

SVENSK STANDARD

SS-EN 1363-3:2018

Fastställt/Approved: 2018-01-22
Publicerad/Published: 2018-01-25
Utgåva/Edition: 1
Språk/Language: engelska/English
ICS: 13.220.50

Provning av brandmotstånd – Del 3: Verifiering av ugnens prestanda

Fire resistance tests – Part 3: Verification of furnace performance

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Denna standard ersätter SIS 24820, utgåva 2.

The European Standard EN 1363-3:1998 has the status of a Swedish Standard. This document contains the official version of EN 1363-3:1998.

This standard supersedes the Swedish Standard SIS 24820, edition 2.

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EUROPEAN PRESTANDARD

prENV 1363-3: 1998

PRENORME EUROPÉENNE

EUROPÄISCHE VORNORM

English version

**FIRE RESISTANCE TESTS
PART 3: VERIFICATION OF FURNACE PERFORMANCE**

This draft European Prestandard is submitted to CEN Members for formal vote.

It has been drawn up by CEN/TC127 "Fire Safety in Buildings".

CEN Members shall make the ENV available at national level in an appropriate form promptly and announce its existence in the same way as for EN or HD. Existing conflicting national standards may be kept in force (in parallel with the ENV) until the final decision about the possible conversion of the ENV into an EN is reached. The lifetime of an ENV is first limited to three years. After two years the Central Secretariat shall take action by requesting Members to send in comments on that ENV within six months. The comments received will be transmitted to the Technical Board for further action as follows:

- conversion to an EN after formal vote;
- or extension of the life of an ENV for another two years (once only);
- or replacement by a revised ENV approved in accordance with 7.2 and 7.3 at the CEN/CENLEC Internal Regulations Part 2: or withdrawal of the ENV;
- or assignment to a technical body of the task of assisting the Technical Board to reach any of the decisions listed above.

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CEN

European Committee for Standardisation
Comité Européen de normalisation
Europäisches Komitee für Normung

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Foreword

This European Prestandard has been prepared by Technical Committee CEN/TC 127 "Fire safety in buildings", the secretariat of which is held by BSI.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this European Prestandard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

The general requirements for fire resistance testing including the specifications of the apparatus to be used are given in EN1363-1. However, the specification for the thermal exposure provided by fire resistance furnaces only requires that they are able to follow a defined temperature-time relationship when controlled with thermocouples of a prescribed type. In order to have a reproducible test method, it is important that the thermal exposures produced by fire resistance furnaces of different design are within defined limits. The purpose of this document is to verify the thermal exposure performance of furnaces used for the fire resistance testing of separating elements.

In addition to verifying the thermal exposure in furnaces, the procedure also verifies that the static pressure distribution in the furnace is within defined limits and the oxygen concentration are within the limits given in EN 1363-1. Variations in pressure and oxygen content will affect the integrity measurements when using the cotton pad and variations in oxygen content will also affect the rate of combustion of combustible test specimens.

The verification procedure is performed using an arrangement of measuring elements mounted within a supporting construction. The measuring elements consist of two steel plates separated by insulation. The test construction is exposed to the standard heating and pressure conditions given in EN 1363-1 for 60 minutes and measurements are made of the exposed face temperature of the steel plate of the measuring elements. In addition measurements are also made in the furnace of the static pressure distribution at several positions and of the oxygen concentration.

The thermal exposure performance of the furnace is deemed acceptable if the measurements obtained from the measuring elements and the static pressure distribution are within defined limits and the oxygen concentration is within the limits given in EN 1363-1.

Caution

The attention of all persons concerned with managing and carrying out fire resistance tests is drawn to the fact that fire testing may be hazardous and that there is a possibility that toxic and/or harmful smoke and gases may be evolved during the test. Mechanical and operational hazards may also arise during the construction of the test elements or structures, their testing and disposal of test residues.

An assessment of all potential hazards and risks to health shall be made and safety precautions shall be identified and provided. Written safety instructions shall be issued. Appropriate training shall be given to relevant personnel. Laboratory personnel shall ensure that they follow written safety instructions at all times.

1 Scope

This European Prestandard describes a procedure for the verification of the thermal and pressure characteristics of fire resistance furnaces for the testing of separating elements.

The procedure is to be carried out on new furnaces, when the furnace is relined (replacement of > 30% of the lining), when the furnace is overhauled or every two years, whichever occurs first.

Information on additional measurements is given in annex A.

2 Normative references

This European Prestandard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 1363 Fire resistance tests Part 1 General requirements

EN 10088 Stainless steels Part 2 Technical delivery condition for sheet/plate and strip.

EN 10095 Heat resisting steels and nickel alloys

ISO 13943 Glossary of fire terms and definitions

3 Definitions

For the purposes of this Part of EN1363, the definitions given in EN 1363-1 and ISO 13943 together with the following apply:

3.1 time constant: The time representative of the response of a system to a step change in the input variable: the time after which a characteristic property for the process has reached 63 % of the final change due to the step change.

Note: This definition is derived from the response of a so-called first-order system to a step change. It can be shown that this response is of the form: $\Delta Y(t) = (1 - e^{-t/\tau}) \cdot \Delta Y_{\infty}$. In this expression, t is time, Y_{∞} is the final change of Y . τ is the time constant.

3.2 measuring element: A device provided for the purpose of measuring the thermal exposure in a fire resistance furnace.

3.3 test construction: The complete assembly of the measuring element together with their supporting construction.

4 Test equipment

The test equipment shall be as specified in EN 1363-1.

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5 Test conditions

The heating and pressure conditions and the furnace atmosphere shall conform to those given in EN 1363-1.

6 Measuring elements

6.1 General

Each element shall consist of layers of calcium silicate insulation board, sandwiched between two steel plates of 5mm and 2mm thickness. The thicker steel plate shall be exposed to the fire. The assembly is nominally 290mm x 290mm and is shown in figures 1 to 4.

6.2 Constructional details

6.2.1 Fibre washers (pads)

The insulating fibre pads used in the construction of the measuring element shall have a density of $(90 \pm 10) \text{ kg/m}^3$.

6.2.2 Spring-loaded bolt assembly

The steel plates shall be assembled using four spring-loaded bolt assemblies which are intended to accommodate the distribution of the assembly when it is heated. The bolt holes in the plate shall be made with sufficient clearance to avoid contact when assembled. This, together with the insulating fibre washers is intended to avoid heat conduction during test.

6.2.3 Steel plate-unexposed surface

The steel plate comprising the unexposed surface of the measuring element shall be constructed from steel number 1.4436 to EN10088-2 or equal in accordance with figure 3.

6.2.4 Thermocouples

Two thermocouples shall be peened to each steel plate at the positions specified in the figure 1. The wires shall follow the isotherm through the hot junction along a distance of 20mm from this junction.

6.2.5 Insulation boards

The insulation boards shall consist of inorganic insulation material with a density of $(28 \pm 3) \text{ kg/m}^3$ and a thickness of $(10 \pm 1) \text{ mm}$.

6.2.6 Steel plate - fire exposed surface

The steel plate comprising the fire-exposed surface of the measuring element shall be constructed from steel number 2.4816 to EN10095 equal in accordance with figure 4.

6.3 Measuring element thermocouples

The sensors and data-acquisition apparatus shall comply with the requirements given in EN 1363-1 and the following :

Sensors	:	1.0 mm or less bare-wire thermocouples
Measurement error	:	$< \pm 5 \text{ }^\circ\text{C}$
Range	:	0 $^\circ\text{C}$ to 1200 $^\circ\text{C}$

7 Installation of measuring element

The measuring elements shall be mounted in a supporting construction as illustrated in figure 5. The supporting shall be either:

- a) made from concrete with a minimum nominal thickness of 100mm, or,
- b) if a wall, one of the high density rigid or low density rigid supporting constructions given in EN 1363-1.

The aperture into which the measuring elements are mounted shall be sloped, as shown in figure 6, to allow free flow of air over the exposed face of the measuring elements.

The exposed face of the supporting construction shall be lined with non combustible insulation board having a density of $(310 \pm 30) \text{ kg/m}^3$ and a thickness of $(10 \pm 1) \text{ mm}$.

The dimensions of the test construction and the distribution of the measuring elements shall be appropriate to the furnace being evaluated. For furnaces which have an opening not greater than 4m² (e.g. 2m high x 2m wide) only one measuring element is required positioned in the centre of the supporting construction. The test construction shall be mounted in such a way that the whole of its exposed face shall be exposed to the heating conditions

8 Conditioning

The test construction shall be conditioned as described in EN 1363-1.

9 Application of instrumentation

9.1 Furnace thermocouples (plate thermometers)

Plate thermometers shall be provided in accordance with EN 1363-1. There shall be at least one for every 1.5m² of the exposed surface area of the test construction. The plate thermometers shall be oriented so that side A faces the back wall of the furnace, if it is a wall furnace, or the floor of the furnace if it is a horizontal furnace.

9.2 Pressure

The furnace shall be provided with a probe for controlling the static pressure in the furnace. Its position in the furnace shall be as specified in EN 1363-1. The furnace shall also be provided with probes for the measurement of the distribution of static pressure over the test assembly. They shall be positioned as shown in figure 7. Probes for controlling static pressure in the furnace and for determining the distribution over the test construction shall comply with EN 1363-1 and the following:

Measurement error	:	$< 2 \text{ Pa}$
Time constant	:	$< 10 \text{ s}$
Range	:	0 to 50 Pa