



BSI Standards Publication

Domestic direct gas-fired tumble dryers of types B22D and B23D, of nominal heat input not exceeding 6 kW

Part 1: Safety

National foreword

This British Standard is the UK implementation of EN 1458-1:2011. It supersedes BS EN 1458-1:2000 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GSE/37, Gas fired sorption and laundering appliances.

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

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English Version

Domestic direct gas-fired tumble dryers of types B22D and B23D, of nominal heat input not exceeding 6 kW - Part 1: Safety

Sèche-linge domestiques à tambour rotatif à chauffage direct utilisant les combustibles gazeux, de type B22D et B23D, de débit calorifique nominal ne dépassant pas 6 kW
- Partie 1: Sécurité

Direkt gasbeheizte Haushalts-Trommeltrockner der Typen B22D und B23D mit Nennwärmebelastungen nicht über 6 kW - Teil 1: Sicherheit

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Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN 1458-1:2011) has been prepared by Technical Committee CEN/TC 299 “Gas-fired sorption appliances, indirect fired sorption appliances, gas-fired endothermic engine heat pumps and domestic gas-fired washing and drying appliances”, the secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by May 2012, and conflicting national standards shall be withdrawn at the latest by May 2012.

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

This document supersedes EN 1458-1:1999.

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

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

This edition has been prepared to up-date this European Standard in the following respects:

- a) electrical safety by calling up EN 60335-2-102,
- b) its normative references, and
- c) the CEN Member countries and their national situations.

The test gases, test pressures and appliance categories given in this European Standard are in accordance with those specified in EN 437.

The marking requirements in this European Standard take into account CR 1472.

The first part of the standard specifies the requirements and test methods for the construction, safety, marking and testing of the appliances. The second part of the standard specifies the requirements for rational use of energy.

This European Standard covers type testing only.

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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the requirements and test methods for the construction, safety, and marking of domestic direct gas-fired tumble dryers, of types B_{22D} and B_{23D}, of nominal heat input not exceeding 6 kW, hereafter referred to as "appliances".

This European Standard does not apply to:

- a) catalytic combustion appliances;
- b) appliances designed exclusively for industrial purposes;
- c) appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere;
- d) appliances of the condensing type wherein the heated air and products of combustion used for the drying process are dehumidified by cooling with water or air;
- e) appliances intended to be used in vehicles or on board ships or aircraft.

This European Standard covers type testing only.

2 Normative references

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

EN 88-1:2011, *Pressure regulators and associated safety devices for gas appliances — Part 1: Pressure regulators for inlet pressures up to and including 500 mbar*

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

EN 126:2004, *Multifunctional controls for gas burning appliances*

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

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

EN 298:2003, *Automatic gas burner control systems for gas burners and gas burning appliances with or without fans*

EN 1057:2006+A1:2010, *Copper and copper alloys — Seamless, round copper tubes for water and gas in sanitary and heating applications*

CEN/TR 1749:2009, *European scheme for the classification of gas appliances according to the method of evacuation of the products of combustion (types)*

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

EN 60335-2-11:2003, *Household and similar electrical appliances — Safety — Part 2-11: Particular requirements for tumble dryers (IEC 60335-2-11:2002, modified)*

EN 60335-2-102:2006, *Household and similar electrical appliances — Safety — Part 2-102: Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections (IEC 60335-2-102:2004, modified)*

EN 60584-1:1995, *Thermocouples — Part 1: Reference tables (IEC 60584-1:1995)*

EN 60730-2-9:2002, *Automatic electrical controls for household and similar use — Part 2-9: Particular requirements for temperature sensing controls (IEC 60730-2-9:2000, modified)*

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

EN ISO 1182:2010, *Reaction to fire tests for products — Non-combustibility test (ISO 1182:2010)*

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

3 Terms and definitions

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

3.1

direct gas-fired tumble dryer

appliance in which textile material is dried by tumbling in a rotating drum through which heated air and products of combustion are forced or induced by mechanical means

3.2

gases

3.2.1

test gases

gases intended for the verification of the operational characteristics of gas appliances. They consist of reference gases and limit gases

[EN 437:2003+A1:2009]

3.2.2

reference gases

test gases with which appliances operate under nominal conditions when they are supplied at the corresponding normal pressure

[EN 437:2003+A1:2009]

3.2.3

limit gases

test gases representative of the extreme variations in the characteristics of the gases for which appliances have been designed

[EN 437:2003+A1:2009]

3.2.4

gas pressure

static pressure, relative to the atmospheric pressure, measured at right angles to the direction of flow of the gas

NOTE Test pressures are expressed in millibars (mbar) or bars.

3.2.5

gas supply pressure

relative static pressure measured at the gas inlet connection of the appliance, with the appliance in operation

3.2.6

test pressures

gas pressures used to verify the operational characteristics of gas appliances. They consist of normal and limit pressures

NOTE The gas pressures are expressed in millibars (mbar) 1 mbar = 10^2 Pa.

[EN 437:2003+A1:2009]

3.2.7

normal pressure

p_n
pressure under which the appliances operate in nominal conditions when they are supplied with the corresponding reference gas

[EN 437:2003+A1:2009]

3.2.8

limit pressures

maximum pressure: $p_{\max}$; minimum pressure: $p_{\min}$
pressures representative of the extreme variations in the appliance supply conditions

[EN 437:2003+A1:2009]

3.2.9

pressure couple

combination of two distinct gas distribution pressures applied by reason of the significant difference existing between the Wobbe indices within a single family or group in which

— the higher pressure corresponds only to gases of low Wobbe index;

— the lower pressure corresponds to gases of high Wobbe index

[EN 437:2003+A1:2009]

3.2.10

relative density

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

3.2.11

calorific value

quantity of heat produced by the complete combustion, at a constant pressure equal to 1 013,25 mbar, of a unit volume or mass of gas, the constituents of the combustible mixture being taken at reference conditions and the products of combustion being brought back to the same conditions

A distinction is made between:

- the gross calorific value H_s : the water produced by combustion is assumed to be condensed;
- the net calorific value H_i : the water produced by combustion is assumed to be in the vapour state

NOTE The calorific value is expressed:

- either in megajoules per cubic metre (MJ/m^3) of dry gas at the reference conditions;
- or in megajoules per kilogram (MJ/kg) of dry gas.

[EN 437:2003+A1:2009]

3.2.12

Wobbe index

gross Wobbe index W_s ; net Wobbe index W_i

ratio of the calorific value of a gas per unit volume and the square root of its relative density under the same reference conditions. The Wobbe index is said to be gross or net according to whether the calorific value used is the gross or net calorific value

NOTE The Wobbe index is expressed –

- either in megajoules per cubic metre (MJ/m^3) of dry gas at the reference conditions
- or in megajoules per kilogram (MJ/kg) of dry gas.

[EN 437:2003+A1:2009]

3.3

conditions of operation and measurement

3.3.1

reference conditions

- for calorific values, temperature: 15 °C;
- for gas and air volumes dry, brought to 15 °C and to an absolute pressure of 1 013,25 mbar

3.3.2

cold condition

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

3.3.3

hot condition

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

3.3.4

equivalent resistance

resistance to flow in millibar, measured at the outlet of the appliance, which is equivalent to that of the actual duct

3.4 appliance construction

3.4.1 gas circuit

3.4.1.1 gas circuit

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

3.4.1.2 mechanical joint

means of ensuring the soundness of an assembly of several (generally metallic) parts without the use of liquids (e.g. pastes and tapes)

EXAMPLE Metal to metal joints; conical joints; toroidal sealing rings ("O" rings); flat joints.

3.4.1.3 restrictor

device with an orifice, which is placed in the path of the gas flow between the appliance inlet connection and the burners 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

3.4.1.4 gas rate adjuster

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

NOTE 1 Adjustment may be progressive (screw adjuster) or in discrete steps (by changing restrictors).

NOTE 2 The adjusting screw of an adjustable regulator is regarded as a gas rate adjuster.

NOTE 3 The action of adjusting this device is called "adjusting the gas rate".

NOTE 4 A factory sealed gas rate adjuster is considered to be non-existent.

3.4.1.5 injector

component that admits the gas into a burner

3.4.1.6 gas rate control

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

NOTE 1 It can also be used to adjust the gas rate of certain burners to a predetermined value, called the "reduced rate".

NOTE 2 This device can be a "tap".

3.4.2 burners

3.4.2.1 main burner

burner that assures the thermal function of an appliance

3.4.2.2

ignition device

any means (e.g. flame, electrical ignition device or other device) used to ignite the gas at the ignition burner or at the main burner

3.4.2.3

ignition burner

burner intended to ignite a main burner

3.4.2.4

intermittent ignition burner

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

3.4.2.5

fixed primary aeration restrictor

device containing an orifice of fixed cross section which limits the supply of air to a burner

3.4.3

exhaust duct

means of evacuating the moist air produced by the drying process together with the combustion products to the outside of the building

3.4.4

auxiliary equipment

3.4.4.1

regulator

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

3.4.4.2

flame supervision device

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

3.4.4.3

control knob

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

3.4.4.4

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;

the programming unit follows a predetermined sequence of actions and always operates in conjunction with a flame detector device

[EN 298:2003]

3.4.4.5

programme

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

safety actions such as safety shut down and lock out are also part of the programme

[EN 298:2003]

3.4.4.6

flame detector device

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

it can consist of a flame sensor, an amplifier and a relay for signal transmission. These parts, with the possible exception of the actual flame sensor, can be assembled in a single housing for use in conjunction with a programming unit

[EN 298:2003]

3.4.4.7

flame signal

signal given by the flame detector device in case of sensed flame

[EN 298:2003]

3.4.4.8

flame simulation

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

[EN 298:2003]

3.4.4.9

automatic burner control system

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

the various functions of an automatic burner control system can be in one or more housings

[EN 298:2003]

3.4.4.10

control thermostat

device controlling the operation of the appliance (by on/off, high/low or modulating control) and enabling the temperature to be kept automatically, within a given tolerance, at a predetermined value

3.4.4.11

modulating control

automatic control by which the heat input of the appliance can be adjusted continuously between the nominal heat input and a minimum value

3.4.4.12

high/low control

automatic control which permits an appliance to operate either at the nominal heat input or at a fixed reduced heat input

3.4.4.13

overheat cut-off device

device that shuts-off and locks-out the gas supply before the appliance is damaged (and before safety is put into question) and that requires manual intervention to restore the gas supply

3.5

immobilizing an adjuster or a control

3.5.1

setting an adjuster

immobilization of an adjuster (by some means such as e.g. a screw) after the manufacturer or installer has adjusted it

3.5.2

sealing an adjuster

setting of an adjuster using a material such that any attempt to change the adjustment breaks the sealing material and makes the interference with the adjuster apparent; the adjuster is then said to be "sealed" in its adjustment position

NOTE 1 A factory sealed adjuster is considered to be non-existent.

NOTE 2 A regulator is considered to be non-existent if it has been factory sealed in a position such that it is not operational in the range of supply pressures corresponding to the appliance category.

3.5.3

putting an adjuster or a control out of service

putting an adjuster or a control (e.g. of temperature, pressure) out of action and sealing it in this position; the appliance then functions as if the adjuster or control had been removed

3.6

appliance performance

3.6.1

gas rates

3.6.1.1

volume flow rate

V

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

NOTE The volume flow rate is expressed in cubic metres per hour (m^3/h), litres per minute (l/min), cubic decimetres per hour (dm^3/h) or cubic decimetres per second (dm^3/s).

[EN 437:2003+A1:2009]

3.6.1.2

mass flow rate

M

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

NOTE The mass flow rate is expressed in kilograms per hour (kg/h) or grams per hour (g/h).

[EN 437:2003+A1:2009]

3.6.1.3

heat input

Q

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

NOTE The heat input is expressed in kilowatts (kW).

[EN 437:2003+A1:2009]

3.6.1.4

nominal heat input

Q_n

value of the heat input (kW) declared by the manufacturer

3.6.2 **gas combustion**

3.6.2.1 **flame stability**

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

3.6.2.2 **flame lift**

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

NOTE Flame lift can cause the flame to blow out (i.e. extinction of the air-gas mixture).

3.6.2.3 **light-back**

entry of a flame into the body of the burner

3.6.2.4 **light-back at the injector**

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

3.6.2.5 **sooting**

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

3.6.2.6 **yellow tipping**

yellowing of the tip of the blue cone of an aerated flame

3.6.2.7 **first safety time**

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 at the end of this interval

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

3.6.2.8 **second safety time**

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

3.6.2.9 **extinction safety time**

time span between the extinction of the supervised flame and the order to shut off the gas supply to the burner

3.6.2.10 **start gas flame**

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

3.6.2.11

running condition of the system

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

[EN 298:2003]

3.6.2.12

controlled shut-down

process by which the power to the gas shut-off valve(s) is removed before any other action takes place, e.g. as a result of the action of a controlling function

[EN 298:2003]

3.6.2.13

safety shut-down

process which is effected immediately following the response of a protection device or the detection of a fault in the automatic burner control system and puts the burner out of operation;

the resulting state of the system is defined by deactivated terminals for the gas shut-off valves and the ignition device

[EN 298:2003]

3.6.3

lock-out

3.6.3.1

non-volatile lock-out

safety shut-down condition of the system, such that a restart can only be accomplished by a manual reset of the system and by no other means

[EN 298:2003]

3.6.3.2

volatile lock-out

safety shut-down condition of the system, such that a restart can only be accomplished by either the manual reset of the system, or an interruption of the main power and its subsequent restoration

[EN 298:2003]

3.6.3.3

spark restoration

process by which, after disappearance of the flame signal, the ignition device is energized again without the gas supply having been totally interrupted; this process ends with the restoration of the running condition or, if there is no flame signal at the end of the safety time, with non-volatile lock-out

3.6.3.4

automatic recycling

process by which, following loss of flame signal during the running condition or accidental interruption of the operation of the appliance, the gas supply is interrupted and the complete start sequence is automatically re-initiated; this process ends with the restoration of the running condition or, if there is no flame signal at the end of the safety time, or, if the cause of the accidental interruption has not disappeared, with volatile lock-out or non-volatile lock-out

3.7

marking of the appliance and packaging

3.7.1 **direct country of destination**

country for which the appliance has been certified and which is specified by the manufacturer as the intended country of destination;

at the time of putting the appliance on the market and/or of installation, the appliance needs to be capable of operating, without adjustment or modification, with one of the gases distributed in the country concerned, at the appropriate supply pressure

NOTE More than one country can be specified if the appliance, in its current state of adjustment, can be used in each of these countries.

3.7.2 **indirect country of destination**

country for which the appliance has been certified, but for which, in its present state of adjustment, it is not suitable;

subsequent modification or adjustment is essential in order that it can be utilized safely and correctly in this country

3.7.3 **manufacturer**

person responsible for designing and manufacturing a product covered by the directive, with a view to placing it on the Community market on his own behalf

NOTE This definition is as given in the guide to the implementation of Community harmonization directives based on the new approach and global approach provisions.

4 Classification

4.1 Classification of gases

Gases are classified into three families, possibly divided into groups according to the value of the Wobbe index. Table 1 specifies the families and groups of gases used in this European Standard.

Table 1 — Classification of gases

Gas families and groups	Gross Wobbe Index at 15 °C and 1 013,25 mbar	
	MJ/m ³	
	minimum	maximum
First family		
- Group a	22,4	24,8
Second family		
- Group H	39,1	54,7
- Group L	45,7	54,7
- Group L	39,1	44,8
- Group E	40,9	54,7
Third family		
- Group B/P	72,9	87,3
- Group P	72,9	76,8
- Group B	81,8	87,3

4.2 Classification of appliances

4.2.1 Classification according to the gases capable of being used

4.2.1.1 General

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

The definitions of categories are given in 4.2.1.2, 4.2.1.3 and 4.2.1.4.

In each country, taking account of the local gas distribution conditions (gas composition and supply pressures), only some of the categories defined in 4.2.1.2, 4.2.1.3 and 4.2.1.4 are marketed.

The conditions concerning the marketing of these appliance categories in each country, and the corresponding supply pressures, are given in Tables A.2 and A.3 (see also A.4 for the categories marketed locally and nationally, corresponding to the test gases and test pressures given in Table A.5; Annex B gives the particular conditions specific to one country).

4.2.1.2 Category I

4.2.1.2.1 General

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

4.2.1.2.2 Appliances designed for use on first family gases only

Category I_{1a}: Appliances using only gases of group a of the first family at the prescribed supply pressure. (This category is not used).

4.2.1.2.3 Appliances designed for use on second family gases only

Category I_{2H}: Appliances using only gases of group H of the second family at the prescribed supply pressures.

Category I_{2L}: Appliances using only gases of group L of the second family at the prescribed supply pressures.

Category I_{2E}: Appliances using only gases of group E of the second family at the prescribed supply pressures.

Category I_{2E+}: Appliances using only gases of group E of the second family, and operating with a pressure couple without adjustment on the appliance. The appliance gas pressure regulating device, if it exists, is not operative in the range of the two normal pressures of the pressure couple.

4.2.1.2.4 Appliances designed for use on third family gases only

Category I_{3B/P}: Appliances capable of using the third family gases (propane and butane) at the prescribed supply pressure.

Category I₃₊: Appliances capable of using gases of the third family (propane and butane) and operating with a pressure couple without adjustment of the appliance other than a possible adjustment of the primary air in order to change from butane to propane and vice versa. No gas pressure regulating device is permitted on the appliance.

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

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

4.2.1.3 Category II

4.2.1.3.1 General

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

4.2.1.3.2 Appliances designed for use on gases of the first and second families

Category II_{1a2H}: Appliances capable of using gases of group a of the first family and gases of group H of the second family. The first family gases are used under the same conditions as for category I_{1a}. The second family gases are used under the same conditions as for category I_{2H}.

4.2.1.3.3 Appliances designed for use on gases of the second and third families

Category II_{2H3B/P}: Appliances capable of using gases of group H of the second family and gases of the third family. The second family gases are used under the same conditions as for category I_{2H}. The third family gases are used under the same conditions as for category I_{3B/P}.

Category II_{2H3+}: Appliances capable of using gases of group H of the second family and gases of the third family. The second family gases are used under the same conditions as for category I_{2H}. The third family gases are used under the same conditions as for category I₃₊.

Category II_{2H3P}: Appliances capable of using gases of group H of the second family and gases of group P of the third family. The second family gases are used under the same conditions as for category I_{2H}. The third family gases are used under the same conditions as for category I_{3P}.

Category II_{2L3B/P}: Appliances capable of using gases of group L of the second family and gases of the third family. The second family gases are used under the same conditions as for category I_{2L}. The third family gases are used under the same conditions as for category I_{3B/P}.

Category II_{2L3P}: Appliances capable of using gases of group L of the second family and gases of group P of the third family. The second family gases are used under the same conditions as for category I_{2L}. The third family gases are used under the same conditions as for category I_{3P}.

Category II_{2E3B/P}: Appliances capable of using gases of group E of the second family and gases of the third family. The second family gases are used under the same conditions as for category I_{2E}. The third family gases are used under the same conditions as for category I_{3B/P}.

Category II_{2E+3+}: Appliances capable of using gases of group E of the second family and gases of the third family. The second family gases are used under the same conditions as for category I_{2E+}. The third family gases are used under the same conditions as for category I₃₊.

4.2.1.4 Category III

Category III appliances are designed for use on gases of the three families.

This category is not in general use.

Category III appliances admitted in certain countries are given in A.4.

4.2.2 Classification according to the mode of evacuation of the combustion products/supply of combustion air

Appliances are classified into several types according to the method of evacuation of the combustion products and admission of the combustion air. Appliances for which the combustion air is introduced by mechanical means other than a fan shall be regarded for the purposes of classification as if the mechanical means is a fan.

This appliance classification is based on that described in CEN/TR 1749:2009.

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 B₂: A type B appliance without a draught diverter.

Type B₂₂: A type B₂ appliance incorporating a fan downstream of the combustion chamber/heat exchanger.

Type B₂₃: A type B₂ appliance incorporating a fan upstream of the combustion chamber/heat exchanger.

This European Standard only applies to the following appliance types:

Type B_{22D}: A type B₂₂ appliance that is intended to be connected to a flexible non-metallic duct that evacuates humid air and products of combustion to the outside of the room containing the appliance.

Type B_{23D}: A type B₂₃ appliance that is intended to be connected to a flexible non-metallic duct that evacuates humid air and products of combustion to the outside of the room containing the appliance.

5 Construction and design requirements

5.1 General

5.1.1 Conversion to different gases

The only acceptable operations when converting from a gas of one group or family to a gas of another group or family and/or to adapt of different gas supply pressures are given in 5.1.1.1, 5.1.1.2 and 5.1.1.3.

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

5.1.1.1 Category I

- a) **Categories I_{2H} and I_{2L}, I_{2E} and I_{2E+}:** No modification of the appliance;
- b) **Categories I_{3B/P} and I_{3B}:** No modification of the appliance;
- c) **Category I₃₊:** Replacement of injectors or restrictors but only in order to convert from one pressure couple to another (e.g. 28-30/37 mbar $\Leftrightarrow$ 50/67 mbar);
- d) **Category I_{3P}:** No modification to appliance relative to a change of gas. For changing pressure, replacement of injectors and adjustment of gas rates.

5.1.1.2 Category II

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

- a) Adjustment of the gas rate with, if necessary, a change of injector, restrictors or regulator;
- b) adjustment of the gas rate of ignition burners, either by using an adjuster or by a change of injectors or restrictors and, if necessary, a change of complete ignition burners or of some of their parts;
 - putting the regulator out of service under the conditions of 5.2.5;
 - putting the gas rate adjusters out of service under the conditions of 5.2.6;
- c) these adjustments or component changes are only acceptable when converting from a gas of the 1st family to a gas of the 2nd family or vice versa.

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

- a) Adjustment of the gas rate with, if necessary, a change of injector, restrictors or regulator;
- b) adjustment of the gas rate of ignition burners, either by using an adjuster or by a change of injectors or restrictors and, if necessary, a change of complete ignition burners or of some of their parts;
 - putting the regulator out of service under the conditions of 5.2.5;
 - putting the gas rate adjusters out of service under the conditions of 5.2.6;
- c) these adjustments or component changes are only acceptable when:
 - converting from a gas of the 2nd family to a gas of the 3rd family or vice versa;
 - converting from one butane/propane pressure couple to another,
(e.g. 28-30/37 mbar $\Leftrightarrow$ 50/67 mbar).

5.1.1.3 Category III

Category III appliances admitted in certain countries and the conversion criteria are also given in Annex A (see A.3).

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 and performance characteristics do not alter significantly during a reasonable life under normal conditions of installation and use.

In particular, when the appliance is installed according to the instructions and accepted practice, all components shall withstand the mechanical, chemical and thermal conditions to which they can be subjected during service.

In normal conditions of use, maintenance or adjustment, they shall not show any alteration likely to impair their marking and, in particular, their safety.

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

Asbestos or materials containing asbestos shall not be used.

Hard solder containing cadmium in its formulation shall not be used in the construction of the appliance.

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

Where appropriate, materials used on the appliance shall be non-combustible in accordance with the requirements of EN ISO 1182.

Condensation produced at the start-up and/or during use must not affect the safety of the appliance.

5.1.3 Screws

Screws affecting electrical safety shall comply with the relevant requirements of EN 60335-2-11.

Self-tapping screws shall not be used to ensure gas soundness.

In addition, a single self-tapping screw shall not be used to secure devices essential to the safe operation of the gas burner.

5.1.4 Maintenance and use

Any control placed in the gas circuit shall be so arranged that any adjustment, maintenance or exchange is easy.

Levers and other controlling and setting devices shall be clearly marked and give appropriate instructions so as to prevent any error in handling. Their design shall be such as to preclude accidental manipulation.

Removable parts shall be so designed or marked that they are easy to reassemble correctly and difficult to reassemble incorrectly.

It shall be possible for the user to clean without difficulty the external parts of the appliance likely to become soiled by dust, possibly after removing the outer case or a part of this case. This exercise shall be carried out in accordance with the manufacturer's instructions.

In particular, it shall be possible to complete without the aid of a tool 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.

Removable parts (with the exception of the heating body) shall be dismantable for maintenance by a service engineer using commonly available tools, such as a screwdriver or a spanner.

The appliance may be moved in accordance with the manufacturer's instructions provided this operation does not affect the safety of the appliance.

If necessary an appliance shall be able to be fixed securely. The installation instructions shall give relevant and precise information.

5.1.5 Thermal insulation

Any thermal insulation shall retain its insulating properties under the influences of heat and ageing. The insulation shall withstand the normally expected thermal and mechanical (including all movement) stresses. The insulation shall be non-combustible, securely located and shall be protected against mechanical damage, condensate and vermin.

5.1.6 Gas connections

The connection of the gas inlet to the gas supply shall be possible from both the left and the right of the appliance.

The appliance can have one or two points of connection. If there is only one gas inlet connection point, it shall be such that connection to the gas supply can be made from either side during normal installation of the appliance. In order to satisfy this requirement, the use of supplementary means provided by the manufacturer is allowed. If for this purpose, a part of the pipework is movable, it shall be sufficiently rigid, if necessary by use of a means of support.

The gas connection to the gas supply shall be by means of a flexible hose, suitable for the appliance category, with mechanical end fittings. The connection shall be capable of being made in an easy manner; the appliance being in place or the appliance being removed, according to the manufacturer's instructions.

Subject to the requirements given below, the appliance inlet connection shall be accessible and in accordance with Table A.6.

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

- a) a thread conforming to EN ISO 228-1:2003. In this case the end of the gas inlet connection shall have a flat annular surface at least 3 mm wide for thread nominal sizes 1/2 and 3/8 and at least 2,5 mm wide for thread nominal size 1/4, to allow the interposition of a sealing washer. Moreover, when the end of the gas inlet connection has a thread of nominal size 1/2, it shall be possible to insert a gauge of 12,3 mm diameter to a depth of at least 4 mm;
- b) a thread conforming to EN 10226-1:2004 or EN 10226-2:2005;
- c) a compression fitting suitable for copper tube conforming to EN 1057:2006+A1:2010;
- 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).

This can be achieved, if necessary, by the use of an adapter fitted on the appliance by the manufacturer in such a way that the end of the gas inlet to the appliance conforms to the installation practices of the country of destination. If such an adapter is supplied, it shall have a label indicating the type of thread. The details for the utilization of such an adapter shall appear in the installation instructions (see 7.4.2). The installation practices in force in the various countries are given in Table A.6.

The end of the gas inlet connection shall be positioned to allow the free movement of a flexible hose connection.

5.1.7 Soundness of the gas circuit

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

The soundness of components and assemblies connected to the gas circuit and likely to be dismantled for routine maintenance at the consumer's premises shall be assured by means of mechanical joints, e.g. metal to metal joints, O-ring joints or packing, i.e. excluding the use of any sealing compound such as tape, mastic or paste. The soundness shall be maintained after dismantling and reassembly.

However, sealing compounds can be used for permanent threaded assemblies including injectors. 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.

5.1.8 Supply of combustion air and evacuation of combustion products

Air, lint and products of combustion associated with the drying process shall only discharge from the appliance through the purpose designed outlet(s).

The exhaust duct and associated connections shall be as specified or supplied by the manufacturer.

For an appliance intended to be used with an exhaust duct having a wall termination, the manufacturer shall either supply the termination or state the type of termination which shall be used.

The design of the termination shall be such that it will not allow entry of a ball of 16 mm diameter whilst the machine is not in operation but it will allow entry of a ball of 6 mm diameter whilst the machine is in operation.

5.1.9 Lint collection

A lint filter or other means shall be provided for minimizing the discharge of lint from the exhaust of the appliance.

The filter screen shall be readily removable or easily accessible for cleaning without disconnecting the exhaust duct.

5.1.10 Flame visibility

Appliances shall be designed so that correct ignition and operation of the burners and the flame length of the ignition burners, if any, can always be directly confirmed.

Where mirrors or windows are used, they shall retain their optical properties. Where it is not possible to see the main burner an indirect means of signalling (e.g. control lamp) is required. In this case, it shall not be possible for the signal of the existence of the flame to be confused with a signal for any malfunction, apart from that of a malfunction of the flame control itself, which shall be expressed by the indication of an absence of flame.

5.1.11 Electrical equipment

5.1.11.1 General

The electrical equipment of the appliance shall comply with the requirements of EN 60335-2-11:2003 and EN 60335-2-102:2006.

If the appliance is fitted with electronic components or electronic systems providing a safety function, these shall comply with the requirements of EN 298:2003.

5.1.11.2 Supply voltage tolerance

The electrical circuits and components of the appliance associated with the operation of the gas burner shall function safely when the appliance is connected to a supply of 85 % of the minimum rated voltage and of 110 % of the maximum rated voltage. This shall be verified by the test described in 6.16.3.2 a).

5.1.11.3 Internal conductors

In addition to the requirements of EN 60335-2-11:2003, solid or rigid internal conductors shall not be used where they are subject to vibration, repeated bending or undue strain.

5.1.12 Motors and fans

Motors and fans shall be so protected by suitable guards, shields or screens of adequate size, strength and durability that they are not liable to be touched accidentally (see also EN 60034-5).

Removal of such guards, shields or screens shall be possible only with the use of commonly available tools.

Belt drives, where used, shall be so designed or positioned as to afford protection to the operator.

Means shall be provided, if necessary, to facilitate adjustment of belt tension. Access to such means shall be possible only with the use of commonly available tools.

Belt drive arrangement for the rotation of the drum of the appliance can use a self-tensioning spring system.

Motors and fans shall be mounted in such a way as to minimize noise and vibration.

Lubrication points, if provided, shall be readily accessible.

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

The control system shall be so arranged that a hazardous condition cannot arise in the event of failure of the supply electricity or upon its subsequent restoration nor shall any damage to the appliance occur.

Interruption of the electricity supply at any time during starting up or operation of the appliance shall result in the continued safe operation or safety shut-down such that re-start may only take place after manual intervention or by means of a single automatic re-start. If this automatic re-start is unsuccessful volatile lock-out shall result.

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

NOTE The method for testing for the safety of the appliance in the event of normal and abnormal fluctuation of the main voltage supply is described in 6.16.3.2 a).

5.1.14 Combustion air flow failure

In the event of the fan failing to produce the necessary air flow for any reason during start-up or during normal operation, no hazard shall arise and the gas supply to the main burner shall be shut off within 30 s.

Attempts to re-ignite are permitted. However, if the air flow failure still exists, the gas supply to the main burner shall be shut off within 30 s after each attempt and no hazard shall arise.

Any control for carrying out this function shall be so designed that, should failure of the control occur, the appliance remains in a safe condition.

5.2 Requirements for adjusting, control and safety devices

5.2.1 General

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

5.2.2 Automatic shut-off valves

Automatic shut-off valves shall comply with the requirements of EN 161:2011.

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 shall be automatic, and 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.

The gas line shall be fitted with a Class A valve or Class B valve to shut off the gas supply to the main burner and ignition burner, if any; the overheat cut-off device, the safety temperature limiter and also the flame detector can operate on this valve.

An appliance shall have in addition a second valve of either Class A, Class B or Class C for purposes of controlled shut-down or shut-down caused by the limit thermostat.

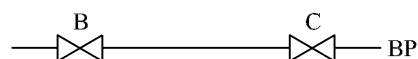
If the appliance has an ignition burner, the gas line to the ignition burner shall be fitted with either a Class A valve, Class B valve or a Class C valve downstream of the main gas valve.

The following arrangements are given as examples. Any other arrangement giving at least an equivalent level of safety is permissible.

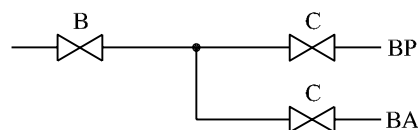
Legend: BA - ignition burner

BP - main burner

1) Appliances with direct ignition of the main burner



2) Appliances with intermittent ignition burner



A shut-off device shall be protected against internal blocking, e.g. by means of a strainer.

5.2.3 Multifunctional controls

Any multifunctional control shall comply with the requirements of EN 126:2004.

5.2.4 Flame supervision devices

5.2.4.1 General

The burner shall be fitted with a flame supervision device.

The presence of a flame shall be detected:

- either by a thermoelectric flame supervision device;
- or by the flame detector of an automatic burner control system.

At least one flame detector is required.

Where the main burner is ignited by an ignition burner, the presence of the ignition burner flame shall be detected before gas is admitted to the main burner.

The programme shall be designed so that it is never possible to perform two or more actions which would be unacceptable in combination. The order of the actions shall be fixed in such a manner that it is not possible to change it.

Upon flame failure, the flame supervision device shall cause volatile lock-out, or, provided the conditions of 5.5.2 are met, a single attempt at re-ignition by spark restoration or automatic recycling is permitted.

5.2.4.2 Thermoelectric flame supervision device

Thermoelectric flame supervision devices shall comply with EN 125:2010.

The device shall cause non-volatile lockout of the appliance in the event of flame failure or failure of the flame supervision device.

The device shall include:

- either an ignition interlock;
- or a restart interlock.

5.2.4.3 Flame detector of an automatic burner control system

The flame detector of an automatic burner control system shall comply with EN 298:2003.

5.2.5 Regulators

Any regulator shall comply with EN 88-1:2011.

Appliances intended to operate with first family gases shall have a gas regulator. A gas regulator is optional for other appliances.

A regulator intended for operation with a pressure couple shall be adjusted or shall be capable of being adjusted in such a way that it cannot operate between the two normal pressures.

However, when operating with a pressure couple, a non-adjustable gas regulator is permitted for the ignition burner.

The design and accessibility of the gas regulator shall be such that it can be easily adjusted or put out of service or, possibly, the regulator or its components can be changed on conversion to another gas, but precautions shall be taken to make unauthorized interference with the preset adjuster difficult.

5.2.6 Preset gas rate adjusters

Preset gas rate adjusters shall be designed so that they are protected against accidental maladjustment by the user once the appliance has been put into service.

Any parts of the appliance that are not to be manipulated by the installer or user, shall also be protected in an appropriate manner. Lacquer may be used for this purpose provided that it resists the heat to which it is subjected during normal operation of the appliance.

A preset gas rate adjuster is mandatory for appliances using more than one group of the first gas family, and optional for other appliances.

The preset adjuster shall:

- be sealed if the adjustment is only made by the manufacturer;
- be able to be sealed if an adjustment is carried out by the installer.

The preset gas rate adjuster shall be locked and sealed when a gas of a family or group carrying a "+" suffix is used.

The adjustment can be continuous (adjusting screw) or discrete (change of restrictors).

The adjuster of an adjustable gas regulator is regarded as a preset adjuster.

The action of adjusting these devices is called "adjusting the gas rate".

These devices shall be designed so that after normal, even prolonged, use, they can be moved easily with commonly available tools.

5.2.7 Automatic burner control systems

Automatic burner control systems shall comply with EN 298:2003.

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

5.2.8 Gas strainers

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

In multiple valve safety shut-off systems, only one strainer need be fitted, provided it gives adequate protection to all valves.

NOTE Where a regulator is fitted upstream of the safety shut-off system, the strainer may be fitted upstream of the regulator.

5.3 Ignition devices

5.3.1 General

It shall be possible to light the appliance from a readily accessible position.

Ignition burners and ignition devices shall be protected by design and position against external influences.

Ignition burners, ignition devices and their mountings shall be so designed that they can only be located rigidly and correctly in relation to every component and burner with which they are designed to ignite.

Where the ignition device incorporates a repetitive high voltage generator that provides more than 20 sparks at each output during a three second energization period, all the high voltage outputs shall be regarded as electrically "live" and suitable protection against electric shock equivalent to that given in EN 60335-2-11:2003 shall be provided.

5.3.2 Ignition device for the main burner

The main burner shall be fitted with an ignition burner or other ignition device for direct ignition.

5.3.3 Ignition burners

If different ignition burners are used for the different gases, they shall be marked, easy to substitute for one another and easy to fit. The same applies to injectors where only they have to be changed. Injectors shall carry an indelible means of identification and shall only be removable with the aid of a tool.

Ignition burners shall be protected against blockage by gas-borne particulate matter (see 5.2.8).

5.4 Ignition burner or start-gas flame establishment

Any start-gas flame shall be established either at the main burner or at a separate ignition burner.

The ignition spark (or other means of ignition) shall not be energized before the completion of the pre-purge period and shall be de-energized at or before the end of the start-gas flame ignition period.

The start-gas valve(s) shall not be energized before the ignition spark (or other means of ignition) is energized. However, where a hot surface ignition system is used, the ignition system shall be so energized that the ignition source is capable of igniting incoming gas before the gas valve(s) is(are) opened.

The start-gas flame proving period shall establish that the flame is stable on its own. If the flame fails during this period, safety shut-down and non-volatile lock-out shall result.

5.5 Main flame establishment

5.5.1 Establishment by means of an ignition burner or start-gas flame

The main gas safety shut-off valves shall not be energized to admit the main gas flow to the burner until after the start-gas flame has been detected and proved.

Flame failure at any time after the main gas safety shut-off valves have been signalled to open shall lead to safety shut-down.

5.5.2 Direct establishment of the main flame e.g. spark ignition, hot surface igniter

The ignition source shall not be energized before a safe-start check has been made of the flame supervision system and shall be de-energized at, or before, the end of the safety time. Where a hot surface ignition system is used, the ignition system shall be so energized that the ignition source is capable of igniting incoming gas before the gas valves are opened.

If the flame has not been detected before the end of the safety time, safety shut-down and volatile lock-out shall result.

A single attempt at re-ignition by spark restoration or automatic recycling is permitted, under the following conditions:

- a) re-ignition by spark restoration shall commence within 1 s of flame failure. If the flame is not detected within the first safety time safety shut-down and non-volatile lock-out shall result;
- b) following automatic recycling, if the flame is not detected within the first safety time, safety shut-down and non-volatile lock-out shall result.

5.6 Burners

The section of the flame ports shall not be adjustable.

Removal and replacement of the burner in accordance with the manufacturer's instructions shall be possible with commonly available tools.

The burner position shall be well defined and the burner shall be fitted so that it is difficult to place it incorrectly.

The relative position between the burner(s) and injector(s) shall be well defined.

For an appliance burning 3rd family gas, the space below the burner shall be designed such that in the case of release of unburnt gas, this gas can escape out of the appliance without risk of accumulation.

5.7 Thermostats and control of air temperature

5.7.1 General requirements

The appliance shall be equipped with a suitable device(s), e.g. control thermostat(s), to control the temperature in the drum.

An overheat cut-off device which functions independently of the operating temperature control device shall be provided.

Integral mechanical thermostats shall comply with EN 257:2010.

Electrical thermostats shall comply with EN 60730-2-9:2002.

5.7.2 Overheat cut-off device

An overheat cut-off device shall be fitted to the appliance to cause shut-down and non-volatile lock-out in the event of an overheat condition occurring.

The operating temperature of the overheat device shall be set and sealed by the manufacturer. The device shall not be wired in series with the flame sensor and it shall not operate during the normal operation of the appliance.

5.8 Clocks and timing devices

The failure of a clock or timing device shall in no way affect the safety of the appliance. The operation of a manual override, if provided, shall not affect the safe operation of the appliance.

5.9 Pressure test points

An unregulated appliance shall have at least one pressure test point and a regulated appliance shall have at least two pressure test points, one to measure pressure at the appliance inlet and another immediately upstream of the burner.

In all cases, a pressure test point shall be provided on the appliance for measurement of the manufacturer's stated operating pressure. The pressure test nipple shall have an external diameter of $9_{-0,5}^0$ mm and a useful length of at least 10 mm for connection to tubing. The diameter of the hole in the test point shall be not greater than 1 mm.

5.10 Mechanical hazards

5.10.1 General

All appliances shall be fitted with an interlock (see 6.4.1).

The interlock shall disconnect the motor before the door opening exceeds 20 mm. In addition, it shall not be possible to start the motor while the door opening exceeds 20 mm.

The interlock shall be so designed that unexpected operation of the appliance is unlikely to occur while the door is open.

5.10.2 Requirements for appliances with an opening dimension exceeding 200 mm and a drum having a volume exceeding 60 dm³

The appliance shall comply with the requirements of 5.10.1. In addition, it shall not be possible to start the motor until a separate means which controls the movement of the drum is operated manually.