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**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*



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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 7203-3 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*

Annex A forms an integral part of this part of ISO 7203. Annexes B to D are for information only.

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## Introduction

Firefighting foams are widely used to control and extinguish fires of flammable liquids and for inhibiting re-ignition. They may also be used to prevent ignition of flammable liquids and, under 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 in annex D.

A specification for foam systems designed in accordance with this part of ISO 7203 is being prepared and will be published as ISO 7076.

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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 part of ISO 7203 is applicable to low expansion foam concentrates which conform to ISO 7203-1. It specifies additional requirements to assess their suitability for use on water-miscible fuels.

In this part of ISO 7203, the fire performance is tested using acetone as fuel, which also forms the basis for the performance classification. However, there are a large number of water-miscible liquids which have more or less different properties compared to acetone. It has been shown by tests using other fuels that the performances of various foams differ considerably. See clause 6.

### 2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 7203. At the time of publication, the edition indicated was 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 edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

### 3 Definitions

For the purposes of this part of ISO 7203, the definitions given in ISO 7203-1 apply.

### 4 General requirements

The foam concentrate shall conform to ISO 7203-1.

### 5 Grades and uses of alcohol-resistant foam concentrates

#### 5.1 Grade

The foam concentrate shall be graded for

- extinguishing performance as grade AR I or AR II,
- burnback resistance as level A, B or C,

according to its fire test performance (see clause 6).

NOTE Typical anticipated extinguishing performance and burnback resistance are given in annex B.

**5.2 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.

**6 Test fire performance (water-miscible liquids)**

**6.1** The foam produced from the foam concentrate before and, if the foam concentrate is designated temperature-sensitive, after conditioning in accordance with A.2 of ISO 7203-1:1995, with potable water and if appropriate with the synthetic sea water of G.1.4 of ISO 7203-1:1995, shall have an extinguishing performance class and burnback resistance level as specified in table 1 when tested in accordance with annex A.

**6.2** In this part of ISO 7203, the fire performance is tested using acetone as fuel, which also forms the basis for the performance classification. However, there are a large number of water-miscible liquids which have more or less different properties compared to acetone. It has been shown by tests using other fuels that the performances of various foams differ considerably. Examples of such fuels are isopropyl alcohol (IPA) and methyl ethyl ketone (MEK).

**CAUTION: It is therefore essential that the user check for any unfavourable or unacceptable loss of efficiency when the foam is used against fires in water-miscible liquids other than acetone.**

The fire test conditions and procedure described in annex A might be used in order to achieve results comparative with acetone and related requirements. Other fuels might also require the use of other application rates, both lower and higher, to achieve relevant test data. Other trays might then be used correcting the amount of fuel to achieve the same fuel depth as specified in annex A.

It is also essential for the user to note that other fuel depths and methods of application compared to those specified in annex A can cause considerable loss in efficiency. These matters should be carefully considered by the user when assessing the suitability for particular applications.

**Table 1 — Maximum extinction times and minimum burnback times**

Times in minutes

Extinguishing performance grade	Burnback resistance level	Extinction time not more than	Burnback time not less than
AR I	A	3	15
	B	3	10
	C	3	5
AR II	A	5	15
	B	5	10
	C	5	5

NOTE Typical extinguishing performance grades and burnback resistance levels for different types of foam concentrate are given in annex B.

For extinguishing performance, grade AR I is the higher grade and grade AR II the lower grade. For burnback resistance, level A is the highest level and level C the lowest level.

## 7 Marking, packaging and specification sheet

In addition to the information specified in 14.1 of ISO 7203-1:1995, the following information shall be provided in the same format:

- a) additional to the designation of 14.1 a) of ISO 7203-1:1995, the words “suitable for use on water-miscible liquids”;
- b) additional to the grade and level of 14.1 of ISO 7203-1:1995, the words “(on water-immiscible liquids)”;
- c) the grade (AR I or AR II) and level (A, B or C) of the foam concentrate, and the words “on water-miscible liquids (ACETONE)”;
- d) if appropriate, the minimum and/or maximum transit time (between proportioning and foam-making) recommended by the manufacturer.

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## Annex A (normative)

### Determination of fire test performance

#### A.1 General

See clause 6.

NOTE Where appropriate, it is recommended that the tests of this part of ISO 7203 are carried out after those of ISO 7203-1 so as to avoid the expense of unnecessary testing of foam concentrates which do not comply in other respects.

#### A.2 Test series

**A.2.1** A test is successful only if all the appropriate requirements of clause 6 are met.

**A.2.2** For foam concentrates not compatible with sea water, carry out two or three tests (the third test is not necessary if the first two are both successful or if both are not successful). The concentrate complies with clause 6 if two tests are successful.

**A.2.3** For foam concentrates compatible with sea water, carry out one of the first two tests with potable water the other with the synthetic sea water of A.3.3. If both are successful, or if both are not successful terminate the test series. If only one of the tests is not successful repeat that test. If this repeat test is successful carry out a second repeat test, otherwise terminate the test series. The concentrate complies with the clause 6 either:

- a) if the first two tests are successful; or
- b) if one of the first two tests and both repeat tests are successful.

#### A.3 Test conditions

##### A.3.1 Temperature and wind speed

Carry out the tests under the following conditions:

Air temperature	(15 ± 5) °C
Fuel temperature	(17,5 ± 2,5) °C
Foam solution temperature	(17,5 ± 2,5) °C
Maximum wind speed	3 m/s in the proximity of the test pan

NOTE If necessary, some form of windscreen may be used.

##### A.3.2 Records

During the fire test record the following:

- indoor or outdoor test;
- air temperature;

- fuel temperature;
- foam solution temperature;
- wind speed;
- extinction time;
- 25 % burnback time.

NOTE For quality control purposes, it is recommended that 90 % and 99 % control times are recorded. Control times may either be determined visually by an experienced person or may be determined from thermal radiation measurements. Annex H in ISO 7203-1:1995 gives details of one method suitable for low- and medium-expansion foams.

### A.3.3 Foam solution

Prepare a foam solution following the recommendations from the supplier for concentration, maximum premix (transit) time, compatibility with the test equipment, avoiding contamination by other types of foam, etc.

Use potable water to make up the foam solution and, if the manufacturer claims the concentrate to be suitable for sea water, also make a foam solution using simulated sea water made up by dissolving the following components:

Mass fraction (%)	Component
2,50	Sodium chloride (NaCl)
1,10	Magnesium chloride ( $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ )
0,16	Calcium chloride ( $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ )
0,40	Sodium sulfate ( $\text{Na}_2\text{SO}_4$ )
95,84	Potable water

### A.3.4 Fuel

Use acetone of not less than 99 % purity.

## A.4 Fire test

See clause 6.

### A.4.1 Apparatus

**A.4.1.1 Circular fire tray**, made of steel, with dimensions as follows:

diameter at rim:	(1 480 ± 15) mm
depth:	(150 ± 10) mm
nominal thickness of steel wall:	2,5 mm

with a vertical steel backboard (1 ± 0,05) m wide and (1 ± 0,05) m long, fitted as closely as possible along the curved top of the curved wall, or formed by an extension of the wall.

The tray should have an area of approximately 1,73 m<sup>2</sup>

**A.4.1.2 Foam making equipment**, in accordance with F.1.3 of ISO 7203-1:1995.

**A.4.1.3 Burnback pot**, of nominal 2,5 mm steel, of diameter (300 ± 5) mm and of height (250 ± 5) mm.

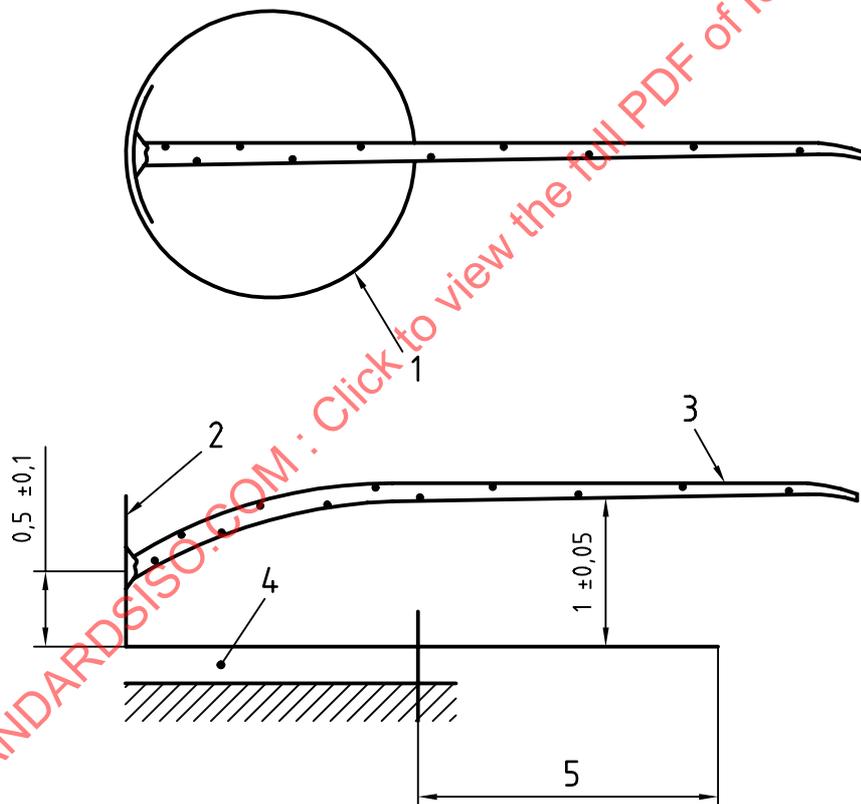
**A.4.2 Test procedure**

Place the tray directly on the ground and ensure that it is level. Set up the foam nozzle horizontally ( $1 \pm 0,05$ ) m above the fuel level in a position where the central part of the foam discharge will strike the centre axis of the backboard ( $0,5 \pm 0,1$ ) m above the fuel level (see figure A.1). Add ( $125 \pm 5$ ) l of fuel, to give a nominal freeboard of 78 mm.

Ignite the tray not more than 5 min after adding the fuel and allow it to burn for a period of ( $120 \pm 5$ ) s after full involvement of the surface of the fuel then start foam application. Record the extinction time as the period between the start of foam application and extinction.

Apply foam for ( $180 \pm 2$ ) s for extinction class I, or for ( $300 \pm 2$ ) s for extinction class II. Ignore any spillage of foam from the tray during foam application. Stop foam application and after a further ( $300 \pm 10$ ) s place the burnback pot, containing ( $2 \pm 0,1$ ) l of acetone in the centre of the tray and ignite. Record the time when 25 % of the tray is covered with sustained flames.

Dimensions in metres



**Key**

- 1 Fire tray
- 2 Steel backboard
- 3 Foam nozzle
- 4 Fuel
- 5 Distance as required

**Figure A.1 — Test fire for alcohol-resistant foams**

## Annex B (informative)

### Anticipated performance

Typical anticipated performances for various types of alcohol resistant foams on **acetone** are given in table B.1.

NOTE Other fuels might influence the performance of a foam considerably, see 6.2.

**Table B.1 — Anticipated performance**

Type of foam	Extinguishing performance class	Burnback resistance level
AFFF/AR	AR I	A or B
FFFP/AR	AR I	A or B
FP/AR	AR I or II	A or B
P/AR	AR II	A or B
S/AR	AR I	B

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## Annex C (informative)

### Small-scale fire test for quality control purposes

#### C.1 General

Annex A describes large-scale fire tests for type approval. This annex describes a small-scale fire test which might be suitable for quality control purposes. It should be noted that the foam quality produced with the nozzle specified in this informative annex does not give the same foam properties as the foam nozzle used in the normative part of this part of ISO 7203. Expansion and drainage are therefore not directly comparable using the two nozzles.

#### C.2 Test conditions

##### C.2.1 Temperature and wind speed

Carry out the tests under the following conditions:

Air temperature	(15 ± 5) °C
Fuel temperature	(17,5 ± 2,5) °C
Foam solution temperature	(17,5 ± 2,5) °C
Maximum wind speed	indoors in a draught-free room

##### C.2.2 Records

During the fire test record the following:

- air temperature
- fuel temperature
- foam solution temperature
- wind speed
- 90 % control
- 99 % control
- extinction time
- 100 % burnback time

NOTE Control and burnback times may either be determined visually by an experienced person or may be determined from thermal radiation measurements. Annex H of ISO 7203-1:1995 gives details of one method suitable for low- and medium-expansion foams.

### C.2.3 Foam solution

Prepare a foam solution following the recommendations from the supplier for concentration, maximum premix time, compatibility with the test equipment, avoiding contamination by other types of foam, etc.

Use potable water to make up the foam solution and, if the manufacturer claims the concentrate to be suitable for sea water, also make a foam solution using simulated sea water according to the composition given in annex A.

### C.2.4 Fuel

Use acetone of not less than 99 % purity.

NOTE Other fuels may be used for comparative purposes.

## C.3 Fire test

### C.3.1 Apparatus

**C.3.1.1 Circular fire tray**, made of brass, with a turned-over rim and central drain point and valve, with dimensions as follows:

internal diameter at rim:	(565 ± 5) mm
depth:	(150 ± 5) mm
conical base:	(30 ± 5) mm
nominal thickness of brass wall:	(1,2 ± 0,2) mm

with a curved steel backboard (0,3 ± 0,05) m high, (0,6 ± 0,05) m long and of 2 mm nominal thickness, fitted inside and along the fire tray side located opposite the nozzle, as shown in figure C.1.

The tray should have an area of approximately 0,25 m<sup>2</sup>.

**C.3.1.2 Foam-making equipment**, consisting of a branch pipe having a maximum flow rate of 5 l/min.

It is fitted with a collar which can be positioned to allow foam to be projected from the branch pipe before reaching the nozzle, so the flow rate from the nozzle can be controlled (see figure C.2).

**C.3.1.3 Burnback pot**, of (1,2 ± 0,2) mm brass, of diameter (120 ± 2) mm and (80 ± 2) mm internal height, with four studs on the base to give an overall height of (96 ± 2) mm.

The pot shall have a turned-over rim and a chain fitted to the rim to allow the pot to be lifted using a metal rod and lowered into the tray when required.

### C.3.2 Test procedure

Place the tray approximately 1 m above the floor in a steel frame with four legs and ensure that it is level. Carry out the tests beneath an extraction hood which will just exhaust the smoke without interfering with the fire.

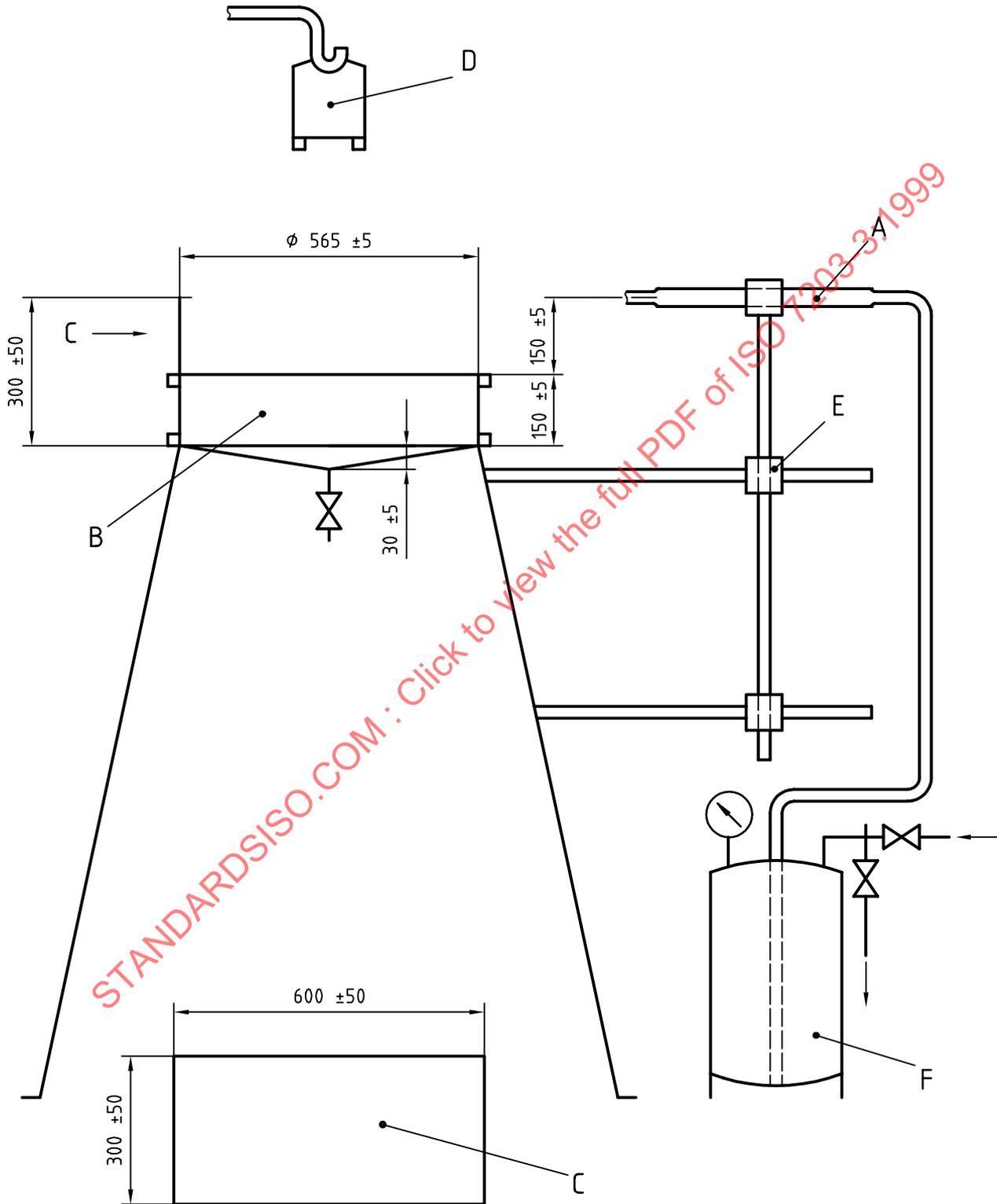
Pressurize the premix to 7 bar and adjust the branch pipe flowrate to (1 625 ± 75) g/min. It is convenient to collect the foam in a tared vessel for 6 s and weigh to calculate the flowrate.

Set up the foam nozzle horizontally with the by-pass holes directed downwards (150 ± 5) mm above the rim of the tray in a position where the central part of the foam discharge will strike the centre of the backboard (see figure C.1). Drain, clean and dry the tray and close the drain valve. Add (9 ± 0,1) l of acetone to the tray.

Ignite the tray 120 s after adding the acetone and allow it to burn for a period of (120 ± 5) s after full involvement of the surface of the fuel, then start foam application. Record the extinction time as the period between the start of foam application and extinction of the fire.

Apply foam for  $(120 \pm 2)$  s or, if the fire still is not extinguished, for  $(240 \pm 2)$  s. Stop foam application and, after a further  $(60 \pm 5)$  s, ignite and lower the burnback pot, containing  $(0,3 \pm 0,01)$  l of acetone into the centre of the tray. Care shall be taken not to allow foam to enter the pot. Record the time when 100 % of the tray is covered with sustained flames.

Dimensions in millimetres



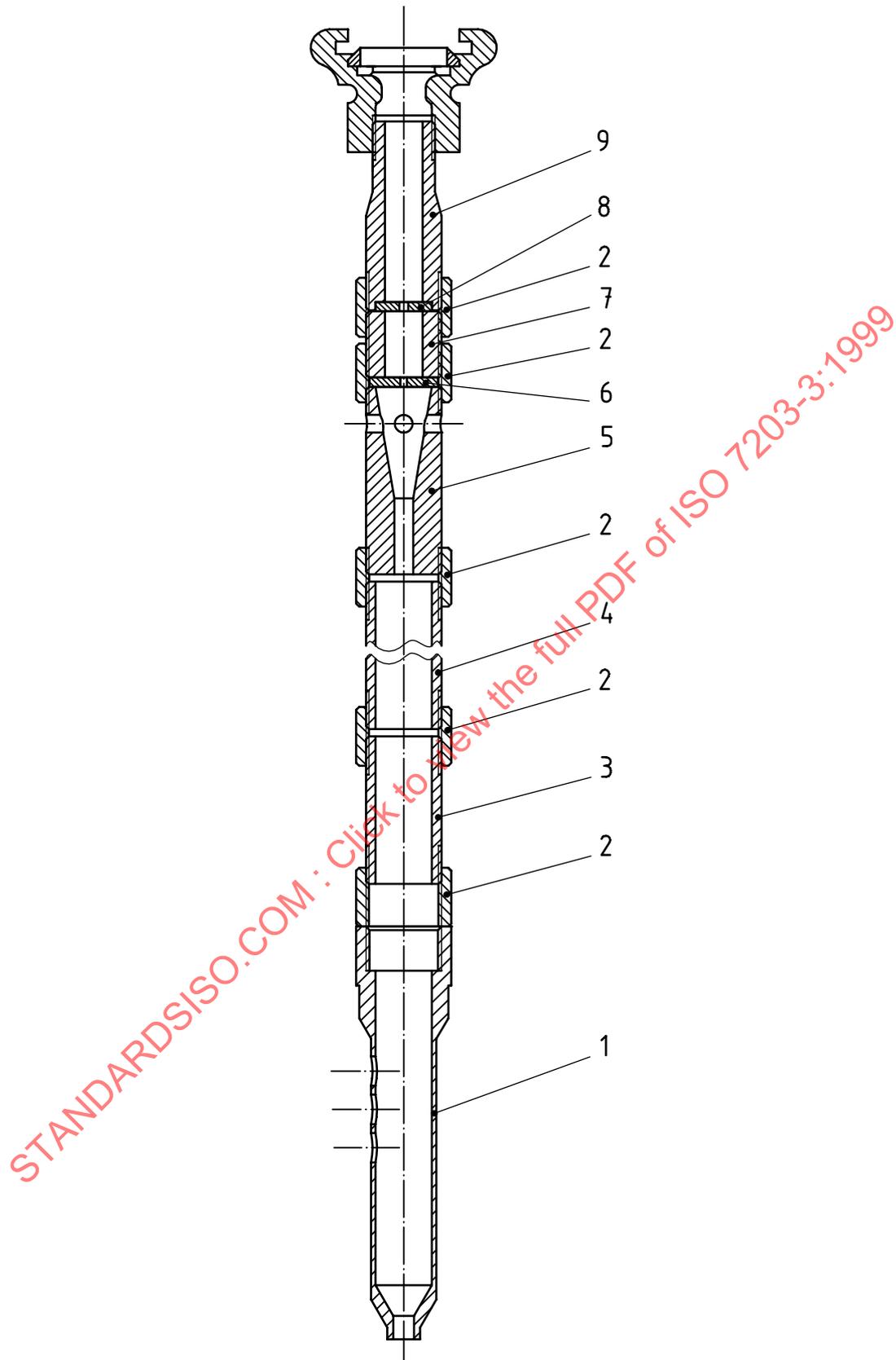
**Key**

- A Foam nozzle
- B Fire tray

- C Back board
- D Burnback pot

- E Adjustable boss
- F Foam solution

**Figure C.1 — Quality control test fire (0,25 m<sup>2</sup>) for alcohol-resistant foams**



**Key**

- |                             |                    |                   |
|-----------------------------|--------------------|-------------------|
| 1 Nozzle with foam diverter | 4 Stabilizing tube | 7 Spacing piece   |
| 2 Coupling                  | 5 Venturi tube     | 8 Orifice plate P |
| 3 Mixing tube               | 6 Orifice plate G  | 9 Inlet           |

**Figure C.2 — Foam branch pipe for quality control test — Typical assembly**

Dimensions in millimetres

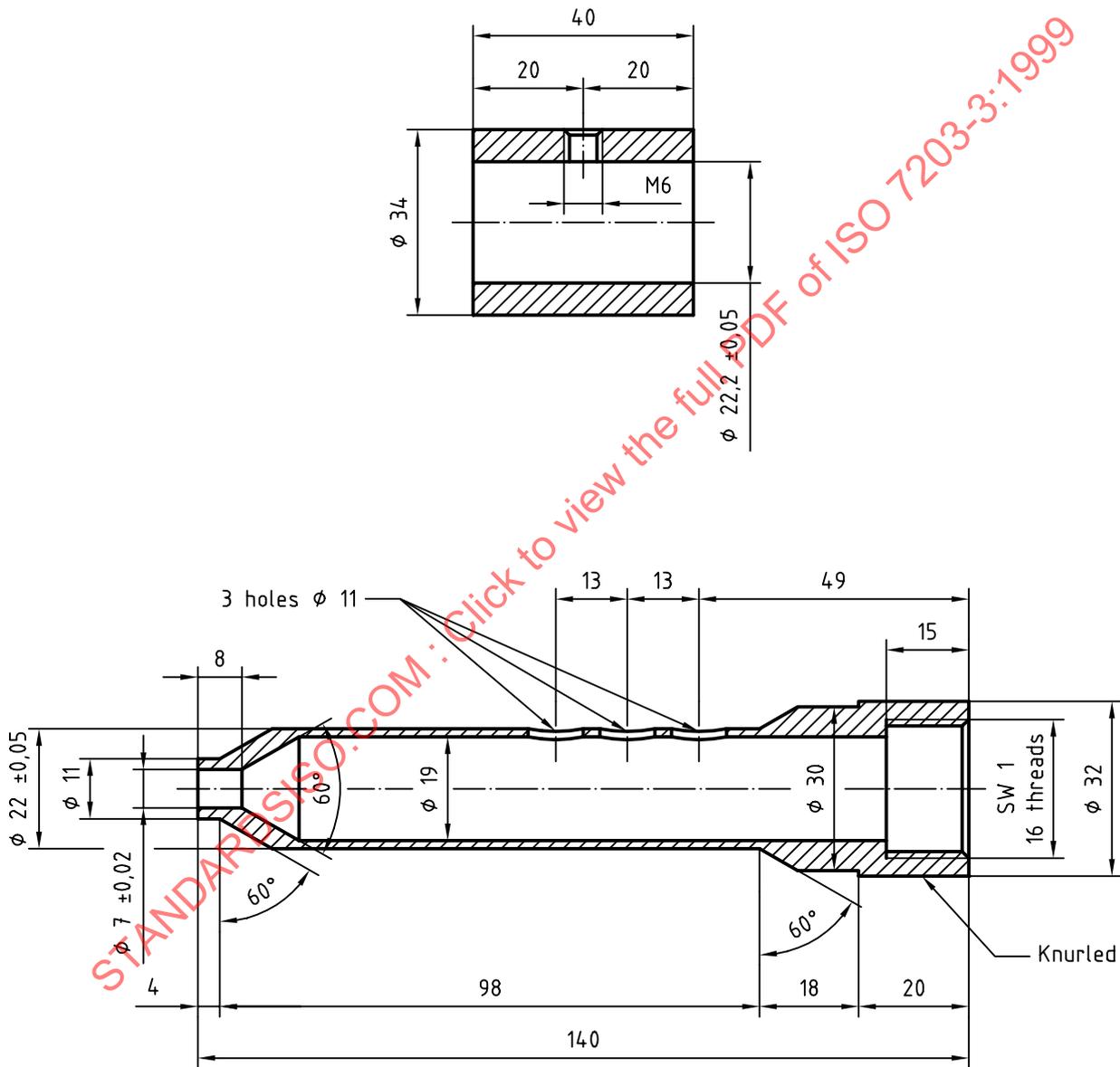


Figure C.3 — Sleeve and nozzle with foam diverter

Dimensions in millimetres

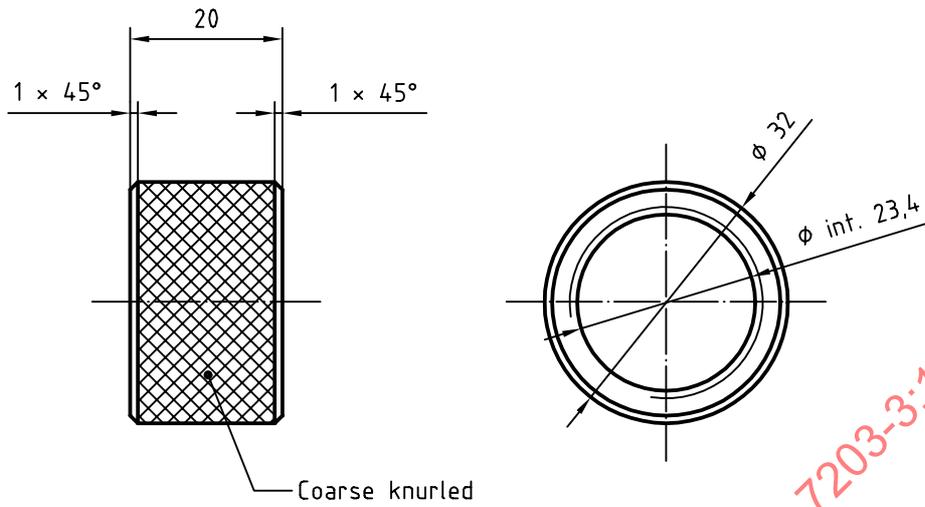


Figure C.4 — Coupling

Dimensions in millimetres

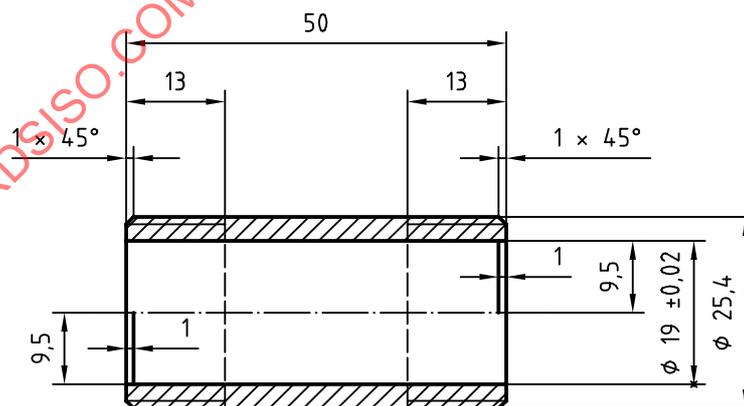
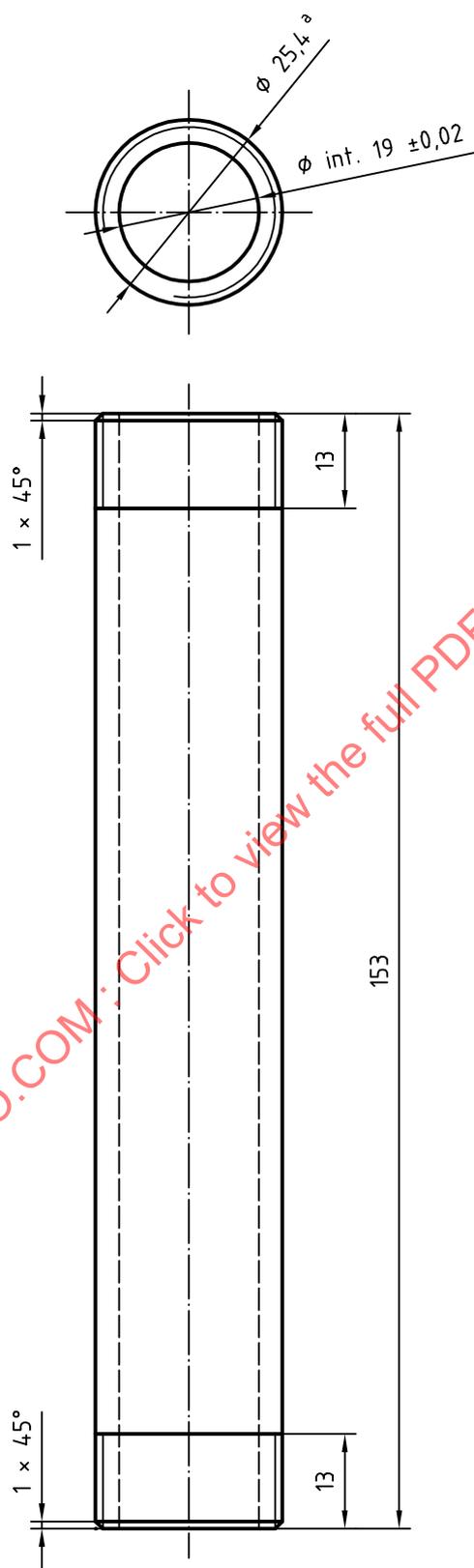


Figure C.5 — Mixing tube

Dimensions in millimetres



End faces shall be 90° to axis.

<sup>a</sup> Thread: Whitworth, 16 tpi

Figure C.6 — Stabilizing tube

Dimensions in millimetres

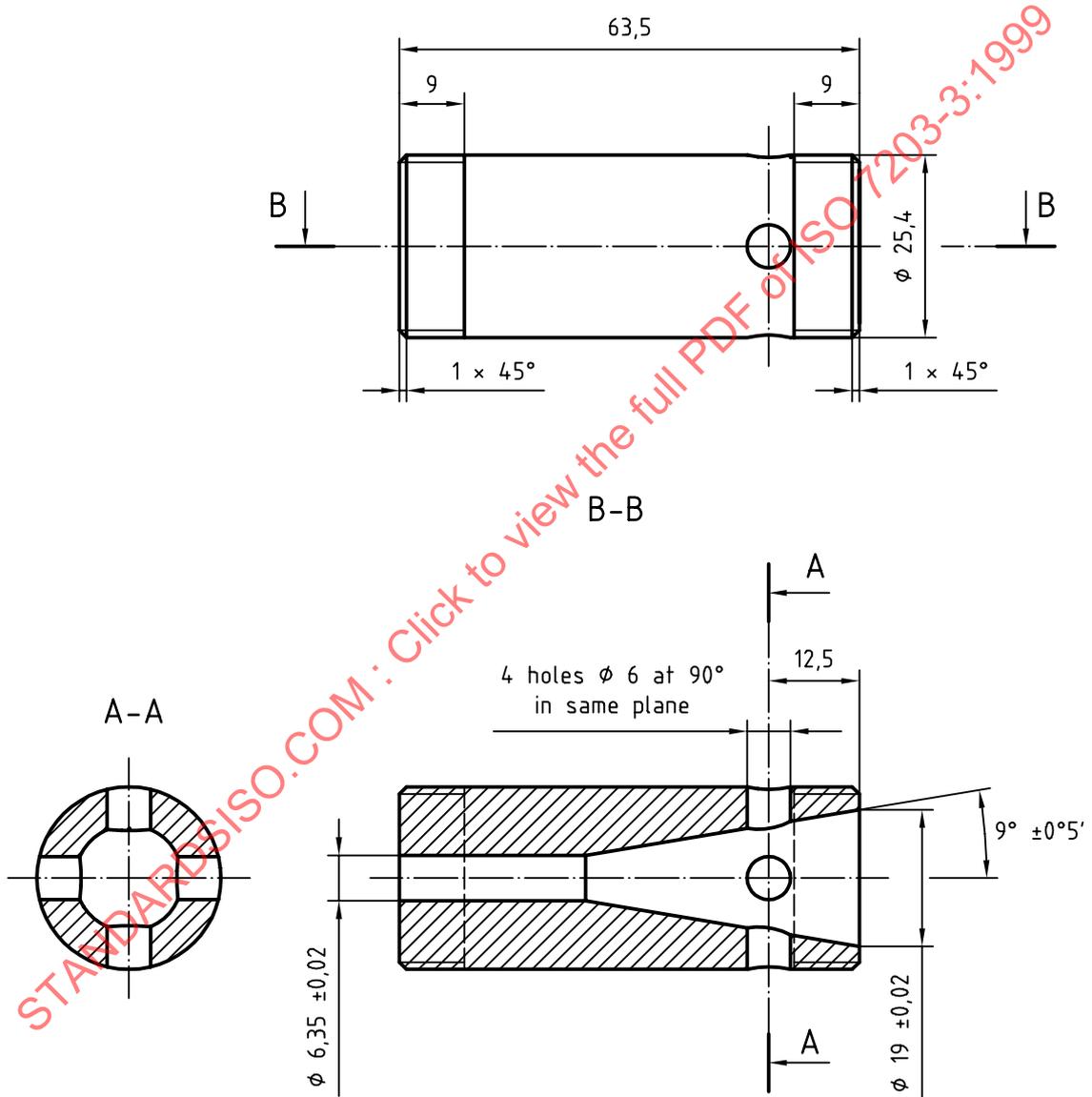


Figure C.7 — Venturi tube