

Project Number: 1534/18\_en

Purpose: Assessment of resistance under fire exposure of the MKT  
Injection System VME in fire tests

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## 1. General

The Technische Universität Kaiserslautern had been authorized by Metall- Kunststoff-Technik GmbH & Co.KG to evaluate the fire resistance of the MKT Injection System VME. This report is based on the test reports of MPA Braunschweig [3]. The fire tests and their evaluation were executed according to DIN EN 1363-1:2012 [2] and [1].

The fire resistances (listed in Table. 1) are based on the results of a fire exposure on a one side uncracked concrete slab. The evaluation in this report is based on TR 020 [1].

## 2. References

- [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] Test Report (3290/0966)-NB dd. 06/03/2008 ; iBMB Braunschweig; deposited at the TU Kaiserslautern
- [4] ETA-09/0350 from 12 December 2017, MKT Injection System VME for concrete

## 3. Product Description

The Product is described in [4].

## 4. Evaluation Scope

The fire resistance evaluation of MKT Injection System VME is based on the executed fire tests. The anchors were installed upside down to simulate the real situation of a ceiling and put under the uniform temperature curve fire test (UTC) according to [2]. In all tests, a fixture was used based on TR020 [1], therefore the following fire resistance evaluation applies only for anchors which are protected (in a comparable manner to the used fixture in the fire test) against the temperature increase during a fire case.

The fire tests were executed on a uncracked concrete slab.

The evaluation was executed depending on TR020 [1].

Nut failures, rips in the anchor rod and pull-out failures occurred in the tests.

## 5. Fire Resistances

The following tables show the decisive fire resistances  $N_{Rk,fi}$  of a fire exposure on a one side uncracked concrete with tensile loading (minimum strength class C20/25). The given fire resistances  $N_{Rk,fi}$  apply for a single anchor under tensile load with an edge distance greater than  $c_{cr}=2 h_{ef}$  and a spacing of at least  $s = 2 c_{cr} = 4 h_{ef}$  between the neighbouring anchor. By keeping the mentioned edge distances and spacing, a concrete cone failure is not relevant. The given values apply for anchor rods with a strength class of at least 5.8 (EN 1993-1-8:2005+AC:2009). The same fire resistances can be assumed for threaded rods of stainless steel and high corrosion resistant steel with a strength class of 70 (EN ISO 3506-1:2009).

If the edge distance  $c$  is chosen in a way, that steel failure / pull-out is determined in the fire design, the following load values can be also applied on anchors under shear load.

**Table 1: Fire resistance  $N_{Rk,fi}$  of MKT Injection System VME in uncracked concrete slab**

Fire resistance	Anchors Sizes	M8	M10	M12	M16	M20	M24	M27	M30
$N_{Rk,fi}$	Minimum embedment depth	$\geq 80$	$\geq 90$	$\geq 110$	$\geq 125$	$\geq 170$	$\geq 210$	$\geq 250$	$\geq 280$
in [kN]	$h_{ef,min}$ [mm]								
Fire resistance duration	30	0,5	1,5	3,2	8,0	15,6	22,5	29,2	35,7
$t_u$ [min]	60	0,4	1,1	2,3	5,9	11,7	16,9	21,9	26,8
	90	0,2	0,6	1,4	3,8	7,8	11,3	14,7	17,9
	120	0,1	0,4	0,9	2,7	5,9	8,5	11,0	13,5