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**Barve in laki - Reaktivni premazi za požarno zaščito kovinskih podlag - Definicije, zahteve, karakteristike in označevanje**

Paints and varnishes - Reactive coatings for fire protection of metallic substrates - Definitions, requirements, characteristics and marking

Beschichtungsstoffe - Reaktive Beschichtungen für den Brandschutz metallischer Substrate - Begriffe, Einteilung, Eigenschaften und Bezeichnung

Peintures et vernis - Revêtements réactifs pour la protection contre l'incendie des subjectiles métalliques - Partie 1: Définitions, classification, caractéristiques et marquage

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13.220.50	Požarna odpornost gradbenih materialov in elementov	Fire-resistance of building materials and elements
87.040	Barve in laki	Paints and varnishes

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## Paints and varnishes - Reactive coatings for fire protection of metallic substrates - Definitions, requirements, characteristics and marking

Peintures et vernis - Revêtements réactifs pour la protection contre l'incendie des subjectiles métalliques - Définitions, classification, caractéristiques et marquage

Beschichtungsstoffe - Reaktive Beschichtungen für den Brandschutz metallischer Substrate - Begriffe, Einteilung, Eigenschaften und Bezeichnung

This European Standard was approved by CEN on 12 December 2014.

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COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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**EN 16623:2015 (E)****Foreword**

This document (EN 16623:2015) has been prepared by Technical Committee CEN/TC 139 "Paints and vanishes", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2015, and conflicting national standards shall be withdrawn at the latest by August 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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## Introduction

This European Standard applies to reactive coatings intended for the fire protection of steel and other ferrous substrates used as structural elements such as beams and columns, beams supporting composite steel deck floors and concrete filled hollow steel sections. The reactive coating can be applied directly to the substrate or over a priming system. The reactive coating may require a protective top-coat depending on the end service conditions.

Throughout this European Standard, steel and other ferrous substrates are referred to as steel.

Currently, under the requirements of the Construction Products Regulation 2011 (CPR), which superseded the requirements of the Construction Products Directive (CPD), each reactive coating product used to provide fire protection to structural members is required to be subject to a European Technical Assessment (ETA). These are elaborated and issued by a European Technical Assessment Body (TAB) on the basis of guidance given in a European Assessment Document (EAD) produced by the European Organisation for Technical Approvals (EOTA). Previously, under the requirements of the CPD, the relevant equivalent guidance for the issue of ETAs (then termed European Technical Approvals) for reactive coatings was documented in the EOTA Technical Specification ETAG018-2. At the time of ratification of this standard, ETAG018-2 is being edited into an EAD but all existing ETAs issued against ETAG018-2 remain valid until their expiry date. The ETA forms the basis of the voluntary CE marking of the product by the manufacturer based on a 'certificate of conformity' provided by a 'notified certification body' endorsing ongoing compliance of the product with its ETA.

This standard is intended to be supportive to the above mandatory process, reflecting agreed best practice within the industry and for adoption by manufacturers on a voluntary basis. Requirements of this standard do not conflict with requirements of ETAG018-2 or its superseding EAD. They may elaborate on the detail of essential production processes and procedures necessary to provide consistency of reactive products. Approaches are specified to assess the consequences to a product's fire protection performance caused by variation or changes in product specification (e.g. changes in raw material) and/or production process (e.g. a process temperature). As such, it provides support to 'notified certification bodies', especially in relation to 'factory production controls' that should be exercised by product manufacturers.

This standard also provides a common basis for non-mandatory product characteristics that a manufacturer may wish to claim for a product, that fall beyond the scope of a product's ETA.

**EN 16623:2015 (E)****1 Scope**

This European Standard relates to reactive coating systems intended to provide fire protection to metallic based structural members, including various grades and types of steel. Reactive coating systems may comprise the reactive coating component alone and/or that component used in conjunction with associated primers, topcoats and, if applicable, reinforcement. It covers the characterization of such systems in end use conditions.

**NOTE** Fundamental to proving the suitability of any reactive coating system to provide fire protection to any metallic substrate is its fire resistance performance determined in accordance with CEN fire resistance test methods, which are currently EN 13381-6, EN 13381-8 and prEN 13381-9. Consequently, the scope of application and fire performance of any reactive protection system is limited by the scope of available and applicable published CEN fire test methods.

The European Standard sets out the performance criteria, the verification methods used to examine the various aspects of performance, the assessment criteria used to judge the performance for the intended use and the presumed conditions for the design and execution of the reactive coating system in the works.

It deals with the compatibility of the reactive coating component with various primers and topcoats, and a reactive coating system's durability in a number of different service and end use conditions. Specifically, it provides a process for establishing 'generic' primer compatibility and acceptable topcoats for use with a given reactive component layer without prejudicing the reactive coating systems fire performance.

The European Standard also provides guidelines for the manufacture, storage, application, maintenance and repair of the reactive coating system and the final inspection of its installation in end use.

This European Standard does not specify the required performance level or classification <sup>1)</sup> of a given property to be achieved by a product to demonstrate fitness for purpose in a particular application. This European Standard establishes the route for generic primer approval and the use of specific top-coats with which the reactive coating may carry the CE mark.

This European Standard provides guidelines for the manufacture, storage, application, maintenance and repair of the reactive coating system and final inspection of works.

**2 Normative references**

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1363-1:2012, *Fire resistance tests — Part 1: General Requirements*

EN 13238, *Reaction to fire tests for building products — Conditioning procedures and general rules for selection of substrates*

EN 13381-6, *Test methods for determining the contribution to the fire resistance of structural members — Part 6: Applied protection to concrete filled hollow steel columns*

EN 13381-8:2013, *Test methods for determining the contribution to the fire resistance of structural members — Part 8: Applied reactive protection to steel members*

prEN 13381-9, *Test methods for determining the contribution to the fire resistance of structural members — Part 9: Contribution of fire resistance to steel beams with web opening*

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

1) The performance levels or classes required for a given application can be found in regulations.



EN 13501-2:2007+A1:2009, *Fire classification of construction products and building elements — Part 2: Classification using data from fire resistance tests, excluding ventilation services*

EN 13823, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item*

EN ISO 1182, *Reaction to fire tests for products — Non-combustibility test (ISO 1182)*

EN ISO 1716, *Reaction to fire tests for products — Determination of the gross heat of combustion (calorific value) (ISO 1716)*

EN ISO 4618:2014, *Paints and varnishes — Terms and definitions (ISO 4618:2014)*

EN ISO 11664-4, *Colorimetry — Part 4: CIE 1976 L\*a\*b\* Colour space (ISO 11664-4)*

EN ISO 11925-2, *Reaction to fire tests - Ignitability of products subjected to direct impingement of flame — Part 2: Single-flame source test (ISO 11925-2)*

EN ISO 13788, *Hygrothermal performance of building components and building elements — Internal surface temperature to avoid critical surface humidity and interstitial condensation — Calculation methods (ISO 13788)*

EN ISO 16474-3:2013, *Paints and varnishes — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps (ISO 16474-3:2013)*

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025)*

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### 3 Terms and definitions

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For the purposes of this document, the terms and definitions given in EN ISO 4618:2014 and the following apply.

#### 3.1

##### **reactive coating**

reactive materials which are specifically formulated to provide a chemical reaction upon heating such that their physical form changes and in so doing provide fire protection by thermal insulative and cooling effects

#### 3.2

##### **reactive coating system**

reactive coating layer together with a specified, blast primer, primer, tie-coat and topcoat if applicable

Note 1 to entry: The reactive coating system can contain reinforcing mesh.

#### 3.3

##### **test specimen**

substrate, plus the reactive coating system under test

#### 3.4

##### **reactive coating thickness**

mean dry film thickness (DFT) of the reactive coating only

#### 3.5

##### **section factor**

ratio of the fire exposed outer perimeter area of the steel structural member itself, per unit length, to its cross sectional volume per unit length

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- 3.6**  
**steel temperature**  
overall mean temperature of the steel
- 3.7**  
**blast primer**  
layer of corrosion protection applied to grit or shot blasted steel as a temporary protection to prevent corrosion prior to application of the main coat of primer
- 3.8**  
**primer**  
coating applied directly to a suitably prepared steel surface to provide corrosion protection
- 3.9**  
**tie-coat**  
coating applied prior to the reactive coating to improve the bonding
- 3.10**  
**topcoat**  
coating(s) applied over the reactive coating as a protection against environmental degradation and/or for decorative purposes
- 3.11**  
**reinforcing mesh**  
mesh applied in close proximity or fixed to the substrate
- 3.12**  
**batch**  
unit or quantity of reactive coating produced in a single, complete production operation  
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- 3.13**  
**durability**  
ability of the reactive coating system to maintain an adequate level of fire protection after exposure to environmental conditions  
<https://standards.iteh.ai/catalog/standards/sist/89514ec0-bae3-4f63-ba91-b23279009440/sist-en-16623-2015>
- 3.14**  
**initial type testing**  
testing carried out in accordance with EN 13381-6 and/or EN 13381-8 to establish fire performance
- 3.15**  
**controlled stock**  
product in stock that is traceable to a manufacturing record and factory production control test results
- 3.16**  
**yield strength**  
stress level, for a given temperature, at which the stress-strain relationship of steel is truncated to provide a yield plateau as given in EN 1993-1-2
- 3.17**  
**approved body**  
body nominated in accordance with Article 18 of the Construction Products Directive by an EU Member State or by an EFTA State (contracting party to the EEA Agreement), to perform specific tasks in the framework of the Attestation of Conformity decision for specific construction products (certification, inspection or testing)

Note 1 to entry: All such bodies are members of the Group of Notified Bodies.

**4 Symbols and abbreviations**

For the purposes of this document, the following symbols and abbreviations apply:

A/V	section factor
DFT	dry film thickness
FPC	factory production control
QC	quality control
RH	relative humidity
SBI	single burning item

## 5 Requirements

### 5.1 Reaction to fire

The reactive coating system shall be tested, using the test method(s) relevant for the corresponding reaction to fire class, in order to be classified according to EN 13501-1.

Guidance on mounting and fixing arrangements for tests in accordance with the test methods is given in Annex A. If the reactive coating system is intended to be used with or without a topcoat then both situations shall be tested.

### 5.2 Resistance to fire

Fire resistance classifications are given in Clause 7 of EN 13501-2:2007+A1:2009.

The resistance to fire tests and the assessment shall be carried out in accordance with EN 13381-8, EN 13381-6 and prEN 13381-9. (standards.iteh.ai)

### 5.3 Durability

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#### 5.3.1 General

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During the life time of the reactive coating system in service it may be subject to a variety of environmental conditions. The ability of the reactive coating system to withstand the adverse effects of water, humidity, UV, temperature, is a measure of its durability. Any deterioration of the reactive coating system shall have an effect on its fire resistance properties. The addition of a topcoat to the fire protection system shall not impair the fire resistance properties of the system. The evaluation of durability is addressed in this European Standard. Evaluation of durability against deterioration effects of chemicals, ozone or any other service environments are not addressed in this European Standard.

The colour of the topcoat has no influence on the result of the durability assessment for types Z1 and Z2. Therefore there is no need to test different colours of the topcoat. The durability assessment is valid for all topcoat colours.

For environmental use categories type Y, W/Y and type X the test results could be influenced by the various topcoat types and their colours. No generic approach is possible in relation to the type of topcoat and the applicant shall test all topcoats. However, in order to cover all colours of a particular topcoat, a colour having an index  $L^* < 50$  on the CIELAB<sup>2)</sup> scale (see EN ISO 11664-4) shall be selected for test. The decision to choose the colour of the topcoat used in durability assessment is taken by the Approved Body and the Applicant. The test results are valid for the tested topcoat and all its different colours.

Durability classifications are given in Table 1.

2) "Commission International de l'Éclairage" (CIE) system of colour space defines lightness/darkness ( $L$ ) scale in CIELAB units. White is defined as  $L^* = 100$  and black as  $L^* = 0$ .

Table 1 — Durability classifications

Type	Exposure Description
X	intended for all conditions (internal, semi-exposed and exposed)
W/Y	Temporary full external for a maximum of 6 months then semi external
Y	intended for internal and semi-exposed conditions. Semi exposed includes temperatures below zero, but no exposure to rain and limited exposure to UV. (UV is not assessed)
W/Z1	Temporary full external for a maximum of 6 months then internal with high humidity
W/Z2	Temporary full external for a maximum of 6 months then internal with controlled environment
Z1	intended for internal conditions (excluding temperatures below zero) with high humidity
Z2	intended for internal conditions (excluding temperatures below zero) with humidity classes other than Z1 These conditions apply for internal humidity class 5 in accordance with EN ISO 13788.

### 5.3.2 Verification of durability

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Durability shall be determined for a given reactive coating system by testing in accordance with Annex C after exposure to the conditions as described in Annex B for the required durability class. Durability is deemed verified when:

- the average time to achieve a steel temperature of 500 °C is not less than 85 % of the average time achieved from identical unexposed panels or sections;
- and no single result shall be less than 80 % of the average time to 500 °C of the identical unexposed panels or sections.

The approved body shall ensure that the furnace temperature conditions are identical for all the samples used for comparative testing.

To remove influences due to the variability of the thickness of the reactive coating, the relationship of thickness and time may be assumed as linear and corrected in accordance with the limits given in Annex C.

Where the result falls outside the above criteria, 4 additional specimens and a new control specimen shall be tested and assessed in this case all 4 specimens shall fulfil the above criteria.

In some instances a raw material change may affect durability and re-verification of durability shall be required. For guidance refer to Annex F.

### 5.3.3 Use of topcoats

A topcoat may comprise of:

- a single layer of topcoat;
- multiple layers of the same topcoat;

c) multiple layers of different topcoats.

The rules below shall apply to the topcoat system.

Where a topcoat is used to achieve the required durability classification then it shall be identified by its unique product reference and description. Generic equivalence is not acceptable.

Each topcoat shall be applied in accordance with the manufacturer's recommendation.

For each topcoat the minimum DFT used for durability testing to a particular exposure condition shall be the minimum DFT that can be specified for that exposure condition. The maximum DFT shall not be more than 50 % greater than that tested.

The topcoat may be applied in one or more layers and when referring to the minimum and maximum DFT below this shall be the total DFT of all of the layers.

The reactive coating system with topcoat shall then be subjected to the required environmental testing and the insulating efficiency shall then be determined in accordance with Annex C.

A topcoat is deemed approved if in combination with a reactive coating the system passes the claimed exposure testing.

## 5.4 Primer Compatibility

### 5.4.1 General

The reactive coating shall be compatible with a surface preparation, as recommended by the manufacturer, or the primer, such that not only is good adhesion achieved during normal service conditions, but also during fire exposure conditions.

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### 5.4.2 Generic types

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The most commonly used generic types of primer are given in Table 2. Only one primer from a primer family in Table 2 is subjected to testing.

Primers types not covered by the generic types listed in Table 2 and galvanized steel shall be the subject of a separate evaluation in accordance with Annex C. Each generic primer group shall be evaluated separately for both water borne and solvent borne primers. Solvent free primers shall be classed in the same generic group as the solvent borne equivalent.

**Table 2 — Generic primer types**

Generic Primer Type
Acrylic
Short/medium oil alkyd
Two component epoxy
Zinc rich epoxy (containing about 80 % by mass of metallic zinc powder in the dry film)
Zinc silicate

The allowed mean primer thickness range shall be as follows:

- the minimum mean thickness shall not be less than 50 % of the mean thickness tested;
- the maximum mean thickness shall not be greater than 50 % more than the mean thickness tested.