BRITISH STANDARD

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14829:2007

Independent gas-fired flueless space heaters for nominal heat input not exceeding 6 kW

The European Standard EN 14829:2007 has the status of a British Standard

ICS 97.100.20

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 14829:2007.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Independent gas-fired flueless space heaters for nominal heat input not exceeding 6 kW

Appareils de chauffage domestiques non raccordés indépendants utilisant les combustibles gazeux pour un débit calorifique nominal inférieur ou égal à 6 kW

Konvektions-Raumheizer ohne Abgasabführung für gasförmige Brennstoffe mit einer Nennwärmebelastung kleiner oder gleich 6 kW

This European Standard was approved by CEN on 24 June 2007.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

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Foreword

This document (EN 14829:2007) 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of an identical text or by endorsement, at the latest by February 2008, and conflicting national standards shall be withdrawn at the latest by February 2008.

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 ZA, which is an integral part of this document.

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

1 Scope

This document specifies, for the purpose of type examination, the requirements and test methods for construction, safety, marking and rational use of energy of 2nd and 3rd family gas-fired domestic flueless space heating appliances having a nominal input not exceeding 6 kW (based on net calorific value).

It covers the following Type A_{AS} fixed flueless heaters:

NOTE These are type A appliances fitted with an atmosphere sensing device, with or without a fan.

a) heaters with or without a catalytic converter;

b) Category 1 appliances burning gases of the second family;

c) Category 2 appliances burning gases of the second and third families.

It does not cover

i. Mobile heaters.

ii. Category 1 appliances burning gases of the third family.

iii. Portable flueless heaters.

iv. Diffusive catalytic combustion heaters.

There are no specific thermal efficiency requirements appropriate to these types of appliance as:

— All the heat produced by the combustion process is released into the space to be heated.

— The requirements with regard to the combustion performance, which is a safety matter, ensure the effective burning of the fuel gas.

This standard is only applicable to appliances which are to be type tested. Matters related to quality assurance systems, tests during production and to certificates of conformity of auxiliary devices are not dealt with by this standard.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

EN 125, *Flame supervision devices for gas burning appliances — Thermoelectric 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 437:2003, *Test gases - Test pressures - Appliance categories*

EN 751-1, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water - Part 1: Anaerobic jointing compounds*

EN 751-2, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water - Part 2: Non-hardening jointing compounds*

EN 1057:2006*, Copper and copper alloys - Seamless, round copper tubes for water and gas in sanitary and heating applications*

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

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

EN 60335-1:2002, *Household and similar electrical appliances – Safety - Part 1: General requirements (IEC 60335- 1:2001, modified)*

EN 60335-2-102, *Household and similar electrical appliances – Safety – Part 2-102: Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections (IEC 60335-2-102:2004, 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 2-9: Particular requirements for temperature sensing controls (IEC 60730-2-9:2000, modified)*

EN ISO 228-1:2003 *Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation (ISO 228-1:2000)*

EN ISO 3166-1, *Codes for the representation of names of countries and their subdivisions - Part 1: Country codes (ISO 3166-1:2006)*

ISO 7-1:1994, *Pipe threads where pressure-tight joints are made on the threads - Part 1: Dimensions, tolerances and designation*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
working surfaces
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 Burner

3.2.1
main burner
burner that assures the thermal function of an appliance, usually called simply ‘burner’

3.2.2
ignition burner
burner intended to light the main burner

3.2.3
permanent ignition burner
ignition burner that operates continuously throughout the whole period that the appliance is in use

3.2.4
intermittent ignition burner
ignition burner that is ignited before and is extinguished at the same time as the main burner

3.3 Heat input

3.3.1
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)

3.3.2
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)

3.3.3
heat input
quantity of energy used divided by time corresponding to the volumetric or mass flow rates, the calorific value used being either the net or gross calorific value

Symbol: *Q,* Unit: kilowatt (kW)

3.3.4
nominal heat input
value of the heat input declared by the manufacturer

Symbol: *Q*n, Unit: kilowatt (kW)

3.4
flame lift
phenomenon characterized by the partial or total movement of the base of the flame away from the burner port or the flame contact area provided by the design

3.5
relative density (*d*)
ratio of a mass of dry gas to the mass of an equal volume of dry air under the same temperature and pressure conditions

3.6
ignition device
device to ignite one or more burners

3.7
flame supervision device
device including a sensing element which causes the gas supply to a burner to be opened or closed according to the presence or absence of the flame which activates the sensing element

3.8
Wobbe index
ratio of the calorific value of a gas per unit volume and 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

3.9
injector
component part that admits the gas into a burner. There are two types of injector:

— calibrated injector; where the section of the outlet orifice is fixed.

— adjustable injector; where the section of the outlet orifice is variable. (NB: this is not allowed in this standard, see 5.2.2.1).

3.10
sound mechanical joint
connection device assuring soundness in an assembly made up of several parts, generally of metal

It may be:

— a conical joint;

— an O-ring joint;

— a flat-faced joint;

— metal to metal joints.

3.11
tap handle
manually operated component used to open, partially open or close a tap

3.12
dress guard
integral part of the appliance designed to prevent objects accidentally coming into contact with flames or incandescent surfaces

3.13
putting a control out of service
putting a control (of temperature, pressure etc.) out of action and sealing it in this position, the appliance then functions as if this device had been removed

3.14
aeration adjuster
device allowing the primary aeration of a burner to be set at a predetermined value according to the supply conditions, the operation of changing the setting of this device is termed the ‘adjustment of primary air’

3.15
fixed primary aeration restrictor
non-adjustable device which limits the supply of primary air to a burner

3.16
gas rate adjuster
component intended for the manufacturer or installer to set the gas rate to each burner at a predetermined value, according to supply conditions

The adjustment may be progressive (screw adjuster) or discontinuous (changing restrictors)

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

The action of setting this device is called ‘setting the gas rate’

3.17
calorific value
quantity of heat produced by the complete combustion, at constant pressure of 1013,25 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 the reference conditions; or

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

3.18 reference conditions

— for calorific values, temperature: 15 °C;

— for gas and air volumes dry, brought to 15 °C and an absolute pressure of 1 013,25 mbar.

3.19 Gas supply pressure

3.19.1
test pressure
gas pressure used to verify the operational characteristics of appliances using combustible gases, consisting of normal and limit pressures

They are expressed in millibar (mbar).

NOTE 1 mbar = 100 Pa.

3.19.2
normal pressure
pressure under which appliances operate in nominal conditions, when supplied with the corresponding reference gas

Symbol: p_n

3.19.3
limit pressures
pressures representative of the extreme variations in appliance supply condition

Symbols: maximum pressure: p_{max}: minimum pressure: $p_{min.}$

3.19.4
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.

3.20
light back
phenomenon characterized by the return of the flame inside the body of the burner

3.21
tap
device to adjust the heat input during use and/or isolate the gas supply to the various burners

3.22
sealing of an adjuster
action whereby the locking of an adjuster is achieved by a means such that any attempt to change the adjustment makes the interference with the adjuster apparent (e.g. breaking of a sealing material)

3.23
soft solder
solder for which the lowest temperature of the melting range, after application, is less than 450 °C

3.24
stability of flames
condition of the flames at the burner ports or the flame contact area provided by the design when the phenomena of flame lift or light back do not occur

3.25
thermostat
device to maintain automatically a selected constant temperature, it may include a graduated scale for the selection of the temperature

3.26
close-fronted appliance
appliance which has no exposed flames or exposed incandescent areas

3.27
open-fronted appliance
appliance which has exposed flames or exposed incandescent areas

3.28
cold condition
condition of the appliance required for some tests and obtained by allowing the unit appliance to attain equilibrium at room temperature

3.29
hot condition
condition of the appliance required for some tests and obtained by heating for one hour at the normal test pressure

3.30
fixed heater
heater intended to be used only in the location it is installed

3.31
portable heater
heater for connection to a gas supply by means of flexible tubing and designed to be easily carried

3.32
mobile heater
self-contained heater incorporating its own gas container within the body of the appliance and designed to be moved without lifting

3.33
atmosphere sensing device
device that is designed to shut off the gas supply when the carbon dioxide content of the surrounding atmosphere exceeds a given level, such a device normally comprises a vitiation sensitive pilot in conjunction with a suitable flame supervision device

3.34
catalytic converter
component placed in the path of the products of combustion that contains a chemical which helps to reduce the levels of some emissions

3.35
by-pass rate
non-adjustable rate of flow through a thermostat when the valve is closed

3.36
minimum operational rate
Either:

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

b) for any burner that is manually controlled but where it is only possible to obtain certain predetermined fixed settings, the lowest rate obtainable in normal use.

3.37
non-volatile lock-out
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

3.38
safety time
interval between the ignition burner gas valve, the start gas valve or main gas valve, as applicable, being energised and the ignition gas valve, start gas valve or main gas valve, as applicable, being de-energised if the flame detector signals the absence of a flame

3.39
spark restoration
process by which, after disappearance of the flame signal in the running condition, the ignition device is energised again without the gas supply having been totally interrupted. 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 non-volatile lock-out

3.40
automatic recycling
process by which, following loss of flame signal 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. 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 non-volatile lock-out

3.41
pan burner
main burner which utilises a particulate medium (e.g. sand) for the distribution of gas over a defined area

3.42
durably
quality of lasting a long time

3.43 Marking of the appliance and packaging

3.43.1
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

3.43.2
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 utilized safely and correctly in the country

4 Classification

4.1 Classification of gases

Gases are classified into three families, which may be divided into groups according to the value of the Wobbe number. Table 1 of EN 437:2003 gives the families and groups of gases.

4.2 Categories of appliances

4.2.1 General

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

The definitions of categories are given in 4.2.2 and 4.2.3.

In each country, only some of the categories specified in 4.2.2 and 4.2.3 are marketed, on account of local gas distribution conditions (composition of gases and supply pressures).

The situations relating to the marketing of these categories of appliance in each country, and the corresponding supply pressures, are given in A.2 (see also in A.4 particular categories marketed locally and nationally corresponding to the specific gases and supply pressures given in A.5).

4.2.2 Category I

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

Category I_{2H}: As defined in EN 437:2003, 6.1.2.2.

Category I_{2L}: As defined in EN 437:2003, 6.1.2.2.

Category I_{2E}: As defined in EN 437:2003, 6.1.2.2.

Category I_{2E+}: As defined in EN 437:2003, 6.1.2.2.

4.2.3 Category II

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

Category $II_{2H3B/P}$: As defined in EN 437:2003, 6.1.3.2.

Category II_{2H3+}: As defined in EN 437:2003, 6.1.3.2.

Category II_{2H3P}: As defined in EN 437:2003, 6.1.3.2.

Category $II_{2L3B/P}$: As defined in EN 437:2003, 6.1.3.2.

Category II_{2L3P}: As defined in EN 437:2003, 6.1.3.2.

Category $II_{2E3B/P}$: As defined in EN 437:2003, 6.1.3.2.

Category $II_{2E+3B/P}$: As defined in EN 437:2003, 6.1.3.2.

Category II_{2E+3+}: As defined in EN 437:2003, 6.1.3.2.

Category II_{2E+3P}: As defined in EN 437:2003, 6.1.3.2.

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 4.2.2 and 4.2.3 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 and 5.1.1.3 for each appliance category.

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 permitted.

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.

5.1.1.3 Category II

5.1.1.3.1 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:

— adjustment of the gas rate with, if necessary, a change of injectors, restrictors or regulator;

— replacement of a burner assembly;

— replacement of complete ignition burners or some of its parts;

— exchange of the fixed primary aeration restrictor.

The regulator shall be put out of service where this is required in accordance with the requirements of 5.2.6.

Gas rate adjusters shall be put out of service in accordance with the requirements of 5.2.2.2.

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

— 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 <=> 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.

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.

5.1.2 Materials and method of construction

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

The construction of the appliance shall be such that, during normal conditions of use and maintenance any displacement, distortion or deterioration of parts likely to impair its good performance will not occur.

In particular, all parts of the appliance shall withstand the mechanical, chemical and thermal conditions to which they may be submitted during their use. In normal conditions of use, of cleaning or of adjustment, the materials shall not be liable to any deformation that might impair their performance. Metal parts shall be suitably protected against the effects of corrosion.

When a means of sealing used on the appliance falls within the scope of a European Standard, the means of sealing shall comply with the requirements of that European Standard.

The appliance gas pipework and gas controls shall be of metal except as allowed in 5.1.5.

Material containing asbestos shall not be used.

Components shall not have sharp edges or corners likely to cause injury during use or maintenance. Mountings for glass components shall be such as to avoid stresses on the glass during normal use.

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.

If condensation is produced at the start-up and/or during the normal operation of the appliance, it shall not cause a deterioration in the construction of the appliance and/or materials used so as to affect the safety of the appliance. The design of an appliance shall be such that condensate formed within the appliance cannot drip onto the floor.

Air inlet grille(s) and combustion products outlet vent(s) shall be designed and/or positioned so as to minimise the risk of their inadvertent blockage or obstruction by the user.

5.1.3 Accessibility for use and maintenance

5.1.3.1 General

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 any incorrect assembly shall be obvious.

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 user's instructions, without the aid of a tool.

An appliance shall be capable of being fixed securely. The installation instructions shall give relevant and precise information in order to comply with 7.2.

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

When the combustion circuit of an appliance incorporates a door which is required to be opened or a panel which is required to be removed, it shall be difficult to close the door or replace the panel incorrectly. If this operation does not require the use of a tool, this operation shall not be obvious and the procedure shall be specified in the instructions for use and maintenance (8.5).

In the case where a special tool is supplied by the manufacturer, this tool shall be removable once the operation has been completed.

5.1.3.2 Cleaning and user maintenance

Any part of the appliance requiring cleaning by the user shall be easily accessible without having to move the appliance. It shall be possible to replace such parts correctly and without difficulty.

Sharp corners and edges which could give rise to injury to the user or installer, for example during cleaning or maintenance, shall be avoided.

5.1.4 Connections

5.1.4.1 Appliance inlet connections

For appliance inlet connections see A.5.

The gas inlet to the appliance shall be one of the following types:

a) a thread conforming to EN 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. Moreover, 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 1057:2006;

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 cone-seated union.

5.1.4.2 Access to the connection

The position to 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 assembly

Holes for screws, pins etc. intended for the assembly of components shall not open into the gasways. The residual wall thickness shall be at least 1 mm.

The soundness of assemblies requiring to be dismantled during normal maintenance, shall be assured by being connected to the gas circuit by means of a sound mechanical joint.

For parts that do not require to be dismantled during normal maintenance, for example taps and injectors, the use of appropriate thread sealing compounds is permitted. Those compounds shall comply with EN 751-1 or EN 751-2.

Soft solder shall not be used to ensure the soundness of the connections of the gas circuit.

Removable components or the threaded parts of the pipework which may be dismantled during normal maintenance shall remain sound after five disconnections, if necessary after changing a gasket, where such exists.

5.1.6 Electrical equipment

The electrical equipment of the appliance shall comply with the relevant requirements of EN 60335-2-102.

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.

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 safety shutdown.

5.1.7 Safety in the event of fluctuation, 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 7.9.3 and complying with the requirements of 6.8.4.

5.1.8 Appliance stability and fixing

When tested in accordance with 7.2, appliances shall not move along the test surface or fall over.

5.1.9 Dress guards

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 E. Where the dress guard is not supplied with the appliance, the appliance shall carry a warning label, which states the following:

> ‘It is advisable to fit the dress guard available from the manufacturer. Failure to fit this dress guard will result in a potential hazard to clothing when approaching the appliance.’

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 8.5.3.

5.1.10 Confirmation of operation

The user shall be able at all times to ensure visually that the appliance is in operation. After turning the appliance off the fuel bed may continue to glow for a time and a "cooling down" period shall be taken into account. In all appliances where mirrors are used, they shall retain their optical properties.

Where the operator is unable to see the main burner an indirect means of signalling (e.g. control lamp) is required. In this case, it shall not be possible for the signal of the existence of the flame to be

confused with a signal for any malfunction, apart from that of a malfunction of the flame control itself, which should be expressed by the indication of an absence of flame.

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 unauthorized adjustment is obvious.

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

The appliance shall be fitted with such taps and controls as are essential for the normal operation of the appliance by the user.

For any component or fitting that comes within the scope of a harmonized standard, that equipment shall comply with the requirements of that standard. For example, if a flame supervision device, multifunctional control, automatic shut-off valve or thermostat falls within the scope of EN 125, EN 126, EN 161 or EN 257, the requirements of that standard shall be met.

5.2.2 Injectors and gas rate adjusters

5.2.2.1 Injectors

Injectors shall be removable.

Injectors shall carry an indelible means of identification of their orifice.

Adjustable injectors shall not be used.

5.2.2.2 Gas rate adjusters

It shall be possible to seal gas rate adjusters (e.g. with paint) 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+}, $II_{2H3B/P}$, II_{2H3+}, I_{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 regulator.

For appliances in category II_{2H3+} having an adjuster which is the regulator adjusting screw (see 3.16), it shall be possible to put this device out of service when these appliances are supplied with a third 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 when these appliances are supplied with a second 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 Aeration adjusters

An aeration adjuster shall be set and sealed by the manufacturer.

5.2.4 Shut-off valves

5.2.4.1 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 may 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.

Any flame supervision device shall comply with EN 125.

Examples of gas valve arrangements for automatic controls are given in Annex B. 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.

5.2.4.2 Manual valve systems

Manual valve systems shall be placed in such a way that their strength, operation, manipulation and accessibility undergo no damage from actions to which they are subjected in normal use, and they shall be protected against ingress of foreign matter.

Taps shall be mounted in such a way that no accidental movement in relation to the gas inlet connection is possible.

Any control placed in the gas circuit shall be arranged so that any maintenance by a service engineer is easy and so that its exchange by a service engineer is possible.

A plug type tap shall have a compensating device to take up automatically any wear between the plug and the tap body.

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 may be either combined or in separate units.

5.2.4.3 Control handles, knobs or pushbuttons

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 durably and clearly, as a full disc or circle. The markings for other positions are optional.

The off, open and any reduced rate positions shall be marked in a visible, legible and durable fashion (e.g. a large flame to denote full on, a small flame to indicate a low rate and a full disc or circle to denote any off position).

If control handles operate by turning, and their axes are in a horizontal plane, the closure mark placed in a vertical plane shall be situated above the turning axis of the handle in its closed position. The closed position of the tap shall not give rise to any possibility of confusion with an open position.

Any special position of the tap intended for ignition and/or any special button that has to be operated to cause ignition shall be clearly marked (e.g. by a star). Where more than one tap is provided it shall be obvious which burner is controlled by each tap.

Tap handles shall be so designed or arranged relative to one another that the movement of one handle does not cause inadvertent movement of an adjacent one. Tap handles shall be so designed that they can neither be fitted in the wrong position nor move by themselves. The shape of a handle shall be such that its grip makes manipulation easy.

If control handles operate by turning, the closing direction shall be clockwise.

5.2.5 Flame supervision devices

A flame supervision device shall be fitted, it shall control the gas supply to the main burner and any ignition burner if fitted. It shall be so designed that, in the case of a failure of any of the components indispensable to its performance, the supply of the gas to the burners is cut off automatically. It shall be so mounted as to guarantee satisfactory performance.

The appliance shall not incorporate any device that allows the flame supervision device to be over-ridden unless this requires continuous manual operation.

5.2.6 Pressure regulators

Pressure regulators shall comply with EN 88-1.

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 regulator 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.

Regulators 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 regulator, 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 regulator partially out of service when they are supplied with second family gases such that the pressure regulator 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 regulator 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.

5.2.7 Thermostats

Any mechanical thermostat shall comply with EN 257.

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

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

5.2.8 Atmosphere sensing device

Appliances shall be fitted with an atmosphere sensing device or equivalent.

Where the ignition burner of an atmosphere sensing device is required to perform functions other than vitiation detection its performance shall also comply with the requirements of the relevant clauses of this standard relating to those functions.

Any atmosphere sensing device used for this purpose shall:

- Not have any adjustment other than that made and sealed by the manufacturer,
- Be so designed that it cannot be removed or dismantled without the use of a tool,
- Be securely located in relation to every component with which it is designed to operate,
- Shall carry, as a permanent mark of identification, the name of the manufacturer (or its acronym or logo), and the reference of the product.

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.

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.

An open-fronted 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. It 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 meet this 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.

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 Flame supervision systems (Appliances with automatic burner systems only)

The manufacturer shall specify the safety time (see 6.11.2.2).

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,

OR

b) automatic recycling.

5.5 Ignition burner or start-gas flame establishment

5.5.1 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.

5.5.2 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 energized before the ignition spark (or other means of ignition) is energized.

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

5.6 Main flame establishment

5.6.1 General

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

5.6.2 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).

5.6.3 Appliances with automatic burner systems

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

5.6.4 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 energized before a safe-start check has been made of the flame supervision system and shall be de-energized 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.

5.7 Burners

5.7.1 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.

5.7.2 Pan burners

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

5.8 Fan to assist in the distribution of heat

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.

5.9 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 regulator.

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.

6 Operational requirements

6.1 General

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

6.2 Soundness

The gas circuit shall be sound. It is deemed to be sound if, when tested as described in 7.3, the external leakage of air does not exceed 100 cm^3/h irrespective of the number of components, whether mounted in series or parallel on the appliance.

6.3 Heat inputs

6.3.1 Nominal heat input

When measured in accordance with the procedures described in 7.4.1, each of the main burners, supplied separately, and in combination shall be capable of giving its nominal heat input within a tolerance of ± 5 %.

6.3.2 Reduced rate heat input

When measured in accordance with the procedures described in 7.4.2, each of the main burners, supplied separately, and in combination shall be capable of giving its reduced heat input stated by the manufacturer. However, a tolerance of ± 10 % relative to the stated rate is permitted for the value obtained in the test.

6.4 Temperature of various parts of the appliance

6.4.1 Temperature of external parts of the appliance

When tested as described in 7.5.1 and 7.5.2, 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) 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 7.5.1 and 7.5.3, the temperature of any component (including taps) shall remain within the temperature range declared by the component manufacturer. For appliances with a catalytic converter, the temperature of the catalyst shall remain within the working temperature range as specified by the manufacturer of the catalyst, at both the full on input and the lowest reduced rate. The temperatures shall be taken in at least three positions on the catalyst.

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 7.5.1 and 7.5.4.

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.

6.5 Ignition and cross-lighting

6.5.1 General

When tested as described in 7.6.2.1, 7.6.2.2, 7.6.3 and 7.6.4 smooth and correct ignition and cross-lighting shall be assured and the appliance shall continue to operate safely.

For piezo ignition devices, the appliances shall successfully ignite on at least eight out of ten attempts.

For appliances with a thermostat, correct ignition shall be assured at the reduced rate position.

6.5.2 Construction integrity test on glass fronted appliances

When tested as described in 7.6.2.3, there shall be no hazard to the user or damage to the appliance which affects safety.

6.6 Flame stability

When tested as described in 7.7 the flames shall be stable. A slight tendency to lift at the moment of ignition is acceptable.

6.7 Pressure regulators

When tested in accordance with 7.8.1 the rate shall not differ by more than ± 5 % from the rate obtained at the normal test pressure, when the upstream pressure is varied between the minimum and maximum values given in 7.1 for the reference gases of the relevant category.

Where the function of the regulator has been annulled by the manufacturer, as given in 7.8.2 the relationship between the flow rate and the pressure shall remain constant when the inlet pressure is varied between its minimum and maximum values.

6.8 Combustion

6.8.1 Reference gas When tested in accordance with 7.9.1, 7.9.2.1 and 7.9.2.2.1, the CO concentration in the dry, air-free products of combustion shall not exceed 0,02 %.

When tested in accordance with 7.9.1, 7.9.2.1 and 7.9.2.2.4 the CO concentration in the dry air free products of combustion shall not exceed 0,04 % or the appliance shall shut down within 20 min.

6.8.2 Limit gas When tested in accordance with 7.9.1, 7.9.2.1 and 7.9.2.2.2, the concentration of CO in the dry, air-free products of combustion shall not exceed 0,04 %.

6.8.3 Appliances fitted with a fan to assist in the evacuation of the products of combustion - When tested in accordance with 7.9.1, 7.9.2.1 and 7.9.2.2.3, the concentration of CO in the dry, air-free products of combustion shall not exceed 0,02 %.

6.8.4 Normal and abnormal voltage fluctuation When tested in accordance with 7.9.1, 7.9.2.1 and 7.9.3, the concentration of CO in the dry, air-free products of combustion shall not exceed 0,02 %. After the appliance is restarted it shall ignite and continue to run satisfactorily.

6.8.5 Measurement of nitrogen dioxide (NO_2).

When tested as described in 7.9.4, the NO_2 concentration in the air-free, dry products of combustion shall not exceed the limit for the declared class given in Table 1. Tests are carried out with any catalytic converter rendered inoperative and repeated with it functioning. The emission rate will be the higher of the two values.

Table 1 – NO_2 concentration limits

Classes	NO_2 concentration limit (mg/MJ)
1	7
2	6
3	5
4	4
5	3

6.8.6 Values to be used in Annex G

All actual values of the products of combustion shall be stated for the purposes of the formulae given in the normative Annex G.

6.9 Sooting

6.9.1 Cold condition

When tested as described in 7.10, the smoke number shall be less than or equal to 1.

6.9.2 Hot condition

When tested as described in 7.10 the smoke number shall be less than or equal to 1.

6.10 Atmosphere sensing device

When the appliance is tested in accordance with the method given in 7.11.1 the device shall cause shut off of the gas supply when the CO_2 content of the atmosphere lies between 0,8 % and 1,5 % (*V/V*), and before the CO value exceeds 80 µg/g.

When the appliance is tested in accordance with the methods given in 7.11.2 the device shall cause shut-off of the gas supply before the CO value exceeds 80 µg/g.

6.11 Flame supervision devices

6.11.1 Thermoelectric device

6.11.1.1 Cold condition

When tested as described in 7.12.1.1, any flame supervision device shall open fully from cold in not more than 60 s.

No device shall require more than 20 s of sustained manual operation before opening.

6.11.1.2 Hot condition

When tested as described in 7.12.1.2, any flame supervision device shall close from the fully heated condition within 60 s.

6.11.2 Automatic burner control system

6.11.2.1 General

When tested as described in 7.12.2.1, the rapid (on and off) manual operation of any start switch shall not set up a hazardous condition.

6.11.2.2 Safety time

The safety time specified by the manufacturer (see 5.4) is verified as described in 7.12.2.2.

6.11.2.3 Extinction delay time

When tested as described in 7.12.2.3, the time for the flame supervision device to de-energize the burner safety shut-off valves upon flame failure shall be not more than 3 s.

7 Test methods

7.1 General

7.1.1 Characteristics of test gases: reference and limit gases

Appliances are intended for use with gases of various qualities. One of the aims of this standard is to check that the performance of an appliance is satisfactory for each family or group of gases and for the pressures for which it is designed, if necessary using the adjusting devices.

The characteristics of the reference and limit gases are given in Tables 2, 3, 4 and 5 of EN 437:2003.

7.1.2 Conditions for preparation of the test gases

The conditions for preparation of the test gases are given in Annex A of EN 437:2003.

7.1.3 Practical application of test gases

7.1.3.1 Choice of test gases

This is specified in Clause 7 of EN 437:2003.

7.1.3.2 Conditions of supply and adjustment of the burners

7.1.3.2.1 Initial adjustment of appliance

The appliance shall be fitted with the appropriate equipment (injector(s), fixed primary aeration restrictor(s), etc.) corresponding to the gas family or gas group to which the specified test gas belongs (see Table 2 of EN 437:2003). Any gas rate adjusters are set in accordance with the manufacturer's instructions using the appropriate reference gas(es) and the corresponding normal pressure(s) given in 7.1.4.

This initial adjustment of the appliance is subject to the limitations given in 5.1.1.

7.1.3.2.2 Supply pressures

Except where an adjustment of the supply pressure is necessary (as described in 7.1.3.2.3 and 7.1.3.2.4) the normal, minimum and maximum supply pressures to be used for testing purposes shall be in accordance with 7.1.4.

Unless otherwise specified, the initial adjustment of the appliance is not altered.

7.1.3.2.3 Corrected pressures

Where, in order to obtain the nominal heat input within ± 2 %, it is necessary to use a supply pressure, p, different from the normal pressure p_n, then those tests normally carried out at the minimum or maximum pressures p_{min} and p_{max} shall be carried out at the corrected pressures p' and p'' where:

$$\frac{p'}{p_{min}} = \frac{p''}{p_{max}} = \frac{p}{p_n}$$

7.1.3.2.4 Adjustment of heat inputs

For tests requiring adjustment of the burner to the nominal or another specified heat input, it shall be ensured that the pressure upstream of the injectors is such that the heat input obtained is within ± 2 % of that specified (by altering the preset adjusters or the appliance pressure regulator, if adjustable, or the appliance supply pressure).

The specified heat input shall be determined in accordance with 7.4.1 and with the appliance supplied with the appropriate reference gas(es).

7.1.4 Test pressures

The values of the test pressures, i.e. the pressure to be applied at the gas inlet connection to the appliance whilst in operation, are given in Tables 6 and 7 of EN 437:2003.

These pressures are used in accordance with the special national conditions given in Annex A, for the country in which the appliance is to be installed.

7.1.5 General test conditions

7.1.5.1 General

These general test conditions shall apply unless the test method states otherwise.

7.1.5.2 Test room

The appliance is installed in a well ventilated, draught free room which has an ambient temperature of (20 ± 5) °C, a wider temperature range is permissible provided that the test results are not affected.

7.1.5.3 Test installation

The appliance shall be installed in accordance with the manufacturer's instructions.

NOTE For the convenience of carrying out tests, the appliance may be installed at a height above the floor which is other than specified in the manufacturer's instructions, provided that this does not affect the performance of the appliance.

The gas connection and system up to and including the burner are to be examined for soundness both before and after test. The test results are deemed to be invalid unless the system is sound, (see 6.2).

Test pressures are to be measured correct to 0,2 mbar and controlled so that the variation does not exceed 0,2 mbar.

7.1.5.4 Electrical supply, (where applicable)

The appliance shall be connected to an electrical supply at the nominal voltage, except where otherwise stated in the clause concerned.

7.1.5.5 Convection fan (where applicable)

If the appliance incorporates a convection fan, then tests are carried out with the fan in operation, except where otherwise stated in the clause concerned.

7.1.5.6 Test procedure

The appliance shall be fitted with the appropriate injectors for the gas and pressure used. Precautions shall be taken to prevent thermostats and variable controls from acting to interfere with the gas flow. For example for thermostats it may be necessary to immerse the sensor in iced water for tests at full input and in hot water for tests at bypass or reduced heat input.

7.1.5.7 Catalytic converters

Unless specified in individual tests, any catalytic converter shall be rendered inoperative while retaining its resistance to the flow of the products of combustion.

This can be achieved by any suitable means (to be agreed between the manufacturer and the Test House), such as installing 'dummy' catalyst, coating the catalyst with a non-reactive substance or by removing the catalyst and replacing it with a plate which gives an equivalent resistance to the products of combustion (pressure drop between the burner and the products outlet).

NOTE If the "suitable means" chosen to render the catalytic converter inoperative is a dummy catalyst, care should be taken when selecting the material as some materials, e.g. stainless steel, may adversely affect the emission values/properties.

7.2 Appliance stability and fixing

Fix or stand the appliance on a hard smooth test surface of polished marble or equivalent in accordance with the manufacturer's instructions without any connection being made to the gas connection. Where a manufacturer gives an option of not fixing to the wall or floor, the appliance shall not be fixed. Apply a horizontal force of 6 Newton in all directions to the top of the appliance.

7.3 Soundness of the gas circuit

The appliance gas inlet is connected to a gas supply capable of being maintained constantly at the appropriate pressure.

For appliances using 2nd family gases, the tests are carried out with an air pressure of 50 mbar: the inlet valve is however tested with an air pressure of 150 mbar. For appliances using 3rd family gases, all the tests are carried out with an air pressure of 150 mbar.

With the appliance at ambient temperature, compliance with 6.2 is checked under each of the following conditions:

a) Each valve in the main gas supply is tested in turn for soundness in its closed position, all other valves being open.

b) With the gas tap, the gas valve controlled by the automatic valve and the valve of the flame supervision device open, and the final unmixed gas outlets to the ignition burner and main burner sealed.

   For the determination of the leakage rate a method is used which gives a reading which is of such accuracy that the error in its determination does not exceed 0,01 dm^3/h.

   These tests are carried out first when the appliance is delivered, after any assembly in the gas circuit that has a gas-tight joint whose removal is provided for in the manufacturer's instructions has been removed and replaced 5 times.

7.4 Heat inputs

7.4.1 Nominal heat input

The nominal gas rate is the volumetric rate (V_n) or mass rate (M_n) of the gas corresponding to the nominal heat input obtained with reference gas under reference test conditions (dry gas, 15 °C, 1 013,25 mbar).

The nominal heat input (Q_n) in kW is given by one of the following expressions:

$$Q_n = 0{,}278\ M_n \bullet H_i \qquad (1)$$

$$Q_n = 0{,}278\ V_n \bullet H_i \qquad (2)$$

$$Q_n = 0{,}278\ M_n \bullet H_s \qquad (3)$$

$$Q_n = 0{,}278\ V_n \bullet H_s \qquad (4)$$

where:

M_n is the nominal mass flow rate in kilograms per hour (kg/h) obtained under reference conditions (dry gas, 15 °C, 1 013,25 mbar).

V_n is the nominal volumetric flow rate in cubic metres per hour (m^3/h) obtained under reference conditions (dry gas, 15°C, 1 013,25 mbar).

H_i is the net calorific value of the reference gas in megajoules per kilogram (MJ/kg) in expression (1), or in megajoules per cubic metre (MJ/m^3) (dry gas, 15 °C, 1 013,25 mbar) in expression (2).

H_s is the gross calorific value of the reference gas in megajoules per kilogram (MJ/kg) in expression (3), or in megajoules per cubic metre (MJ/m^3) (dry gas, 15 °C, 1 013,25 mbar) in expression (4).

These mass and volume rates correspond to a measurement and to a flow of reference gas under reference conditions, i.e. assuming the gas to be dry, at 15 °C and under 1 013,25 mbar pressure. In practice the values of mass and volumetric rates obtained during the tests do not correspond with these reference conditions, and have therefore to be corrected to bring to the values that would have been obtained had the reference conditions existed during the tests, at the outlet of the injector.

When the determination is made by mass the corrected mass rate is calculated by the formula:

$$M_o = M\sqrt{\frac{(1013{,}25 + p)}{(p_a + p)} x \frac{(273{,}15 + t_g)}{288{,}15} x \frac{d_r}{d}} \quad (1)$$

When the determination is made from the volumetric rate the following correction formula is used:

$$V_o = V\sqrt{\frac{(1013{,}25 + p)}{(1013{,}25)} x \frac{(p_a + p)}{1013{,}25} x \frac{288{,}15}{(273{,}15 + t_g)} x \frac{d}{d_r}} \quad (2)$$

The corrected mass flow rate is calculated from the formula:

$$M_o = 1{,}226 \bullet V_o \bullet d \quad (3)$$

where:

M_o is the mass rate under reference conditions

M is the mass rate under test conditions

V_o is the volumetric rate under reference conditions at the appliance inlet

V is the volumetric rate obtained under test conditions (measured at, or corrected to pressure p and temperature t_g)

p_a is the atmospheric pressure in mbar

p is the supply pressure in mbar

t_g is the temperature of the gas at the appliance inlet in °C

d is the density of dry test gas relative to that of dry air

d_r is the density of reference gas relative to that of dry air

These are the formulae used to calculate from the mass (M) or volumetric (V) rates measured under test conditions, the corresponding M_o or V_o rates that would have been obtained under reference conditions, and it is these values M_o and V_o, that are compared with the values M_n and V_n, calculated from the nominal heat input, using the formulae given earlier in this clause.

These formulae are applicable if the test gas used is dry.

If a wet (water filled) meter is used or if the gas used is saturated, the value d (density of dry gas in relation to dry air) is replaced by the value of the density of the wet gas d_h given by the following formula:

Where W is the saturation vapour pressure of the test gas expressed in mbar at the temperature t_g.

$$d_h = \frac{d(p_a + p - W) + 0{,}622W}{p_a + p} \quad (4)$$

For all the tests described in 6.3 the measurements are taken with the appliance in the hot condition and any thermostat put out of action.

7.4.2 Reduced rate

The reduced rate is calculated as described in 7.4.1 by supplying the burner successively with the reference gas pertaining to the appliance category, after adjusting the burner to its nominal heat input and after turning the tap handle to the reduced rate position, or after letting the thermostat operate in its minimum position if it is of the 'modulating' type.

7.5 Temperature of various parts of the appliance

7.5.1 General

The test is carried out with reference gas at the nominal heat input and any electrical supply shall be adjusted to the most unfavourable voltage within the range 85 % to 110 % of the nominal.

For appliances fitted with a convection fan, if the appliance is designed such that failure of the convection fan (i.e. stoppage) does not result in closure of the gas valve(s), then the tests given below are repeated with the convection fan inoperative.

7.5.2 Temperature of external parts of the appliance

The appliance is installed as described in 7.5.4.

Initially, establish the zone that has the highest temperature. Temperature measurements are carried out when the difference between the surface temperature and the ambient temperature is constant for this zone, i.e. within ± 2 K.

The temperatures of external surfaces of the appliance are measured using a method which is accurate to within ± 2 °C.

Check the location of the working surface declared by the manufacturer.

7.5.3 Temperature of components

The temperature of components is measured during the tests for external temperature (see 7.5.2).

7.5.4 Temperature of floor, shelf and walls

7.5.4.1 General

The appliance is installed on a test rig (see Figure 1). This test corner may have to be modified to accept individual appliances. The test rig consists of hardwood panels of thickness (25 ± 1) mm with their surfaces coated with matt black paint. Thermocouples are incorporated into each panel at the centre of squares of side 100 mm; these thermocouples penetrate the panels from the outside so that the junctions are situated 3 mm from the surface of the test panels facing the appliance.

For an appliance where the manufacturer specifies installation underneath a shelf, the manufacturer's user instructions should state any limitations on the height of the shelf above the appliance and shelf depth. An appropriate shelf of maximum recommended depth is placed at the minimum height above the appliance with the appropriate insulating material, if necessary, which should be supplied by the manufacturer.

For an appliance which is intended to be installed on a combustible surface, the manufacturer should indicate in the installation instructions the nature of the effective protection to be applied between the appliance and the floor, shelf or walls. This protection should be supplied to the test laboratory by the manufacturer.

If the manufacturer states in the instructions that it is necessary to use effective protection to limit the temperature, the test is carried out with the appliance fitted with the protection.

The appliance is installed and tested as described in 7.5.4.2 with the burner adjusted to its nominal heat input using reference gas.

7.5.4.2 Test method

The appliance is installed in a test corner (see Figure 1). The distance between the back and side surfaces and test panels are the minimum distances specified by the manufacturer or, where appropriate, that distance created by fixing to the wall. The side panel is placed at the side of the appliance where the temperatures are the highest.

Initially, for each surface of the test rig, establish the zone that has the highest temperature. All measurements are taken when the difference between the surface temperature and the ambient temperature for each zone is constant, i.e. within ± 2 K.

It is recommended that for this test the appliance should be placed in a room where the ambient temperature is approximately 20 °C. This is measured at a height of 1,50 m and at least 3 m from the appliance using a thermometer which is protected from the influence of stray heat.

The test is carried out with reference gas at the nominal heat input with the appliance installed as described in 7.5.4.

The temperatures are measured by contact thermocouples, the appliance thermostat, if any, being in the fully open position.

Check the location of the working surface declared by the manufacturer.

7.6 Ignition and cross-lighting

7.6.1 General

The test gases and pressures to be used are as shown in Table 2.

Table 2 - Test gases and pressures for ignition and crosslighting tests

Gas	Pressure
Reference gas	Maximum Minimum
Light back gas	Minimum
Lift gas	Maximum

7.6.2 Ignition performance

7.6.2.1 Cold condition

With each of the test gases and at each of the pressures in turn, as specified in 7.6.1, ignite the appliance in accordance with the manufacturer's instructions. The appliance shall ignite satisfactorily on at least eight out of ten attempts.

7.6.2.2 Hot condition

Heat the appliance to the hot condition, turn off the gas and then re-ignite in accordance with the manufacturer's instructions, with each of the test gases and at each of the pressures in turn, as specified in 7.6.1.

7.6.2.3 Construction integrity test on glass fronted appliances

Supply the appliance with reference gas at the normal pressure. Open any gas shut off devices to allow gas to flow to the burners. After a short delay ignite the appliance. Repeat the test progressively increasing the delay before ignition until the worst condition has been found or the delay between opening the gas supply and ignition has reached 3 min.

NOTE For the purposes of this test it may be necessary to interrupt the normal means of ignition and override any safety devices in order to delay the ignition of the appliance.

7.6.3 Crosslighting

7.6.3.1 Cold condition

Carry out the following procedure:

a) Light the appliance in accordance with the manufacturer's instructions. Immediately turn off all sections of the burner that are separately controlled. After 30 s turn these sections on again;

b) Light and operate the appliance at the full-on rate and repeat the test with any thermostat at any setting that will give the bypass rate.

7.6.3.2 Hot condition

Carry out the following procedure:

After heating the appliance to the hot condition, repeat the tests given in 7.6.3.1 except that any delay before re-lighting shall be as specified in the manufacturer's instructions;

Light the appliance in accordance with the manufacturer's instructions and then turn off any sections that are separately controlled. Allow the remaining section(s) to come to thermal equilibrium and then turn on the separately controlled sections in turn, allowing each to come to thermal equilibrium.

7.6.4 Supplementary tests

7.6.4.1 Ignition burner flame reduction

The appliance is supplied with reference gas. The pressure is reduced at the appliance to the minimum pressure. For an appliance with a pressure regulator, the pressure downstream of the pressure regulator is reduced, if necessary, to obtain a heat input equal to 92,5 % of the nominal heat input for second family gases (for reference gas) or 95 % of the nominal heat input for third family gases.

The ignition burner gas rate is reduced to the minimum required to keep the gasway to the burner open.

The necessary reduction in the ignition burner gas rate may be achieved by either:

— by the adjustment of the ignition burner rate adjuster, if this exists;

or, if this is not possible;

— by means of adjustment of an adjuster inserted into the ignition burner gas supply system for this purpose.

The correct ignition of the burner by the ignition burner is then checked.

The test is repeated either at the minimum rate given by the thermostat, where this exists, or at the rate obtained when the tap is in the reduced rate position, if ignition is possible under these conditions in normal use according to the manufacturer's recommended procedure.

7.7 Flame stability

7.7.1 Lift

In the cold condition, operate the burner using the lift test gas at the maximum pressure. After 1 min observe the appearance of the flames.

Repeat the test using the reference gas at the maximum pressure.

7.7.2 Light back

Operate the appliance using reference gas at the normal pressure. After 1 h, replace the reference gas with light back test gas, reduce the inlet pressure to the minimum pressure and progressively reduce the rate to the low or bypass rate.

7.7.3 Resistance to draught

7.7.3.1 Apparatus

An example of a suitable apparatus for producing the draught is shown in Figure 2. It consists of a variable speed centrifugal fan which releases air into a rectangular conduit, containing meshes and a honeycomb to straighten the flow.

7.7.3.2 Test procedure

The appliance is supplied with the reference gas at normal pressure and is subjected at burner level to a wind stream of 2 m/s. The wind stream covers at least the width of the burner.

The axis of the wind stream is in a horizontal plane and is moved one or more (at the discretion of the laboratory) angles of incidence within a semi-circle in front of the appliance, the centre of the semi-circle being at the intersection of the plane of symmetry of the appliance and the plane of the test. A shield is placed between the fan and the appliance and, immediately after lighting the appliance, the shield is removed for periods of 3 s to produce gusts. This is repeated at each angle of incidence, applying 3 gusts in each position at 3 s intervals.

The test is carried out with the appliance at ambient temperature and in the hot condition with the main burner and any ignition burner alight together and, if appropriate, with only the ignition burner alight. Any lighting door remains closed during the test.

The test is repeated at the minimum input given by the controls, if such an operation is intended by the manufacturer.

7.8 Pressure regulators

7.8.1 Operational pressure regulator

If the appliance has a pressure regulator set the appliance to give the nominal volumetric rate at the manufacturer's declared setting pressure with reference gas at normal inlet pressure given in 7.1 and appropriate to the gas. Keeping this initial adjustment, the supply pressure is varied between the corresponding minimum and maximum values (see 7.1).

The test is carried out for all reference gases for which the pressure regulator is not put out of service.

7.8.2 Pressure regulator out of service

The appliance is supplied with the reference gas at the minimum and then at the maximum pressure given in 7.1 and the flow rate is measured under the same conditions of temperature and pressure. It is then verified that:

$$\frac{V_{\min}}{\sqrt{p_{\min}}} \times \frac{\sqrt{p_{\max}}}{V_{\max}} = 1 \pm 0{,}05 \qquad (5)$$

where:

$V_{\min}$ is the volumetric flow rate at minimum pressure $p_{\min}$ (m^3/h)

$V_{\max}$ is the volumetric flow rate at maximum pressure $p_{\max}$ (m^3/h)

$p_{\min}$ is the appropriate minimum pressure for the gas family or gas group to which the reference gas belongs (see 7.1) (mbar)

$p_{\max}$ is the appropriate maximum pressure for the gas family or gas group to which the reference gas belongs (mbar)

The test is carried out for all reference gases for which the pressure regulator is put out of service.

7.9 Combustion

7.9.1 General

A sample of the products of combustion is taken with the appliance in the hot condition.

The CO concentration of the dry, air-free products of combustion (neutral combustion) is given by the formula:

$$V_{CO,N} = V_{CO2,N} \times \frac{V_{CO,M}}{V_{CO2,M}} \quad (6)$$

where:

$V_{CO,N}$ is the percentage CO concentration of the dry, air-free products of combustion

$V_{CO2,N}$ is the calculated percentage of CO_2 in the dry, air-free products of combustion of the gas involved

$V_{CO,M}$ and $V_{CO2,M}$ are the carbon monoxide and carbon dioxide concentrations respectively measured in the sample during the combustion test, both expressed in percentage by volume.

The values of $V_{CO2,N}$ (neutral combustion) for the gases are given in Table 3.

The CO concentration of the dry, air-free products of combustion may also be calculated from the formula:

$$V_{CO,N} = \frac{21}{21 - V_{O2,M}} \times V_{CO,M} \quad (7)$$

where:

$V_{O2,M}$ and $V_{CO,M}$ are the oxygen and carbon monoxide concentrations respectively measured in the sample, both expressed as a percentage.

The use of this formula is recommended where the CO_2 concentration is less than 2 %.

The instrumentation used to measure the concentrations shall be capable of analysing the CO and CO_2 contents to accuracies of 0,000 5 % (*V/V*) CO and 0,05 % (*V/V*) CO_2.

Any bricks, radiants and imitation fuel not positively located with respect to the burner and to each other are to be arranged at the limit of their movement. Due note being taken of the manufacturer's instructions and the ease with which refractories can be positioned.

If it is obvious that any particular arrangement is not in accordance with the manufacturer's instructions for assembly of the fuel bed, this arrangement is not used for testing purposes.

For appliances incorporating a catalytic converter, the combustion tests specified in 7.9.2 are carried out with and without the catalyst put out of action as described in 7.1.5.7.

7.9.2 Combustion when tested in an atmosphere with approximately normal level of oxygen

7.9.2.1 Test conditions

The appliance is placed in a suitably ventilated room and installed in accordance with the manufacturer's instructions. It is supplied with the appropriate reference gas and, if necessary, adjusted to give the nominal heat input. The products of combustion are collected so as to minimize the amount of dilution with room air and to ensure a well-mixed sample.

A stainless steel sampling device is selected according to the shape of the appliance, an example of which is shown in Figure 3. The device is placed over the appliance such that it extends the appliance or its outlet grilles by at least 40 mm. The size and design of the device will depend upon the size of

the appliance and whether the appliance is freestanding or built in. It may be necessary during type testing for the manufacturer to supply the sampling device to suit their appliance.

The combustion products are sampled by drawing off some of the gases in the upper part of the sampling device.

This device shall collect all the products of combustion but not alter their course to the extent where this is likely to affect the quality of combustion. In particular, the distance between the base of the device and the level of the outlet grille shall be such that: it does not affect the quality of combustion; there is no escape of products of combustion from the base of the sampling device; the CO_2 concentration is greater that 1 %. If the CO_2 concentration in the combustion products is less than 1% by volume, a restrictor is placed in the upper part of the device in order to bring this quantity to a value slightly over 1 %. However, a restrictor is not used if it affects combustion quality or if, as a result of its presence, the combustion products spill outside the device.

If it is impossible to obtain a CO_2 concentration of 1 % by volume without compromising the result, a value of less than 1 % is acceptable but the laboratory shall ensure that the sample taken is representative.

7.9.2.2 Method

7.9.2.2.1 Reference gas

With the appliance installed as described in 7.9.2.1, the following tests are carried out under still air conditions using the appropriate reference gas(es).

a) For appliances without a gas rate adjuster or pressure regulator, or for appliances fitted with these devices but where their function has been annulled, the test is carried out with the appliance supplied at the maximum pressure given in 7.1.

b) For an appliance with a gas rate adjuster but without a pressure regulator, the test is carried out at the maximum pressure given in 7.1.

c) For an appliance with a pressure regulator that has not been put out of action, the test is carried out by raising the burner rate 1,05 times the nominal input for gases of the second and third family.

If the appliance is intended to be installed solely on a gas installation with a pressure governed meter, the factor of 1,05 may be applied.

Following on directly after this, the appliance is adjusted to the lowest available rate, either by the control tap or by the thermostat bypass, and the test repeated at the minimum inlet pressure given in 7.1.

7.9.2.2.2 Incomplete combustion gas

After the test with reference gas(es) in 7.9.2.2.1, the appliance is tested with the incomplete combustion limit gas for the appliance category.

For this test, in the three cases above (i.e. 7.9.2.2.1 a), b) and c), using the reference gas, the heat input of the appliance is adjusted to 1,05 times the nominal heat input if a pressure regulator is fitted or at the maximum pressure given in 7.1 if the appliance does not incorporate a pressure regulator. If the appliance is intended to be installed solely on a gas installation with a pressure governed meter, the factor of 1,05 may be applied.

Without changing the adjustment of the appliance or supply pressure, the reference gas is replaced by the corresponding incomplete combustion gas.

Following on directly after this, the appliance is adjusted to the lowest available rate, either by the control tap or by the thermostat bypass, and the test repeated at the minimum inlet pressure given in 7.1.

7.9.2.2.3 For an appliance fitted with a fan to assist in the evacuation of the products of combustion

With the appliance installed as described in 7.9.2.1 and under the test conditions described in 7.9.2.1 repeat the tests 7.9.2.2.1 and 7.9.2.2.2 with the fan turned off.

7.9.2.2.4 Blockage of combustion gases (closed-fronted appliances only)

7.9.2.2.4.1 General

This is to confirm that if the flow of combustion gases is affected by an unusual occurrence, then the burner is able to burn the gas without the production of excessive concentrations of carbon monoxide, or the appliance shuts down safely.

These tests are carried out on reference gas at nominal heat input and with the appliance adjusted to the lowest available rate, either by the control tap or by the thermostat bypass.

7.9.2.2.4.2 Blockage of the products of combustion outlet

The test is carried out using a suitable material[1)] cut to an appropriate size, placed over the products of combustion outlet(s), so as to completely block the flow of combustion products.

7.9.2.2.4.3 Blockage of the catalyst

The test is carried out using a suitable material[2)] cut to an appropriate size, placed over the catalyst(s) so as to completely block the flow of combustion products through the catalyst(s).

NOTE Throughout 7.9.2.2.4 the sampling device described in 7.9.2.1 may have to be altered in size and/or position in order to obtain a representative sample of combustion products.

7.9.3 Normal and abnormal voltage fluctuation

The appliance is installed as in 7.9.1.

With the mains electrical supply reduced to 85 % of the minimum voltage for which the appliance is designed, using the appropriate reference gas(es) and at the normal gas supply pressure, ignite the appliance. With the appliance at its maximum setting (tap or thermostat) and in the hot condition, measure the CO concentration of the dry, air-free products of combustion. Repeat the test with the mains electrical supply increased to 110 % of the maximum voltage for which the appliance is designed.

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1) e.g. ceramic fibre (pre-treated to remove all volatile compounds)

2) e.g. ceramic fibre (pre-treated to remove all volatile compounds)

Table 3 — $V_{CO2,N}$ values

Gas	G110	G20	G21	G23	G25 G231	G26	G30	G31	G271
*V*CO2,N	7.6	11.7	12.2	11.6	11.5	11.8	14.0	13.7	11.2

7.9.4 Nitrogen dioxide (NO_2)

7.9.4.1 General

The products of combustion are collected in a hood as specified in 7.9.2.1. For the purposes of this test, the hood shall be made of stainless steel, the sample line shall be fabricated from Teflon or stainless steel and the line shall be heated to a temperature above the dew point of the gas.

The method of test is in accordance with CR 1404 with regard to apparatus and its use.

7.9.4.2 Method of test

The tests are carried out with the appliance in the hot condition using the reference gas at nominal pressure at nominal input and again at the minimum rate allowed in normal operation by the controls on the appliance.

Before commencing and again on completion of the tests, measure ambient concentrations of all gases of interest; these will be used in the calculation of the NO_2 concentrations.

When the hot condition is reached measure the concentration of CO_2, CO and NO_2.

7.9.4.3 Determination of the concentration of NO_2

Calculate the NO_2 emission rate as follows:

$$E_{\mathrm{R}} = \frac{195 \times (y_2 - y_1) \times C}{(x_2 - x_1) \times H_{\mathrm{s}}} \tag{8}$$

where:

E_R = NO_2 emission rate in mg/MJ

y_1 = concentration of NO_2 in the ambient air in µg/g (*V/V*)

y_2 = concentration of NO_2 in the products of combustion in µg/g (*V/V*)

C = volume of CO_2 produced per unit volume of gas when completely combusted (See Table 4)

x_1 = concentration of CO_2 in the ambient air in % (*V/V*)

x_2 = concentration of CO_2 in the products of combustion in % (*V/V*)

H_S = gross calorific value of the test gas in MJ/m^3

Table 4 — Value of '*C*' for various test gases

Test gas	G 20	G 30	G 31
Value of '*C*'	1	4	3

7.10 Sooting

7.10.1 General

The apparatus is described in Annex D.

7.10.2 Determination of the smoke number

Unscrew the paper fixing device, insert the filter in the slot provided on the pump and screw up the device.

Introduce the sampling tube horizontally into the middle of the outlet of the combustion gases, care shall be taken to ensure that the products of combustion are sampled with the minimum of dilution by room air. Gas-tightness between the sampling tube and the wall of the measuring sleeve, where the sample is taken, should be ensured.

The sampling may be by either a hand pump or an electro-mechanical pump.

When a hand pump is used, ten suctions are to be carried out; each suction is to be regular and last 2 s to 3 s. The end of the suction is reached when the operator no longer feels the reactions of the piston.

Remove the pump from the apparatus, unscrew the fixing device, withdraw the filter paper with care.

Compare the test spot visually with the standard grey scale by holding the band of filter paper against the standard scale. Examine the spot through the central window of the scale. Note the grade number whose shade is closest to that of the test spot. For the range of the grey scale between 0 and 4, the intermediate grades are to be distinguished particularly carefully.

An equivalent opto-electronic method of determining the smoke number may be used.

7.10.3 Test conditions

7.10.3.1 General

The appliance is installed as in 7.9.1.

7.10.3.2 Cold condition

The appliance is installed and ignited according to the manufacturer's instructions using the appropriate reference gas and adjusted to give the nominal heat input. Substitute the reference gas with the appropriate sooting limit gas. Turn the appliance off and allow to cool to ambient temperature.

Light the appliance from the cold condition in accordance with the manufacturer's instructions and immediately, using the apparatus described in 7.10.1, sample the flue gases as described in 7.10.2 applying 10 successive suctions. At the end of the tenth cycle verify compliance with 6.9.1.

7.10.3.3 Hot condition

At the end of the tenth suction in test 7.10.3.2, leave the appliance running for 1 h on the sooting limit gas. At the end of this period, using the apparatus described in 7.10.1, sample the flue gases as described in 7.10.2 applying 10 successive suctions. At the end of the tenth cycle verify compliance with 6.9.2.

7.11 Atmosphere sensing devices

7.11.1 All appliances

The test shall be carried out at full rate and with the appliance adjusted to the lowest available rate, either by the control tap or by the thermostat bypass.

Install the appliance in the vitiation room (as described in Annex F) and operate the appliance in a free air environment for 60 min on the reference gas at the normal pressure.

Seal the room and take samples of the room atmosphere at geometric centre of the room continuously from the start of the test and analyse for CO and CO_2. The sampling system shall return the gases analysed to the room.

The temperature in the room shall be between 20 °C and 40 °C when measured at the geometric centre of the room using a thermocouple shielded both from draughts and radiation. If it is necessary to use a cooling device (e.g. an air conditioning unit) during this test care shall be taken to ensure that the performance of the appliance is not affected by the means of cooling. In particular the appliance shall be protected from draughts.

7.11.2 Blockage of combustion gases for closed fronted appliances

For appliances with no catalyst the appliance is installed with the products of combustion outlet blocked as in 7.9.2.2.4.2.

For appliances with a catalyst the appliance is installed with the products of combustion blocked as in whichever of 7.9.2.2.4.2 or 7.9.2.2.4.3 gave the highest CO reading.

Under these installation conditions the test described in 7.11.1 is repeated.

7.12 Flame supervision device

7.12.1 Thermoelectric device

7.12.1.1 Cold condition

The tests are carried out with the appropriate reference gas(es) with the appliance adjusted to its nominal heat input.

After this adjustment has been made, the appliance is allowed to cool to ambient temperature. The gas is turned on again and lit at the ignition burner, if any, or main burner as appropriate. The opening time is that between the moment of lighting the ignition burner, or main burner, as appropriate, to that when the safety device is actuated.

7.12.1.2 Hot condition

The appliance is left to operate at its nominal heat input for 1 h.

The time measured is the interval between the moment when the ignition burner and main burner are intentionally extinguished by cutting off the gas supply and the moment when, after turning on again, the gas supply is shut off through the action of the flame supervision device. A gas meter or any other appropriate device may be used to detect the closure of the valve of the flame supervision device.

7.12.2 Automatic burner control systems

7.12.2.1 General

The appliance is installed as described in 7.9.2.1 and supplied with an appropriate reference gas at the nominal heat input in accordance with 7.4.1. The start device is manually operated 10 times, i.e. once every 5 s.

7.12.2.2 Safety time

Isolate the gas supply to the appliance. Attempt to ignite the appliance in accordance with the manufacturer's instructions, and measure the time between the signals for valve opening and closure. Compare this time with the manufacturer's specified time.

7.12.2.3 Extinction delay time

With the appliance in the running condition, isolate the gas supply to the main burner. Measure the time between the moment when the main burner is extinguished and the signal of valve closure is given.

8 Marking and instructions

8.1 Data plate

All appliances shall carry, in a position visible to the installer, a durable data plate which gives, in indelible characters, at least the following:

a) the manufacturer’s name and/or identification symbol[3)];

b) the trade name of the appliance;

c) the serial number;

d) the type of gas and category in relation to the pressure and/or the pressure couple, for which the appliance has been adjusted; any pressure identified in relation to the corresponding category index. If an intervention is necessary on the appliance in order to change from one pressure to the other within a pressure couple of the third family, only the pressure corresponding to the current adjustment of the appliance shall be indicated;

e) the nominal heat input and, where necessary, the range of inputs for an appliance with an adjustable input, expressed in kilowatts (kW), stating whether it is based on gross calorific value;

f) the direct country or countries of destination of the appliance (8.4.4);

g) the setting pressure;

3) ‘Manufacturer’ means the organization or company which assumes responsibility for the product.

h) the nature and voltage of the current used and the maximum electrical power used, in volts (V), amperes (A), frequency (Hz) and kilowatts (kW) for all intended electrical supply conditions;

i) the appliance category or categories: if more than one appliance category is specified, each of these categories shall be identified in relation with the appropriate country or countries of destination.

For an appliance with an adjustable nominal input, there shall be room for the installer to durably mark the input value for which it has been adjusted.

No other information shall be included on the appliance if this could lead to confusion with regard to the current state of adjustment of the appliance and the corresponding appliance category (or categories) and the direct country (or countries) of destination.

The indelibility of the marking shall be checked by a test carried out in accordance with EN 60335-1:2002, 7.14.

8.2 Other marking

8.2.1 General

The appliance shall be marked with the following text:

> 'This appliance must be installed in accordance with the rules in force, and used only in a sufficiently ventilated space of adequate volume. Consult the instructions before installation and use of this appliance.'

8.2.2 Warning labels

Appliances fitted with the approved dress guard shall have a label reading as follows:

> "No part of the guard shall be permanently removed.
>
> IT DOES NOT GIVE FULL PROTECTION FOR YOUNG CHILDREN, THE ELDERLY OR THE INFIRM."

Appliances supplied without the dress guard shall have affixed to them a tie-on label headed 'To be removed only by the user' and bearing in capital letters not less than 8 mm high the words:

> **"WARNING**: THIS APPLIANCE HAS A NAKED FLAME, A SUITABLE GUARD SHOULD BE USED FOR THE PROTECTION OF YOUNG CHILDREN, THE ELDERLY AND THE INFIRM."

8.3 Marking of the packaging

The packaging shall carry at least the following information:

— the type of gas in relation to the pressure and/or the pressure for which the appliance has been adjusted; any pressure indication shall be identified in relation to the corresponding category index; if an intervention is necessary on the appliance in order to change from one pressure to the other within a pressure couple of the third family, only the pressure corresponding to the current adjustment of the appliance shall be indicated;

— the direct country or countries of destination of the appliance;

— the appliance category or categories: if more than one appliance category is specified, each of these categories shall be identified in relation with the appropriate country or countries of destination.

The packaging shall be marked with the following text:

> 'This appliance must be installed in accordance with the rules in force, and used only in a sufficiently ventilated space of adequate volume. Consult instructions before installation and use of this appliance.'

No other information shall be included on the packaging if this could lead to confusion with regard to the current state of adjustment of the appliance and the corresponding appliance category (or categories) and the direct country (or countries) of destination.

8.4 Utilization of symbols on the appliance and packaging

8.4.1 Electrical supply

The marking concerning electrical values shall comply with EN 60335-1.

8.4.2 Type of gas

In order to represent all of the category indices corresponding to the adjustment of an appliance, the symbol of the reference gas shall be used which is common to all of these indices, in accordance with Table 5.

NOTE In order to satisfy the needs expressed by CEN members it is permitted that their countries declared means of identification may be included in addition to the symbol. These additional means are given in Annex C.

Table 5 — Corresponding category index

Symbol of the type of gas[a]	Corresponding category index
Second family:	
G 20	2H, 2E, 2E+
G 25	2L, 2LL
Third family:	
G 30	3B/P, 3+[bd]
G 31	3+[cd], 3P

[a] If, in its current state of adjustment, the appliance may use gases from different groups, all the reference gases corresponding to these groups shall be indicated.

[b] Only applies to appliances which do not need any adjustment between G 30 and G 31, or to appliances which need an adjustment and which are adjusted for G 30.

[c] Only applies to appliances which need an adjustment between G 30 and G 31, and which are adjusted for G 31.

[d] For the appliances which need an adjustment between G 30 and G 31, the label concerning the adjustment to the other gas and the other pressure of the pressure couple shall be supplied with the technical instructions.

8.4.3 Gas supply pressure

The gas supply pressure can be expressed uniquely by the numerical value using the unit (mbar). Nevertheless, if it is necessary to explain this value, the symbol "*p*" shall be used.

8.4.4 Country of destination

The names of countries shall be represented by the codes in accordance with EN ISO 3166-1.

8.4.5 Category

The category can be expressed uniquely by its designation in accordance with EN 437. Nevertheless, if it is necessary to explain it, the term "category" shall be symbolized by "cat".

8.4.6 Other information

The symbol for nominal heat input of a burner, represented by Q_n is not obligatory, but is recommended under the title "preferential", and to the exclusion of any other symbol, to avoid the use of many and different markings.

8.5 Instructions

8.5.1 General

Instructions shall be written in the official language(s) of the country or countries of destination stated on the appliance and shall be valid for that country or countries.

If the instructions are written in an official language that is used by more than one country, the country or countries for which they are valid shall be identified using the symbols given in 8.4.

8.5.2 Instructions for use, and user maintenance

8.5.2.1 General

The appliance will be sold with instructions for use and servicing intended for the user.

All information shall be given in the official language(s) of the country(ies) of destination of the appliance and following the practices of that country.

The instructions shall give all the information necessary for the appliance to be used safely and sensibly. They shall include the following information:

— the manufacturer’s name and address;

— the name or number of the appliance;

— that in the event of gas leakage from the appliance, the gas supply must be turned off at the nearest isolating valve;

— advice that material of any description should not be thrown on to the fuel bed;

— advice that the appliance shall not be used in bathrooms or bedrooms;

— a warning such as: ’This appliance requires installation by a competent person to ensure that, the room size where the appliance is to be installed and the ventilation provision for that room, is suitable for this appliance; details of how to determine the suitable room size and ventilation are described in the Installation instructions accompanying this appliance’;

— a warning such as: ‘ventilation openings should never be blocked or restricted in any way’;

— a warning such as: ‘On no account must inlet or outlet grilles be obstructed’ and a diagram included which indicates these areas;

— the information indicated in 8.1 with the exception of the serial number;

— the operations of ignition, cleaning and user maintenance;

— normal cleaning and maintenance;

— recommended frequency of servicing;

— where appropriate, the statement of the form ‘The guard on this appliance is to prevent risk of fire or injury from burns and no part of it should be permanently removed. IT DOES NOT GIVE FULL PROTECTION FOR YOUNG CHILDREN OR THE INFIRM’;

— a statement ‘It is advisable to fit the dress guard available from the manufacturer. Failure to fit this dress guard will result in a potential hazard to clothing when approaching the appliance’;

— a recommendation, for any additional guard that may be required for the protection of young children, aged or infirm persons;

— where any glass is a functional part of the appliance the manufacturer must warn that the appliance must not be used unless the glass is fitted correctly.

8.5.3 Technical instructions for installation and maintenance

The technical instructions for installation and adjustment intended for the installer shall be supplied with the appliance and shall specify that the installation shall be undertaken by a competent person and in accordance with the installation instructions.

They shall contain all the information necessary to enable a competent installer to make a safe installation.

They shall make suitable reference to the following:

a) the nominal input;

b) the type and pressure of the gas for which the appliance is adjusted;

c) that the appliance shall not be used in bathrooms or bedrooms;

d) the method of connection and the installation regulations in the country where the appliance is to be installed (if such regulations exist);

e) that the room size in which the appliance is to be installed and the ventilation for that room shall conform to the local regulations, but that in the absence of such local regulations the room size and ventilation shall conform to the requirements of Annex G.

f) the details of assembly and fixing;

g) the siting of the appliance including, the minimum clearances around the appliance, the minimum height above the floor, whether or not the appliance can be placed against a wall of combustible material and whether or not the appliance requires a non-combustible hearth;

h) the gas and electricity supply and connections and where appropriate a wiring diagram;

i) the procedure to be followed for commissioning the appliance;

j) details for replacement of exchangeable parts;

k) for category II appliances, the instructions necessary to allow a competent person to change from gas of one family to gas of the other family;

l) appliance heat input and the burner pressure;

m) injector identification;

n) physical dimensions;

o) any other technical data that may be required by the installer or the commissioning engineer.

p) the instructions for installation and maintenance and the user instructions shall be handed to the user and advise that the ventilation openings shall not be blocked or restricted in any way.

q) the installer shall instruct the user in the safe use and need for regular maintenance of the appliance;

r) where the dress guard is not supplied with the appliance, the installer shall inform the user of the local rules in force and advise the fitting of the manufacturer's dress guard. He shall also warn the user of the hazard caused to clothing by open flames if the dress guard is not fitted, and make reference to the user's instructions;

s) The manufacturer shall state the method by which a service engineer can determine that the appliance is working safely and correctly;

t) the manufacturer shall specify the minimum distance from the appliance to any ventilation grille;

u) the manufacturer shall state that the appliance is only intended to be used as secondary heating.

For open-fronted appliances 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, the following statement shall be included:

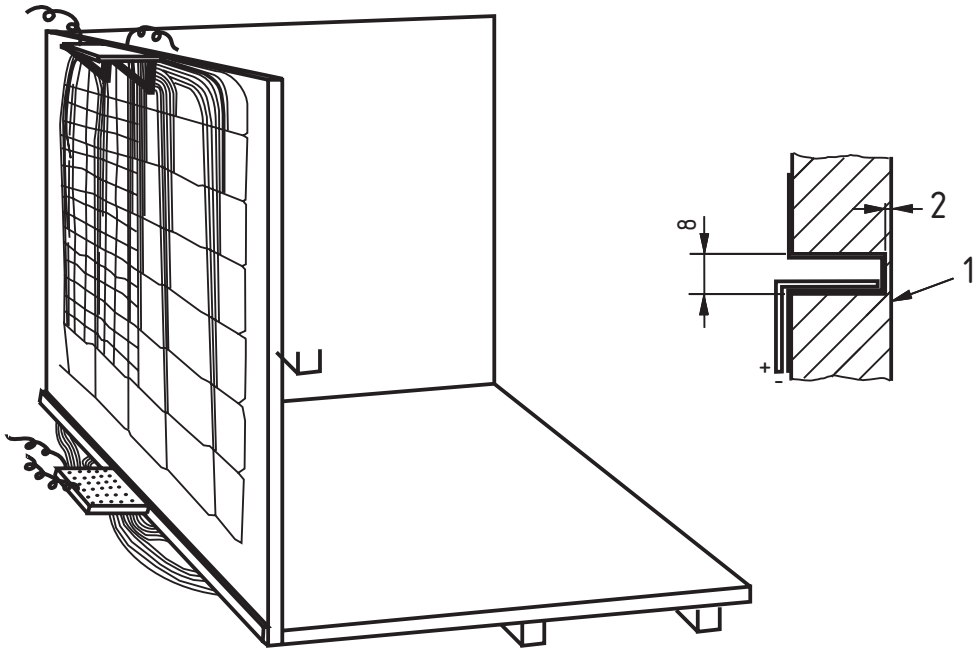
'Unless a dress guard is fitted, this appliance shall be installed with a hearth that projects at least 300 mm in front of the naked flame/incandescent fuel bed, extends at least 150 mm at either side, and around its periphery is a height of at least 50 mm above finished floor level.'

8.5.4 Additional information

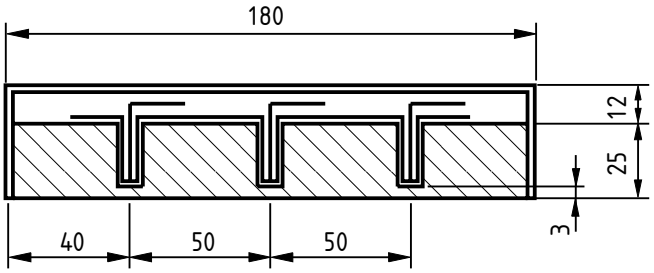
In the Technical instructions, the manufacturer shall specify the NO_2 class of the appliance (see 6.8.5).

If the appliance is designed for use on more than one gas and the NO_2 classes are different when changing from one gas to the other, the manufacturer shall specify the lower class (i.e. the level that gives the higher NO_2 limit).

Dimensions in millimetres



2



3

Material for test shelf: hardwood. Oak is preferred, but any other wood or board having a thermal conductivity of approximately 0,16 W/(m•K) is acceptable.

Backing sheet: 0,9 mm aluminium.

Key

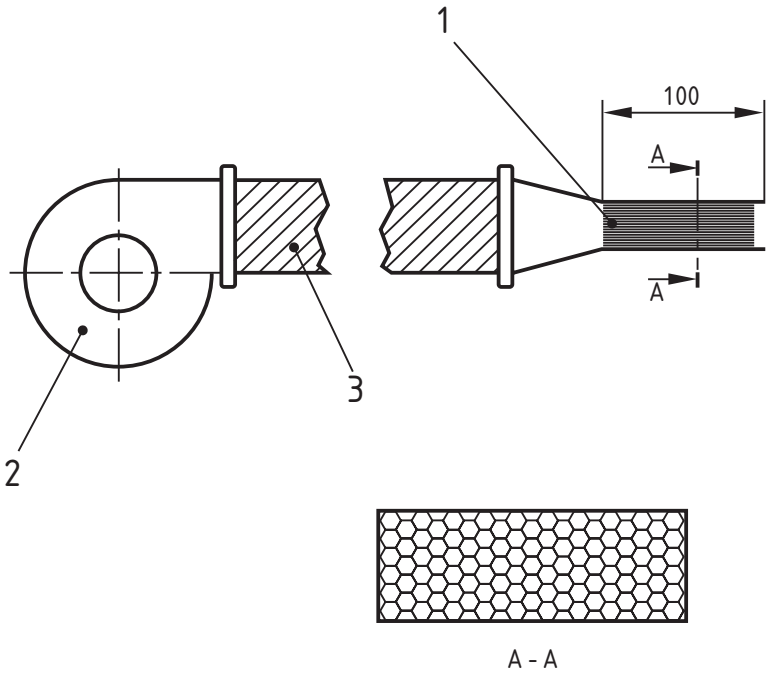
1 Face of wall

2 Thermocouple arrangement

3 Spacing of thermocouples

Figure 1 — Test corner for measuring floor, wall and shelf temperatures

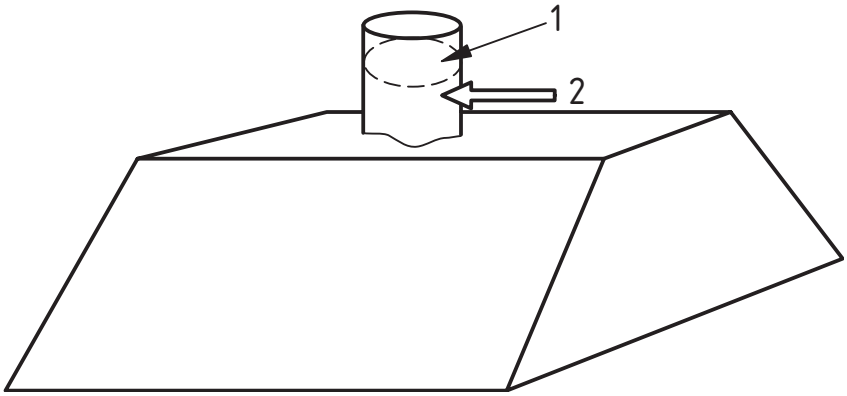
Dimensions in millimetres



Key

1 Honeycomb
2 Centrifugal fan
3 Flexible duct

Figure 2 — Stability of flames – example of an apparatus for the draught test



Key

1 Restrictor

2 Sampling point

Figure 3 – Example of combustion products collecting device

Annex A
(informative)

National situations

A.1 General

In each country in which this standard applies, appliances may be marketed only if they comply with the particular national supply conditions of that country.

In order to permit, both at the time of testing the appliance and at the time of its sale, the correct choice to be made from all the situations covered, the various national situations are summarized in A.2, A.3, A.4, A.5 and A.6.

A.2 Marketing in different countries of the categories listed in the text of the standard

Tables A.1 and A.2 give the national situations concerning the marketing in the various countries of the appliance categories listed in the body of the standard.

The information given in the table indicates only that these categories may be sold throughout the whole of the country concerned and A.3 should be consulted for confirmation.

In all cases of doubt the local gas supplier should be consulted in order to identify the precise category applicable.

Table A.1 – Category I (single categories) marketed

Country	I2H	I2L	I2E	I2E+	I2N [a]	I2R [a]	I3B/P	I3+	I3P	I3B	I3R [a]
AT							x				
BE									x[e]		
CH	x						x	x	x		
CY [b]											
CZ	x						x		x		
DE			x				x		x		
DK	x						x				
EE [b]											
ES	x							x	x		

Table A.1 *(concluded)*

Country	I2H	I2L	I2E	I2E+	I2N [a]	I2R [a]	I3B/P	I3+	I3P	I3B	I3R [a]
FI	x						x				
FR	x [c]	x [c]		x			x [d]	x	x		
GB	x							x	x		
GR	x							x	x		
HU [b]	x						x		x	x	
IE	x							x	x		
IS											
IT	x							x			
LT [b]											
LU			x								
LV [b]											
MT [b]											
NL	x [c]	x					x		x		
NO							x				
PL [b]											
PT	x							x	x		
SE	x						x				
SI [b]											
SK [b]											

[a] Category to be deleted if it is not selected by any country.

[b] Information on categories to be supplied by new CEN member.

[c] Categories applicable only to certain types of appliance, submitted to on site EC verification procedure, Annex II, article 6 of the Gas Appliance Directive (90/396/EEC). (France and Netherlands to clarify if applicable here).

[d] Categories applicable only to certain types of appliance specified in the individual standards (France to specify if applicable here)

[e] Only for outside use

Table A.2 – Double categories marketed

Country	II 1a2H	II 2H3B/P	II 2H3+	II 2H3P	II 2H3B	II 2L3B/P	II 2L3P	II 2E3B/P	II 2E3+B/P	II 2E+3+	II 2E+3P	II 2R3R [a]
AT												
BE												
CH	x	x	x	x								
CY [b]												
CZ		x		x								
DE								x				
DK	x	x										
EE [b]												
ES			x [c]	x								
FI		x										
FR				x [d]			x [d]		x [e]	x	x	
GB			x	x								
GR		x	x	x								
HU [b]		x		x	x							
IE			x	x								
IS												
IT	x		x									
LT [b]												
LU												
LV [b]												
MT [b]												
NL						x	x					
NO												
PL [b]												
PT			x	x								
SE	x	x										
SI [b]												
SK [b]												

[a] Category to be deleted if it is not selected by any country.
[b] Information on categories to be supplied by new CEN member.
[c] Appliances of this category set for group H gases of the second family may use air and commercial propane gas mixtures where the gross wobbe index (at 15 °C and 1 013,25 mbar) is between 46 MJ/m^3 and 51,5 MJ/m^3 a, at the same supply pressure, without additional tests.
[d] Categories applicable only to certain types of appliance, submitted to on site EC verification procedure, Annex II, article 6 of the Gas Appliance Directive (90/396/EEC). (France to clarify if applicable here).
[e] Categories applicable only to certain types of appliance specified in the individual standards (France to specify if applicable here)

A.3 Supply pressures for the appliances corresponding to the categories given in A.2

Table A.3 gives the conditions in the various countries concerning the supply pressures to appliances in the categories given in A.2.

Other, higher supply pressures may be necessary and such pressures may be provided after consultation with the appropriate gas supplier(s) in the country(ies) concerned.

Table A.3 – Normal supply pressures

Gas	G 20	G 25		G 20 + G 25	G 30		G 31			G 30 + G 31	
Pressure (mbar)	**20**	**20**	**25**	**Couple 20/25**	**30 28-30**	**50**	**30**	**37**	**50**	**Couple 28-30/37**	**Couple 50/67**
Country											
AT	X					X			X		
BE								X			
CH	X					X			X	X	
CY [b]											
CZ	X[c]					X[d]	X	X	X[e]		
DE	X	X			x	X			X		
DK	X						X				
EE [b]											
ES	X				x			X	x[a]	X	
FI	X				X		X				
FR				X	x	x[a]		x	x[a]	X	
GB	X[f]				X			X	x	X	
GR	X				X		X	X	X	x	
HU [b]	x[g]				x	x	x		x		
IE	X				x			X		X	
IS											
IT	X									X	
LT [b]											
LU	x										
LV [b]											
MT [b]											
NL			X				X		X		
NO					X		X				
PL [b]											
PT	X				X			X		X	
SE	X				X		X				
SI [b]											
SK [b]											

[a] Only for certain types of non-domestic appliances. (Countries to clarify)
[b] Information on supply pressures to be supplied by new CEN member.
[c] Currently 18 mbar.
[d] For certain types of industrial appliances. (CZ to clarify).
[e] For certain types of appliances. (CZ to clarify)
[f] Normal supply pressure for this appliance: 17,5 mbar.
[g] Nominal supply pressures of 25mbar and 85 mbar.

NOTE For Hungary, 2H 25 mbar is tested at minimum 18 mbar and maximum 33 mbar.

A.4 Special categories marketed nationally or locally

A.4.1 General

The national or local conditions of gas distribution (gas composition and supply pressures) lead to the definition of special categories which are marketed nationally or locally in certain countries, as shown in Table A.4.

Table A.4 — Test gases corresponding to categories marketed nationally or locally

Category	Reference gas	Incomplete combustion limit gas	Light back limit gas	Lift limit gas	Sooting limit gas	Country
I_{2Esi}, I_{2Er}	G 20, G 25	G 21	G 222	G 231	G 21	FR
$I_{2E(S)B}$	G 20, G 25	G 21	G 222	G 231	G 21	BE
$I_{2E(R)B}$	G 20, G 25	G 21	G 222	G 231	G 21	BE
I_{2ELL}	G 20,G 25	G 21	G 222	G 231, G 271	G 21	DE
I_{2S}	G 25.1	G 26.1	G 222	G 27.1	G 26.1	HU[a]
I_{2HS}	G 20, G 25.1	G 21 G 26.1	G 222	G 27.1	G 21, G 26.1	HU[a]
II_{1c2H}	G 130, G 20	G 21	G 132, G 222	G 23	G 21	CH
II_{2Esi3+} II_{2Er3+}	G 20, G 25 G 30	G 21	G 222 G 32	G 231 G 31	G 30	FR
II_{2Esi3P} II_{2Er3P}	G 20, G 25 G 31	G 21	G 222 G 32	G 231 G 271	G 31 G 32	FR
$II_{2ELL3B/P}$	G 20, G 25, G 30	G 21, G30	G 222, G 32	G 231 G 271	G 30	DE
$II_{2S3B/P}$	G 25.1, G 30	G 26.1, G 30	G 32	G 27.1 G31	G 26.1, G 30	HU[a]
II_{2S3P}	G25.1, G 31	G 26.1, G 30	G 32	G 27.1, G 31	G 26.1, G 31, G32	HU[a]
II_{2S3B}	G 25.1, G30	G 26.1, G30	G 32	G 27.1, G31	G 26.1, G 30	HU[a]
$II_{2HS3B/P}$	G 20, G 25.1 G 30	G 21, G26.1, G 30	G 222 G 32	G 23, G27.1, G 31	G 21, G 26.1, G 30	HU[a]
II_{2HS3P}	G 20, G 25.1 G 31	G 21, G 26.1, G 30	G 222 G 32	G 23, G 271, G 31	G 21, G 26.1, G 31, G 32	HU[a]
II_{2HS3B}	G 20, G 25.1 G 30	G 21, G 26.1, G 30	G 222 G 32	G 23, G 271, G 31	G 21, G 26.1, G 30	HU[a]

[a] Hungary to confirm selection.

A.4.2 Definition of special categories

The definitions of the special categories given in Table A.4 are derived in the same way as those categories listed in 4.2. The characteristics of the gases distributed regionally are given in A.5.

A.4.2.1 Category I

A.4.2.1.1 Appliances designed for the use of gases linked to the first family

Category I_{1b}: appliances using only gases of Group b linked to the first family, at a fixed supply pressure (this category is not used).

Category I_{1c}: appliances using only gases of Group c linked to the first family, at a fixed supply pressure (this category is not used).

Adjustment of the gas rate is optional for the replacement of a gas of one group to a gas of another group within the first family and of the gases which are linked to it.

A.4.2.1.2 Appliances designed for the use of gases of the second family and the gases linked to it

Category I_{2Esi}: appliances capable of using only gases of group E of the second family, and operating under the appropriate pressure of a pressure couple. The replacement of a gas in the range Es of group E (Wobbe index between 44,8 MJ/m^3 and 54,7 MJ/m^3) by a gas in the range Ei of group E (Wobbe index in the range 40,9 MJ/m^3 and 44,8 MJ/m^3) or vice versa necessitates a modification to the burner setting and possibly a change of injectors, of calibrated orifices and of the atmosphere control device.

Category I_{2Er}: appliances capable of using only gases of group E of the second family and being able to operate with a pressure couple without adjustment on the appliance. However, specific adjustment of the burner gas rate is optional for the replacement of a gas of the range Es of group E (Wobbe index between 44,8 MJ/m^3 and 54,7 MJ/m^3) by a gas of the range Ei of group E (Wobbe index between 40,9 MJ/m^3 and 44,8 MJ/m^3). If this adjustment has been carried out, a re-adjustment to the previous setting is then necessary in order to return to the use of a gas in the range Es of group E.

Category I_{2LL}: appliances using only gases of group LL linked to the second family, at a fixed supply pressure. On condition that the Wobbe index of the second family gas distributed does not exceed the upper limit of 43,7 MJ/m^3, the appliance may be adjusted according to a lower nominal value (this category is not used).

Category I_{2ELL}: appliances capable of using gases of group E of the second family, and gases of group LL linked to the second family. The gases of group E of the second family are used under the same conditions as for category I_{2E}. The gases of group LL of the second family are used under the same conditions as for category I_{2LL}.

Category I_{2S}: appliances using only gases of group S linked to the second family, at the defined supply pressure.

Category I_{2HS}: appliances using only gases of group H of the second family and gases of group S linked to the second family. The group H second family gases are used under the same conditions as for category I_{2H}. The group S second family gases are used under the same conditions as for category I_{2S}.

A.4.2.2 Category II

A.4.2.2.1 Appliances designed to use gases of the first family or that are linked to it and gases of the second family or that are linked to it

Category II_{1c2H}: appliances capable of using gases of group c linked to the first family and gases of group H of the second family. The gases linked to the first family are used under the same conditions as for category I_{1c}. The second family gases are used under the same conditions as for category I_{2H}

A.4.2.2.2 Appliances designed to use gases of the second family or that are linked to it and gases of the third family

Category II_{2Esi3+}: 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_{2Esi}. The third family gases are used under the same conditions as for category I_{3+}.

Category II_{2Esi3P}: 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_{2Esi}. The gases of the third family are used under the same conditions as for category I_{3P}.

Category II_{2Er3+}: 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_{2Er}. The gases of the third family are used under the same conditions as for category I_{3+}.

Category II_{2Er3P}: 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_{2Er}. The gases of the third family are used under the same conditions as for category I_{3P}.

Category $II_{2ELL3B/P}$: appliances capable of using gases of group E of the second family, gases of group LL linked to the second family and gases of the third family. The second family gases or the gases that are linked to it are used under the same conditions as for category I_{2ELL}. Gases of the third family are used under the same conditions as for category $I_{3B/P}$.

Category $II_{2S3B/P}$: appliances capable of using gases of group S linked to the second family and gases of the third family. The gases linked to the second family are used under the same conditions as for category I_{2S}. The third family gases are used under the same conditions as for category $I_{3B/P}$.

Category II_{2S3P}: appliances capable of using gases of group S linked to the second family and gases of group P of the third family. The gases linked to the second family are used under the same conditions as for category I_{2S}. The third family gases are used under the same conditions as for category I_{3P}.

Category II_{2S3B}: appliances capable of using gases of group S linked to the second family and gases of group B of the third family. The gases linked to the second family are used under the same conditions as for category I_{2S}. The third family gases are used under the same conditions as for category I_{3B}.

Category $II_{2HS3B/P}$: appliances capable of using gases of group H of the second family, gases of group S linked to the second family and gases of the third family. Gases of the second family or gases linked to it are used under the same conditions as for category I_{2HS}. The third family gases are used under the same conditions as for category $I_{3B/P}$.

Category II_{2HS3P}: appliances capable of using gases of group H of the second family, gases of group S linked to the second family and gases of group P of the third family. Gases of the second family or gases linked to it are used under the same conditions as for category I_{2HS}. The third family gases are used under the same conditions as for category I_{3P}.

Category II_{2HS3B}: appliances capable of using gases of group H of the second family, gases of group S linked to the second family and gases of group B of the third family. Gases of the second family or gases linked to it are used under the same conditions as for category I_{2HS}. The third family gases are used under the same conditions as for category I_{3B}.

A.4.3 Gas rate adjusters, aeration adjusters and regulators

This clause has been included to enable CEN members to provide information equivalent to that given in 5.2.2.2, 5.2.3 and 5.2.6 in relation to the special categories they have requested, detailed in A.4.1.

A.4.4 Conversion to different gases

This clause has been included to enable certain member states to provide information equivalent to that given in 5.1.1 in relation to the special appliance categories listed in A.4.1.

A.5 Test gases corresponding to the special categories given in A.4

The characteristics of the gases distributed nationally or locally and the corresponding test gases are given in Table B.5 of EN 437:2003 at 15 °C and 1 013,25 mbar.

The characteristics of the test gases corresponding to the gases distributed nationally or locally and the corresponding test pressures are given in Table A.5 (reference conditions only).

Mixtures of gases of group a with gases of Groups c or e, where the Wobbe index is between 21,1 MJ/m^3 and 24,8 MJ/m^3 are also linked to Group a of the first family.

These mixtures may only be used without supplementary tests in appliances in multiple categories including Group a of the first family.

Table A.5 — Test gases corresponding to local situations

Gas family and group		Nature of gas	Desig-nation	Composition Volume %	*Wl* *MJ/m3*	*Hl* *MJ/m3*	*Ws* *MJ/m3*	*Hs* *MJ/m3*	*d*	Test Pressure mbar	Country
Gases linked to the first family	Group b	Reference Incomplete combustion Sooting	G 120	H_2 = 47 CH_4 = 32 N_2 = 21	24,40	15,68	27,64	17,77	0,413	p_n = 8 p_{min} = 6 p_{max} = 15	SE
		Light back	G 112	H_2 = 59 CH_4 = 17 N_2 = 24	19,48	11,81	22,36	13,56	0,367		
	Group c	Reference (Propane–air)	G 130	C_3H_8 = 26,9 Air = 73,1 [a]	22,14	23,66	24,07	25,72	1,142	p_n = 8 p_{min} = 6 p_{max} = 15	FR
		Light back	G 132	C_3H_8 = 13,8 C_3H_6 = 13,8 Air[a] = 72,4	22,10	23,56	23,84	25,41	1,136		
Gases inked to the second family	Group LL	Reference	G 25	CH_4 = 86 N_2 = 14	37,38	29,25	41,52	32,49	0,612	p_n = 20 p_{min} = 18 p_{max} = 25	DE
		Incomplete combustion Sooting	G 26	CH_4 = 80 C_3H_8 = 7 N_2 = 13	40,52	33,36	44,83	36,91	0,678		
		Flame lift	G 271	CH_4 = 74 N_2 = 26	30,94	25,17	34,36	27,96	0,662		
	Group S	Reference	G 25.1	CH_4 = 86 CO_2 = 14	35,25	29,30	39,11	32,51	0,691	p_n = 25 p_{min} = 20 p_{max} = 33 02 p_n = 85 p_{min} = 73 p_{max}= 100	HU
		Incomplete combustion Sooting	G 26.1	CH_4 = 80 C_3H_8 = 6 CO_2 = 14	37,61	32,60	41,58	36,04	0,751		
		Lift limit	G 27.1	CH_4 = 82 CO_2 = 18	32,70	27,94	36,29	31,00	0,730		

Table A.5 *(concluded)*

Gas family and group		Nature of gas	Desig-nation	Composition Volume %	*Wl* *MJ/m3*	*Hl* *MJ/m3*	*Ws* *MJ/m3*	*Hs* *MJ/m3*	*d*	Test Pressure mbar	Country
Gases of the second family	Range Es of Group E	Reference	G 20	CH_4 = 100	45,67	34,02	50,72	37,78	0,555	p_n = 20 p_{min} = 17 p_{max} = 25	FR
		Incomplete combustion Sooting	G 21	CH_4 = 87 C_3H_8 = 13	49,60	41,01	54,76	45,28	0,684		
		Light back	G 222	CH_4 = 77 H_2 = 23	42,87	28,53	47,87	31,86	0,443		
		Lift limit	G 26	CH_4 = 80 C_3H_8 = 7 N_2 = 13	40,52	33,36	44,83	36,91	0,678		
	Range Ei of Group E	Reference Light back	G 25	CH_4 = 86 N_2 = 14	37,38	29,25	41,52	32,49	0,612	p_n = 25 p_{min} = 20 p_{max} = 30	
		Incomplete combustion Sooting	G 26	CH_4 = 80 C_3H_8 = 7 N_2 = 13	40,52	33,36	44,83	36,91	0,678		
		Lift limit	G 231	CH_4 = 85 N_2 = 15	36,82	28,91	40,90	32,11	0,617		

[a] Composition of the air (%): 0_2 = 20,95; N_2 = 79,05.

The data in this table for the ranges Es of group Ec and Ei of group E do not apply.

A.6 Gas connections in the various countries

Table A.6 lists the situations concerning types of connection specified in 5.1.4.

Table A.6 — Types of connection used in different countries

Countries	Categories I3B/P, I3+, I3P				Other categories		
	Without thread	With thread		Position connector	Thread		Position connector
		ISO 7-1: 1994	EN ISO 228-1:2003		ISO 7-1: 1994	EN ISO 228-1: 2003	
AT	yes	Yes[b]	yes	no	yes	yes	no
BE	yes	yes	yes	yes	Yes[b]	no	no
CH	no	yes	yes	yes	yes	yes	no
CY							
CZ							
DE	yes	Yes[b]	no	no	Yes[b]	no	no
DK	yes	yes	no	no	yes	no	no
EE							
ES	no	Yes[ab]	yes	yes	Yes[ab]	yes	yes
FI	no	yes	yes	yes	yes	yes	no
FR	no	no	yes	yes	no	yes	yes
GB	yes	Yes[ab]	no	no	Yes[ab]	no	no
GR	yes	Yes[b]	no	no	Yes[b]	no	on
HU							
IE	yes	Yes[ab]	no	no	Yes[ab]	no	no
IS							
IT	yes	yes	no	yes	Yes[b]	no	yes
LT							
LU							
LV							
MT							
NL	no	Yes[b]	no	yes	Yes[b]	no	no
NO	yes	yes		no			no
PL							
PT	yes	yes	yes	no	yes	yes	no
SE	no	yes	yes	yes	yes	yes	no
SI							
SK							

[a] Taper - taper threads.

[b] Taper - parallel threads.

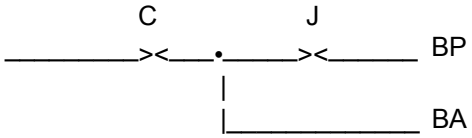
Annex B
(informative)

Gas valve arrangements for automatic controls for automatic control

Legend: BA = ignition burner

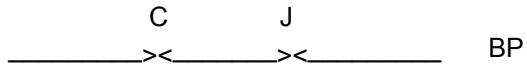
BP = main burner

a) Appliances with permanent ignition burner

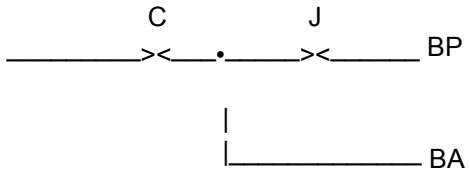


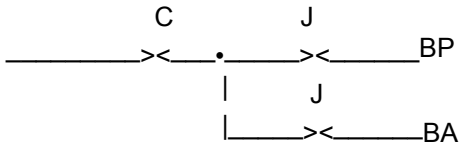
b) Appliances with automatic ignition

1) Direct ignition of the main burner



2) Appliances with an intermittent ignition burner





Annex C
(informative)

Means of identification of the types of gas in use in the various countries

Table C.1 — Means of identification of the types of gas in use in the various countries

Gas type	G 20	G 25	G 30	G 31
AT	Erdgas		Flüssiggas	Flüssiggas
BE	Aardgas, Gaz naturel	Aardgas, Gaz naturel	Butaan, Butane	Propaan, propane
CH	Erdgas H		Butan	Propan
CY				
CZ				
DE	Erdgas E Ws.n = 15,0 kWh/m^3	Erdgas LL Ws.n = 12, 4kWh/m^3	Flüssiggas B	Flüssiggas P
DK	Naturgas		F-Gas	F-Gas
EE				
ES	Gas natural		Butano	Propano
FI	Maakaasu naturgas		Butaani butan	Propaan/ propan
FR	Gaz naturel Lacq	Gaz naturel Groningue	Butane	Propane
GB	Natural gas		Butane	Propane
GR				
HU				
IE	Natural gas		Butane	Propane
IS				
IT	Gas naturale/ Gas metano		GPL	
LT				
LU				
LV				
MT				
NL		Aardgas	Butaan	Propaan
NO			Butan	Propan
PL				
PT	Gás naturel		Butano	Propano
SE				
SI				
SK				

Annex D
(normative)

Apparatus for the determination of the smoke number

D.1 Pump

A (hand) pump by means of which (160 ± 8) cm³ may be sucked in a single operation through an effective filtering surface 6 mm in diameter (i.e. approximately (570 ± 27,5) cm^3 per cm^3 of effective filtering surface); the piston stroke of the pump should be approximately 200 mm.

The tensioning of the paper fixing device, which is set in the specified position before the paper is inserted, is to ensure satisfactory air-tightness for the re-heating operation which is intended to eliminate condensation.

The distance travelled by the gases from the sampling point to the filtering surface shall not exceed 40 cm.

D.2 Sampling tube

A suitable sampling tube is a 6 mm diameter tube with holes drilled at 50 mm centres. The number of holes shall be such that they are only situated in or over the appliance flue products outlet. The tube should be positioned such as to give minimum dilution by room air.

The total area of the sampling holes shall be equal to (90 ± 10) % of the internal area of the sampling tube.

D.3 Filter paper

Use a filter paper with a reflection factor of (85 ± 2,5) % determined photometrically. For this measurement, place the filter paper on a white surface having a reflection factor of 75 % or more.

The passage of clean air through the new filter paper, at a flow rate of 3 dm³ per min and cm² of effective filtering surface, shall give a pressure drop of between 20 mbar and 100 mbar.

D.4 Grey scale

The grey scale consists of ten numbered grades from 0 to 9, scaled in equal intervals from white to dark grey. These grades comprise samples printed, or made by other means, on a support made of paper or plastic with a reflection factor of (85 ± 2,5) % determined photometrically.

The identification number of each grade is equal to one tenth of the reduction rate. This is expressed as a percentage of the incident light reflected on the corresponding sample. The number 0 corresponds to the support paper and the number 6, for example, to a reduction rate of 60 %.

The tolerance of the deviations of the reflection factor for each of the points on the scale, should not exceed 3 % of its value.

If the scale is protected by a transparent plastic cover, it should be made in such a way that the test spot and the standard grades are observed through the same thickness of protection material. The grades of the scale range have a diameter of about 20 mm and a circular central window 6 mm in diameter.

Annex E
(normative)

Dress guards

E.1 Scope

This annex contains requirements and tests for integral dress guards described in 5.1.9.

E.2 Requirements

E.2.1 Access

When tested with the test probe shown in Figure E.1 in accordance with E.3.1 it shall not be possible to touch the heated radiants, radiant material, or any flame, with any part of the test probe cone.

No opening in the guard or between the guard and the aperture to be protected shall have a major dimension exceeding 150 mm, a minor dimension exceeding 35 mm and a diagonal measurement exceeding 154 mm. The above dimensions do not apply to any opening:

— between the guard and the aperture to be protected if it is not possible to pass the 12 mm diameter probe, according to Figure E.1, through that opening;

— where the gap between any vertical rods does not exceed 5 mm.

E.2.2 Strength

E.2.2.1 Metallic designs

The guard, when subjected to the test load described in E.3.2.1, shall not have been removed, permanently distorted or permanently displaced.

Any hinged guard opened by the test probe described in E.3.2.1 shall return to its original position on release of the pull but any fastening clip need not necessarily re-engage.

E.2.2.2 Guard designs which include glass or similar material

When subjected to the test described in E.3.2.2, the glass shall not break.

E.3 Tests

E.3.1 Access

With the cone (b) illustrated in Figure E.1 assembled to the handle (a), under normal conditions of burning, insert the probe through or around the guard with a pressure exerted on the probe not exceeding 5 N. Take the weight of the probe into account in the force applied.

With the probe (c) illustrated in Figure E.1 assembled to the handle (a), under normal conditions of burning, insert the probe through any opening between the guard and the aperture to be protected

with a pressure exerted on the probe not exceeding 5 N. Take the weight of the probe into account in the force applied.

E.3.2 Strength

E.3.2.1 Metallic designs

Place the appliance used at room temperature, so that the plane of the central section of the guard is horizontal, then:

a) place a load consisting of a flat disc 100 mm in diameter and 5 kg in mass on the guard midway between the fixing points and retain it there for 1 min. At the end of that period remove the load, then;

b) apply a pull of 20 N in any direction to the guard when it is in its normal position of use.

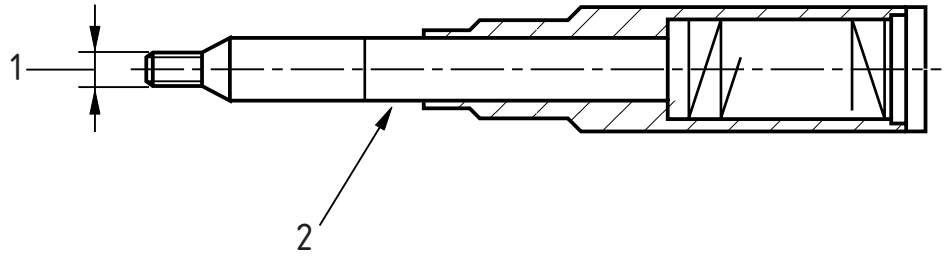
E.3.2.2 Guard designs which include glass or similar material

With the appliance at room temperature, apply a direct blow at the weakest point of the guard equivalent to an impact energy of 0,5 N.m.

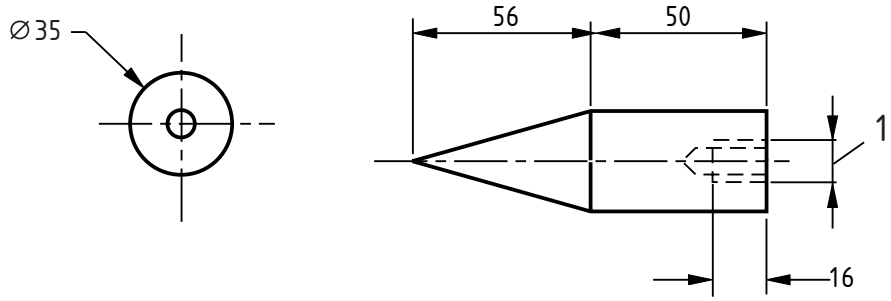
When a guard consists of bars of glass or similar material packed along side each other so as to touch, reduce the impact energy to 0,25 N.m.

Apply the blow by means of the spring-operated impact-test apparatus in accordance with EN 60068-2-75.

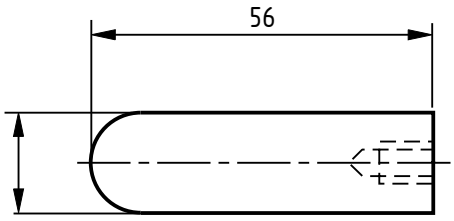
Dimensions in millimetres



a)



b)



c)

Key

1. 6 mm thread medium fit
2. 5 N force for the horizontal and vertical planes are marked on either side

Figure E.1 — Test probe

Annex F
(normative)

Vitiation room

F.1 Dimensions

The dimensions are as follows:

— length 3,5 m;

— width 2,0 m;

— height 2,5 m;

— volume 17,5 m^3.

For low rated appliances (< 1,0 kW (H_s)) a smaller room having a volume of 4,5 m^3 ± 0,5 m^3 may be used. The room shall be between 1,80 m and 2,10 m high and shall have a width and length not less than 1 m.

F.2 Sealing requirement

2 h after an homogeneous CO_2 content of (4 ± 0,2) % (*V/V*) has been created in the room without heating but by releasing CO_2 from a container. The drop in CO_2 content shall be less than 0,1 % (*V/V*).

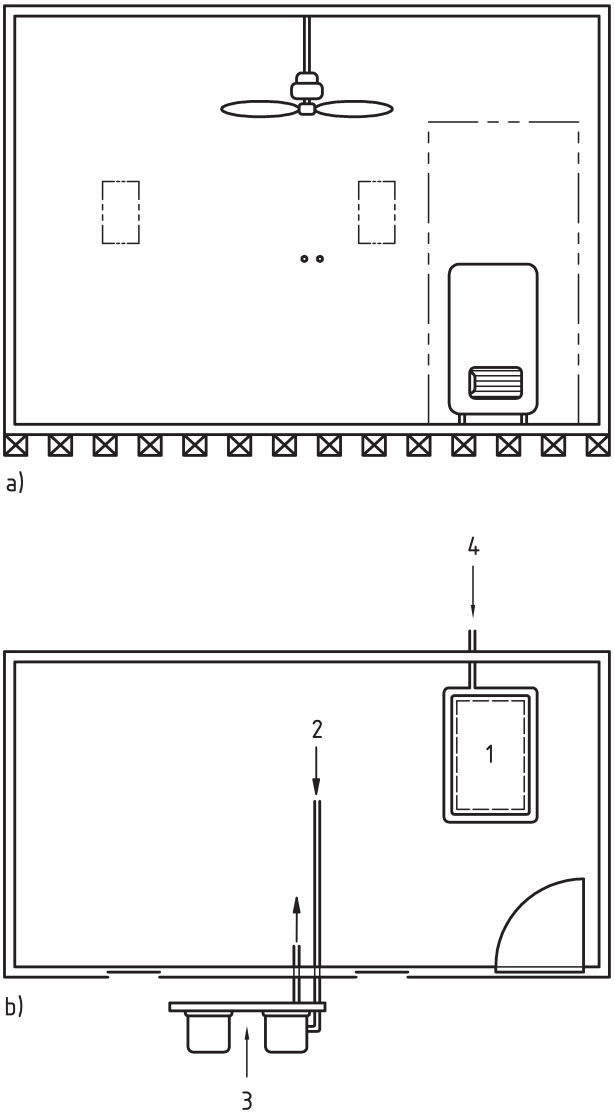
F.3 Construction

The room shall be constructed in such a way that:

a) the operator can at all times see the appliance burner unit operating, the appliance being placed in accordance with the plan in Figure F.1;

b) the gas samples can be reintroduced into the room after analysis;

c) the appliance can be supplied from a gas container placed outside the room, the regulator being mounted on the container.



Key

1 Appliance

2 Sampling

3 Analyzers

4 Gas

a) Sectional elevation

b) Plan

Figure F.1 — Vitiation room

Annex G
(normative)

Room size and ventilation

G.1 General

Flueless appliances use air from the room in which they are installed for combustion and they discharge their products of combustion back into the room. Therefore it is essential that the input of the appliance is not too great and that ventilation is adequate to ensure sufficient oxygen for correct operation of the appliance and for the well-being of those in the room.

The instructions shall state any ventilation and room size regulations, standards, rules in force or requirements of the country(ies) of destination and shall furthermore state that these requirements shall be met.

If the country of destination has no such requirements, then the instructions shall state ventilation and room size requirements conforming to the following clauses.

G.2 Room size

G.2.1 General

One accepted mass-balance model used is

$$c(t) = \frac{ac_o + \frac{E_R Q_R}{P_C}}{(a+k)}(1 - e^{-(a+k)t}) + c(o)e^{-(a+k)t} \qquad \text{(G.1)}$$

where:

a = air change per hour (h^{-1})

c = indoor concentration of contaminant (µg/g)

$c(o)$ = indoor concentration of contaminant at the start of the period of interest (µg/g)

c_o = ambient concentration of contaminant (µg/g)

E_R = contaminant emission rate from the appliance (ng/J)

k = contaminant decay rate other than by air exchange (h^{-1})

Q_R = input rate per m³ of room ($MJ \times h^{-1} \times m^{-3}$)

P_C = density of the contaminant (kg/m³)

t = time elapsed (h)

Additional formulae are as follows:

1) Simpler formulae

$$c(t) = c_a + (c_o - c_a)e^{-at} + \frac{E_R}{aV}\left(1 - e^{-at}\right) \quad \text{(G.2)}$$

where:

$c(t)$ = contaminant rate in the room (µg/g)

c_a = contaminant rate in outside air (µg/g)

c_0 = indoor concentration of contaminant rate in the room at the start (µg/g)

E_R = contaminant emission rate from the appliance (cm^3/h)

a = air change per hour (h^{-1})

V = volume of the room (m^3)

2) Formula for continuous heating when the constant concentration of the contamination rate is reached:

$$c = c_a + \frac{E_R}{aV} \quad \text{(G.3)}$$

3) Or: The necessary air change is:

$$a = \frac{E_R}{V(c_p - c_a)} \quad \text{(G.4)}$$

where:

C_p = admissible concentration

G.2.2 Maximum allowable gas input with regard to CO emissions

Using the formula (G.1), the maximum gas input rate per m³ of room volume (Q_R) to ensure a room CO concentration below 9 µg/g given by the formula:

$$Q_R = \frac{0{,}0003}{(CO / CO_2)} \quad \text{(G.5)}$$

where CO/CO_2 is the ratio of carbon monoxide to carbon dioxide measured at nominal rate on reference gas.

G.2.3 Maximum allowable gas input with regard to NO_2 emissions

The maximum gas input per m³ of room volume to ensure a room concentration of NO_2 below

300 ppb (0,3 µg/g) is given by the formula:

$$Q_R = \frac{0{,}75}{E_R} \quad \text{(G.6)}$$

where E_R is the emission rate obtained in 7.9.4.3

G.2.4 Calculation of minimum room size

The maximum allowable gas input rate will be the lesser of equations (G.5) and (G.6). The minimum room size (in m³) is calculated from the formula:

$$\text{Minimum room size} = \frac{\text{Nominal input}}{Q_R} \qquad \text{(G.7)}$$

G.2.5 Ventilation

Permanent ventilation shall be provided of at least 100 cm² plus 55 cm² for each kW by which the appliance nominal input exceeds 2,7 kW (based on net calorific value). This ventilation shall be equally distributed between high and low levels.

Annex H
(informative)
A-deviation

A- deviation: National deviation due to regulations, the alteration of which is for the time being outside the competence of the CEN/ CENELEC member.

In the relevant CEN/ CENELEC countries these A- deviations are valid instead of the provisions of the European Standard until they have been removed.

France

Clause	**Deviation**
	Arrêté Ministériel August 2nd 1977 modified by arrêté October 5th 2005 (clause 17 §4)
	The maximum output of appliances exempt from connection to a product of combustion evacuation duct is limited to 4,2 kW.
Title and scope	In the title and the scope : Replace « 6 kW » by « 4,2 kW ».
	Appliances exempt from connection to a product of combustion evacuation duct shall be mobiles.
Foreword	In the last paragraph delete « fixed ».
Scope	Second paragraph delete « Fixed ». Delete second a) Mobile heaters
5.1.3.1	Delete the 4th paragraph
	Appliances exempt from connection to a product of combustion evacuation duct shall only be additional heating's.
8.2	The appliance shall bear a marking stating that it is an additional heating that can only be used intermittently.
8.3	The packaging shall indicate that it is an additional heating that can only be used intermittently.
8.5.2	The instructions for use shall indicate that it is an additional heating that can only be used intermittently.

Annex ZA
(informative)
Relationship between this European Standard and the Essential Requirements of EU Directive 90/396/EEC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 90/396/EEC.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 90/396/EEC

Relevant Clause	Essential requirement	Subject
Whole standard	1.1	Safe design and construction
8.5.3 8.5.2 8.1 & 8.2 8.3	1.2	Instructions - installer - user Warning notice - appliance - packaging
8.5.3	1.2.1	Type of gas used, supply pressure, fresh air
8.5.1 & 8.5.2	1.2.2	Instructions for use and servicing
8.1, 8.2 & 8.3	1.2.3	Warning notices on appliance and packaging
5.2.4 5.2.6 5.2.1 & 5.2.4.1 5.2.1, 5.2.4.1 & 5.2.5 5.2.4 5.2.7 Not applicable	1.3	Fittings - manual valves - regulators - multifunctional controls - flame supervision device - automatic valves - thermostats Instructions
5.1.2 & 5.1.3	2.1	Appropriate materials
1	2.2	Properties
5.1.2 & 5.1.3	3.1.1	Durability
5.1.2	3.1.2	Condensation
5	3.1.3	Explosion risk
Not applicable	3.1.4	Air/water penetration into gas circuit
5.1.7 & 6.8.4	3.1.5	Normal fluctuation of auxiliary energy
6.8.4	3.1.6	Abnormal fluctuation of energy
5.1.6	3.1.7	Electrical hazards
Not applicable	3.1.8	Deformation
5.2 5.2.6 5.5.2 & 5.6.3 5.2.1, 5.2.4.1 & 5.2.5 5.2.4 5.2.7	3.1.9	Safety/control device failure Fittings - gas circuit - regulators - automatic burner control systems - flame supervision device - automatic valves - thermostats
5.2.1	3.1.10	Overruling of safety devices
5.2.1 & 5.2.2.2	3.1.11	Pre-set adjuster protection
5.2.4	3.1.12	Marking of levers and setting devices
5.1.5 & 6.2	3.2.1	Gas leakage
5.4 & 6.11	3.2.2	Gas release during ignition, re-ignition and extinction.
5.2.5 & 5.4	3.2.3	Unburned gas accumulation
6.5	3.3	Ignition, re-ignition and crosslighting
6.6 6.8	3.4.1	Flame stability Harmful substance
6.10	3.4.2	Combustion products release
6.10	3.4.3	Combustion products release
6.10	3.4.4	Flueless domestic appliances
1	3.5	Rational use of energy
6.4.3	3.6.1	Floor etc. temperatures
6.4.2	3.6.2	Temperature of knobs and levers
6.4.1	3.6.3	External parts
Not applicable	3.7	Foodstuffs
1	Annex II	Certification

WARNING Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

[1] EN 449, *Specification for dedicated liquefied petroleum gas appliances - Domestic flueless space heaters (including diffusive catalytic combustion heaters)*

[2] EN 549, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*

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