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ISO 7203-2

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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

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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Contents

Annexes

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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.

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.

International Standard ISO 7203-2 was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 6, *Extinguishing media for fire fighting*.

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*

Annexes A, B, C, D, E, F and G form an integral part of this part of ISO 7203. Annexes H and J are for information only.

Introduction

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

Foams may be used in combination with other extinguishing media, particularly halons, carbon dioxide and powders, which are the subject of other International Standards including those listed below:

ISO 5923:1989, *Fire protection — Fire extinguishing media — Carbon dioxide.*

ISO 6183:1990, *Fire protection equipment — Carbon dioxide extinguishing systems for use on premises — Design and installation.*

ISO 7201-1:1989, *Fire protection — Fire extinguishing media — Halogenated hydrocarbons — Part 1: Specifications for halon 1211 and halon 1301.*

ISO 7201-2:1991, *Fire extinguishing media — Halogenated hydrocarbons — Part 2: Code of practice for safe handling and transfer procedures of halon 1211 and halon 1301.*

ISO 7202:1987, *Fire protection — Fire extinguishing media — Powder.*

A specification for foam systems designed in accordance with this part of ISO 7203 is being prepared and will be published as:

ISO 7076:—[1], *Fire protection equipment — Automatic extinguishing systems for applying low, medium and high expansion foam.*

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

1) To be published.

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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 and/or high expansion foams for the control, extinction and inhibition of reignition of fires of water-immiscible liquids. Minimum performance on certain test fires is specified.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 7203. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 7203 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 304:1985, *Surface active agents — Determination of surface tension by drawing up liquid films.*

ISO 3310-1:1990, *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 3734:1976, *Crude petroleum and fuel oils — Determination of water and sediment — Centrifuge method.*

ISO 7203-1:1995, *Fire extinguishing media — Foam concentrates — Part 1: Specification for low expansion foam concentrates for top application to water-immiscible liquids.*

BS 5117:1989, *Testing corrosion inhibiting, engine coolant concentrate (antifreeze) — Part 1: Methods of test for determination of physical and chemical properties — Section 1.3: Determination of freezing point.*

3 Definitions

For the purposes of this part of ISO 7203, the following definitions apply.

3.1 characteristic values: Values declared by the foam concentrate supplier for the chemical and physical properties and the performances of the foam and foam solution.

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: Applied to foam with expansion in the range 1 to 20, and to associated equipment, systems and concentrates.

3.6 medium expansion: Applied to foam with expansion in the range 21 to 200 and to associated equipment, systems and concentrates.

3.7 high expansion: Applied to foam with expansion greater than 201 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: Liquid which, when mixed with water in the appropriate concentration, gives a foam solution.

3.10 protein foam concentrate (P): Foam concentrate derived from hydrolized 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 may 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 polar 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 which 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 to fall 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: Measure of 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 and/or high expansion 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 percentage volume 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 percentage volume of sediment shall be not more than 1,0 %, when tested in accordance with annex C.

7 Comparative fluidity of the foam concentrate

Before and after temperature conditioning in accordance with A.2, the flow rate of the concentrate shall be not less than the flow rate achieved with a reference liquid of kinematic viscosity 200 mm^2/s, when tested in accordance with annex D.

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 9,5 at (20 ± 2) °C.

8.2 Sensitivity to temperature

If there is a difference of more than 0,5 pH unit between the two values (before and after temperature conditioning), the foam concentrate shall be designated as temperature sensitive.

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.

If the value obtained after temperature conditioning is less than 0,95 times, or more than 1,05 times, the value obtained before temperature conditioning, the foam concentrate shall be designated as temperature sensitive.

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.

If the two values obtained before and after temperature conditioning differ by more than 0,5 mN/m or if the value obtained after temperature conditioning is less than 0,95 times, or more than 1,05 times, the value obtained before temperature conditioning, whichever is the greater, the foam concentrate shall be designated as temperature sensitive.

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 1 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

12.1.1 Limits

12.1.1.1 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.1.4, shall have an expansion of not less than 50, and 25 % and

50 % drainage times within ± 20 % of the characteristic values, when tested in accordance with F.1.

12.1.1.2 If the foam concentrate is marked as suitable for use with sea water [see 14.1 j)], the foam produced from the foam concentrate with the synthetic sea water of G.1.4, when tested in accordance with F.1, shall have an expansion as follows:

a) if the characteristic value is less than 100, within ± 10 of the expansion value obtained from the same sample of foam concentrate tested with potable water (see 12.1.1.1); or

b) if the characteristic value is not less than 100, not less than 0,9 times and not more than 1,1 times the expansion value obtained from the same sample of foam concentrate tested with potable water (see 12.1.1.1).

NOTE 2 Expansion is a function of the foam concentrate and the branch pipe (see figure F.2). The test branch pipe of F.1 tends to give expansions higher than some other equipment, so the minimum expansion is greater than that given in the definition for medium expansion (see 3.6).

12.1.2 Temperature sensitivity

If the value for expansion, and/or 25 % drainage time and/or 50 % drainage time, obtained after temperature conditioning is less than 0,8 times, or more than 1,2 times, the corresponding value obtained before temperature conditioning, the foam concentrate shall be designated as temperature sensitive.

12.2 High expansion foam concentrates

12.2.1 Limits

12.2.1.1 The foam produced from the foam concentrate, before and after temperature conditioning in accordance with A.2, with potable water shall have an expansion of not less than 201, and a 50 % drainage time of not less than 10 min within ± 20 % of the characteristic value, when tested in accordance with F.2.

12.2.1.2 If the foam concentrate is marked as suitable for use with sea water [see 14.1 j)], the foam produced from the foam concentrate with sea water shall have an expansion not less than 0,9 times and not more than 1,1 times the expansion value obtained from the same sample of foam concentrate tested with potable water (see 12.2.1.1), when tested in accordance with F.2.

12.2.2 Temperature sensitivity

If the value for expansion, and/or 50 % drainage time, obtained using temperature-conditioned foam concentrate is less than 0,8 times, or more than 1,2 times, the corresponding value obtained using foam concentrate that is not temperature conditioned, the foam concentrate shall be designated as temperature sensitive.

13 Test fire performance

13.1 Medium expansion foam concentrates

The foam produced from the foam concentrate, before and, if the concentrate is designated as temperature sensitive, after temperature conditioning in accordance with A.2, with potable water and, if appropriate, with the synthetic sea water of G.1.4, shall have an extinction time not greater than the value given in table 1 and a burnback time not less than the value given in table 1, when tested in accordance with G.1 and G.2.

13.2 High expansion foam concentrates

The foam produced from the foam concentrate, before and, if the concentrate is designated as temperature sensitive, after temperature conditioning in accordance with A.2, with potable water and, if appropriate, with the synthetic sea water of G.1.4, shall have an extinction time not greater than the value given in table 1, when tested in accordance with G.1 and G.3.

Table 1 — Test fire performance

	Medium expansion foam	High expansion foam
Extinction time, s	Not more than 120	Not more than 150
1 % burnback time, s	Not less than 30	Not applicable

14 Marking, packaging and specification sheet

14.1 The following information shall be provided by the supplier as a specification sheet either supplied with or marked on the shipping container:

a) the 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 "film-forming";

c) recommended concentration for use (most commonly 1 %, 3 % or 6 %);

d) any tendency of the foam concentrate to cause harmful physiological 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) the nominal quantity in the container;

h) the supplier's name and address;

i) the batch number;

j) the words "Not suitable for use with sea water" or "Suitable for use with sea water", as appropriate;

k) any corrosiveness of the concentrate, both in storage and in use, which significantly exceeds that of potable water;

l) suitable materials for storage containers and equipment, both for the concentrate and the foam solution.

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

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.

Markings on shipping containers shall be permanent and legible.

It is recommended that non-Newtonian concentrates are appropriately identified.

Foam concentrates complying with ISO 7203-1 shall also be marked "low expansion".

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

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 full closed containers.

NOTE 3 Containers of capacity 20 litres 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.

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