BRITISH STANDARD

BS EN 615:2009

Fire protection — Fire extinguishing media — Specifications for powders (other than class D powders)

ICS 13.220.10,

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 615:2009. It supersedes BS EN 615:1995 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FSH/18/4, Powder media.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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Fire protection - Fire extinguishing media - Specifications for powders (other than class D powders)

Protection contre l'incendie - Agent extincteurs - Prescriptions pour les poudres (autres que les poudres pour classe D)

Brandschutz - Löschmittel - Anforderungen an Löschpulver (nicht für Löschpulver der Brandklasse D)

This European Standard was approved by CEN on 12 March 2009.

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Foreword

This document (EN 615:2009) has been prepared by Technical Committee CEN/TC 191 “Fixed firefighting systems”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2009, and conflicting national standards shall be withdrawn at the latest by October 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 615:1994.

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1 Scope

This European Standard is applicable to fire extinguishing powders for fire classes A, B and C. It specifies, by means of defined test methods, minimum requirements for the chemical and physical properties and minimum extinguishing capabilities. Requirements are also specified for the information and data to be given by the supplier.

This European Standard is not applicable to powders for class D fires.

NOTE 1 The classification of fires is given in EN 2 [1].

NOTE 2 Some countries have national standards for class D powders.

2 Normative references

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.

EN 3 (all parts), *Portable fire extinguishers*

EN ISO 4788, *Laboratory glassware - Graduated measuring cylinders (ISO 4788:2005)*

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

3 Definitions

3.1
(extinguishing) powder
extinguishing medium composed of finely divided solid chemical products consisting of one or more principal components which are combined with additives to improve its characteristics

NOTE 1 In North America and some other countries, the term "dry powder" is used to denote special metal fire extinguishing agents and the term "dry chemical extinguishing agent" is used to denote the extinguishing medium specified in the European Standard.

NOTE 2 When it is useful to indicate the class of fire for which a powder is designed, capital letters may be added before the term. The letters used in this European Standard are those defined in EN 2 [1].

EXAMPLE BC powder is designed to extinguish class B (liquids or liquefiable solids) and class C (gases) fires; ABC powder is designed to extinguish class A (solids which form glowing embers), class B and class C fires.

3.2
batch
single charge of powder in the processing equipment that has been made homogeneous by subjection to the same unit and physical processing

3.3
lot
one or more batches, but not more than 25 t of powder, manufactured to the same formulation by the same manufacturing process and under the same environmental conditions

NOTE Any substantial change in manufacturing process, source of raw materials, or change in environmental conditions may justify identifying the material as a different lot.

3.4
characteristic value
value declared by the supplier for the chemical and physical properties of the powder

3.5
supplier
party e.g. manufacturer, distributor, importer, responsible for the powder and able to ensure that quality assurance is exercised

4 Sampling

4.1 Samples for testing shall be taken using a method which will provide a representative sample. In order to avoid any risk of condensation, it is essential that the temperature of the powder in its original container is not lower than the ambient air temperature when the sample is being taken.

4.2 Samples shall be stored in individual, clean, dry, airtight, non-reactive and suitably identified containers.

4.3 Sample containers should not be opened until temperature equilibrium with the laboratory has been reached.

NOTE 1 One suitable method of sampling is suggested in Annex F.

NOTE 2 Unless otherwise specified, all tests on samples are carried out at (20 ± 5) ºC.

5 Bulk density

The bulk density shall be within ± 0,07 g/ml of the characteristic value when tested in accordance with Annex A.

6 Sieve analysis

The cumulative percentages oversize on the 40 µm sieve and on the 63 µm sieve shall not differ from the characteristic values by more than ± 8 % of the total mass of the sample, and the cumulative percentage oversize on the 125 µm sieve shall not differ from the characteristic value by more than ± 5 % of the total mass of the sample when the powder is tested in accordance with one of the methods of Annex B.

NOTE 1 Annex G describes one of the methods of analysis technique which gives more detailed information on particle size.

NOTE 2 The two methods described in Annex B may give differing results. The method used should therefore be given in the results.

7 Chemical content

Characteristic values for chemical content shall be expressed as percentages (*m*/*m*) of the total content.

The characteristic values for chemical content shall include all constituents present in the powder at a concentration representing 10 % or more of the total content. The sum of the characteristic values for chemical content shall be 90 % or more of the total content.

Each constituent given a characteristic value shall be identified by its chemical name, or as the reaction product of a chemical process between reactants identified by their chemical names. In the latter case, the chemical process shall be specified, for example by reference to a published patent.

The content of a declared constituent shall be as follows:

a) within ± 1,0 % of the total chemical content for constituents of characteristic value more than 10 % but not more than 15 %;

b) within ± 1,5 % of the total chemical content for constituents of characteristic value more than 15 % but not more than 25 %;

c) within ± 2,0 % of the total chemical content for constituents of characteristic value more than 25 % but not more than 65 %;

d) within ± 3,0 % of the total chemical content for constituents of characteristic value more than 65 % and above.

NOTE 1 For example, a constituent with a characteristic value of 20 % has tolerance limits of 18,5 % and 21,5 % and a constituent with a characteristic value of 80 % has tolerance limits of 77 % and 83 %.

NOTE 2 WARNING It is important that under normal conditions of use the various materials and additives used to produce powders be generally recognized as being non-toxic to humans. In some countries there may be a legal obligation to disclose to designated authorities the complete chemical content, and any proposed changes of chemical content, with documented details of non-toxicity.

NOTE 3 The compatibility of the powder with foam (see Annex H) depends on chemical content. The test described in Annex K may allow a determination of foam/powder compatibility to be made.

NOTE 4 WARNING The mixing of different types of powder (ABC and BC) may result in caking, and the production of gas which will increase pressure in the container to an unsafe level. Such increases in pressure have been known to cause containers to rupture, and to cause bodily injury and damage.

NOTE 5 WARNING Recovered powder may have been previously contaminated, and may have absorbed moisture. If it is then recycled, the powder may eventually become lumpy, and interrupt the flow of powder when used on a fire.

8 Fire test performance

8.1 General

A 6 kg or 9 kg stored pressure or cartridge extinguisher may be used to test conformity to this clause, but the same model of extinguisher shall be used for class A rating (if applicable), class B rating and to test conformity with Clause 9.

NOTE Clauses 8.2 and 8.3 specify minimum performance requirements, Annex I gives information on the suitability and equivalence of extinguishing powders in the equipment, and Annex J gives information on the importance of other performance testing.

8.2 Class A powders

A powder claimed by the supplier to be suitable for class A fires when tested using either a 6 kg or 9 kg extinguisher recommended by the supplier, shall conform to the fire performance requirements of EN 3.

8.3 Class B powders

A powder claimed by the supplier to be suitable for class B fires when tested using either a 6 kg or 9 kg extinguisher recommended by the supplier, shall conform to the fire performance requirements of EN 3.

8.4 Class C powders

A powder claimed by the supplier to be suitable for class C fires shall conform to 8.3.

9 Residual mass after discharge

When tested in the 6 kg or 9 kg extinguisher model recommended by the powder supplier and used to test conformity to Clause 8, the residual mass shall conform to the requirements of EN 3.

NOTE Annex J describes a technique for conducting discharge performance tests which give more detailed information than that necessary to establish conformity to EN 3.

10 Resistance to caking and lumping

Any lumps formed shall not be retained on the 425 µm sieve when the powder is tested in accordance with Annex C.

11 Water repellency

There shall be no COMPLETE absorption of the water droplets when the powder is tested in accordance with Annex D.

12 Moisture content

The moisture content shall not exceed 0,25 % (*m*/*m*) when determined in accordance with Annex E.

13 Marking and packaging

NOTE Extinguishing powders should be packaged in containers which are essentially moisture resistant. The supplier should ensure that every consignment is packed in such a way as to preserve its essential characteristics when stored and handled in accordance with the supplier's recommendations.

Each separate package, or a label firmly attached to the package, shall be marked in a language required by the purchaser with the following information:

a) the commercial name of the product followed by the words "Fire extinguishing powder";

b) the classes of fire for which the powder is claimed to be suitable;

c) the year of manufacture, and the batch or lot number;

d) any essential recommendations regarding conditions of storage;

e) the name and address of the supplier;

f) the warning statement "Ensure compatibility between this product and the equipment in use";

g) the words "See supplier's data sheet for precautions in handling";

h) the number and date of this European Standard, i.e. EN 615:2009 [1].

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[1] Marking EN 615:2009 on or in relation to a product represents a supplier's declaration of conformity, i.e. a claim by or on behalf of the supplier that the product meets the requirements of this standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

14 Supplier's data sheet

If requested by the purchaser, the supplier shall provide a data sheet giving precautions in handling, a declaration of conformity with this European Standard, the characteristics value for bulk density and, with descriptions of the test methods used, the characteristic values for sieve analysis and chemical content (see Clauses 5, 6 and 7).

Annex A
(normative)

Test method for determination of bulk density

NOTE See Clause 5.

A.1 Apparatus

Clean dry 250 ml stoppered glass measuring cylinder, conforming to EN ISO 4788, having an approximate height of 320 mm and an approximate internal diameter of 40 mm.

A.2 Procedure

Place (100 ± 0,1) g of the powder in the cylinder. Secure the stopper in the cylinder. Rotate the cylinder end over end for 10 complete revolutions, at approximately 1 revolution every 2 s. Immediately after the 10 revolutions have been completed, set the cylinder upright on a level surface and allow the powder to settle for (180 ± 10) s. Read off the volume occupied by the powder. Calculate the bulk density, Q_b from the equation:

$$Q_b = \frac{m}{v}$$

where

m is the mass of the powder (in g);

v is the volume occupied by the powder (in ml).

NOTE 1 Electrostatic phenomena may cause difficulty in testing powders containing stearates. The problem is reduced by prior testing of a siliconized powder.

NOTE 2 After long-term storage the bulk density may increase.

Annex B
(normative)

Test methods for sieve analysis

NOTE 1 See Clause 6.

NOTE 2 The two methods described in B.1 and B.2 may give differing results.

B.1 Method 1

B.1.1 Apparatus

B.1.1.1 *Nest of sieves*, having a nominal diameter of 200 mm and aperture sizes of 125 µm, 63 µm and 40 µm, conforming to ISO 3310-1, a lid and a collecting pan with the 125 µm sieve as the top sieve with the lid placed on top and the 40 µm sieve as the bottom sieve with the collecting pan placed underneath.

B.1.1.2 *Sieve-shaking device*, capable of moving the nest in a horizontal ellipse with an impact from the bottom to the top of the nest at every ninth pass.

B.1.2 Procedure

Accurately weigh to ± 0,02 g approximately, 20 g of the powder into the top sieve. Assemble on the shaking device and shake for (10 ± 0,2) min. Weigh the quantity of powder retained on each sieve and in the collecting pan. Check that the sum of all weights equals the initial weight of powder taken, to within ± 2 %; if not, repeat the test. Calculate the cumulative weights retained on the 63 µm and 40 µm sieves, and report as cumulative percentage oversize.

B.2 Method 2

B.2.1 Apparatus

B.2.1.1 *Three sieves*, as described in B.1.1.1.

B.2.1.2 *Air-jet sieving device* [2], which provides an air flow from above to below the sieve with a reverse air-jet from a rotating arm beneath the sieve (see Figure B.1).

B.2.2 Procedure

Carry out three tests using the 125 µm, 63 µm and 40 µm sieves in turn.

Follow the air-jet sieving device manufacturer's instructions. Accurately weight to ± 0,02 g approximately 20 g of powder and sieve for (5 ± 0,1) min. Report the percentage retained on each sieve as cumulative percentage oversize.

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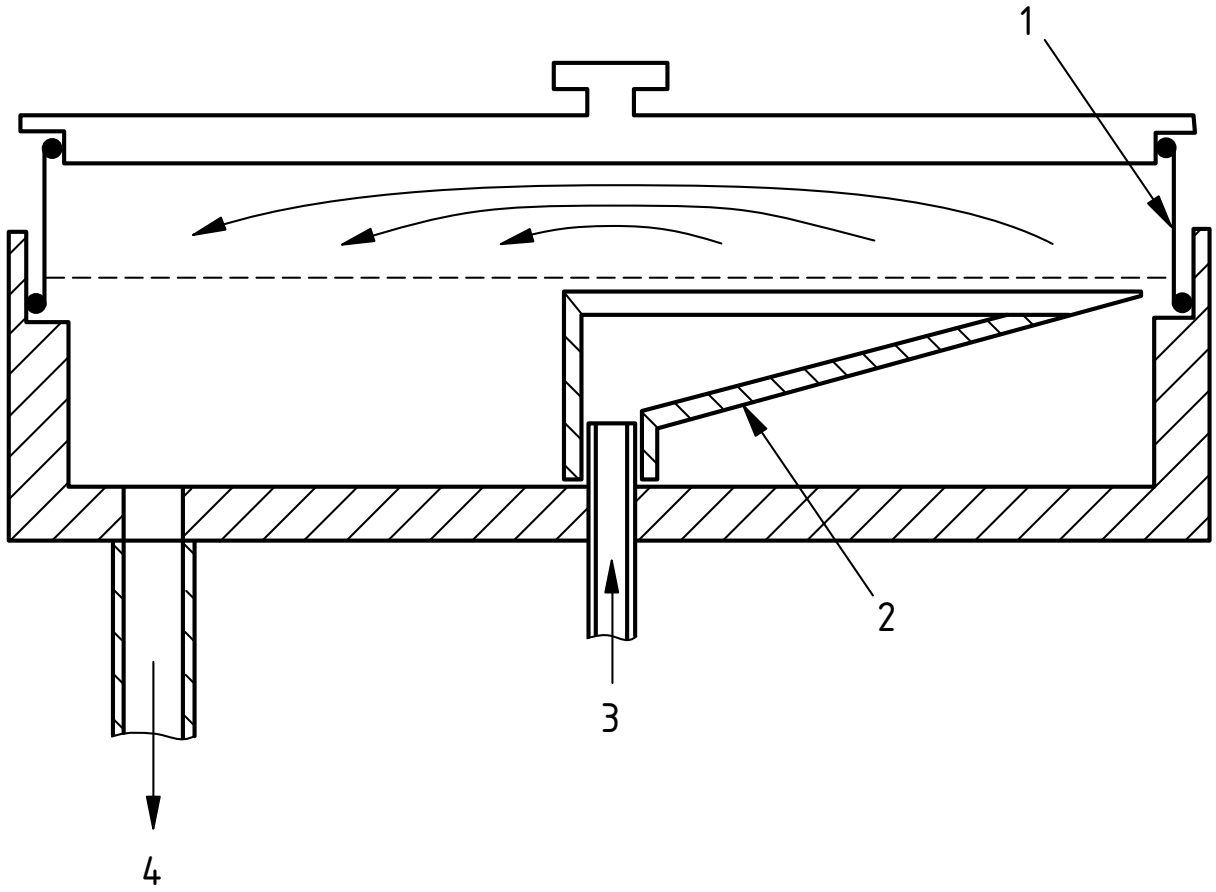
[2] A suitable apparatus, available commercially, is Model A200LS manufactured by Alpine AG, Peter-Dörfler-Strasse 13-25, P.O. Box 101109, 8900 Augsburg, Germany. This information is given for the convenience of the users of this European Standard and does not constitute an endorsement of this apparatus by CEN.



Key

1 Sieve
2 Rotating radial arm with slot
3 Air in
4 Air and fine particles out

Figure B.1 – Air-jet sieving device

Annex C
(normative)

Test method for resistance to caking and lumping

NOTE See Clause 10.

C.1 Apparatus

C.1.1 *Petri dish*, approximately 70 mm diameter.

C.1.2 *Pallet knife*.

C.1.3 *Desiccator*, with saturated sodium chloride solution giving approximately 75 % relative humidity.

C.1.4 *Oven*, controlled to (48 ± 3) °C.

C.1.5 *425 µm sieve*, conforming to ISO 3310-1.

C.2 Procedure

Place an excess of powder in the Petri dish and smooth the surface flush with the rim using the pallet knife. Place the Petri dish in the desiccator at (20 ± 5) °C for (24 ± 1) h, then place the Petri dish in the oven for (24 ± 1) h. Cover the Petri dish and allow to cool at (20 ± 5) °C for (60 ± 10) min, then remove the cover and overturn the Petri dish on to a clean sheet of paper. Gently pour the powder into the sieve, and gently shake the sieve to separate any lumps that may have formed.

Using a spatula to lift the lumps, drop them from a height of (200 ± 10) mm on to a hard surface. Carefully collect the powder and place gently into the sieve. Gently shake as before for (20 ± 2) s and check to see whether any lumps are retained.

Annex D
(normative)

Test method for water repellency

NOTE See Clause 11.

D.1 Apparatus

Petri dish, pallet knife and desiccator as described in C.1.1, C.1.2 and C.1.3.

D.2 Procedure

Place an excess of powder in the Petri dish and smooth the surface flush with the rim using the pallet knife. On three different areas of the powder surface, place a drop (approximately 0,3 ml) of distilled water. Place the Petri dish in the desiccator for (120 ± 5) min at (20 ± 5) °C. Remove the Petri dish from the desiccator and examine the drops. The drops shall not have been completely absorbed by the powder.

Annex E
(normative)

Test method for moisture content

NOTE See Clause 12.

E.1 Apparatus

E.1.1 *Petri dish*, as described in C.1.1.

E.1.2 *Desiccator,* with concentrated sulphuric acid.

E.2 Procedure

Accurately weigh to ± 0,001 g approximately 20 g of the powder into the Petri dish. Store the uncovered dish for (48 ± 2) h at a temperature of (20 ± 3) °C in the desiccator. Reweigh and calculate weight loss. Report the weight loss as a percentage of original sample weight.

Annex F
(informative)

Suggested method of sampling

When sampling a lot, not less than 12 kg of material should be taken at random from batches. For batch testing, not less than 2,5 kg should be taken at random from a container.

For relatively small quantities, a 25 mm metal sampling tube should be inserted to the full depth of the container at no fewer than five locations.

Annex G
(informative)

Laser diffraction particle size analysis

In order to obtain more detailed information about the particle size distribution in the range 0 µm to 100 µm, equipment other than that specified in Clause 6 should be used.

One instrument that can give such information is the laser diffraction particle size analyser.

Using the technique of laser diffraction particle size analysis, particles from approximately 0,5 µm to 500 µm can be analysed. In principle, the equipment consists of a laser transmitter and receiver unit usually mounted about 500 mm apart. The powder is sprayed with a dry powder feeder or in a saturated solution through the laser beam. Particles passing through the laser beam scatter the light, which is focused on to a special detector. Suitable electronic equipment detects the various outputs and digitizes them. They are then converted into a particle size distribution by an integral computer.

Annex H
(informative)

Compatibility between extinguishing powders and foams

Under some circumstances, incompatibility between extinguishing powders and foams may exist. The user should ensure that any combination of extinguishing powder and foam which may be used does not lead to an unacceptable loss of efficiency caused by unfavourable interaction of the chosen media, when applied simultaneously or successively.

The test described in Annex K may be useful in determining whether incompatibility between extinguishing powder and foam may exist.

Annex I
(informative)

Suitability and equivalence of extinguishing powders in equipment

This European Standard does not provide an assessment of the performance of an extinguishing powder in a particular piece of equipment, nor does it attempt to compare the performance of different extinguishing powders.

The fire performance tests specified in Clause 8 only establish whether or not the powder is above a minimum acceptable quality, and it is not suggested that the tests can be used to compare the potential fire extinguishing performance of different powders.

It is important that a powder complying with this European Standard should also be tested for correct function in the particular equipment in which it is to be used, as specified in the appropriate national or other standard.

Annex J
(informative)

Suggested test method for effective discharge time

J.1 Principle

A particularly informative way of conducting discharge performance tests is to measure the weight loss from the extinguisher throughout the discharge test. This gives information regarding the rate of discharge as a function of time and facilitates comparison of the effects of changes in the flow properties of the powder, or the extinguisher, e.g. pressure, nozzle size. The effective discharge time of an extinguisher, for the purposes of this test, may be defined as the time from the moment of actuation until the rate of discharge from the extinguisher per time has declined to 40 % of the starting value, which is determined as the mean value of extinguishing powder discharge between (2 ± 0,5) s after the instant of actuation.

J.2 Apparatus[3]

J.2.1 *Load sensing system*, such that the recoil forces from the jet of extinguishing media and the hose do not affect the measurement.

J.2.2 *Weight recorder*, accurate to ± 10 g for extinguishers with a gross weight of 1 kg to 3 kg and ± 25 g for other extinguishers which will record weight loss at not less than 1 s intervals.

J.2.3 *Automatic operating means* for the extinguisher.

J.3 Procedure

Mount the extinguisher vertically on the test equipment so that the nozzle forms a 90° ± 2° angle with the longitudinal axis of the extinguisher. Fit the automatic actuating mechanism to the extinguisher's actuating device. Start the recording equipment and discharge the extinguisher.

J.4 Expression of results

Prepare a curve of weight loss against time.

Calculate and report the effective discharge time for the extinguisher. Examine the discharge curve for variations in the discharge rate during the discharge sequence. Large variations are a sign of poor flow properties.

Measure the powder residue in the extinguisher after the test and calculate the percentage residue.

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[3] A suitable apparatus, available commercially, is the EFFUNC apparatus manufactured by SP (Swedish National Testing and research Institute), Box 857, 501 15 BORAS, Sweden. Phone +46 33 135502. This information is given for the convenience of users of the European Standard and does not constitute an endorsement of this apparatus by CEN.

Annex K
(informative)

Suggested test method for testing the compatibility of powder with foam

K.1 General

The following small-scale fire test also found in EN 1568-3:2008 [2], Annex I may be used to show whether incompatibility between extinguishing powders and foams may exist.

This test is carried out on the foam in question, and then repeated after the fuel has been covered in powder. If the increase in extinction time is equal to or greater than 25 % longer than the result without powder, then the combination of powder and foam may be considered to lead to an unacceptable loss in efficiency.

Likewise, a reduction in burnback time by 25 % or more when powder is used would indicate that the foam and powder are incompatible.

(500 ± 1) g powder is weighed into a 180 µm sieve, placed on a sheet of paper or cardboard. The sieve is held over the fuel, and the cardboard or paper removed. The powder is then evenly distributed over the surface of the fuel from a height of (150 ± 10) mm. The fuel is lit not more than 60 s after the powder has been spread over the surface of the fuel. The fire-test is carried out following the method in EN 1568-3:2008 [2], Annex I.

K.2 Apparatus

K.2.1 Circular fire tray of brass as shown in Figure K.1 with dimensions as follows:

a) internal diameter at rim (565 ± 5) mm;

b) height of vertical wall (150 ± 5) mm;

c) height of conical base (30 ± 5) mm;

d) thickness of vertical wall (1,2 ± 0,2) mm,

with a turned over rim, and a drain point with valve at the centre of the conical base.

NOTE The tray has an area of approximately 0,25 m^2.

The fire tray is supported approximately 1 m above the ground on a steel frame with four legs. The tray is normally placed beneath a suitable fume extraction hood which will extract the smoke without interfering with the fire.

K.2.2 Burn-back pot of brass with dimensions as follows:

a) internal diameter at rim (120 ± 2) mm;

b) internal depth (80 ± 2) mm;

c) thickness of wall (1,2 ± 0,2) mm,

with a turned over rim, and fitted with four studs at the base to give an overall height of (96 ± 2) mm. A chain fitted to the rim allows the burn-back pot to be lifted using a metal rod.

K.2.3 Foam making nozzle as shown in Figure K.2 which has a nominal flow rate of 5,0 l/min at 7 bar when tested with water. It is fitted with an adjustable collar to allow foam to be ejected from the side of the nozzle and thus vary the foam flow rate through the outlet. The foam flow rate can also be controlled by adjusting the pressure applied to the foam solution.

K.2.4 Fuel

An aliphatic hydrocarbon mixture according to the following specification:

a) distillation range: 84 °C to 105 °C;

b) maximum difference between initial and final boiling points: 10 °C;

c) maximum aromatic content: 1 % w/w;

d) density at 15 °C: (700 ± 20) kg/m3.

NOTE 1 The normal value of surface tension of the aliphatic hydrocarbon mixture measured in accordance with ISO 304 at (20 ± 1) °C is 21 mN/m-1 to 22 mN/m-1

NOTE 2 Typical fuels meeting this specification are certain solvent fractions sometimes referred to as commercial heptane.

K.3 Test procedure

K.3.1 Test conditions

Carry out the test under the following conditions:

a) air temperature (15 ± 5) °C;

b) fuel temperature (17,5 ± 2,5) °C;

c) foam solution temperature (17,5 ± 2,5) °C.

K.3.2 Set up

Position the foam nozzle horizontally with the by-pass holes in the adjustable collar facing downwards at a height of (150 ± 5) mm above the rim of the fire tray (see Figure K.2).

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

Set the nozzle pressure to 7 bar and the foam flow rate to (0,75 ± 0,025) kg/min by adjusting the collar and, if necessary, reducing the nozzle pressure. It is convenient to collect the foam in a tarred vessel for 6 s and to weigh it to calculate the flow rate.

Position the nozzle while keeping it horizontal so that the foam strikes the centre of the fire tray. Shut off the foam discharge. Clean the tray and close the drain valve.

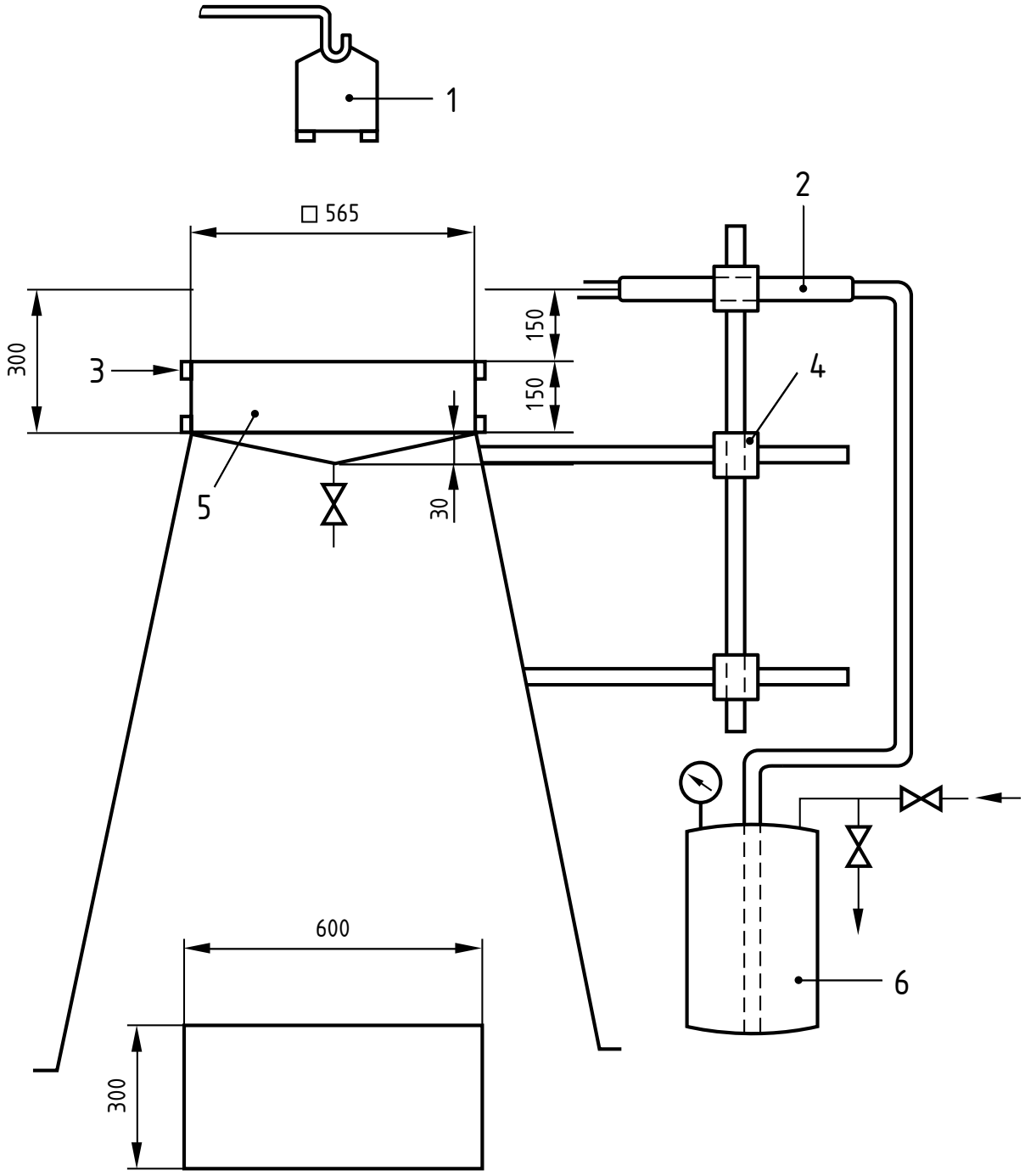
K.3.3 Fire test

Place (9 ± 0,1) l of fuel in the tray, and (0,3 ± 0,01) l of fuel in the burn-back pot.

(120 ± 2) s after fuelling ignite the fuel and allow to burn for (60 ± 2) s before starting foam application. Apply foam for (120 ± 2) s to the centre of the tray and record the times from the start of foam application to 90 % control, 99 % control, and complete extinction.

At the end of foam application ignite the fuel in the burn-back pot, and (60 ± 2) s after the end of foam application lower the pot into the centre of the tray with a metal rod, taking care not to allow foam to enter the pot. Record the time taken from positioning of the burn-back pot to permanent full reinvolvement of the fire tray surface in flames as the burn-back time.

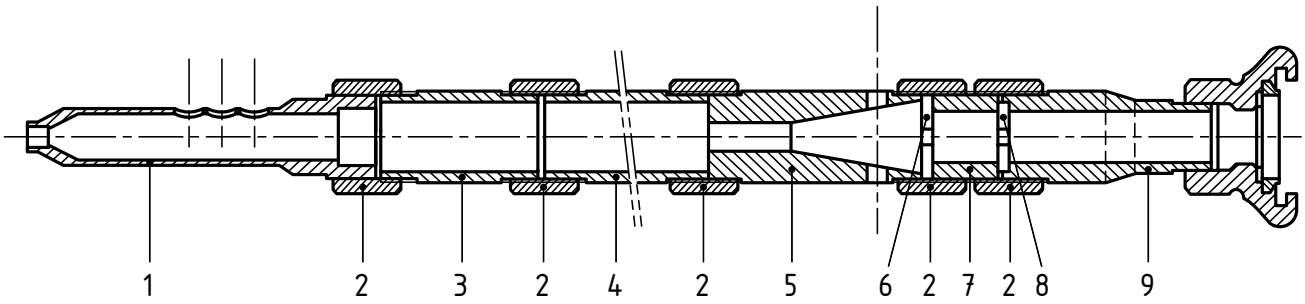
Dimensions in millimetres



Key

1 burn-back pot
2 foam nozzle
3 backboard (optional)
4 adjustable boss
5 fire tray
6 foam solution

Figure K.1 — Small scale fire test

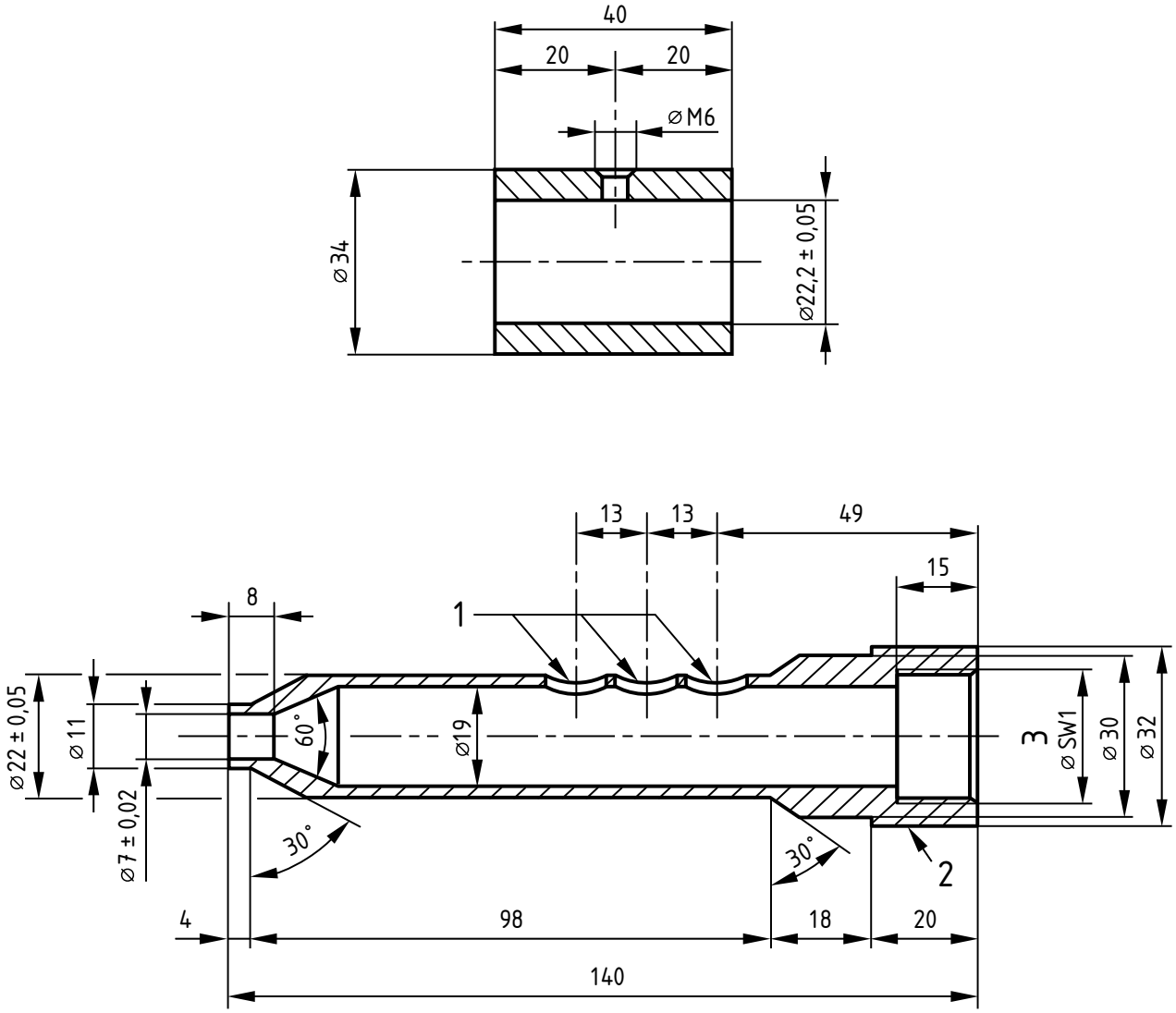


Key

1 nozzle with foam diverter (see Figure K.3)
2 coupling (see Figure K.4)
3 mixing tube (see Figure K.5)
4 stabilizing tube (see Figure K.6)
5 venturi (see Figure K.7)
6 orifice plate G (see Figure K.8)
7 spacing piece (see Figure K.9)
8 orifice plate P (see Figure K.10)
9 inlet (see Figure K.11)

Figure K.2 — Foam making nozzle for small scale fire test

Dimensions in millimetres

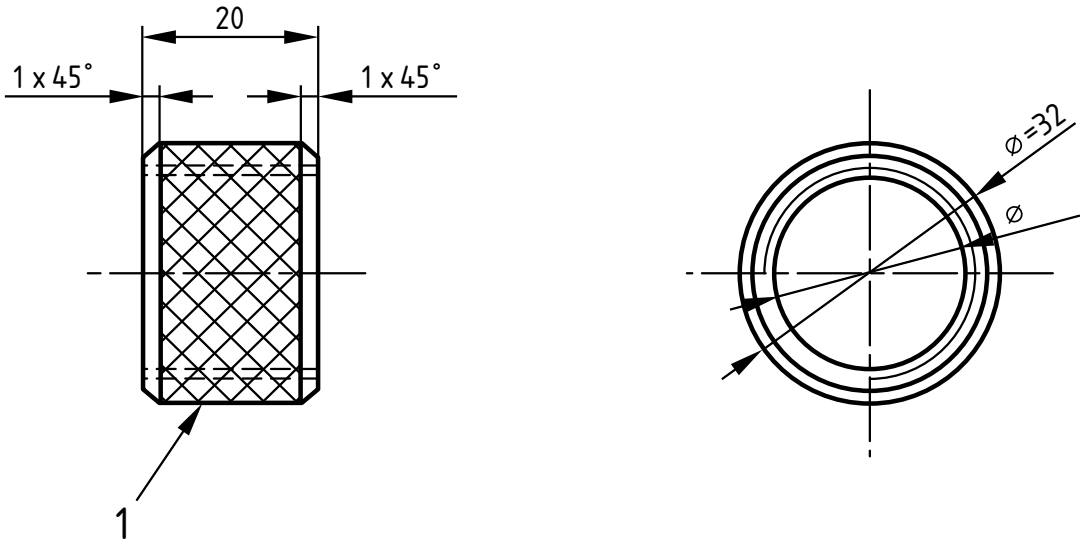


Key

1 3 holes ∅ H
2 knurled
3 16 threads

Figure K.3 — Sleeve and item 1 – Nozzle with foam diverter

Dimensions in millimetres



Key

1 coarse knurled

Figure K.4 — Item 2 - Coupling

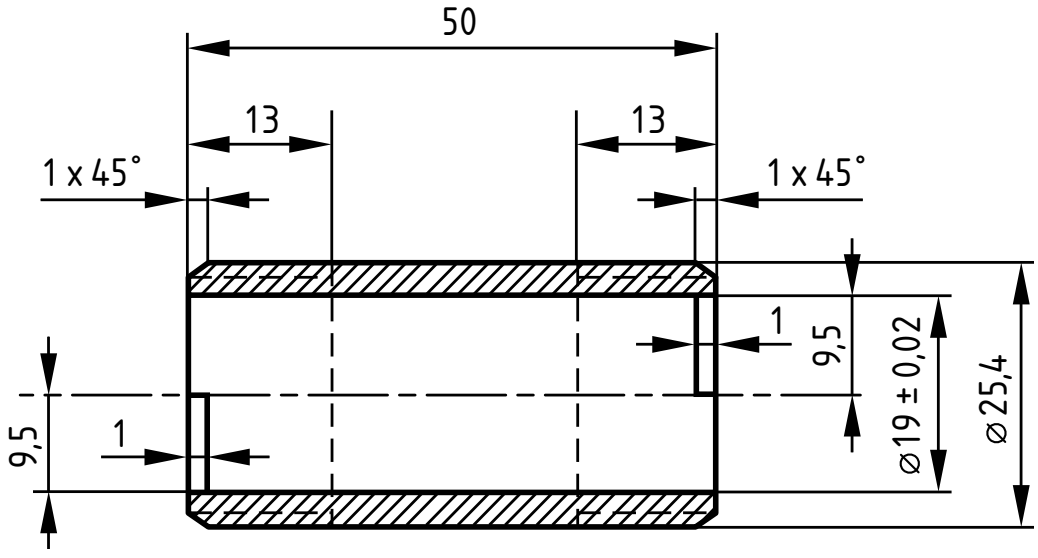
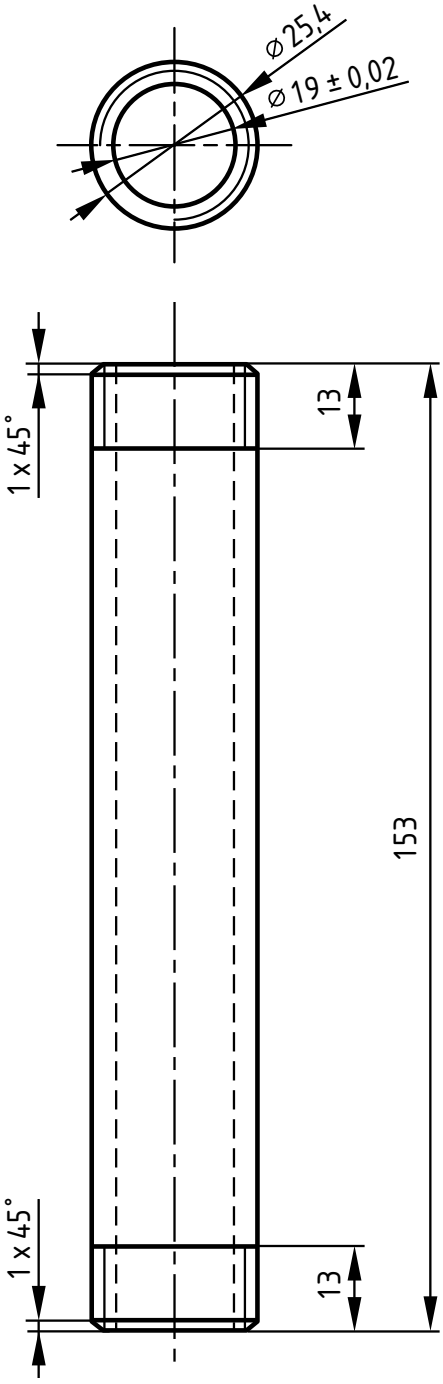


Figure K.5 — Item 3 - Mixing tube

Dimensions in millimetres

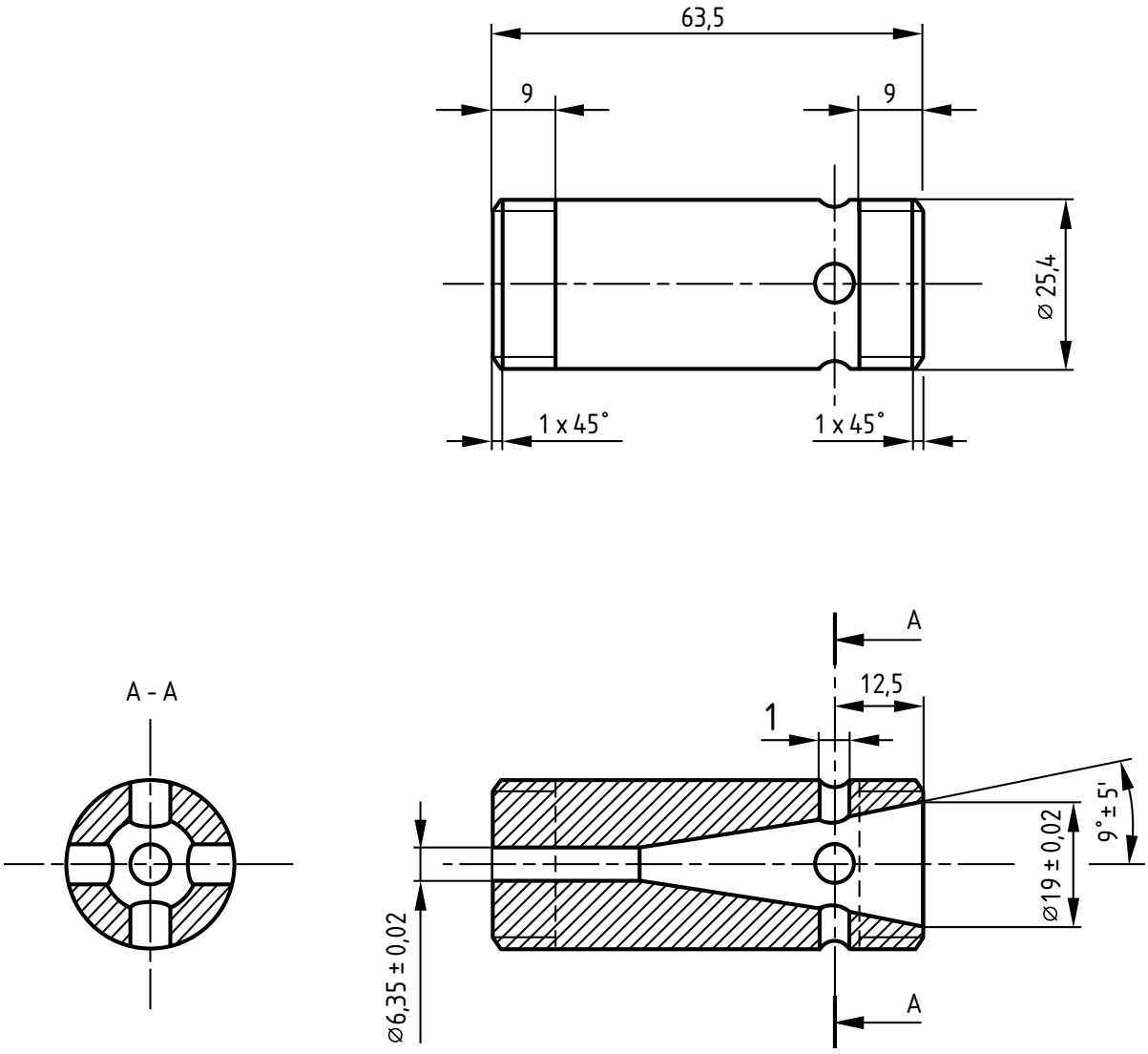
NOTE End faces to be at 90° to axis



Thread: Whitworth, 16 tpi
Chamfer each end 1 x 45°

Figure K.6 — Item 4 - Stabilizing tube

Dimensions in millimetres

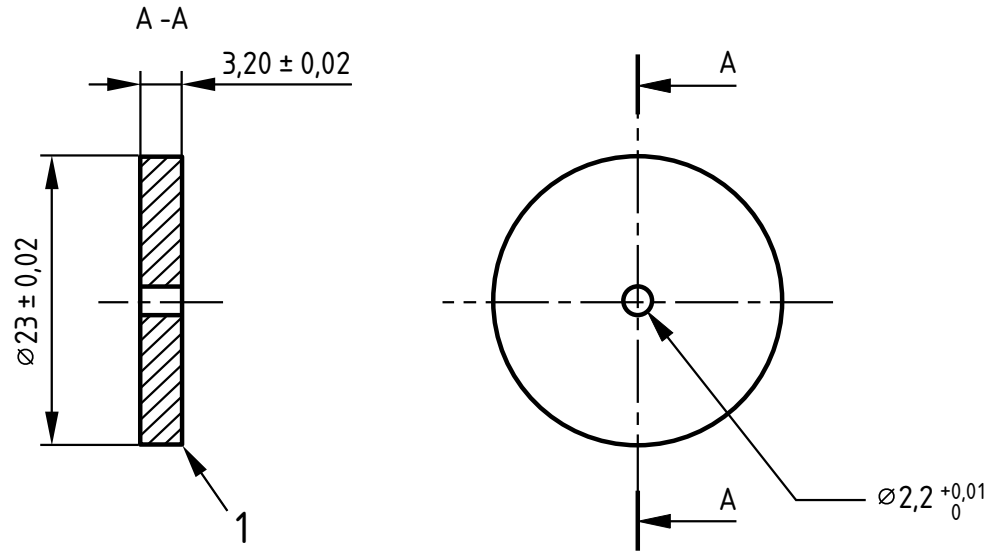


Key

1 4 holes ∅ 6 at 90° in same plane

Figure K.7 — Item 5 Venturi

Dimensions in millimetres

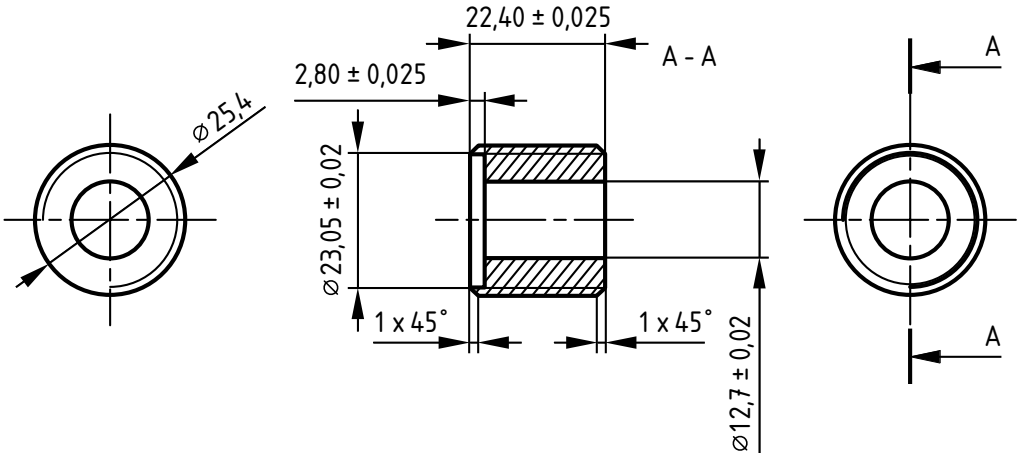


Key

1 slight radius
Faces parallel to within 0,02
Hole concentric with O.D. to within 0,02
Hole at 90° to each face within 0,01

Figure K.8 — Item 6 - Orifice plate G

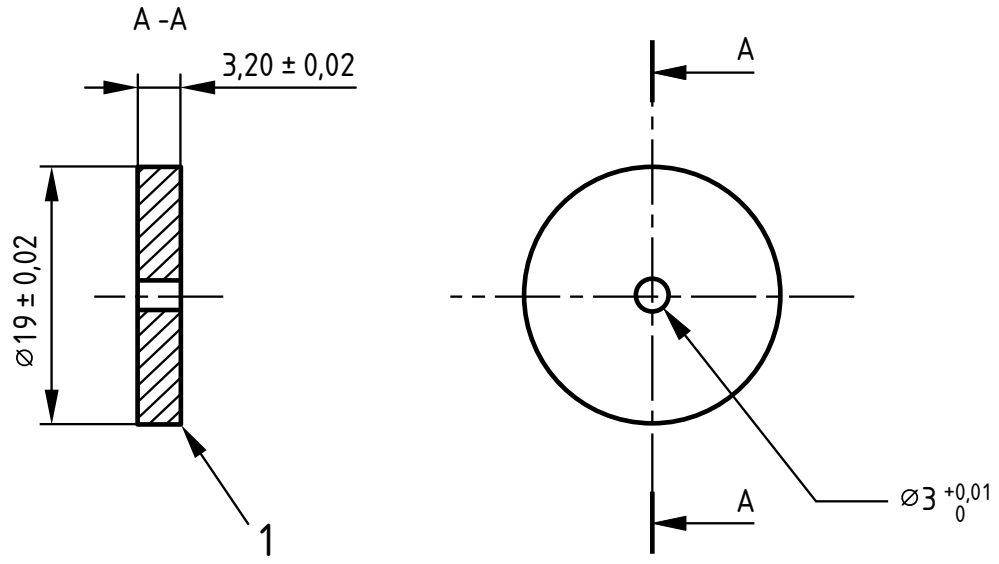
Dimensions in millimetres



Bore and counter bore concentric to O.D. within 0,02
Counter bore face parallel to end face within 0,02
Counter bore faces and end faces square with axis to within 0,01
Chamfer thread edges 1 x 45°, leave other edges sharp

Figure K.9 — Item 7 - Spacing piece

Dimensions in millimetres

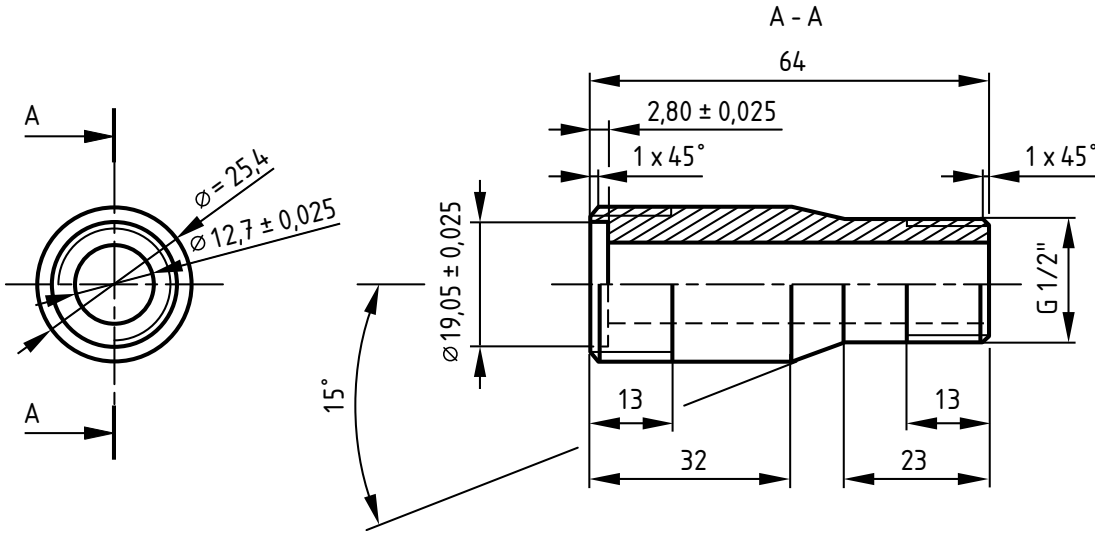


Key

1 slight radius
Faces parallel to within 0,02
Hole concentric with O.D. to within 0,02
Hole at 90° to each face within 0,01

Figure K.10 — Item 8 - Orifice plate P

Dimensions in millimetres



Bore and counter bore concentric to O.D. within 0,02

Figure K.11 — Item 9 - Inlet

Bibliography

[1] EN 2, *Classification of fires*

[2] EN 1568-3:2008, *Fire extinguishing media - Foam concentrates - Part 3: Specification for low expansion foam concentrates for surface application to water-immiscible liquids*

[3] ISO 304, *Surface active agents -- Determination of surface tension by drawing up liquid films*

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