,05	0
	12	130	SH 20 x 130	0,21	0,13	0,05	0
	12	200	SH 20 x 200	0,21	0,13	0,05	0

[1)] applies for stainless steel A4

Date: 1st of August 2018

C. Thiele

Dr.-Ing. Catherina Thiele

M. Reichert

Dipl.-Ing. Marie Reichert