

## Evaluation

21726\_2

Product name:

MKT bonded anchor V in case of fire

Product family:

Bonded anchor

Author of evaluation

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This evaluation contains:

Fire resistance for non-cracked concrete

Date of completion

21.5.2017

Period of validity

5 Jahre

Pages

4

**Table of contents**

- 1. General.....3
- 2. Literature.....3
- 3. Product description .....3
- 4. Extent of evaluation .....3
- 5. Summary .....4

## 1. General

MKT GmbH & Co. KG has engaged the Ingenieurbüro Thiele to evaluate the fire resistance of the bonded anchor V. This evaluation is based on inspection reports of the MPA Braunschweig. The fire tests and evaluations described in the inspection reports were conducted with regard to DIN EN 1363-1:2012 [2] and referring to [1].

All fire resistances mentioned below consider solely a one-sided fire exposure. The assessment in this evaluation followed the TR 020 [1]. However, the premise for the application of the design concept following TR 020 is the use of an anchor which is suitable for cracked concrete. This premise is not fulfilled by the bonded anchor V. Depending on the design situation, the application of the design procedure following TR 020 must be verified and appraised. The following evaluations are valid for threaded rods with a minimum strength class of 5.8.

## 2. Literature

- [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] Prüfung und Bewertung von in der Zugzone von Stahlbetondeckenabschnitten gesetzten, auf zentrischen Zug belasteten MKT Verbundanker V in Verbindung mit Ankerstangen (Dimension M8 bis M24) aus galvanisch verzinktem Stahl (Festigkeitsklasse 5.8) und nichtrostendem Stahl A4 sowie hochkorrosionsbeständigem Stahl (HCR) auf Brandverhalten zur Ermittlung der Feuerwiderstandsdauer; (3019/272/07) – CM/NB vom 1.11.2007; MPA Braunschweig.
- [4] ETA-05/0231 vom 4.Juni 2013, MKT Verbundanker V
- [5] Gutachten 21726: Feuerwiderstand von Verbundankern V in ungerissenem Beton, 21.5.2017, Ingenieurbüro Thiele, Pirmasens.

## 3. Product description

The product is described in [4].

## 4. Extent of evaluation

The evaluation of the fire resistance of the bonded anchor V is based on fire tests. There, the anchors were fixed in a ceiling position and strained by the standard temperature fire curve (ETK) following [2]. In all tests a fixture regarding TR020 [1] was used without air gap, so that the following evaluation of the fire resistance is only valid for anchors that are correspondingly protected from the temperature by the fire.

The fire tests were conducted in non-cracked concrete.

The evaluation was conducted with regard to TR020 [1]. All tests resulted in a failure of the nut or a crack of the threaded rod. Pullout failure has not been observed.

## 5. Summary

The fire resistances for bonded anchors V shown below were evaluated regarding TR 020 and the significant value resulting from the various failure modes is presented. In case of the failure mode concrete cone failure it was assumed that the concrete cone failure can be entirely completed. Influences of spacings and edge distances were not taken into account. An illustration of the fire resistance of the different failure modes is presented in [5]

The following tables show the most significant fire resistances  $N_{Rk,fi}$  for a one-sided fire exposure for tension in non-cracked concrete. The listed fire resistances are valid for single anchors with an edge distance of more than  $c_{cr}=2 h_{ef}$  and a spacing to the adjacent anchor of  $s=2 c_{cr}=4 h_{ef}$ .

For edge distances that result in steel failure, the following fire resistances can be assumed for shear loads.

Additionally the strength class of the treated rods has to be minimum 5.8 (EN 1993-1-8:2005+AC:2009). The given values are also valid for stainless steel and high corrosion resistance steel HCR (strength class 70 acc. EN ISO 3506-1:2009).

Table 1: fire resistance  $N_{Rk,fi}$  for bonded anchor V

thread [mm]	$h_{ef}$ [mm]	fire resistance $N_{Rk,fi}$ [kN]			
		R30	R60	R90	R120
8	80	1,7	1,2	0,7	0,5
10	90	3,0	2,2	1,4	0,9
12	110	4,7	3,5	2,2	1,6
16	125	8,8	6,5	4,2	3,0
20	170	13,8	10,1	6,5	4,7
24	210	19,9	14,6	9,4	6,8

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