

Fire extinguishing media — Foam concentrates — Part 3: Specification for low-expansion foam concentrates for top application to water-miscible liquids

Agents extincteurs — Émulseurs —

Partie 3: Spécifications pour les émulseurs bas foisonnement destinés à une application par le haut sur les liquides miscibles à l'eau

DIS stage

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 6, *Foam and powder media and firefighting systems using foam and powder*.

This third edition cancels and replaces the second edition (ISO 7203-3:2011), which has been technically revised.

The main changes compared to the previous edition are as follows:

- Clause 2 “Terms and definitions” has been extended;
- Clause 9 “Expansion and drainage of foam” has been modified to run two tests instead of one and take the average of both values instead having just one datum;
- Several Figures were corrected;
- Annex F “Determination of test fire performance” has been extended by a scheme of a decision tree and the acceptable temperature range for testing fire performance has been modified;
- Annex “Typical anticipated performance for various types of foam concentrate” has been removed from the document.

A list of all parts in the ISO 7203 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Firefighting foams are widely used to control and extinguish fires of Class B (flammable liquids) and / or Class A fuels (Solid materials, usually of an organic nature) and for inhibiting re-ignition.

Foams can be used in combination with other extinguishing media, particularly halons, carbon dioxide and powders, which are the subject of other International Standards, including, ISO 6183, ISO 7201-1, ISO 7201-2 and ISO 7202. A specification for foam systems can be found in ISO 7076.

Attention is drawn to Annex H, which deals with the compatibility of foam concentrates, and the compatibility of foams and powders.

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Fire extinguishing media — Foam concentrates — Part 3: Specification for low-expansion foam concentrates for top application to water-miscible liquids

1 Scope

This document specifies the essential properties and performance of liquid foam concentrates used to make low-expansion foams for the control, extinction and inhibition of re-ignition of fires of water-miscible liquids. Minimum performance on certain test fires is specified.

These foams are suitable for top application to fires of water-miscible liquids. Those foams that also comply with ISO 7203-1 are also suitable for top application to fires of water-immiscible liquids.

The foam concentrates can be suitable for use in non-aspirating sprayers or for subsurface application to liquid fires, but requirements specific to those applications are not included in this document.

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.

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

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

ISO 3506-1, *Mechanical properties of corrosion-resistant stainless steel fasteners — Part 1: Bolts, screws and studs*

ISO 7203-2, *Fire extinguishing media — Foam concentrates — Part 2: Specification for medium - and high - expansion foam concentrates for top application to water-immiscible liquids*

BS 5117-1.3:1985, *Testing corrosion inhibiting, engine coolant concentrate (“antifreeze”). Methods of test for determination of physical and chemical properties. Determination of freezing point*

3 Terms and definitions

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

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

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

3.1

characteristic value

value declared by the foam concentrate supplier for the chemical and physical properties and the performances of the foam, foam solution, and foam concentrate

3.2

25 % drainage time

time for 25 % of the liquid content of a foam to drain out

3.3

expansion

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

3.4

low-expansion

expansion (3.3) in the range 1 to 20, as applied to foam and to associated equipment, systems and concentrates

3.5

medium-expansion

expansion (3.3) in the range 21 to 200, as applied to foam and to associated equipment, systems and concentrates

3.6

high-expansion

expansion (3.3) greater than 200, as applied to foam and to associated equipment, systems and concentrates

3.7

foam

<firefighting> aggregate of air-filled bubbles formed from an aqueous solution of a suitable foam concentrate

3.8

concentrate

<foam> liquid that, when mixed with water in the appropriate concentration, gives a foam solution

3.9

protein foam concentrate

P

foam *concentrate* (3.8) derived from hydrolysed protein materials

3.10

fluoroprotein foam concentrate

FP

protein foam *concentrate* (3.8) with added fluorinated surface-active agents

3.11

synthetic foam concentrate

S

foam *concentrate* (3.8) based on a mixture of hydrocarbon surface-active agents and which can contain fluorocarbons with additional stabilizers

3.12

alcohol-resistant foam concentrate

AR

foam *concentrate* (3.8) resistant to breakdown when applied to the surface of alcohol or other water-miscible solvents

3.13

aqueous film-forming foam concentrate

AFFF

foam *concentrate* (3.8) based on a mixture of hydrocarbon and fluorinated surface-active agents with the ability to form an aqueous film on the surface of some hydrocarbons

3.14**film-forming fluoroprotein foam concentrate****FFFP**

fluoroprotein foam *concentrate* (3.8) that has the ability to form an aqueous film on the surface of some hydrocarbons

3.15**foam solution**

solution of foam *concentrate* (3.8) and water

3.16**forceful application**

application of foam such that it falls directly onto the surface of a liquid fuel

3.17**gentle application**

application of foam indirectly to the surface of a liquid fuel via a backboard, tank wall or other surface

3.18**sediment**

insoluble particles in the foam concentrate

3.19**spreading coefficient**

value calculated from the measured surface and interfacial tensions to indicate the ability of one liquid to spontaneously spread across the surface of another

3.20**temperature for use**

maximum and minimum temperature claimed by the manufacturer between which the foam concentrate is ready for use

3.21**fluorine free foam concentrate****F3**

foam *concentrate* (3.8) which does not form an aqueous film on hydrocarbon fuels but is targeting Class B performance at forceful application and which is not containing any fluorochemicals

3.22**Class A foam concentrate**

foam *concentrate* (3.8) for use on *Class A fire* (3.23)

3.23**Class A fire**

fire involving solid materials, usually of an organic nature, in which combustion normally takes place with the formation of glowing embers

Note 1 to entry: Adapted from ISO 3941:2007, Clause 2.

Note 2 to entry: Class A fires involve solid materials, usually of an organic nature (such as vegetation, wood, cloth, and paper), rubber, and some plastics, in which combustion can occur at or below the surface of the material with or without the formation of glowing embers.

4 Grades and uses of foam concentrates

4.1 Grades

Based on the test fire performance of the foam concentrate (see Clause 10), it shall be graded

- as class I or II for extinguishing performance;
- as level A, B or C for burn-back resistance.

4.2 Use with sea water

If a foam concentrate is marked as suitable for use with sea water, the recommended concentrations for use with fresh water and sea water shall be identical.

5 Tolerance of the foam concentrate to freezing and thawing

Before and after temperature conditioning in accordance with A.2, the foam concentrate, if claimed by the supplier not to be adversely affected by freezing and thawing, shall show no visual sign of stratification and non-homogeneity when tested in accordance with Annex B.

Foam concentrates complying with Annex B shall be tested for compliance with the appropriate requirements given in other clauses and subclauses of this document after freezing and thawing in accordance with A.2.1.

6 Sediment in the foam concentrate

6.1 Sediment before ageing

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

6.2 Sediment after ageing

Any sediment in the concentrate 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.

7 Determination of viscosity

7.1 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 ISO 3104. If the viscosity is $>200 \text{ mm}^2\text{s}^{-1}$, the container shall be marked: "This concentrate can require special proportioning equipment".

7.2 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^{-1} , the container shall be marked: "This concentrate can require special proportioning equipment".

NOTE Pseudo-plastic foam concentrates are a particular class of non-Newtonian foam concentrates and have a viscosity that decreases with increasing shear rate at constant temperature.

8 pH of the foam concentrate

8.1 pH limits

The pH of the foam concentrate, before and after temperature conditioning in accordance with A.2, shall be not less than 6,0 and not more than 8,5 at (20 ± 2) °C.

8.2 Sensitivity to temperature

The difference in pH between before and after temperature conditioning shall not be greater than 1,0 pH units.

9 Expansion and drainage of foam

9.1 General

Either of the following tests shall be conducted twice with potable water and if appropriate twice with synthetic sea water and the average of both series shall be recorded.

9.2 Expansion limits

The foam produced from the foam concentrate, before and after temperature conditioning in accordance with A.2, with potable water and, if appropriate, with the synthetic sea water according to F.2.4, shall have an average expansion within either ± 20 % of the characteristic value or $\pm 1,0$ of the characteristic value, whichever is greater, when tested in accordance with E.4.

9.3 Drainage limits

The foam produced from the foam concentrate, before and after temperature conditioning in accordance with A.2, with potable water and, if appropriate, with the synthetic sea water of F.2.4, shall have a 25 % drainage time within ± 20 % of the characteristic value when tested in accordance with E.4.

10 Test fire performance

The foam produced from the 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 synthetic 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 G.1 and G.2.

Table 1 — Extinguishing performance classes and burn-back resistance levels

Times in minutes

Extinguishing performance class	Burn-back resistance level	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