



BSI Standards Publication

Independent closed-fronted gas-fired type B11, type C11, type C31 and type C91 heaters

National foreword

This British Standard is the UK implementation of EN 613:2021. It supersedes BS EN 613:2001, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GSE/36, Independent gas-fired space heaters.

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

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

© The British Standards Institution 2022
Published by BSI Standards Limited 2022

ISBN 978 0 580 52466 0

ICS 97.100.20

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2022.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

English Version

Independent closed-fronted gas-fired type B11, type C11, type C31 and type C91 heaters

Appareils de chauffage indépendants à foyer fermé
utilisant les combustibles gazeux de types B11, C11,
C31 et C91

Konvektions-Raumheizer für gasförmige Brennstoffe
der Geräte Art B11, Art C11, Art C31 und Art C91

This European Standard was approved by CEN on 12 April 2021.

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-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword.....	4
1 Scope	6
2 Normative references	6
3 Terms and definitions	8
3.1 Independent gas-fired heaters	8
3.2 Appliance construction	8
3.3 Appliance performance	12
4 Classification of appliances	13
4.1 Classification according to the nature of the gases used (categories)	13
4.2 Classification according to the method of evacuation of the products of combustion	14
5 Constructional requirements	15
5.1 General	15
5.2 Adjusting, control and safety devices	20
5.3 Ignition devices	23
5.4 Flame supervision systems	23
5.5 Burners	24
5.6 Gas pressure test points	24
6 Operational requirements	24
6.1 Soundness of the gas circuit and combustion products circuit, and evacuation of the combustion products	24
6.2 Heat inputs	25
6.3 Temperature of various parts of the appliance	25
6.4 Ignition, cross-lighting and flame stability	26
6.5 Pressure regulators	27
6.6 Combustion	27
6.7 Sooting (live fuel effect gas-fired heaters only)	28
6.8 Spillage monitoring system	28
6.9 Flame supervision device	29
6.10 Efficiency	30
7 Test methods	30
7.1 General	30
7.2 Soundness of the gas circuit and combustion products circuit and evacuation of the combustion products	33
7.3 Heat inputs	34
7.4 Temperature of various parts of the appliance	36
7.5 Ignition, cross-lighting and flame stability	38
7.6 Pressure regulators	42
7.7 Combustion	43
7.8 Sooting (live fuel effect gas-fired heaters only)	47
7.9 Spillage monitoring system	48
7.10 Flame supervision device	50
7.11 Efficiency	51
8 Marking and instructions	53
8.1 Marking	53

8.2 Instructions.....	56
Annex A (normative) Hood test method (type B appliances)	71
Annex B (informative) Gas designations in force in the various EU countries.....	75
Annex C (normative) Apparatus for the determination of the smoke number.....	77
Annex D (informative) Symbols and abbreviations	78
Annex E (normative) Calculation of conversions of NO_x.....	79
Annex F (normative) Arrangement for measuring the leakage rate.....	80
Annex G (normative) Special national conditions	81
Bibliography	82

European foreword

This document (EN 613:2021) 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 June 2022, and conflicting national standards shall be withdrawn at the latest by June 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 613:2000.

The main changes compared to EN 613:2000 are the following:

- Clause 1 – the Scope has been extended to cover type C₃₁ and type C₉₁ appliances;
- Clause 3.2 – all terms and definitions related to gas in EN 613:2000, cl. 3.2, have been deleted and replaced by reference to EN 437;
- EN 613:2000, Clauses 3.4 and 3.5 – have been deleted;
- EN 613:2000, Clause 3.6 – has been deleted;
- Clause 4.1 – original replaced by reference to EN 437;
- Clause 4.2 – classification extended to type C₃₁ and type C₉₁ appliances;
- EN 613:2000, Clauses 5.1.1.4, 5.2.7 and 5.6 – have been deleted;
- Clauses 7.1.1 and 7.1.2 – original replaced by reference to EN 437;
- Clause 6.2.2.2 and 7.2.2.2 – have been extended to cover type C₃₁ and type C₉₁ appliances;
- Clause 6.5.2.3 and 7.5.4 – have been extended to cover type C₃₁ and type C₉₁ appliances;
- Clause 7.1.5.3 – has been extended to cover type C₃₁ and type C₉₁ appliances;
- Clause 7.5.2 – has been extended to cover type C₃₁ and type C₉₁ appliances
- Clause 7.7.1.2 and 7.7.3.3 – have been extended to cover type C₃₁ and type C₉₁ appliances;
- Clause 7.11.1.3 – has been extended to cover type C₃₁ and type C₉₁ appliances;
- EN 613:2000, Annexes A, B, F and L – have been deleted;
- Annex G – new Annex to cover arrangement for measuring the leakage rate.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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

1 Scope

This document specifies the requirements and test methods for the construction, safety, marking and rational use of energy.

This document is applicable to types B_{11AS}, B_{11BS}, B_{11CS}, C₁₁, C₃₁ and C₉₁ appliances (see 4.2) and those that:

- are closed-fronted;
- incorporate a natural draught burner;
- are connected directly to an open flue or to a device to evacuate the products of combustion (open-flued appliances, balanced-flued appliances);
- are wall mounted, free-standing or built-in;
- have a nominal heat input not exceeding 20 kW (based on the net calorific value).

This document is not applicable to:

- open fronted appliances as specified in EN 13278:2013;
- decorative fuel effect appliances as specified in EN 509:1999/A1:2003;
- catalytic combustion appliances;
- appliances in which the supply of combustion air and/or evacuation of products of combustion is achieved by mechanical means as specified in EN 1266:2002;
- ducted-air appliances;
- appliances installed by means of a closure plate (see 3.3.3.3).

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 documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 88-1:2011+A1:2016, *Pressure governors for gas appliances for inlet pressure up to 200 mbar*

EN 125:2010+A1:2015, *Flame supervision devices for gas burning appliances — Thermoelectric flame supervision devices*

EN 126:2012, *Multifunctional controls for gas burning appliances*

EN 161:2011+A3:2013, *Automatic shut-off valves for gas burners and gas appliances*

EN 257:2010, *Mechanical thermostats for gas-burning appliances*

EN 298:2012, *Automatic burner control systems for burners and appliances burning gaseous or liquid fuels*

EN 437:2021, *Test gases — Test pressures — Appliance categories*

EN 751-1:1996, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 1: Anaerobic jointing compounds*

EN 751-2:1996, *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 10226-1:2004, *Pipe threads where pressure tight joints are made on the threads — Part 1: Taper external threads and parallel internal threads — Dimensions, tolerances and designation*

EN 10226-2:2005, *Pipe threads where pressure tight joints are made on the threads — Part 2: Taper external threads and taper internal threads — Dimensions, tolerances and designation*

EN 1106:2010, *Manually operated taps for gas burning appliances*

EN 10305-1:2016, *Steel tubes for precision applications — Technical delivery conditions — Part 1: Seamless cold drawn tubes*

EN 23166:1993, *Codes for the representation of names of countries (ISO 3166:1993)*

EN ISO 3166-1:2020, *Codes for the representation of names of countries and their subdivisions — Part 1: Country Codes (ISO 3166-1:2020)*

EN 60335-1:2012/A2:2019, *Household and similar electrical appliances — Part 1: Safety. General requirements*

EN 60335-2-102:2016, *Household and similar electrical appliances — Safety — Part 2-102: Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections*

EN 60529:1991/A2:2013, *Degrees of protection provided by enclosures (IP code)*

EN IEC 60730-2-9:2019/A1:2019, *Automatic electrical controls — Part 2-9: Particular requirements for temperature sensing control*

EN 60730-1:2016, *Automatic electrical controls — Part 1: General requirements*

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

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)*

CR 1404:1994, *Determination of emissions from appliances burning gaseous fuels during type-testing*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 437 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 Independent gas-fired heaters

3.1.1

closed-fronted appliance

appliance which does not have exposed flames or exposed incandescent areas

Note 1 to entry: Access to the flame is prevented by a panel made of glass, metal or a suitable material.

Note 2 to entry: Type C1 and type C3 appliances are room-sealed appliances.

3.1.2

forced gas-fired heater

appliance that incorporates a fan and thus allows an acceleration of the circulation of the air in contact with the heating body

Note 1 to entry: Such an appliance is designed to discharge heated air directly into the room in which the appliance is installed.

3.1.3

live fuel effect gas-fired heater

appliance which has a visual flame effect

3.1.4

working surfaces

area of the appliance that generates and emits heat

Note 1 to entry: Examples of working surfaces include fire bricks, refractories, imitation fuel, fire fronts, fire baskets, burners, burner trays and bracketry.

3.1.5

convection fan

device to assist in the distribution of heated air

3.2 Appliance construction

3.2.1 The gas circuit

3.2.1.1

inlet connection

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

3.2.1.2**mechanical joint**

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

Note 1 to entry: For example the following:

- cone seat joints;
- flat joints;
- metal to metal joints.

3.2.1.3**gas circuit**

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

3.2.1.4**gas restrictor**

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

3.2.1.5**gas rate adjuster**

component intended to set the gas rate to each burner at a predetermined value according to the supply conditions

Note 1 to entry: The adjustment can be progressive (screw adjuster) or discontinuous (changing restrictors).

Note 2 to entry: The adjuster of an adjustable governor is regarded as a gas rate adjuster.

Note 3 to entry: The action of setting this device is called 'setting the gas rate'.

3.2.1.6**gas rate control**

component allowing the user to open or close the gas supply to one or more burners

Note 1 to entry: It may also be used to adjust the gas rate of certain burners to a predetermined value, called the 'reduced rate'. This device can be a 'tap'.

3.2.1.7**injector**

component that admits the gas into a burner, where the section of the outlet orifice is fixed

3.2.1.8**start gas**

initial quantity of gas ignited to give a flame which is used to ignite the main burner

Note 1 to entry: It can be discharged through a separate ignition burner or part of the main burner.

3.2.2 Burner**3.2.2.1****main burner**

burner that provides the primary thermal function of the appliance

3.2.2.2

pilot burner

burner intended to light the main burner and that supplements the main burner in providing a thermal function of the appliance

3.2.2.2.1

permanent pilot

pilot burner that operates continuously throughout the whole period that the appliance is in use, independent of the main burner, and has to be extinguished by manual intervention

3.2.2.2.2

non-permanent pilot

pilot burner that is extinguished automatically when there is no heat demand

3.2.2.2.3

fixed primary aeration restrictor

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

3.2.3 Combustion products circuit

3.2.3.1

flue outlet

part of a type B appliance that connects with a flue to evacuate the products of combustion

3.2.3.2

draught diverter

device placed in the combustion product's circuit to reduce the influence of flue-pull and to minimize the effect of down-draught on the burner flame stability and combustion

3.2.3.3

closure plate

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

Note 1 to entry: This plate contains an aperture through which the flue outlet spigot of the appliance projects into the cavity of the builder's opening, or fireplace recess, but is not connected to the flue.

Note 2 to entry: The plate can be a separate component, or an integral part of the appliance, e.g. the back panel, but in either case it is to be considered as part of the appliance.

3.2.3.4

builder's opening

enclosure constructed to accommodate fireplace components

3.2.3.5

fireplace opening

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

3.2.3.6

fireplace recess

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

3.2.4 Auxiliary equipment

3.2.4.1

pressure governor

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

3.2.4.2

ignition device

device that ignites one or more burners

3.2.4.3

flame supervision device

device that senses the absence or presence of a flame

3.2.4.4

combustion products discharge safety device

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

3.2.4.5

atmosphere sensing device

device that reacts to the lack of oxygen in the surrounding atmosphere

3.2.4.6

control knob

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

3.2.4.7

programming unit

unit which reacts to signals from control and safety devices, gives control commands, controls the start-up sequence, supervises the burner operation and causes controlled shut-down, and if necessary safety shut-down and lock-out

Note 1 to entry: The programming unit follows a predetermined sequence of actions and always operates in conjunction with a flame detector device.

3.2.4.8

flame detector device

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

Note 1 to entry: It can consist of a flame sensor, an amplifier and a relay for signal transmission. These parts, with the possible exception of the actual flame sensor, may be assembled in a single housing for use in conjunction with a programming unit.

3.2.4.9

automatic burner system

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

3.2.4.10

restart interlock

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

3.3 Appliance performance

3.3.1 Gas rates

3.3.1.1

nominal heat input

Q_n

value of the heat input declared in the technical specification

Note 1 to entry: Unit: kilowatt (kW).

3.3.2 Gas combustion

3.3.2.1

flame stability

state of the flames resting in a stable manner on the burner ports or the flame contact area provided by the design with no flame lift or light-back

3.3.2.2

flame lift

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

3.3.2.3

light-back

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

3.3.2.4

light-back at the injector

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

3.3.2.5

sooting

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

3.3.2.6

yellow tipping

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

3.3.3

safety time

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

3.3.4**extinction delay time**

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

3.3.5**ignition delay time**

time that elapses between ignition of the supervised flame and the moment when the closure element is held open by the flame signal

Note 1 to entry: This applies to a thermoelectric flame supervision device.

3.3.6**thermal equilibrium**

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

3.3.7**controlled shutdown**

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

3.3.8**safety shutdown**

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

3.3.9**non-volatile lockout**

shutdown condition so that a start can only be accomplished by a manual reset

3.3.10**volatile lockout**

shutdown condition so that a start can be accomplished by restoration of the electrical supply after its loss

3.3.11**smoke number**

qualitative scale of the soot emission

4 Classification of appliances**4.1 Classification according to the nature of the gases used (categories)****4.1.1 Classification of gases**

Gases are classified into three families, possibly divided into groups as a function of the Wobbe index in accordance with the values given in EN 437:2021, Table 1.

4.1.2 Appliance categories

Appliance are classified into categories defined according to the gases and the pressures for which they are designed as given in EN 437:2021, 6.1.

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

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

- Type B: An appliance intended to be connected to a flue which evacuates the products of combustion to the outside of the room containing the appliance. The combustion air is drawn directly from the room.
- Type B₁: A type B appliance incorporating a draught diverter.
- For the purposes of this standard a type B₁ appliance is an appliance that is connected directly or by means of an adaptor to a flue.
- Type B₁₁: A natural draught type B₁ appliance designed for a natural draught flue, which includes Type B_{11AS}, Type B_{11BS} and Type B_{11CS} appliances.
- Type B_{11AS}: A type B₁₁ appliance fitted with an atmospheric sensing device to prevent the release of combustion products in a dangerous quantity into the room under abnormal draught conditions.
- Type B_{11BS}: A type B₁₁ appliance fitted with a combustion products discharge safety device to prevent the release of combustion products in dangerous quantities into the room under abnormal draught conditions.
- Type B_{11CS}: A type B₁₁ appliance not fitted with an atmosphere sensing device or combustion products discharge safety device, but is constructed to prevent the release of combustion products in dangerous quantities into the room under abnormal draught conditions.
- Type C: An appliance in which the combustion circuit (air supply, combustion chamber, heat exchanger, and evacuation of the combustion products) is sealed with respect to the room in which the appliance is installed.
- Type C₁: A type C appliance that is designed for connection via its ducts to its horizontal terminal, which at the same time admits fresh air to the burner and discharges the products of combustion to the outside through orifices which are either concentric or close enough together to come under the same wind conditions.
- Type C₁₁: A natural draught type C₁ appliance.
- Type C₃: A type C appliance that is designed for connection via its ducts to a vertical terminal, which at the same time admits fresh air to the burner and discharges the products of combustion to the outside through orifices that are either concentric or close enough together to come under the same wind conditions.
- Type C₃₁: A natural draught type C₃ appliance.
- Type C₉: A type C appliance that is designed for connection via its flue duct to a vertical terminal and via its inlet duct to an existing vertical duct. The terminal at the same time admits fresh air to the burner and discharges the products of combustion to the outside through orifices that are either concentric or close enough to come under similar wind conditions.
- Type C₉₁: A natural draught type C₉ appliance.

5 Constructional requirements

5.1 General

5.1.1 Conversion to different gases

5.1.1.1 General

In accordance with the categories (see 4.1), the only acceptable modifications and/or adjustments when converting from a gas of one group or family to another group or family and/or for adapting to a different gas distribution pressures, are given in 5.1.1.2 to 5.1.1.3 for each appliance category.

For type B_{11AS} appliances, when the operation of atmosphere sensing devices depends upon the characteristics of the gas (including pressure), a change of the complete atmosphere sensing device is required when converting from a gas of one family to a gas of another family, or from one pressure or pressure couple to another within the third family, if this is specified in the instructions for installation, use and servicing.

5.1.1.2 Category I

- Categories I_{2H}, I_{2L}, I_{2E}, I_{2E+}: Modification and/or adjustment of the appliance is not applicable.
- Category I₃₊: No modification and/or adjustment of the appliance except for replacement of the injectors or restrictors in order to convert from one pressure couple to another (e.g. 28 mbar to 30 mbar/37 mbar < = > 50 mbar/67 mbar). Exchange of fixed primary aeration restrictor when changing from one pressure couple to another or from one pressure to another within a pressure couple is permitted.
- Category I_{3P}, I_{3B/P}: No modification and/or adjustment of the appliance with respect to a change of gas. For a change of pressure range, replacement of injectors, and adjustment of gas rates and exchange of fixed primary aeration restrictor is permitted.

5.1.1.3 Category II

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

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

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

If the appliance is intended to function without an operational governor for use with gases of the second family, it is obligatory to put the governor out of service in these circumstances (see 5.2.6).

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

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

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

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

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

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

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

- 1) 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 $\leq$ $>$ 50 mbar/67 mbar).
- 2) 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 the materials used in the construction of the appliance, and the method of assembling the various parts, shall be such that the constructional, functional and operational characteristics do not alter during a reasonable life under normal conditions of installation, use and maintenance. This includes the gas carrying components which shall be of metallic or non-metallic material but suitable for the type of gas for which the appliance is approved, this includes the gas carrying and flue carrying components.

When the appliance is installed according to the instructions for installation, use and servicing and national installation requirements, all components shall withstand the mechanical, chemical and thermal conditions to which they might be subjected during 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.

Asbestos or materials containing asbestos shall not be used.

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 cannot drip outside of the appliance.

5.1.3 Accessibility for use and maintenance

Any control placed in the gas circuit shall be arranged so that it can be adjusted, maintained or exchanged.

Removable parts shall be so designed or marked that they are easy to reassemble correctly in accordance with the instructions for installation, use and servicing and difficult to reassemble incorrectly. Removable parts shall be so designed or marked that they are easy to reassemble correctly in accordance with the instructions for installation, use and servicing 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 instructions for installation, use and servicing, without the aid of a tool.

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

For a type C₁₁, C₃₁ and C₉₁ appliances, the soundness of the combustion circuit shall be maintained after reassembly and, if required, after replacing the sealing gasket following cleaning or maintenance operations.

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

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 the above 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 servicing (see 8.2.2).

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

5.1.4 Connections

5.1.4.1 Appliance inlet connection

The appliance inlet connection shall conform to the soundness requirements specified in 6.1.1.

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

- a) a thread conforming to EN 10226-1:2004. In this case the end of the gas inlet connection shall have a flat annular surface at least 3 mm wide for thread sizes 1/2" and 3/8" and at least 2,5 mm wide for thread size 1/4", to allow the interposition of a sealing washer. When the end of the gas inlet connection has a thread of nominal size 1/2", it shall be possible to insert a gauge of 12,3 mm diameter to a depth of at least 4 mm;
- b) a thread conforming to ISO 7-1:1994 and EN ISO 228-1:2003;
- c) a compression fitting with dimensions compatible with the steel tube dimensions conforming to EN 10305-1:2016;
- 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 seat union.

Other connections are possible if the soundness requirements of 6.1.1 are met.

5.1.4.2 Access to the inlet connection

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

5.1.5 Soundness of the gas circuit

The joints, sealing compounds and sealing materials used in the construction of the appliance, and the method 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. This includes the gas carrying components. Sealing materials for metallic threaded joints in gas circuit shall be in accordance with EN 751-1:1996 (for anaerobic jointing compounds) or EN 751-2:1996 Class B (for non-hardening jointing compounds) for the threads in compliance with EN 10226-1:2004 (Threaded joints using taper external threads and parallel internal threads) (Threaded joints using taper external threads and taper internal threads) and EN 10226-2:2005 (Threaded joints using taper external threads and taper internal threads).

Holes for screws, studs, etc., intended for the assembly of components shall not open into the gasways.

Brackets for supporting components shall not be interposed in any gas-carrying joints.

The soundness of components and assemblies connected to the gas circuit and likely to be dismantled for routine maintenance at the consumer's premises, with the exception of taps and cocks, shall be ensured by means of mechanical joints, e.g. metal to metal joints, O-ring joints or packing, but excluding the use of any sealing compound such as tape, mastic or paste. Sealing compounds may be used for permanent threaded assemblies and injectors and grease for taps and cocks. The sealing material shall remain effective under normal conditions of appliance use.

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

The soundness of the gas circuit shall conform to 6.1.1.

5.1.6 Soundness of the combustion circuit

5.1.6.1 Type B₁ appliances

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

Parts which can be removed for routine maintenance shall be so designed and arranged that soundness is ensured after reassembly.

5.1.6.2 Type C₁₁, C₃₁ and C₉₁ appliances

The soundness of the heating body and of the connection of an appliance to the combustion air inlet and the products outlet ducts shall be effected by mechanical means only.

However, those parts of the assembly which do not require to be dismantled for routine maintenance may be joined with mastic or paste in such a way that permanent soundness is ensured under normal conditions of use.

The construction of the whole assembly shall ensure soundness in relation to the room in which an appliance is installed.

Parts which can be removed for routine maintenance shall be so designed and arranged that soundness is ensured after reassembly.

5.1.6.3 Built-in appliances

If an appliance is supplied in several sub-groups which have to be assembled on installation, it shall be possible to carry out this operation without ambiguity when assembling in accordance with the instructions for installation, use and servicing. If a special tool is required it shall be supplied by the manufacturer.

Any components or materials necessary to assemble these sub-groups shall be supplied by the manufacturer.

5.1.7 Supply of combustion air and evacuation of combustion products

5.1.7.1 General

The appliance shall include the whole of the combustion circuit, from the entry of the combustion air to the appliance to the combustion products outlet.

5.1.7.2 Type B₁ appliances

A type B₁ appliance shall have, as an integral part of the appliance, a draught-diverter.

The flue socket shall be female with a circular terminal section, and allow connection, if necessary by means of an adapting piece supplied with the appliance, to a flue pipe of a diameter which meets the requirements in force in the country where the appliance is to be installed.

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

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

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

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

The appliance shall be constructed to prevent the release of combustion products in a dangerous quantity into the room under abnormal draught conditions (see 6.8).

5.1.7.3 Type C₁₁, C₃₁ and C₉₁ appliances

The external surfaces of the terminal shall not have openings that allow the insertion of a 16 mm diameter ball into the ducts.

It shall not be possible to directly see the burner and ignition burner flames through the terminal.

Any accessories (e.g. wall liner, terminal guard etc.) shall be specified in instructions for installation, use and servicing or supplied with the appliance.

The flue duct assembly instructions shall be provided with the appliance. The terminal and ducts for the entry of combustion air and evacuation of combustion products need not be supplied if the instructions for installation, use and servicing give the specifications of the ducts.

5.1.8 Electrical equipment

The electrical equipment of the appliance shall be so designed and constructed as to obviate hazards of an electrical origin. The appliance shall comply to the requirements of EN 60335-2-102:2016 which covers such hazards.

If the appliance is fitted with electronic components or electronic systems providing a safety function, these shall comply with the relevant requirements of EN 298:2012 with regard to electromagnetic compatibility immunity levels.

If the electrical protection of the appliance is specified on the data plate, this specification shall conform to EN 60529:1991/A2:2013 to give the degree of personal protection against contact with dangerous electrical components.

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

5.1.9.1 Interruption and restoration

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 either safety shutdown, or, the appliance shall comply to 6.4.2.3.

5.1.9.2 Fluctuation

The appliance is deemed to be safe in the event of normal and abnormal fluctuation of the mains voltage supply by carrying out the test 7.7.3.1 and complying with the requirements of 6.4.2.3 and 6.6.1 b).

5.1.10 Confirmation of operation

The user shall be able at all times to ensure visually that the appliance is in operation.

In all appliances where mirrors are used, they shall retain their optical properties.

Where the operator is unable to see the main burner, there shall be an indirect means of signalling (e.g. control lamp). 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

Any multifunctional control shall comply with EN 126:2012.

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 or marked such that any unauthorized adjustment is obvious.

NOTE Paint can be used for indicating whether any unauthorized adjustments have been made, providing that it withstands the temperature to which it is subjected during normal operation of the appliance.

5.2.2 Gas rate adjusters

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

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

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

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

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

For appliances in category II_{2H3+} having an adjuster which is the governor adjusting screw (see 3.2.1.5), it shall be possible to put this device out of service when these appliances are supplied with a third family gas, and the same applies for appliances in category II_{1a2H} when they are supplied with a second family gas. For appliances in category II_{2E+3P} having a gas rate adjuster, it shall be possible to put these devices out of service fully or partially (see 5.2.6) 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 adjuster

An aeration adjuster shall be set and sealed.

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.

The gas line shall be fitted with either a thermoelectric device according to EN 125:2010+A1:2015 or a valve of class A, B or C according to EN 161:2011+A3:2013 to shut off the gas supply to the main burner and ignition burner, if any.

Appliances shall have, in addition, a second valve.

5.2.4.2 Manual valve system

Manual valves shall comply with EN 1106:2010 or EN 126:2012 as appropriate.

For a manual valve system the second valve may be combined with the first valve to make a single device which incorporates a gas tap and a flame supervision device.

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.

5.2.4.3 Automatic valve systems

Any electrically operated automatic shut-off valve shall conform to EN 161:2011+A3:2013.

5.2.4.4 Control knob

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

The “off” position on a tap shall be marked indelibly and clearly, as a disc. Other positions shall be marked accordingly.

5.2.5 Flame supervision devices

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

Heat sensitive flame supervision devices of the thermoelectric type shall conform to EN 125:2010+A1:2015.

In the event of the failure of the means of sensing, the appliance shall be safe.

5.2.6 Pressure regulators

Pressure regulators shall conform to EN 88-1:2011+A1:2016.

An appliance in category I3+ shall not have a pressure regulator,

The pressure of appliances of category I_{2E+}, and all other categories which have the index “E+”, shall not be governed.

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 governor, if any, out of service when using third family gases. For appliances in categories II_{2E+3+} and II_{2E+3P}, it shall be possible to put the pressure governor partially out of service when 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 and Overheat Limit devices

Any mechanical thermostat shall conform to EN 257:2010.

Any electrical thermostat shall conform to EN IEC 60730-2-9:2019/A1:2019.

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

Regulating and overheat limit devices shall conform to EN 257:2010 if mechanical, EN 60730-1:2016: if electrical selecting, at least, type 1 for regulating devices and type 2 (2.A, 2.D, 2.E, 2.F, 2.H, 2.J, 2.K, 2.L, 2.Y for overheating limit devices or shall be a component of a multifunctional control according to EN 126:2012.

The sensing elements of regulating and overheat limit devices shall be arranged and protected so as to minimize the risk of damage in normal conditions of use.

In all cases, the action of the overheat limit device has priority.

Safety devices may act on the same sensing element as the flame supervision device.

5.2.8 Spillage monitoring system

Appliances shall be so constructed that in abnormal draught conditions there is no release of combustion products in a dangerous quantity into the room concerned (see 6.8).

Any safety device used for this purpose shall:

- not have any adjustment other than that made and sealed during manufacture;
- be so designed that it cannot be removed or dismantled without the use of a tool;

- have electrical insulation that will withstand the thermal and chemical stresses resulting from spillage of the combustion products;
- be designed such that interruption of any link between the sensor and the device shall cause safety shutdown, if necessary after a waiting time.

5.2.9 Manually operated devices

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

5.3 Ignition devices

5.3.1 Direct ignition of the main burner

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

- incorporate an automatic ignition system; or
- have a heat input less than or equal to 4 kW during the ignition procedure.

5.3.2 Ignition burner

The heat input of the ignition burner shall not exceed 0,3 kW.

The ignition burner shall be so positioned that its products of combustion are evacuated with those of the burner. The position of the ignition burner shall be fixed relative to that of the burner.

If the ignition burner(s) differ(s) according to the nature of the gas used it (they) shall be marked, and easily replaced. This requirement applies to parts of ignition burners, e.g. their injectors, if it is necessary to change only those parts.

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

Where the ignition burner rate is ungoverned, a means of adjusting the gas rate is mandatory for an appliance using first family gases, optional on second family gases, and forbidden on third family gases. However, this is optional for first family gases when, at a pressure of 15 mbar, the heat input of the ignition burner is less than 0,17 kW with the reference gas.

The adjuster may be omitted if the ignition burner and/or injector can be easily changed to suit the gas used.

For a type B₁ appliance, it shall be easy to ignite the ignition burner with a match unless a special device is provided for igniting the ignition burner.

Type C₁₁, C₃₁ and C₉₁ appliances shall be provided with an integral ignition device. It shall be possible to ignite the ignition burner of such an appliance with the combustion chamber closed.

5.4 Flame supervision systems

5.4.1 Appliances with automatic burner systems

If an appliance is fitted with an automatic burner control system, it shall conform to EN 298:2012.

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

The safety time shall be specified (see 6.9.2.2).

Upon flame failure during the running condition the flame supervision device shall cause non-volatile lock-out, except in the case of appliances with direct ignition of the main burner, in which case:

- a) spark restoration within 1 s is allowable or;
- b) a single restart attempt is allowed within 10 s.

In the event that re-ignition is unsuccessful during either of these periods non-volatile lock-out shall occur.

5.5 Burners

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 instructions for installation, use and servicing shall be possible with 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.

5.6 Gas pressure test points

A pressure test point shall be provided on the appliance for measurement of the manufacturer's stated pressure which can be found on the data plate and in the instructions for installation and adjustment. An uncontrolled appliance shall have one pressure test point and a controlled appliance shall have two pressure test points, one to measure the appliance inlet pressure and another upstream of the burner.

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 test point hole diameter shall not be greater than 1 mm at its narrowest point.

6 Operational requirements

6.1 Soundness of the gas circuit and combustion products circuit, and evacuation of the combustion products

6.1.1 Soundness of the gas circuit

The gas circuit shall be sound. It is deemed to be sound if, when tested as described in 7.2.1, the leakage of air does not exceed 100 cm³/h irrespective of the number of components, whether mounted in series or parallel on the appliance.

6.1.2 Soundness of the combustion products circuit and evacuation of the combustion products

6.1.2.1 Type B₁ appliances

Soundness for the combustion products circuit shall meet one of the following requirements.

When the appliance is tested as described in 7.2.2.1, the leakage of the combustion products circuit shall not exceed 0,04 m³/h per kW of heat input.

6.1.2.2 Type C₁₁, C₃₁ and C₉₁ appliances

When the appliance is tested as described in 7.2.2.2, the leakage of compressed air shall not exceed the following:

- a) for appliances less than or equal to 12 kW heat input, 0,25 m³/h per kW of heat input;