
**Fire extinguishing media — Foam
concentrates —**

Part 3:

**Specification for low-expansion foam
concentrates for top application to water-
miscible liquids**

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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

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Contents

Page

Foreword	v
Introduction.....	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Grades and uses of foam concentrates	3
4.1 Grades	3
4.2 Use with sea water	4
5 Tolerance of the foam concentrate to freezing and thawing	4
6 Sediment in the foam concentrate.....	4
6.1 Sediment before ageing.....	4
6.2 Sediment after ageing.....	4
7 Viscosity of the foam concentrate.....	4
7.1 Newtonian foam concentrates	4
7.2 Pseudo-plastic foam concentrates.....	4
8 pH of the foam concentrate.....	4
8.1 pH limits	4
8.2 Sensitivity to temperature	5
9 Surface tension of the foam solution.....	5
9.1 Before temperature conditioning.....	5
9.2 Temperature sensitivity	5
10 Interfacial tension between the foam solution and cyclohexane.....	5
10.1 Before temperature conditioning.....	5
10.2 Temperature sensitivity	5
11 Spreading coefficient of the foam solution on cyclohexane	5
12 Expansion and drainage of foam.....	6
12.1 Expansion	6
12.2 Drainage	6
13 Test fire performance.....	6
14 Marking, packaging and specification sheet.....	7
14.1 Marking	7
14.2 Packaging.....	7
14.3 Specification sheet.....	7
Annex A (normative) Preliminary sampling and conditioning of the foam concentrate	8
Annex B (normative) Determination of tolerance to freezing and thawing	9
Annex C (normative) Determination of percentage of sediment	11
Annex D (normative) Determination of viscosity for pseudo-plastic foam concentrates	12
Annex E (normative) Determination of surface tension, interfacial tension and spreading coefficient.....	14
Annex F (normative) Determination of expansion and drainage time	15
Annex G (normative) Determination of test fire performance.....	20

Annex H (informative) Small-scale fire test	24
Annex I (informative) Description of a radiation measurement method	34
Annex J (informative) Compatibility	38
Bibliography	39

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[ISO 7203-3:2011](https://standards.iteh.ai/catalog/standards/sist/6201d706-436d-41a0-a142-620774f2e37a/iso-7203-3-2011)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 7203-3 was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 6, *Foam and powder media and fixed firefighting system using foam and powder*.

This second edition cancels and replaces the first edition (ISO 7203-3:1999), which has been technically revised.

ISO 7203 consists of the following parts, under the general title *Fire extinguishing media — Foam concentrates*:

- *Part 1: Specifications for low-expansion foam concentrates for top application to water-immiscible liquids*
- *Part 2: Specification for medium- and high-expansion foam concentrates for top application to water-immiscible liquids*
- *Part 3: Specification for low-expansion foam concentrates for top application to water-miscible liquids*

Introduction

Firefighting foams are widely used to control and extinguish fires of flammable liquids and for inhibiting reignition. They can also be used to prevent the ignition of flammable liquids and, in certain conditions, extinguish fires of solid combustibles.

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 5923, ISO 6183, ISO 7201-1, ISO 7201-2 and ISO 7202. A specification for foam systems [ISO 7076 (all parts)¹⁾] designed in accordance with this part of ISO 7203 is being prepared and will be published as ISO 7076 (all parts).

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

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1) To be published.

Fire extinguishing media — Foam concentrates —

Part 3:

Specification for low-expansion foam concentrates for top application to water-miscible liquids

1 Scope

This part of ISO 7203 specifies the essential properties and performance of liquid foam concentrates used to make low-expansion foams for the control, extinction and inhibition of reignition 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 part of ISO 7203.

2 Normative references

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The following referenced documents are indispensable for the application 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 304, *Surface active agents — Determination of surface tension by drawing up liquid films*

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 3696:1987, *Water for analytical laboratory use — Specification and test methods*

ISO 3734, *Petroleum products — Determination of water and sediment in residual fuel oils — Centrifuge method*

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, *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.

- 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**
with expansion in the range 1 to 20, as applied to foam and to associated equipment, systems and concentrates
- 3.5 medium-expansion**
with expansion in the range 21 to 200, as applied to foam and to associated equipment, systems and concentrates
- 3.6 high-expansion**
with expansion 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 concentration**
P
foam concentrate derived from hydrolyzed protein materials
- 3.10 fluoroprotein foam concentrate**
FP
protein foam concentrate with added fluorinated surface active agents
- 3.11 synthetic foam concentrate**
S
foam concentrate based on a mixture of hydrocarbon surface-active agents and which can contain fluorocarbons with additional stabilizers

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3.12**alcohol-resistant foam concentrate****AR**

foam concentrate 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 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 that has the ability to form an aqueous film on the surface of some hydrocarbons

3.15**foam solution**

solution of foam concentrate 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

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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**lowest temperature for use**

temperature claimed by the manufacturer or supplier to be the lowest temperature at which the foam concentrate can be proportioned correctly using equipment normally available

4 Grades and uses of foam concentrates**4.1 Grades**

Based on the test fire performance of the foam concentrate (see Clause 13), 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 part of ISO 7203 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 prepared 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.

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6.2 Sediment after ageing

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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.

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7 Viscosity of the foam concentrate

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 $120 \text{ mPa}\cdot\text{s}$ at 375 s^{-1} , the container shall be marked: "Pseudo-plastic foam concentrate. This concentrate can require special proportioning equipment".

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 $(20 \pm 2) \text{ }^\circ\text{C}$.

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 Surface tension of the foam solution

9.1 Before temperature conditioning

The surface tension of the foam solution prepared from the concentrate, before temperature conditioning in accordance with A.2 at the supplier's recommended concentration, shall be within $\pm 10\%$ of the characteristic value when determined in accordance with E.2.

9.2 Temperature sensitivity

The surface tension of the foam solution prepared from the concentrate, after temperature conditioning in accordance with A.2 at the supplier's recommended concentration, shall be determined in accordance with E.2.

The value obtained after temperature conditioning shall not be less than 0,95 times, or more than 1,05 times the value obtained before temperature conditioning.

10 Interfacial tension between the foam solution and cyclohexane

10.1 Before temperature conditioning

The difference between the interfacial tension between the foam solution prepared from the foam concentrate, before temperature conditioning in accordance with A.2, and cyclohexane (when determined in accordance with E.3) and the characteristic value, shall not exceed 1,0 mN/m or 10 % of the characteristic value, whichever is the greater.

10.2 Temperature sensitivity

The interfacial tension between the foam solution prepared from the foam concentrate, after temperature conditioning in accordance with A.2, and cyclohexane shall be determined in accordance with E.3.

The two values obtained before and after temperature conditioning shall not differ by more than 0,5 mN/m.

11 Spreading coefficient of the foam solution on cyclohexane

The spreading coefficient of the foam solution prepared from a concentrate claimed by the supplier to be "film-forming" before and after temperature conditioning in accordance with A.2, calculated in accordance with E.4, shall be positive.

NOTE Foam concentrates complying with Clause 11 are more likely to be of types AFFF or FFFP than of types FP, P or S.

12 Expansion and drainage of foam

12.1 Expansion

12.1.1 Limits

The difference between the expansion of 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 G.2.4, and the characteristic value shall be within either $\pm 20\%$ of the characteristic value or $\pm 1,0$ of the characteristic value, whichever is the greater, when tested in accordance with Annex F.

12.2 Drainage

12.2.1 Limits

The difference between the drainage time of 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 G.2.4, and the characteristic value shall be within $\pm 20\%$ of the characteristic value when tested in accordance with Annex F.

13 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 F.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.

ISO 7203-3:2011
Table 1 — Extinguishing performance classes and burn-back resistance levels

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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

- NOTE 1 The values obtained with sea water can differ from those obtained with potable water.
- NOTE 2 Annex H describes a small-scale fire test which can be suitable for quality control purposes.
- NOTE 3 Extinction time is the period from the start of foam application until the time when all flames are extinguished.
- NOTE 4 25 % burn-back time is the period from the ignition of the burn-back pot until 25 % of the tray is covered by sustained flames.

14 Marking, packaging and specification sheet

14.1 Marking

14.1.1 The following information shall be marked on the shipping container:

- a) designation (identifying name) of the concentrate and the words “low-expansion foam concentrate”;
- b) class (I or II) and level (A, B, or C) of the foam concentrate and, if the concentrate complies with Clause 11, the words “aqueous film-forming”;
- c) recommended usage concentration for use (most commonly 1 %, 3 % or 6 %);
- d) any tendency of the foam concentrate to cause harmful physical effects, the methods required to avoid them and the first aid treatment if they occur;
- e) recommended storage temperature and temperature of use;
- f) if the concentrate complies with Clause 5, the words “Not affected by freezing and thawing” or, if the foam concentrate does not comply with Clause 5, the words “Do not freeze”;
- g) nominal quantity in the container;
- h) supplier's name and address;
- i) batch number;
- j) words “Not suitable for use with sea water” or “Suitable for use with sea water”, as appropriate.

WARNING — It is extremely important that the foam concentrate, after dilution with water to the recommended concentration and in normal usage, not present a significant toxic hazard to life in relation to the environment.

ISO 7203-3:2011

The packaging of the foam concentrate shall ensure that the essential characteristics of the concentrate are preserved when stored and handled in accordance with the supplier's recommendations.

14.1.2 Markings on shipping containers shall be permanent and legible.

14.1.3 It is recommended that non-Newtonian concentrates be appropriately identified.

14.1.4 Foam concentrates in accordance with ISO 7203-2 shall also be marked “medium-expansion” or “high-expansion” or both.

14.1.5 Foam concentrates in accordance with ISO 7203-3 shall also be marked “alcohol resistant”.

14.2 Packaging

14.2.1 If requested by the user, the supplier shall provide a list of the characteristic values.

14.3 Specification sheet

14.3.1 If the foam concentrate is Newtonian and the viscosity at the lowest temperature for use is more than 200 mm²/s when measured in accordance with ISO 3104, the words “This concentrate can require special proportioning equipment” shall be marked.

14.3.2 If the foam concentrate is pseudo-plastic and the viscosity at the lowest temperature for use is greater than or equal to 120 mPa·s at 375/s, the words “Pseudo-plastic foam concentrate. This concentrate can require special proportioning equipment” shall be marked.

14.3.3 It is recommended that non-Newtonian concentrates be appropriately identified.