

Non-domestic gas-fired overhead luminous radiant heaters —

Part 1: Safety

The European Standard EN 419-1:1999; with the incorporation of amendments A1:2000, A2:2001 and A3:2002, has the status of a British Standard

ICS 97.100.20

National foreword

This British Standard is the official English language version of EN 419-1:1999, including amendments A1:2000, A2:2001 and A3:2002. It supersedes BS 3561:1962 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GSE/20, Non-domestic space heaters (gas), 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;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

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au gaz, à usage non domestique - Partie 1: Sécurité
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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 180, Non-domestic gas-fired overhead radiant 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of an identical text or by endorsement, at the latest by February 2000, and conflicting national standards shall be withdrawn at the latest by February 2000.

This European Standard 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 Z.A, which is an integral part of this standard.

Test methods for rational use of energy are dealt with in European pre-standards ENV 1259-1, ENV 1259-2 and ENV 1259-3.

The test gases, test pressures and appliance categories given in this European Standard are in accordance with those specified in EN 437:1993 + A1:1997 + A2:1999, Test gases — Test pressures — Appliance categories.

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, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A1

This amendment EN 419-1:1999/A1:2000 to EN 419-1:1999 has been prepared by Technical Committee CEN/TC 180, Non-domestic gas-fired overhead radiant heaters, the Secretariat of which is held by BSI.

This amendment to the European Standard EN 419-1:1999 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2001, and conflicting national standards shall be withdrawn at the latest by April 2001.

This amendment to the European Standard EN 419-1:1999 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).

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, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A2

This amendment EN 419-1:1999/A2:2001 to EN 419-1:1999 has been prepared by Technical Committee CEN/TC 180, Non-domestic gas-fired overhead radiant 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 January 2002, and conflicting national standards shall be withdrawn at the latest by January 2002.

This amendment to the European Standard EN 419-1:1999 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).

This amendment modifies EN 419-1:1999. It has been prepared to incorporate general amendments to EN 419-1:1999 and EN 437:1993 + A1:1997 + A2:1999.

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, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A3

This document EN 419-1:1999/A3:2002 has been prepared by Technical Committee CEN/TC 180, Non-domestic gas-fired overhead radiant heaters, the Secretariat of which is held by BSI.

This amendment to the European Standard EN 419-1:1999 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2003, and conflicting national standards shall be withdrawn at the latest by June 2003.

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).

This amendment modifies EN 419-1:1999. It has been prepared to incorporate requirements for the range-rated appliances.

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, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the requirements and test methods for the construction, safety, classification and marking of non-domestic gas-fired overhead luminous radiant heaters for environmental comfort, incorporating an atmospheric burner system referred to in the body of the text as “appliances”.

This European Standard is applicable to Type A₁ and Type B₁₁ appliances only (see 4.3).

This European Standard is not applicable to:

appliances designed for use in domestic dwellings;

outdoor appliances;

appliances of heat input in excess of 120 kW (based on the net calorific value of the appropriate reference gas);

appliances having fully pre-mixed gas and air burners in which:

either the gas and all the combustion air are brought together just before the level of the combustion zone;

or the pre-mixing of the gas and all combustion air is carried out in a part of the burner upstream of the combustion zone;

appliances in which the supply of combustion air and/or the removal of the products of combustion is achieved by integral mechanical means.

This standard is applicable to appliances which are intended to be type tested. Requirements for appliances which are not intended to be type tested would need to be subject to further consideration.

Requirements concerning the rational use of energy have not been included in this European Standard.

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.

CR 1404:1994	<i>Determination of emissions from appliances burning gaseous fuels during type-testing.</i>
EN 88:1991	<i>Pressure governors for gas appliances for inlet pressures up to 200 mbar.</i>
EN 125:1995	<i>Flame supervision devices for gas burning appliances — Thermo-electric flame supervision devices.</i>
EN 126:1995	<i>Multifunctional controls for gas burning appliances.</i>
EN 161:1991	<i>Automatic shut-off valves for gas burners and gas appliances.</i>
EN 257:1992 + A1:1996	<i>Mechanical thermostats for gas burning appliances.</i>
EN 298:1993	<i>Automatic gas burner control systems for gas burners and gas burning appliances with or without fans.</i>
EN 437:1993 + A1:1997 + A2:1999	<i>Test gases — Test pressures — Appliance categories.</i>
EN 23166:1993	<i>Specification for codes for the representation of names of countries (ISO 3166:1993).</i>
EN 50165:1995 + A1:2001	<i>Electrical equipment of non-electrical heating appliances for household and similar purposes. Safety requirements, amendment 1</i>
EN 60335-1: 1988	<i>Safety of household and similar electrical appliances — Part 1: General requirements.</i>
EN 60529:1991	<i>Degrees of protection provided by enclosures (IP Code).</i>
ISO 7-1:1994	<i>Pipe threads where pressure-tight joints are not made on the threads — Part 1: Designation, dimensions and tolerances.</i>
ISO 228-1:1994	<i>Pipe threads where pressure-tight joints are not made on the threads — Part 1: Designation, dimensions and tolerances.</i>
ISO 274:1975	<i>Copper tubes of circular section — Dimensions.</i>
ISO 6976:1995	<i>Natural gas — calculation of calorific values, density, relative density and Wobbe index from composition.</i>
ISO 7005-1:1992	<i>Metallic flanges — Part 1: Steel flanges.</i>
ISO 7005-2:1988	<i>Metallic flanges — Part 2: Cast iron flanges,</i>

ISO 7005-3:1988	<i>Metallic flanges — Part 3: Copper alloy and composite flanges.</i>
IEC 479	<i>Effects of current on human beings and livestock.</i>
IEC 479-1:1994	<i>Part 1: General aspects.</i>
IEC 479-2:1987	<i>Part 2: Special aspects.</i>

3 Definitions

For the purposes of this standard the following definitions apply.

3.1 Appliance and its constituent parts

3.1.1

overhead luminous radiant heater

a gas-fired appliance intended for installation at a height above head level and which is designed to heat the space beneath by radiation and in which the heat is produced by means of burning the fuel at or near the outer surface of a material such as a ceramic plaque or gauze, or by means of an atmospheric burner heating a gauze or similar material

3.1.2

atmospheric burner

an aerated burner in which the air for combustion is entrained at atmospheric pressure

3.1.3

inlet connection

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

3.1.4

mechanical joint

a means of ensuring the soundness of an assembly of several (generally metallic) parts without the use of liquids, pastes, tapes, etc.

NOTE For example the following:

metal to metal joints;

conical joints;

toroidal sealing rings (“O” rings);

flat joints.

3.1.5

gas circuit

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

3.1.6

restrictor

a device with an orifice, 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

3.1.7

gas rate adjuster

a component allowing an authorized person to set the gas rate of the burner to a predetermined value according to the supply conditions

NOTE Adjustment can be progressive (screw adjuster) or in discrete steps (by changing restrictors).

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

The action of adjusting this device is called "adjusting the gas rate".

A factory sealed gas rate adjuster is considered to be non-existent.

3.1.8

setting an adjuster

immobilizing a gas rate adjuster by such means as a screw, etc., after the gas rate has been adjusted by the manufacturer or installer

3.1.9

sealing an adjuster

the term applied to any arrangement in respect of the adjuster such that any attempt to change the adjustment breaks the sealing device or sealing material and makes this interference apparent

NOTE A factory sealed adjuster is considered to be non-existent.

A governor is considered to be non-existent if it has been factory sealed in a position such that it is not operational in the range of supply pressures corresponding to the appliance category.

3.1.10

putting an adjuster or a control out of service

an adjuster or a control (of temperature, pressure, etc.) is said to be "put out of service" if it is put out of action and sealed in this position. The appliance then functions as if this device had been removed

3.1.11

injector

a component that admits the gas into a burner

3.1.12

main burner

a burner that is intended to ensure the thermal function of the appliance and is generally called "the burner"

3.1.13

ignition burner

a burner whose flame is intended to ignite another burner

3.1.14

ignition device

a means (flame, electrical ignition device or other device) used to ignite the gas at the ignition burner or at the main burner

3.1.15

primary aeration adjuster

a device enabling the primary air to be set at the necessary value according to the supply conditions

3.2 Combustion products circuit

3.2.1

flue outlet

the part of a Type B₁₁ appliance that connects with a flue to evacuate the products of combustion

3.2.2

draught diverter

a device placed in the combustion products circuit to reduce the influence of flue pull and that of down-draught on the burner performance and combustion

3.3 Adjusting, control and safety devices

3.3.1

automatic burner control system

a system comprising at least a programming unit and all the elements of a flame detector device

The various functions of an automatic burner control system may be in one or more housings.

3.3.2

programming unit

a device 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

3.3.3

programme

the sequence of control operations determined by the programming unit involving switching on, starting up, supervising and switching off the burner

3.3.4

flame detector

a 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, may be assembled in a single housing for use in conjunction with a programming unit.

3.3.5

flame signal

the signal given by the flame detector, normally when the flame sensor senses a flame

3.3.6

flame supervision device

a device that, in response to a signal from the flame detector, keeps the gas supply open and shuts it off in the absence of the supervised flame

3.3.7

flame simulation

a condition which occurs when the flame signal indicates the presence of a flame when in reality no flame is present

3.3.8

pressure governor¹⁾

a device which maintains the outlet pressure constant independent of the variations in inlet pressure within defined limits

3.3.9

adjustable pressure governor

a governor provided with means for changing the outlet pressure setting

3.3.10

volume governor¹⁾

a device which maintains the gas rate constant within a given tolerance, independent of the upstream pressure

3.3.11

range-rating device

a component on the appliance intended to be used by the installer to adjust the heat input of the appliance within a range of heat inputs stated by the manufacturer; to suit the actual heat requirements of the installation

This adjustment may be progressive (e.g. by use of a screw adjuster) or in discrete steps (e.g. by changing restrictors).

¹⁾ The term “governor” is used in both cases.

3.3.12

automatic shut-off valve

a valve designed to open when energized and to close automatically when de-energized

3.4 Operation of the appliance

3.4.1

heat input

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

Symbol: Q

Unit: kilowatt (kW) [EN 437:1993 + A2:1999]

3.4.2

nominal heat input

the value of the heat input declared by the manufacturer

Symbol: Q_n

Unit: kilowatt (kW) [EN 437:1993 + A2:1999]

3.4.3

volume flow rate

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

Symbol: V

Unit: cubic metre per hour (m³/h), litre per minute (l/min), cubic decimetre per hour (dm³/h) or cubic decimetre per second (dm³/s) [EN 437: 1993 + A2:1999]

3.4.4

mass flow rate

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

Symbol: M

Unit: kilogram per hour (kg/h), or gram per hour (g/h) [EN 437: 1993 + A2:1999]

3.4.5

start gas

gas that is supplied at the start gas rate either at the main burner or at a separate ignition burner

3.4.6

start gas rate

the restricted gas flow rate admitted either to a separate ignition burner or to the main burner during start up

3.4.7

start gas flame

a flame established at the start gas rate either at the main burner or at a separate ignition burner

3.4.8

flame stability

the characteristic of flames which remain on the burner ports or in the flame reception zone intended by the construction

3.4.9

flame lift

the total or partial lifting of the base of the flame away from the burner port or the flame reception zone provided by the design

Flame lift may cause the flame to blow out, i.e. extinction of the air-gas mixture.

3.4.10

light-back

the entry of a flame into the body of the burner

3.4.11

light-back at the injector

ignition of the gas at the injector, either as a result of light-back into the burner or by the propagation of the flame outside the burner

3.4.12

sooting

a phenomenon appearing during incomplete combustion and characterized by deposits of soot on the surfaces or parts in contact with the combustion products or with the flame

3.4.13

first safety time²⁾

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

3.4.14

second safety time

where there is a first safety time applicable to either an ignition burner or to a start gas flame only, the second safety time is the interval between the main gas valve being energized and the main gas valve being de-energized if the flame detector signals the absence of a flame at the end of this interval

²⁾ Where there is no second safety time, this is called the safety time.

3.4.15

running condition of the system

the condition in which the burner is in normal operation under the supervision of the programming unit and its flame detector

3.4.16

controlled shut-down

the process by which the power to the automatic shut-off valve(s) is removed immediately as a result of the action of a controlling function

3.4.17

safety shut-down

the process which is effected immediately following the response of a safety control or sensor or the detection of a fault in the burner control system and which puts the burner out of operation by immediately removing the power from the automatic shut-off valve(s) and the ignition device

3.4.18

lock-out

3.4.18.1

non-volatile lock-out

the 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

3.4.18.2

volatile lock-out

the 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 mains electrical supply and its subsequent restoration

3.4.19

spark restoration

the process by which, following loss of the flame signal, the ignition device will be switched on again without total interruption of the gas supply

NOTE This process ends with the restoration of the running condition or, if there is no flame signal at the end of the safety time, with volatile or non-volatile lock-out.

3.4.20

automatic recycling

the process by which, after loss of flame during the running condition or accidental interruption of the operation of the appliance, the gas supply is interrupted and the complete start sequence is automatically re-initiated

NOTE This process ends with the restoration of the running condition or, if there is no flame signal at the end of the safety time, or if the cause of the accidental interruption has not disappeared, with volatile or non-volatile lock-out.

3.4.21

ignition opening time

the time interval between ignition of the supervised flame and the moment when the valve is held open

3.4.22

extinction safety time

the time which elapses between the moment when the supervised flame is extinguished and the moment when:

- for an appliance without an automatic burner control system, the gas supply is shut-off:
 - to the main burner;
 - and/or to the ignition burner;
- or for an appliance with an automatic burner control system, the control system initiates shut-down of the burner by removing power to the automatic gas shut-off valves

3.5 Gases

3.5.1

calorific value

the quantity of heat produced by the complete combustion, 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

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

Unit: either

megajoule per cubic metre (MJ/m³) of dry gas at the reference conditions; or

megajoule per kilogram (MJ/kg) of dry gas [EN 437:1993 + A2 :1999]

3.5.2

relative density

the ratio of the masses of equal volumes of dry gas and dry air measured under the same conditions of temperature and pressure.

Symbol: d

3.6 Conditions of operation and measurement

3.6.1

reference conditions

in this standard the following reference conditions apply:

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

3.6.2

cold condition

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

3.6.3

hot condition

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

3.6.4

thermal equilibrium

the operating state of the appliance, corresponding to a particular setting of the input in which the flue gas temperature does not change by more than ± 2 % (in °C) over a period of 10 min

3.7 Country of destination

3.7.1

direct country of destination

a 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 shall be 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.

3.7.2

indirect country of destination

a 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 utilized safely and correctly in this country

4 Classification of appliances

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

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 the gas used in this standard.

Table 1 — Classification of gases

Gas families	Gross Wobbe index at 15 °C and 1 013,25 mbar MJ/m ³	
	Minimum	Maximum
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

4.2 Classification according to the gases capable of being used

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

a) 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.)

b) 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 of the appliance. The appliance gas pressure regulating device, if it exists, is not operative at pressures in between the two normal pressures of the pressure couple.

c) 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 the gases of third family gases (propane and butane) and operating with a pressure couple without adjustment of the appliance. However for certain types of appliance specified in the particular standards 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.

Category I_{3B}: Appliances using only gases of group B of the third family (butane) at the prescribed supply pressure.

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

a) 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}.

b) 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 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 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 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}.

4.2.3 *Category III:* Appliances of category III are designed for use on gases of three families.

This category is not in general use.

Categories III appliances which are in use in certain countries are given in annex A (see A.3).

4.3 Classification according to the mode of evacuation of the combustion products

4.3.1 General: Appliances are classified into several types according to the method of evacuation of the combustion products and admission of the combustion air.

4.3.2 Type A: An appliance not intended for connection to a flue or to a device for evacuation of the products of combustion to the outside of the room in which the appliance is installed.

This standard applies to:

Type A₁: A type A appliance without a fan.

4.3.3 Type B: An appliance intended for connection to a flue discharging outside the room in which the appliance is installed; the combustion air being drawn directly from the air in the room in which the appliance is installed.

Type B₁: A type B appliance incorporating a draught diverter.

This standard applies to:

Type B₁₁: A natural draught B₁ appliance.

5 Constructional requirements

5.1 General

5.1.1 *Conversion to different gases*

The only acceptable operations when converting from a gas of one group or family to a gas of another group or family and/or to adapt to different gas distribution pressures are given below for each category.

It is recommended that these operations should be possible without disconnecting the appliance.

5.1.1.1 *Category I*

Categories I_{2H}, I_{2L}, I_{2E}, I_{2E+}: no modification to the appliance.

Category I_{3B/P}: no modification to the appliance.

Category I₃₊: replacement of injectors or calibrated orifices and primary adjusters but only in order to convert from one pressure couple to another, e.g. 28 - 30/37 mbar $\Leftrightarrow$ 50/67 mbar.

Category I_{3P}: no modification to the appliance relative to a change of gas. For a change of pressure, replacement of injectors and adjustment of gas rates.

5.1.1.2 *Category II*

5.1.1.2.1 *Categories of appliance designed for use with gases of the first and second families*

Adjustment of the gas rate with, if necessary, a change of injector, restrictor or governor.

Adjustment of the gas rate of the ignition burner(s), either by using an adjuster or by a change of injector or restrictor and, if necessary, a change of the complete ignition burner(s) or of some of its/their parts.

A change, if necessary, of the automatic shut-off valves(s).

Putting the governor out of service under the conditions of **5.2.5**.

Putting the gas rate adjuster(s) out of service under the conditions of **5.2.2**.

The adjustments or component changes are only acceptable when converting from a gas of the first family to a gas of the second family or vice versa.

5.1.1.2.2 *Categories of appliance designed for use with gases of the second and third families*

Adjustment of the gas rate with, if necessary, a change of injector, restrictor or governor.

Adjustment of the gas rate of the ignition burner(s), either by using an adjuster or by a change of injector or restrictor and, if necessary, a change of the complete ignition burner(s) or of some of its/their parts.

A change, if necessary, of the automatic shut-off valves(s).

Adjustment of the low pressure cut-off, if any.

Putting the governor out of service under the conditions of **5.2.5**.

Putting the gas rate adjuster(s) out of service under the conditions given in **5.2.2**.

The adjustments or component changes are only acceptable when:

converting from a gas of the second family to a gas of the third family or vice versa.

converting from one butane/propane pressure couple to another, e.g. 28 - 30 /37 mbar $\Leftrightarrow$ 50/67 mbar.

5.1.1.3 *Category III*

Category III appliances that are permitted in certain countries are given in annex A.

5.1.2 *Materials and method of construction*

The quality and thickness of materials used in the construction of an appliance shall be:

such that the construction and performance characteristics are not altered so as to affect the safe operation of the appliance in normal conditions of use and of maintenance by the user;

such as to ensure a reasonable operating life.

In particular, when the appliance is installed according to the manufacturer's instructions, all the components shall withstand the mechanical, chemical and thermal conditions to which they may be subjected when used in a manner which can be reasonably foreseen.

Copper shall not be used for gas-carrying parts where the temperature is likely to exceed 100 °C.

Asbestos or materials containing asbestos shall not be used.

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

5.1.3 Accessibility for maintenance and use

Components and controls shall be arranged such that they are readily accessible for adjustment, maintenance or exchange. Where necessary access doors or removable panels shall be provided.

Parts that are intended to be removed for maintenance or cleaning shall be readily accessible, shall be simple to assemble correctly and difficult to assemble incorrectly. Such parts shall be difficult to assemble incorrectly where incorrect assembly would create a hazardous condition or result in damage to the appliance and its controls.

Parts of the appliance which are not intended to be removed by the user and for which removal would affect safety shall be capable of removal only with the aid of tools.

5.1.4 Means of sealing

5.1.4.1 Soundness of the gas circuit

Holes for screws, studs, etc. intended for the assembly of components shall not open into the gasways. The wall thickness between holes (including threads) and gasways shall be not less than 1 mm.

The soundness of components and assemblies connected to the gas circuit and likely to be dismantled for routine maintenance at the consumer's premises shall be ensured 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 re-assembly.

Sealing compounds may be used for permanent threaded assemblies. The sealing material shall remain effective under normal conditions of appliance use.

5.1.4.2 Soundness of the combustion circuit (type B₁₁ appliances)

The soundness of the combustion circuit of the appliance 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 ensured under normal conditions of use.

5.1.5 Supply of combustion air and evacuation of combustion products

5.1.5.1 Air inlets

The cross-sectional area of the inlet air passageway(s) shall not be adjustable.

5.1.5.2 Appliance outlet

The cross-sectional area of the combustion circuit shall not be adjustable. Any outlet for products of combustion shall be so designed and arranged that it is protected against inadvertent blockage.

5.1.5.3 Type B₁₁ appliances

The appliance shall be provided with a draught diverter which shall either:

be integral with the appliance; or

be supplied with the appliance by the manufacturer.

The flue outlet shall be female and shall allow, if necessary by means of an adaptor supplied with the appliance, connection to a flue pipe whose diameter complies with the standards in force in the country where the appliance is to be installed (see A.6).

It shall be possible to insert a flue pipe of external diameter ($D-2$) mm to a depth of at least $D/4$, but not so far that the evacuation of the combustion products is impaired. However, for a vertical connection the depth of insertion may be reduced to 15 mm.

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

5.1.6 Inlet connection

The inlet connection shall be one of the following types:

- a) a thread conforming to ISO 228-1:1994. In this case the end of the gas inlet connection shall have a flat annular surface at least 3 mm wide for thread sizes $\frac{1}{2}$ and $\frac{3}{8}$ and at least 2,5 mm wide for thread size $\frac{1}{4}$, to allow the interposition of a sealing washer. Moreover, when the end of the gas inlet connection has a thread of nominal size $\frac{1}{2}$, 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 7-1:1994;
- c) a compression fitting suitable for copper tube conforming to Table 2 of ISO 274:1975;
- d) a straight tube at least 30 mm long, the end of which is cylindrical, smooth and clean, to allow connection by means of a compression fitting as specified in c);
- e) a flange to ISO 7005-1:1992, ISO 7005-2:1988 or ISO 7005-3:1988.

NOTE The conditions of inlet connections prevailing in the various countries are given in A.5.

The gas inlet connection shall be so secured that connections to the gas supply can be made without disturbing any controls or gas-carrying components of the appliance.

Appliances shall be provided with adequate means of support or suspension other than the gas supply pipe.

5.1.7 Confirmation of operation

Means shall be provided to allow observation of any ignition burner flame during commissioning and servicing.

It shall at all times be possible for the user to ascertain visually whether the appliance is in operation or whether the main burner has been extinguished.

5.1.8 *Electrical equipment*

The electrical equipment of the appliance shall be so designed and constructed as to obviate hazards of electrical origin and shall comply with the requirements of EN 50165:1997/A1:2001 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 298:1993 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 60529:1991:

to give the degree of personal protection against contact with dangerous electrical components inside the appliance case;

to give the degree of electrical protection, inside the appliance case, against harmful actions due to water penetration.

5.1.9 *Operational safety in the event of fluctuation, interruption and restoration of the auxiliary energy*

Interruption and subsequent restoration of the electricity supply at any time during the starting up or operation of the appliance shall result in:

continued safe operation; or

closure of the main burner gas valve; or

volatile or non-volatile lock-out where the appliance is fitted with an automatic burner control system; or

safety shut-down followed by automatic recycling.

Interruption and subsequent restoration of the electricity supply shall not override any “lock-out” condition except where the appliance is intended to be reset by means of switching off and on the electricity supply to the appliance, e.g. volatile lock-out. Such resetting shall only be possible if any interruption and subsequent restoration of the electricity supply cannot give rise to a hazardous appliance condition.

NOTE Requirements relating to the continued and safe operation of the appliance in the event of normal and abnormal fluctuation of auxiliary energy are specified in 6.7.2.

5.2 Requirements for 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.

The appliance shall not incorporate any controls which need to be manipulated by the user when the appliance is in normal operation.

5.2.2 Gas rate adjusters

Gas rate adjusters shall be pre-set and sealed by the manufacturer in the positions appropriate for the gas and pressure for which the appliance has been adjusted.

The instructions for conversion to different gases shall specify that all the sealing devices shall be restored after the gas conversion operations.

Appliances in categories I_{2H}, I_{2L}, I_{2E}, I_{2E+}, I_{3B/P}, I_{3P}, II_{2H3B/P}, II_{2H3+}, II_{2H3P}, 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 II_{2E+3+} may have a gas rate adjuster consisting of an adjusting screw on the gas governor.

Appliances in category II_{1a2H} shall have a gas rate adjuster for the first family of gases.

For appliances in category II_{2H3+} having a gas rate adjuster, it shall be possible to put these devices out of service when these appliances are supplied with a third family gas. This also applies to appliances in category II_{1a2H} when they are supplied with a second 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 second family gas.

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

5.2.3 Range-rating devices

A range-rating device on an appliance is optional.

For appliances on category II_{1a2H} the gas rate adjuster and the range-rating device may be one and the same. However, if the gas rate adjuster has to be sealed, either completely or partially, when the appliance is supplied with a second family gas, the gas rate adjuster or its sealed part shall be no longer be used by the installer as a range-rating device.

5.2.4 Primary aeration adjusters

Primary aeration adjusters shall be pre-set and sealed by the manufacturer in the positions appropriate for the gas for which the appliance has been adjusted.

The instructions for conversion to different gases shall specify that all sealing devices shall be restored after the gas conversion operations.

5.2.5 Controls and safety devices

5.2.5.1 General

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

The appliance shall not incorporate any controls which need to be manipulated by the user when the main burner is in normal operation.

This requirement shall not apply to controls which have to be manipulated in order to ignite the ignition burner.

5.2.5.2 Manual controls

Manual valves, push buttons or electrical switches that are essential for normal operation and commissioning of the appliance shall either be provided with the appliance or be specified in the manufacturer's installation instructions.

Where the operation of the main burner is normally controlled by a manual valve, the means of operating the valve shall be readily accessible to the user from floor level.

If the appliance is intended for ON/OFF operation only the manual means of operation shall be clearly marked.

5.2.5.3 Manual valves

Any manual valve shall be of the 90° turn type unless it is incorporated in a flame supervision device.

Manual valves shall be so designed or positioned as to prevent inadvertent operation but shall be easy to operate when required. They shall be so designed that in operation the "OPEN" and "CLOSED" positions are readily distinguishable.

When a manual valve is provided at the inlet of the appliance, it shall be capable of operating at a pressure equal to 1,5 times the maximum supply pressure and shall be readily accessible.

Manual valves used solely for OPEN/CLOSED operation shall be provided with positive stops at the "OPEN" and "CLOSED" positions.

5.2.6 Governors

Governors shall comply with EN 88:1991.

The gas supply to the burner and any ignition burner shall be under the control of a governor fitted in the appliance gas circuit upstream of the automatic shut-off valve(s) unless the governor is incorporated in a multifunctional control.

The design and accessibility of the 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 unauthorized interference with the adjustment difficult.

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

5.2.7 Flame supervision devices

The appliance shall incorporate a flame supervision device.

Thermo-electric flame supervision devices shall comply with EN 125:1995.

Electronic flame supervision devices shall comply with EN 298:1993 except that the device shall have a flame ionization current of at least $0,2 \times 10^{-6}$ amperes.

NOTE The amperage requirement would cater for those appliances which use first family gases.

5.2.8 Multifunctional controls

Multifunctional controls shall comply with EN 126:1995.

5.2.9 Automatic shut-off valves

Automatic shut-off valves shall comply with EN 161:1991.

Unless the appliance is fitted with a thermo-electric flame supervision device the gas supply to the main burner shall be under the control of at least one automatic shut-off valve connected in the gas circuit of either class A or class B capability.

The start gas supply shall be under the control of at least one automatic shut-off valve of either class A, class B, class C or class D capability.

5.2.10 Gas strainers

A strainer shall be fitted at the inlet of any gas circuit incorporating an automatic shut-off valve(s) to prevent the ingress of foreign matter. The strainer may be integral with the upstream automatic shut-off valve. The maximum strainer hole dimension shall not be greater than 1,5 mm and the mesh shall not permit a 1 mm pin gauge to pass through it.

In gas circuits incorporating more than one automatic shut-off valve only one strainer need be fitted, provided it gives adequate protection to all valves.

For valves incorporating a shearing action (self-cleaning) the strainer may be omitted.

Where a governor is fitted upstream of the automatic shut-off valve(s) the strainer may be fitted upstream of the governor.

5.2.11 Automatic burner control system

5.2.11.1 General

Where an appliance is fitted with an automatic burner control system it shall comply with EN 298:1993.

5.2.11.2 Manually operated devices

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

Under the test conditions described in 7.2.4.4 the rapid (on and off) operation of any start switch shall not set up a hazardous condition.

5.2.11.3 Flame detector

The flame detector shall incorporate a means to prevent the energization of any gas valve and of the ignition device if a flame or flame simulating condition is present during the start-up period.

Upon flame failure in the running condition the flame detector shall cause one of the following:

non-volatile lock-out; or

volatile lock-out; or

one of the following provided that such action cannot give rise to a hazardous condition:

safety shut-down followed by automatic recycling; or

spark restoration.

Where a spark restoration system is used, the time allowed before the automatic shut-off valve(s) closes may be extended to permit the re-ignition attempt, but this extended time shall not exceed the first safety time.

5.2.11.4 Ignition burner flame establishment

The main gas automatic shut-off valve(s) shall not be energized to admit the main gas flow to the main burner until after the ignition burner flame has been detected.

5.2.11.5 Direct main burner flame establishment

The ignition spark (or other means of ignition e.g. hot surface igniter) shall be de-energized at or before the end of the safety time.