

**BS 7977-1:2009+A1:2013**



**BSI Standards Publication**

# **Specification for safety and rational use of energy of domestic gas appliances – Part 1: Radiant/convectors**

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Published by BSI Standards Limited 2013

ISBN 978 0 580 83715 9

ICS 97.100.20

The following BSI references relate to the work on this standard:

Committee reference GSE/36

Drafts for comment 08/30166387 DC, 13/30286930 DC

**Publication history**

First published December 2002

Second (present) edition, July 2009

**Amendments issued since publication**

Date	Text affected
November 2013	8.2.12.2 Test b) and Figure D.17 amended

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### Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 94, an inside back cover and a back cover.

## Foreword

### Publishing information

This part of BS 7977-1 was published by BSI Standards Limited, under licence from The British Standards Institution and came into effect on 31 July 2009. It was prepared by Technical Committee GSE/36, Independent *Gas-Fired Space Heaters*. A list of organizations represented on this committee can be obtained on request to its secretary.

### Supersession

BS 7977-1:2009+A1:2013 supersedes BS 7977-1:2009, which is withdrawn.

### Relationship with other publications

BS 7977 is published in two parts:

- Part 1: *Radiant/convectors*;
- Part 2: *Combined appliances: Gas fire/back boiler*.

### Information about this document

This was a full revision of the standard, and introduced the following principal changes:

- clarification of **6.8**, efficiency measurement and calculation;
- addition of a new clause on “Particular requirements for cassette fires fitted with a flue kit” (Clause 9); and
- general revision to reflect current state of technology.

Text introduced or altered by Amendment No. 1 is indicated in the text by tags **A1** **A1**. Minor editorial changes are not tagged.

Matters related to quality assurance systems, tests during production and to certificates of conformity of auxiliary devices are not dealt with.

The test gases, test pressures and appliance categories specified in this standard are in accordance with those specified in BS EN 437.

Annex A gives equivalence rules, Annex B gives calculation of conversions of NO<sub>x</sub>, and a guide to the clauses of this British Standard addressing the Essential Requirements of the Gas Appliance Directive (GAD) is given in Annex C. Figures illustrating appliance types and test equipment are shown in Annex D.

### Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

*Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.*

Requirements in this standard are drafted in accordance with *The BSI guide to standardization – Section 2: Rules for the structure, drafting and presentation of British Standards*, subclause **11.3.1**, which states, “Requirements should be expressed using wording such as: ‘When tested as described in Annex A, the product shall ...’”. This means that only those products that are capable of passing the specified test will be deemed to conform to this standard.

### **Contractual and legal considerations**

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.**

In particular, attention is drawn to the following:

The Gas Appliances (Safety) Regulations 1995 [1].

# 1 Scope

This standard specifies the requirements and methods of test for the construction, safety, rational use of energy, classification and marking of 2nd and 3rd family gas-fired domestic radiant convector heating appliances not exceeding a nominal heat input of 15 kW based on the net calorific value and which incorporate a natural draught burner.

This standard applies to open-flued independent radiant/convector gas fires not connected directly or by means of an adapter to an open flue. The appliance and flue are separated by a void which can be in one or more of the following forms:

- fireplace recess;
- builder's opening;
- metal flue box to BS 715;
- pre-cast flue to BS EN 1858.

The void is covered by a closure plate, which may be an integral part of the appliance, or a separate plate; in either case it is regarded as a part of the appliance and is supplied with it. These appliances are designed to discharge their products of combustion into the void behind the closure plate; they also have an integral flue break which may be in the form of a draught diverter or an open front.

Although all appliances covered by this standard are radiant/convectors, they have traditionally been divided into the following types:

- radiant/convectors;<sup>1)</sup>
- live fuel effect (LFE);<sup>1)</sup>
- inset live fuel effect (ILFE);<sup>1)</sup>

*NOTE An inset live fuel effect fire with a top outlet flue spigot that is directly connected to the flue is not within the scope of this standard.*

This document does not apply to the following:

- decorative fuel effect appliances;
- catalytic combustion appliances;
- appliances in which the supply of combustion air and/or the evacuation of the products of combustion is achieved by mechanical means;
- appliances which permit automatic ignition whilst unattended.

This standard is only intended for type testing.

# 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.

BS 715, *Specification for metal flue boxes for gas-fired appliances not exceeding 20 kW*

BS 1251, *Specification for open-fireplace components*

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<sup>1)</sup> See Terms and definitions.

BS 5871-2:2005+A1:2007, *Specification for the installation and maintenance of gas fires, convector heaters, fireback boilers and decorative fuel effect gas appliances – Part 2: Inset live fuel effect gas fires of heat input not exceeding 15 kW, and fireback boilers (2nd and 3rd family gases)*

BS EN 88-1, *Pressure regulators and associated safety devices for gas appliances – Part 1: Pressure regulators for inlet pressures up to and including 500 mbar*

BS EN 125, *Specification for flame supervision devices for gas-burning appliances – Thermo-electric types*

BS EN 126, *Multifunctional controls for gas burning appliances*

BS EN 161, *Automatic shut-off valves for gas burners and gas appliances*

BS EN 257, *Mechanical thermostats for gas-burning appliances*

BS EN 437, *Test gases – Test pressures – Appliance categories*

BS EN 1057, *Copper and copper alloys – Seamless, round copper tubes for water and gas in sanitary and heating applications*

BS EN 1856-1, *Chimneys – Requirements for metal chimneys – Part 1: System chimney products*

BS EN 1858, *Chimneys – Components – Concrete flue blocks*

BS EN 60068-2-75:1997, *Environmental testing – Part 2: Tests – Test Eh. Hammer tests*

BS EN 60335-1:1995, *Specification for safety of household and similar electrical appliances – Part 1: General requirements (IEC 60335-1: 1991)*

BS EN 60335-2-102, *Household and similar electrical appliances – Safety – Part 2-102: Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections*

BS EN ISO 3166-1, *Codes for the representation of names of countries and their subdivisions – Part 1: Country codes*

ISO 7/1, *Pipe threads where pressure-tight joints are made on the threads – Part 1: Dimensions, tolerances and designation*

PD 6574:1994, *Determination of emissions from appliances burning gaseous fuels during type testing*

### 3 Terms and definitions

For the purposes of this part of BS 7977, the following terms and definitions apply.

#### 3.1 Domestic gas-fired radiant/convector heating appliances

##### 3.1.1 radiant/convector [see Figure D.1a)]

gas fired appliance designed to heat a room mainly by the emission of air heated by convection

*NOTE* Such an appliance also contains vertical, or near vertical, mounted radiant elements designed to give maximum radiant output to the room; it is designed to be mounted on a hearth, floor or wall; it can be mounted wholly or partially inset into the void behind the fireplace opening.



**3.1.2 live fuel effect fire [see Figure D.1a)]****LFE**

gas fired appliance designed to heat a room mainly by the emission of air heated by convection; such an appliance also contains radiant elements designed to provide a decorative effect, e.g. by using coloured pebbles, a simulated solid fuel fire bed etc.

*NOTE It is designed to be mounted on a hearth, floor or wall.*

**3.1.3 inset live fuel effect fire [see Figure D.1b)]****ILFE**

live fuel effect fire (3.1.2), but designed to be installed wholly or partially inset into the void behind the fireplace opening

**3.1.4 decorative fuel effect appliance [see Figure D.1c)]**

appliance designed to burn gas for a decorative effect and intended to be installed so that the products of combustion pass unrestricted from the fire-bed to the chimney or flue

**3.1.5 working surfaces**

those parts of an appliance, which due to the nature of the appliance, have temperatures exceeding the limits specified in 6.4.3.1, excluding parts that are likely to be touched during normal use of the appliance, for example, the area adjacent to the control knobs

*NOTE 1 Also included are refractories, radiants, outlet grills and those parts which, due to their function and/or position, are at high temperature; examples are dress guards, reflectors and fenders.*

*NOTE 2 Any point within 15 mm of a working surface is considered to be part of the working surface.*

**3.1.6 simulated fuel elements**

decorative effects usually in the form of simulated solid fuel which are not in contact with a flame or products

**3.1.7 cassette fire**

inset live fuel effect fire (3.1.3) with a top outlet flue spigot in the outer case (firebox), which is designed for building into a purpose made opening

**3.2 Gases****3.2.1 reference conditions**

reference conditions are as follows:

- for calorific values, temperature: 15 °C;
- for gas and air volumes dry, brought to 15 °C and to an absolute pressure of 1 013.25 mbar;

reference conditions for calorific values, temperature: 15 °C; for gas and air volumes, dry, brought to 15 °C and to an absolute pressure of 1 013.25 mbar

**3.2.2 calorific value**

quantity of heat produced by the complete combustion of gas, at a constant pressure equal to 1 013.25 mbar, of unit volume or mass of gas, the constituents of the combustible mixture being taken at reference conditions and the products of combustion being brought back to the same conditions

*NOTE 1 A distinction is made between the following:*

- the gross calorific value,  $H_g$  in which the water produced by combustion is assumed to be condensed;
- the net calorific value,  $H_i$  in which the water produced by combustion is assumed to be in the vapour state.

*NOTE 2 The units are either megajoules per cubic metre ( $\text{MJ/m}^3$ ) of dry gas at reference conditions or megajoules per kilogram ( $\text{MJ/kg}$ ) of dry gas.*

### 3.2.3 relative density

ratio of the masses of equal volumes of dry gas and dry air at the same conditions of temperature and pressure

*NOTE Symbol,  $d$ .*

### 3.2.4 Wobbe index

**gross Wobbe index,  $W_g$**

**net Wobbe index,  $W_i$**

ratio of the calorific value of a gas per unit volume and the square root of its relative density under the same reference conditions

*NOTE The Wobbe index is said to be gross or net according to whether the calorific value used is the gross or net calorific value; the Wobbe indices are expressed either in megajoules per cubic metre ( $\text{MJ/m}^3$ ) of dry gas under the reference conditions or in megajoules per kilogram ( $\text{MJ/kg}$ ) of dry gas.*

### 3.2.5 test pressure

gas pressures used to verify the operational characteristics of appliances using combustible gases, they consist of normal and limit pressures

*NOTE Gas pressures are expressed in millibars (mbar); 1 mbar = 100 Pa.*

### 3.2.6 normal pressure

pressure under which the appliances operate in nominal conditions, when they are supplied with the corresponding reference gas

*NOTE The symbol for normal pressure is:  $p_n$ .*

### 3.2.7 limit pressures

pressures representative of the extreme variation in the appliance supply conditions

*NOTE The symbols for limit pressures are: maximum pressure:  $p_{max}$ , minimum pressure:  $p_{min}$ .*

## 3.3 Appliance construction

### 3.3.1 The gas circuit

#### 3.3.1.1 components of the gas circuit

part of the appliance that conveys or contains the gas between the appliance gas inlet connection and the burner(s)

#### 3.3.1.2 gas rate adjuster

component intended for the manufacturer or installer to set the gas rate to each burner at a predetermined value according to the supply conditions, the adjustment may be progressive (screw adjuster) or discontinuous (changing restrictors)

*NOTE 1 The adjuster of an adjustable governor is regarded as a gas rate adjuster.*

*NOTE 2 The action of setting this device is called "setting the gas rate".*