



BSI Standards Publication

Fixed firefighting systems - Condensed aerosol extinguishing systems

Part 1: Requirements and test methods for components

National foreword

This British Standard is the UK implementation of EN 15276-1:2019. It supersedes PD CEN/TR 15276-1:2009, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FSH/18/6, Gaseous Extinguishing Media and Systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

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© The British Standards Institution 2019
Published by BSI Standards Limited 2019

ISBN 978 0 580 96805 1

ICS 13.220.20

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 April 2019.

Amendments/corrigenda issued since publication

Date	Text affected
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English Version

**Fixed firefighting systems - Condensed aerosol
extinguishing systems - Part 1: Requirements and test
methods for components**

Installations fixes de lutte contre l'incendie -
Systèmes d'extinction à aérosol - Partie 1 : Exigences
et méthodes d'essais pour les éléments constitutifs

Ortsfeste Brandbekämpfungsanlagen -
Löschanlagen für konzentrierte Aerosole - Teil 1:
Anforderungen und Prüfverfahren für Bauteile

This European Standard was approved by CEN on 6 January 2019.

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European foreword

This document (EN 15276-1:2019) has been prepared by Technical Committee CEN/TC 191 "Fixed firefighting systems", the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by October 2019, and conflicting national standards shall be withdrawn at the latest by October 2019.

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

This document supersedes CEN/TR 15276-1:2009.

In comparison with the previous edition CEN/TR 15276-1:2009, the following technical modifications have been made:

- the Technical Report CEN/TR 15276-1:2009 has been revised and published as a standard;
- Normative references have been updated;
- [Clause 3](#) "Terms and definitions" has been revised;
- [4.5](#) "End plate and housing" has been revised;
- [5.11.3](#) "Aerosol flow temperature" has been revised;
- [Clause 6](#) "Marking" has been revised;
- [Clause 7](#) "Test methods" has been revised;
- [Annex A](#) "Extinguishing density/coverage test procedure" has been revised;
- the standard has been editorially revised.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

It has been assumed in the preparation of this document that the execution of its provisions is entrusted to appropriately qualified and experienced people in the specification, design, installation, testing, approval, inspection, operation and maintenance of systems and equipment, for whose guidance it has been prepared, and who can be expected to exercise a duty of care to avoid unnecessary release of extinguishant.

Firefighting systems covered in this document are designed to provide a supply of fixed condensed aerosol extinguishing medium to extinguish fire.

The requirements of this document are made in the light of the best technical data known at the time of writing but, since a wide field is covered, it has been impracticable to consider every possible factor or circumstance that might affect implementation of the requirements.

It is important that the fire protection of a building or plant be considered as a whole. Aerosol extinguishant systems form only a part, though an important part, of the available facilities, but it should not be assumed that their adoption necessarily removes the need to consider supplementary measures, such as the provision of portable fire extinguishers or other mobile appliances for first aid or emergency use, or to deal with special hazards.

Aerosol extinguishants have been recognized as effective media for the extinction of Class A fires (solid surface burning fires) and Class B and Class C fires according to EN 2 but it should not be forgotten, in the planning of comprehensive schemes, that there can be hazards for which these mediums are not suitable, or that in certain circumstances or situations there can be dangers in their use requiring special precautions.

Advice on these matters can be obtained from the appropriate manufacturer of the aerosol generators or the extinguishing system. Information can also be sought from the appropriate fire authority, the health and safety authorities and insurers. In addition, reference should be made as necessary to other standards and statutory regulations.

It is essential that fire-fighting equipment be carefully maintained to ensure instant readiness when required. Routine maintenance is liable to be overlooked or given insufficient attention by the owner of the system. It is, however, neglected at peril to the lives of occupants of the premises and at the risk of crippling financial loss. The importance of maintenance cannot be too highly emphasized.

Condensed aerosol can contain traces of toxic substances like those produced by a fire, and will obscure vision like smoke from fire. This standard requires, as a precaution, that the room is evacuated and sealed off whenever a generator is activated — much like recommended response to fires. Precautions include evacuation of the proximity area, criteria for re-entering and other safeguards.

1 Scope

This document specifies requirements and test methods for condensed aerosol extinguishing system components.

This document covers the use of condensed aerosol extinguishing systems for total flooding applications.

This document is not applicable to explosion suppression applications.

This document does not cover all legislative requirements. In certain countries specific national regulations apply and take precedence over this document. Users of this document are advised to inform themselves of the applicability or non-applicability for this document by their national responsible authorities.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 2, *Classification of fires*

EN 15276-2, *Fixed firefighting systems — Condensed aerosol extinguishing systems — Part 2: Design, installation and maintenance*

EN 60068-2-6:2008, *Environmental testing — Part 2-6: Tests — Test Fc: Vibration (sinusoidal)* (IEC 60068-2-6:2007)

EN 60068-2-30:2005, *Environmental testing — Part 2-30: Tests — Test Db: Damp heat, cyclic (12 h + 12 h cycle)* (IEC 60068-2-30:2005)

ISO 5660-1, *Reaction-to-fire tests — Heat release, smoke production and mass loss rate — Part 1: Heat release rate (cone calorimeter method) and smoke production rate (dynamic measurement)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15276-2 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Clearance

3.1.1 electrical clearance

unobstructed air distance between extinguishing system equipment and unenclosed or uninsulated live electrical components not at ground potential

3.1.2 thermal clearance

air distance between a condensed aerosol generator and any structure or components sensitive to the temperature developed by the generator

3.2

condensed aerosol

extinguishing medium consisting of finely divided solid particles and gaseous matter, these being generated by a combustion process of a solid aerosol-forming compound

3.3

condensed aerosol generator

non-pressurized device which, when activated, generates an aerosol and includes the mounting brackets

3.4

design application density

extinguishing density multiplied by the safety factor, required for system design purposes

Note 1 to entry: The extinguishing density and the design application density is expressed in grams per cubic meter.

Note 2 to entry: Extinguishing density is the actual concentration of aerosol in the test room.

3.5

discharge time

time from the generator activation to the end of its discharge

3.6

efficiency

efficiency is the assessment of the effective mass of discharged extinguishant per generator type and provides in the actual density amount of aerosol extinguishing agent in the enclosure

3.7

extinguishing density

effective minimum mass of discharged extinguishant per unit of enclosure volume required to extinguish fire involving specific fuel under defined experimental conditions

NOTE Measured in g/m^3 .

3.8

family

group of generators with same solid compound, same kind of cooling device, same kind of discharge outlet, same ignition device, same layout and same internal or external architecture

3.9

ignition device

activation device

any device which is intended to ignite the solid aerosol-forming compound

3.10

maintenance

thorough check to give maximum assurance that the extinguishing system will operate as intended

NOTE It includes a thorough examination and any necessary repair or replacement of system components.

3.11

monitoring

supervision of the operating integrity of an electrical, mechanical, pneumatic or hydraulic control feature of a system

3.12

protected volume

volume enclosed by the building elements around the protected enclosure, minus the volume of any permanent impermeable building element within the enclosure

3.13
release

physical discharge or emission of an aerosol as a consequence of the generator activation

3.14
safety factor

multiplier of the extinguishing density to determine the design application density

3.15
solid aerosol forming compound

mixture of oxidant, combustible component and technical admixtures producing fire extinguishing aerosol upon activation

3.16
supplier

legal person that is responsible for the product and is able to ensure that its quality is ensured

3.17
thermal activation device

device which automatically operates at a rated temperature and is arranged for the activation of the solid aerosol-forming compound

4 Component requirements

4.1 Condensed aerosol generator

The condensed aerosol generator typically consists of the following main components:

- a) solid aerosol-forming compound;
- b) cooling mechanism (if applicable);
- c) activation device(s);
- d) end plate discharge outlet(s);
- e) housing;
- f) mounting bracket.

The generator is a non-pressurized canister, because aerosol is generated and distributed by the combustion process of the solid aerosol-forming compound.

4.2 Solid aerosol forming compound

Mixture of oxidant, combustible component and technical admixtures producing fire extinguishing aerosol upon activation.

4.3 Cooling mechanism

The cooling mechanism provides cooling of the hot aerosol prior to its discharge into the enclosure.

4.4 Activation device

4.4.1 General

The activation device is arranged to initiate the aerosol-forming compound.

If the activation device is a complex device incorporating several components, all components shall be specified by the manufacturer.

4.4.2 Electrical activation device

The electrical activation device shall be capable of operating via an electrical input and arranged to initiate the aerosol-forming compound.

4.4.3 Thermal activation device

The thermal activation device shall be capable of operating at a rated temperature and arranged to initiate the aerosol-forming compound.

4.4.4 Other methods of activation device

Methods capable to initiate the aerosol-forming compound, other than [4.4.2](#) and [4.4.3](#), shall be specified by the manufacturer.

4.5 End plate and housing

The outer case and all parts inside the generator shall be made of corrosion-resistant material or shall be suitably treated to resist corrosion. The manufacturer shall ensure that the materials of construction are also compatible with the solid aerosol-forming compound and the cooling device so that corrosion or chemical action does not adversely affect performance.

Materials for non-metallic components that are exposed to ultraviolet light shall be UV-stabilized.

The housing shall be designed so that the function cannot be adversely affected by ageing or environmental influences.

Non-metallic materials and elastomers shall be selected to be stable and not alter their performance over the working life recommended by the manufacturer.

4.6 Extinguishants

The extinguishants referred to in this document are electrically non-conductive media.

5 Condensed aerosol generators requirements

5.1 General

The test samples shall conform to the technical description (drawings, parts list, description of function, operating instructions) as stated by the manufacturer (see 5.17 and [7.3](#)).

The manufacturer shall specify the minimum distance from the generator outlet to the first obstacle.

The manufacturer shall specify the minimum and maximum mass of aerosol compound discharged from the generator.

5.2 Extinguishing density

The extinguishing density for specific fuels under different classes of fires shall be determined by test using the fire test protocol described in [Annex A](#).

5.3 Agent distribution

The maximum area coverage and the related maximum and minimum height of the protected enclosure for each aerosol generator unit size shall be determined by tests using the fire test protocol described in [7.5](#).

5.4 Discharge time

Discharge time shall be specified by the manufacturer and shall not exceed 90 s when tested in accordance with [7.14.1](#).

5.5 Ambient temperature and humidity operation ranges

Condensed aerosol generators shall operate at ambient temperatures as specified by the manufacturer and as a minimum requirement from -20 °C to +50 °C.

Condensed aerosol generators shall operate at ambient humidity up to 95 %.

These operation ranges shall be verified by the temperature and humidity operation range tests as described in [7.6](#).

5.6 Service life

The service life of condensed aerosol generator under specific conditions, as described in [5.5](#), shall be specified by the manufacturer and as a minimum requirement shall not be less than 15 years.

The specified service life shall be verified by test using the accelerated ageing test as described in [7.7](#).

5.7 Shelf life and storage conditions

The shelf life and storage conditions shall be specified by the manufacturer.

5.8 Corrosion

The aerosol generator shall operate according to [7.14](#) and shall show no sign of damage which could alter the proper extinguishing action after being subjected to the corrosion test described in [7.8](#).

Any copper alloy part used in the component shall not crack, when tested in accordance with [7.9](#) (stress corrosion test).

5.9 Vibration

The aerosol generator shall operate according to [7.14](#) after being subjected to a vibration test described in [7.10](#).

5.10 Mechanical Shock

The aerosol generator shall operate according to [7.14](#) after being subjected to a drop test as described in [7.11](#).

5.11 Discharge temperature

5.11.1 General

The requirements of [5.11.2](#) and [5.11.3](#) shall be verified by test according to the procedure described in [7.14.4](#).

5.11.2 Casing temperature

The manufacturer shall specify the maximum developed temperature for aerosol casing that shall not exceed 400 °C.

5.11.3 Aerosol flow temperature

The selected unit sizes shall be appropriate for the protected area in terms of the minimum thermal clearance from the discharge outlets.

The following general criteria shall apply:

- for locations where personnel can be situated, the minimum thermal clearance shall refer to a temperature not exceeding 75 °C;
- for locations where combustible materials or equipment can be situated, the minimum thermal clearance shall refer to a temperature not exceeding 200 °C;
- for locations where non-combustible equipment can be situated, the minimum thermal clearance shall refer to a temperature not exceeding 400 °C.

5.12 Activation device

5.12.1 General

The characteristics of the activation device shall be verified and the reliability of operation tested by using the test method as described in [7.13](#).

5.12.2 Electrical activation device

The manufacturer shall specify at least the minimum activation current and its duration, form of the signal, maximum monitoring current, range of voltage and the type of connection for a multiple generators arrangement.

5.12.3 Thermal activation device

The manufacturer shall specify at least the minimum rated temperature at which the device operates.

5.13 Function reliability

When activated, the aerosol generator shall operate satisfactorily when tested in accordance with the procedure described in [7.14](#) (Function test).

5.14 Open fire conditions

As the aerosol generators are installed inside the protected enclosure, the generators shall pass the function test after being subjected to the fire exposure test as described in [7.15](#).

5.15 Accessories

The mounting bracket shall be tested together with the generator for corrosion, vibration and drop test as described in [7.8](#), [7.10](#), and [7.13](#).

5.16 Documentation

The manufacturer shall prepare and maintain documentation.

The manufacturer shall prepare installation and user documentation.

This documentation shall comprise at least the following:

- a) general description of the components;
- b) technical specification including:
 - 1) information mentioned in [5.1](#) and [7.15](#);
 - 2) sufficient information to permit an assessment of the compatibility with other components of the system (if applicable e.g. mechanical, electric or software compatibility);
- c) installation instructions including mounting instructions;
- d) operating instructions;
- e) maintenance instructions;
- f) safety data sheet.

The manufacturer shall prepare design documentation. This documentation shall include drawings, parts lists, block diagrams (if applicable), circuit diagrams (if applicable) and a functional description to such an extent that conformity to this document can be checked and that a general assessment of the design is possible.

6 Marking

Each generator shall be marked with the following information:

- a) name of the product;
- b) manufacturer's name or trade mark;
- c) some mark(s) or code(s) (e.g. serial number or batch code), by which the date or batch and place of manufacture (if several places of manufacture) can be identified by the manufacturer;
- d) mass of aerosol-forming compound;
- e) date of manufacture;
- f) temperature range;
- g) storage humidity range;
- h) service life;
- i) distances as specified in [5.11.3](#);
- j) fire classes according to EN 2;
- k) reference to the relevant version of operation and instruction manual.

The markings shall be non-detachable, non-flammable, permanent and legible.

7 Test methods

7.1 Conditions

The components shall be tested assembled as recommended for installation by the manufacturer. The tests shall be carried at a temperature of $(25 \pm 10) ^\circ\text{C}$, except when otherwise stated.

The tolerance for all test parameters is $\pm 5 \%$, unless otherwise stated.

7.2 Samples

The manufacturer shall submit for tests a minimum of 55 samples from the same family. From this number, 20 samples shall be tested according to the function test in [7.14](#) only.

The order of tests (with the exception of the compliance test and the function test) can be changed when necessary.

The sequence of tests is shown in [Table 1](#) and is given by the numbers 1, 2, 3 etc. in the columns A, B etc. are the different samples.

Table 1 — Test order for samples

Test method		A	B	C	D	E	F	G	H	I	J	K	H
	Amount Samples	3	3	3	3	3	3	3	3	3	3	5	100
7.3 Compliance		1	1	1	1	1	1	1	1	1	1	1	1
7.6 Temperature and humidity operation range tests													
7.6.2 Temperature and humidity test		2											
7.6.3 Low temperature test			2										
7.7 Accelerated ageing test				2									
7.8 Corrosion test					2								
7.9 Stress corrosion test						2							
7.10 Vibration test							2						
7.11 Drop test									2				
7.13 Activation performance test													2
7.14 Function test		3	3	3	3	–	3	3	3			2	
7.14.1 Discharge test												2	
7.14.2 Aerosol flow temperature												2	
7.14.4 Casing temperature test												2	
7.15 Fire exposure test										2			

7.3 Compliance

A visual and measurement check shall be made to determine whether the condensed aerosol generator corresponds to the description in the technical literature (drawings, parts lists, description of functions, operating and installation instructions).

7.4 Extinguishing density determination

The extinguishing density for specific fuels under different classes of fires shall be determined by specific tests using the fire test procedures described in [Annex A](#).

Extinguishing density tests shall be conducted with generator(s) of the same family. The number of aerosol generator units shall be sufficient to provide the needed extinguishing density in the test enclosure. The mass of the generator unit prior and after discharge shall be recorded in order to determine the efficiency of the generator.

7.5 Coverage determination

NOTE This test relates to the requirements of [5.3](#).

The maximum coverage and maximum and minimum height of the protected enclosure for each aerosol generator unit size shall be determined by test using the fire test procedures as described in [Annex A](#).