
**Fire extinguishing media — Foam
concentrates —**

Part 2:

**Specification for medium- and high-
expansion foam concentrates for top
application to water-immiscible liquids**

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Agents extincteurs — Émulseurs —

*Partie 2: Spécifications pour les émulseurs moyen et haut
foisonnements destinés à une application par le haut sur les liquides
non miscibles à l'eau*

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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 7203-2 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 systems using foam and powder*.

This second edition cancels and replaces the first edition (ISO 7203-2:1995), which has been technically revised.

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

- *Part 1: Specification 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 re-ignition. They can also be used to prevent 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), which is cited in this part of ISO 7203, is under preparation.

Attention is drawn to Annex K, 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 2:

Specification for medium- and high-expansion foam concentrates for top application to water-immiscible liquids

1 Scope

This part of ISO 7203 specifies the essential properties and performance of liquid foam concentrates used to make medium- or high-expansion foams or both for the control, extinction and inhibition of reignition of fires of water-immiscible liquids. Minimum performance on certain test fires is specified.

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

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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 7203-1, *Fire extinguishing media — Foam concentrates — Part 1: Specifications for low-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.

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
50 % drainage time
time for 50 % of the liquid content of a foam to drain out

3.4
expansion
ratio of the volume of foam to the volume of the foam solution from which it was made

3.5
low-expansion
with expansion in the range 1 to 20, as applied to foam and to associated equipment, systems and concentrates

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3.6
medium-expansion
with expansion in the range 21 to 200, as applied to foam and to associated equipment, systems and concentrates

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3.7
high-expansion
with expansion greater than or equal to 200, as applied to foam and to associated equipment, systems and concentrates

3.8
foam
(firefighting) aggregate of air-filled bubbles formed from an aqueous solution of a suitable foam concentrate

3.9
foam concentrate
concentrate
liquid which, when mixed with water in the appropriate concentration, gives a foam solution

3.10
protein foam concentration
P
foam concentrate derived from hydrolysed protein materials

3.11
fluoroprotein foam concentrate
FP
protein foam concentrate with added fluorinated surface-active agents

3.12
synthetic foam concentrate
S
foam concentrate based on a mixture of hydrocarbon surface-active agents and which can contain fluorocarbons with additional stabilizers

3.13**alcohol-resistant foam concentrate****AR**

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

3.14**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

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

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

3.16**foam solution**

solution of foam concentrate and water

3.17**forceful application**

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

3.18**gentle application**

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

3.19**sediment**

insoluble particles in the foam concentrate

3.20**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

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

The foam concentrate shall be classified as medium- or high-expansion or both and shall comply with the appropriate requirements.

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 this clause shall be tested for compliance with the appropriate requirements given in other clauses 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 volume percentage of 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 volume percentage of sediment shall be not more than 1,0 % when tested in accordance with Annex C.

7 Determination of viscosity for pseudo-plastic foam concentrates

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 greater than 200 mm/s, 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, 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 ± 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 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 ± 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

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

10.2 Temperature sensitivity

After temperature conditioning in accordance with A.2, the interfacial tension between the foam solution prepared from the foam concentrate 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

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

NOTE Foam concentrates complying with this clause are more likely to be of type AFFF or FFFP than of type FP, P or S.

12 Expansion and drainage of foam

12.1 Medium-expansion foam concentrates — 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 H.2.4, shall have an expansion of not less than 50 when tested in accordance with Annex F.

12.2 High-expansion foam concentrate — 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 I.2.4, shall have an expansion of not less than 201 when tested in accordance with Annex G.

13 Test fire performance

The foam produced from the foam concentrate with potable water, and if appropriate, with the synthetic sea water of H.2.4 and/or I.2.4, shall have an extinguishing performance class and burn-back resistance level as specified in Table 1 when tested in accordance with Annex H or Annex I, or both, as appropriate.

Table 1 — Test fire performance

Types of expansion foam	Medium-expansion foam	High-expansion foam
Extinction time, seconds	Not more than 120	Not more than 150
1 % burn-back time, seconds	Not less than 30	Not applicable

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, as appropriate, the words “medium” or “high”, or “medium and high” and “expansion foam concentrate”;
- b) if the concentrate complies with Clause 11, the words “aqueous film-forming”;
- c) recommended 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 should 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.

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

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 complying with ISO 7203-1 shall also be marked “low-expansion”.

14.2 Packaging

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.

14.3 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 included on the specification sheet.

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 included on the specification sheet.

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

Annex A (normative)

Preliminary sampling and conditioning of the foam concentrate

A.1 Preliminary sampling

The sampling method shall ensure representative samples, whether taken from a bulk container or a number of individual packages.

Store samples in fully closed containers.

NOTE Containers with a capacity of 20 l are suitable.

A.2 Conditioning of foam concentrate

A.2.1 If the supplier claims that the concentrate is not adversely affected by freezing and thawing, condition the concentrate sample through four cycles of freezing and thawing, generally as described in B.2, before conditioning in accordance with A.2.2. If the foam concentrate is adversely affected by freezing and thawing, it shall be conditioned according to A.2.2 without prior freezing and thawing.

A.2.2 Condition the concentrate in the sealed container for 7 d at (60 ± 2) °C, followed by 1 d at (20 ± 5) °C.

A.3 Subsequent testing

Test samples prepared in accordance with A.1, or A.1 and A.2 as appropriate. Agitate the sample container before sampling for further tests.