
Specification for
Safety of domestic gas appliances

Part 11. Flueless catalytic combustion heaters
(3rd family gases)

Spécification des règles de sécurité des appareils domestiques utilisant des combustibles gazeux
Partie 11. Appareils de chauffage à combustion catalytique non raccordés à un conduit
d'évacuation (gaz de la famille 3)

Spezifikation für Sicherheitsbestimmungen für häusliche Gasverbrauchseinrichtungen
Teil 11. Katalyt-Strahler die nicht an einen Schornstein oder eine Abgasabführung
angeschlossen sind (Gase aus der Familie 3)

Contents

	Page		Page
Foreword	Inside front cover	13. Flame stability	6
Cooperating organizations	Back cover	14. Sooting	6
Specification		15. Flue systems	6
0. Introduction	1	16. Fire hazard and limiting temperatures	6
Section one. General		17. Prolonged performance test	9
1. Scope	1	18. Automatic controls	9
2. References	1	19. Manual controls	10
3. Definitions	1	20. Electrical safety	10
4. Classification of appliances	2	21. User's instructions	10
5. General requirements	2	22. Installation and servicing	10
6. General conditions of test	2	Appendix	
Section two. Safety requirements and associated methods of test		A. Vitiation room	12
7. General design and construction	2	Figures	
8. Soundness	3	1. Bubble leak indicator	4
9. Heat input	4	2. Apparatus for measuring floor and wall temperatures	7
10. Combustion	4	3. Test shelf	7
11. Ignition	5	4. Apparatus for the measurement of increase of vapour pressure	8
12. Ignition system	6	5. Vitiation room	12

Foreword

BS 5258 has been prepared, under the direction of the Gas Standards Committee, to meet the need for a standard specifying the safety requirements and associated methods of test for domestic gas appliances burning 1st, 2nd and 3rd family gases.

BS 1250 has specified safety and performance requirements for a range of domestic appliances burning 1st family gas while BS 2491, BS 2773 and BS 2883 have similarly covered a limited range of appliances burning 3rd family gas. The increased distribution of 2nd family gas, and the development of a new generation of appliances, often designed to burn more than one family of gas, have necessitated the publication of new British Standards that relate to appliances burning 1st, 2nd and 3rd family gases and in which the requirements and methods of test for the three gas families have been, where technically appropriate, harmonized. BS 5258 specifies safety requirements and associated methods of test and therefore supersedes, in part, BS 1250, BS 2491, BS 2773 and BS 2883. Other, non-safety, aspects of appliances will be the subject of another British Standard now in course of preparation.

BS 5258 is being prepared in a number of Parts, each of which will apply to one particular type of appliance. In each Part, the sequence of the clauses and their subject matter are being arranged so that, as far as possible, a particular main clause number refers to the same aspect of the specification in all Parts. The following Parts are published or are, as indicated by an asterisk, in course of preparation.

- Part 1 Central heating boilers and circulators
- Part 2 Cooking appliances
- Part 3 Drying cabinets
- Part 4 Fanned-circulation ducted-air heaters
- Part 5 Gas fires
- Part 6 Refrigerators and food freezers

Part 7 Storage water heaters

*Part 8 Combined appliances: gas fire/back boiler

*Part 9 Combined appliances: air heater/circulator

Part 10 Flueless space heaters (excluding catalytic combustion heaters) (3rd family gases)

Part 11 Flueless catalytic combustion heaters (3rd family gases)

Part 12 Decorative gas log and other fuel effect appliances (2nd and 3rd family gases)

Some of the provisions of this standard are set deliberately high to make allowance for manufacturing tolerances and variations in the supply of fuel gases. Some of the tests are destructive and it follows that it is not practicable to check each appliance made against all the provisions of the standard. However, the intention of the standard is that, if all its requirements are met when applied to a sample representing the average of production, this will ensure:

that all appliances claimed to be designed to it are safe in normal use when installed and maintained in accordance with the relevant British Standard codes of practice and with the manufacturer's instructions, and that such servicing as may be necessary to maintain the appliance in a safe condition can be carried out by a competent fitter without difficulty.

For this Part the relevant code of practice is:

BS 5482 : Parts 1, 2 and 3. Home Office Fire Prevention Guide No. 4, 'Safe use and storage of LPG in residential premises' is also pertinent.

Furthermore, attention is drawn to the requirements of the Gas Safety Regulations issued by the Department of Energy, of the Building Regulations issued by the Department of the Environment and of the Building Standards (Scotland) (Consolidation) Regulations issued by the Scottish Development Department.

Certification. Attention is drawn to the certification facilities described on the inside back cover of this standard.

British Standard Specification for

Safety of domestic gas appliances

Part 11. Flueless catalytic combustion heaters (3rd family gases)

0. Introduction

This Part of BS 5258 has been prepared in response to a request from the Home Office for a standard covering the safety of flueless catalytic combustion heaters burning liquefied petroleum gases. In 1965, when BS 2773 was published, catalytic space heaters were specifically excluded as some may have constituted a safety hazard. Since then, however, there has been considerable development of catalysts and of catalyst supports and this type of appliance can now be at least as safe as those employing flame combustion.

Although there are as yet no commercial 1st and 2nd family gas equivalents to this type of space heater, the requirements of this type of heater are of the same nature as those of other domestic gas appliances and therefore are considered appropriate to the BS 5258 series.

Section one. General

1. Scope

This Part of BS 5258 specifies safety requirements and associated methods of test for the following types of flueless, diffusive, catalytic combustion space heaters provided that they have a rated heat input not exceeding 4.75 kW, that they are intended for use in a domestic environment, and provided that the gases comply with the requirements of BS 4250:

- (a) fixed heaters burning commercial butane or commercial propane,
- (b) portable and mobile heaters burning butane, including those that incorporate their own butane container.

Requirements for appliances given in this standard assume that the gas supply from the container will be governed by a pressure regulator complying with the requirements of BS 3016 but without a pressure relief device.

Requirements for controls, given herein, 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.

This standard does not take into account the special hazards that exist in nurseries and other places where there are young children or aged or infirm persons without supervision; in such cases additional requirements may be necessary.

2. References

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

3. Definitions

For the purposes of this Part of this British Standard, the following definitions, together with those in BS 1179 and BS 5482 apply.

NOTE. See also 9.1 and 10.1.

3.1 adjustment pressure. The pressure, measured at the test point, that is required to obtain the rated heat input using the reference test gas.

3.2 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.

3.3 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.

3.4 cold condition. A condition of the appliance required for some tests and obtained by allowing the unlit appliance to attain equilibrium at room temperature.

3.5 diffusive catalytic combustion space heater. A space heating appliance in which neat gas diffuses through a catalytic pad and is flamelessly oxidized by oxygen 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 full pre-mixing 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.

3.6 fixed heater. A heater designed to be secured to a wall or floor.

3.7 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.

3.8 low-temperature cut-off device. A device that is coupled to the temperature of the catalyst pad and that shuts off the supply of gas when the pad is at a temperature below that permitting efficient catalytic oxidation.

3.9 mobile heater. A self-contained heater, incorporating its own butane container within the body of the appliance and designed to be moved without lifting.

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

3.11 products of combustion. The combustion products issuing from the front of the catalytic unit. These comprise the normal oxidation products of the fuel gas and the associated nitrogen, and may contain small quantities of the unburnt gas which have passed unchanged through the catalytic pad.

3.12 rated heat input. The manufacturer's declared heat input for the appropriate reference test gas.

3.13 setting pressure. The pressure, measured at the test point, that is specified by the manufacturer for the purpose of adjusting the appliance heat input.

4. Classification of appliances

4.1 By category. 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.

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

- (a) for fixed appliances, Category I_L, I_{L/B}, I_{L/P};
- (b) for portable appliances and mobile appliances, Category I_{L/B}.

4.2 By flue type. 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:

- type A : flueless appliances
- type B : open flued 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.

This Part of this standard covers type A appliances only.

5. General requirements

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.

Notwithstanding the requirements specified in this standard, any new designs, materials and methods of assembly are permissible provided that at least equivalent results are achieved.

Any new features incorporated in an appliance for which no provision for testing is made in this standard shall be examined in the light of the manufacturer's claims and instructions. The claims shall be checked against the instructions and shall be valid.

6. General conditions of test

6.1 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 temperature shall be maintained at 20 ± 5 °C.

6.2 Preparation of appliance for testing. 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.

Test gas	Inlet pressure
	mbar*
LPGA	28
LPGC	37

*1 mbar = 10² N/m² = 100 Pa.

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.

6.3 Test procedure. The gas connections and system up to and including the catalytic unit 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 8).

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.

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.

BS 4947 gives guidance on the measurement of heat input rate.

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 the appliance adjusted for butane and test gases LPGC and LPGE with the appliance adjusted for propane.

Section two. Safety requirements and associated methods of test

7. General design and construction

7.1 Materials, fittings and finishes. Materials, fittings and finishes, the failure of which may affect the safe operation of the appliance, shall comply with the requirements of 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, grit or other foreign matter. The appliance shall not have any sharp edges likely to cause injury during normal use, maintenance or servicing.

7.2 Removal and reassembly of parts by user. Parts that are intended to be removable 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.

7.3 Materials in contact with gas

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

7.3.2 Non-metallic materials. Diaphragms shall comply with the requirements of 3.3(1) and 3.3(6) of BS 3016 : 1972.

Valve pads shall comply with the requirements of 3.4(1), 3.4(4) and 3.4(5) of BS 3016 : 1972.

All non-metallic materials, excluding the catalytic pad, shall show no marked deterioration when subjected to an accelerated ageing test for 7 days at a temperature of 20 °C in excess of the manufacturer's maximum recommended temperature.

NOTE. The requirements of the above three paragraphs may not be met by materials made of some silicone rubbers although these rubbers are claimed to be satisfactory. Criteria for testing silicone rubber materials are still under consideration and, in the meantime, components and appliances containing such a material will be considered acceptable provided that the appropriate manufacturer can demonstrate that it has proved satisfactory in use.

Joining compounds shall comply with the relevant requirements of BS 5292.

Flexible rubber tubing and hose shall comply with the requirements of BS 3212. Flexible plastics tubing, for which there is no standard specification, may be used provided that the appliance manufacturer can demonstrate that it has proved satisfactory.

Each length of flexible plastics tubing shall be clearly and durably marked with the following information:

- (a) the supplier's name or identification;
- (b) the month and year of manufacture.

7.4 Catalytic materials. Precautions shall be taken to prevent the emission from the catalytic unit of materials used in its manufacture (e.g. asbestos, silica, etc.).

7.5 Insulation. Thermal or acoustic insulation shall be non-combustible (see BS 476 : Part 4), shall be securely located and shall be protected against mechanical damage and condensate. If asbestos is used for insulation it shall be sealed or stabilized.

7.6 Guards. The appliance shall be provided with a guard in accordance with current regulations and complying with the requirements of BS 1945. This guard shall not be removable without the use of tools.

7.7 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 of not less than 450 °C.

7.8 Compartments for liquefied petroleum gas containers. The compartment 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 be 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 minimal internal communication between the container housing and the catalytic unit.

7.9 Stability

7.9.1 Appliances with integral containers

7.9.1.1 Requirement. The appliance shall be so designed that, with its container in place, it cannot be tipped over when subjected to the force and the test conditions specified in 7.9.1.2.

7.9.1.2 Method. Ensure that the wheels or rollers of the appliance are fixed so that it cannot roll or slide and place an empty container within it. Place the appliance on a horizontal plain surface and, for appliances with containers of up to 4.5 kg (10 lb), apply a force of 25 N to the upper part of the appliance and in the most unfavourable direction. For appliances with larger containers, increase the force by 1 N for every extra kilogram in excess of 4.5 kg up to 15 kg.

7.9.2 Appliances without integral containers. The appliance shall not fall forward when placed on a plane inclined at an angle of 15 ° to the horizontal and it shall not fall backward when placed on a plane inclined at 10 ° to the horizontal.

7.9.3 Fixed appliances. When the appliance is installed as described in the manufacturer's instructions, it shall be stable.

8. Soundness

8.1 General. All gas-carrying parts of the appliance shall be sound, and when connected shall form a complete assembly that is sound. The basic test shall be carried out on the complete assembly but additional and more stringent tests may be necessary for certain components to ensure an adequate margin of safety.

8.2 Complete assembly

8.2.1 Requirement. The fully assembled appliance shall be sound when subjected to an internal air pressure of 150 mbar.

This requirement shall be deemed to 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 6 bubbles per minute should be equivalent to 85 cm³/h but this should be checked before the indicator is used.

8.2.2 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:

- (a) with all gas taps in the OFF position;
- (b) with all gas taps turned to the ON position, any control device being maintained in the open position and the gas supply disconnected and blanked off at the catalytic pad and at any pilot.

Care shall 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.