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Fire extinguishing media — Foam concentrates —

Part 4:
Specification for Class A foam concentrates for application on Class A fires

Agents extincteurs — Émulseurs —

Partie 4: Spécifications pour les agents émulseurs destinés à une application par les matières solide combustible

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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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 system using foam and powder.*

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 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 halocarbons, 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 the ISO 7076 series.

Attention is drawn to Annex I, which deals with the compatibility of foam concentrates.

Attention is also drawn to Annex J, which contains information previously included ISO 3219:1993[1] that is considered relevant to this document.

NOTE ISO 3219:1993 is currently under revision with a view to expansion into a series. The content included in Annex J has not yet been incorporated into a new Part.

A specification for portable extinguishers can be found in ISO 7165.

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[1] Cancelled and replaced by ISO 3219-1:2021 and ISO 3219-2:2021.

Fire extinguishing media — Foam concentrates —

Part 4:
Specification for Class A foam concentrates for application on Class A fires

1 Scope

This document specifies the essential properties and performance of liquid foam concentrates used to make foams for the extinguishment and inhibition of reignition of fires of Class A fuels. Minimum performance on certain test fires is specified.

NOTE 1 Class A fires are fires involving solid materials, usually of an organic nature, in which combustion normally takes place with the formation of glowing embers (see 3.16).

NOTE 2 Class A fuels can include materials such as vegetation, wood, cloth, paper, rubber and some plastics (see 3.17).

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 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 3219-2, *Rheology — Part 2: General principles of rotational and oscillatory rheometry*

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

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

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*

ISO 7203-3, *Fire extinguishing media — Foam concentrates — Part 3: Specification for low-expansion foam concentrates for top application to water-miscible liquids*

EN 1568-3:2018, *Fire extinguishing media — Foam concentrates — Part 3: Specification for low expansion foam concentrates for surface application to water-immiscible liquids*

UNITED NATIONS (UN), *Globally Harmonized System of Classification and Labelling of Chemicals*, 4th revised edition (2011)[2)]

3 Terms and definitions

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

[2)] Available at: https://unece.org/fileadmin/DAM/trans/danger/publi/ghs/ghs_rev04/English/ST-SG-AC10-30-Rev4e.pdf.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
characteristic value
value declared by the *foam* (3.7) concentrate supplier for the chemical and physical properties and the performances of the foam, *foam solution* (3.11), and *foam concentrate* (3.8)

3.2
25 % drainage time
time for 25 % of the liquid content of a *foam* (3.7) to drain out

3.3
expansion
ratio of the volume of *foam* (3.7) to the volume of the *foam solution* (3.11) from which it was made

3.4
low-expansion
with *expansion* (3.3) in the range 1 to 20, as applied to *foam* (3.7) and to associated equipment, systems and concentrates

3.5
medium-expansion
with *expansion* (3.3) in the range greater than 20 to 200, as applied to *foam* (3.7) and to associated equipment, systems and concentrates

3.6
high-expansion
with *expansion* (3.3) greater than 200, as applied to *foam* (3.7) 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)

3.8
foam concentrate
liquid that, when mixed with water in the appropriate concentration, gives a *foam solution* (3.11)

3.9
protein foam concentrate
P
foam concentrate (3.8) derived from hydrolysed protein materials

3.10
fluoroprotein foam concentrate
FP
protein foam concentrate (3.9) with added fluorinated surface-active agents

3.11
foam solution
solution of *foam concentrate* (3.8) and water

3.12
sediment
insoluble particles in the foam *concentrate* (3.8)

3.13
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

3.14
temperature for use
maximum and minimum temperature claimed by the manufacturer between which the *foam concentrate* (3.8) is ready for use

3.15
Class A foam concentrate
foam concentrate (3.8) for use on *Class A fire* (3.16)

Note 1 to entry: *Protein foam concentrate* (3.9) and *fluoroprotein foam concentrate* (3.10) describe types of foam which can be used in Class A applications.

3.16
Class A fire
fires involving solid materials, usually of an organic nature, in which combustion normally takes place with the formation of glowing embers

Note 1 to entry: See ISO 3941.

3.17
Class A fuel
solid materials, usually of an organic nature (such as vegetation, wood, cloth, 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

3.18
freezing point
temperature at which the first ingredient of a mixture starts to solidify or freeze out

4 Type and use of Class A foam concentrates

4.1 General

Foam concentrates capable of providing positive fire testing results if tested in accordance with Annex G are considered Class A foam concentrates.

4.2 Use with sea water

If a Class 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. Consider increased corrosiveness on equipment used if foam solution is prepared using sea water.

5 Tolerance of the foam concentrate to freezing and thawing

Before and after temperature-conditioning in accordance with A.2, the foam concentrate, if it is 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 conforming to Annex B shall be tested for conformance 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. 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 B.2 shall be dispersible through a 180 µm sieve. 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 mm^2s^{-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 concentrate 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 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 Expansion and drainage of foam

10.1 Expansion

10.1.1 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 synthetic sea water in accordance with F.4, and the characteristic value shall be within either ±20 % of the characteristic value or ±1,0 of the characteristic value, whichever is the greater, when tested in accordance with Annex F.

10.2 Drainage

10.2.1 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 synthetic sea water in accordance with F.4, and the characteristic value shall be within ±20 % of the characteristic value when tested in accordance with Annex F.

11 Test fire performance

Class A foam concentrate shall extinguish a wood crib fire according to G.1.1 and pass the test for extinguishment of deep-seated fires according to G.1.2.

12 Corrosion

Where used in aircraft or other applications involving corrosion-sensitive technologies, it is recommended to conduct appropriate corrosion tests and provide the information to end users.

13 Toxicology and environmental information

Manufacturers of concentrates shall provide information about the toxicological and ecotoxicological impact of their product at its highest recommended concentration in accordance with Annex H.

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 “Class A foam concentrate”;

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

c) 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;

d) recommended storage temperature and temperature of use;

e) if the concentrate conforms with Clause 5, it shall be marked with the words "Not affected by freezing and thawing" or, if the foam concentrate does not conform with Clause 5, the words "Do not freeze";

f) nominal quantity in the container;

g) supplier's name and address;

h) batch number;

i) the 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, does not 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 Non-Newtonian concentrates should be appropriately identified.

14.1.4 Foam concentrates in accordance with ISO 7203-1 shall also be marked "low-expansion".

14.1.5 Foam concentrates in accordance with ISO 7203-2 shall also be marked "medium-expansion" or "high-expansion" or both.

14.1.6 Foam concentrates in accordance with ISO 7203-3 shall also be marked "alcohol resistant".

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

14.3.2 If the foam concentrate is Newtonian and the viscosity at the lowest temperature for use is more than 200 mm^2/s when measured in accordance with ISO 3104, it shall be marked with the words "This concentrate can require special proportioning equipment.".

14.3.3 If the foam concentrate is pseudo-plastic and the viscosity at the lowest temperature for use is greater than or equal to 120 $mPa \cdot s$ at 375 s^{-1}, it shall be marked with the words "Pseudo-plastic foam concentrate. This concentrate can require special proportioning equipment.".

14.3.4 Non-Newtonian concentrates should 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 tightly closed containers.

NOTE Containers of capacity 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 is conditioned in accordance with A.2.2 without prior freezing and thawing.

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 shall be prepared in accordance with A.1, or A.2.1 and A.2.2 as appropriate. Shake the sample container before sampling for further tests.

Annex B
(normative)

Determination of tolerance to freezing and thawing

B.1 Apparatus

The usual laboratory apparatus and, in particular, the following.

B.1.1 Freezing chamber, capable of achieving the temperatures required in B.2.

B.1.2 Tube, polyethylene, approximately 10 mm in diameter, approximately 400 mm long and sealed and weighted at one end, with suitable spacers attached; see Figure B.1 for a typical form.

B.1.3 Measuring cylinder, glass, of capacity 500 ml, approximately 400 mm high and approximately 65 mm in diameter, with a stopper.

B.2 Procedure

Set the temperature of the freezing chamber (B.1.1) to at least 10 °C below the freezing point of the sample measured in accordance with EN 1568-3:2018, Annex K.

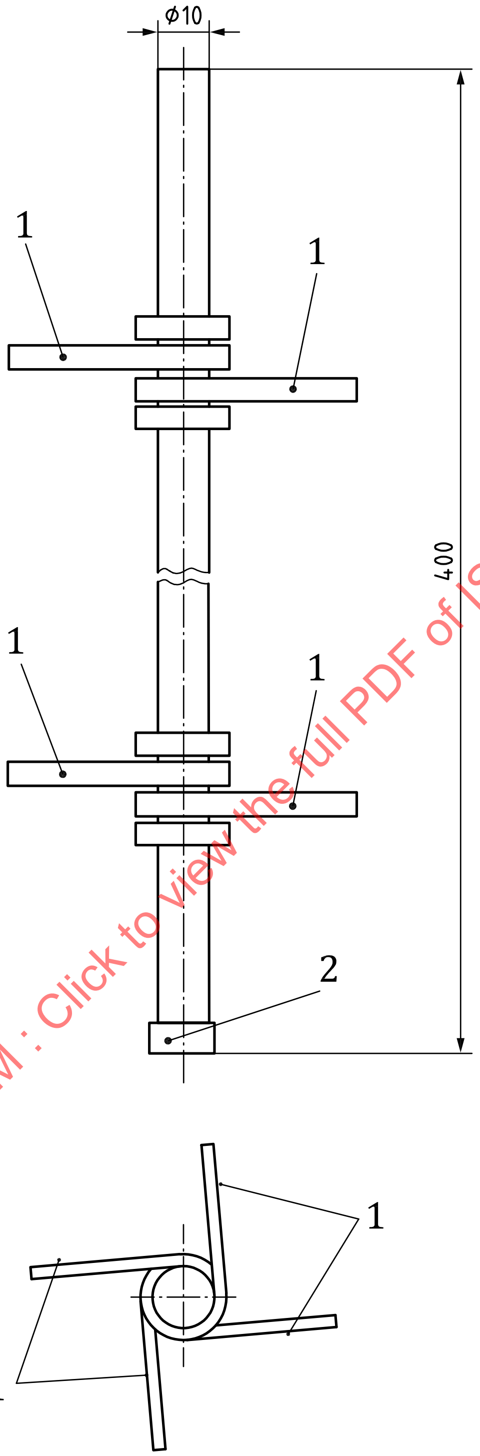
To prevent the glass measuring cylinder (B.1.3) from breaking due to expansion of the foam concentrate upon freezing, insert the tube (B.1.2) into the measuring cylinder with the sealed end downward, weighted if necessary to avoid flotation, with the spacers to ensure that it remains approximately on the central axis of the cylinder. Fill the cylinder and fit the stopper.

Place the cylinder in the freezing chamber, cool it and maintain at the required temperature for 24 h. At the end of this period, thaw the sample for not less than 24 h and not more than 96 h in an ambient temperature of (20 ± 5) °C.

Repeat three times to give four cycles of freezing and thawing before testing.

Examine the sample for stratification and non-homogeneity.

Dimensions in millimetres



Key

1	spacers (e.g. plastics cable strap)
2	weight at sealed end

Figure B.1 — Typical form of polyethylene tube

Annex C
(normative)

Determination of percentage of sediment

C.1 Sampling

Use a sample prepared in accordance with A.1. Ensure that any sediment is dispersed by shaking the sample container. Take two samples, testing one immediately and the other after ageing for (24 ± 2) h at (60 ± 2) °C in a filled container without access to air.

C.2 Apparatus

The usual laboratory apparatus and, in particular, the following.

C.2.1 Centrifuge tubes, graduated.

C.2.2 Centrifuge, operating at (6 000 ± 600) m/s^2.

NOTE A centrifuge and tubes in accordance with ISO 3734 are suitable.

C.2.3 Sieve, of nominal aperture size 180 µm, in accordance with ISO 3310-1.

C.2.4 Wash bottle, plastic.

C.3 Procedure

Centrifuge each sample of the concentrate for (10 ± 1) min. Determine the volume of the sediment and record it as a percentage of volume of the centrifuged sample volume.

Wash the contents of the centrifuge tube (C.2.1) onto the sieve (C.2.3) and check whether or not the sediment can be dispersed through the sieve by the jet from the plastic wash bottle (C.2.4).

Annex D
(normative)

Determination of viscosity for pseudo-plastic foam concentrates

D.1 General

This annex gives the procedure for determining the viscosity for pseudo-plastic foam concentrates. The procedure for determining the viscosity using a rotational viscometer with defined shear rate is described in Annex J (see also ISO 3219:1993).

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

D.2 Viscosity determination

D.2.1 Apparatus

The usual laboratory apparatus and, in particular, the following.

D.2.1.1 Viscometer, rotational, fitted with a temperature control unit that can maintain the sample temperature within ±1 °C of the required temperature, in accordance with Annex J, with the following parameters:

— maximum shear stress: ≥ 75 Pa;

— maximum shear rate: ≥ 600 s^{-1}.

D.2.2 Test temperature

The viscosity of the foam concentrate shall be measured at temperatures from 20 °C to and including the lowest temperature for use claimed by the manufacturer in steps of 10 °C. Use a fresh sample for each temperature.

D.2.3 Viscosity measurement

If the sample contains suspended air bubbles, the sample shall be centrifuged for 10 min using the apparatus specified in C.2.1 and C.2.2 before the sample is applied in the apparatus.

The test should be performed in accordance with the following test procedure:

a) adjust the temperature control unit;

b) set the gap;

c) apply the sample;

d) wait a minimum of 10 min (period of no shear) to reach temperature equilibrium;

e) pre-shear for 1 min at 600 s^{-1};

f) wait 1 min without shearing;

g) measure the shear stress for 10 s at each shear rate, starting at the lowest shear rate (preferably at 75 s^{-1}).

Measure the shear stress at least at eight different shear rates over the range 0 s^{-1} to 600 s^{-1}, e.g. 75 s^{-1}, 150 s^{-1}, 225 s^{-1}, 300 s^{-1}, 375 s^{-1}, 450 s^{-1}, 525 s^{-1}, 600 s^{-1}. Calculate the apparent viscosity, v, expressed in millipascal-seconds, from Formula (D.1):

$$v = 1\,000 \times \frac{s_1}{s_2} \tag{D.1}$$

where

s_1 is the shear stress, expressed in pascals;

s_2 is the shear rate, expressed in reciprocal seconds.

D.2.4 Results

Report the results as a table, including the test temperature (°C), shear rate (1 s^{-1}), shear stress (Pa), and apparent viscosity (mPa·s).

Annex E
(normative)

Determination of surface tension

E.1 Reagents

E.1.1 Foam concentrate solution, at the recommended concentration for use in freshly made analytical water conforming with grade 3 as defined in ISO 3696 and surface tension not less than 70 mN/m.

NOTE The solution can be made up in a 100 ml volumetric flask using a pipette to measure the foam concentrate.

E.1.2 Cyclohexane, of purity not less than 99 %, for interfacial tension and spreading coefficient only.

E.2 Procedure for surface tension

Determine the surface tension of the solution (E.1.1) at a temperature of (20 ± 1) °C using the ring method in accordance with ISO 304.

Annex F
(normative)

Determination of expansion and drainage time

F.1 Apparatus

The usual laboratory apparatus and, in particular, the following.

F.1.1 Collecting vessel, plastic cylindrical, of volume known to ±1 %, equipped with a bottom discharge facility, as shown in Figure F.1.

F.1.2 Foam collector, for expansion and drainage measurement; stainless steel, aluminium, brass and plastics are suitable materials for the collection surface; see Figure F.2.

F.1.3 Foam-making nozzle, that, when tested with water, has a flow rate of 11,4 l/min at a nozzle pressure of (630 ± 30) kPa [(6,3 ± 0,3) bar[3]]; see Figure F.3 and Figure F.4.

F.1.4 Foam solution tank, connected to the nozzle.

F.2 Temperature conditions

Carry out the tests under the following temperature conditions:

- air (20 ± 5) °C;
- foam solution (17,5 ± 2,5) °C.

F.3 Procedure

Check that the pipework and hose from the foam solution tank (F.1.4) to the nozzle (F.1.3) is completely full of solution. Set up the nozzle horizontally, directly in front of the foam collector (F.1.2), with the front of the nozzle (3 ± 0,3) m from the top edge of the collector. Wet the vessel internally and weigh it. Record the mass as m_1. Set up the foam equipment and adjust the nozzle pressure within the range (630 ± 30) kPa [(6,3 ± 0,3) bar] to give a flow rate of 11,4 l/min. With the drain at the base closed, collect foam, taking care that voids are not formed in the vessel. Start the timing device when the vessel is half full. As soon as the vessel is full, stop collecting foam and strike the foam surface level with the rim. Weigh the vessel and record the mass, m_2.

Calculate the expansion, E, from Formula (F.1):

$$E = \frac{V}{m_2 - m_1} \tag{F.1}$$

where

V is the volume, expressed in litres, of the collecting vessel (F.1.1);

m_1 is the mass, expressed in kilograms, of the empty vessel;

---

[3] 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.

m_2 is the mass, expressed in kilograms, of the full vessel.

Assume that the density of the foam solution is 1,0 kg/l.

Open the drainage facility (see F.1.1) and collect the foam solution in the graduated measuring cylinder to measure the 25 % drainage time. Adjust the drainage facility such that the drained foam solution can flow out whilst preventing the passage of foam.

NOTE This can be achieved by controlling the level of the liquid/foam interface in the plastics tube at the outlet.

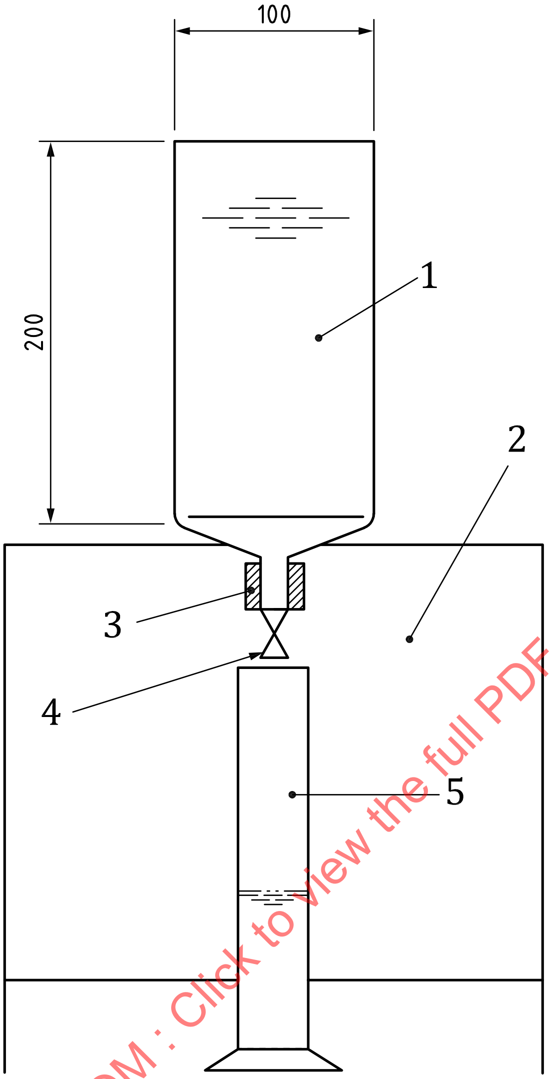
F.4 Synthetic sea water

Prepare the synthetic sea water by dissolving the components listed in Table F.1.

Table F.1 — Components of synthetic sea water

Mass percentage	Component	Chemical formula
2,50	Sodium chloride	$NaCl$
1,10	Magnesium chloride	$MgCl_2 \cdot 6H_2O$
0,16	Calcium chloride	$CaCl_2 \cdot 2H_2O$
0,40	Sodium sulphate	Na_2SO_4
95,84	Potable water	—

Dimensions in millimetres



Key

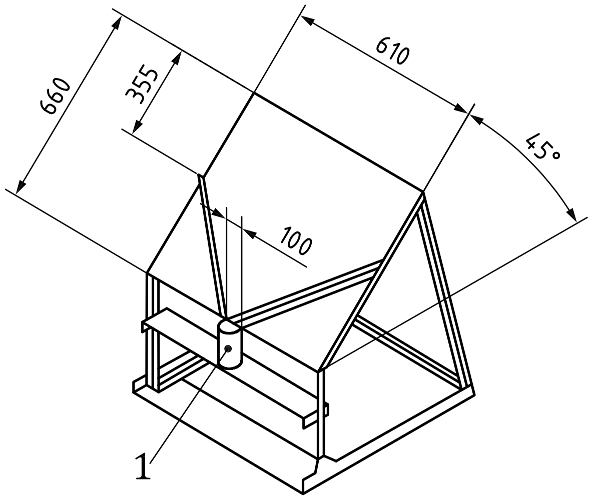
1 collecting vessel
2 stand
3 transparent tube, 30 mm to 50 mm long, 6 mm to 8 mm bore
4 discharge outlet closure
5 graduated measuring cylinder

NOTE 1 The nominal base angle of the pot is 11°.

NOTE 2 Foam can effectively be separated from draining liquid by inserting an aperture size 125 µm-sieve between the bottom outlet of collection vessel 1 and the upper side of discharge outlet closure 4. This provides more stable results.

Figure F.1 — Collecting vessel for determination of expansion and drainage time

Dimensions in millimetres unless otherwise specified

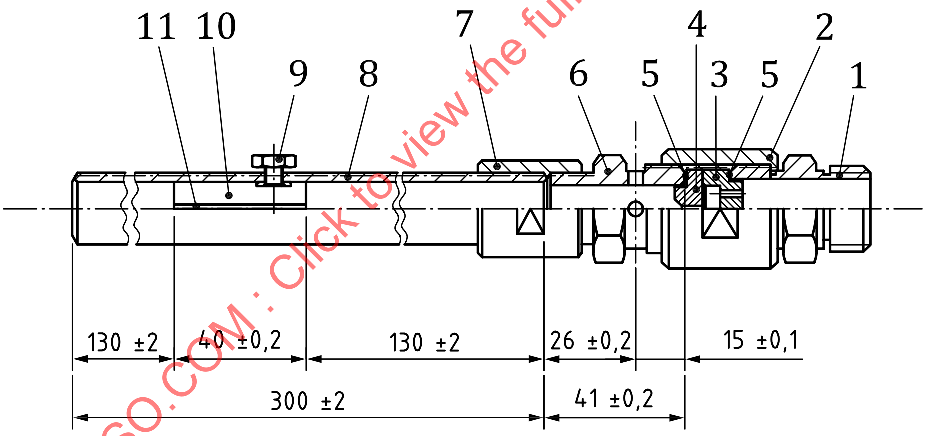


Key

1 collecting vessel

Figure F.2 — Foam collector for expansion and drainage measurement

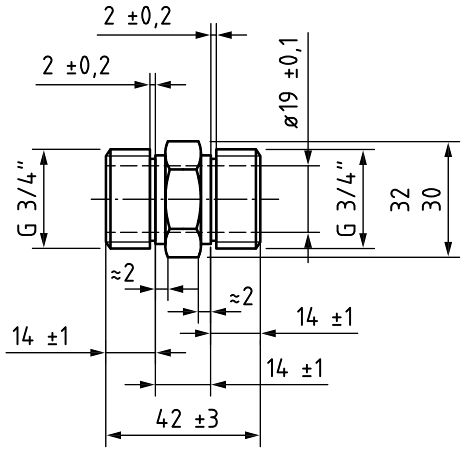
Dimensions in millimetres unless otherwise specified



NOTE The numbers in this figure refer to the subfigures in Figure F.4.

Figure F.3 — Foam-making nozzle – General arrangement

Dimensions in millimetres unless otherwise specified



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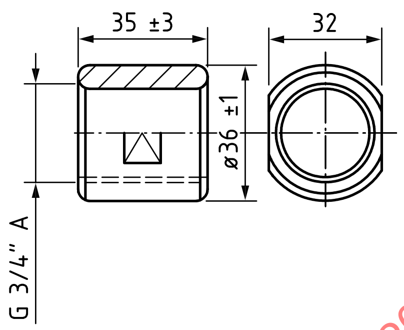

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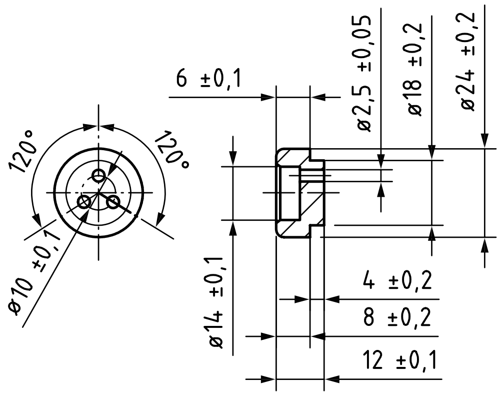

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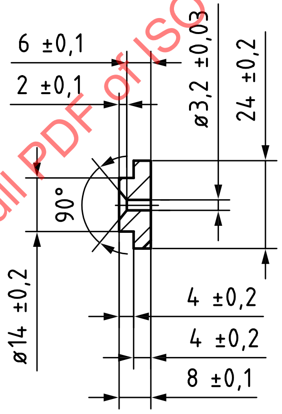

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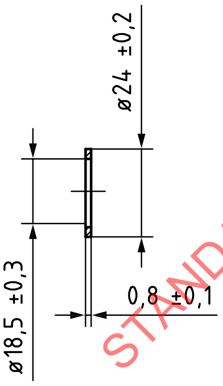

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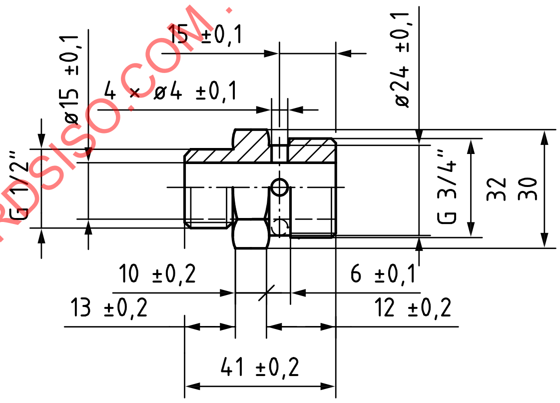

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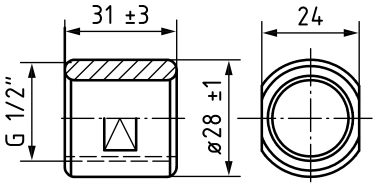
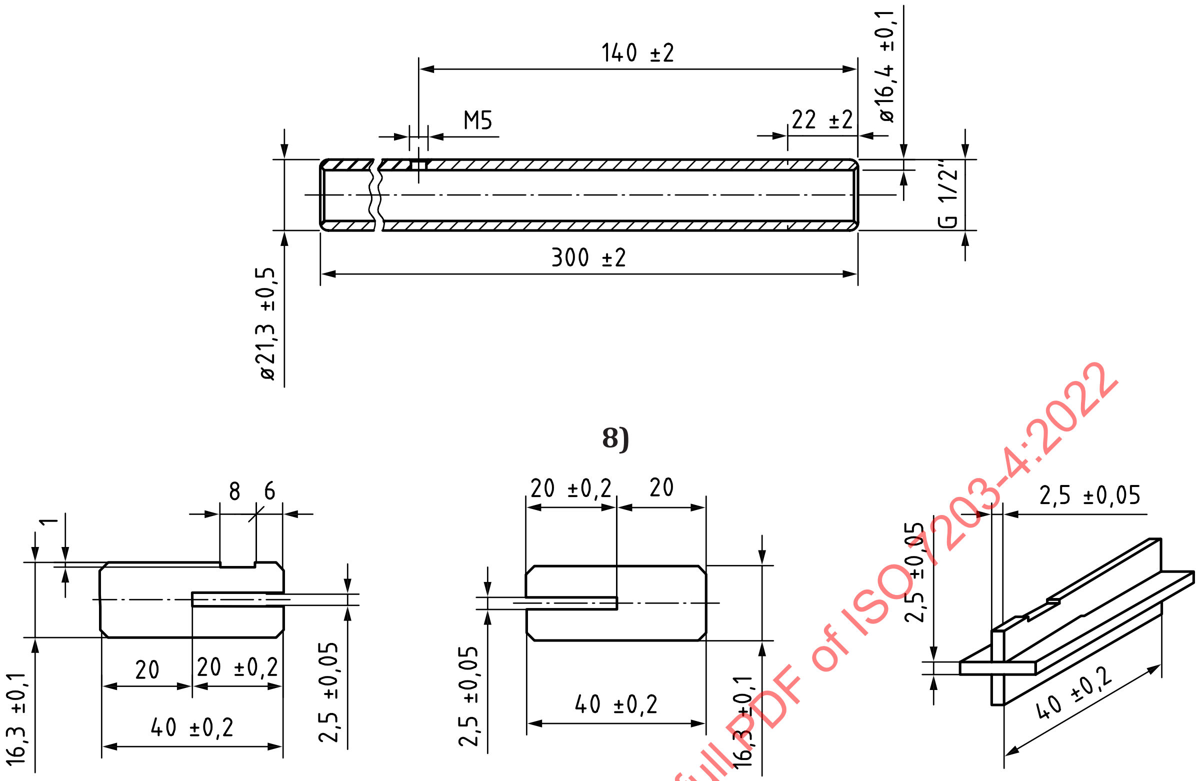


7)



8)

9) **10)** **9–10)**

NOTE The numbers underneath each figure refer to the numbers in Figure F.3.

Figure F.4 — Foam-making nozzle — Details

Annex G
(normative)

Determination of fire test performance

G.1 General

All of the following tests shall be conducted at the manufacturer's recommended concentration and this shall remain the same for all tests.

G.1.1 Wood crib fire test

The evaluation of wood crib fire performance shall be executed according to one of the following options:

Option 1: The test result using Class A foam solution shall extinguish at least a 3A crib in two out of three consecutive attempts. Execute the wood crib fire test following the requirements for general and Class A test fires in ISO 7165 using a portable fire extinguisher listed with a 2A rating using a maximum of 9,5 l water. The fire test with the Class A foam solution shall be executed with the same device using a maximum of 9,5 l of foam solution.

Option 2: The test result using Class A foam solution shall extinguish at least a 2A crib in two out of three consecutive attempts. Execute the wood crib fire test following the requirements for general and Class A test fires in ISO 7165 using a portable fire extinguisher listed with a 1A rating using a maximum of 6 l water. The fire test with the Class A foam solution shall be executed with the same device using a maximum of 6 l of foam solution.

G.1.2 Deep-seated fire test

The following tests shall be conducted three times with plain water and three times with the Class A foam solution.

The test is passed if the Class A foam solution extinguishes the cotton in all three runs and if the average of the collected run-off is less than the average of the plain water run-off.

G.1.2.1 Equipment

a) A cylindrical basket of perforated sheet steel, 114 mm in diameter and 178 mm high;

b) (100 ± 2) g of raw cotton;

c) steel cylinder 35 mm in diameter, 33 mm long;

d) (250 ± 0,1) ml water;

e) (250 ± 0,1) ml Class A foam concentrate;

f) a pan (or petri dish) of a diameter greater than the diameter of the basket.

G.1.2.2 Procedure

a) Weigh the pan and note the net weight;

b) place (50 ± 1) g of cotton into the basket and stuff it to fill the bottom portion of the cylinder;

c) heat the steel cylinder to a temperature of (590 ± 5) °C;

d) place the steel cylinder on the cotton in the basket and immediately insert the remainder of the raw cotton on top of the steel cylinder to fill up the basket;

e) place the basket above the beaker;

f) pour 250 ml of test liquid (water or Class A foam solution) slowly onto the cotton, allowing for it to penetrate into the cotton, and catch the liquid with the beaker;

g) record the weight of the pan with the collected liquid. The weight of run-off is calculated from the total weight of the beaker with the liquid minus the net weight of the pan.

Annex H
(normative)

Toxicology and environmental information

The manufacturer shall provide toxicological data as listed below for both the concentrate and the foam solution.

- The data given below shall be generated in accordance with the most recent revision of the GHS (UN Globally Harmonized System of Classification and Labelling of Chemicals) where a maximum of 5 % of the constituents of the mixture may have an unknown level of toxicity as defined in the regulation.

  NOTE The GHS allows the application of mathematical methodologies to evaluate the toxicological properties of a mixture based on the toxicological information of its constituents. This is to reduce animal (vertebrates) testing as much as possible. In general, the mathematical evaluation leads to a higher toxicology level compared to testing.

- If more than 5 % of the mixture has an unknown toxicity, the manufacturer shall generate the missing data by testing in accordance with the GHS and shall then provide the data generated. The testing may only be carried out on those constituents of the mixture for which data are missing or on the entire mixture.

- For the testing, the methods proposed in Table H.1 may be applied or alternatively suitable methods from local legislation may be used, as appropriate.

- It shall be mentioned if the data provided is based on mathematical methodology or on testing.

Table H.1 — Requested data and reference standard

Parameter	**Proposed method**
Bacteria (Waste water treatment)	ISO 11348-2
Aquatic life	
Fish	OECD 203
Daphnia	OECD 202
Algae	OECD 201
Degradation	OECD 301f
Mammals	
Acute toxicity, oral, rats	OECD 420
Skin irritation and corrosion	OECD 404
Eye irritation	OECD 405
Soil	
Earthworm, acute toxicity test	OECD 207
Terrestrial plant test	OECD 208