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KAISERSLAUTERN

E B B

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Arbeitsgruppe Experimenteller Baulicher Brandschutz
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Project Number:	EBB 170019_21en
Purpose:	Assessment of resistance under fire exposure of the Friulsider Injection system KEM-UP + Vinylester
Client:	Friulsider S.p.A. Via Trieste 1 33048 San Giavanni al Natisone (UD) ITALY
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This report consist of 4 pages.

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1. General

The Technische Universität Kaiserslautern had been authorized by Friulsider S.p.A. to evaluate the fire resistance of the Friulsider Injection system KEM-UP + Vinylester. 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 test results of a one-sided fire exposure of a non-cracked 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; hinterlegt an der TU Kaiserslautern.

[4] ETA-08/0383 from 16 May 2018, Friulsider Injection system KEM-UP + Vinylester for concrete, Friulsider S.p.A..

3. Product Description

The Product is described in [4].

4. Evaluation Scope

The fire resistance evaluation of the Friulsider Injection system KEM-UP + Vinylester is based on the executed fire tests. The anchors were installed upside down to simulate the real situation of a ceiling and stressed by 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 non-cracked concrete slab.

The evaluation was executed depending on TR020 [1].

Nut failures, fracture of 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 one side fire exposure in non-cracked 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 $s = 2\ c_{cr} = 4$ hef. to the adjacent 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 (A4) and high corrosion resistant steel (HCR) 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 Friulsider Injection system KEM-UP + Vinylester in non-cracked concrete

Fire resistance $N_{Rk,fi}$ in [kN]	Anchors Sizes	M8	M10	M12	M16	M20	M24	M27	M30
	Minimum embedment depth $h_{ef,min}$ [mm]	≥ 80	≥ 90	≥ 110	≥ 125	≥ 170	≥ 210	≥ 250	≥ 280
Fire resistance duration t_u [min]	30	1,6	2,6	3,4	6,2	9,8	14,0	18,3	22,3
	60	1,1	1,8	2,6	4,8	7,5	10,8	14,1	17,2
	90	0,6	0,9	1,8	3,4	5,3	7,6	9,9	12,1
	120	0,3	0,5	1,4	2,7	4,2	6,0	7,9	9,6

slab