

Fire extinguishing media — Foam concentrates —

Part 4: Specification for low expansion foam concentrates for surface application to water-miscible liquids

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 45 and a back cover.

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**Fire extinguishing media - Foam concentrates - Part 4:
Specification for low expansion foam concentrates for surface
application to water-miscible liquids**

Agents extincteurs - Emulseurs - Partie 4: Spécifications
pour les émulseurs bas foisonnement destinés à une
application à la surface des liquides ayant une affinité pour
l'eau

Feuerlöschmittel - Schaummittel - Teil 4: Anforderungen an
Schaummittel zur Erzeugung von Schwertschaum zum
Aufgeben auf mit Wasser mischbare Flüssigkeiten

This European Standard was approved by CEN on 13 November 1999.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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Foreword

This European Standard 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of an identical text or by endorsement, at the latest by April 2001, and conflicting national standards shall be withdrawn at the latest by April 2001.

This European Standard is one of the series specifying requirements for fire extinguishing media in common use. This series includes the following:

EN 25923	<i>Fire protection - Fire extinguishing media - Carbon dioxide (ISO 5923:1985)</i>
EN 27201-1	<i>Fire protection - Fire extinguishing media - Halogenated hydrocarbons - Part 1: Specification for halon 1211 and halon 1301 (ISO 7201-1:1989)</i>
EN 27201-2	<i>Fire protection - Fire extinguishing media - Halogenated hydrocarbons - Part 2: Code of practice for safe handling and transfer procedures (ISO 7201-2:1991)</i>
EN 615	<i>Fire protection - Fire extinguishing media - Specification for powder (other than Class D powders)</i>

This standard is Part 4 of EN 1568 which has the general title “Fire extinguishing media - Foam concentrates”. The other parts are:

- Part 1 - Specification for medium expansion foam concentrates for surface application to water-immiscible liquids.
- Part 2 - Specification for high expansion foam concentrates for surface application to water-immiscible liquids.
- Part 3 - Specification for low expansion foam concentrates for surface application to water-immiscible liquids.

As fire-fighting foams are chemical preparations, EC Directives 67/548/EEC, 76/464/EEC and 88/379/EEC apply and should be taken into account.

The Annexes A, I, J are informative, the Annexes B, C, D, E, F, G, H are normative.

Annex K is an A-deviation for National Regulations applicable in Denmark and in Germany and is informative.

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

Introduction

Classes of fire are defined in EN 2:1992 as follows:

- Class A: fires involving solid materials, usually of an organic nature, in which combustion normally takes place with the formation of glowing embers;
- Class B: fires involving liquids or liquefiable solids;
- Class C: fires involving gases;
- Class D: fires involving metals.

Fire-fighting foams are widely used to control and extinguish Class B fires and to inhibit reignition. These foams can also be used for prevention of ignition of flammable liquids and, in certain conditions, to extinguish Class A fires.

Foams can be used in combination with other extinguishing media, particularly gaseous media and powders, which are the subject of other European Standards (see Foreword).

These specifications have been designed to ensure that fire extinguishing media have the minimum useful fire-fighting capability. The user should ensure that the foam concentrates are used accurately at the concentration recommended by the manufacturer. Fire performances indicated by this standard cannot replicate practical fire situations.

Foam concentrates of different types and manufacture should not be mixed.

It should be noted that some combinations of extinguishing powder and foam can lead to unacceptable loss of efficiency, caused by unfavourable interaction of the chosen media when applied simultaneously or successively to the fire.

It is extremely important that the foam concentrate after dilution with water to the recommended concentration should not in normal usage present a significant toxic hazard to life in relation to the environment. The current version of EC Directives 67/548/EEC, 76/464/EEC and 88/379/EEC apply when considering the testing of ecotoxicological properties and safety in the work environment.

1 Scope

This European Standard specifies requirements for chemical and physical properties, and minimum performance requirements of low expansion foams suitable for surface application to water-miscible liquids. Requirements are also given for marking.

IMPORTANT NOTE: In this part of the European Standard, the fire performance is tested using acetone as the fuel, which also forms the basis for the performance classification. However, there are a large number of water-miscible liquids which have different properties to acetone. It has been shown by tests using other fuel that the performance of various foams can differ considerably. Examples of such fuels are Isopropylalcohol (IPA) and Methyl Ethyl Ketone (MEK). It is therefore essential that the user checks for any unfavourable or unacceptable loss of efficiency when the foam is used against fires in any other water-miscible fuels than acetone. The fire test conditions and procedure given in J.2 can be used in order to achieve results comparative with acetone and related requirements. Other fuels can also require the use of other application rates, both higher and lower, to achieve relevant test data. Other fuel trays can then be used, correcting the amount of fuel to achieve the same fuel depth as specified in I.2.

It is also essential for the user to note that fuel depths and methods of application other than those specified in I.2 can cause considerable loss of efficiency, and these matters should be carefully considered by the user when assessing the suitability for particular applications.

NOTE: Some concentrates complying with this part of EN 1568 can also comply with other parts and therefore can also be suitable for application as medium and/or high expansion foams.

2 Normative references

This European Standard 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 (including amendments).

EN ISO 3104	<i>Petroleum products - Transparent and opaque liquids - Determination of kinematic viscosity and calculation of dynamic viscosity (ISO 3104:1994)</i>
ISO 304	<i>Surface active agents - Determination of surface tension by drawing up liquid films</i>
ISO 3310-1:1990	<i>Test sieves - Technical requirements and testing - Part 1: Test sieves of metal wire cloth</i>
ISO 3696	<i>Water for analytical laboratory use - Specification and test methods</i>

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1

25/50 % drainage time

time taken for 25/50 % of the volume of the original foam solution to drain out of the generated foam

3.2

expansion

ratio of the volume of foam to the volume of the foam solution from which it was made

3.3

low expansion foam

foam which has an expansion ratio not greater than 20

3.4

medium expansion foam

foam which has an expansion ratio greater than 20 but not greater than 200

3.5

high expansion foam

foam which has an expansion ratio greater than 200

3.6

fire-fighting foam

aggregate of air filled bubbles formed from a foam solution used for fire-fighting

3.7

foam concentrate

liquid which is diluted with water to produce foam solution

NOTE: Annex A gives information on grades of foam concentrate.

3.8

foam solution

solution of foam concentrate in water

3.9

gentle application

application (of foam from the test nozzle) indirectly to the surface of the fuel from a backboard

NOTE: This definition of gentle application relates to the fire test procedures used in EN 1568 Parts 3 and 4. In practice fire-fighting systems, foam can also be applied gently by fixed foam pourers or by indirect application via a tank wall or other surface.

3.10

sediment

insoluble particles in the foam concentrate

3.11

spreading coefficient

value which indicates the ability of one liquid to spread spontaneously across the surface of another

3.12

Newtonian foam concentrates

foam concentrates which have a viscosity which is independent of the shear rate

3.13

pseudoplastic foam concentrates

foam concentrates which have a viscosity which decreases with increasing shear rate

4 Sediment in the foam concentrate

4.1 Sediment before ageing

Any sediment in the foam concentrate sampled in accordance with Annex B, but not aged in accordance with C.1, shall be dispersible through a 180 μm sieve, and the percentage volume of sediment shall be not more than 0,25 % when tested in accordance with Annex C.

4.2 Sediment after ageing

Any sediment in the foam concentrate sampled in accordance with Annex B, and aged in accordance with C.1, shall be dispersible through a 180 μm sieve and the percentage volume of sediment shall be not more than 1,0 % when tested in accordance with Annex C.

5 Viscosity of the foam concentrate

5.1 Newtonian foam concentrates

The viscosity of the foam concentrate at the lowest temperature for use claimed by the manufacturer, shall be determined in accordance with EN ISO 3104.

5.2 Pseudoplastic foam concentrates

The viscosity of the foam concentrate shall be determined in accordance with Annex D.

6 pH of the foam concentrate

The pH of the foam concentrate sampled in accordance with Annex B shall be not less than 6,0 and not more than 9,5 at $(20 \pm 1) ^\circ\text{C}$.

7 Surface tension of the foam solution

The surface tension (determined in accordance with Annex F.2.1) of the foam solutions prepared using top and bottom samples (see E.4) of the foam concentrate, sampled in accordance with Annex B and conditioned in accordance with Annex E, shall be not less than 0,95 times and not more than 1,05 times the surface tension (determined in accordance with Annex F.2.1) of the foam solution prepared using the foam concentrate sampled in accordance with Annex B.

8 Spreading coefficient of the foam solutions

NOTE: The spreading coefficient indicates the possibility of film-forming, but it does not measure its quality. Certain properties of film-forming foams are not defined by this standard.

8.1 Before temperature conditioning

The foam solution prepared using the concentrate, if it is claimed by the supplier to be “film-forming”, sampled in accordance with Annex B shall have a positive spreading coefficient over cyclohexane when tested in accordance with F.2.2.

8.2 After temperature conditioning

The foam solution prepared using top and bottom samples, see E.4, of the foam concentrate, if it is claimed by the supplier to be “film-forming”, sampled in accordance with Annex B and conditioned in accordance with Annex E, shall have a positive spreading coefficient over cyclohexane when tested in accordance with F.2.2.

9 Expansion and drainage of foam

9.1 Before temperature conditioning

The foam produced from the foam solution prepared from the foam concentrate, sampled in accordance with Annex B at the suppliers recommended concentration with potable water, shall be tested in accordance with Annex G. If appropriate, a further sample of the same concentration made with the simulated sea water of G.4 shall also be tested.

9.2 After temperature conditioning

The foams produced from the foam solutions, prepared using top and bottom samples, see E.4, of foam concentrate, sampled in accordance with Annex B at the supplier's recommended concentration, and if appropriate further samples at the same concentration made with the simulated sea water of G.4, when tested in accordance with Annex G shall have the following:

- a) expansion values which do not differ from each other or from the value obtained in 9.1 (i.e. before temperature conditioning) by more than 20 % of the value obtained in 9.1; and
- b) 25 % drainage times which do not differ from each other or from the value obtained in 9.1 (i.e. before temperature conditioning) by more than 20 % of the value obtained in 9.1.

10 Test fire performance

The foam produced from the foam solution prepared using the foam concentrate sampled in accordance with Annex B, at the supplier's recommended concentration with potable water, and if appropriate at the same concentration with the simulated sea water of G.4, shall have an extinguishing performance class and burnback resistance level as specified in Table 1 when tested in accordance with H.1 and H.2.

NOTE 1: The values obtained with seawater can differ from those obtained with potable water.

NOTE 2: Annex I describes a small-scale fire test which can be suitable for quality control purposes.

Table 1 - Extinguishing performance classes and burnback resistance levels.

Extinguishing performance class	Burnback resistance level	Time in minutes	
		Extinction time not more than	Burnback time not less than
I	A	3	15
	B	3	10
	C	3	5
II	A	5	15
	B	5	10
	C	5	5

11 Container marking

The following information shall be marked on the packaging or transport container:

- the designation (identifying name) of the concentrate;
- the words "low expansion fire-fighting foam concentrate" and the number and date of this European Standard (i.e. EN 1568-4:2000);

NOTE: For low expansion concentrates which also conform to other parts of EN 1568, additional markings can be used as given in those parts.

- if the concentrate conforms to Clause 8 the words "film-forming";
- recommended usage concentration (most commonly 1 %, 3 % or 6 %);
- any tendency of the foam concentrate to cause harmful physiological effects, the methods needed to avoid them and the first aid treatment if they should occur;
- recommended maximum storage temperature and lowest temperature for use;
- if the concentrate does not conform to clause 7, 8.2 and 9.2 after conditioning in accordance with E.2, the words "Do not store below 0 °C".
- the nominal quantity in the container;
- the supplier's name and address;

- j) the batch number and the date of manufacture;
- k) the words “Not suitable for use with sea water” or “Suitable for use with sea water” as appropriate;
- l) the extinguishing performance class and the burnback resistance level using potable water, and if appropriate, using seawater;
- m) if the foam concentrate is Newtonian and the viscosity at the lowest temperature for use is more than $200 \text{ mm}^2 \cdot \text{s}$ when measured in accordance with EN ISO 3104, the words “This concentrate can require special proportioning equipment”;
- n) if the foam concentrate is pseudoplastic the words “Pseudoplastic foam concentrate”.

NOTE 1: The packaging of the foam concentrate should ensure that the essential characteristics of the concentrate are preserved when stored and handled in accordance with the supplier’s recommendations.

NOTE 2: Markings on shipping containers should be permanent and legible.

Annex A (informative)

Grades of foam concentrate

A.1 Grades

Foam concentrates are graded as follows:

- protein foam concentrates (P): these are liquids derived from hydrolysed protein materials;
- fluoroprotein foam concentrates (FP): these are protein concentrates with added fluorinated surface active agents;
- synthetic foam concentrates (S): these are based upon mixtures of hydrocarbon surface-active agents and can contain fluorinated surface-active agents with additional stabilizers;
- alcohol resistant foam concentrates (AR): these can be suitable for use on hydrocarbon fuels, and additionally are resistant to breakdown when applied to the surface of water-miscible liquid fuels. Some alcohol resistant foam concentrates can precipitate a polymeric membrane on the surface of alcohol;
- aqueous film-forming foam concentrates (AFFF): these are generally based on mixtures of hydrocarbon and fluorinated surface active agents and have the ability to form an aqueous film on the surface of some hydrocarbon fuels;
- film-forming fluoroprotein foam concentrates (FFFP): these are fluoroprotein foam concentrates which have the ability to form an aqueous film on the surface of some hydrocarbon fuels.

Annex B (normative)

Preliminary sampling of foam concentrates

Take samples for testing using a method which will provide a representative sample of the foam concentrate to be tested. Store the sample, suitably identified, in completely filled containers.

NOTE: Nominal 25 litre containers are convenient.

Annex C (normative)

Determination of percentage sediment

NOTE: See Clause 4.

C.1 Sampling

Use a sample prepared in accordance with Annex B. Place approximately 1 l of the sample in a suitable container of nominal capacity sufficient to provide an ullage of 5 % to 10 % of the container volume. Seal the container. Ensure that any sediment is dispersed by agitating the sample container.

Take two samples, testing one immediately at a temperature of $(20 \pm 5) ^\circ\text{C}$, the other after ageing for (24 ± 2) h at $(60 \pm 2) ^\circ\text{C}$ in a completely filled container without access to air.

C.2 Apparatus

C.2.1 Graduated centrifuge tubes.

NOTE: The centrifuge tubes described in ISO 3734 are suitable.

C.2.2 Centrifuge operating at $(6\,000 \pm 600) \text{ m}\cdot\text{s}^{-2}$.

NOTE: The centrifuge described in ISO 3734 is suitable.

C.2.3 180 μm sieve complying with ISO 3310-1:1990.

C.2.4 Plastic wash bottle.

C.3 Procedure

C.3.1 Centrifuge each sample of the concentrate for 10 min. Determine the volume of the sediment and report it as a percentage of the volume of the centrifuged sample.

C.3.2 Wash the contents of the centrifuge tube onto the sieve and check whether the sediment can be dispersed through the sieve by the jet from the plastic wash bottle.