

Open fronted gas-fired independent space heaters

The European Standard EN 13278:2003 has the status of a
British Standard

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National foreword

This British Standard is the official English language version of EN 13278:2003.

The UK participation in its preparation was entrusted to Technical Committee GSE/36, Independent gas-fired space heaters, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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Open fronted gas-fired independent space heaters

Appareils de chauffage indépendants à foyer ouvert
utilisant les combustibles gazeux

Konvektions-Raumheizer für gasförmige Brennstoffe mit
offener Verbrennungskammer

This European Standard was approved by CEN on 29 November 2002.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (EN 13278:2003) has been prepared by Technical Committee CEN/TC 62 “Independent gas-fired space heaters”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2003, and conflicting national standards shall be withdrawn at the latest by August 2003.

The appliance classifications are based on the definitions given in CR 1749. This classifies appliances according to the method of evacuation of the products of combustion.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZB, which is an integral part of this document.

Annexes A, C, D, F and ZA are informative. Annexes B, E, G, H and I are normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the requirements and test methods for the construction, safety, marking and rational use of energy of open fronted gas-fired independent space heaters with and without a fan to assist with the transportation of flue gases, hereafter referred to as appliances. Although the fan may be mounted outdoors, this standard only covers appliances where the body of the appliance is indoors.

This standard applies to types B_{11AS}, B_{11BS}, B_{14AS}, and B_{14BS} (commonly referred to in this standard as type B₁ appliances) open fronted gas-fired independent space heating appliances:

- ¾ that incorporate an atmospheric burner;
- ¾ that are connected directly to an open flue (see Figure 1), or to a device to evacuate the products of combustion (open-flued appliances);
- ¾ that have a nominal heat input not exceeding 20 kW (based on the net calorific value);
- ¾ that are delivered with the gas-carrying components, burner(s), combustion chamber and heat exchanger fully assembled.

It does not apply to:

- ¾ closed-fronted appliances;
- ¾ decorative fuel effect appliances as specified in EN 509;
- ¾ catalytic combustion appliances;
- ¾ ducted-air appliances;
- ¾ appliances installed by means of a closure plate (see 3.3.3.3).

This standard is only applicable to appliances which are intended to be type tested.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 88, *Pressure governors for gas appliances for inlet pressures up to 200 mbar.*

EN 125, *Flame supervision devices for gas burning appliances — Thermo-electric flame supervision devices.*

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

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

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

EN 298, *Automatic gas burner control systems for gas burners and gas burning appliances with or without fans.*

EN 437:1993, *Test gases — Test pressures — Appliance categories.*

EN 1057:1996, *Copper and copper alloys - Seamless, round copper tubes for water and gas in sanitary and heating applications.*

EN 50165, *Electrical equipment of non-electric appliances for household and similar purposes — Safety requirements.*

EN 60068-2-75, *Environmental testing — Part 2: Tests — Test Eh: Hammer tests (IEC 60068-2-75:1997).*

EN 60335-1: 1994, *Safety of household and similar electrical appliances — Part 1: General requirements (IEC 60335-1: 1991, modified).*

EN 60529, *Degrees of protection provided by enclosures (IP code)(IEC 60529: 1989).*

EN 60730-2-9, *Automatic electrical controls for household and similar use — Part 2: Particular requirements for temperature sensing controls (IEC 60730-2-9:2000, modified).*

EN ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes (ISO 3166-1:1997).*

CR 1404, *Determination of emissions from appliances burning gaseous fuels during type testing.*

CR 1749, *European scheme for the classification of gas appliances according to the method of evacuation of the products of combustion (Types).*

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

ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation.*

3 Terms and definitions

For the purpose of this European Standard the following terms and definitions apply.

3.1 Open fronted gas-fired independent space heaters

3.1.1

convection heater

appliance that is designed to heat a room mainly by the emission of air heated by convection. Such an appliance can also contain radiant heating elements provided that it complies with all the requirements of this standard

3.1.2**forced convection heater**

convection appliance that incorporates a fan and thus allows an acceleration of the circulation of the air in contact with the heating body. Such an appliance is designed to discharge air directly into the room in which the appliance is installed and not to be connected to a warm air distribution system

3.1.3**live fuel-effect convection heater**

convection appliance which simulates the visual effect of a solid fuel appliance

3.1.4**open-fronted appliance**

appliance which has exposed flames or exposed incandescent areas

3.1.5**closed-fronted appliance**

appliance which does not have exposed flames or exposed incandescent areas

3.1.6**working surfaces**

those parts of an appliance, which, due to the nature of the appliance, have temperatures exceeding the limits specified in 6.4.1 excluding parts that are likely to be touched during operations carried out in the normal use of the appliance, for example, the area adjacent to control knobs

Working surfaces do not include that part of any surface within 25 mm of parts that have to be touched or removed during normal operation of the appliance

3.2 Gases**3.2.1****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 combustion, at a constant pressure of 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

A distinction is made between:

the gross calorific value in which the water produced by combustion is assumed to be condensed;

Symbol: H_s

the net calorific value in which the water produced by combustion is assumed to be in the vapour state;

Symbol: H_i

Units: either

megajoules per cubic metre (MJ/m^3) of dry gas at reference conditions; or

megajoules per kilogram (MJ/kg) of dry gas.

[EN 437:1993]

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

Symbol: d

3.2.4

Wobbe index

ratio of the calorific value of a gas per unit volume to the square root of its relative density under the same reference conditions. The Wobbe index is said to be gross or net according to whether the calorific value used is the gross or net calorific value

Symbol: gross Wobbe index: W_s

net Wobbe index: W_i

Units: either:

megajoules per cubic metre (MJ/m^3) of dry gas at the reference conditions; or

megajoules per kilogram (MJ/kg) of dry gas.

[EN 437:1993]

3.2.5

test pressures

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

They are expressed in millibar (mbar)

NOTE 1 mbar = 100 Pa.

3.2.6

normal pressure

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

Symbol: p_n .

3.2.7

limit pressures

pressures representative of the extreme variations in the appliance supply conditions

Symbols: maximum pressure: $p_{\max}$

minimum pressure: $p_{\min}$

3.2.8

pressure couple

combination of two distinct gas distribution pressures applied by reason of the significant difference existing between the Wobbe indices within a single family or group in which:

the higher pressure corresponds only to gases of low Wobbe index;

and

the lower pressure corresponds to gases of high Wobbe index.

[EN 437:1993]

3.3 Appliance construction

3.3.1 The gas circuit

3.3.1.1

inlet connection

part of the appliance intended to be connected to the gas supply

3.3.1.2**mechanical joint**

connection device assuring soundness in an assembly of several parts, generally of metal

NOTE For example the following:

cone seated joints

torroidal sealing rings ('O' rings)

flat joints

metal to metal joints

3.3.1.3**gas circuit**

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

3.3.1.4**gas restrictor**

non-adjustable device which is placed in the gas circuit so as to create a pressure drop and thus reduce the gas pressure at the burner to a predetermined value for a given supply pressure and rate

3.3.1.5**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 can be progressive (screw adjuster) or discontinuous (changing restrictors)

The adjuster of an adjustable governor is regarded as a gas rate adjuster

The action of setting this device is called 'setting the gas rate'

3.3.1.6**gas rate control**

component allowing the user to open or close the gas supply to one or more burners. It can also be used to adjust the gas rate of certain burners to a predetermined value, called the 'reduced rate'. This device can be a 'tap'

3.3.1.7**injector**

component that admits the gas into a burner

3.3.1.8**start gas**

initial quantity of gas ignited to give a flame which is used to ignite the main burner. It can be discharged through a separate ignition burner or part of the main burner

3.3.2 Burner**3.3.2.1****main burner**

burner that assures the thermal function of an appliance. It is usually called simply 'burner'

3.3.2.2**pan burner**

main burner which utilises a particulate medium (e.g. sand) for the distribution of gas over a defined area

3.3.2.3**ignition burner**

separate burner intended to light the main burner

3.3.2.3.1

permanent ignition burner

ignition burner that operates continuously throughout the whole period that the appliance is in use

3.3.2.3.2

intermittent ignition burner

ignition burner that is ignited before and extinguished at the same time as the main burner

3.3.2.4

fixed primary aeration restrictor

non-adjustable device which limits the supply of primary air to a burner

3.3.3 Combustion products circuit

3.3.3.1

flue outlet

part of a type B appliance (see 4.2) that connects with a flue to evacuate the products of combustion

3.3.3.2

draught diverter

part of the combustion products circuit to reduce the influence of flue-pull and to minimise the effect of down-draught on the burner flame stability and combustion

3.3.3.3

closure plate (see Figure 2)

non-combustible plate used to cover and seal the front plane of a builder's opening, or fireplace opening, such that when the appliance is installed, any air flowing from the room into the flue does so in accordance with the design requirements of the appliance

This plate contains an aperture through which the flue outlet spigot of the appliance projects into the cavity of the builder's opening, or fireplace recess, but is not connected to the flue

The plate can be a separate component, or an integral part of the appliance, e.g. the back panel, but in either case it is to be considered as part of the appliance

3.3.3.4

builder's opening

enclosure constructed by the builder to accommodate fireplace components

3.3.3.5

fireplace opening

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

3.3.3.6

fireplace recess

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

3.3.3.7

hearth

floor area in front of the plane of the builder's opening or fireplace opening

3.3.3.8

flue box

non-combustible enclosure that provides a substitute builder's opening or fireplace recess

3.3.4 Auxiliary equipment

3.3.4.1

pressure governor

device that maintains, within a fixed range, a constant downstream pressure, independent of the upstream pressure and/or the gas rate

3.3.4.2**ignition device**

device that ignites one or more burners

3.3.4.3**flame supervision device**

device, including a sensing element, that causes the gas supply to a burner to be opened or closed according to the presence or absence of the flame that activates the sensing element

3.3.4.4**combustion products discharge safety device**

device that automatically shuts off the gas supply to the main burner, and perhaps to the ignition burner, when there is unacceptably high spillage of combustion products from the draught diverter

3.3.4.5**atmosphere sensing device**

device designed to shut off the gas supply before the combustion products of the surrounding atmosphere reaches a set value

3.3.4.6**control knob**

component designed to be moved by hand in order to operate an appliance control (tap, thermostat, etc.)

3.3.4.7**programming unit**

unit which reacts to signals from control and safety devices, gives control commands, controls the start-up sequence, supervises the burner operation and causes controlled shut-down, and if necessary safety shut-down and lock-out. The programming unit follows a predetermined sequence of actions and always operates in conjunction with a flame detector device

3.3.4.8**flame detector device**

device by which the presence of a flame is detected and signalled

It can consist of a flame sensor, an amplifier and a relay for signal transmission. These parts, with the possible exception of the actual flame sensor, can be assembled in a single housing for use in conjunction with a programming unit

3.3.4.9**automatic burner system**

burner system in which, when starting from the completely shut-down condition, the gas is ignited and the flame is detected and proved and the main gas valve(s) is actuated without manual intervention

3.3.4.10**non-automatic burner system**

burner system with an ignition device which is operated under manual supervision

3.3.4.11**restart interlock (manual)**

device which prevents the restoration of the gas supply to the main burner, or to the main burner and ignition burner, until the end of the extinction delay time

3.3.4.12**flue gas monitoring device**

device intended to cause safety shut-down in the event of abnormal conditions of air admission or of combustion products evacuation

3.3.4.13**remote control**

device used to operate an appliance from a distance. This can be achieved by utilising a hand-held transmitter which communicates by electromagnetic or sonic means with a receiver that is part of the appliance

3.3.5

dress guards

integral part of the appliance designed to prevent objects accidentally coming into contact with flames or incandescent surfaces

3.4 Adjusters and controls

3.4.1

setting an adjuster

the action of immobilising an adjuster in position by some means such as a screw, etc. It is said that the adjuster is "set" in this position

3.4.2

sealing an adjuster

procedure by which after setting an adjuster, material is added such that any attempt to alter the adjustment setting is apparent

A factory sealed pre-set adjuster is considered to be non-existent

A pressure governor is considered to be non-existent if it has been factory sealed in the fully opened position

3.4.3

putting a control out of service

procedure by which a control (of temperature, pressure, etc.) is put out of action and sealed in this position. The appliance then functions as if this device had been removed

3.5 Appliance performance

3.5.1 gas rates

3.5.1.1

volumetric flow rate

volume of gas consumed by the appliance in unit time during continuous operation

Symbol: V

Units: cubic metres per hour (m^3/h), litres per minute (l/min), cubic decimetres per hour (dm^3/h), or cubic decimetres per second (dm^3/s).

[EN 437:1993]

3.5.1.2

mass flow rate

mass of gas consumed by the appliance in unit time during continuous operation

Symbol: M

Units: kilograms per hour (kg/h), or grams per hour (g/h)

[EN 437:1993]

3.5.1.3

heat input

quantity of energy used in unit time corresponding to the volumetric or mass flow rates, the calorific value to be used being the net or gross calorific value

Symbol: Q

Unit: kilowatts (kW)

3.5.1.4**nominal heat input**

value of the heat input declared by the manufacturer

Symbol: Q_n

Unit: kilowatt (kW)

[EN 437:1993]

3.5.2 gas combustion**3.5.2.1****flame stability**

state of the flames resting in a stable manner on the burner ports or the flame contact area provided

3.5.2.2**flame lift**

phenomenon characterised by the total or partial lifting of the base of the flame from the burner port or the flame contact area provided

3.5.2.3**light-back**

phenomenon characterised by the entry of a flame into the body of a burner

3.5.2.4**light-back at the injector**

phenomenon characterised by ignition of the gas at the injector, either as a result of the flame entering the burner or by the propagation of a flame around the outside of the burner

3.5.2.5**sooting**

phenomenon characterised by deposits of soot on the surfaces of parts of the appliance in contact with the products of combustion or with the flame, or as particulate matter in the combustion products

3.5.2.6**yellow tipping**

phenomenon characterised by the appearance of yellow colouring at the top of the blue cone of an aerated flame

3.5.3**safety time**

interval between the ignition burner gas valve, the start gas valve or main gas valve, as applicable, being energised and the ignition burner gas valve, start gas valve or main gas valve, as applicable, being de-energised if the flame detector signals the absence of a flame

3.5.4**extinction delay time**

time that elapses between the disappearance of the flame and the interruption of the gas supply

3.5.5**ignition delay time**

for a thermoelectric flame supervision device, time that elapses between ignition of the supervised flame and the moment when the closure element is held open by the flame signal

3.5.6**thermal equilibrium**

operating state of the appliance, corresponding to a particular setting of the input, after 1 h on the reference gas

3.5.7**controlled shutdown**

process by which a control device (on the appliance or external to it) causes the gas supply to the main burner to be stopped immediately

3.5.8

safety shutdown

process which is initiated immediately in response to the signal from a limiting device or sensor and which causes any burner to shut down

3.5.9

non-volatile lockout

safety shut-down condition of the system, such that a restart can only be accomplished by a manual reset of the system and by no other means

3.5.10

volatile lockout

safety shut-down condition of the system, such that a restart can only be accomplished by either the manual reset of the system, or an interruption of the main power and its subsequent restoration

3.5.11

equivalent resistance (of the flue system)

resistance to flow in millibars, measured at the outlet of the appliance, which is equivalent to that of the actual flue

3.5.12

equivalent length

length of straight duct which has the same effect as the ducts to be used

3.6 Marking of the appliance and packaging

3.6.1

direct country of destination

country for which the appliance has been certified and which is specified by the manufacturer as the intended country of destination. At the time of putting the appliance on the market and/or installation, the appliance is capable of operating, without adjustment or modification, with one of the gases distributed in the country concerned, at the appropriate supply pressure

More than one country can be specified if the appliance, in its current state of adjustment, can be used in each of these countries

3.6.2

indirect country of destination

country for which the appliance has been certified, but for which, in its present state of adjustment, it is not suitable. Subsequent modification or adjustment is essential in order that it can be utilised safely and correctly in the country

4 Classification of appliances

4.1 Classification according to the nature of the gases used (categories)

4.1.1 Classification of gases

Gases are classified into three families, possibly divided into groups according to the value of the Wobbe index. Table 1 specifies the families and groups of gas used in this standard.

Table 1 — Classification of gases

Gas families and groups	Gross Wobbe index at 15 °C and 1 013,25 mbar	
	minimum	maximum
	MJ/m ³	MJ/m ³
First family		
Group a	22,4	24,8
Second family	39,1	54,7
Group H	45,7	54,7
Group L	39,1	44,8
Group E	40,9	54,7
Third family	72,9	87,3
Group B/P	72,9	87,3
Group P	72,9	76,8
Group B	81,8	87,3

4.1.2 Appliance categories

4.1.2.1 General

Appliances are classified into categories defined according to the gases and the pressures for which they are designed.

The definition of categories follows from 4.1.2.2, 4.1.2.3 and 4.1.2.4.

In each country, taking account of the local gas distribution conditions (gas composition and supply pressures), only some of the categories defined in 4.1.2.2, 4.1.2.3 and 4.1.2.4 are marketed.

The national situations concerning the marketing of these appliance categories in each country, and the corresponding supply pressures, are given in Tables A.1 and A.2 (see also in A.3 the special categories marketed locally nationally or corresponding to special gases and supply pressures indicated in Table A.4; conditions which are particular to a country are given in annex G).

4.1.2.2 Category I

Appliances of category I are designed exclusively for the use of gases of a single family or of a single group.

4.1.2.2.1 Appliances designed for use on first family gases only

Category I_{1a}: appliances using only gases of group a of the first family at the prescribed supply pressure (This category is not used).

4.1.2.2.2 Appliances designed for use on second family gases only

Category I_{2H}: appliances using only gases of group H of the second family at the prescribed supply pressures.

Category I_{2L}: appliances using only gases of group L of the second family at the prescribed supply pressures.

Category I_{2E}: appliances using only gases of group E of the second family at the prescribed supply pressures.

Category I_{2E+}: appliances using only gases of group E of the second family, and operating with a pressure couple without adjustment on the appliance. The appliance gas pressure regulating device, if it exists, is not operative in the range of the two normal pressures of the pressure couple.

4.1.2.2.3 Appliances designed for use on third family gases only

Category I_{3B/P}: appliances capable of using the third family gases (propane and butane) at the prescribed supply pressure.

Category I₃₊: appliances capable of using gases of the third family (propane and butane) and operating with a pressure couple without adjustment of the appliance. However for certain types of appliance specified adjustment of the primary combustion air may be permitted when changing from propane to butane and vice versa. No gas pressure regulating device is permitted on the appliance.

Category I_{3P}: appliances using only gases of group P of the third family (propane) at the prescribed supply pressure.

4.1.2.3 Category II

Appliances of category II are designed for use on gases of two families.

4.1.2.3.1 Appliances designed for use on gases of the first and second families

Category II_{1a2H}: appliances capable of using gases of group a of the first family and gases of group H of the second family. The first family gases are used under the same conditions as for category I_{1a}. The second family gases are used under the same conditions as for category I_{2H}.

4.1.2.3.2 Appliances designed for use on gases of the second and third families

Category II_{2H3B/P}: appliances capable of using gases of group H of the second family and gases of the third family. The second family gases are used under the same conditions as for category I_{2H}. The third family gases are used under the same conditions as for category I_{3B/P}.

Category II_{2H3+}: appliances capable of using gases of group H of the second family and gases of the third family. The second family gases are used under the same conditions as for category I_{2H}. The third family gases are used under the same conditions as for category I₃₊.

Category II_{2H3P}: appliances capable of using gases of group H of the second family and gases of group P of the third family. The second family gases are used under the same conditions as for category I_{2H}. The third family gases are used under the same conditions as for category I_{3P}.

Category II_{2L3B/P}: appliances capable of using gases of group L of the second family and gases of the third family. The second family gases are used under the same conditions as for category I_{2L}. The third family gases are used under the same conditions as for category I_{3B/P}.

Category II_{2L3P}: appliances capable of using the gases of group L of the second family and gases of group P of the third family. The second family gases are used under the same conditions as for category I_{2L}. The third family gases are used under the same conditions as for category I_{3P}.

Category II_{2E3B/P}: appliances capable of using gases of group E of the second family and gases of the third family. The second family gases are used under the same conditions as for category I_{2E}. The third family gases are used under the same conditions as for category I_{3B/P}.

Category II_{2E+3+}: appliances capable of using gases of group E of the second family and gases of the third family. The second family gases are used under the same conditions as for category I_{2E+}. The third family gases are used under the same conditions as for category I₃₊.

Category II_{2E+3P}: appliances capable of using gases of group E of the second family and gases of group P of the third family. The second family gases are used under the same conditions as for category I_{2E+}. The third family gases are used under the same conditions as for category I_{3P}.

4.1.2.4 Category III

Category III appliances are designed for use on gases of three families.

This category is not in general use.

Category III appliances which are marketed in certain countries are given in annex A (see A.3).

4.2 Classification according to the method of evacuation of the products of combustion

In accordance with CR 1749 appliances are classified into types according to the method of evacuation of the products of combustion and of admission of the combustion air:

Type B: An appliance intended to be connected to a flue which evacuate the products of combustion to the outside of the room containing the appliance. The combustion air is drawn directly from the room.

Type B₁: A type B appliance incorporating a draught diverter which is upstream of the heat exchanger. For the purposes of this standard the open front is considered a draught diverter.

For the purposes of this standard a type B₁ appliance is an appliance that is connected directly or by means of an adaptor to a flue. A closure plate is not considered to be an adaptor.

Type B₁₁: A natural draught B₁ appliance.

Type B_{11AS}: A type B₁₁ appliance fitted with an atmospheric sensing device.

Type B_{11BS}: A type B₁₁ appliance fitted with a combustion products discharge safety device.

Type B₁₄: A type B₁ appliance having an integral fan downstream of both the combustion chamber/heat exchanger and the draught diverter.

Type B_{14AS}: A type B₁₄ appliance fitted with an atmospheric sensing device.

Type B_{14BS}: A type B₁₄ appliance fitted with a combustion products discharge safety device.

5 Constructional requirements

5.1 General

5.1.1 Conversion to different gases

5.1.1.1 General

In accordance with the definitions given in 4.1.2.2, 4.1.2.3 and 4.1.2.4 the only acceptable modifications and/or adjustments when converting from a gas of one group or family to another group or family and/or for adapting to a different gas distribution pressures, are given in 5.1.1.2 to 5.1.1.4 for each appliance category.

For type B_{11AS} appliances, when the operation of atmospheric sensing devices depends upon the characteristics of the gas (including pressure), a change of the complete atmosphere sensing device is required when converting from a gas of one family to a gas of another family, or from one pressure or pressure couple to another within the 3rd family, if this is specified in the manufacturer's instructions.

5.1.1.2 Category I

Categories I_{2H}, I_{2L}, I_{2E}, I_{2E+}: Modification and/or adjustment of the appliance is not applicable.

Category I₃₊: No modification and/or adjustment of the appliance except for replacement of the injectors or restrictors in order to convert from one pressure couple to another (e.g. 28 mbar to 30 mbar/37 mbar $\Leftrightarrow$ 50 mbar/67 mbar). Exchange of fixed primary aeration restrictor when changing from one pressure couple to another or from one pressure to another within a pressure couple is permitted.

Category I_{3P}, I_{3B/P}: No modification and/or adjustment of the appliance with respect to a change of gas. For a change of pressure range, replacement of injectors, and adjustment of gas rates and exchange of fixed primary aeration restrictor is permitted.

5.1.1.3 Category II

5.1.1.3.1 Appliance categories designed for use on gases of the first and second families

The following modifications and/or adjustments are permitted but only when converting from a gas of one family to a gas of another family:

- ¾ adjustment of the gas rate with, if necessary, a change of injectors, restrictors or governor;
- ¾ replacement of a burner assembly;
- ¾ replacement of complete ignition burners or some of its parts;
- ¾ exchange of fixed primary aeration restrictor.

If the appliance is intended to function without an operational governor for use with gases of the second family, it is obligatory to put the governor out of service in these circumstances (see 5.2.5).

It is obligatory to put gas rate adjusters out of service for use with gases of the second family (see 5.2.2).

5.1.1.3.2 Appliance categories designed for use on gases of the second and third families

The following modifications and/or adjustments are permitted but only when converting from a gas of one family to a gas of another family:

- ¾ adjustment of the gas rate with, if necessary, a change of injectors, restrictors or governor;
- ¾ replacement of a burner assembly;

- ¾ replacement of complete ignition burners or some of its parts;
- ¾ exchange of the fixed primary aeration restrictor.

The governor shall be put out of service where this is required in accordance with the requirements of 5.2.5.

Gas rate adjusters shall be put out of service in accordance with requirements of 5.2.2.

The following modifications and/or adjustments are permitted when changing from one pressure couple to another or from one pressure range to another:

- ¾ Replacement of the injectors or restrictors in order to convert from one pressure couple to another within the third family (e.g. 28 mbar to 30 mbar/37 mbar $\Leftrightarrow$ 50 mbar/67 mbar).
- ¾ Exchange of fixed primary aeration restrictor when changing from one pressure couple to another or from one pressure to another within a pressure couple is permitted.

For a change of pressure range in the case of appliance categories using third family gases without a pressure couple (i.e. "3P" and "3B/P"), replacement of injectors, adjustment of the gas rates and exchange of fixed primary aeration restrictor is permitted.

5.1.1.4 Category III

Category III appliances admitted in certain countries are given in A.3.

5.1.2 Materials and method of construction

The quality and thickness of the materials used in the construction of the appliance, and the method of assembling the various parts, shall be such that the constructional and operational characteristics do not alter significantly during a reasonable life under normal conditions of installation and use.

In particular, when the appliance is installed according to the manufacturer's instructions and national installation requirements, all components shall withstand the mechanical, chemical and thermal conditions to which they may be subjected during use.

For built-in appliances, if an appliance is supplied in several sub-groups which have to be assembled on installation, it shall be possible to carry out this operation without ambiguity when assembling in accordance with the manufacturer's instructions. If a special tool is required, it shall be supplied by the manufacturer. Any components or materials necessary to assemble these sub-groups shall be supplied by the manufacturer.

Parts which may be removed for routine maintenance by a service engineer shall be so designed and arranged that soundness is assured after reassembly.

The appliance shall be designed in such a way that there is no condensation at the operating temperature provided by the controls.

If condensation is produced at start-up, this shall not:

- ¾ affect the operational safety;
- ¾ escape from the appliance into the room.

If the appliance has any bricks, radiants or imitation fuel that is not fixed, then the appliance when installed shall incorporate an enclosure or fire front or both, to retain the fuel. When the fire front is removable without the use of tools its removal shall not allow the imitation fuel to fall out.

Asbestos or materials containing asbestos shall not be used.

Sheet metal parts in contact with products of combustion and not made of corrosion-resistant material shall be coated with an effective protection against corrosion, e.g. enamel.

Thermal or acoustic insulation shall be non-combustible, securely located and protected against mechanical damage.

Copper shall not be used for those parts of the gas circuit which exceed 100 °C when the appliance is in normal use, when tested in accordance with 7.4.

5.1.3 Accessibility for use and maintenance

Any control placed in the gas circuit shall be so arranged that any adjustment, maintenance or exchange is easy.

Removable parts shall be so designed or marked that they are easy to reassemble correctly according to the manufacturer's instructions and obviously incorrect when reassembled incorrectly.

It shall be possible to complete all the operations of removal and reassembly of parts which the user has to carry out in the course of routine maintenance as explained in the instructions, without the aid of a tool.

Removable parts shall be dismountable for maintenance by a service engineer using ordinary tools, such as a screwdriver or a spanner.

An appliance shall be capable of being fixed securely. The installation instructions shall give relevant and precise information.

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.

If the manufacturer's instructions specify the removal of the appliance for servicing, any joint specified in the gas circuit for this purpose shall be capable of being checked for gas soundness after re-assembly.

5.1.4 Connections

5.1.4.1 Appliance inlet connections

For appliance inlet connections see A.5.

Appliances shall not be supported by their connections.

The appliance inlet connection shall be one of the following types:

- a) a thread conforming to ISO 228-1. In this case the end of the gas inlet connection shall have a flat annular surface at least 3 mm wide for thread sizes 1/2" and 3/8" and at least 2,5 mm wide for thread size 1/4", to allow the interposition of a sealing washer. When the end of the gas inlet connection has a thread of nominal size 1/2", it shall be possible to insert a gauge of 12,3 mm diameter to a depth of at least 4 mm;
- b) a thread conforming to ISO 7-1;
- c) a compression fitting suitable for copper tube conforming to Table 2 of EN 1057:1996;
- d) a straight tube at least 30 mm long, the end of which is cylindrical, smooth and clean, to allow connection by means of compression fitting as specified in c).
- e) a cone-seated union.

5.1.4.2 Access to the inlet connection

The position of the connection shall be such that connection to the gas supply can be made easily with tools in common use.

5.1.5 Soundness of the gas circuit

Holes for screws, studs, etc., intended for the assembly of components shall not open into the gasways. The residual wall thickness shall be at least 1 mm. Brackets for supporting components shall not be interposed in any gas-carrying joints.

The soundness of components and assemblies connected to the gas circuit and likely to be dismantled for routine maintenance at the consumer's premises with the exception of taps and cocks shall be assured by means of mechanical joints, e.g. metal to metal joints, o-ring joints or packing, but excluding the use of any sealing compound such as tape, mastic or paste. The soundness shall be maintained after dismantling and reassembly.

Sealing compounds may be used for permanent threaded assemblies and injectors and grease for taps and cocks. The sealing material shall remain effective under normal conditions of use.

The soundness of the gas circuit assemblies shall not be achieved by means of soft solder for which the lowest temperature of the melting range, after application, is less than 450 °C.

5.1.6 Soundness of the combustion circuit (Type B₁ appliances)

The soundness of an appliance up to the draught-diverter shall be effected by mechanical means only, with the exception of those parts which do not require to be disconnected for routine maintenance, and which may be joined with mastic or paste in such a way that permanent soundness is assured under normal conditions of use.

Parts which may be removed for routine maintenance by a service engineer shall be so designed and arranged that soundness is assured after reassembly.

5.1.7 Evacuation of combustion products

5.1.7.1 Type B₁ appliances

For vertical flues, the flue socket shall be female. All sockets shall have a circular terminal section, and allow connection, if necessary by means of an adapting piece supplied with the appliance, to a flue pipe of a diameter which meets the requirements in force in the country where the appliance is to be installed (see Table A.6).

It shall be possible to insert into the socket a pipe, with an outside diameter of $(D - 2)$ mm, for a distance of at least equal to:

- a) 30 mm for a horizontal connection,
- b) 15 mm for a vertical connection,

but it shall be impossible to insert it to such a depth that the evacuation of the products of combustion is impaired.

The appliance shall be constructed to prevent the release of combustion products in a dangerous quantity into the room under abnormal draught conditions (see 6.9).

NOTE D is the nominal internal diameter of the appliance outlet.

As these appliances use the open front as the draught diverter, no additional draught diverters are permitted.

5.1.7.2 Type B₁₄ appliances

The appliance may be fitted with a means of adjustment in the combustion circuit in order to keep the flue losses constant independently of the flue length. This adjustment is effected either by restrictors or by fixing the means of adjustment to predetermined positions in accordance with detailed instructions from the manufacturer. The assembly of the various parts during installation shall be such that no work is necessary other than adjusting the length of the combustion products evacuation duct (possibly by cutting them). Such adaption shall not impair the correct operation of the appliance.

It shall be possible to connect these ducts to the appliance using ordinary tools if necessary. The accessories and fitting instructions shall be supplied by the manufacturer.

Where the appliance is intended to be fitted to a flue having a wall termination:

- $\frac{3}{4}$ the manufacturer shall either supply a flue terminal or state the type of termination which shall be used. The design of this shall be such that it will not allow entry of a ball of 16 mm diameter applied with a force of 5 N. The design of the flue system shall be such that any condensate formed when operating the appliance from cold shall either be retained and subsequently re-evaporated or discharged clear of the wall. In addition, a terminal guard shall be fitted in accordance with the National Regulations applicable in the various member countries;
- $\frac{3}{4}$ any accessories (e.g. wall liner, terminal guard etc.) shall be specified or supplied by the manufacturer;
- $\frac{3}{4}$ the manufacturer shall state the minimum and maximum equivalent resistance. The manufacturer's instructions shall give details for calculating the equivalent resistance, for example the allowance to be made for bends etc.

5.1.7.3 Built-in appliances

A built-in appliance shall be so designed that the combustion air inlet is unimpaired when the appliance is installed in accordance with the manufacturer's instructions.

5.1.8 Electrical equipment

The electrical equipment of the appliance shall be so designed and constructed as to obviate hazards of an electrical origin and shall comply with the requirements of EN 50165 which cover such hazards.

If the appliance is fitted with electronic components or electronic systems providing a safety function, these shall comply with the relevant requirements of EN 298 with regard to electromagnetic compatibility immunity levels.

If the manufacturer specifies the nature of the electrical protection of the appliance on the data plate, this specification shall comply with EN 60529 to give the degree of personal protection against contact with dangerous electrical components.

5.1.9 Safety in the event of interruption and restoration of the auxiliary energy

When interruption and subsequent restoration affects safety, then interruption and subsequent restoration of the electricity supply at any time during the starting up or operation of the appliance shall result in safety shutdown.

The appliance is deemed to be safe in the event of normal and abnormal fluctuation of the mains voltage supply by carrying out the test 7.7.3.1 and complying with the requirements of 6.5.3 and 6.7.1 b).

5.1.10 Guarding

Appliances which are to be marketed for installation such that all or part of the flame or incandescent material project more than 50 mm into the room or living space shall be tested with a dress guard which meets the requirements of annex I. Where the dress guard is not supplied with the appliance, the appliance shall carry a warning label, which states the following:

'An optional dress guard is available from the manufacturer. If this dress guard is not fitted, the user is warned of the hazard caused by the open flames.'

Appliances which are to be marketed for installation such that no part of the flame or incandescent material project more than 50 mm into the room or living space are not required to be tested with a dress guard, but, depending on national installation standards, regulations, or rules in force, shall include in the installation instructions the statement specified in the final paragraph of 8.2.2.1.

5.2 Adjusting, control and safety devices

5.2.1 General

The functioning of any safety device shall not be overruled by that of any control device.

Any adjuster or control which is not intended to be altered by the user or the installer shall be sealed such that any unauthorised adjustment is obvious.

NOTE Paint can be used for sealing provided that it withstands the temperature to which it is subjected during normal operation of the appliance.

5.2.2 Gas rate adjusters

It shall be possible to seal gas rate adjusters after adjustment; this seal shall resist the heat to which it is subjected during normal operation of the appliance. The adjusting screws shall be so located that they cannot fall into the gasways.

Gas rate adjusters shall be so designed that they are protected against adjustment by the user once the appliance has been installed and put into service.

The soundness of the gas circuit shall not be put at risk by the presence of gas rate adjusters.

Appliances in categories I_{2H}, I_{2L}, I_{2E}, I_{2E+}, I₃₊, I_{3B/P}, I_{3P}, II_{2H3B/P}, II_{2H3+}, II_{2H3P}, II_{2L3P}, II_{2L3B/P}, II_{2E3B/P}, II_{2E+3+} and II_{2E+3P} shall not be fitted with gas rate adjusters. However governed appliances in all of these categories except category I_{2E+} and II_{2E+3+} may have a gas rate adjuster consisting of an adjusting screw on the gas governor.

Appliance in category II_{1a2H} and all categories in III shall have a gas rate adjuster for 1st family gases.

For appliances in category II_{2H3+} having an adjuster which is the governor adjusting screw (see 3.3.1.5), it shall be possible to put this device out of service when these appliances are supplied with a 3rd family gas, and the same applies for appliances in category II_{1a2H} when they are supplied with a 2nd family gas. For appliances in category II_{2E+3P} having a gas rate adjuster, it shall be possible to put these devices out of service fully or partially (see 5.2.5) when these appliances are supplied with a 2nd family gas.

The adjusters shall be moveable only with the use of a tool and they shall be capable of being set in the operating position.

5.2.3 Shut-off valves

5.2.3.1 General

An appliance shall have a device that will allow the gas to the burner and to any ignition burner to be shut off as required. Operation of this device may be manual or automatic, but the shut-off shall be effected without delay, for example it shall not be subject to the inertia time of the safety device.

The gas line shall be fitted with either a thermoelectric device or a valve of class A, B or C to shut off the gas supply to the main burner and ignition burner, if any.

NOTE The flame detector can operate on this valve.

Appliances shall have, in addition, a second valve of either class A, B or C.

Any electrically operated automatic shut-off valve shall comply with EN 161.

Any multifunctional control shall comply with EN 126.

Examples of gas valve arrangements for automatic controls are given in annex C. Any other arrangement giving at least an equivalent level of safety is permissible.

When a single push button operates a safety device that controls both burner and ignition burner, no markings are required if incorrect operation is not possible.

5.2.3.2 Taps

To indicate a reduced rate position, the tap shall have either a stop at the end of the travel when the reduced rate position is beyond the full-on position, or an arrest position when the reduced rate position is situated between the full-on and the off positions.

If an appliance has two separate shut-off devices, one for the burner and one for the ignition burner, the controls for these devices shall be interlocked in such a way that it is impossible for the main burner to be supplied before the ignition burner. If the burner and ignition burner are served by a single shut-off device the ignition burner ignition position shall be indicated by a stop or notch that provides a definite arrest. It shall be possible to operate the shut-off and unlocking device with one hand only.

If a control knob operates by turning, movement in a clockwise direction by a user facing the knob shall close the gasway.

NOTE The thermoelectric device/main valve and tap/second valve can be either combined or in separate units.

5.2.3.3 Control knob

A control knob shall be designed and placed so that it can neither be mounted incorrectly nor move by itself.

The "off" position on a tap or control shall be marked indelibly and clearly, as a disc. The markings for other positions are optional.

5.2.4 Flame supervision devices

An appliance shall have a flame supervision device. It shall control the gas supply to the main burner and to any ignition burner, if fitted.

The flame supervision device shall be securely located in relation to every component with which it is designed to operate.

Heat sensitive flame supervision devices of the thermoelectric type shall comply with EN 125.

Failure of the means of sensing shall lead to safety shut down.

An atmospheric sensing device can serve as a flame supervision device providing it satisfies the requirements of 6.9.

5.2.5 Pressure governors

Pressure governors shall comply with EN 88.

An appliance in category I₃₊ shall not have a pressure governor.

The pressure of appliances of category I_{2E+}, and all other categories which have the index "E+", shall not be governed. However if a gas pressure governor is fitted, it shall not function within the range of the two normal pressures of the second family pressure couple, i.e. 20 mbar to 25 mbar.

Governors are optional for an appliance in the other categories.

For appliances in categories II_{2H3+} and II_{2E+3+}, it shall be possible to put the pressure governor, if any, out of service when using third family gases. For appliances in categories II_{2E+3+} and II_{2E+3P}, it shall be possible to put the pressure governor partially out of service when supplied with second family gases such that the pressure governor is not operational in the range of the normal pressures of the second family pressure couple, i.e. 20 mbar to 25 mbar.

The design and accessibility of the pressure governor shall be such that it can be easily adjusted or put out of service for use with another gas, but precautions shall be taken to make unauthorised interference with the adjustment difficult.

5.2.6 Automatic burner control system

Automatic burner control systems shall comply with EN 298.

The manual operation of push buttons, switches, etc., incorrectly or out of sequence shall not adversely affect the safety of the automatic burner control system.

When tested as described in 7.10.2.1, the rapid (on and off) manual operation of any start switch shall not set up a hazardous condition.

5.2.7 Thermostats

Any mechanical thermostat shall comply with EN 257.

Any electrical thermostat shall comply with type 2 of EN 60730-2-9.

Any thermostat control handle shall be placed in an accessible location; its positions shall be marked with graduations.

5.2.8 Spillage monitoring system

Appliances shall be so constructed that in abnormal draught conditions there is no release of combustion products in a dangerous quantity into the room concerned.

Any safety device used for this purpose shall:

- ¾ not have any adjustment other than that made and sealed by the manufacturer;
- ¾ be so designed that it cannot be removed or dismantled without the use of a tool;
- ¾ have electrical insulation that will withstand the thermal and chemical stresses resulting from spillage of the combustion products;
- ¾ be designed such that interruption of any link between the sensor and the device shall cause safety shutdown, if necessary after a waiting time;

$\frac{3}{4}$ for fan-flued appliances, not operate on the same gas valve as the device used to ensure the evacuation of flue gases (see 5.4).

5.3 Ignition devices

5.3.1 General

Ignition of the ignition burner (or main burner if there is no ignition burner) shall be possible from a safe and easily accessible position.

If an appliance is not fitted with an automatic burner control system, it shall be possible to light the ignition burner safely with a match or a wooden spill in the event of failure of the ignition device, (e.g. piezo).

The appliance shall be designed such that it shall not be possible to achieve ignition of the ignition burner and/or main burner by any means when the appliance is left unattended.

The appliance shall be designed such that it shall only be possible to achieve ignition of the ignition burner and/or main burner by a person in the room in which it is installed. A thermostat shall also meet the requirement. A thermostat may be used to regulate the input of the appliance, but shall not be able to turn the appliance, or its main burner, on or off.

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

Ignition burners and ignition devices shall be protected by design and position against diminution or extinction resulting from, for example, draughts, products of combustion, overheating, condensation, corrosion or matter falling from above.

Ignition burners, ignition devices and their mountings shall be so designed that they can only be located rigidly and correctly in relation to every component and burner with which they are designed to operate.

5.3.2 Ignition burners

If different ignition burners are used for different gases, they shall be marked, easy to substitute for one another and easy to fit. The same applies to injectors where only they have to be changed. Injectors shall carry an indelible means of identification and shall only be removable with the aid of a tool.

Ignition burners shall be protected against blockage by gas borne particulate matter.

Any ignition burner aeration adjuster shall be pre-set and locked or sealed by the manufacturer.

5.4 Evacuation of flue gases (Type B₁₄ appliances only)

Appliances shall be fitted with a suitable device to ensure satisfactory evacuation of flue gases.

The flue gas monitoring device shall be proved in the 'no flow' state prior to start-up. Failure to prove 'no flow' shall prevent start-up.

Failure to prove adequate flow of flue gases shall cause safety shut-down.

Flue gas flow failure during operation of the appliance shall result in closure of both shut-off valves (including a thermoelectric device) in the main gas line. The appliance shall clear its products of combustion at all times prior to closure of the shut-off valves. Compliance with 6.2.2.1 shall be checked. This is regarded as the appliance spillage monitoring system (see 5.2.8) and the requirements of 6.9 are not applicable.

5.5 Flame supervision systems (Appliances with automatic burner systems only)

The manufacturer shall specify the safety time (see 6.10.2.2).

Upon flame failure during the running condition the flame supervision device shall cause non-volatile lock-out. In the case of appliances with direct ignition of the main burner, one of the following is allowable, provided that such attempts cannot give rise to a hazardous condition:

- a) spark restoration within 1 s of the disappearance of the flame signal and within the safety time specified by the manufacturer,

OR

- b) a single restart attempt.

In the event that re-ignition is unsuccessful, non-volatile lock-out shall occur.

5.6 Ignition burner or start-gas flame establishment

5.6.1 Appliances with non-automatic burner systems

If an appliance is fitted with a separate ignition burner, the heat input of the ignition burner shall not exceed 0,3 kW.

5.6.2 Appliances with automatic burner systems

A start gas flame may be established at the main burner.

The start-gas automatic shut-off valve(s) shall not be energised before the ignition spark (or other means of ignition) is energised.

If the start-gas flame is not detected by the end of the safety time, non-volatile lock-out shall result.

5.7 Main flame establishment

5.7.1 General

Flame failure at any time before and after the main gas safety shut-off valves have been signalled to open shall lead to safety shut-down and non-volatile lock-out.

5.7.2 Appliances with non-automatic burner systems

Main gas shall not be admitted to the burner until the start-gas flame has been detected by the flame supervision system and manual intervention has occurred (e.g. release of a push-button).

5.7.3 Appliances with automatic burner systems

The main gas safety shut-off valves (see annex C, b) 2)) shall not be energised to admit the main gas flow to the burner until after the start-gas flame has been detected.

5.7.4 Direct establishment of the main flame

Direct ignition of the main burner is allowable for appliances which:

- a) incorporate an automatic ignition system;

or

- b) have a start-gas heat input ≤ 4 kW.

The ignition source shall not be energised before a safe-start check has been made of the flame supervision system and shall be de-energised at, or before, the end of the safety time.

If the flame has not been detected before the end of the safety time, non-volatile lock-out shall result.

5.8 Burners

5.8.1 General

Every removable injector and/or removable restrictor shall carry an indelible means of identification preventing any confusion.

The section of the flame ports shall not be adjustable.

Removal and replacement of the burner, in accordance with the manufacturer's instructions shall be possible using commercial tools (i.e. tools which are available on the open retail market).

The burner position shall be well defined and the burner shall be difficult to fit incorrectly.

The relative position between the burner(s) and injector(s) shall be well defined.

5.8.2 Pan burners

For those appliances using a pan burner, the pan shall hold and define the quantity of distribution medium.

5.9 Motors and fans

5.9.1 Fan to assist in the evacuation of flue gases

The parts of a fan in contact with combustion products shall be effectively protected against corrosion unless they are of corrosion resistant material; furthermore they shall withstand the temperature of the combustion products.

5.10 Pressure test points

A pressure test point shall be provided on the appliance for measurement of the manufacturer's stated operating pressure. An ungoverned appliance shall have one pressure test point and a governed appliance shall have two test points, one to measure pressure at the appliance inlet and another downstream of the governor.

The pressure test nipple shall have an external diameter of $(9^{+0}_{-0.5})$ mm and a useful length of at least 10 mm for connection to tubing. The diameter of the hole in the test point shall be not greater than 1 mm at its narrowest point.

5.11 Additional requirements for appliances where a fan is supplied for outdoor installation and is fitted to assist the evacuation of flue gases

5.11.1 General

The fan and compartment shall be so constructed that it is fully protected against the rigours of the environmental conditions under which it is expected to operate. It shall comply with EN 60529, IP44. The appliance manufacturer shall state the ambient temperature range and it shall be verified that the operation of the fan is suitable for this range.

5.11.2 Access panels and doors

Access panels and doors and such insulation as needs to be removed during normal servicing shall be so designed that repeated removal and replacement does not damage the insulation or impair the waterproofing of the fan compartment.

5.11.3 Dimensions of openings

No dimensions of any opening, e.g. electrical wiring points, from the inside of the appliance to the outside air shall permit the entry of a ball of diameter 16 mm applied with a force of 5 N.

5.11.4 Fixing screws

External panels intended to be removed for maintenance and servicing shall be fixed using only screws, except in the case of user access panels, which may be fixed by suitable hinges and door catches.

6 Operational requirements

6.1 General

Unless otherwise specified the test gases and conditions of test are given in 7.1.

6.2 Soundness

6.2.1 Soundness of the gas circuit

The gas circuit shall be sound. It is deemed to be sound if, when tested as described in 7.2.1, the external leakage of air does not exceed $100 \text{ cm}^3/\text{h}$ irrespective of the number of components, whether mounted in series or parallel on the appliance.

6.2.2 Soundness of the combustion products circuit and correct evacuation of combustion products

6.2.2.1 General

- a) When tested as described in 7.2.2.1 a), any leakage shall not exceed $0,04 \text{ m}^3/\text{h}$ per kW of heat input.

Alternatively

- b) When tested as described in 7.2.2.1 b), any leakage of products of combustion from the appliance shall not exceed the ambient CO_2 by more than 0,02 %.

6.2.2.2 Supplementary tests

For an appliance incorporating a door which is required to be opened, or a panel which is required to be removed, during ignition of the ignition burner and/or maintenance of the appliance, when tested as described in 7.2.2.2 it shall comply with 6.2.2.1 a) or 6.2.2.1 b), as appropriate.

6.2.3 Escape of unburnt gas

When the appliance is tested as described in 7.2.3, there shall be no escape of an ignitable quantity of gas between the injector outlet and the external surface of the burner, excluding the flame ports.

6.3 Heat inputs

6.3.1 Nominal heat input

When measured in accordance with the procedures described in 7.3.1:

- a) for an appliance without a gas rate adjuster, under the test conditions described in 7.3.2, the heat input obtained at normal test pressure shall be within $\pm 5 \%$ of the nominal heat input;
- b) for an appliance with a gas rate adjuster but no governor, the heat input shall be at least equal to the nominal heat input when measured under the conditions described in 7.3.3, test No.1, and shall not exceed the nominal heat input when measured under the conditions described in 7.3.3, test No. 2;
- c) an appliance with a governor shall comply with 6.6.

6.3.2 Start gas heat input

The heat input shall be measured in accordance with 7.3.4. If there is a gas rate adjuster, it shall allow an ignition burner rate necessary for assured ignition of the burner at all gas inlet pressures between the minimum and maximum values given in 7.1.4.

6.3.3 Reduced rate

When tested as described in 7.3.5, any reduced rate specified by the manufacturer shall be within $\pm 10\%$ of the specified rate.

6.4 Temperature of various parts of the appliance

6.4.1 Temperature of external parts of the appliance

When tested as described in 7.4.1 and 7.4.2, the surface temperature of the control handles and of all the parts that have to be manipulated during normal operation of the appliance, measured only in the areas intended to be touched shall not exceed the ambient temperature by more than:

35 K for metals and equivalent materials;

45 K for porcelain and equivalent materials;

60 K for plastics and equivalent materials.

The temperature of those parts of the appliance other than working surfaces (see 3.1.6) shall not exceed the ambient temperature by more than:

80 K for base metal;

95 K for glass enamelled steel, coated or painted metals and equivalent materials;

100 K for plastics, rubber or wood.

6.4.2 Temperature of components

When the appliance is tested as described in 7.4.1 and 7.4.3, the temperature of any component (including taps) shall not exceed that declared by the component manufacturer.

In addition, at the end of the test any taps fitted shall be easy to turn.

6.4.3 Temperature of floor, shelf and walls

6.4.3.1 Tests shall be carried out as described in 7.4.1 and 7.4.4.

6.4.3.2 For appliances intended to be installed on, or against, non-combustible surfaces, the temperature at any user touchable point of the floor on which an appliance is to be placed and that of the walls at the sides and back of the appliance and shelf, shall not exceed the ambient temperature by more than 80 K.

6.4.3.3 For appliances intended to be installed on combustible surfaces the temperature at any point of any floor on which an appliance is to be placed and that of the walls at the sides and back of the appliance and shelf, shall not exceed the ambient temperature by more than 60 K.

6.4.3.4 For built-in appliances which are exclusively for installation in an enclosure made of refractory material, the temperature of the surfaces of the enclosure are not measured.

6.5 Ignition, cross-lighting and flame stability

6.5.1 Ignition and cross-lighting (*for all appliances*)

6.5.1.1 General

When tested as described in Test No.1 to 3 of 7.5.1.1, correct ignition of the ignition burner and main burner by the ignition burner, or, main burner if this is ignited directly, shall be smooth and cross-lighting assured.

For piezo ignition devices, the appliance shall successfully ignite eight out of ten operations of the device.

When tested as described in Test No.4 of 7.5.1.1 the main burner shall not cause a hazard to the user or deformation to the appliance and/or its components which affects safety.