

Safety of domestic gas appliances —

**Part 16: Specification for inset live fuel
effect gas fires (2nd and 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/17, upon which the following bodies were represented:

- Association for Consumer Research (ACRE)
- British Gas plc
- British Non-ferrous Metals Federation
- Consumer Policy Committee of BSI
- Department of Energy (Energy Efficiency Office)
- Department of the Environment (Construction Directorate)
- Department of Trade and Industry (Consumer Safety Unit, CA Division)
- Gas Consumers' Council
- Institution of Gas Engineers
- Liquefied Petroleum Gas Industry Technical Association (UK)
- National Caravan Council Limited
- Royal Society for the Prevention of Accidents
- Society of British Gas Industries

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Decorative Gas Fire Manufacturers' Association
- Coopted member

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Foreword

This Part of BS 5258 has been prepared under the direction of the Gas Standards Policy Committee to meet the need for a standard specifying the safety requirements and associated methods of test for inset live fuel effect gas fires burning 2nd and 3rd family gases.

In common with other Parts of BS 5258 currently being revised and prepared, this Part can be applied to all production appliances through a recognized scheme of quality assurance, whereas originally the Parts were written with type approval in mind. The intention is that all appliances manufactured in accordance with this standard will be safe in normal use when installed and maintained in accordance with the relevant British Standard codes of practice and with the manufacturer's instructions.

The codes of practice and installation specifications relevant to this Part of BS 5258 are BS 5440-1 and BS 5440-2, BS 5482-1 and BS 5482-2 and BS 5871-2.

Attention is also drawn to the requirements of the Gas Safety (Installation and Use) Regulations, the Low Voltage Electrical Equipment (Safety) Regulations and of the various Building Regulations.

The following Parts of BS 5258 are already published:

- *Part 1: Specification for central heating boilers and circulators;*
- *Part 2: Cooking appliances (obsolescent);*
- *Part 4: Specification for fanned-circulation ducted-air heaters;*
- *Part 5: Specification for gas fires;*
- *Part 6: Specification for refrigerators and food freezers;*
- *Part 7: Storage water heaters;*
- *Part 8: Combined appliances: gas fire/back boiler;*
- *Part 9: Specification for combined appliances: fanned-circulation ducted-air heaters/circulators;*
- *Part 10: Flueless space heaters (excluding catalytic combustion heaters) (3rd family gases);*
- *Part 11: Flueless catalytic combustion heaters (3rd family gases);*
- *Part 12: Specification for decorative fuel effect gas appliances (2nd and 3rd family gases);*
- *Part 13: Specification for convector heaters;*
- *Part 14: Specification for barbecues (3rd family gas);*
- *Part 15: Specification for combination boilers.*

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.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 32, 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.

Section 1. General

1 Scope

This Part of BS 5258 specifies safety requirements and describes associated methods of test for 2nd and 3rd family inset live fuel effect gas fires that are designed to simulate visually solid fuels and are designed to be installed within a builder's opening and/or fireplace recess, and may, additionally, be intended for installation in a purpose-designed metal flue box and flue complying with the constructional requirements of BS 715.

This Part of BS 5258 is not applicable to:

- a) inset live fuel effect gas fires having a rated heat input exceeding 15 kW;
- b) decorative fuel effect gas appliances which are the subject of BS 5258-12;
- c) inset live fuel effect gas fires incorporating a fan either to assist in the supply of air for combustion or in the flue.

In specifying requirements for appliances burning 2nd family gases, it is assumed that a meter governor will be fitted and for appliances burning 3rd family gases it is assumed that the gas supply from the container will be governed by a pressure regulator complying with BS 3016.

The requirements for controls 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 This specification contains requirements relating to the guarding of the appliance but it should be noted that the Heating Appliances (Fireguards) Regulations (Statutory Instrument 2106:1973) are subject to government review.

NOTE 2 The titles of the publications referred to in this standard are listed on page 32.

2 Definitions

For the purposes of this Part of BS 5258, the definitions given in BS 1179:1967, BS 1179-6 and in the relevant British Standard codes of practice apply, together with the following.

2.1

adjustment pressure

the pressure in the hot condition, measured at the appliance test point (see 2.1.4), that is required to obtain the rated heat input using the reference test gas

2.2

builder's opening

the enclosure constructed by the builder to accommodate fireplace components

2.3

cold condition

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

2.4

decorative fuel effect gas appliance

an appliance designed to simulate a solid fuel appliance primarily for decorative purposes and intended to be installed so that the products of combustion pass unrestricted from the firebed to the chimney or flue [see Figure 1(a)]

2.5

fireplace opening

the aperture formed in the face of the builder's opening, the fireplace recess or fire surround, if fitted

2.6

fireplace recess

the recess formed by the inclusion of fireplace components in the builder's opening

2.7

hot condition

a condition of the appliance required for some tests and obtained by heating the appliance for 1 h at the adjustment pressure, any thermostat remaining fully open

2.8

inset live fuel effect gas fire

an appliance designed to simulate a solid fuel appliance and intended to be installed so that the passage of the products of combustion from the firebed to the chimney or flue is restricted by the appliance and so that air enters the fireplace only through purpose designed openings [see Figure 1(b)]

2.9

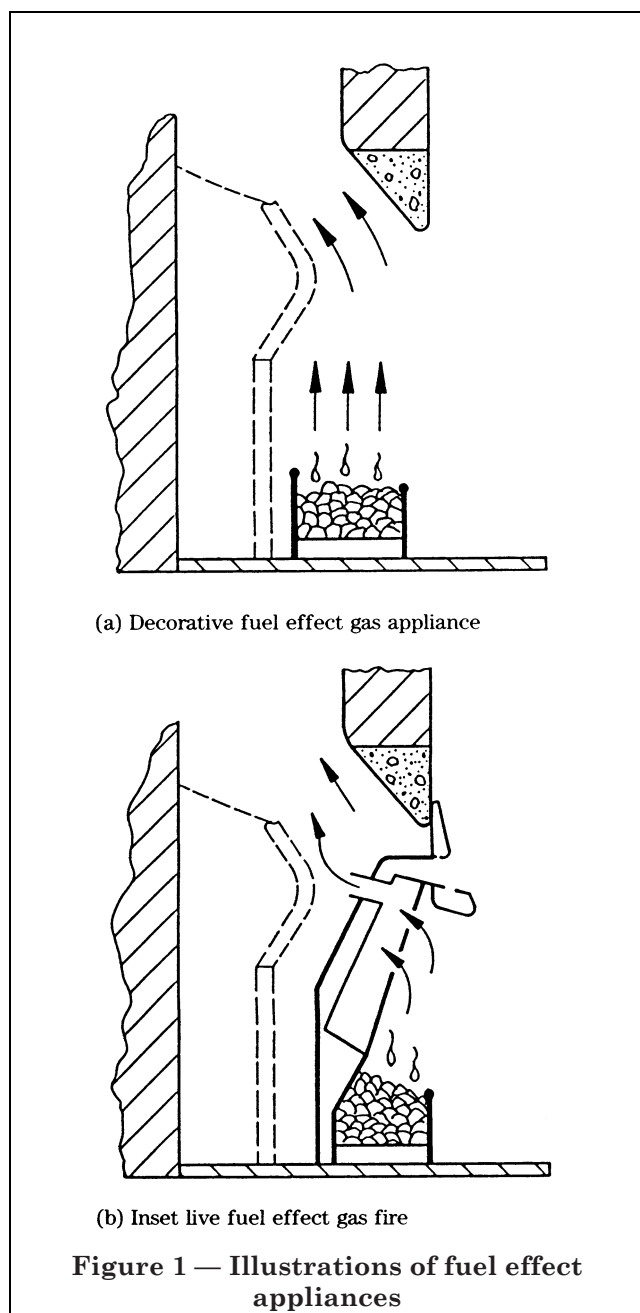
manufacturer's recommended setting pressure

the pressure, measured at the appliance test point (see 2.1.4), that is specified by the manufacturer for the purpose of adjusting the appliance heat input

2.10

rated heat input

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



3 Classification of appliances

3.1 Classification by category

The category system of appliance classification is described in A.1.3 of BS 4947:1984 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. The gas families are identified by subscripts T, N and L for 1st, 2nd and 3rd gas families respectively. Subscripts P and B denote to propane and butane respectively.

For the purposes of this Part of BS 5258, the following categories of appliance are permitted:

Categories I_N, I_L, I_{L/B}, I_{L/P}

Categories II_{NL}, II_{NL/B}, II_{NL/P}

Within a given category the changes that are allowed in adapting an appliance from operation on one gas or gas family to operation on another are limited as follows.

- a) Change of gas family.
 - 1) Adjustment of governor setting or exchange of governor springs or immobilization of the governor (when fitted).
 - 2) Exchange of injectors or non-aerated burner assemblies.
 - 3) Adjustment of aeration.
 - 4) Exchange or adjustment of auxiliary components (e.g. pilots, igniters, restrictors).
- b) Change of gases within 3rd family.
 - 1) Adjustment of aeration.

3.2 Classification by flue type

Appliances are also classified according to the flue system for which they are designed and the source of the combustion air. This Part of BS 5258 covers type B, i.e. open-flued appliances only.

NOTE The definition of this type of appliance is given in BS 1179-6.

4 General requirements

The appliance shall comply with this Part of BS 5258 when tested using the specified test gases of the appropriate gas family.

NOTE 1 Full details of the test gases are given in BS 4947.

NOTE 2 Appliances designed to burn 3rd family gases may be designed for use with either commercial butane or commercial propane, or both.

When submitted for type testing an appliance shall be supplied with all decorative trims and fire fronts.

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 influenced by the temperature of the ambient air, the room temperatures shall be maintained at 20 ± 5 °C.

5.2 Preparation of appliance

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

Family	Test gas	Inlet pressure
2nd	NGA	20 mbar ^a
3rd	LPGA	28
	LPGC	37
^a 1 mbar = 0.1 kPa = 10 ² N/m ² .		

Before any tests are made the appliance shall be operated at its full working temperature for a period sufficient to dry the insulation and remove any temporary finish that might interfere with observations.

5.3 Test conditions

5.3.1 The test conditions given in **5.3.2** to **5.3.8** shall apply except where otherwise specified in section 2.

5.3.2 The appliance shall be installed on a test box and flue as described in Appendix A. The chimney shall terminate inside the test room.

Where an appliance is also suitable for installation and use in a metal flue box (see **6.1**), the appropriate tests specified in **14.2**, **14.3** and **15.4** shall be carried out in a flue box and test flue assembly (see Figure 2). The flue box and test flue shall be supplied by the manufacturer to the test authority. The flue box shall have the minimum dimensions specified in the manufacturer's installation instructions and shall comply with the constructional requirements of BS 715. The test flue shall have the minimum nominal diameter specified in the manufacturer's instructions and be of such a height that the distance between the base of the flue box and the top of the flue is 3 m.

5.3.3 Where the appliance is to be used with a surround, specific to the appliance, this surround shall be supplied by the manufacturer for the purposes of testing the appliance. This surround shall be of the minimum thickness specified in the manufacturer's instructions.

5.3.4 The gas connections and systems up to and including the burner shall be examined for soundness both before and after test. The test results are deemed invalid unless the system is sound (see **7.1**).

5.3.5 The appliance shall be at room temperature at the start of each test.

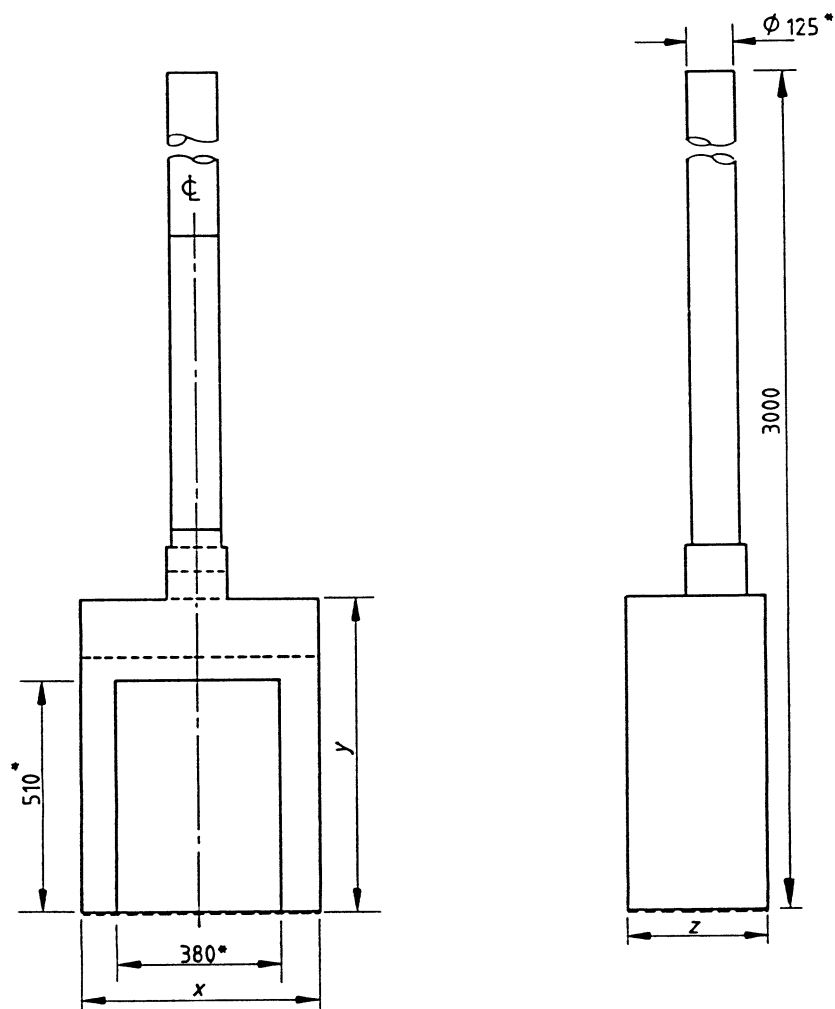
5.3.6 During testing the initial adjustment of the appliance shall not be altered.

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

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

NOTE 1 The test gases (and, where appropriate, their conditions of application) to be used are specified in the relevant clauses of section 2. For 3rd family gas appliances, test gases LPGA and LPGB are used with the appliance adjusted for butane and test gases LPGC and LPGE with the appliance adjusted for propane.

NOTE 2 In general, except for tests involving governor performance, the appliance governor, if any, may be put out of operation and the specified test pressure obtained by adjustment of the gas pressure at the inlet to the appliance.



All dimensions are in millimetres.

NOTE 1 Dimensions marked with an asterisk are minimum dimensions.

NOTE 2 Dimensions x , y and z are subject to the limitations specified in the manufacturer's instructions.

Figure 2 — Test box and flue for appliances that can be installed in a metal flue box

Section 2. Safety requirements and associated methods of test

6 General design and construction

6.1 Location

6.1.1 The appliance shall be designed for use in a builder's opening in which the sides of the recess immediately above the throat-forming lintel are tapered to form a smooth gather to the walls of the flue.

6.1.2 The appliance shall be designed for location and use in one or more of the following.

- a) A fireplace recess comprising components as specified in BS 1251.
- b) A fireplace recess in the form of a builder's opening with special components, which shall be supplied with the appliance.
- c) A builder's opening.

If, in addition to one or more of the locations specified above, the manufacturer specifies that an appliance is suitable for location and use in a metal flue box fitted to a metal flue having a nominal diameter of not less than 125 mm the flue box and flue shall comply with the constructional requirements of BS 715. The design of the flue box shall be such that when the appliance is installed in accordance with the manufacturer's instructions, no part of the flue outlet spigot or products outlet shall be less than 50 mm from any surface within the fireplace recess.

6.1.3 Unless a guard complying with BS 1945 is fitted, the following shall apply when the appliance is installed in accordance with the manufacturer's instructions.

- a) No naked flame or incandescent part of the firebed shall project more than 50 mm from the vertical plane of the fireplace opening.
- b) The forward projection of any naked flame or incandescent part of the firebed shall be enclosed on all sides except the front.
- c) The hearth shall project at least 300 mm in front of any naked-flame, e.g. pilot or burner, and any incandescent part of the appliance firebed.
- d) The hearth and any surround that is fitted shall project at least 150 mm beyond each side of the naked flame or incandescent part of the firebed at its widest point.
- e) The periphery of the hearth shall be at least 50 mm above the floor level. This requirement is deemed to be satisfied if the appliance is supplied with a fender of at least this height.

6.1.4 The appliance shall be capable of being fitted so that there is a void below the base of the flue spigot or products outlet for the collection of debris. The space should be readily accessible for inspection and clearance of the debris, e.g. by removal of the appliance. The appliance shall be capable of being installed in such a manner as to ensure that air enters the fireplace opening only through purpose-designed passages through the appliance.

6.2 Materials, fittings and finishes

Materials, fittings and finishes, the failure of which may affect the safe operation of the appliance, shall comply with the relevant British Standards and 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 or other foreign matter.

Asbestos-containing materials shall not be used.

6.3 Removal and assembly of parts by user

The correct assembly of parts that are intended to be removable by the user, for example for cleaning or replacement, shall be obvious. It shall be difficult to assemble such parts incorrectly.

Parts that are not intended to be removed by the user and that on removal may result in a hazard, e.g. injector jets, shall require the use of tools for their removal.

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 above 100 °C.

6.4.2 Jointing compounds

Jointing compounds shall comply with BS 5292.

6.5 Aeration adjusters

Any aeration adjuster shall not be liable to inadvertent movement, shall not be capable of closing the air inlet completely and shall not be capable of being set in such a manner as to cause gas to spill from the burner venturi throat.

If the aeration is intended to be adjusted by the user, the appliance shall comply with **9.1**, **13.1** and **13.2** with any adjuster set to the position of minimum aeration, and with **12.1.1**, **12.1.2** and **16.2** with any adjuster set to the position of maximum aeration. In addition, the appliance shall comply with **14.2** with any aeration adjuster set in the most onerous position for the purposes of this requirement.

6.6 Burner design

For those appliances using a particulate gas distribution medium, e.g. sand, a container shall be provided to define and locate the quantity of distribution medium.

6.7 Insulation

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

6.8 Refractories

Any bricks, radiants and imitation fuel, when installed in accordance with the manufacturer's instructions for installation and use, shall be so located with respect to the burner and to each other that, at the limit of their movement, the requirements of 9.1 and 14.2 are met.

6.9 Assembly of appliance casing

Where screws are used for the assembly of any part of the appliance casing which is removable for general servicing, they shall be fitted with spring steel fasteners or have at least 2½ threads engagement.

6.10 Assembly of gas-carrying parts

Drillings for bolts and screws shall not connect with fuel gasways. The residual wall thickness shall be at least 1 mm.

Brackets for supporting components shall not be interposed in any gas-carrying joints.

NOTE The niting plate is not considered to be a gas-carrying joint.

Solder that has a melting point below 450 °C after application shall not be used for the connection of gas-carrying parts.

Gas-carrying components which may be removed during servicing shall be designed so that when replaced they form an assembly which is sound. This requirement is assessed by removing and replacing the relevant components five times, following which the requirements of 7.1 shall be met. If required by the servicing instructions any gaskets or seals shall be replaced.

7 Gas soundness

7.1 General

All gas-carrying parts of the appliance shall be sound, and when connected shall form a complete assembly which is sound.

NOTE Additional and more stringent tests may be required by other standards for certain components to ensure an adequate margin of safety.

7.2 Requirement

When tested as described in 7.3, the fully assembled appliance shall be sound at the following internal air pressure.

Family	Air-pressure
	mbar
2nd	50
3rd	150

Where the appliance is for use on both gas families, the test pressure shall be 150 mbar.

This requirement shall be deemed to be met if the leakage rate does not exceed 100 cm³/h over a period of 1 min.

NOTE One convenient method of measuring the leakage rate is by the bubble leak indicator illustrated in Figure 3. A rate of seven bubbles per minute should be equivalent to 100 cm³/h but this should be checked before the indicator is used.

7.3 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 flame supervision device being maintained in the open position by suitable means (e.g. thermal or mechanical) compatible with its normal operation and all injectors and pilots capped off.

8 Heat input

8.1 Definition and conditions of measurement

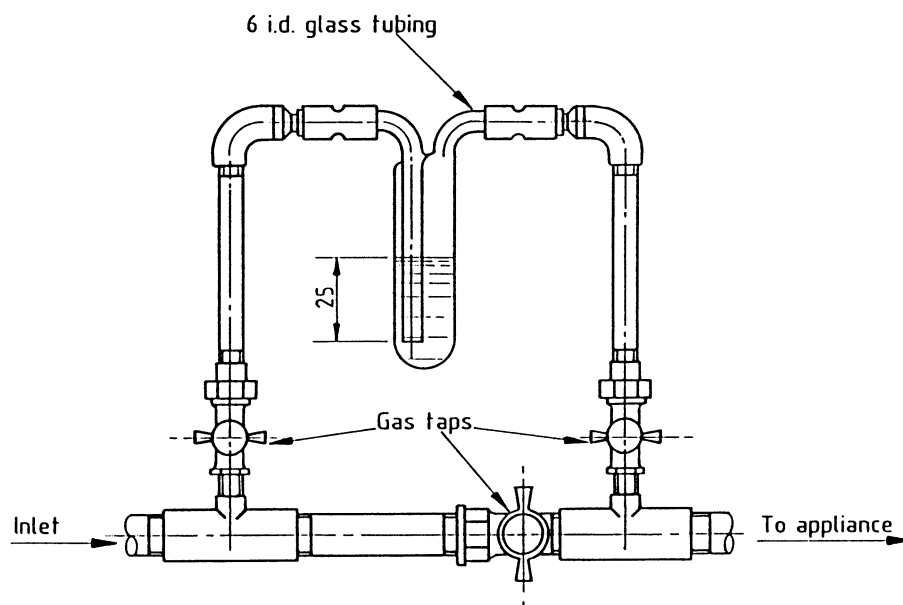
For the purposes of 8.1 to 8.3, the heat input is that which would be obtained with a reference gas of the following Wobbe number.

Family	Test gas	Wobbe number ^a
		MJ/m ³
2nd	NGA	50.8
3rd	LPGA	87.5
	LPGC	77.0

^a The reference conditions are 1013.25 mbar, 15 °C, dry.

The heat input shall be measured with the appliance fitted to the test box and flue in accordance with 5.3 and 1 h after lighting (see Appendix B).

For category I_L appliances, the heat input shall be measured with LPGA only.



All dimensions are in millimetres.

Figure 3 — Bubble leak indicator

8.2 Tolerance

The heat input shall be within $\pm 5\%$ of the rated heat input with the following pressure applied to the inlet of the appliance and with the appliance adjusted to the manufacturer's recommended setting pressure.

Family	Test gas	Inlet pressure
2nd	NGA	20 mbar
3rd	LPGA	28
	LPGC	37

NOTE The heat input of the type test sample should be within $\pm 2\%$ of the rated heat input in order to ensure that the results of other tests are not unduly affected by deviations from the stated test conditions.

8.3 Adjustment

If any means of adjustment to the heat input of the appliance is provided, other than the user's control, it shall be designed to discourage unauthorized interference with the adjusting mechanism and shall not be liable to inadvertent movement.

NOTE Suitable means of sealing the adjusting mechanism include locknuts, locking wire with seal, a cover screw with a screwdriver slot or any means that requires the use of tools to gain access to the adjusting mechanism.

9 Combustion

9.1 General test

9.1.1 Requirement

When the appliance is tested in accordance with 9.1.3, the CO/CO₂ ratio shall not exceed 0.02.

NOTE For the purposes of this Part of BS 5258, the carbon dioxide and carbon monoxide contents of the products of combustion should be determined with respective accuracies of 0.05 % and 0.001 % of the volume of the sample. The concentration of the two gases can be determined conveniently with adequate accuracy by a variety of methods (see BS 1756) and the ratio is not appreciably affected by dilution of the products of combustion during sampling.

The test gases and conditions shall be as follows.

Family	Test gas	Conditions
2nd	NGA	Minimum operational rate to 115 % of rated heat input
	NGB	Adjustment pressure
3rd	LPGA	Minimum operational rate to 112 % of rated heat input
	LPGC	Minimum operational

9.1.2 Minimum operational rate

For the purposes of 9.1 and clause 12, the minimum operational rate is defined as follows:

- a) for any burner or section of a burner which is controlled by a thermostat, the bypass rate;

b) for any burner which is manually controlled and which is subdivided into sections under control of a tap (e.g. duplex burners), 30 % of the normal rate of each individual section;

c) for any burner which is manually controlled, but which is not subdivided into sections (i.e. simplex burner), 20 % of the normal rate;

d) for any burner where it is only possible to obtain certain predetermined fixed settings, the rate obtainable at the lowest fixed setting.

9.1.3 Method

Fit the appliance to the test box and flue in accordance with 5.3.

Make tests at a sufficient number of heat inputs to determine the combustion performance over the whole of the prescribed range. At the minimum operational rate heat the appliance for 1 h and take readings. At increasing heat inputs take further readings at intervals of 30 min up to the prescribed overload. If this is done by plotting a curve of CO/CO₂ against heat input, no extrapolation shall be made. Collect the products of combustion, taking precautions to ensure that the sample drawn is mixed and representative.

During the tests record the CO and CO₂ contents of the products of combustion that are attributable to the appliance.

9.2 Blocked flue test

9.2.1 Requirement

The appliance shall not give rise to a CO/CO₂ ratio exceeding 0.02 when tested in accordance with the following conditions and the method described in 9.2.2.

Family	Test gas	Conditions
2nd	NGA	Adjustment pressure
3rd	LPGA	
	LPGA	

9.2.2 Method

Fit the appliance to the test box and flue in accordance with 5.3 and seal off the top of the flue. When the hot condition is reached, sample the flue gases emitted into the room from the appliance.

9.3 Reduced inlet pressure

9.3.1 Requirement

When tested in accordance with the following conditions and by the method described in 9.3.2, an appliance shall not give rise to a CO/CO₂ ratio exceeding 0.02 or, if the heat input obtained under the test conditions is less than 50 % of the rated heat input, $0.02 \times \text{half rate/test rate}$.

Family	Test gas	Inlet pressure
		mbar
2nd	NGA	12.5
3rd	LPGA	25
	LPGA	34

9.3.2 Method

Fit the appliance to the test box and flue in accordance with 5.3. Adjust the heat input of the appliance to the minimum operational rate given in 9.1.2 and operate it for 1 h. Then reduce the inlet pressure to the value(s) specified in 9.3.1, as appropriate, and after 30 min collect the products of combustion taking precautions to ensure that the sample drawn is mixed and representative.

10 Ignition

10.1 General

Ignition of the pilot (or main burner if there is no pilot) shall be from a safe position.

It shall be possible to light the appliance safely with a match or a 150 mm wooden spill when there is no ignition device incorporated or in the event of failure of the ignition device.

It shall be possible to determine readily that the pilot (or main burner if there is no pilot) is alight.

Any specific instructions that are necessary in respect of operation of the tap shall be stated in the user's instructions.

Flames shall carry across to all ports or jets.

10.2 Cold condition

When the appliance is operated in accordance with the manufacturer's instructions, ignition shall be achieved in less than 3 s from when gas is available at the ports. Ten attempts shall be made to ignite the burner (or pilot), of which at least nine shall be successful. For piezo-electric spark ignition devices, the electrodes are shorted out after each ignition attempt.