

Specification for

Safety of small non-domestic flueless space heaters burning 3rd family gases

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Gas Standards Policy Committee (GSE/-) to Technical Committee GSE/20, upon which the following bodies were represented:

- British Combustion Equipment manufacturers' Association
- British Gas Plc
- Chartered Institution of Building Services Engineers
- Co-opted members
- Chief and Assistant Chief Fire Officers' Association
- Health and Safety Executive
- Home Office
- Institution of Gas Engineers
- Liquefied Petroleum Gas Industry Technical Association (UK)
- Loss Prevention Council
- Society of British Gas Industries

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Foreword

This British Standard has been prepared under the direction of the Gas Standards Policy Committee in response to a request from the Department of Trade and Industry for a standard specifying the safety of certain flueless non-domestic space heaters burning liquified petroleum gases, including site hut heaters, greenhouse heaters and catalytic heaters.

It introduces a new category $I_{L/P50}$ designed to burn propane at a supply pressure of 50 mbar.¹⁾

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations. In particular attention is drawn to:

- a) Statutory Instrument 1358:1984: The Gas Safety (Installation and Use) Regulations 1984.
- b) Statutory Instrument 1065:1985 (as amended). Building Regulations 1985.
- c) Statutory Instrument 1596:1981 (as amended). The Building Standards (Scotland) Regulations 1981.
- d) The Electrical Equipment (Safety) (Amendment) Regulations 1976.
- e) The IEE Regulations for Electrical Installations (the Wiring Regulations) 1981, fifteenth edition.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 26, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ 1 mbar = 10^2 N/m² = 100 Pa.

Section 1. General

1 Scope

This British Standard specifies safety requirements and associated methods of test for the following types of flueless space heater provided that they have a rated heat input not exceeding 10 kW or 4.75 kW for catalytic heaters and 4.0 kW for greenhouse heaters, that they are not intended for use in a domestic environment, and provided that the gases comply with BS 4250:

- a) fixed heaters of a maximum installed height of 2.1 m burning commercial butane or commercial propane;
- b) portable and mobile heaters burning butane or propane including those that incorporate their own containers.

This standard does not apply to appliances which incorporate a fan for either the assistance of combustion or the circulation of convected air. Neither does it cover appliances incorporating full sequence automatic control.

Requirements for appliances given in this standard assume that the gas supply from the container will be governed by a low pressure regulator (not exceeding 50 mbar) complying with BS 3016.

Requirements for controls given in this standard relate to controls fitted as part of, or supplied with, particular appliances; they do not necessarily provide a complete specification for controls intended for general use.

NOTE 1 Catalytic heaters are not considered suitable for use in greenhouses or in areas of high moisture content or in areas having chemicals present which are likely to prevent the correct operation of the catalytic pad.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard, the definitions, given in BS 1179:1967, in BS 1179-6:1980 and in BS 5482 apply, together with the following.

NOTE See also 8.1, 9.2.1 and 9.3.1.

2.1

adjustment pressure

the pressure, measured at the inlet to the appliance, that is required to obtain the rated heat input using the reference test gas

2.2

atmosphere sensing device

a device that is designed to shut off the main gas supply when the carbon dioxide content of the surrounding atmosphere exceeds a given level. Such a device normally comprises a vitiation sensitive pilot in conjunction with a suitable flame failure device

2.3

catalytic unit

the panel and its contents, including the catalytic pad, into which the gas is injected, through which it is distributed and oxidized, and from which the products are emitted

2.4

cold condition

a condition of the appliance required for some tests and obtained by allowing the unlit appliance to attain equilibrium at room temperature

2.5

diffusive catalytic combustion space heater

a space heating appliance in which neat gas diffuses through a catalytic pad and is flamelessly oxidized by air that has diffused into the pad from the surrounding atmosphere at a temperature below that at which flame combustion would occur

NOTE Such heaters do not include catalytic combustion heaters in which premixing of gas and air is effected before the catalytic pad is reached, nor do they include appliances employing after-burners in which products of incomplete combustion from burners are further oxidized over a catalyst.

2.6

fixed heater

a heater designed to be secured to a wall or floor, or suspended from a ceiling

2.7

greenhouse heater

a flueless convector heater of not more than 4 kW specially designed to be able to tolerate a partially vitiated environment and, when not required to be firmly secured, to be self-extinguishing if knocked over

2.8

hot condition

a condition of the appliance required for some tests and obtained by heating to thermal equilibrium at the adjustment pressure, any thermostat remaining fully open

2.9

mobile heater

a self-contained heater incorporating its own gas container within the body of the appliance and designed to be moved without lifting

2.10

portable heater

a self-contained heater for connection to a gas container by means of flexible tubing and designed to be carried easily

2.11

rated heat input

the manufacturer's declared heat input for the appropriate reference test gas

2.12

site hut

an enclosed relocateable structure comprising floor, external walls and roof designed to be transportable by road vehicle either complete or after dismantling

2.13

site hut heater

a portable/mobile or fixed space heating appliance designed specifically for the purpose of heating either temporary or permanent site accommodation

3 Classification of appliances

3.1 By category

For the purpose of this standard, the following categories of appliance are permitted.

Category I_L, I_{L/B}, I_{L/P}, I_{L/P50}

NOTE BS 4947 describes the category system of appliance classification, by which an appliance is denoted by a category number, I, II or III, according to the number of gas families that it is designed to burn and the families are identified by subscripts, T, N and L, for the 1st, 2nd and 3rd gas families respectively.

3.2 By flue type

For the purposes of this standard the following types of appliance are permitted:

type A: flueless appliances

type B: open flues appliances

type C: room-sealed appliances

type C₁: balanced flue appliances

type C₂: Se-duct appliances

Relevant definitions for these types of appliance are given in BS 1179-6:1980.

This standard covers types A appliances only.

NOTE For the purposes of this standard, appliances are also classified according to the flue system for which they are designed and the source of combustion air.

4 General

The appliance shall comply with the requirements of this standard when tested using the specified test gases, full details of which are given in BS 4947.

5 General conditions of test

5.1 Test room

The room shall be adequately ventilated but free from draughts likely to affect the performance of the appliance. If the test results are likely to be influenced by the temperature of the ambient air, then the room temperature shall be maintained at 20 ± 5 °C.

5.2 Preparation of appliance for testing

The appliance shall be installed in accordance with the appliance manufacturer's instructions, using the appropriate reference test gas at the appropriate inlet pressure as follows.

Appliance category	Test gas	Inlet pressure
		mbar
I _L	LPGA	28
I _{L/B}	LPGA	28
I _{L/P}	LPGC	37
I _{L/P50}	LPGC	50

Before any tests are made the appliance shall be operated at its full working temperature for a period of not less than 8 h to dry any insulation and remove any temporary finish that might interfere with observations.

5.3 Test procedure

The gas connections and systems up to and including the injector(s) shall be examined for soundness both before and after test. The test results are deemed to be invalid unless the system is sound (see clause 7).

The appliance shall be at room temperature at the start of each test unless otherwise stated.

During testing, the initial adjustment of the appliance shall not be altered unless specifically required by the test method.

Precautions shall be taken to prevent thermostats or other variable controls from acting to interfere with the gas flow, except as necessitated by the test.

Test pressures shall be measured correct to 0.2 mbar and controlled so that the variation does not exceed ± 0.2 mbar.

NOTE Tables giving details of the test gases (and, where appropriate, their conditions of application) to be used are inserted in relevant clauses. Test gases LPGA and LPGB are used with appliances burning butane and test gases LPGC and LPGE are used with appliances burning propane.

Section 2. Safety requirements and associated methods of test

6 General design and construction

6.1 Materials, fittings and finishes

Materials, fittings and finishes, the failure of which may affect the safe operation of the appliance, shall be appropriate to the conditions arising in the part of the appliance in which they are used. The appliance shall be free from swarf, grit or other foreign matter.

6.2 Removal and reassembly of parts by user

Parts that are intended to be removeable by the user, e.g. for cleaning, shall be readily accessible, shall not require the use of tools for their removal, shall be easy to assemble correctly and difficult to assemble incorrectly. Parts that are not intended to be removed by the user shall require the use of tools for their removal.

6.3 Access for servicing or adjustment

There shall be easy and safe access to components and controls that may require servicing or adjustment.

6.4 Materials in contact with gas

6.4.1 Copper tubing

Copper tubing shall not be used where it would be exposed to temperatures exceeding 100 °C.

6.4.2 Non-metallic materials

6.4.2.1 Seals

Non-metallic seals in the gas system other than those incorporated in controls shall comply with the requirements of BS 6505 class 3A1, 3B1 or 3C1.

6.4.2.2 Jointing

Jointing components shall comply with BS 5292.

6.4.3 Hose

Flexible rubber hose shall comply with hose type 2 of BS 3212 (BS 3212-2).

6.4.4 Catalytic material

Precautions shall be taken to prevent the emission from the catalytic unit of materials used in its manufacture.

6.5 Gas-carrying components

Gas-carrying tubes and fittings shall be resistant to corrosion.

Drillings for bolts, screws, etc. shall not connect with gasways. Where solder is used for jointing gas carrying components it shall have a melting point, after application, of not less than 450 °C.

6.6 Gas connections

6.6.1 Fixed appliances

The gas connection on the appliance shall be as follows:

- have a jointing thread complying with clause 5 of BS 21:1985; or
- be suitable for direct connection to copper tube complying with BS 2871-1, or
- be suitable for direct connection to copper capillary and compression fittings complying with BS 864-2.

6.6.2 Portable and mobile appliances

A hose and regulator shall be fitted to the appliance, and the hose connections shall be secured with suitable clips. (e.g. those conforming to BS 5315).

Portable heaters for use in site huts shall have a maximum hose length of 2 m.

The regulator shall supply gas at a nominal pressure of 28 mbar, 37 mbar or 50 mbar as appropriate and shall comply with the requirements of the relevant Parts of BS 3016.

NOTE Appliances of category I_L need be supplied with only one regulator either for propane (37 mbar) or for butane (28 mbar).

6.7 Pressure test point

For fixed appliances, means shall be provided to allow the setting pressure to be measured easily.

6.8 Aeration adjusters

No means of adjusting the primary air supply to the burner shall be provided.

6.9 Insulation

Thermal or acoustic insulation shall be non-combustible (see BS 476-4), shall be securely located and shall be protected against mechanical damage and condensate.

6.10 Asbestos

Materials containing asbestos shall not be used.

6.11 Portable heaters and fixed heaters

Portable and fixed heaters intended for installation 2.1 m or less above floor level shall be fitted with a guard complying with clauses 1.3.3, 2.1.1 and 2.1.2 of BS 1945:1971. Any products of combustion outlets in the surround shall each have a major dimension less than 150 mm, a minor dimension less than 35 mm and a diagonal of less than 154 mm.

6.12 Appliance designed to incorporate an LPG container

The gas container shall be supported upright above ground level. Means shall be provided to hold the container securely on the appliance.

Compartments within appliances for liquefied petroleum gas containers shall be so designed that effective ventilation is provided by openings at the bottom and at the top. The total area of the openings at the bottom and at the top shall at least 5 % and 1 % respectively of the compartment floor area.

The container shall be supported within the compartment so that it is clear of the ground. Such support shall have sufficient strength to resist deformation under the weight of the full container. The housing shall not have a raised threshold relative to the base on which the container rests.

The compartment door shall not open when the appliance, with a full container located as far forward as possible, is tilted in a backward direction until the balance of the container is lost.

It shall be possible to insert the container into, and extract it from, the compartment without difficulty and without the container being tilted.

The container valve shall be accessible without opening the compartment door.

The compartment shall not have a well.

There shall be a minimal internal communication between the container housing and the burner unit.

6.13 Appliances designed for mounting on a LPG container

Means shall be provided for securely mounting the appliance onto the container. The container valve shall not be used for such mounting.

6.14 Stability

6.14.1 *Mobile and portable Appliances*

The appliance shall not fall forward or sideways when placed on a plane inclined at an angle of 15° to the horizontal and shall not fall backwards when placed on a plane inclined at 10° to the horizontal.

Greenhouse heaters, other than those intended to be firmly secured, shall be self-extinguishing when knocked over. This shall be verified as specified in 16.2.2.

For an appliance incorporating a means to vary the position of the heating element, the element shall be fixed in the most unfavourable position with regard to the appliance stability.

For an appliance incorporating its own gas supply the stability test specified in this subclause shall be carried out with both full and empty cylinders of the maximum and minimum sizes recommended by the appliance manufacturer. The cylinder shall not be displaced from its mounting during this test.

6.14.2 *Other appliances*

Means shall be provided for fixing the appliance to a floor or wall.

6.15 Wheels and castors

Appliances incorporating wheels or castors shall have means to prevent accidental movement of the appliance when in use. Wheels and castors shall be sufficiently robust to withstand normal use of the appliance.

6.16 Portable appliances not incorporating a gas cylinder

It shall not be possible to position the appliance in any way such that the guard lies within 5° of horizontal unless the burner is automatically extinguished.

NOTE This is to prevent misuse as a cooking appliance.

7 Soundness

7.1 General

All gas-carrying parts of the appliance shall be sound, and when connected shall form a complete assembly that is sound. The test specified in 7.2 shall be carried out on the complete assembly.

NOTE Additional and more stringent tests may be necessary for certain components to ensure an adequate margin of safety.

7.2 Complete assembly

7.2.1 Requirement

When tested as described in 7.2.2 the fully assembled appliance shall be sound when subjected to an internal air pressure of 150 mbar.

This requirement shall be met if the leakage rate (see note) does not exceed 85 cm³/h over a period of 1 min.

NOTE One convenient method of measuring the leakage rate is the bubble leak indicator illustrated in Figure 1. The rate of six bubbles per minute should be equivalent to 85 cm³/h but this should be checked before the indicator is used.

7.2.2 Method

Connect to the appliance inlet an air supply maintained constant at the appropriate pressure and embodying a suitable meter for measuring air flow. Test the appliance under the following conditions:

- with all gas taps in the OFF position;
- with all gas taps turned to the ON position, any control device being maintained in the open position and the gas supply disconnected and all injectors and pilots capped off.

NOTE Care should be taken to ensure that any means (e.g. thermal or mechanical) used to maintain the control device in the open position is compatible with the normal operation of the device.

8 Heat input

8.1 Definition and conditions of measurement

For the purposes of this clause, the heat input is that which would be obtained with a reference gas of the following Wobbe number. The heat input shall be measured with the appliance at thermal equilibrium.

Test gas	Wobbe number
	MJ/m ³
LPGA	87.5
LPGC	77.0

8.2 Tolerance

The heat input shall be within ± 5 % of the maximum rated heat input, and of any minimum stated heat input (for catalytic heaters a tolerance of ± 10 % is permitted) when the following pressure is applied to the inlet of the appliance.

Appliance category	Test gas	Inlet pressure
		mbar
I _L	LPGA	28
I _{L/B}	LPGA	28
I _{L/P}	LPGC	37
I _{L/P50}	LPGC	50

The heat input shall include that to any permanent pilot.