BRITISH STANDARD

BS 7867 : 1997

Specification for

Portable fire extinguishers for use in aircraft

ICS 13.220.10; 49.040

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee FSH/2, Fire extinguishers, upon which the following bodies were represented:

Association of Metropolitan Authorities
British Aerosol Manufacturers' Association
British Compressed Gases Association
British Fire Consortium
British Fire Services Association
British Telecommunications plc
Chief and Assistant Chief Fire Officers' Association
Consumer Policy Committee of BSI
Consumers' Association
Civil Aviation Authority
Department of the Environment (The Buying Agency)
Fire Extinguishing Trades Association
Home Office
Independent Fire Equipment Distributors' Association
Institution of Fire Engineers
London Fire and Civil Defence Authority
Loss Prevention Council
National Association of Fire Officers
Nationwide Fire Services
Society of Chemical Industry
Society of Motor Manufacturers and Traders Limited

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Foreword

This British Standard has been prepared by Technical Committee FSH/2 and specifies requirements for aircraft extinguishers additional to the requirements of BS EN 3 : Parts 1 to 6 : 1996. Together with BS EN 3, Part 1 to Part 6, and BS 7863, it supersedes BS 5423, which is withdrawn.

BS EN 3 only allows whole number sizes. However, for the purposes of this standard, for use in aircraft only, other sizes are permitted. Whilst not specified in BS EN 3-1, and for aircraft extinguishers only, 3A and 13B fire test ratings are allowed.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 6, an inside back cover and a back cover.

1 Scope

This British Standard specifies requirements for portable extinguishers to be used in aircraft additional to the requirements for all portable extinguishers given in BS EN 3 : Part 1 to Part 6. It details the type of extinguishers to be used in aircraft, and requirements for marking and fixing of extinguishers in aircraft.

2 Normative references

This British Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on the inside back cover. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this British Standard only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

3 Definitions

For the purposes of this British Standard, the definitions given in BS EN 2 and BS EN 3 : Part 1 to Part 6 apply.

4 Classification

Extinguishers intended for use in aircraft shall be classified as one of the following:

a) type 1(C), which shall contain one of the extinguishing agents, other than powder, listed in table 1 of BS 7863 : 1996 as the extinguishing medium; or

b) type 1(M), which shall contain halon 1211 as the extinguishing medium; or

c) type 2, which shall contain water with a freezing point depressant as the extinguishing medium.

NOTE. The classification (C) denotes application for civil use only; (M) denotes application for civil or military use.

5 Portability and ease of use

Extinguisher of overall mass 5 kg or less shall be so designed that it is possible to perform the handling and operation tasks necessary to carry out the tests described in annexes A and B of BS EN 3-1 : 1996 using only one hand.

6 Discharge

6.1 Duration of discharge

The duration of discharge shall be not less than 10 s when measured by the method described in **A.1**.

6.2 Discharge at an angle

While being held upright and at an angle of 60° to the vertical position, extinguishers shall discharge not less than the following:

a) for type 1: 75 % of the contents during the liquid phase of the extinguishing medium discharge (see also **7.2** for type 1(M));

b) for type 2: 85 % of the contents;

when tested by the method described in **A.2**.

7 Bracket

7.1 Extinguishers shall be provided with a mounting bracket which shall hold the extinguisher securely against the appropriate acceleration test specified in ISO 7137 : 1995.

NOTE. ISO 7137 : 1995 is an endorsement of publications EUROCAE/ED-14C and RTCA/DO-160C[1)].

7.2 After testing in accordance with **7.1**, type 1(M) extinguishers shall conform to clause **6** and **7.5**.

7.3 The bracket shall prevent inadvertent operation of the extinguisher by unaided manual means whilst in the bracket.

7.4 It shall not be possible to mount the extinguisher upside down in the bracket.

7.5 It shall be possible to remove an extinguisher of overall mass 5 kg or less from its bracket using one hand only.

NOTE. The bracket design should be such as to minimize the possibility of inadvertent opening of the bracket release by snagging on clothing, etc.

8 Test fire rating

8.1 General

Type 1 extinguishers shall have a minimum test fire rating of 21B, when tested in accordance with **B.2**.

Type 1 extinguishers of nominal charge not less than 1.5 kg shall have test fire ratings not less than 3A or 34B as appropriate, when tested in accordance with **B.1** and **B.2**.

[1)] These publications can be obtained from:
EUROCAE (European Organization for Civil Aviation Electronics), 11 Rue Hamlet, 75783 Paris Cedex, France;
RTCA (Radio Technical Commission for Aeronautics), 1140 Connecticut Avenue N.W., Suite 1020, Washington, D.C. 20036, USA.

8.2 Additional extinguishing requirements for type 1(M) extinguishers

Type 1(M) extinguishers shall extinguish the 13B test fire when tested at (-30 ± 2) °C and at (55 ± 2) °C by the method described in **B.3**.

9 Additional marking for extinguishers and brackets

In addition to the appropriate markings specified in clause **7** of BS EN 3-5 : 1996 and BS 7863 : 1996, aircraft extinguishers shall be marked with the full and empty masses in kilograms, with or without the operating head as appropriate. Brackets for type 1 extinguishers shall be marked to indicate suitability for (C) or (M) application (see clause **7**).

NOTE. Purchasers or approving authorities[2)] may specify requirements, additional to those of this standard, for aircraft extinguishers for general or particular application which make reference to the above standards or publications.

[2)] The approving authority for British civil aircraft equipment is:
Civil Aviation Authority Safety Regulation Group, Aviation House, South Area, Gatwick Airport, West Sussex, RH6 0YR.

Annexes

Annex A (normative)
Discharge tests

A.1 Duration of discharge

See **6.1**.

Carry out the test as described in annex A of BS EN 3-1 : 1996.

A.2 Discharge of aircraft extinguishers at an angle

See **6.2**.

Carry out the test as described in annex A of BS EN 3-1 : 1996, but hold the extinguisher at 60° to the vertical position during the discharge. Do not move the extinguisher during the test. If the dip tube is asymmetrically placed or cut above the vertical axis of the extinguisher, hold the extinguisher in its least favourable attitude.

Annex B (normative)
Fire tests

B.1 Class A fire performance

B.1.1 ***Apparatus***

B.1.1.1 *Metal frame support*, (250 ± 10) mm high, (900 ± 10) mm wide and of a length equal to that of the test fire (within the tolerance limits). The steel frame (see figures B.1 and B.2) is constructed of 50 mm × 50 mm angle sections.

B.1.1.2 *Wooden sticks*, made of *Pinus silvestris* containing 12.5 % to 17.5 % moisture by mass, and of square section of side (39 ± 2) mm. The moisture content of the sticks shall be determined using commercially available instruments which measure conductivity between two needle probes pushed into the sticks.

NOTE. Some variation of reading may be obtained due to structural variation of the timber and the direction of the grain. This type of instrument should therefore be calibrated in case of doubt by drying samples of the sticks, cut to convenient length, to constant mass at (103 ± 2) °C, and by weighing them at 24 h intervals.

The moisture content expressed as a percentage is given by the following equation:

$$\text{Percentage moisture} = \left(\frac{\text{Initial mass} - \text{dry mass}}{\text{dry mass}}\right) \times 100$$

The wooden sticks shall be stacked in 14 layers on the metal frame(s) as shown in figures B.1 and B.2.

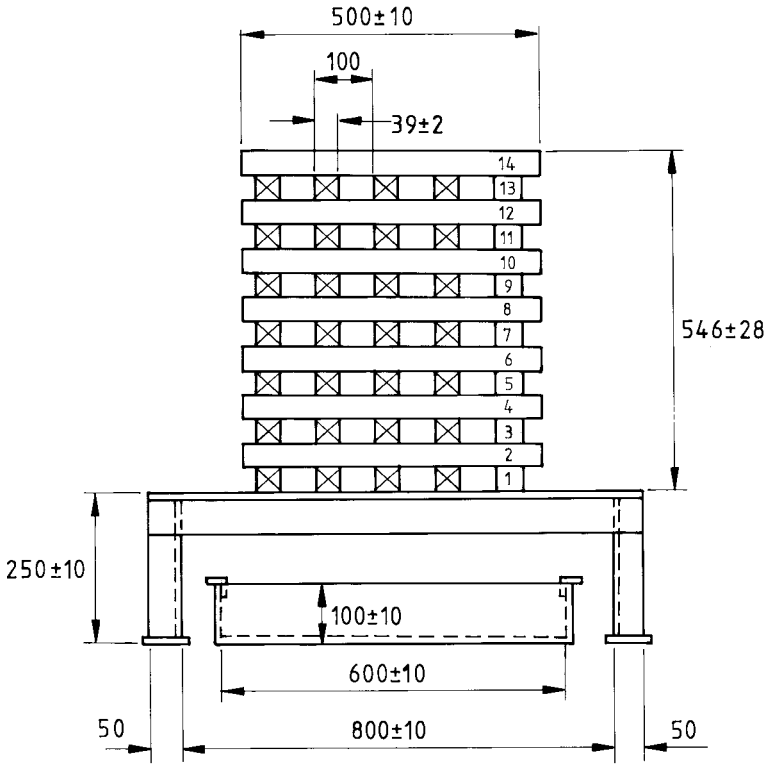

Figure B.1 Class A test fire front view

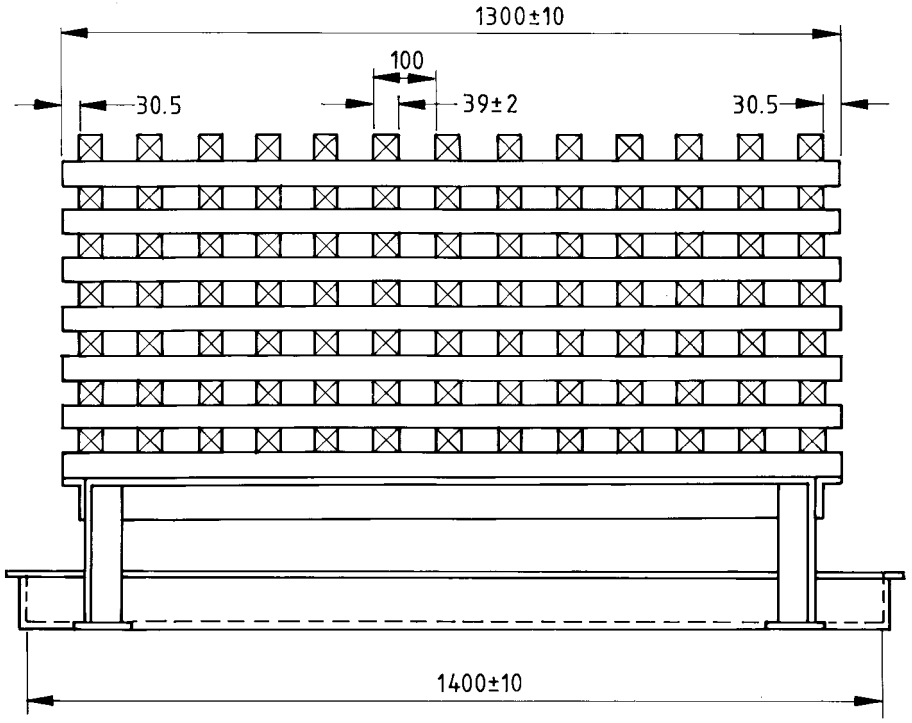

Figure B.2 Class A test fire side view showing a 13A fire

The sticks in each layer shall be spaced at nominal 100 mm centres with nominal 61 mm gaps between the sticks.

The sticks laid transversely (layers 2, 4, 6, 8, 10, 12 and 14) shall have a length of (500 ± 10) mm.

The sticks laid longitudinally (layers 1, 3, 5, 7, 9, 11 and 13) shall have a length equal to the test fire length given in table B.1, with a permissible deviation of ± 10 mm.

B.1.1.3 *Lighting fuel*, consisting of an aliphatic hydrocarbon having an initial boiling point of not less than 88 °C and a final boiling point of not more than 105 °C.

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

B.1.1.4 *Lighting tray*, being (100 ± 10) mm longer than the nominal length of the test fire, of width (600 ± 10) mm and depth (100 ± 10) mm.

NOTE. Long lighting trays are difficult to handle, and it may be convenient to use a number of smaller trays to give the required length, arranged with no appreciable gap between the trays.

B.1.2 ***Test fire dimensions***

The test fire shall be the appropriate designated test fire specified in table B.1.

NOTE. Each test fire is designated by a number followed by the letter A. The designation number of the test fire represents:

a) the nominal length of the test fire in decimetres, i.e. the nominal length of the wooden sticks arranged in the longitudinal direction of the test fire; and

b) the number of 500 mm wooden sticks for each layer arranged in the transverse direction of the test fire.

Table B.1 Dimensions of class A test fires

Designation of test fire	Length of test fire m	Number of 500 mm wooden sticks in each transverse layer
3A	0.3	3
5A	0.5	5
8A	0.8	8
13A	1.3	13

B.1.3 *Test fire location*

Locate the test fire indoors and sheltered from draughts, in a test chamber that does not impede the natural development of the test fire or effective fire fighting.

B.1.4 *Procedure*

The procedure is as follows.

a) Pour water into the lighting tray(s) to form a layer at least 3 mm deep over the whole base of the tray, then add sufficient fuel to give an additional depth of 5 mm.

b) Ignite the fuel.

c) 120^{+10}_{-20} s after fuel ignition, withdraw the lighting tray(s) from the crib.

d) Permit the crib to burn for a further 6 min, making a total burn time of 8 min.

e) Operate the extinguisher and apply it to the test fire. The extinguishers may be discharged continuously or in successive bursts.

NOTE. The operator may move round the fire to obtain the best results.

B.1.5 *Result*

If the test fire is put out, the extinguisher has passed the test.

B.2 Class B fire performance

B.2.1 *Apparatus*

B.2.1.1 *Test fire trays*, made of welded sheet steel and of circular cylindrical shape (dimensions are given in table B.2), and with vertical sides. The bases of the trays are set horizontal above, or level with, the surrounding ground.

NOTE. Reinforcement of the base of the large test fire trays will be necessary to minimize distortion. In such cases it will be necessary to ensure that the undersides of the trays are not exposed to the atmosphere.

B.2.1.2 *Lighting fuel*, consisting of an aliphatic hydrocarbon having an initial boiling point of not less than 88 °C and a final boiling point of not more than 105 °C.

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

B.2.2 *Test fire dimensions*

The test fire shall be the appropriate designated test fire specified in table B.2.

NOTE. Each test fire is designated by a number followed by the letter B. The designating number of the test fire represents the volume of the liquid in litres contained in the tray.

The area of the test fire tray expressed in square decimetres is given by this number multiplied by π. The depth of liquid in the trays is approximately 30 mm, with a water base to the fuel. Details of class B test fires are contained in table B.2.

B.2.3 *Test fire location*

Carry out test fire indoors in a building which will not impede the natural development of the fire or outdoors but with a wind speed not exceeding 3 m/s.

Table B.2 Dimensions of class B test fires

Designation	Minimum volume of fluid		Dimensions of test fire tray			
	Fuel	Water	Diameter (measured at rim)	Depth	Nominal thickness of walls	Approximate area of fire
	l	l	mm	mm	mm	m^2
13B	10	3	720 ± 10	150 ± 10	2.0	0.41
21B	15	6	920 ± 10	150 ± 10	2.0	0.66
34B	25	9	117 ± 10	150 ± 10	2.5	1.07

B.2.4 *Procedure*

The procedure is as follows:

a) Add the appropriate volume of fuel and water as specified in table B.2. Add additional water to obviate any distortion of the tray, subject to there being a minimum of 15 mm depth of fuel at any one point and a maximum depth of liquid of 50 mm at any point on the periphery of the tray.

b) For the testing of foam, halon or vaporizing liquid extinguishers, use fresh fuel for each test. When testing extinguishers of other types, it is not necessary to use fresh fuel for each test, provided that previous tests have not contaminated the fuel so that the efficiency of the test fire is impaired.

c) Ignite the fuel.

d) Permit the fuel to burn freely for a minimum of 60 s.

e) Stand initially with no part of the body nearer to the fire tray than 1.5 m or the tray diameter, whichever is less.

f) Operate the extinguisher, apply it to the test fire with the control mechanism fully open and maintain the initial discharge for a minimum of 5 s unless the fire has been extinguished. Thereafter, the extinguisher may be discharged continuously or in successive bursts.

NOTE. The operator may move around the tray in order to obtain the best results.

WARNING: At no time should the operator step onto or into the tray to reach further with the extinguisher discharge or for any other reason. This is unsafe and violates the test conditions.

B.2.5 *Result*

If the test fire is put out, the extinguisher has passed the test.

B.3 Additional test for aircraft type 1(M) extinguishers

The rules and conditions given in BS EN 3 : Parts 1–6 : 1996 apply, with the following additions. Condition the extinguishers at $(-30 \pm 2)\,^{\circ}C$ for not less than 24 h. Test against 21B fire within 1 min of removal from the extreme temperature environment. The test is successful if one fire is extinguished, and further tests need not be carried out. Repeat using extinguishers conditioned at $(55 \pm 2)\,^{\circ}C$.

List of references (see clause 2)

Normative references

BSI publications

BRITISH STANDARDS INSTITUTION, London

BS EN 2 : 1992	*Classification of fires*
BS EN 3	*Portable fire extinguishers*
BS EN 3-1 : 1996	*Description, duration of operation, class A and B fire test*
BS EN 3-2 : 1996	*Tightness, dielectric test, tamping test, special provisions*
BS EN 3-3 : 1996	*Construction, resistance to pressure, mechanical tests*
BS EN 3-4 : 1996	*Charges, minimum required fire*
BS EN 3-5 : 1996	*Specification and supplementary tests*
BS EN 3-6 : 1996	*Provisions for the attestation of conformity of portable fire extinguishers in accordance with EN 3 Part 1 to Part 5*
BS 7863 : 1996	*Recommendations for colour coding to indicate the extinguishing media contained in portable fire extinguishers*
ISO 7137 : 1995	*Aircraft — Environmental conditions and test procedures for airborne equipment*

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