

Specification for dedicated liquefied petroleum gas appliances — Flueless non-domestic space heaters not exceeding 10 kW

The European Standard EN 461:1999, with the incorporation of amendment A1:2004, has the status of a British Standard

ICS 97.100.20

National foreword

This British Standard is the English language version of EN 461:1999, including amendment A1:2004. It supersedes BS 7261:1990 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags [A1] <A1>. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by [A1] <A1>.

The UK participation in its preparation was entrusted by Technical Committee GSE/24, Dedicated LPG appliances, to Subcommittee GSE/24/-/1, Space heaters, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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English version

**Specification for dedicated liquefied petroleum gas appliances -
Flueless non-domestic space heaters not exceeding 10 kW
(including amendment A1:2004)**

Spécifications pour les appareils fonctionnant
exclusivement aux gaz de pétrole liquéfiés - Appareils de
chauffage non domestiques non raccordés avec un débit
calorifique ne dépassant pas 10 kW
(inclut l'amendement A1:2004)

Festlegungen für Flüssiggasgeräte - Abzuglose
Gewerberaumheizgeräte bis zu 10 kW
(enthält Änderung A1:2004)

This European Standard was approved by CEN on 11 October 1998; amendment A1 was approved by CEN on 24 December 2003.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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FOREWORD

This European Standard has been prepared by Technical Committee CEN/TC 181, Dedicated liquefied petroleum gas appliances, the Secretariat of which is held by NSAI.

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of an identical text or by endorsement, at the latest by March 2000, and conflicting national standards shall be withdrawn at the latest by March 2000.

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

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

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

FOREWORD to amendment A1

This document (EN 461:1999/A1:2004) has been prepared by Technical Committee CEN/TC 181, Dedicated liquefied petroleum gas appliances, the Secretariat of which is held by AFNOR.

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 September 2004, and conflicting national standards shall be withdrawn at the latest by September 2004.

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1 Scope

Ⓐ This European Standard defines requirements test methods concerning, in particular, the construction, safety as well as classification and marking of non-domestic flueless space heaters (including greenhouse heaters and diffusive catalytic combustion heaters), having a nominal heat input not exceeding 10 kW (H_s) burning 3rd family gases at nominal operating pressure not exceeding 50 mbar, referred to in the body of the text as “appliances”.

It covers the following types of appliance:

- a) fixed heaters;
- b) portable or mobile heaters including those that incorporate a compartment for a transportable refillable liquefied petroleum gas cylinder;
- c) heaters intended for use in non domestic areas;
- d) heaters intended solely for outdoor use.

NOTE 1 LPG appliances having a nominal heat input not exceeding 4,2 kW and intended for use in domestic premises are covered by EN 449.

NOTE 2 Overhead radiant heater appliances are covered by EN 416-1.

There are no specific thermal efficiency requirements appropriate to these types of appliances 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 does not apply to appliances which incorporate a fan for either the assistance of combustion or the circulation of convected air. Neither does it cover appliances incorporating full sequence automatic controls.

This standard does not apply to appliances for heating buildings used for animals rearing (see EN 12669).

Requirements for appliances given in this standard assume that the supply of gas will be controlled by a pressure regulator giving an outlet pressure as indicated in Table A.1.

Requirements for controls, given herein, relate to controls fitted as part of, or supplied with, particular appliances; they do not necessarily provide a complete specification for controls intended for general use.

NOTE 3 Catalytic heaters are not considered suitable for use in areas having chemicals present which are likely to prevent the correct operation of the catalytic pad.

This standard does not cover cylinders for liquefied petroleum gases or their associated regulators, which shall comply with national requirements in force.

This European Standard only covers type testing. Ⓐ

2 Normative references

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

EN 125	Flame supervision devices for gas burning appliances - Thermo-electric flame supervision devices
EN 126	Multifunctional controls for gas-burning appliances
[A1] Text deleted [A1]	
EN 257	Mechanical thermostats for gas-burning appliances
EN 437	Test gases, Test pressures, Appliance categories
EN 449	Specification for dedicated liquefied petroleum gas appliances - Domestic flueless space heaters (including diffusive catalytic combustion heaters)
EN 549	Rubber materials for seals and diaphragms for gas appliances and gas equipment
EN 1057	Copper and copper alloys - Seamless, round copper tubes for water and gas in sanitary and heating applications
[A1] Text deleted [A1]	
EN 50165	Electrical equipment of non-electric heating appliances for household and similar purposes - Safety requirements
EN 60335-1	Safety of household and similar electrical appliances - Part 1: General requirements
EN 60730-2-1	Automatic electrical controls for household and similar use - Part 2: Particular requirements for electrical control for electrical household appliances
EN 60730-2-9	Automatic electrical controls for household and similar use - Part 2: Particular requirements for electrical thermosensitive controls
CR 1472	General guidance for the marking of gas appliances

ISO 7-1	Pipe threads where pressure-tight joints are made on the threads - Part 1: Designation, dimensions and tolerances
ISO 228-1	Pipe threads where pressure-tight joints are not made on the threads - Part 1: Designation, dimensions and tolerances

3 Definitions

For the purpose of this standard the following definitions apply:

3.1 atmosphere sensing device: a 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

3.2 auxiliary equipment: equipment comprising:

- taps and cocks;
- flame supervision devices;
- thermostats;
- multifunctional controls;
- automatic shut-off valves;
- atmosphere sensing devices

3.3 burner: a component that allows the gas to burn.

It may be one of two types:

3.3.1 aerated burner: a burner in which part of the air for combustion, termed “primary air”, is mixed with gas before the burner port: the remainder of the air drawn in at the port is termed “secondary air”

3.3.2 non-aerated burner: a burner in which the air for combustion is entrained entirely at the burner outlet

3.4 gross calorific value (H_g): the quantity of heat produced by the combustion, at constant pressure, of unit volume or mass of the considered gas, the water produced by the combustion being condensed. It is expressed in megajoules referred either per cubic metre of dry gas measured at 15 °C at a pressure of 1 013,25 mbar or to 1 kg of dry gas

3.5 catalytic unit: the panel and its content, including the catalytic pad, into which the gas is injected, through which it is distributed and oxidized, and from which the products of combustion are emitted

3.6 cock: a type of valve used to stop the main supply of gas, that is operated by the rotation of a drilled or slotted plug and which is normally left in the ON position

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

3.8 competent person: a person who is qualified by training or experience to carry out a specified task

3.9 conversion: an operation carried out by a competent person at the time of a change of gas

3.10 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 of installation, the appliance shall be capable of operating, without adjustment or modification, with one of the gases distributed in the country concerned, at the appropriate supply pressure. More than one country can be specified if the appliance, in its current state of adjustment, can be used in each of these countries

3.11 diffusive catalytic combustion space heater: a space heating appliance in which neat gas diffuses through a catalytic pad and is flamelessly oxidized by oxygen that has diffused into the pad from the surrounding atmosphere at a temperature below that at which flame combustion would occur.

NOTE: Such heaters do not include catalytic combustion heaters in which pre-mixing of gas and air is effected before the catalytic pad is reached, nor do they include appliances employing after-burners in which products of incomplete combustion from burners are further oxidized over a catalyst

3.12 flame lift: phenomenon characterized by the partial or total movement of the base of the flame away from the burner port

3.13 flame supervision device: a 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

3.14 fixed heater: a heater designed to be secured to a wall or floor or suspended from a ceiling

3.15 gas rate adjuster: a device allowing the gas rate to a burner to be set at a predetermined value according to the supply conditions. It often consists of a screw, termed a “throttle screw” or an “adjustment screw”. The operation of changing the setting of this device is termed the “adjustment of the gas rate”

3.16 gas supply pressure: the difference between the static pressure measured at the inlet connection of the appliance and the atmospheric pressure

3.17 heat input: the product of the volume or mass rate and the calorific value of the gas (brought to the same reference conditions). It is expressed in kilowatts

3.18 hot condition: a condition of the appliance required for some tests and obtained by heating to thermal equilibrium at the adjustment pressure, any thermostat remaining fully open

3.19 ignition device: any means (flame, electrical ignition device or other device) used to ignite the gas admitted to the ignition burner or the main burner

3.20 indirect country of destination: a country for which the appliance has been certified, but for which, in its present state of adjustment, it is not suitable. Subsequent modifications or adjustments are essential in order that it can be utilized safely and correctly in that country

3.21 injector: a component that admits the gas into an aerated burner

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

3.23 setting and locking of an adjuster: if an adjuster, after having been adjusted by the manufacturer or installer, is immobilized in this position by an effective means (screw, plug, etc), it is said to be locked in this position

3.24 mobile heater: a self-contained heater incorporating its own gas cylinder within the body or on the frame of the appliance and designed to be moved without lifting and used in a fixed position

3.25 nominal heat input: the value of the heat input, as declared by the manufacturer

3.26 non-domestic space heater: an appliance that is designed for the heating of a building other than a residential dwelling

3.27 portable heater: an appliance for connection to a gas supply by means of flexible tubing and designed to be easily carried and used in a fixed position

3.28 pressure regulator: a device which is not part of the appliance, but which maintains a constant inlet pressure to the appliance

3.29 primary air adjuster: a 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"

3.30 putting a control out of service: a control (of temperature, pressure, etc.) that is put out of action and then sealed in this position. The appliance then functions as if this device had been removed

3.31 relative density: the ratio of the mass of a volume of dry gas to an equal volume of air under the same temperature and pressure conditions

3.32 restrictor: a device with a calibrated orifice which is placed in the gas circuit to create a pressure loss and thus reduce the gas pressure at the burner to a predetermined value

3.33 sealing of an adjuster: an 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)

3.34 slip: $\frac{A_2}{A_1}$ ratio of unburnt fuel gas to total hydrocarbons which have passed through the catalytic pad $\frac{A_1}{A_2}$

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

3.36 sound mechanical joint: a connection device assuring gas soundness in an assembly made up of several parts, generally of metal.

It may be, for example:

- a conical joint;
- an O-ring joint;
- a flat-faced joint;
- a nut and olive joint;
- a cone seated union;
- a flat-faced washered union

3.37 flame stability: the flames are stable at the burner ports when the phenomena of flame lift or light back do not occur

3.38 tap: a type of valve on an appliance that controls the flow of gas to the various burners and to adjust their rate during use. When the appliance is not in operation the tap will be in the OFF position

3.39 thermostat: a device to maintain automatically a selected constant temperature.

3.40 volume or mass rate:

3.40.1 volume rate: the volume of gas passed in unit time. This is expressed in m³/h or in dm³/h (l/h)

3.40.2 mass rate: the mass of gas passed in unit time. This is expressed in kg/h or g/h

3.41 Wobbe number (W_s): this is given by the formula:

$$W_s = \frac{H_s}{\sqrt{d}}$$

where H_s is the gross calorific value of a gas expressed in MJ/m³, and d is its relative density

3.42 yellow tipping: phenomenon characterized by the appearance of yellow colouring at the top of the blue cone of an aerated flame

3.43 by-pass rate: the fixed rate of flow through a thermostat when the valve is closed

3.44 relative density: the ratio of the mass of a volume of dry gas to an equal volume of air under the same temperature and pressure conditions (temperature and pressure 15 °C and 1013,25 mbar)

3.45 gas circuit: an assembly of parts of the appliance that carry or contain the combustible gas between the appliance gas inlet connection and the point at which air is admitted

3.46 gas inlet connection: the part of the appliance intended to be connected to the gas supply

3.47 ignition burner: a burner intended to ignite the main burner

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

3.49 ignition opening time (T_{IA}): for a thermoelectric flame supervision device, the time that elapses between ignition of the supervised flame and the moment when the closure element is held open by the flame signal

3.50 extinction delay time (T_{IE}): for a thermoelectric flame supervision device, the time that elapses between disappearance of the supervised flame and interruption of the gas supply

4 Classification

4.1 Classification of gases

Gases likely to be used are classified in families according to the value of their Wobbe number as shown in Table 1.

Table 1: Classification of gases

Gas families and groups	Wobbe number $\text{MJ/m}^3 (H_s)$
Group B/P Group P	Between 72,9 and 87,3 Between 72,9 and 76,8

4.2 Classification of appliances

Appliances are classified into categories according to the gases that they use. However, for each country, only some of the categories mentioned below are applicable, on account of local gas supply conditions (types of gas and supply pressures). For these categories, no requirement different from those defined in this standard shall be applied.

The gas supply conditions and types of connection applicable to each country are given in annex A.

Appliances within the field of application of this standard belong to the following categories:

a) Category $I_{3B/P(30)}$

An appliance capable of using third family gases (propane, butane or their mixtures), without adjustment at normal supply pressures from 28 mbar to 30 mbar;

b) Category $I_{3B/P(50)}$

An appliance capable of using third family gases (propane, butane or their mixtures), without adjustment at normal supply pressures of 50 mbar;

c) Category $I_{3+(28-30/37)}$

An appliance capable of burning third family gases (butane and propane), and operating without adjustment on the appliance using a pressure couple. For butane, appliances in this category may be used without adjustment at normal supply pressures from 28 mbar to 30 mbar; for propane they are used at a normal supply pressure of 37 mbar;

d) Category $I_{3P(30)}$

An appliance capable of using third family gases in group P (propane), without adjustment, at a normal supply pressure of 30 mbar;

e) Category $I_{3P(37)}$

An appliance capable of using third family gases in group P (propane), without adjustment at a normal supply pressure of 37 mbar;

f) Category $I_{3P(50)}$

An appliance capable of using third family gases in group P (propane), without adjustment at a normal supply pressure of 50 mbar.

5 Safety and constructional requirements

5.1 General

Except otherwise stated the constructional requirements are verified by the inspection of the appliance and its instruction literature. The safety requirements are checked under the conditions of clause 6.

There shall be no provision for adjustment of parts of the appliance which have been set by the manufacturer.

5.2 Conversion to different gases

The appliance shall be supplied for a single gas category and for a single operating pressure or pressure couple. Conversion to another category or pressure or pressure couple is not permitted.

5.3 Materials

The quality and thickness of material used in the construction of an appliance shall be such that the constructional and safety characteristics are not altered in use.

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 alterations which might impair their performance. Sheet metal parts not made of corrosion-resistant material shall be vitreous enamelled or be covered with another effective protection against corrosion.

▣_{A1} Rubber seals shall be made from materials which comply with EN 549 as appropriate. ▣_{A1}

▣_{A1} Text deleted ▣_{A1}

The appliance gas pipework and gas controls shall be of metal, except as allowed in 5.6.

Materials containing asbestos shall not be used.

Copper tubing shall not be used where it would be exposed to temperatures in excess of 100 °C.

Any thermal or acoustic insulation shall be securely located and shall be protected against mechanical damage.

5.4 Cleaning and maintenance

Any part of the appliance requiring cleaning by the user shall be easily accessible without having to move the fixed appliance or to use a tool for dismantling. It shall be possible to replace such parts correctly and without difficulty, and shall be difficult to reassemble such parts incorrectly.

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

Any control placed in the gas circuit shall be arranged so that any adjustment or maintenance by a competent person is easy and so that its exchange by him is possible.

5.5 Strength of assembly

The construction of an appliance shall be such that, during normal conditions of use, maintenance and movement (for mobile and portable appliances), any displacement, distortion or deterioration of parts likely to impair its safety characteristics will not occur.

5.6 Soundness of the gas circuit assembly

5.6.1 Construction

Holes for screws, pins, etc., intended for the assembly of components shall not open into the gas ways, or leave a wall thickness of less than 1 mm.

The soundness of assemblies connected to the gas circuit shall be assured, by means of metal-to-metal joints or joints with seals (e.g. washers, O-rings or gaskets).

For parts that do not require to be dismantled during normal maintenance, for example taps and injectors, the use of thread sealing compounds is permitted.

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 pipe work which may be dismantled during normal maintenance shall remain sound after five disconnections, if necessary after changing a gasket, where such exists.

5.6.2 Soundness test

Under the test condition specified in 6.6.2, the leak detected during each of the tests number 1 and 2 shall not exceed 0,07 dm³/h.

This requirement shall also be satisfied after all the appliance tests have been carried out but before any of the components used in the soundness tests have been removed.

5.7 Connections

5.7.1 Gas inlet

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

- a) for fixed appliances:
 - 1) without a thread: for a length of at least 30 mm it shall be cylindrical, smooth and clean to allow connection by means of a gas-tight compression fitting;
 - 2) with a thread: its extremity shall have a thread following ISO 228-1 or ISO 7-1, size 1/2, 3/8 or 1/4 (external diameter 21 mm, 17 mm or 13 mm);
 - 3) for connection to copper tube shall comply with EN 1057 (compression or capillary fittings).
- b) for mobile and portable appliances:
 - 1) with a nozzle for the secure attachment of a flexible tube using clips or a similar method;
 - 2) with a cone seated union, or a flat-faced washered union, or threaded union, attached to a flexible tube.

The Special National Conditions with regard to connection are as indicated in Table A.3 and Figure A.1.

5.7.2 Pressure test point

For fixed appliances, easily accessible means shall be provided to allow the gas pressure to be measured.

The diameter of the pressure test point shall be $(9_{-0,5}^0)$ mm.

5.8 Appliance stability, fixing and mobility devices

5.8.1 Mobile and portable appliances

When tested in accordance with 6.8.1 the appliance shall not fall forwards or sideways when placed on an inclined plane at an angle of 15 ° to the horizontal and shall not fall backwards when placed on an inclined plane at 10 ° to the horizontal.

For an appliance incorporating its own gas supply the stability test specified in this subclause shall be carried out with both full and empty gas cylinders of the maximum and minimum sizes recommended by the appliance manufacturer. The cylinder shall not be displaced from its mounting during this test.

Ⓐ) For appliance to be mounted on a support, which can include wheels, the stability test shall be carried out with the appliance mounted on this support. Ⓐ)

For appliances designed for mounting on to a gas cylinder, means shall be provided for securely mounting the appliance onto the cylinder. The cylinder valve shall not be used for this purpose. Where the gas cylinder is mounted on the appliance means shall be provided to ensure that it is securely mounted.

For an appliance incorporating a means to vary the position of the heating element the element shall be fixed in the most unfavourable position with regard to the appliance stability. It shall not be possible to position the appliance in any way such that the guard lies within 5 ° of the horizontal unless the burner is automatically extinguished.

NOTE: This is to discourage misuse as a cooking appliance.

5.8.2 Fixed appliances

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

5.8.3 Mobility devices

Appliances incorporating wheels or castors shall have means to prevent accidental movement when in use. Wheels and castors shall be sufficiently robust to support the weight of the appliance and any full gas cylinder.

5.9 Taps and controls

5.9.1 General

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

Fixed appliances that incorporate only a flame supervision device shall be supplied with a service cock as part of the inlet connection.

Ⓐ) When a flame supervision device, multifunctional control, automatic shut-off valve or thermostat falls within the scope of EN 125, EN 126, or EN 257, the requirements of the relevant standard shall be met. Ⓐ)

Gas controls fitted to mobile and portable appliances shall not incorporate a position capable of completely closing the gas supply.

Catalytic appliances which employ a flame for ignition shall be so constructed that after any pre-heat period it is not possible to select the pre-heat position without continuous manual operation.

Taps 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 external clogging. Their manipulation shall remain easy during and after the test described in **6.25.2**.

All parts of a control shall be clean (e.g. free from swarf).

A1 Taps shall be mounted in such a way that no accidental movement relative to the gas supply connection is possible. Taps shall be replaceable. **A1**

It shall be possible to dismantle the parts of a tap as far as necessary for its maintenance.

The valves and adjusters shall be designed and fitted in such a manner as to cut out the gas supply before an unsafe situation occurs.

5.9.2 Plug type taps

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

5.9.3 Needle type taps

A needle type tap shall not be capable of closing the gas flow to a burner below a pre-set minimum.

It shall not be possible to unscrew the needle from its housing when opening the valve. When closing the pressure of the needle on its seat constitutes the stop.

5.9.4 Multifunctional controls

Any multifunctional control shall comply with the requirements of EN 126.

5.9.5 Thermostats

Any integral mechanical thermostat shall comply with the requirements of EN 257.

5.10 Control handles, knobs and push buttons

The closed, open and any reduced rate positions shall be marked in a visible and durable fashion.

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

If the 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 which 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.

5.11 Injectors

Injectors shall be removable.

Injectors shall carry an indelible means of identification, preferably the diameter of the orifice expressed in hundredths of a millimetre.

Adjustable injectors shall not be used.

5.12 Ignition devices

Where an ignition device exists, it shall ensure rapid and safe ignition.

Where the ignition device incorporates a repetitive high voltage generator that provides more than 20 sparks at each output during a three second energization period, all the high voltage outputs shall be regarded as electrically live and suitable protection against electric shock equivalent to that given in EN 60335-1 and EN 50165 shall be provided.

All the components of the ignition device shall be designed to avoid damage or accidental displacement in use. The relative positions of the ignition device and the burner shall be sufficiently well defined to ensure satisfactory operation of the assembly.

It shall be possible to light any pilot with an external source of ignition.

5.13 Safety devices

All safety devices shall be designed and fitted in such a manner as to cut out the gas supply before an unsafe situation occurs.

A₁ Diffusive catalytic combustion heaters shall either be fitted with a low bed temperature cut off device or an atmospheric sensing device. The devices shall carry a permanent mark of identification. **A₁**

5.13.1 Flame supervision devices

5.13.1.1 General

Flame supervision devices shall comply with the requirements of EN 125. A flame supervision device shall be fitted to all appliances, and its operation shall not be over-ridden by the thermostat or any other gas control fitted. It shall be so mounted as to ensure satisfactory performance. The sensing element of a flame supervision device shall supervise a single burner only.

The appliance shall not incorporate any device that allows the flame supervision device to be over-ridden. However, during the lighting operation, a temporary supply of gas, in the absence of flame, is allowed under the conditions described in 6.13.1.2.

5.13.1.2 Ignition opening time and extinction delay time

Under the conditions of test described in 6.13.1.2 ignition opening time shall not exceed 20 s where there is continuous manual intervention by the user; if there is no continuous manual intervention, the ignition opening time may be increased to 45 s. The extinction delay time shall not exceed 60 s.

5.13.2 Low bed temperature cut-off device

A1 Text deleted **A1**

The slip of gas at 110 % of the cut off rate shall not exceed 0,075.

The appliance shall not incorporate any device that allows the low bed temperature device to be permanently over-ridden, unless it requires continued manual operation.

5.13.3 Atmosphere sensing device

A1 With the exception of diffusive catalytic combustion heaters, or appliances intended specifically for outdoor use, all appliances shall be fitted with an atmosphere sensing device. They shall carry a permanent mark of identification. **A1**

When the appliance is tested in the hot condition in accordance with the method given in 6.13.3 the atmosphere sensing device shall cause shut off of the main gas supply when the CO₂ content of the atmosphere lies between 0,8 % and 1,5 %.

Where the pilot 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 these functions.

A1 5.13.4 Clause deleted **A1**