



BSI Standards Publication

Decorative fuel-effect gas appliances

National foreword

This British Standard is the UK implementation of EN 509:2024. It supersedes BS EN 509:2000, which is withdrawn.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 2024
Published by BSI Standards Limited 2024

ISBN 978 0 539 15711 6

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 October 2024.

Amendments/corrigenda issued since publication

Date	Text affected

English Version

Decorative fuel-effect gas appliances

Appareils à effet décoratif de combustion utilisant les
combustibles gazeux

Dekorative Gasgeräte mit Brennstoffeffekt

This European Standard was approved by CEN on 15 April 2024.

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, Türkiye 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.....		6
1	Scope	7
2	Normative references	7
3	Terms and definitions	8
3.1	Decorative fuel effect gas appliances	9
3.2	Appliance construction	9
3.2.1	The gas circuit	9
3.2.2	Burner	10
3.2.3	Combustion products circuit.....	11
3.2.4	Auxiliary equipment	11
3.3	Appliance performance	12
3.3.1	nominal heat input	12
3.3.2	Gas combustion.....	12
4	Classification.....	15
4.1	Gases and categories.....	15
4.1.1	Classification of gases	15
4.1.2	Appliance categories.....	15
4.2	Classification according to the method of evacuation of the products of combustion	15
5	Constructional requirements	16
5.1	General.....	16
5.1.1	Conversion to different gases	16
5.1.2	Materials and method of construction	17
5.1.3	Accessibility for use and maintenance	18
5.1.4	Connections.....	18
5.1.5	Soundness of the gas circuit	19
5.1.6	Spacing	19
5.1.7	Electrical equipment.....	19
5.1.8	Safety in the event of fluctuation, interruption and restoration of the auxiliary energy.....	19
5.2	Adjusting, control and safety devices	20
5.2.1	General.....	20
5.2.2	Gas rate adjusters	20
5.2.3	Flame picture adjuster	20
5.2.4	Manual controls	20
5.2.5	Pressure regulators.....	21
5.2.6	Multifunctional controls.....	22
5.2.7	Flame supervision devices.....	22
5.2.8	Shut-off valves	22
5.2.9	Automatic burner control systems	22
5.2.10	Atmosphere sensing device.....	23
5.3	Ignition devices.....	23
5.3.1	General.....	23
5.3.2	Ignition burners.....	23
5.4	Flame supervision systems.....	23
5.4.1	General.....	23

5.4.2	Appliances with automatic burner control systems	24
5.5	Ignition burner or start-gas flame establishment	24
5.5.1	Appliances with non-automatic burner systems	24
5.5.2	Appliances with automatic burner systems.....	24
5.6	Main flame establishment	24
5.6.1	General	24
5.6.2	Appliances with non-automatic burner systems	24
5.6.3	Appliances with automatic burner control systems	24
5.6.4	Direct establishment of the main flame	24
5.7	Burners.....	25
5.7.1	General	25
5.7.2	Pan burners	25
5.8	Gas pressure test points.....	25
6	Operational requirements	25
6.1	Soundness of the gas circuit and correct evacuation of combustion products	25
6.1.1	Soundness of the gas circuit.....	25
6.1.2	Correct evacuation of combustion products.....	25
6.1.3	Escape of unburnt gas from the burner.....	25
6.2	Heat inputs.....	26
6.2.1	Nominal heat input.....	26
6.2.2	Start gas heat input	26
6.2.3	Reduced rate.....	26
6.3	Temperature of various parts of the appliance and its surrounding area	26
6.3.1	Temperature of external parts of the appliance	26
6.3.2	Temperature of components.....	26
6.3.3	Floor temperatures.....	27
6.4	Ignition, cross-lighting and flame stability	27
6.4.1	Ignition and cross lighting.....	27
6.4.2	Flame stability	27
6.4.3	Effect of room draughts	27
6.4.4	Fluctuation of auxiliary energy	27
6.5	Pressure regulators	27
6.6	Combustion	28
6.6.1	CO concentration for all appliances	28
6.6.2	Supplementary tests under special conditions.....	28
6.6.3	Measurement of oxides of nitrogen, NO _x (all appliances)	28
6.7	Sooting.....	28
6.7.1	Cold condition	28
6.7.2	Hot condition.....	28
6.7.3	Long cycle	28
6.8	Atmosphere sensing device	29
6.9	Flame supervision device	29
6.9.1	Thermoelectric device	29
6.9.2	Automatic burner control system.....	29
7	Test methods.....	29
7.1	General	29
7.1.1	Characteristics of test gases: reference and limit gases	29
7.1.2	Conditions for preparation of the test gases.....	29
7.1.3	Practical application of test gases	29
7.1.4	Test pressures.....	30
7.1.5	General test conditions.....	32
7.2	Soundness of the gas circuit and correct evacuation of combustion products	38

7.2.1	Soundness of the gas circuit	38
7.2.2	Correct evacuation of combustion products	39
7.2.3	Escape of unburnt gas from the burner	39
7.3	Heat inputs	39
7.3.1	Nominal heat input.....	39
7.3.2	Calibrated injector rate of appliances without gas adjusters or where these adjusters are put out of action	41
7.3.3	Performance of gas rate adjusters for ungoverned appliances	41
7.3.4	Start-gas heat input	41
7.3.5	Reduced rate.....	41
7.4	Temperature of various parts of the appliance and its surroundings.....	42
7.4.1	General.....	42
7.4.2	Temperature of external surfaces	42
7.4.3	Temperature of components	42
7.4.4	Temperature of floor	42
7.5	Ignition, cross-lighting and flame stability	44
7.5.1	Ignition and cross-lighting.....	44
7.5.2	Flame stability	45
7.5.3	Effect of room draughts.....	46
7.6	Pressure regulators.....	46
7.6.1	Operational pressure regulator.....	46
7.6.2	Pressure regulator out of service	46
7.7	Combustion	47
7.7.1	General.....	47
7.7.2	Tests under limit conditions	48
7.7.3	Supplementary tests under special conditions	49
7.7.4	Measurement of oxides of nitrogen.....	49
7.8	Sooting.....	49
7.8.1	Apparatus for the determination of the smoke number.....	49
7.8.2	Determination of the smoke number	50
7.8.3	Test conditions.....	50
7.9	Atmosphere sensing device.....	51
7.9.1	General.....	51
7.9.2	Test method	53
7.10	Flame supervision device.....	53
7.10.1	Thermoelectric device.....	53
7.10.2	Automatic burner control systems	53
8	Marking and instructions.....	54
8.1	Marking.....	54
8.1.1	Marking of the appliance.....	54
8.1.2	Marking of the packaging	55
8.1.3	Utilization of symbols on the appliance and packaging	55
8.2	Instructions	57
8.2.1	Instructions for installation and adjustment.....	57
8.2.2	Instructions for use and servicing	58
8.2.3	Conversion instructions.....	60
Annex A	(normative) Additional and amended requirements for decorative fuel effect gas appliances not exceeding a net heat input of 20 kW designed to be installed under a non-combustible canopy	61
A.1	Scope	61
A.2	Normative references	61

A.3	Terms and definitions.....	62
A.4	Classification of appliances.....	62
A.5	Constructional requirements.....	62
A.6	Operational requirements	62
A.7	Test methods.....	63
Annex B (informative) Means of identification of the types of gas in force in the various countries		66
Annex C (informative) Special national conditions.....		68
C.1	General	68
C.2	Belgium.....	68
Annex D (informative) A-deviations.....		69
Annex E (normative) Calculation of conversions of NO _x		70
Annex F (normative) Additional requirements for decorative fuel effect gas appliances not exceeding a net heat input of 20 kW fitted with a combustion products discharge safety device without a canopy		71
F.1	Scope	71
F.2	Normative references	71
F.3	Definitions.....	71
F.4	Classification of appliances.....	71
F.5	Constructional requirements.....	71
F.6	Operational requirements	72
F.7	Test methods.....	72
F.8	Marking and instructions	74
Bibliography		75

European foreword

This document (EN 509:2024) 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 April 2025 and conflicting national standards shall be withdrawn at the latest by April 2025.

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 509:1999.

The main changes compared to EN 509:1999 are the following:

- Clause 1 - the Scope has been extended to cover Type B_{BS} appliances which are covered in a new Annex F;
- 3.2 - all terms and definitions related to gas in EN 509:1999, 3.2 have been deleted and replaced by reference to EN 437:2021;
- 3.4 and 3.5 have been deleted and the definitions, which were considered necessary, retained and included in 3.2 and 3.3 as appropriate;
- 3.6 has been deleted;
- 4.1 - original text has been replaced by reference to EN 437:2021;
- 4.2 - classification has been extended to type C₃₁ and type C₉₁ appliances;
- 5.1.1.4 has been deleted;
- 7.1.1 and 7.1.2 - original text has been replaced by reference to EN 437:2021;
- Annexes A, B, D and G have been deleted;
- Annex F has been added to cover Type B_{BS} appliances.

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 organizations 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, Türkiye and the United Kingdom.

1 Scope

This document specifies the requirements and test methods for the construction, safety, and marking of decorative fuel effect gas appliances not exceeding a nominal heat input of 20 kW (based on the net calorific value), thereafter referred to as appliances.

This document is applicable to appliances that are designed to simulate a solid fuel fire and incorporate a natural draught burner with or without an ignition burner, that uses one or more combustible gases of the three gas families at the pressures stated in EN 437:2021. The appliances are for decorative purposes only and are not heating appliances.

This document is applicable to type B_{AS}, as described in 4.2, decorative fuel effect gas appliances that are designed to be installed within a non-combustible builder's opening or a non-combustible fireplace recess.

NOTE 1 This document specifies special national conditions in Annex C for appliances of category I_{2E+}, marketed in Belgium.

NOTE 2 This document specifies special A-deviations in Annex D for appliances in Switzerland which require additional requirements for subclauses 6.6 and 6.7.

This document includes additional requirements for Type B_{BS} appliances which are specified in Annex F.

In addition, this document is applicable to decorative fuel-effect gas appliances that are designed to be installed under a non-combustible canopy which is independent or integral with a flue box, for which additional requirements are specified in Annex A.

The use of toxic gases is not covered.

This document is not applicable to:

- catalytic combustion appliances;
- appliances in which the supply of combustion air and/or the evacuation of products of combustion is achieved by mechanical means.

NOTE 3 Requirements concerning the rational use of energy have not been included in this document, because the appliances are for decorative purposes.

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 88-1:2022+A1:2023, *Safety and control devices for gas burners and gas burning appliances — Part 1: Pressure regulators for inlet pressures up to and including 50 kPa*

EN 125:2022, *Flame supervision devices for gas burning appliances — Thermoelectric flame supervision devices*

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

EN 161:2022, *Automatic shut-off valves for gas burners and gas appliances*

EN 298:2022, *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 1106:2022+A1:2023, *Manually operated taps for gas burning appliances*

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

EN 60335-1:2012,¹ *Household and similar electrical appliances — Safety — Part 1: General requirements (IEC 60335-1:2010)*

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 (IEC 60335-2-102:2004, IEC 60335-2-102:2004/A1:2008, IEC 60335-2-102:2004/A2:2012)*

EN 60529:1991,² *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

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

ISO 7-1:1994,³ *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 terms and definitions given in EN 437:2021 and the following apply.

ISO and IEC maintain terminology 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/>

¹ As impacted by EN 60335-1:2012/A11:2014, EN 60335-1:2012/A13:2017, EN 60335-1:2012/A1:2019, EN 60335-1:2012/A14:2019, EN 60335-1:2012/A2:2019 and EN 60335-1:2012/A15:2021.

² As impacted by EN 60529:1991/A1:2000 and EN 60529:1991/A2:2013/AC:2019-02.

³ As impacted by ISO 7-1:1994/Cor 1:2007.

3.1 Decorative fuel effect gas appliances

3.1.1

decorative fuel effect gas fire

appliance designed to simulate a solid fuel appliance for decorative purposes and intended to be installed so that the products of combustion pass unrestricted from the firebed to the chimney or flue

Note 1 to entry: A decorative fuel effect gas fire is illustrated in Figure 1.

3.1.2

working surface

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.

3.1.3

appliance guard

guard supplied integral with an appliance and intended to prevent direct contact with, or close approach to a heat source(s)

Note 1 to entry: An appliance guard is principally intended to reduce risk of accidental ignition of flammable materials; however, if personal contact occurs, it does not necessarily prevent a danger to the health and safety of persons exposed.

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 the 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 may be progressive (screw adjuster) or discontinuous (changing restrictors). The adjuster of an adjustable regulator is regarded as a gas rate adjuster.

Note 2 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

pan burner

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

3.2.2.3

pilot burner

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

3.2.2.3.1

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

3.2.2.3.2

non-permanent pilot

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

3.2.2.4

fixed primary aeration restrictor

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

3.2.2.5**flame picture adjuster**

device operated by the user to vary the flame picture

Note 1 to entry: This is achieved by varying the aeration between maximum and minimum values which are specified by the design of the appliance.

3.2.3 Combustion products circuit**3.2.3.1****builder's opening**

enclosure constructed to accommodate fireplace components

Note 1 to entry: See Figure 1.

3.2.3.2**fireplace opening**

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

Note 1 to entry: See Figure 1.

3.2.3.3**fireplace recess**

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

Note 1 to entry: See Figure 1.

3.2.3.4**hearth**

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

3.2.3.5**flue box**

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

3.2.3.6**canopy**

enclosure situated at the base of a flue system and which is permanently fixed above the appliance to facilitate the passage of the products of combustion into the flue

3.2.4 Auxiliary equipment**3.2.4.1****pressure regulator**

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

atmosphere sensing device

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

3.2.4.5

control knob

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

3.2.4.6

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.

3.2.4.7

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.

3.2.4.8

automatic burner control 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

3.2.4.9

non-automatic burner system

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

3.3 Appliance performance

3.3.1

nominal heat input

Q_n

value of the heat input declared in the technical specifications

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 danger of 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 a flame, or as particulate matter in the combustion products

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, the start gas valve or main gas valve, as applicable, being de-energized if the flame detector signals the absence of the 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**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

3.3.7**safety shutdown**

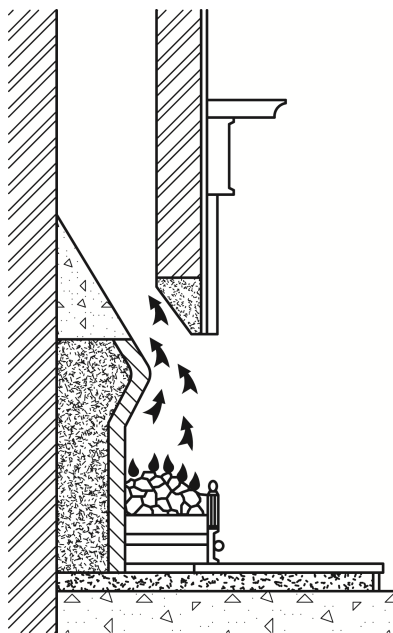
process which is initiated immediately in response to the signal from a limiting device or sensor and which causes any burner to shut down

3.3.8**non-volatile lock-out**

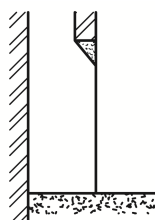
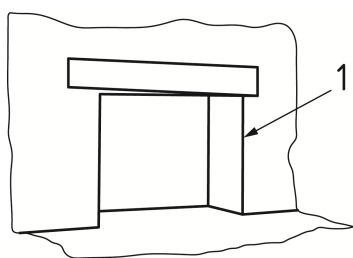
shut down condition so that a start can only be accomplished by a manual reset

3.3.9**volatile lock-out**

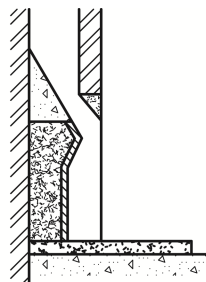
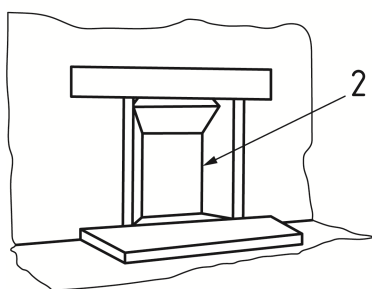
shut down condition so that a start can be accomplished by restoration of the electrical supply, after its loss



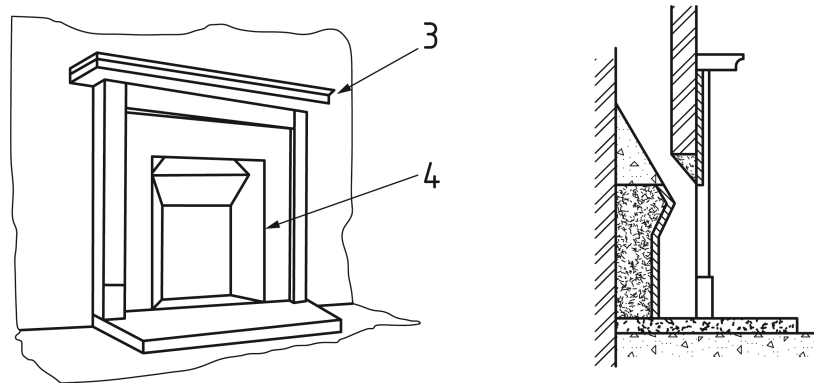
a) Decorative fuel-effect gas appliance



b) Builders opening



c) Fireplace recess



d) Fireplace opening

Key

- 1 builders opening
- 2 fireplace components
- 3 fire surround
- 4 fireplace opening

Figure 1 — Fireplace components for decorative fuel-effect gas appliance

4 Classification

4.1 Gases and categories

4.1.1 Classification of gases

Gases are classified into three families, possibly divided into groups and ranges in accordance with EN 437:2021.

4.1.2 Appliance categories

Appliances are classified into categories in accordance with EN 437:2021.

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 admission of the combustion air:

Type B: For the purposes of this document an appliance when installed beneath a flue within a builder's opening or fireplace recess, whereby all the products of combustion are evacuated by natural draught. The combustion air is drawn directly from the room.

Type B_{AS}: A Type B appliance fitted with an atmosphere sensing device to prevent the release of combustion products in a dangerous quantity into the room under abnormal draught conditions.

NOTE Classification of gas appliances according to the method of supplying combustion air and of evacuation of the combustion products is described in EN 1749:2020.

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 are given in 5.1.1.2 to 5.1.1.3 for each appliance category, when converting from a gas of one group or family to another group or family and/or for adapting to different distribution pressures.

For a type B_{AS} appliance, when the operation of the atmospheric sensing devices depends upon the characteristics of the gas (including pressure), the complete atmosphere sensing device shall be replaced 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}, and 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 regulator;
- b) replacement of burner assembly;
- c) replacement of complete ignition burners or some of their parts;
- d) exchange of fixed primary aeration restrictor.

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

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

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 only permitted when converting from a gas of one family to a gas of another family:

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

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

Gas rate adjusters shall be put out of service in accordance with requirements in 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 < = > 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 material but suitable for the type of gas relevant for the appliance.

Any elastomeric material used in the gas carrying components in contact with gaseous fuels shall be appropriate for the intended use in the appliance. Elastomeric materials in contact with 1st, 2nd, or 3rd family gases of temperature class E1 and hardness class H2 as defined in EN 549:2019+A2:2024 are suitable for all appliances.

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

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

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 the appliance.

5.1.3 Accessibility for use and maintenance

Any control placed in the gas circuit shall be so arranged 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, as explained in the instructions for installation, use and servicing, without the aid of a tool.

Removable parts shall be dismantable for maintenance using tools in common use, such as a screwdriver or a spanner.

Parts that are not intended to be removed by the user and that on removal may result in a hazard, e.g. injector jets, shall require the use of tools for their removal.

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

5.1.4 Connections

5.1.4.1 Appliance inlet connections

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

The appliance inlet 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 suitable 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-seated 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 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 Spacing

If, on installation, it is necessary to leave a gap between the back of the appliance and the back of the opening, suitable stops shall be incorporated on, or be supplied with, the appliance.

5.1.7 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 with 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 with the relevant requirements of EN 298:2022 with regard to electromagnetic compatibility immunity levels.

If the nature of the electrical protection of the appliance is indicated, compliance with EN 60529:1991² is required to give the degree of personal protection against contact with dangerous electrical components.

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

5.1.8.1 Interruption and restoration

If interruption of the electrical supply occurs, then 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 6.4.4.

5.1.8.2 Fluctuation

In the event of normal and abnormal fluctuation of the mains voltage supply the appliance is deemed to be safe when complying with the requirements of 6.4.4 and 6.6.1 b).

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 installer shall be sealed or marked such that any unauthorized adjustment is obvious.

Paint may 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} , I_{3+} , $II_{2H3B/P}$, II_{2H3+} , II_{2H3P} , II_{2L3P} , $II_{2L3B/P}$, $II_{2E3B/P}$ and II_{2E+3+} 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.

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

For appliances in categories II_{2H3+} having an adjuster which is the regulator 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 5.2.5) 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 Flame picture adjuster

If a flame picture adjuster is provided the appliance shall comply with 6.6.1 and 6.7 if adjusted in the position of minimum aeration. If adjusted in the position of maximum aeration the appliance shall comply with 6.4.2.

If the flame picture adjuster set to the position where spillage is most likely to occur, the appliance shall comply with 6.1.2.

5.2.4 Manual controls

5.2.4.1 General

The appliance shall be provided with the essential gas taps, push-buttons or electric switches necessary for normal operation of the appliance by the user.

5.2.4.2 Tap design

All gas taps shall comply with the parameters specified in the installation, servicing and use instructions for the tap.

Any gas cock or tap shall be designed, identified or positioned to avoid inadvertent operation but shall be easy to operate. It shall be so designed that the OFF and ON positions are readily distinguishable.

Any gas cock or tap used for the purposes of OFF-ON operation shall be provided with positive stops at the OFF and full ON positions. The gas shall not be shut off in any position of the tap except between the OFF stop and the end of the circumferential seal. For the purpose of this document any operating mechanism between the control and the tap handle shall be deemed part of the control.

A multi-position tap shall be clearly marked at the ignition position and it shall not be possible to move from the OFF to the ON position without a halt at the ignition position unless the control incorporates another device to avoid a hazard arising, e.g. flame supervision device or ignition cut-out.

Any cock or tap shall be easy to operate at the highest working temperature obtained on the appliance and shall be sound at that temperature.

To indicate the 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 a positive stop when the reduced rate position is situated between the full-on and the off positions.

The various tap positions shall be marked indelibly and clearly as follows:

Off:	disc
ignition burner ignition:	stylized star
Full-on (burner):	large stylized flame
Reduced rate (if any):	small stylized flame

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

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

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

If the appliance has a burner that includes fine granular material (e.g. sand), the gas tap shall be protected either by design or position from ingress of such material into the tap mechanism.

5.2.5 Pressure regulators

Pressure regulators shall conform to EN 88-1:2022+A1:2023.

An appliance of 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 regulator, if any, out of service when they are supplied with third family gases. For appliances in category II_{2E+3+}, it shall be possible to put the regulator partially out of service when they are supplied with second family gases, such that the regulator is not operational in the range of the two normal pressures of the second family pressure couple, i.e. 20 mbar to 25 mbar.

The design and accessibility of the 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.

5.2.6 Multifunctional controls

Any multifunctional control shall comply with EN 126:2012.

5.2.7 Flame supervision devices

Heat sensitive flame supervision devices of the thermoelectric type shall comply with EN 125:2022. The flame detector of an automatic burner control system shall comply with EN 298:2022.

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

5.2.8 Shut-off valves

5.2.8.1 General

An appliance shall have two devices 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 control device, or the assembly of which it is a part, shall be removable.

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. On the other hand, 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.

5.2.8.2 Non-automatic burner system

Appliances shall have a thermoelectric device which complies with EN 125:2022, and a manual second valve which complies with EN 1106:2022+A1:2023; these may be either combined or in separate units.

5.2.8.3 Automatic burner system

Appliances shall have two valves of a minimum of class C which comply with EN 161:2022.

5.2.9 Automatic burner control systems

The electronic control ignition system shall not be a type that allows the appliance to operate unattended.

Automatic burner control systems shall comply with EN 298:2022.

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

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