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Test, monitoring and certification office for building materials, products and systems

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Advisory Opinion no. GS 3.2/14-030-2

of 6th August 2014

1st draft

Su

bject: Fire-protection assessment procedure for the TOGE insulation screw TIS

Client: TOGE-Dübel A. Gerhard KG
Illesheimer Strasse 10
90431 Nuremberg

Assignment date: 31st January 2014

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1 Background and assignment

On 31st January 2014 TOGE-Dübel A. Gerhard KG commissioned MFPA Leipzig GmbH to issue an advisory opinion on the load-bearing behaviour of the TOGE insulation screw TIS in a standard fire, pursuant to DIN EN 1363-1.

The fire-protection assessment is required since fire resistance is not cited in the certification and hence there is no general usability certification from the supervisory authority classifying the fire resistance of the insulation screw.

2 Principles and documentation supporting the advisory opinion

The following documents are taken into consideration for the advisory opinion:

- [1] Technical report TR 020 of (May 2004) of the European Organisation for Technical Approvals (EOTA): Evaluation of Anchorages in Concrete concerning Resistance to Fire,
- [2] General supervisory certification Z-21.8-1971 of 07.08.2012 of the DIBt Berlin: TOGE insulation screw TIS,
- [3] Test report PB 3.2/14-030-1 of 12th May 2014 of MFPA Leipzig GmbH: TOGE insulation screw TIS – testing in accordance with TR 020 (May 2004) to determine the characteristic steel tension under tensile load.

3 Description of the design

The TOGE insulation screw TIS is made of hot-galvanized or stainless steel. The TOGE insulation screw TIS is anchored by inserting it into a pre-drilled cylindrical hole. The rawplug* should be anchored in reinforced and non-reinforced standard concrete with a strength class of at least C20/25 and at most C50/60, pursuant to DIN EN 206-1: 2001-07. The TOGE insulation screw TIS should only be used for the multiple attachment of insulating panels.

The TOGE insulation screw TIS is available in variants TIS S, TIS R and TIS R4 which, with a total length of max. 300 mm, are screwed in at least 25 mm in a drilled hole with overall dimensions of 6.4 mm, at least 30 mm deep, in accordance with the installation instructions of the general supervisory certification [2].

4 Fire-protection evaluation

The characteristic resistance values in a fire were determined for failure by pulling out of concrete $N_{Rk,p,fi(t)}$ and steel failure $N_{Rk,s,fi(t)}$. This is based on the test results of high-temperature steel failure (see test report PB 3.2/14-030-1 (3)) for the production variant TIS S. It was shown that the uninsulated TOGE insulation screw TIS S achieves the fire-resistance periods indicated in Table 1, irrespective of the screw length to be assessed.

On the basis of the extensive experience of MFPA Leipzig GmbH with fire-resistance tests on different rawplug and screw designs made of various materials, the values can also be transferred to the stainless steel variants TIS R and TIS R4.

* Translator's note: Technically this is a brand name but is it not usually now just a common noun e.g. like Hoover?

Table 1 *Maximum load N_{Rk} as a function of the fire stress on the TOGE insulation screw TIS in variants TIS S, TIS R and TIS R4 in ferro-concrete structural elements*

Drilling diameter	min. anchoring depth	Characteristic loading as a function of fire-resistance time				
			R30	R60	R90	R120
6 mm	25 mm	0.39 kN	0.31 kN	0.22 kN	0.17 kN	0.12 kN

The values cited in Table 1 apply to longitudinal, transverse or inclined pull at any angle. The characteristic values of concrete-rupture type failures as per TR 020 [1] (equation 2.11 and 2.12) were calculated and are not determinative.

To summarise, it is established that the insulation screws exhibit fire-resistance times of 30 to 180 minutes as per TR 020 [1] in the boundary conditions described here. This applies irrespective of the type of attached fire-protective cladding. In a fire the insulation screw is additionally protected by the insulation/cladding attached to it. The load-bearing action of a particular insulation panel on the rawlplug is not part of this evaluation.

5 Special instructions

This opinion applies only to fire-protection situations. The assessment applies only to the TOGE insulation screw TIS when it is installed in compliance with the assembly conditions of the aforementioned certification [2]. The building firm doing the work is responsible for correctly assembling the insulating screws.

The assessment applies only to the unilateral stressing of ferro-concrete ceilings or walls by fire. In the case of multilateral stressing the verification procedure can only be used if the edge distance of the rawlplug is at least 300 mm.

The assessment applies only in connection with ferro-concrete structural elements of strength class \geq C 20/25 and \leq C 50/60 in accordance with EN 206-1: 2000-12 which can be classified in at least the fire-resistance class corresponding to the rawlplug fire-resistance time.

This document does not replace any conformity or usability certificate subject to building codes (national/European).

Leipzig, 6th August 2014

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