



**SLOVENSKI STANDARD**  
**oSIST prEN 1568-4:2016**  
**01-oktober-2016**

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**Gasila - Penila - 4. del: Specifikacija za penila za težko peno za površinsko uporabo pri tekočinah, topnih v vodi**

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

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

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**Ta slovenski standard je istoveten z: prEN 1568-4**

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**ICS:**

13.220.10      Gašenje požara      Fire-fighting

**oSIST prEN 1568-4:2016**      **en,fr,de**



EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**DRAFT**  
**prEN 1568-4**

July 2016

ICS 13.220.10

Will supersede EN 1568-4:2008

English Version

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

Feuerlöschmittel - Schaummittel - Teil 4:  
Anforderungen an Schaummittel zur Erzeugung von  
Schwerschaum zum Aufgeben auf polare (mit Wasser  
mischbare) Flüssigkeiten

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If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

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## European foreword

This document (prEN 1568-4:2016) has been prepared by Technical Committee CEN/TC 191 “Fixed firefighting systems”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1568-4:2008.

This document 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.*

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

- EN ISO 5923, *Equipment for fire protection and fire fighting — Fire extinguishing media — Carbon dioxide (ISO 5923);*
- EN 27201-1, *Fire protection — Fire extinguishing media - Halogenated hydrocarbons — Part 1: Specifications for halon 1211 and halon 1301 (ISO 7201-1:1989);*
- EN 27201-2, *Fire protection — Fire extinguishing media — Halogenated hydrocarbons — Part 2: Code of practice for safe handling and transfer procedures (ISO 7201-2:1991);*
- EN 615, *Fire protection — Fire extinguishing media — Specifications for powders (other than class D powders).*

## Introduction

As fire fighting foams are chemical agents or chemical preparations Commission Directive 2006/60/CE and Regulations (EC) No 1272/2008 and No 1907/2006 (REACH) apply and should be taken into account.

Classes of fire are defined in EN 2 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;
- Class F: fires involving cooking media (vegetable or animal oils and fats) in cooking appliances.

Fire-fighting foams are widely used to control and extinguish class B fires and to inhibit re-ignition. 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 Commission Directive 2006/60/CE, Regulations (EC) No 1272/2008 and No 1907/2006 apply when considering the testing of ecotoxicological properties and safety in the work environment.



## 1 Scope

This draft 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** — In this part of the document, the fire performance is tested using acetone and isopropanol as the fuel, which also forms the basis for the performance classification. However, there are a large number of water-miscible liquids, which have more or less different properties to acetone and isopropanol. It has been shown by tests using other fuels that the performance of various foams can differ considerably. Examples of such fuel is 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 and isopropanol respectively. The fire test conditions and procedure given in J.2 can be used in order to achieve results comparative with acetone and isopropanol respectively and related requirements.

It is also essential for the user to note that other fuel depths and methods of application 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.

Type approval needs to be executed by independent third party laboratories.

**WARNING:** Any type approval according to this standard is invalidated by any change in composition of the approved product.

**NOTE** Some concentrates conforming to this part of EN 1568 can also conform to other parts and therefore can also be suitable for application as medium and/or high expansion foams.

## 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 1568-1, *Fire extinguishing media — Foam concentrates — Part 1: Specification for medium expansion foam concentrates for surface application to water-immiscible liquids*

EN 1568-2, *Fire extinguishing media — Foam concentrates — Part 2: Specification for high expansion foam concentrates for surface application to water-immiscible liquids*

EN 1568-3, *Fire extinguishing media — Foam concentrates — Part 3: Specification for low expansion foam concentrates for surface application to water-immiscible liquids*

EN ISO 3104, *Petroleum products — Transparent and opaque liquids — Determination of kinematic viscosity and calculation of dynamic viscosity (ISO 3104)*

EN ISO 3219, *Plastics — Polymers/resins in the liquid state or as emulsions or dispersions — Determination of viscosity using a rotational viscometer with defined shear rate (ISO 3219)*

EN ISO 5764, *Milk — Determination of freezing point — Thermistor cryoscope method (Reference method) (ISO 5764)*

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EN ISO 11348-2, *Water quality — Determination of the inhibitory effect of water samples on the light emission of Vibrio fischeri (Luminescent bacteria test) — Part 2: Method using liquid-dried bacteria (ISO 11348-2)*

EN ISO 23753-1, *Soil Quality — Determination of dehydrogenase activity in soil — Part 1: Method using triphenyltetrazolium chloride (TTC) (ISO 23753-1)*

ISO 304, *Surface active agents — Determination of surface tension by drawing up liquid films*

ISO 3310-1, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

OECD 201, *Test No. 201: Freshwater Alga and Cyanobacteria, Growth Inhibition Test*

OECD 202, *Test No. 202: Daphnia sp. Acute Immobilisation Test*

OECD 203, *Test No. 203: Fish, Acute Toxicity Test*

OECD 301, *Test No. 301: Ready Biodegradability*

OECD 404, *Test No. 404: Acute Dermal Irritation/Corrosion*

OECD 405, *Test No. 405: Acute Eye Irritation/Corrosion*

OECD 420, *Test No. 420: Acute Oral Toxicity - Fixed Dose Procedure*

### **3 Terms and definitions**

For the purposes of this document, 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**

##### **expansion value**

##### **expansion ratio**

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 less than 20

#### **3.4**

##### **medium expansion foam**

foam which has an expansion ratio greater than or equal to 20 but less than 200 even after temperature conditioning

**3.5****high expansion foam**

foam which has an expansion ratio greater than or equal to 200 even after temperature conditioning

**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 1 to entry: 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 1 to entry: This definition of gentle application relates to the fire test procedures used in EN 1568-3 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****Newtonian foam concentrates**

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

**3.12****pseudo-plastic foam concentrates**

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

**3.13****surface tension**

tension within the interface between a liquid and air

**3.14****interfacial tension**

tension within the interface between two immiscible liquids

**3.15****freeze point**

temperature at which the first ingredient of a mixture starts to solidify or freeze out

**prEN 1568-4:2016 (E)****3.16****designation****identifying name**

name that corresponds to a chemical formulation and a specific production process

Note 1 to entry: It guarantees consistency of the characteristics, performance and conditions of use of the foam concentrate.

**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 Freezing point**

The freezing point of the foam concentrate sampled in accordance with Annex B shall be determined in accordance with Annex K.

**6 Viscosity of the foam concentrate****6.1 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. If the viscosity is  $> 200 \text{ mm}^2 \text{ s}^{-1}$ , container shall be marked in accordance with Clause 15 l).

**6.2 Pseudo-plastic foam concentrates**

The viscosity of the foam concentrate shall be determined in accordance with Annex D. If the viscosity at the lowest temperature for use is greater than or equal to 120 mPa.s at 375 s<sup>-1</sup>, container shall be marked in accordance with Clause 15 m).

**7 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  $(20 \pm 1) \text{ }^\circ\text{C}$ .

**8 Surface tension of the foam solution**

The surface tension (determined in accordance with F.2) of the foam solutions prepared using top and bottom half-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 of the foam solution prepared using the sampled foam concentrate.

## 9 Evaluation of aqueous film formation

For any foam concentrate claimed to be film forming or aqueous film forming (e.g. AFFF, FFFP) cyclohexane shall not catch fire when tested in accordance with Annex L before and after conditioning to Annex E.

## 10 Expansion and drainage of foam

### 10.1 Before temperature conditioning

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

### 10.2 After temperature conditioning

The foams produced from the solutions prepared with simulated fresh water by using top and bottom half-samples, see E.4, of foam concentrate, sampled in accordance with Annex B, at the supplier's recommended concentration, when tested in accordance with Annex G, shall have the following;

- a) expansions which do not differ from each other or from the value obtained in 10.1 using simulated fresh water (i.e. before temperature conditioning) by more than 20 % of the value obtained in 10.1 using simulated fresh water; and
- b) 25 % drainage times which do not differ from each other or from the value obtained in 10.1 using simulated fresh water (i.e. before temperature conditioning) by more than 20 % of the value obtained in 10.1 using simulated fresh water.

If appropriate repeat the tests using top and bottom half-samples, see E.4, of foam concentrate, sampled in accordance with Annex B, at the supplier's recommended concentration, using foam solutions prepared with the simulated sea water in accordance with G.4. These foam solutions shall have the following:

- c) expansions which do not differ from each other or from the value obtained in 10.1 using the simulated sea water (i.e. before temperature conditioning) by more than 20 % of the value obtained in 10.1 using the simulated sea water in accordance with G.4; and,
- d) 25 % drainage times which do not differ from each other or from the value obtained in 10.1 using the simulated sea water (i.e. before temperature conditioning) by more than 20 % of the value obtained in 10.1 using the simulated sea water in accordance with G.4.

## 11 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 simulated fresh water in accordance with G.4, and if appropriate at the same concentration with the simulated

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sea water in accordance with G.4, shall have an extinguishing performance class and burn-back resistance level as specified in Table 1 when tested in accordance with H.2 and H.3.

NOTE 1 The values obtained with sea water can differ from those obtained with simulated fresh 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 burn-back resistance levels**

Extinguishing performance class	25 % Burn-back resistance level	Time in minutes	
		Extinction time not more than	25 % Burn-back time not less than
I	A	3	15
	B	3	10
	C	3	5
II	A	5	15
	B	5	10
	C	5	5

## 12 Stability/Separation test

The foam concentrate tested in accordance with Annex M shall not separate stratify or precipitate.

## 13 Occupation health and ecotoxicological evaluation

Foam concentrate shall be tested for their occupational health and ecotoxicological properties in accordance with Annex N.

## 14 Technical data sheet

The manufacturer should use the template as given in Annex O to provide information for the foam concentrate.

## 15 Container marking

Markings on shipping containers should be permanent and legible. The following information shall be marked on the packaging or transport container:

- a) the designation (identifying name) of the concentrate;
- b) the words “low expansion fire-fighting foam concentrate” and the number and date of this draft European Standard (i.e. prEN 1568-4:2016);

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

- c) if the concentrate conforms to Clause 9 the words “film-forming”;

- d) recommended usage concentration (mostly commonly 1 %, 3 % or 6 %);
- e) 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;
- f) recommended maximum storage temperature and lowest temperature for use;
- g) if the manufacturer advises that the foam concentrate is adversely affected by low temperature storage according to Annex E the words “Do not freeze”;
- h) the nominal quantity in the container;
- i) 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) if the foam concentrate is Newtonian and the viscosity at the lowest temperature for use is more than  $200 \text{ mm}^2 \text{ s}^{-1}$  when measured in accordance with EN ISO 3104 the words “This concentrate can require special proportioning equipment”;
- m) if the foam concentrate is pseudo-plastic and the viscosity at the lowest temperature for use is greater than or equal to  $120 \text{ mPa}\cdot\text{s}$  at  $375 \text{ s}^{-1}$  the words “Pseudo-plastic foam concentrate. This concentrate can require special proportioning equipment”;
- n) the lowest extinguishing performance class and the lowest burn-back resistance level obtained during testing to each part of EN 1568 (if tested to more than one part) with all fuels in potable water and sea water.

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