BS EN 1458-1:2011

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

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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 It supersedes BS EN 1458-1:2000 which is withdrawn.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.

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

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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

This European Standard was approved by CEN on 25 September 2011.

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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.

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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of an identical text or by endorsement, at the latest by May 2012, and conflicting national standards shall be withdrawn at the latest by May 2012.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, *Multifuctional 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	39,1	54,7
- Group H	45,7	54,7
- Group L	39,1	44,8
- Group E	40,9	54,7
Third family	72,9	87,3
- 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 I_{3+}: 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 I_{3+}.

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 I_{3+}.

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 B_2: A type B appliance without a draught diverter.

Type B_{22}: A type B_2 appliance incorporating a fan downstream of the combustion chamber/heat exchanger.

Type B_{23}: A type B_2 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 B_{22} 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 B_{23} 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 I_{3+}**: Replacement of injectors or restrictors but only in order to convert from one pressure couple to another (e.g. 28-30/37 mbar ⇔ 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 ⇔ 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 dismountable 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.

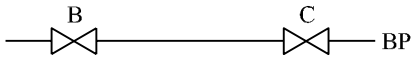
If the appliance has an ignition burner, the gas line to the ignition burner shall be fitted with either a Class A valve, Class B valve or a Class C valve downstream of the main gas valve.

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

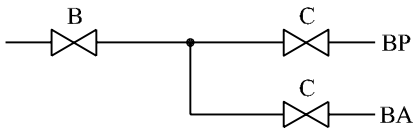
Legend: BA - ignition burner

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 $9^{\,0}_{-0,5}$ mm and a useful length of at least 10 mm for connection to tubing. The diameter of the hole in the test point shall be not greater than 1 mm.

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 dm^3

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.

6 Operational safety

6.1 General

6.1.1 Characteristics of test gases: reference and limit gases

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

The characteristics of test gases (reference and limit gases) are given in Tables 2 and 3. The values in Tables 2 and 3, measured and expressed at 15 °C are derived from EN ISO 6976:2005.

Table 2 — Test gas characteristics [a] (gas dry at 15 °C and 1 013,25 mbar)

Gas family and group	Test gases	Designation	Composition volume %	W_i MJ/m^3	H_i MJ/m^3	W_s MJ/m^3	H_s MJ/m^3	d mm
Gases of the first family [b]								
Group a	Reference gas Incomplete, combustion flame lift and sooting limit gases	G 110	CH_4 = 26 H_2 = 50 N_2 = 24	21,76	13,95	24,75	15,87	0,411
	Light back limit gas	G 112	CH_4 = 17 H_2 = 59 N_2 = 24	19,48	11,81	22,36	13,56	0,367
Gases of the second family								
Group H	Reference gas	G 20	CH_4 = 100	45,67	34,02	50,72	37,78	0,555
	Incomplete combustion Sooting limit gas	G 21	CH_4 = 87 C_3H_8= 13	49,60	41,01	54,76	45,28	0,684
	Light back limit gas	G 222	CH_4 = 77 H_2 = 23	42,87	28,53	47,87	31,86	0,443
	Flame lift limit gas	G 23	CH_4 = 92,5 N_2 = 7,5	41,11	31,46	45,66	34,95	0,586
Group L	Reference gas and Light back limit gas	G 25	CH_4 = 86 N_2 = 14	37,38	29,25	41,52	32,49	0,612
	Incomplete combustion and sooting limit gas	G 26	CH_4 = 80 C_3H_8= 7 N_2 = 13	40,52	33,36	44,83	36,91	0,678
	Flame lift limit gas	G 27	CH_4 = 82 N_2 = 18	35,17	27,89	39,06	30,98	0,629

Table 2 — Test gas characteristics [a] (gas dry at 15 °C and 1 013,25 mbar) *(continued)*

Group E	Reference gas	G 20	CH_4 = 100	45,67	34,02	50,72	37,78	0,555
	Incomplete combustion and sooting limit gas	G 21	CH_4 = 87 C_3H_8= 13	49,60	41,01	54,76	45,28	0,684
	Light back limit gas	G 222	CH_4 = 77 H_2 = 23	42,87	28,53	47,87	31,86	0,443
	Flame lift limit gas	G 231	CH_4 = 85 N_2 = 15	36,82	28,91	40,90	32,11	0,617
Gases of the third family [c]								
Third family and groups 3B/P and 3B	Reference gas, Incomplete combustion and sooting limit gas	G 30	nC_4H_{10} = 50 iC_4H_{10} = 50	80,58	116,09	87,33	125,81	2,075
	Flame lift limit gas	G 31	C_3H_8 = 100	70,69	88,00	76,84	95,65	1,550
	Light back limit gas	G 32	C_3H_6 = 100	68,14	82,78	72,86	88,52	1,476
Group 3P	Reference gas, Incomplete combustion Sooting and flame lift limit gas	G 31	C_3H_8 = 100	70,69	88,00	76,84	95,65	1,550
	Light back and sooting limit gas	G 32	C_3H_6 = 100	68,14	82,78	72,86	88,52	1,476

[a] For gases used nationally or locally, see A.3.

[b] For other groups, see A.3.

[c] See also Table 3.

Table 3 — Calorific values of the test gases of the third family

Test gas designation	H_i MJ/kg	H_s MJ/kg
G 30	45,65	49,47
G 31	46,34	50,37
G 32	45,77	48,94

6.1.2 Conditions for preparation of test gases

The composition of gases used for the tests shall be as near as possible to those given in Table 2. For the constitution of the gases the following rules shall be observed:

a) the Wobbe number of the gas used for the tests shall be within ± 2 % of the value in the table (this tolerance includes the errors of the measuring equipment);

b) the gases used to constitute the mixtures shall have the following minimum degrees of purity:

nitrogen N_2 ... 99 %

hydrogen H_2 ... 99 %

methane CH_4 ... 95 %) with a total concentration of H_2, CO and

propene C_3H_6 ... 95 %) O_2 below 1 % and a total concentration of

propane C_3H_8 ... 95 %) N_2 and CO_2 below 2 %

butane C_4H_{10}[1)] ... 95 %

However, these requirements are not mandatory for each of the constituent gases provided that the final mixture has a composition identical with that of a mixture that would have resulted from using the above constituents. To make up a mixture, a gas may be used which already contains, in convenient proportions, several constituents of the final mixture.

However, for gases of the second family:

— for the tests carried out with reference gases G 20 or G 25, a gas belonging respectively to either group H or group L or group E may be used even if its composition does not satisfy the above conditions, provided that after the addition of either propane or nitrogen as appropriate, the final mixture has a Wobbe index within ± 2 % of the value given in Table 2 for the corresponding reference gas.

— for preparation of the limit gases, a natural gas may be used as the base gas instead of methane:

e) for limit gases G 21, G 222 and G 23 a gas in group H may be used;

a) for limit gases G 27 and G 231 a gas of group H or of group L or of group E may be used;

b) for the limit gas G 26 a gas of group L may be used.

In all cases the final mixture obtained by adding propane or nitrogen shall have a Wobbe index within ± 2 % of the value given in Table 2 for the corresponding limit gas and, the hydrogen concentration of the final mixture shall be as given in Table 2.

6.1.3 Practical application of test gases

6.1.3.1 Choice of test gases

Gases required for the tests described in subclauses:

6.7 Heat inputs

6.8.1 Resistance to overheating

6.13 Ignition, cross-lighting and flame stability

6.14 Flame supervision devices

6.15 Regulators

6.16 Combustion

shall be as specified in 6.1.1 and made up in accordance with 6.1.2.

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1) Any mixture of iso/n butane can be used.

For the tests described in other clauses, it is permissible, in order to facilitate testing, to replace the reference gas by a gas actually distributed, provided that its Wobbe index is within ± 5 % of that of the reference gas.

When an appliance can use gases of several groups or families, test gases selected from those listed in Table 4 and in accordance with the requirements of 6.1.5.1, are used. For special categories marketed nationally or locally the test gases are listed in Table A.3.

Table 4 — Test gases corresponding to the appliance categories

Category	Reference gas	Incomplete combustion limit gas	Light back limit gas	Lift limit gas	Sooting limit gas
I_{2H}	G 20	G 21	G 222	G 23	G 21
I_{2L}	G 25	G 26	G 25	G 27	G 26
I_{2E}, I_{2E+}	G 20	G 21	G 222	G 231	G 21
$I_{3B/P}$, I_{3+}	G 30	G 30	G 32	G 31	G 30

Table 4 — Test gases corresponding to the appliance categories *(continued)*

I_{3P}	G 31	G 31	G 32	G 31	G 31, G 32
II_{1a2H}	G 110, G 20	G 21	G 112	G 23	G 21
$II_{2H3B/P}$, II_{2H3+}	G 20, G 30	G 21	G 222, G 32	G 23, G 31	G 30
II_{2H3P}	G 20, G 31	G 21	G 222, G 32	G 23, G 31	G 31, G 32
$II_{2L3B/P}$	G 25, G 30	G 26	G 32	G 27, G 31	G 30
II_{2L3P}	G 25, G 31	G 26	G 32	G 27, G 31	G 31, G 32
$II_{2E3B/P}$, II_{2E+3+}	G 20, G 30	G 21	G 222, G 32	G 231, G 31	G 30
II_{2E+3P}	G 20, G 31	G 21	G 222, G 32	G 231, G 31	G 31, G 32
NOTE Tests with the limit gases are carried out with the injector and adjustment corresponding to the reference gas of the group to which the limit gas used for the test belongs.					

6.1.3.2 Conditions of supply and adjustment of the burners

6.1.3.2.1 Initial adjustment of appliance

Before all tests that are required to be carried out the appliance shall be fitted with the appropriate equipment (injectors, fixed primary aeration restrictor(s), etc.) corresponding to the gas family or gas group to which the specified test gas belongs.

Any gas rate adjusters are set in accordance with the manufacturer's instructions using the appropriate reference gas(es) (see 6.1.5.1) and the corresponding normal pressure(s) given in 6.1.4.

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

6.1.3.2.2 Supply pressures

Except where an adjustment of the supply pressure is necessary (as described in 6.1.3.2.3 and 6.1.3.2.4) the normal, minimum and maximum supply pressures to be used for testing purposes shall be in accordance with the requirements given in 6.1.4.

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

6.1.3.2.3 Adjustment of heat inputs

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

The specified heat input shall be determined in accordance with 6.7.1.1 and with the appliance supplied with the appropriate reference gas(es).

6.1.3.2.4 Corrected pressures

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

The corrected test pressures are calculated using Equation (1).

$$\frac{p'_{min}}{p_{min}} = \frac{p'_{max}}{p_{max}} = \frac{p}{p_n} \quad (1)$$

6.1.4 Test pressures

The test pressures are given in Tables 5 and 6.

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

The pressures for test gases corresponding to special categories marketed nationally or locally are listed in Table A.5.

Table 5 — Test pressures where no pressure couple exists [a]

Appliance categories having as index	**Test gas**	p_n mbar	p_{min} mbar	p_{max} mbar
1st family: 1a	G 110, G 112	8	6	15
2nd family: 2H	G 20, G 21, G 222, G 23	20	17	25
2nd family: 2L	G 25, G 26, G 27	25	20	30
2nd family: 2E	G 20, G 21, G 222, G 231	20	17	25
3rd family:	G 30, G 31, G 32	29 [b]	25	35
3B/P	G 30, G 31, G 32	50	42,5	57,5
3rd family:	G 31, G 32	37	25	45
3P	G 31, G 32	50	42,5	57,5
3rd family: 3B [c]	G 30, G 31 G 32	29 [b]	20	35

[a] For pressures corresponding to gases distributed locally, refer to Table A.4.

[b] Appliances of this category may be used, without adjustment, at the specified supply pressures of 28 mbar to 30 mbar.

[c] The tests with G 31 and G 32 are carried out at the normal pressure only (p_n = 29 mbar), these test gases being more severe than any gas distributed. This condition covers the normal variations in the gas supply.

Table 6 — Test pressures where a pressure couple exists

Appliance categories carrying as index	**Test gas**	p_n mbar	p_{min} mbar	p_{max} mbar
2nd family: 2E+	G 20, G 21, G 222	20	17 [b]	25
	G 231	(25) [a]	17 [b]	30
3rd family: 3+	G 30	29 [c]	20	35
(28-30/37 couple)	G 31, G 32	37	25	45
3rd family: 3+	G 30	50	42,5	57,5
(50/67 couple)	G 31, G 32	67	50	80

[a] This pressure corresponds to the use of low Wobbe index gas but in principle no test is carried out at this pressure.

[b] See Annex B.

[c] Appliances of this category may be used without adjustment at the specified supply pressures of 28 mbar to 30 mbar.

6.1.5 Use of test gases

6.1.5.1 Tests requiring the use of reference gases

The tests, specified in subclauses:

6.7 Heat inputs

6.13 Ignition, cross lighting and flame stability

6.14 Flame supervision devices

6.16 Combustion

shall be carried out with each of the reference gases appropriate to the country in which the appliance is to be installed, according to the information given in A.1.

Other tests requiring the use of the reference gas are carried out with only one of the reference gases of the appliance category (see 6.1.1) at one of the normal test pressures required in 6.1.4 for the selected reference gas, hereafter referred to as "the reference gas".

However, the test pressure shall be one of those stated by the manufacturer and the appliance shall be fitted with the appropriate injectors.

6.1.5.2 Tests requiring the use of limit gases

These tests shall be carried out with the limit gases appropriate to the appliance category (see Table 4) and with the injectors and the adjustments corresponding to the reference gas of the group, or family, to which each limit gas belongs.

6.1.6 Test room

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

6.1.7 Preparation of the appliance

The appliance shall be set up taking due account of the manufacturer's instructions, with particular reference to minimum clearances around the appliance. It shall then be adjusted in accordance with the manufacturer's instructions using the appropriate reference test gas.

Before any tests are made the appliance shall be operated without a load in the drum at the maximum setting for a period sufficient to dry out any insulation and remove any temporary finish that might interfere with observations.

6.1.8 Test conditions

a) The test conditions given below apply except where otherwise specified in Clause 6.

b) The appliance shall be installed in accordance with the manufacturer's instructions, with particular reference to minimum declared clearances around the appliance.

c) The appliances shall be at room temperature at the start of each test.

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

e) Precautions shall be taken to prevent thermostats or other variable controls from acting to interfere with the gas flow except as necessitated by the test.

f) The appliance shall be tested with the exhaust duct fitted in accordance with the manufacturer's instructions.

NOTE 1 In general, except for tests involving regulator performance, the appliance regulator, if any, can be put out of operation and the specified test pressure obtained by adjustment of the gas pressure at the inlet to the appliance.

g) Test pressure shall be measured correct to 0,2 mbar and the variation in test pressure shall not exceed ± 0,2 mbar.

NOTE 2 The test gases (and, where appropriate, their conditions of application) to be used are specified in the relevant subclauses of Clause 6.

h) For appliances with modulating or high/low control, the tests are carried out at the nominal heat input unless otherwise stated in the particular test.

i) Where tests are specified which require the drum of the appliance to be filled with a load, this load shall consist of a quantity of textile material having a mass in the dry condition equal to the maximum mass specified by the manufacturer.

   The textile material shall be in the form of pre-washed double hemmed cotton sheets having dimensions of approximately 70 cm × 70 cm and a mass per unit area between 140 g/m^2 and 175 g/m^2 in the dry condition.

When the load is required to be wet, the textile material is saturated with a quantity of water having a temperature of (25 ± 5) °C and a mass equal to that of the textile material.

NOTE 3 For the purpose of this European Standard, cotton having a water concentration not exceeding 10 % is considered as being in the dry condition. If cotton is conditioned for 24 h in still air having a temperature of (20 ± 2) °C, a relative humidity between 60 % and 70 % and a pressure between 860 mbar and 1 060 mbar, cotton will contain approximately 7 % water.

NOTE 4 As an alternative to the textile material specified, pieces of cloth with the same material and finishing specification as indicated above but having an area between 4 800 cm^2 and 5 000 cm^2, with one side of at least 55 cm, may be used for the tests.

6.2 Screws

6.2.1 Requirements

With the exception of screws having a full machine thread and self-tapping screws used in conjunction with spring steel fasteners, it shall be verified that screws used:

— for securing components which may be removed during routine servicing, or

— for securing devices essential for the safe operation of the gas burner,

provide a secure fix when tested under the provisions of 6.2.2.

6.2.2 Tests

The screw shall be loosened and tightened 5 times to the torque given in Table 7. The test screwdriver shall have a blade suitable for the screw head and the tightening action shall be smooth - not in jerks. The component shall be removed each time the screw is loosened.

Table 7 — Torque values for screws

Nominal diameter of screw mm	**Torques** N·m
Up to 2,8	0,4
Over 2,8 up to 3,0	0,5
Over 3,0 up to 3,2	0,6
Over 3,2 up to 3,6	0,8
Over 3,6 up to 4,1	1,2
Over 4,1 up to 4,7	1,8
Over 4,7 up to 5,3	2,0
Over 5,3 up to 6,0	2,5

6.3 Manually operated devices of the automatic burner control systems

6.3.1 Requirements

The rapid (on and off) operation of any start switch shall not set up a hazardous condition.

6.3.2 Tests

The appliance is installed as described in 6.1.7 and 6.1.8 and supplied with an appropriate reference gas at the nominal heat input in accordance with 6.1.3.2.1. The start device is manually operated 10 times i.e. once every 5 s.

6.4 Mechanical hazards

6.4.1 General

6.4.1.1 Requirements

The locking means or its components shall not be damaged to such an extent that this will impair compliance with this European Standard.

NOTE This requirement has been drawn from EN 60335-2-11.

6.4.1.2 Tests

Compliance shall be checked by inspection, by measurement and by manual test. The appliance is operated at rated voltage or at the upper limit of the rated voltage range.

While the appliance operates as in normal use, if a means to prevent opening of the door incorporates a coil or similar component to hold the door locked in the closed position, this component is energized and de-energized 6 000 times, at a rate of six times per minute or at the rate imposed by the design and construction of the appliance whichever is the lower.

NOTE If opening and closing of the door is necessary for the mechanical operation of the interlock, the door is opened and closed during the test.

6.4.2 Appliances with an opening dimension exceeding 200 mm and a drum having a volume exceeding 60 dm^3

The appliance shall comply with the requirements of 20.102 given in EN 60335-2-11:2003.

6.5 Stability of appliances

The appliance shall comply with the requirements of 20.1 and 20.103 of EN 60335-2-11:2003.

6.6 Soundness of the gas circuit

6.6.1 Requirements

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

6.6.2 Tests

The appliance gas inlet is connected to an air supply capable of being maintained constant at the appropriate pressure.

For appliances using 1st and/or 2nd family gases only, the tests are carried out with an air pressure of 50 mbar; the inlet valve is however tested with an air pressure of 150 mbar. For appliances using 3rd family gases, all the tests are carried out with an air pressure of 150 mbar. The regulator, if any, can be locked in its maximum open position to avoid damage.

The appliance is tested at ambient temperature under each of the following conditions:

a) each valve in the main gas way is tested in turn for soundness in its closed position, all other valves being open;

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

Where the design of the ignition burner is such that its gas outlet cannot be sealed, this test is carried out with the gas way to the ignition burner sealed at a convenient place. In this case an additional test is also carried out, using soap solution, to verify that there is no leakage from the ignition burner when it is operating at its normal working pressure.

To measure any leakage a method is used allowing a direct measurement to an accuracy of 0,01 dm^3/h.

The tests are first carried out when the appliance is delivered, and again after all the appliance tests have been carried out, but before dismantling any of the parts involved in this soundness test.

6.7 Heat inputs

6.7.1 Nominal heat input

6.7.1.1 General

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

The nominal heat input Q_n in kilowatts is given by one of the following equations:

$Q_n = 0{,}278\ M_n \times H_i$; or

$Q_n = 0{,}278\ V_n \times H_i$.

where

Q_n is the nominal heat input based on the net calorific value [2)] in kilowatt;

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

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

H_i is the net calorific value of the reference gas, in megajoules per cubic metre (1st equation) or in megajoule per kilogram (2^{nd} equation).

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2) The heat input based on gross calorific value is related to the net value for the five main reference gases as follows:
G 110 gross value = 1,136 × net value

G 20 gross value = 1,111 × net value

G 25 gross value = 1,110 × net value

G 30 gross value = 1,083 × net value

G 31 gross value = 1,088 × net value

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

When the determination is made by mass, (3rd family gas), the corrected mass flow rate is calculated from Equation (2)):

$$M_0 = M \sqrt{\frac{1013{,}25 + p}{p_a + p} \times \frac{273 + t_g}{288} \times \frac{d_r}{d}} \quad (2)$$

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

$$V_0 = V \sqrt{\frac{1013{,}25 + p}{1013{,}25} \times \frac{p_a + p}{1013{,}25} \times \frac{288}{273 + t_g} \times \frac{d}{d_r}} \quad (3)$$

The corrected mass rate is calculated using Equation (4).

$$M_0 = 1{,}226\ V_0 \times d \quad (4)$$

where

M_o is the mass flow rate under reference conditions;

M is the mass flow rate obtained under test conditions;

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

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

p_a is the atmospheric pressure in millibar;

p is the gas supply pressure in millibar;

t_g is the temperature of the gas at the appliance inlet in degrees Celsius;

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

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

Equations (2), (3) and (4) are used to calculate, from the mass input, M, or volume input, V, measured during the test, the corresponding rates M_o or V_o which would have been obtained under the reference conditions, and it is these values, M_o and V_o, that are compared with the values M_n and V_n, calculated from the nominal heat input, using the equations given earlier in this subclause.

Equations (2), (3) and (4) are applicable if the test gas used is dry.

If a wet gas meter (water filled) is used or if the gas used is saturated, the value d (density of dry gas in relation to dry air) is replaced by the value of the density of the wet gas, d_h, given by Equation (5).

$$d_h = \frac{d\,(p_a + p - p_w) + 0{,}622\ x\ p_w}{p_a + p} \quad (5)$$

where

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

For all the tests described in 6.7.1.3 and 6.7.2.2, the measurements are taken with the appliance at thermal equilibrium, and with any thermostat put out of action.

6.7.1.2 Requirements

When measured in accordance with 6.7.1.1:

a) for an appliance without a gas rate adjuster, under the test conditions described in 6.7.1.3.1, the heat input obtained at normal test pressure shall be within ± 5 % of the nominal heat input;

b) for an appliance with a gas rate adjuster but no regulator, the heat input shall be at least equal to the nominal heat input when measured under the conditions specified in 6.7.1.3.2, test No. 1, and shall not exceed the nominal heat input when measured under the conditions specified in 6.7.1.3.2, test No. 2.

6.7.1.3 Tests

6.7.1.3.1 Calibrated injector rate of appliances without gas rate adjusters or where these adjusters are put out of action

To check the rate of the injectors each reference gas for the appliance category is used successively.

The tests are carried out at the pressures specified by the manufacturer in accordance with 6.1.4.

The appliance is fitted successively with each of the prescribed injectors and the rate is measured for each reference gas by supplying the appliance at the appropriate normal test pressure in accordance with 6.1.4.

6.7.1.3.2 Performance of gas rate adjusters for appliances without regulators

The tests are carried out with each reference gas pertaining to the appliance category but not with those for which the adjuster is put out of action.

Test No. 1

With the adjuster fully open, the supply pressure is brought to the minimum value given in 6.1.4 corresponding to the particular reference gas.

Test No. 2

With the adjuster fully closed, the supply pressure is brought to the maximum value given in 6.1.4 corresponding to the particular reference gas.

6.7.2 Reduced rate

6.7.2.1 Requirements

When the appliance has a modulating thermostat that completely shuts off the supply of gas to the burner, the minimum modulated rate shall not exceed 50 % of the nominal heat input.

When the appliance has a modulating thermostat that does not completely shut off the gas, the minimum modulated rate shall not exceed 20 % of the nominal heat input.

6.7.2.2 Tests

The burner is supplied successively with each reference gas pertaining to the appliance category, if necessary, after adjusting the burner to its nominal heat input and after turning the tap handle to the reduced rate position, or after letting the thermostat operate in its minimum position if it is of the "modulating" type.

6.7.3 Heat input of ignition burners

6.7.3.1 Requirements

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

If there is a gas rate adjuster, it shall allow an ignition burner rate necessary for certain ignition of the burner at all gas inlet pressures between the minimum and maximum values given in 6.1.4.

6.7.3.2 Tests

The ignition burner heat input is measured as described in 6.7.1.1, with each reference gas at normal test pressure. If the ignition burner has an adjuster the heat input is measured at minimum test pressure with the adjuster fully open.

6.8 Burners

6.8.1 Resistance to overheating

6.8.1.1 Requirements

The various burner parts shall show no deterioration other than the superficial changes associated with gas combustion.

6.8.1.2 Tests

The test is carried out with the reference gas of the appliance category, with the corresponding injector.

For aerated burners the gas is lit intentionally at the injector, provided that ignition is possible without removing any part of the burner, and also, if possible, at the burner head. If combustion can be maintained under these conditions the test is continued for 15 min.

If combustion cannot be maintained at the injector or inside the burner when the burner is working at its nominal heat input, the test is continued by decreasing the pressure until combustion can be maintained, but stopping at the minimum pressure. If there is a reduced rate position on the tap and if the preceding test does not allow combustion to be maintained at the injector or inside the burner, the test is repeated with the tap in the reduced rate position.

6.8.2 Escape of unburnt gas

6.8.2.1 Requirements

There shall be no leakage of any flammable quantity of air/gas mixture between the injector and the burner head.

6.8.2.2 Tests

The test is carried out with reference gas(es) according to the appliance category, supplied at normal pressure at the maximum rate.

A suitable means is then used to search for gas leaks from the joints of the burner assembly and the primary air inlet to the burner.

The above test is repeated at the reduced rate, if it exists.

6.9 Limiting temperature of various parts of the appliance

6.9.1 Requirements

The temperature of the auxiliary equipment (including taps) shall not exceed that indicated by its manufacturer. Furthermore, under these same conditions the temperature of the tap bodies shall not in any case exceed the ambient temperature by more than 125 K.

The surface temperature of the control handles and of all the parts that have to be manipulated during normal operation of the appliance, measured only in the areas intended to be touched, shall not exceed the ambient temperature by more than:

— 35 K for metals and equivalent materials;

— 45 K for porcelain and equivalent materials;

— 60 K for plastics and equivalent materials.

If the temperature of the end of the appliance gas inlet connection exceeds the ambient by more than 30 K, the technical instructions for installation and adjustment shall state the precautions to be taken.

The temperature of those parts of the appliance likely to be touched accidentally shall not exceed the ambient temperature by more than the values given in Table 8.

Table 8 — Maximum temperature rise in parts of the appliance that are likely to be touched accidentally

Parts that are likely to be touched accidentally [a]	**Maximum temperature rise** K
- of metal	45
- of glass, ceramics, vitreous enamelled or painted steel and similar surfaces	65
- of plastics or rubber	80
[a] The use of these materials is subject to compliance with 5.1.2.	

6.9.2 Tests

The appliance is installed in a test rig (see Figure 2) in accordance with the manufacturer's instructions taking into account the minimum clearances and any special insulation. However, the appliance shall be placed as close to the rear wall as physically possible. The test rig may be a test corner or test box. The test rig consists of hardwood panels of a thickness between 19 mm and 25 mm with their surfaces coated with matt black paint. Thermocouples are incorporated into each panel at the centre of squares of side 10 cm; these

thermocouples penetrate the panels from the outside so that the junctions are situated 3 mm from the surface of the test panels facing the appliance.

Temperature rises of the accessible front surface are measured using the probe shown in Figure 3. The probe is applied with a force of (4 ± 1) N to the surface in such a way that the best possible contact between the probe and the surface is ensured.

Any measuring instrument giving comparable results may be used.

The woodwork is thoroughly dried out, either by previous tests or by heating for 24 h with an appliance in position and operating at a suitable gas rate.

The lint trap is cleaned before the test is started and its surface is lined with two layers of cloth, there being no further cleaning during the test.

The composition of the cloth is as given in 6.16.4.2 b).

If the lint trap is of the screen type, 50 % of the area is blocked.

The appliance is operated using the appropriate reference test gas at the nominal heat input with the electrical supply voltage set at the most unfavourable voltage between 85 % of the minimum rated voltage and 110 % of the maximum rated voltage of the appliance.

The temperature rises are measured with all doors or covers in the closed position.

6.10 Limiting temperature of floor, walls and worktop

6.10.1 Requirements

The temperature of any point of any floor on which an appliance is to be placed and that of the walls at the sides and back of the appliance and worktop shall not exceed the ambient temperature by more than 50 K. If appropriate, the manufacturer shall indicate in the installation and adjustment instructions the nature of an effective protection to be applied between the appliance and the floor, worktop or walls unless they are made of non-flammable materials. This protection shall be supplied to the test laboratory which shall check that, when the appliance is fitted with it, the temperature of the floor, walls and worktop does not exceed the ambient temperature by more than 50 K.

6.10.2 Tests

Test the appliance as described in 6.9.2.

Appliances are subjected to three cycles. The duration of each cycle is established by operating the appliance in the test apparatus and noting the point at which the appropriate temperature control device cuts off the gas supply to the burner. Sample temperature measurements are then taken on the test boards to establish the time at which maximum temperatures are reached.

Each cycle of the appliance then consists of operation for the period of time at which maximum temperatures are achieved, followed by a 4 min rest period.

Appliances provided with a timer are operated as above unless, after the maximum time provided by the timer, the temperature control device has not operated. In this case the appliance is operated for the maximum period available using the timer, followed by a 4 min rest period.

At the beginning of each test and during the rest periods the appliance is reloaded with a saturated load of textile as specified in 6.1.8 i).

At the end of the final cycle, and excluding the 4 min rest period, temperature readings are taken at the thermocouples most affected by the heat of the appliance. The temperature rise above room temperature is determined.

6.11 Limiting temperature of components

6.11.1 Normal operation

6.11.1.1 Requirements

The temperature rise of any component, the failure of which is liable to affect the safe operation of the appliance, when added to 25 °C shall not exceed the maximum temperature specified by the component manufacturer.

If the appliance can be connected to a flexible tube (see 5.1.6), the rise in temperature of any part of the appliance likely to come into contact with the tube shall not exceed 70 K above ambient.

6.11.1.2 Tests

The appliance is operated as described in 6.10.2.

6.11.2 Severe operation

6.11.2.1 Requirements

The temperature rise of any component, the failure of which is liable to affect the safe operation of the appliance, when added to 25 °C, shall not exceed the maximum temperature specified by the component manufacturer.

If the appliance can be connected to a flexible tube (see 5.1.6), the rise in temperature of any part of the appliance likely to come into contact with the tube shall not exceed 70 K above ambient.

During the test the requirement of 6.10.1 is again assessed.

6.11.2.2 Tests

The appliance is operated as described in 6.10.2 except that the drum is filled with a suitable dry load to allow the appliance to cycle on the thermal control positioned upstream from the drum.

6.11.3 Abnormal operation

6.11.3.1 Requirements

No hazardous conditions shall arise.

6.11.3.2 Tests

a) The appliance is operated as described in 6.10.2 except that the textile material is not wetted and any thermal control which operates during the test in 6.11.2.2 is short-circuited. If the appliance is provided with more than one control then these are short-circuited in turn. If the short-circuiting of a control is unlikely to be detected by the user, this control is short-circuited for the duration of the above test.

b) Test a) is repeated, however the thermal control is reconnected and the drum rotation is rendered inoperative.

c) Test a) is repeated, however the thermal control is reconnected. The appliance is operated and the air flow is gradually reduced until the appliance shuts down.

6.12 Motor temperatures

6.12.1 Motor bearings

6.12.1.1 Requirements

The maximum temperature of any external motor bearings shall not exceed the maximum temperature stated by the manufacturer.

Bearings incorporated in the motor shall not exceed the temperature stated by the manufacturer. In this case, the maximum temperature of such bearings is taken to be that of the windings measured in accordance with 6.12.2.2.

6.12.1.2 Tests

The appliance is installed according to the conditions of 6.9.2 and supplied with electricity by means of a device that enables the voltage to be varied from 85 % of the minimum to 110 % of the maximum of the voltage range stated by the manufacturer, e.g. a variable voltage transformer.

The test is carried out in still air and with the appliance adjusted to its nominal heat input, using the appropriate reference gas(es). The voltage is adjusted to the most unfavourable value between the above limits.

Temperature measurements are made when the appliance has reached thermal equilibrium and after the appliance has been switched off by the normal means of control.

6.12.2 Motor windings

6.12.2.1 Requirements

The maximum temperature rise of the motor windings shall not exceed the maximum rise stated by the manufacturer.

6.12.2.2 Tests

The appliance is installed and tested as stated in 6.12.1.2 except that when the appliance has reached thermal equilibrium, the electricity supply is switched off.

The resistance of the windings is measured as soon as possible after switching off and then at short intervals so that a curve of resistance against time from switch-off can be plotted, in order to determine the maximum resistance value.

The temperature rise of the windings is calculated using Equation (6).

$$\Delta_t = \frac{(R_2 - R_1)}{R_1}(C + t_1) - (t_2 - t_1) \quad (6)$$

where

Δ_t is the temperature rise in K;

R_1 is the resistance at the beginning of the test (Ω);

R_2 is the maximum resistance at the end of the test (Ω);

t_1 is the room temperature at the beginning of the test in °C;

t_2 is the room temperature at the end of the test in °C;

C is a constant equal to 234,5 °C for copper.

6.13 Ignition, cross-lighting and flame stability

6.13.1 Ignition and cross-lighting

6.13.1.1 Requirements

Under the cold and hot test conditions and in still air, correct and rapid ignition and cross-lighting shall be assured.

Under the test conditions described in test No. 4, there shall be no hazard to the user or damage to the appliance.

For appliances of the reversing type, under the conditions described in test No. 5, there shall be no hazard to the user or damage to the appliance.

6.13.1.2 Tests

The following four tests are carried out with the appliance in both the cold and hot conditions:

Test No. 1

For this test the burner and ignition burner are adjusted in accordance with 6.1.3.2.1 and the appliance is supplied with the appropriate reference and limit gases (see 6.1.3.1) at the normal pressure (see 6.1.4).

The appliance is operated in accordance with the manufacturer's instructions at the maximum gas rate at which the ignition system operates with the normal supply voltage. The test is carried out with no load in the appliance drum and with the appliance connected to an exhaust duct corresponding to the minimum equivalent resistance specified by the manufacturer.

The above test is repeated operating the appliance with the manufacturer's maximum specified dry load, and the appliance outlet connected to an exhaust duct corresponding to the maximum equivalent resistance specified by the manufacturer.

Test No. 2

For this test the initial adjustments of the burner and ignition burner are not altered and the appliance is supplied with reference gas under the following conditions:

a) if the appliance has no regulator, the pressure at the appliance inlet is reduced to 70 % of the normal pressure for 1st and 2nd family gases and to the minimum pressure for 3rd family gases (see 6.1.4);

b) if the appliance has a regulator, the pressure is also lowered to a value equal to 70 % of the normal pressure, but the pressure downstream of the regulator is lowered, if necessary, to the value corresponding to 90 % of the nominal heat input for 1st family gases or 92,5 % of the nominal heat input for 2nd family gases.

Under these supply conditions it is checked that ignition of the burner by the ignition burner, or burner only, as well as cross-lighting of the various parts of the burner occurs correctly and without disturbing noise.

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

Test No. 3

a) Without altering the initial burner or ignition burner adjustment, the appropriate flame lift and light-back limit gases are substituted successively for the reference gas and the pressure is reduced at the appliance inlet to the minimum pressure (see 6.1.4). For an appliance with a pressure regulator, the pressure downstream of the regulator is lowered, if necessary, to the value corresponding to 90 % of the nominal heat input for 1st family gases or 92,5 % of the nominal heat input for 2nd family gases (for the reference gases).

b) The ignition burner gas rate or start flame gas rate is reduced to the minimum required to keep the gasway to the burner open.

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

— by the adjustment of the ignition burner rate adjuster, if this exists, or, if this is not possible;

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

c) The correct ignition of the burner by the ignition burner, or burner only, is then checked.

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

Where an ignition burner has several ports likely to become blocked, tests No. 1 and No. 2 are carried out with all the ignition burner orifices blocked except for the one that heats the sensing element.

Test No. 4

The appliance is initially adjusted in accordance with 6.1.3.2.1 and supplied with the appropriate reference gas(es) (see 6.1.3.1) at nominal heat input.

The appliance contains the maximum dry load as specified by the manufacturer, and the appliance outlet connected to an exhaust duct corresponding to the maximum equivalent resistance specified by the manufacturer.

The main burner is ignited directly at the full-on rate, overruling any start gas flame.

The test is repeated, progressively delaying the ignition up to a maximum of 50 % longer than the safety time or maximum ignition period declared by the manufacturer, whichever is appropriate.

In order to carry out the above test it would be necessary to provide independent control of the main gas and start gas, where applicable, automatic shut-off valves and the operation of the ignition device. A suitable arrangement is to provide a voltage supply, independent of the automatic burner control system, to the relevant gas valve(s) and to the ignition device. For safety reasons the ignition delay should be increased in stages.

In addition, if the appliance does not incorporate an air flow proving device which is checked in the "no flow" position prior to start up, the above test is repeated with the fan inoperative and the drum empty.

Test No. 5 (for reversing type appliances only)

For this test, the appliance is adjusted in accordance with 6.1.3.2.1 and is supplied with the appropriate reference gas at the normal pressure (see 6.1.4).

The appliance contains the maximum dry load as specified by the manufacturer and the appliance outlet is connected to ducting corresponding to the maximum equivalent resistance specified by the manufacturer.

With the ignition device and fan rendered inoperative, the appliance is operated in accordance with the manufacturer's instructions.

The appliance is allowed to run for two cycles for which the appliance is programmed. Each cycle comprises the forward and reverse action of the drum.

On the third cycle, the ignition device is rendered operative and the ignition is progressively delayed up to the end of the first safety time. The ignition is checked.

WARNING — Special precautions should be taken to ensure that a hazard does not arise when carrying out this ignition test.

6.13.2 Flame stability

6.13.2.1 Requirements

The flames shall be stable and shall not make any disturbing noise. A slight tendency to lift at the moment of ignition is acceptable but the flames shall be stable in normal operation.

6.13.2.2 Tests

The following two tests are carried out with the supply voltage at its limit of tolerance.

When the maximum rated voltage is applied, there is no load in the appliance drum and the appliance outlet is connected to an exhaust duct corresponding to the minimum equivalent resistance specified by the manufacturer. When the minimum voltage is applied, the appliance drum is filled with a dry load of textile corresponding to the manufacturer's maximum specified dry load and the appliance outlet is connected to an exhaust duct corresponding to the maximum equivalent resistance specified by the manufacturer.

Test No. 1

For this test the burner and ignition burner are adjusted in accordance with 6.1.3.2.1 and the appliance is supplied with the appropriate light-back limit gas (see 6.1.3.1) at the minimum pressure (see 6.1.4).

For an appliance with a pressure regulator, the pressure downstream of the regulator is lowered, if necessary, to the value corresponding to 90 % of the nominal heat input for 1st family gases or 92,5 % of the nominal heat input for 2nd family gases (for the reference gases).

Under these supply conditions it is checked that the flames are stable.

The test is repeated at the minimum rate given by the thermostat, where this exists.

Test No. 2

For all appliances without a regulator, the initial adjustments of the burner and ignition burner are retained and the appliance is supplied, at the maximum pressure (see 6.1.4) with the flame-lift limit gas. The absence of flame-lift in normal use is checked.

For an appliance with a regulator, the test is carried out by increasing the burner rate to a value corresponding to 107,5 % of the nominal heat input for 1st family gases or 105 % of the nominal heat input for 2nd family gases (for the reference gases).

6.13.3 Supplementary requirements and tests

6.13.3.1 Requirements

The flames shall be stable.

6.13.3.2 Tests

6.13.3.2.1 Adverse outlet conditions

The appliance is connected to an exhaust duct of the minimum equivalent resistance specified by the manufacturer.

The appliance is operated from the cold condition using the reference gas at normal test pressure with no load in the drum and the pressure at the outlet is increased using a fan-induced back-draught:

a) gradually, until any safety device operates;

b) suddenly, by using a baffle arrangement to produce instantaneous increases in back- pressure. The magnitude of the back-pressure is increased until any safety device operates.

6.13.3.2.2 Effect of room draughts

The appliance is supplied with the reference gas at normal test pressure and is subjected to a wind stream of 2 m/s from an axial flow type fan of at least 300 mm diameter.

The axis of the wind stream is in a horizontal plane and is directed at the appliance air inlet. A shield is placed between the fan and the appliance and, immediately after lighting the appliance, the shield is removed for periods of 3 s to produce gusts. The tests are repeated at steps of 30° round the appliance, applying at least three gusts in each position in intervals of 3 s.

6.14 Flame supervision devices

6.14.1 Manual devices

6.14.1.1 Requirements

The ignition delay shall not exceed 20 s. This time limit may be increased to 60 s if no manual intervention by the user is required during this period. The extinction delay shall not exceed 60 s.

6.14.1.2 Tests

The tests are carried out in succession with each reference gas with the appliance adjusted to its nominal heat input.

After this adjustment has been made, the appliance is turned off until it has cooled to ambient temperature. The gas is turned on again and lit at the ignition burner. The ignition delay is the time interval between the moment of lighting the ignition burner and that when the safety device is actuated.

The appliance is then left to operate at its nominal heat input for at least 10 min.

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

6.14.2 Automatic devices

6.14.2.1 Safety time

6.14.2.1.1 Requirements

The safety time measured shall not exceed 30 s.

6.14.2.1.2 Tests

The gas supply to the appliance is isolated. An attempt to light the appliance is made in accordance with the manufacturer's instructions, and the time between the signals for valve opening and closure is measured. This time is compared with the manufacturer's specified safety time.

6.14.2.2 Extinction safety time

6.14.2.2.1 Requirements

The safety time measured shall not exceed 60 s.

6.14.2.2.2 Tests

With the appliance in the running condition, the gas supply to the main burner is isolated. The time between the extinction of the main burner and the signal for valve closure is measured.

6.15 Regulators

6.15.1 Requirements

For a regulated appliance the rate when measured under the conditions specified in 6.15.2, test no. 1 shall not vary by more than ± 7,5 % for 1st family gases, or by more than ± 5 % for 2nd family gases, from the rate obtained at normal test pressure when the pressure upstream varies between the minimum and maximum limits given in 6.1.4 for the reference gas of the relevant category.

Where the function of the regulator has been annulled by the manufacturer, the ratio of the flow rate to the square root of the pressure shall remain constant when the inlet pressure is varied between its minimum and maximum values in accordance with 6.15.2, test no. 2.

6.15.2 Tests

Test no. 1 If the appliance has a regulator an adjustment is made, if necessary, to give the nominal volumetric rate with reference gas at normal pressure as given in 6.1.4 and appropriate to the gas. Keeping this initial adjustment, the supply pressure is varied between the corresponding minimum and maximum values.

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

Test no. 2 The appliance is supplied with the reference gas at the minimum and then at the maximum pressure given in 6.1.4 and the flow rate is measured under the same conditions of temperature and pressure. It is then verified that:

$$\frac{Q_{min}}{\sqrt{p_{min}}} \times \frac{\sqrt{p_{max}}}{Q_{max}} = 1 \pm 0{,}05$$

where

Q_{min} is the flow rate at minimum pressure p_{min};

Q_{max} is the flow rate at maximum pressure p_{max};

p_{min} is the appropriate minimum pressure for the gas family or gas group to which the reference gas belongs (see 6.1.4);

p_{max} is the appropriate maximum pressure for the gas family or gas group to which the reference gas belongs.

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

6.16 Combustion

6.16.1 General

The appliance is supplied with gas and, if necessary, adjusted according to the instructions given in 6.16.3 and 6.16.4.

A sample of the products of combustion is taken in accordance with the method described in 6.16.3 when the appliance has reached thermal equilibrium.

The carbon monoxide, CO, concentration is measured by an instrument capable of determining CO concentrations between 5×10^{-5} and 100×10^{-5} parts by volume. In the range used, the method shall be selective and accurate to $\pm 2 \times 10^{-5}$ parts of CO by volume. Instruments which currently correspond to these requirements are of the infra-red absorption type. The CO measuring apparatus shall be designed or installed so that it is not affected by the presence of carbon dioxide, CO_2, in the products of combustion.

The carbon dioxide, CO_2, concentration is measured by a method accurate to within 5 %. Infra-red absorption instruments are recommended.

The CO concentration of the dry, air-free products of combustion (neutral combustion) is given by Equation (7).

$$V_{CO,N} = V_{CO_2,N} \times \frac{V_{CO,M}}{V_{CO_2,M}} \quad (7)$$

where

$V_{CO,N}$ is the carbon monoxide concentration of the dry air-free products of combustion (%);

$V_{CO2,N}$ the calculated carbon dioxide content of the dry air-free products of combustion (%);

$V_{CO,M}$ and $V_{CO2,M}$ are the carbon monoxide and carbon dioxide concentrations measured in the sample during the combustion test (%).

The values of $V_{CO2,N}$ (neutral combustion) are given for the test gases in Table 9.

Table 9 — $V_{CO_2,N}$ values

Gas designation	G 110	G 20	G 21	G 25	G 26	G 30	G 31
$V_{CO_2,N}$	7,6	11,7	12,2	11,5	11,8	14,0	13,7

The carbon monoxide concentration of the dry, air-free combustion products ($V_{CO,N}$) may also be calculated using Equation (8).

$$V_{CO,N} = \frac{21}{21 - V_{O_2,M}} \times V_{CO,M} \quad (8)$$

where

$V_{CO,N}$ is the carbon monoxide concentration (%) of the dry, air free combustion products;

$V_{O2,M}$ is the oxygen concentration (%) measured in the sample;

$V_{CO,M}$ is the carbon monoxide concentration (%) measured in the sample.

The use of Equation (9) is recommended where it gives greater accuracy than the equation based on the CO_2 concentration (see Equation (7)).

6.16.2 Requirements

When measured and calculated as specified in 6.16.1, the CO concentration in the dry, air-free products of combustion shall not exceed:

a) 0,10 % when the appliance is supplied with reference gas under the conditions described in 6.16.3.1;

b) 0,20 % when the appliance is supplied with the incomplete combustion limit gas under the conditions described in 6.16.3.1;

c) 0,20 % under the conditions of 6.16.3.2.

In addition, under the conditions of 6.16.3.2 a), the appliance shall ignite and continue to operate;

d) 0,20 % under the conditions described in 6.16.4.1 and 6.16.4.2.

In addition, under the conditions described in 6.16.4.1 a), at the point of shut-off, the increase in pressure at the duct outlet shall not be less than 0,75 mbar;

e) Under the test conditions described in 6.16.4.3, the CO concentration in the dry, air-free products of combustion shall not exceed the following:

1) up to a stage where the measured change in pressure differential is that given by Curve A in Figure 4 for the appropriate height of the lowest point of the air inlet aperture above the floor, either

— the CO concentration that would be obtained at 110 % nominal heat input in the absence of lint

or

— 0,004 % plus the CO concentration in percentage at nominal heat input in the absence of lint

whichever is the greater figure

2) at stages where the measured change in pressure differential is between those given by curve A and by curve B in Figure 4 for the appropriate height of air inlet above the floor, the CO concentration shall not exceed 0,20 %.

Where box type burners are employed that are not capable of being opened using commonly available tools, or are not otherwise accessible for internal cleaning, the CO concentration in the dry, air-free products of combustion at the end of the second linting test as described in 6.16.4.3.4 h) shall not be more than 0,004 % above the CO concentration in percentage obtained at the end of the first linting test, subject to a maximum permissible CO concentration in the dry, air-free products of combustion of 0,20 %.

A burner that is not capable of being opened shall not exhibit any appreciable accumulation of lint on examination in accordance with 6.16.4.3.4 i).

6.16.3 Tests under normal conditions

6.16.3.1 General

The appliance is initially adjusted to obtain the nominal heat input as specified in 6.1.3.2 and then the appliance is supplied with reference gas under the following conditions, as appropriate:

a) for appliances without a gas rate adjustment or regulator, or for appliances fitted with these devices but where their function has been annulled, the test is carried out with the appliance supplied at the maximum pressure given in 6.1.4;

b) for an appliance with a gas rate adjuster but without a pressure regulator, the test is done by adjusting the burner to a rate equal to 1,10 times the nominal heat input;

c) for an appliance with a regulator that has not been put out of action, the test is made by bringing the burner rate to 1,07 or 1,05 times the nominal heat input, depending on whether it is supplied with gas G 110 or with gases G 20 or G 25.

After the test with the reference gas or gases, the appliance is tested with the incomplete combustion limit test gas for the appliance category as specified in 6.1.3.1.

This test is done by simply replacing the reference gas by the corresponding incomplete combustion limit test gas without changing either the adjustment of the appliance or the gas supply pressure.

When G 21 is the incomplete combustion limit test gas, the combustion test should be carried out by applying an increase of 5 % in rate where a gas pressure regulator exists and an increase of 7,5 % in the absence of a regulator.

The above measurements shall be made under the following conditions:

— with an exhaust duct fitted to the appliance corresponding to the minimum equivalent resistance specified by the manufacturer and with no load in the appliance drum;

— with a dry load in the appliance drum corresponding to the manufacturer's maximum specified dry load and with an exhaust duct fitted to the appliance outlet corresponding to the maximum equivalent resistance specified by the manufacturer.

6.16.3.2 Voltage variation

In addition to the tests given in 6.16.3.1 tests shall be made using the appropriate reference test gas at normal test pressure as follows:

a) with the supply voltage at 85 % of the minimum rated voltage and at 110 % of the maximum rated voltage of the appliance;

b) with the voltage to the fan reduced until the gas supply to the main burner is shut off by the air flow failure control.

During the test described in a) above, when the maximum voltage is applied, there shall be no load in the appliance drum and the appliance outlet shall be connected to an exhaust duct corresponding to the minimum equivalent resistance specified by the manufacturer. When the minimum voltage is applied, the appliance drum shall be filled with a dry load of textile corresponding to the manufacturer's maximum specified dry load and the appliance outlet shall be connected to an exhaust duct corresponding to the maximum equivalent resistance specified by the manufacturer.

The test described in b) above is carried out with the appliance in the cold condition and with a wet load in the appliance drum, in accordance with 6.1.8 i).

6.16.4 Supplementary tests under special conditions

6.16.4.1 Adverse outlet conditions

The appliance is supplied with the appropriate reference test gas at adjustment pressure and tests shall be carried out under the following conditions:

a) with the manufacturer's maximum specified dry load in the appliance drum, the appliance is connected to an exhaust duct of the maximum equivalent resistance specified by the manufacturer. The outlet of the exhaust duct is further restricted progressively until the gas is shut off by the air flow failure control. At the point of shut-off, the increase in pressure at the outlet of the exhaust duct is measured;

b) with the appliance drum empty, a suction is applied to the appliance exhaust duct outlet so as to reduce the pressure at the outlet to 0,5 mbar below atmospheric pressure;

c) the test described in b) above is repeated with the lint filter removed.

6.16.4.2 Restricted flow

The appliance is supplied with the appropriate reference test gas at adjustment pressure and tests shall be carried out under the following conditions:

a) with the manufacturer's maximum specified dry load in the appliance drum, the air inlet to the appliance is progressively blocked and combustion is monitored until the gas is shut off by the air flow failure control;

b) with the appliance lint trap cleaned and its surface lined with two layers of cloth, there being no further cleaning during the test.

The composition of the cloth used is:

material ……..unbleached cotton

mass per unit area…….. 25 g/m^2 to 34 g/m^2

threads per metre:

warp…….. 1 020 to 1 180

weft ……1 020 to 1 180

If the lint trap is of the screen type, 50 % of the area is blocked.

With the appliance drum empty, combustion is monitored until the gas is shut off by the air flow failure control.

6.16.4.3 Lint resistance of the burner

6.16.4.3.1 Test room

An internal room of normal construction of about 17 m^3 capacity (no dimension being less than 2 m) and having at least one observation window is suitable. The walls and ceiling are papered, painted or varnished so as to give a smooth surface that will minimize dirt collection. Similarly, the floor is smooth tiled.

The air required for combustion and ventilation is provided partly through the lint generator and partly from outside the room via two grills 0,3 m^2 situated on the side walls. The air in the room is mixed by means of small fans that are fixed in the ceiling and adjusted so that they do not interfere with the performance of the appliance under test. These fans are allowed to rotate backwards and forwards about their vertical axis and are run at their lowest speed. Lint is prevented from settling on the floor by means of compressed air jets, at a supply pressure of 1,4 bar, fitted into the floor. These are operated intermittently for periods of 30 s every 4 min. Lint is prevented from reaching the appliance under test directly from the lint generator by means of a V-shaped baffle. The dimensions and positioning of this baffle are indicated in Figure 5.

Combustion products are exhausted through an extract fan by means of a 150 mm diameter fan.

The combustion products extract duct is fitted with a pre-set flow detection device operating on the appliance gas valve.

NOTE Explosion reliefs should be fitted in three walls and the roof.

The room is provided with supplies of test gases and water and is fitted with points for sampling, from outside, the air entering the appliance and the products of combustion. The air inlet ducts and the combustion products outlet are provided with filters and it should be possible to isolate electrically, from outside the room, the appliance under test.

6.16.4.3.2 Apparatus

The apparatus comprises a lint generator and a lint filter.

The lint generator comprises a vertical shaft standing on a horizontal base, fitted with spools of cotton, nylon and wool yarns (see Figure 6). The yarns pass between two contra-rotating rollers, into a cutting chamber, where the strands are shaved by means of impeller blades fitted with cutting edges rotating at high speed (approximately 9 000 min^{-1}).

The lint so produced is mixed with Bentonite dust downstream of the cutting chamber and the mixture, of composition given below, is introduced into the test room through an acoustically insulated tube.

NOTE At the start of each of the test runs described in 6.16.4.3.4 e) and h) the lint generator should be fitted with new cutting blades. Cutting blades should not be used for more than 6 h.

The composition of the lint-dust mixture used is:

cotton fibre	(20 ± 5) % by mass
synthetic fibre	(25 ± 5) % by mass
wool fibre	(30 ± 5) % by mass
dust	(25 ± 5) % by mass

The diameters of the fibres are in the range 5 µm to 50 µm and are of a length not exceeding 30 mm. The Bentonite dust has a particle size not exceeding 25 µm.

The lint filter comprises a 0,9 mm circular plate of diameter 40 mm with nine holes, 2,3 mm in diameter, drilled in octagonal formation at 10 mm radius, and a 0,32 mm circular mesh wire gauze comprising 0,5 mm diameter holes, both plate and gauze fitted into a suitable holder (see Figure 7).

Linted air is drawn through the filter at such a rate as to give an approximate rate of change in pressure differential across the filter of (0,1 ± 0,03) mbar/h. The change in pressure differential is measured continuously.

6.16.4.3.3 Measurement of lint concentration

The lint concentration is monitored by drawing air through a filter (see Figure 7) at a rate of 3,5 dm^3/min and measuring the change in pressure differential across the filter.

The filter is mounted externally and as close to the lowest air inlet of the appliance as is practicable without affecting, or being affected by, the air flow into the appliance. In any case the filter is not more than 300 mm from the air inlet.

The filter is sited at a height above the floor such that the lower edge of the filter element is level with the lowest edge of the air inlet. In any case the filter is not less than 75 mm from the floor.

The filter element is placed such that it samples at right angles to the direction of air flow into the appliance.

Where the appliance has more than one air inlet at the lowest level, the filter is placed in front of the air inlet that is most convenient for the execution of the test.

The filter is cleaned before the start of each test and subsequently when the change in pressure differential equals 0,1 mbar. The total change in pressure differential is the sum of the individual values of the pressure differential determined between each cleaning of the filter.

6.16.4.3.4 Procedure

a) Carry out the following procedure in a test room as described in 6.16.4.3.1 using the appropriate reference test gas.

b) Install the appliance in accordance with the manufacturer's instructions; position the appliance against an artificial wall without any obstruction at either side or in front of the appliance.

c) Note the height of the air inlet above the floor as measured from the lowest edge of the air inlet.

d) Adjust the appliance to the manufacturer's recommended heat input rate using the appropriate reference test gas.

Determine the CO concentration in the dry, air-free products of combustion at this setting and at 10 % heat input overload.

e) After resetting to the manufacturer's specified heat input rate, operate the appliance under test continuously with no load in the appliance drum for periods of 1 h in an atmosphere of airborne lint produced as described in 6.16.4.3.2.

At the end of each hour's operation switch off the appliance for a period of 2 min and then switch it on and allow it to regain thermal equilibrium. During the "off" period, surfaces of the appliance, which would be regularly cleaned by the user and the surrounding area shall be cleaned, i.e. cleared of lint.

f) Sample the combustion products continuously during the operational period and analyze for carbon monoxide and carbon dioxide.

NOTE The combustion measurements described in g) are made after the appliance has reached thermal equilibrium following the off/on operation referred to in e).

g) When the total change in pressure differential is equal to the value obtained from curve A in Figure 4, stop the test and note the CO concentration in the dry, air-free products of combustion.

Continue the test until the total change in pressure differential is equal to the value obtained from curve B in Figure 4 and note the CO concentration in the dry, air-free products of combustion.

h) Clean the appliance and burner(s) using the method described in the manufacturer's instructions and repeat steps c) to g).

i) If the burner is not capable of being opened, after the second linting test h) clean it in accordance with the manufacturer's instructions and then cut it open and visually examine.

6.17 Sooting

6.17.1 Requirements

There shall be no accumulation of soot likely to affect the safe operation of the appliance.

6.17.2 Tests

The appliance is operated for 20 min from the cold condition, the drum being filled with a load of textile corresponding to the manufacturer's maximum specified dry load which has been wetted for the purposes of this test, using the appropriate sooting limit gas at normal test pressure.

The test is repeated three times, the loading being re-wetted at the beginning of each test.

The above test is carried out at all predetermined control settings.

6.18 Cyclic operation

6.18.1 Requirements

The appliance shall comply with the following:

a) the heat input measured at the start of the final cycle shall not have changed by more than 10 % from its initial value;

b) the CO concentration in the dry, air-free products of combustion shall not exceed 0,2 % under the normal conditions specified in 6.16.3;

c) there shall be no accumulation of soot likely to affect the safe operation of the appliance;

d) there shall be no corrosion, breakdown or distortion in any part of the appliance likely to affect its safety;

e) there shall be no seizure of screws or other changes likely to cause undue difficulty in subsequent maintenance;

f) after cooling, the appliance shall comply with the soundness requirement given in 6.6.1;

g) the ignition requirements specified in 6.13 shall be met using the reference test gas at the normal pressure.

6.18.2 Tests

The appliance is installed in a draught-free position between two adjacent side panels and a rear panel such that the clearance between the panels and the appliance is the minimum specified by the manufacturer.

The test is carried out using one of the appropriate reference gases with the appliance adjusted to give 115 % of the nominal heat input.

The appliance is operated at rated voltage and at the maximum heat setting available. If a timer is fitted to the appliance, this is short-circuited for the purposes of this test.

The appliance drum is filled with a load of textile corresponding to the manufacturer's maximum specified dry load.

The main burner is successively ignited and extinguished to give 100 cycles each of 2 h ON and 1 h OFF. Following this, the appliance is operated for a further 100 cycles of 10 min ON and 10 min OFF with no load in the appliance drum and with the lint filter blocked in accordance with 6.9.2.

7 Marking

7.1 Marking of the appliance

7.1.1 Data plates

Each appliance shall carry at least the following information, in a visible (possibly after the removal of part of the case or of a cover), and readable way for the installer as well as in an indelible way, either directly or on one or more data plates and/or labels firmly and durably attached to the appliance:

— the manufacturer's name and/or identification symbol, and address;

— the nominal heat input expressed in kilowatt; and stating whether it is based on net or gross calorific values;

— the trade name of the appliance;

— the serial number;

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

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

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

— the setting pressure for regulated appliances;

— the type of electrical supply used: rated voltage in volts, frequency in Hertz, nature of the current, nominal current in amperes and the maximum electrical power in kilowatts.

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

The identification symbol may be a logo, or a number allocated by the notified body responsible for the production surveillance.

7.1.2 Warning notices

A legible and durable label shall be permanently fitted to the appliance in a position which is readily visible to the user which directs that during the operation of the appliance a window or other means of ventilation shall be opened in the room containing the appliance.

7.1.3 Other marking

The appliance shall be indelibly marked with the following text:

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

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

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

7.2 Marking of the packaging

The packaging shall carry at least the following information:

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

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

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

In addition, it shall be indelibly marked with the following text:

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

Information on the appliance to be seen and read once packaged are considered as meeting those requirements.

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

7.3 Utilization of symbols on the appliance and packaging

7.3.1 Electrical supply

The marking concerning electrical values shall be in conformity with EN 60335-1:2002.

7.3.2 Type of gas

In order to represent all the category indices corresponding to the adjustment of an appliance, the symbol of the reference gas shall be used which is common to all these indices, in accordance with Table 10.

Table 10 — Gas type symbol

Gas type symbol		Corresponding category index
First family [a]	G 110	1a
	G 120	1b
	G 130	1c
Second family	G 20	2H, 2E, 2E+, 2Esi [b], 2Er [b], 2ELL [b]
	G 25	2L, 2Esi [c], 2Er [c], 2ELL [c]
Third family	G 30	3B/P, 3+ [d f], 3B
	G 31	3+ [e f] 3P

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

[b] When the appliance is adjusted for G 20.

[c] When the appliance is adjusted for G 25.

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

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

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

7.3.3 Gas supply pressure

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

7.3.4 Country of destination

In accordance with EN ISO 3166-1:2006, the names of countries shall be represented by:

AT	Austria	IE	Ireland
BE	Belgium	IS	Iceland
BG	Bulgaria	IT	Italy
CH	Switzerland	LT	Lithuania
CY	Cyprus	LU	Luxembourg
CZ	Czech Republic	LV	Latvia
DE	Germany	NL	Netherlands
DK	Denmark	MT	Malta
EE	Estonia	NO	Norway
ES	Spain	PL	Poland
FI	Finland	PT	Portugal
FR	France	RO	Romania
GB	United Kingdom	SE	Sweden
GR	Greece	SI	Slovenia
HU	Hungary	SK	Slovakia

7.3.5 Category

The category may be expressed uniquely by its designation in accordance with 4.2.1 and A.4.2. Nevertheless, if it is necessary to explain it, the term "category" shall be abbreviated by "Cat.".

7.3.6 Other optional information

The symbols given below are not obligatory, but are recommended under the title "preferential, and to the exclusion of any other symbol, to avoid the use of many and different markings.

a) Nominal heat input of a burner……. Q_n

b) Nominal heat input of all appliance burners…. ΣQ_n

c) Additional indication related to the type of gas: as well as the symbol of the type of gas as given in 7.3.2, its declared means of identification (according to Table 11) may be added.

Table 11 — Means of identification of types of gas in use in the various countries

Type of gas / Country code [b]	G 110	G 120	G 130	G 150	G 20	G 25	G 30	G 31
AT					Erdgas		Flüssiggas	
BE					Aardgas, Gaz naturel	Aardgas, Gaz naturel	Butaan, Butane	Propaan, Propane
BG								
CH			Propan-Luft Butan-Luft		Erdgas H		Butan	Propan
CY								
CZ					Zemní plyn		Butan	Propan
DE					Erdgas E	Erdgas LL	Flüssiggas B/P	
					$W_{o,}$(12,0 – 15,7) kWh/m^3 0 °C	$W_{o,}$ (10,0 – 13,1) kWh/m^3 0 °C	Butan	Propan
DK	Bygas				Naturgas		F-Gas	F-Gas
EE								
ES	Gas manufacturado		Aire propanado	Aire metanado	Gas natural		Butano	Propano
FI					Maakaasu, Naturgas		Butaani, Butan	Propaani, Propan
Fr [a]			Air propané/ Air butané		Gaz naturel Lacq	Gaz naturel Groningue	Butane	Propane
GB					Natural Gas		Butane	Propane
GR					Φυσικὸ Αἐριο		Υγραὲριο Μείγμα	Προπανιο
HU								
IE					Natural Gas		Butane	Propane
IS								

Table 11 — Means of identification of types of gas in use in the various countries *(continued)*

IT	Gas di Città				Gas naturale/ Gas metano		GPL	
LT								
LU								
LV								
MT								
NL						Aardgas	Butaan	Propaan
NO							Butan	Propan
PL								
PT					Gás Natural		Butano	Propano
RO								
SE								
SI								
SK								

[a] The meaning of the symbol corresponding to the type of gas should be explained in detail in the technical instructions. Concerning the system and its packaging, if an additional marking is intended by the manufacturer to explain the symbol, this text should be in conformity with the description given in this table. In the case of pressure couples, the two descriptions of the family should be mentioned

[b] See 8.1.5.4 for codes.

7.4 Instructions

7.4.1 General

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

If the instructions are written in an official language that is used by more than one country, the country or countries for which they are valid shall be identified by the codes given in 7.3.4.

Instructions for countries other than those stated on the appliance may be supplied with the appliance, on condition that each set of instructions has the following initial statement:

"These instructions are only valid if the following country code is on the appliance ... If this code is not present on the appliance, it is necessary to refer to the technical instructions which will provide the necessary information concerning the modification of the appliance to the condition of use for the country.".

7.4.2 Technical instructions for installation and adjustment

In addition to the information given in 7.1.1, the technical instructions may include information indicating, where appropriate, that the appliance has been certified for use in countries other than those stated on the appliance [3)]. If such information is given, the instructions shall include a warning that modification of the appliance and its method of installation are essential in order to use the appliance safely and correctly in any of these additional countries. This warning shall be repeated in the official language(s) of each of these countries. Furthermore, the instructions shall indicate how to obtain the information, instructions and parts that are necessary for safe and correct use in the countries concerned.

[3)] Indirect country of destination.

The instructions shall include the following statement:

> "Prior to installation, check that the local distribution conditions, nature of gas and pressure, and the adjustment of the appliance are compatible.".

The technical instructions for installation and adjustment, intended for the installer, shall be available with the appliance. The instructions shall be clear and simple and the terms shall be those in common usage. Wherever necessary, diagrams and/or photographs shall augment the text.

The instructions shall refer to:

a) the method of connection and the installation regulations in the country where the appliance is to be installed (if such regulations exist); also the ventilation dimensions shall be given for the purposes of installation in those countries where there are no appropriate regulations;

b) any fixing of the appliance;

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

d) the gas rate in cubic meters per hour in relation to the calorific value of the gas to be used (based on the gross or net calorific value according to the practice of the country of destination);

e) minimum clearances around the appliance;

f) complete electrical installation instructions and a wiring diagram;

g) for an appliance with an adjustable regulator, the setting pressure as measured upstream of the burner but downstream of any adjuster, in relation to the Wobbe index of the gas used;

h) the adjusters;

i) the assembly of exchangeable parts;

j) the manufacturer's recommendations regarding maintenance.

They shall include, if necessary, any precautions to be taken to avoid over-heating of the floor, worktop and walls. They shall instruct the user either to insert the appropriate protection, or else to use non-flammable materials for the floor, worktop and/or walls close to the appliance if required.

They shall also provide all information on the operations and adjustments to be carried out when converting from one gas to another, and shall give the injector markings for each gas that can be used.

The instructions shall specify the means of restraint used on the appliance to prevent straining of the gas supply when the appliance is moved.

The instructions shall indicate that the connection of gas supply to the appliance shall be made with a flexible hose suitable for the appliance category in accordance with national installation regulations of the country of destination. If in doubt the installer shall contact the supplier.

Reference shall be made to the necessity of installing the appliance in a room with an openable window or equivalent form of opening:

1) for ventilation purposes; and where appropriate,

2) to provide for evacuation of humid air and products of combustion by means of the flexible non-metallic duct (see 4.2.2).

Attention shall be drawn in the installation instructions to the fact that the appliance can cause spillage of products of combustion from an open-flue appliance fitted in the same room and that any such appliance shall be tested for clearance of products with the tumble dryer in operation and all windows and doors closed.

The installation instructions shall indicate the minimum and maximum equivalent resistance of the exhaust duct(s) when installed in accordance with the manufacturer's instructions.

For appliances capable of being stacked, additional installation requirements shall be provided.

7.4.3 Instructions for use and maintenance

Instructions for use and maintenance shall be supplied by the manufacturers with every appliance.

These instructions, which are intended for the user, shall provide all the necessary information for the safe and sensible use of the appliance in clear and simple terms. Wherever necessary, diagrams and/or photographs shall augment the text. They shall be separate or easily separable from the installation instructions.

The instructions shall comply with the requirements of EN 60335-2-11:2003, Clause 7 and include:

a) the operations of ignition and extinction;

b) the use of various controls with which the appliance may be fitted;

c) a statement that during operation of the appliance a window or equivalent means of ventilation must be opened in the room containing the appliance. An equivalent form of opening includes an adjustable louvre, hinged panel or other means of ventilation that opens directly to outside air;

d) the maximum load which can be used in the drum;

e) a statement to the effect that the appliance must only be used with the exhaust ducting fitted in accordance with the manufacturer's instructions, the use of the exhaust duct and, in particular, any precautions which must be taken to ensure its safe use;

f) details of the removal and replacement of the lint filter, instructions for cleaning the filter and a warning that the appliance is not to be operated without the filter in place;

g) the minimum clearances from adjacent furniture, etc.;

h) the name and address of the manufacturer and/or distributor;

i) details of any necessary cleaning and maintenance;

j) clear recommendations as to whether the appliance is capable of being stacked with other appliances.

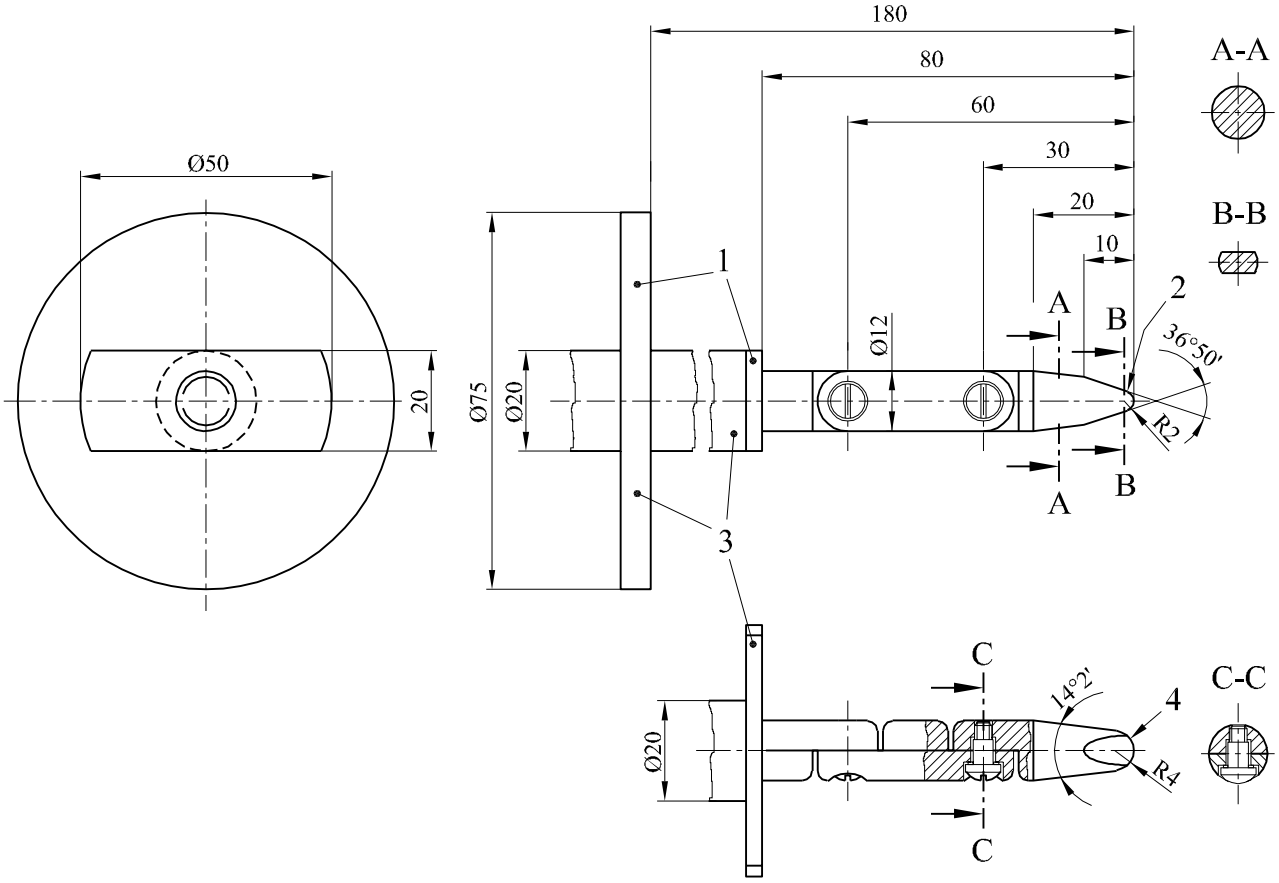
They shall also stress that a qualified installer is required to install and adjust the appliance, and, if the need arises, to convert it for use with other gases. They shall state the recommended frequency of periodic servicing and draw particular attention to the need for periodic cleaning of the filter.

7.5 Presentation

All the information of 7.1, 7.2, 7.3, and 7.4 shall be given in the language(s) and according to the practice of the country in which the appliance will be sold.

Dimensions in millimetres

Tolerances:
On angles ±5'
On linear dimensions:
Less than 25 mm $^{+0}_{-0,05}$
Over 25 mm: ±0,2

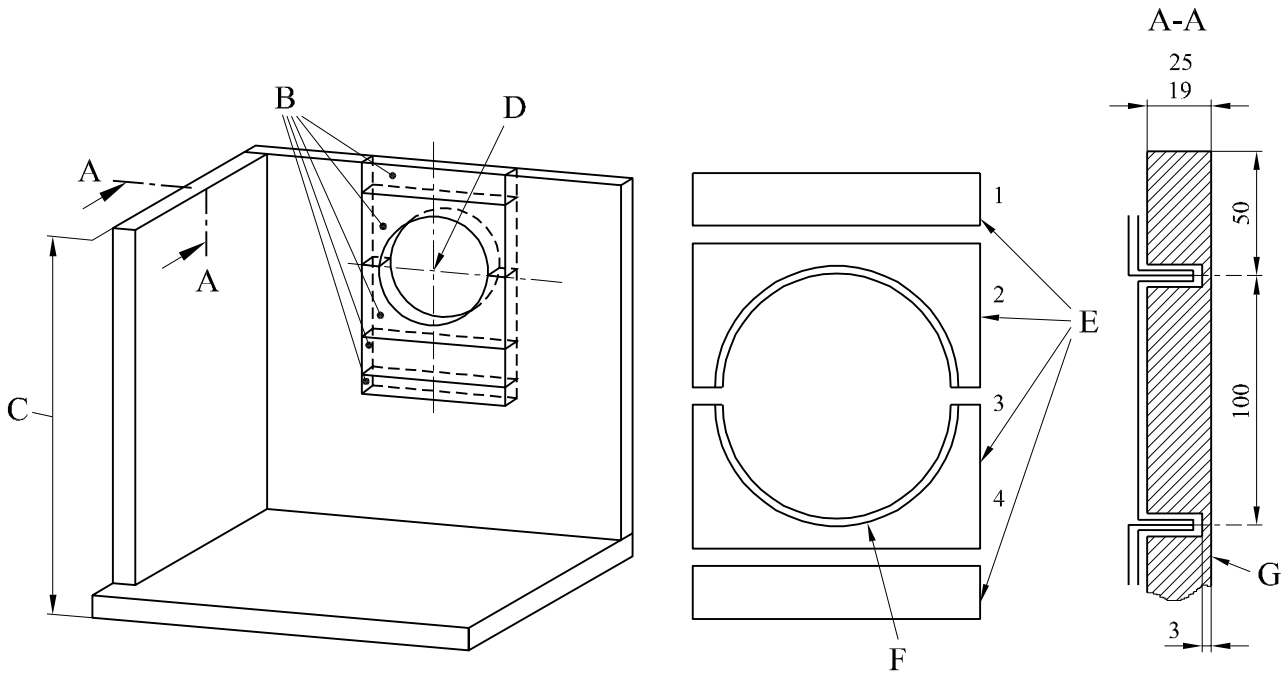


Key

1 stop plate
2 cylindrical
3 insulating material
4 spherical

Figure 1 — Standard test finger

Dimensions in millimetres



Key

B flue outlet connecting device

C minimum height 500 mm above the top of the appliance

D centre of the flue outlet

E wood 19 mm to 25 mm thick with thermocouples inserted from outside to within 3 mm of surface facing the appliance. The thermocouples are spaced at 100 mm intervals. The additional thermocouples in filling pieces 2 and 3 are located so as to measure the highest temperatures in the vicinity of the flue outlet duct.

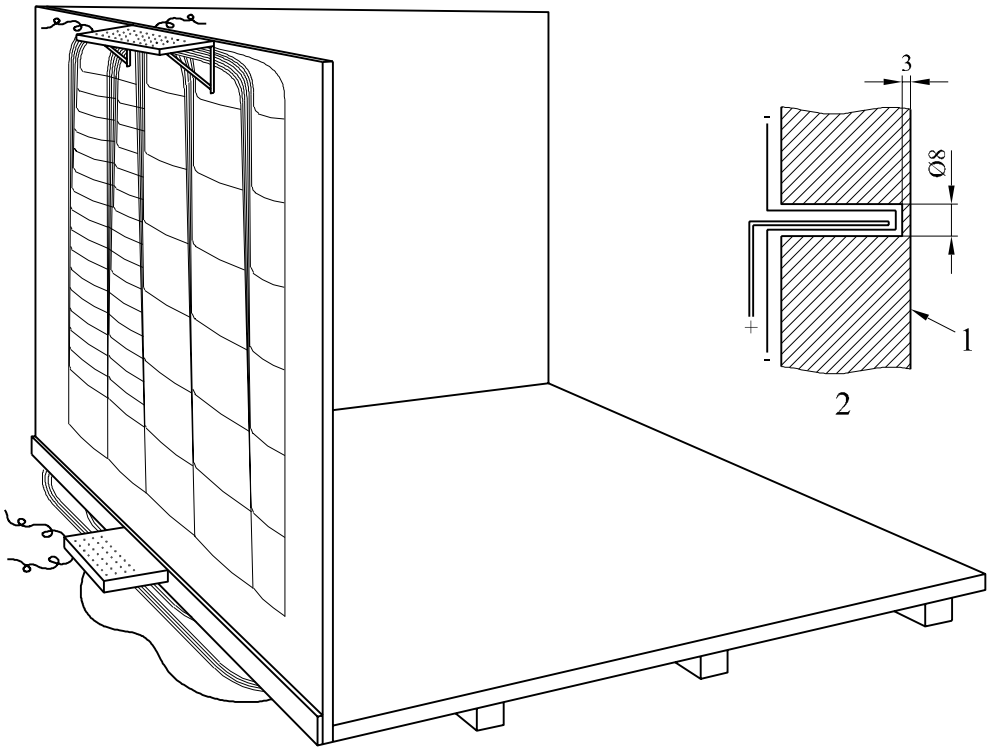
F insulation in accordance with manufacturer's installation instructions.

G face of wall

Figure 2a — Test corner for measuring floor and wall temperatures

The dimensions of the equipment shall be sufficient to allow a gap of 200 mm between the appliance and the wall, for the largest appliance to be tested. The dimensions of the device to take the flue outlet are not specific and they can be modified to take account of the dimensions of the flee outlet.

Dimensions in millimetres



Key

1 face of wall
2 section at thermocouple

Figure 2b — Apparatus for measuring floor and wall temperatures

Dimensions in millimetres

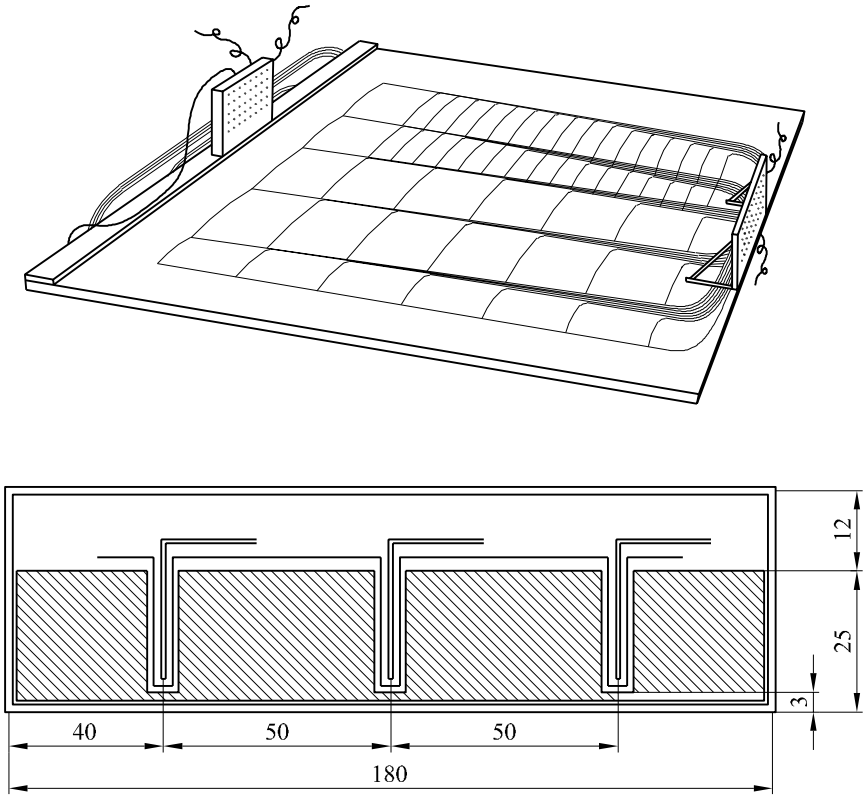


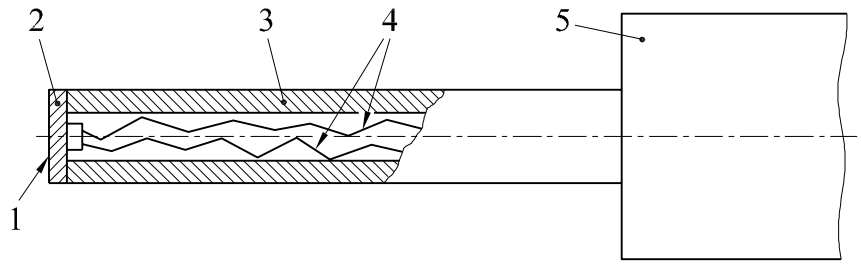
Figure 2c — Test board for measuring worktop temperatures

Figure 2 — Temperature measurements of adjacent surfaces

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

Backing sheet: 0,9 mm aluminium.

Dimensions in millimetres



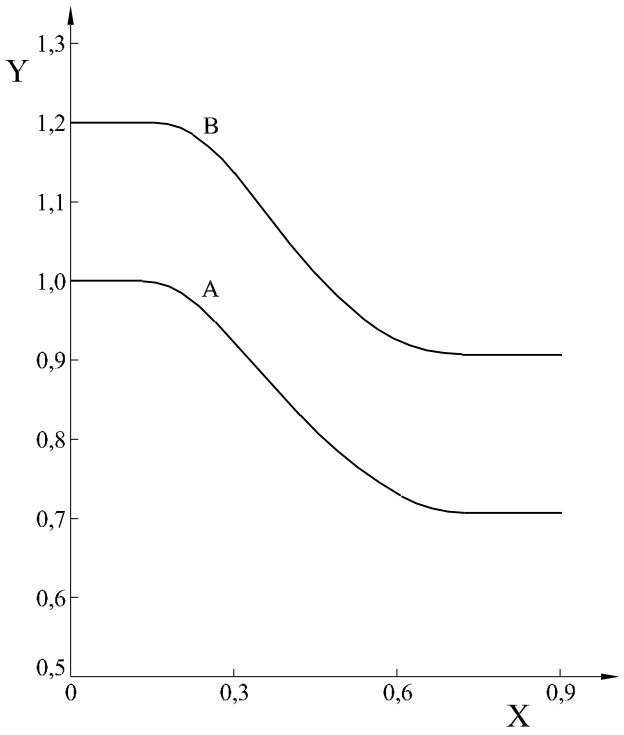
Key

1 tinned cooper disc 5 diameter 0,5 thick
2 adhesive
3 polycarbonate tube inside diameter 3 outside diameter 5
4 thermocouple wires 0,3 diameter according to EN 60584-1:1995 Type K (chrome alumel)
5 handle arrangement permitting contact force of (4 ± 1) N

Figure 3 — Probe for measuring surface temperature

NOTE The contact face of the disc should be flat.

The thermocouple should be soldered with care to ensure disc temperature is measured.

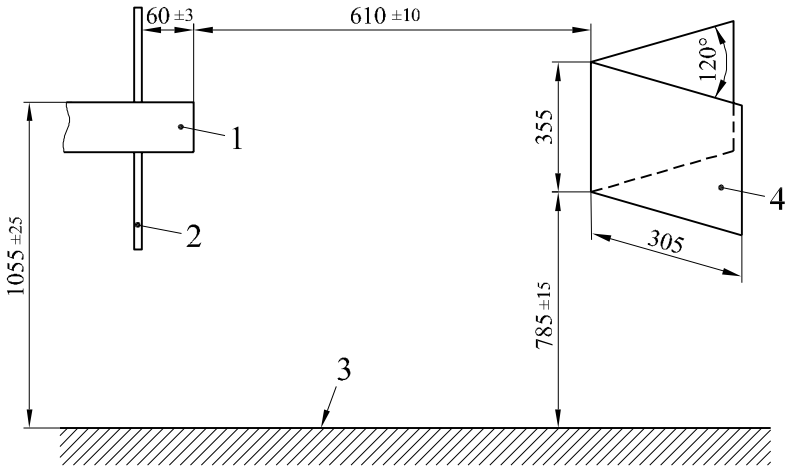


Key

A and B pressure differential curves referred to in 6.12.2
X height of air inlet above floor (m)
Y change in pressure differential (mbar)

Figure 4 — Pressure differentials for lint resistance test

Dimensions in millimetres

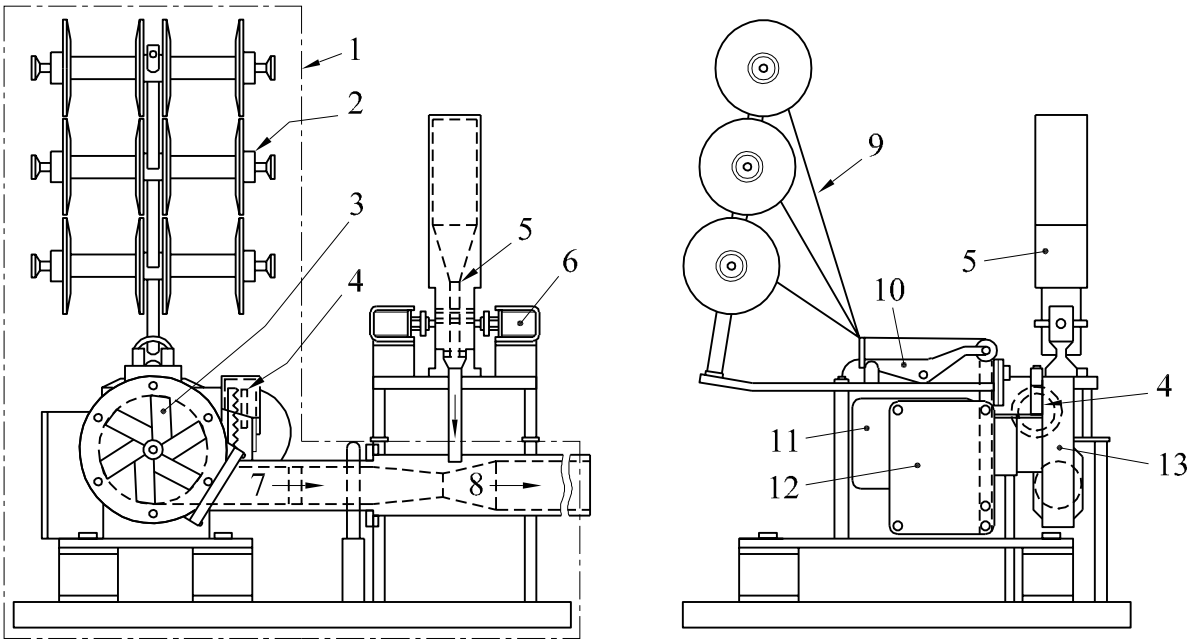


Key

1 outlet
2 perspex window
3 floor
4 baffle

NOTE The figure is not to scale.

Figure 5 — Position of baffle with respect to lint generator outlet duct

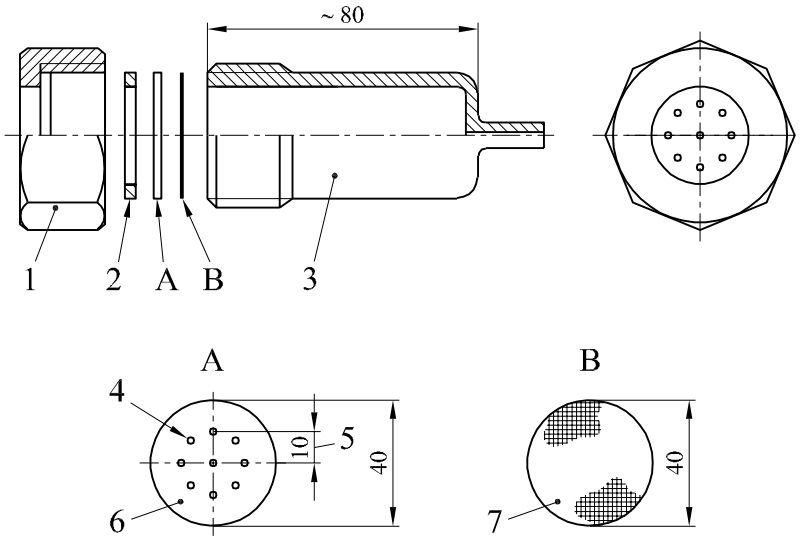


Key

1 cabinet
2 yarn spool
3 cutter and impeller
4 yarn feed unit
5 dust feed unit
6 vibrator
7 lint
8 dust
9 yarn
10 tension frame
11 motor drive
12 control box
13 cutter and impelling housing

Figure 6 — Lint generator

Dimensions in millimetres



Key

1 1 inch washer-type union nut
2 rubber sealing washer
3 filter body to suit nut
4 nine holes Ø 2,3
5 radius between centre and outer holes
6 0,9 mm thick plate
7 0,32 mm thick gauze holes in wire gauze Ø 0,5

Figure 7 — Lint filter

Annex A
(informative)

National situations

A.1 General

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

In order to permit, both at the time of testing the appliance and at the time of its sale, the correct choice to be made from all the situations covered, the various national situations are summarized in A.2, A.3, A.4, A.5, A.6 and A.7.

A.2 Categories listed in the body of the standard and marketed in different countries

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

The information given in the table indicates only that these categories may be sold throughout the whole of the country concerned and A.4 should be consulted for confirmation.

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

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

Country	I_{2H}	I_{2L}	I_{2E}	I_{2E+}	I_{2N} [a]	I_{2R} [a]	$I_{3B/P}$	I_{3+}	I_{3P}	I_{3B}	I_{3R} [a]
AT	X						X				
BE				X				X	X		
BG [b]											
CH	X						X	X	X		
CY [b]											
CZ	X						X		X		
DE			X				X		X		
DK	X						X				
EE [b]											
ES	X							X	X		
FI	X						X				
FR				X				X			
GB	X							X	X	X	
GR	X						X	X	X		
HU [b]	X						X		X	X	
IE	X							X	X	X	
IS [b]											
IT	X							X			
LT [b]											
LU			X								
LV [b]											
MT [b]											
NL		X					X		X		
NO							X				
PL			X				X		X		
PT	X							X	X	X	
RO [a]											
SE	X						X				
SI [b]											
SK [b]											

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

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

Table A.2 — Double categories marketed

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

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

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

[c] Appliances of this Category set for Group H gases of the second family may use air and commercial propane gas mixtures where the gross wobbe index (at 15 °C and 1 013,25 mbar) is between 46 MJ/m^3 and 51,5 MJ/m^3 a, at the same supply pressure, without additional tests.

[d] Categories applicable only to certain types of appliance, submitted to on site EC verification procedure, Annex II, article 6 of the Gas Appliance Directive (2009/142/EC). (France to clarify if applicable here).

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

A.3 Appliance supply pressures corresponding to the categories given in A.2

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

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

Table A.3 — Normal supply pressures

Gas	**G 110**	**G 20**	**G 25**		**G 20 + G 25**	**G 30**		**G 31**			**G 30 + G 31**	
Pressure (mbar)	8	20	20	25	Couple 20/25	30 28-30	50	30	37	50	Couple 28-30/37	Couple 50/67
Country												
AT		X					X			X		
BE					X						X	X
BG [a]												
CH		X					X			X	X	
CY [a]												
CZ		X [b]						X	X	X [c]		
DE		X	X				X			X		
DK	X	X				X		X				
EE [a]												
ES		X				X			X	X	X	
FI		X				X		X				
FR					X						X	
GB		X				X			X		X	
GR		X				X		X	X	X	X	
HU [a]		X [d]				X	X	X		X		
IE		X				X			X		X	
IS [a]												
IT	X	X									X	
LT [a)]												
LU		X										
LV [a]												
MT [a]												
NL				X		X		X		X		
NO						X		X				
PL		X							X			
PT		X				X			X		X	
RO [a]												
SE	X	X				X		X				
SI [a]												
SK [a]												

a Information on supply pressures to be supplied by new CEN member.
b Currently 18 mbar.
c For certain type of appliances (CZ to clarify).
d Pressures of 25mbar and 85 mbar.

A.4 Special categories marketed nationally or locally

A.4.1 General

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

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

Category	Reference gas	Incomplete combustion limit gas	Light back limit gas	Lift limit gas	Sooting limit gas	Country
I_{2Esi}, I_{2Er}	G 20, G 25	G 21	G 222	G 231	G 21	FR
$I_{2E(S)B}$	G 20, G 25	G 21	G 222	G 231	G 21	BE
$I_{2E(R)B}$	G 20, G 25	G 21	G 222	G 231	G 21	BE
I_{2ELL}	G 20, G 25	G 21	G 222	G 231, G 271	G 21	DE
I_{2S}	G 25.1	G 26.1	G 222	G 27.1	G 26.1	HU [a]
I_{2HS}	G 20, G 25.1	G 21, G 26.1	G 222	G 27.1	G 21, G 26.1	HU [a]
I_{2ELw}	G 20, G 27	G 21	G 222	G 2.412	G 21	PL
I_{2ELs}	G 20, G 2.350	G 21	G 222	G 2.352	G 21	PL
I_{2ELn}	G 20, G 2.300	G 21	G 222	G 2.302	G 21	PL
I_{2ELwLs}	G 20, G 27, G 2.350	G 21	G 222	G 2.352	G 21	PL
$I_{2ELwLsLn}$	G 20, G27, G2.350, G 2.300	G 21	G 222	G 2.302		PL
$I_{3B/P}$ [b]	G 30	G 30	G 32	G 31	G 30	PL
$I_{3P(B/P)}$ [b]	G 31, G 30	G 31, G 30	G 32	G 31	G 30	PL
II_{1c2H}	G 130, G 20	G 21	G 132, G 222	G 23	G 21	CH
II_{2Esi3+} II_{2Er3+}	G 20, G 25 G 30	G 21	G 222 G 32	G 231 G 31	G 30	FR
II_{2Esi3P} II_{2Er3P}	G 20, G 25 G 31	G 21	G 222 G 32	G 231 G 271	G 31 G 32	FR
$II_{2ELL3B/P}$	G 20, G 25, G 30	G 21, G 30	G 222, G 32	G 231 G 271	G 30	DE

Table A.4 — Test gases corresponding to categories marketed nationally or locally *(continued)*

$II_{2S3B/P}$	G 25.1, G 30	G 26.1, G 30	G 32	G 27.1 G 31	G 26.1, G 30	HU [a]
II_{2S3P}	G25.1, G 31	G 26.1, G 30	G 32	G 27.1, G 31	G 26.1, G 31, G 32	HU [a]
II_{2S3B}	G 25.1, G 30	G 26.1, G 30	G 32	G 27.1, G 31	G 26.1, G 30	HU [a]
$II_{2HS3B/P}$	G 20, G 25.1 G 30	G 21, G 26.1, G 30	G 222 G 32	G 23, G 27.1, G 31	G 21, G 26.1, G 30	HU [a]
II_{2HS3P}	G 20, G 25.1 G 31	G 21, G 26.1, G 30	G 222 G 32	G 23, G 271, G 31	G 21, G 26.1, G 31, G 32	HU [a]
II_{2HS3B}	G 20, G 25.1 G 30	G 21,G 26.1, G 30	G 222 G 32	G 23, G 271, G 31	G 21, G 26.1, G 30	HU [a]
II_{1Lm2E}	G1.250, G 20	G 21	G 1,252, G 222	G 1,252	G 21	PL
$II_{1Lm2ELwLsLn}$	G.1250, G 20, G 27, G 2.350, G 2.300	G 21	G 1,252, G 222	G 1,252	G 21	PL
$II_{2E3B/P}$	G 20, G 30	G 21	G 222, G 32	G 231, G31	G 30	PL
II_{2E3P}	G 20, G 31	G 21	G 222, G 32	G 231, G31		PL
$II_{2E3P(B/P)}$ [b]	G 20, G30, G 31	G 21	G 222, G 32	G 231, G31	G 30	PL
$II_{2Els3B/P}$	G 20, G 2.350, G 30	G 21	G 222, G 32	G 2.352 G 31	G 30	PL
II_{2Els3P}	G 20, G 2.350, G 31	G 21	G 222, G 32	G 2.352 G 31	-	PL
$II_{2ELwLs3B/P}$	G 20, G 27, G 2.350, G 30	G 21	G 222, G 32	G 2.352 G 31	G 30	PL

Table A.4 — Test gases corresponding to categories marketed nationally or locally *(continued)*

$II_{2ELwLs3P}$	G 20, G 27, G 2.350, G 31	G 21	G 222, G 32	G 2.352 G 31	-	PL
$II_{2ELwLs3P(B/P)}$ [b]	G 20, G 27, G 2.350, G 31, G 30	G 21	G 222, G 32	G 2.352 G 31	G 30	PL
$II_{2ELwLsLn3P(B/P)}$ [b]	G 20, G 27, G 2.350, G 2.300 G 31, G 30	G 21	G 222, G 32	G 2.302 G 31	G 30	PL
$III_{1a2H3B/P}$	G 110, G 20 G 30	G 21	G 112 G 222, G 32	G 23 G 31	G 30	DK, IT
$III_{1c2H3B/P}$	G 130, G 20 G 30	G 21	G 132 G 222, G 32	G 23 G 31	G 30	CH
III_{1c2H3+}	G 130, G 20 G 30	G 21	G 132 G 222, G 32	G 23 G 31	G 30	CH
III_{1c2H3P}	G 130, G 20, G 30	G 21	G 132 G 222, G 32	G 23 G 31	G 31 G 32	CH
$III_{1c2E+3+}$	G 130, G 20, G 30	G 21	G 132 G 222, G 32	G 231 G 31	G 30	FR
$III_{1c2E+3P}$	G 130, G 20 G 31	G 21	G 132 G 222, G 32	G 231 G 31	G 32	FR
$III_{1c2Esi3+}$ $III_{1c2Er3+}$	G 130, G 20 G 25, G 30	G 21	G 132 G 222, G 32	G 231 G 31	G 30	FR
$III_{1c2Esi3P}$ $III_{1c2Er3P}$	G 130, G 20 G 25, G 31	G 21	G 132 G 222, G 32	G 231 G 31	G 32	FR
$III_{1ab2H3B/P}$	G 110, G 120 G 20, G 30	G 21	G 112 G 222, G 32	G 23 G 31	G 30	SE
$III_{1c2E3B/P}$	G 130, G 20, G 30	G 21	G 132, G 222, G 32	G 31	G 30	PL
$III_{1Lm2ELwLsLn3B/P}$	G 1.250, G20, G 27, G 2.350, G 2.300, G 30	G 21	G 1.252, G 222, G 32	G 1.252 G 31	G 30	PL

[a] Hungary to confirm selection.
[b] Only used on appliances less than 12 kW and at normal pressure of 37 mbar for both butane and propane.

A.4.2 Definition of special categories

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

A.4.2.1 Category I

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

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

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

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

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

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

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

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

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

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

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

Category I_{2Lw}: appliances using only of Group Lw gases linked to the second family at the prescribed supply pressure. (this category is not used).

Category I_{2Ls}: appliances using only of Group Ls gases linked to the second family at the prescribed supply pressure. (this category is not used).

Category I_{2Ln}: appliances using only of Group Ln gases linked to the second family at the prescribed supply pressure. (this category is not used).

Category I_{2ELwLs}: appliances capable of using gases of group E second family and gases group Lw and Ls linked to the second family. The gases of Group E are used under the same conditions as for Category I_{2E}. The gases Group Lw and Ls are used accordingly under the same conditions as for Category I_{2Lw} and category I_{2Ls}.

Category $I_{2ELwLsLn}$: appliances capable of using gases of Group E second family and gases Group Lw, Ls and Ln linked to the second family. The gases of Group E are used under the same conditions as for Category I_{2E}. The gases Group Lw, Ls and Ln are used accordingly under the same conditions as for Category I_{2Lw}, Category I_{2Ls} and Category I_{2Ln}.

A.4.2.1.3 Appliances designed for the use of gases of the third family and the gases linked to it

Category $I_{3P(B/P)}$: appliances capable of using gases of Group P and B/P third family. The gases of Group P are used under the same conditions as for Category I_{3P}. The gases Group B/P are used under the same conditions as for Category $I_{3B/P}$.

A.4.2.2 Category II

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

Category $II_{1Lm2ELwLsLn}$: appliances capable of using of Group Lm gases linked to the first family and gases of Group E, Lw, Ls, Ln of the second family or linked to the second family. The gases linked to the first family are used under the same conditions as for Category I_{1Lm}. The second family gases are used under the same conditions as for Category $I_{2ELwLsLn.}$.

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

Category II_{2Esi3+}: appliances capable of using gases of Group E of the second family and gases of the third family. The second family gases are used under the same conditions as for Category I_{2Esi}. The third family gases are used under the same conditions as for Category I_{3+}.

Category II_{2Esi3P}: appliances capable of using gases of Group E of the second family and gases of Group P of the third family. The second family gases are used under the same conditions as for Category I_{2Esi}. The gases of the third family are used under the same conditions as for Category I_{3P}.

Category II_{2Er3+}: appliances capable of using gases of Group E of the second family and gases of the third family. The second family gases are used under the same conditions as for Category I_{2Er}. The gases of the third family are used under the same conditions as for Category I_{3+}.

Category II_{2Er3P}: appliances capable of using gases of Group E of the second family and gases of Group P of the third family. The second family gases are used under the same conditions as for Category I_{2Er}. The gases of the third family are used under the same conditions as for Category I_{3P}.

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

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

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

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

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

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

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

Category $II_{2E3P(B/P)}$: appliances capable of using gases of Group E of the second family and gases of Groups P and B/P of the third family. The second family gases are used under the same conditions as for Category I_{2E}. The gases of the third family are used under the same conditions as for Category $I_{3P(B/P).}$.

Category $II_{2ELwLsLn3B/P}$: appliances capable of using gases of Group E of the second family, gases of Groups Lw, Ls, Ln linked to the second family and gases of Group B/P of the third family. The second family gases are used under the same conditions as for Category $I_{2ELwLsLn}$. The gases of the third family are used under the same conditions as for Category $I_{3B/P.}$.

Category $II_{2ELwLsLn3P}$: appliances capable of using gases of Group E of the second family, gases of Groups Lw, Ls, Ln linked to 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 $I_{2ELwLsLn}$. The gases of the third family are used under the same conditions as for Category $I_{3P.}$.

Category $II_{2ELwLsLn3P(B/P)}$: appliances capable of using gases of Group E of the second family, gases of Groups Lw, Ls, Ln linked to the second family and gases of Group P and B/P of the third family. The second family gases are used under the same conditions as for Category $I_{2ELwLsLn}$. The gases of the third family are used under the same conditions as for Category $I_{3P(B/P)}$.

A.4.2.3 Category III

Category $III_{1a2H3B/P}$: appliances capable of using gases of Group a of the first family, gases of Group H of the second family and gases of the third 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}. The third family gases are used under the same conditions as for Category $I_{3B/P}$.

Category $III_{1c2E+3+}$: appliances capable of using gases of Group c linked to the first family, gases of Group E of the second family and gases of the third family. The gases linked to the first family are used under the same conditions as for Category I_{1c}. The second family gases are used under the same conditions as for Category I_{2E+}. The third family gases are used under the same conditions as for Category I_{3+}.

Category $III_{1c2E+3P}$: appliances capable of using gases of Group c linked to the first family, gases of Group E of the second family and gases of Group P of the third family. The gases linked to the first family are used under the same conditions as for Category I_{1c}. The second family gases are used under the same conditions as for Category I_{2E+}. The third family gases are used under the same conditions as for Category I_{3P}.

Category $III_{1c2Esi3+}$: appliances capable of using gases of Group c linked to the first family, gases of Group E of the second family and gases of the third family. The gases linked to the first family are used under the same conditions as for Category I_{1c}. The second family gases are used under the same conditions as for Category I_{2Esi}. The third family gases are used under the same conditions as for Category I_{3+}.

Category $III_{1c2Esi3P}$: appliances capable of using gases of Group c linked to the first family, gases of Group E of the second family and gases of the third family. The gases linked to the first family are used under the same conditions as for Category I_{1c}. The second family gases are used under the same conditions as for Category I_{2Esi}. The third family gases are used under the same conditions as for Category I_{3P}.

Category $III_{1c2Er3+}$: appliances capable of using gases of Group c linked to the first family, gases of Group E of the second family and gases of the third family. The gases linked to the first family are used under the same conditions as for Category I_{1c}. The second family gases are used under the same conditions as for Category I_{2Er}. The third family gases are used under the same conditions as for Category I_{3+}.

Category $III_{1c2Er3P}$: appliances capable of using gases of Group c linked to the first family, gases of Group E of the second family and gases of Group P of the third family. The gases linked to the first family are used under the same conditions as for Category I_{1c}. The second family gases are used under the same conditions as for Category I_{2Er}. The third family gases are used under the same conditions as for Category I_{3P}.

Category $III_{1ab2H3B/P}$: appliances capable of using gases of Group a of the first family, gases of Group b linked to the first family, gases of Group H of the second family and gases of the third family. The first family gases or the gases linked to it are used under the same conditions as for categories I_{1a} and I_{1b}. 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 $III_{1Lm2ELwLsLn3B/P}$: appliances capable of using gases of group Lm linked to the first family, gases of Group E of the second family, gases of Groups Lw, Ls, Ln linked to the second family and gases of Group B/P of the third family. The first family gases are used under the same conditions as for Category I_{1Lm}. The second family gases are used under the same conditions as for Category $I_{2ELwLsLn}$. The third family gases are used under the same conditions as for Category $I_{3B/P.}$.

A.4.3 Gas rate adjusters, aeration adjusters and regulators

This subclause has been included to enable CEN members to provide information equivalent to that given in 5.2.2, 5.2.3, 5.2.4 and 5.2.6 in relation to the special categories they have requested, detailed in A.4.1.

A.4.4 Conversion to different gases

This clause has been included to enable certain member states to provide information equivalent to that given in 5.1.1.1 in relation to the special appliance categories listed in A.4.1.

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

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

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

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

Table A.5 — Test gases corresponding to local situations

Gas family and group		Nature of gas	Desig-nation	Composition Volume %	W_I MJ/m^3	H_I MJ/m^3	W_S MJ/m^3	H_S MJ/m^3	d	Test pressure mbar	Country
Gases linked to the first family	Group b	Reference Incomplete combustion Sooting	G 120	H_2 = 47 CH_4 = 32 N_2 = 21	24,40	15,68	27,64	17,77	0,413	p_n = 8 p_{min} = 6 p_{max} = 15	SE
		Light back	G 112	H_2 = 59 CH_4 = 17 N_2 = 24	19,48	11,81	22,36	13,56	0,367		
	Group c	Reference (Propane–air)	G 130	C_3H_8 = 26,9 Air = 73,1 [a]	22,14	23,66	24,07	25,72	1,142	FR: p_n = 8 p_{min} = 6 p_{max} = 15 PL: p_n = 20 p_{min} = 16 p_{max} = 23	FR PL
		Light back	G 132	C_3H_8 = 13,8 C_3H_6 = 13,8 Air [a] = 72,4	22,10	23,56	23,84	25,41	1,136		
	Group Lm	Reference	G 1.250	CH_4 = 54 N_2 = 46	21,27	18,36	23,64	20,40	0,745		
		Incomplete combustion	G 1.251 [c]	CH_4 = 58 N_2 = 42	23,12	19,73	25,68	21,31	0,728	PL: p_n = 8 p_{min} = 6 p_{max} = 11	PL
		Light back limit Flame lift limit	G 1.252	CH_4 = 50 N_2 = 50	19,48	17,00	21,65	18,89	0,761		
Gases linked to the second family	Group Lw	Reference	G 27	CH_4 = 82 N_2 = 18	35,17	27,89	39,06	30,98	0,629		
		Incomplete combustion	G 2.411	CH_4 = 89 N_2 = 11	39,09	30,28	43,40	33,62	0,600	p_n = 20 p_{min} = 16 p_{max} = 23	PL
		Light back limit Flame lift limit	G 2.412	CH_4 = 76 N_2 = 24	31,96	25,85	35,50	28,71	0,654		
	Group Ls	Reference	G 2.350	CH_4 = 72 N_2 = 28	29,67	24,49	33,22	27,20	0,670		
		Incomplete combustion	G 2.351	CH_4 = 77 N_2 =23	32,48	26,19	36,09	29,09	0,650	p_n = 13 p_{min} = 10 p_{max} = 16	
		Light back limit Flame lift limit	G 2.352	CH_4 = 67 N_2 = 33	27,42	22,79	30,15	25,31	0,691		

Table A.5 — Test gases corresponding to local situations *(continued)*

	Group Ln	Reference	G 2.300	CH_4 = 63 N_2 = 37	25,49	21,43	28,30	23,80	0,707		
		Incomplete combustion	G 2.301	CH_4 = 68 N_2 = 32	27,91	23,13	31,00	25,69	0,687	p_n = 13 p_{min} = 10	PL
		Light back limit Flame lift limit	G 2.302 [c]	CH_4 = 58 N_2 = 42	23,12	19,73	25,68	21,31	0,728	p_{max} = 16	
Gases Linked to the second family	Group LL	Reference	G 25 [b]	CH_4 = 86 N_2 = 14	37,38	29,25	41,52	32,49	0,612	p_n = 20	DE
		Incomplete combustion Sooting	G 26	CH_4 = 80 C_3H_8 = 7 N_2 = 13	40,52	33,36	44,83	36,91	0,678	p_{min} = 18	
		Flame lift	G 271	CH_4 = 74 N_2 = 26	30,94	25,17	34,36	27,96	0,662	p_{max} = 25	
	Group S	Reference	G 25.1	CH_4 = 86 CO_2 = 14	35,25	29,30	39,11	32,51	0,691	p_n = 25	HU
		Incomplete combustion Sooting	G 26.1	CH_4 = 80 C_3H_8 = 6 CO_2 = 14	37,61	32,60	41,58	36,04	0,751	p_{min} = 20 p_{max} = 33 02	
		Lift limit	G 27.1	CH_4 = 82 CO_2 = 18	32,70	27,94	36,29	31,00	0,730	p_n = 85 p_{min} = 73 p_{max}= 100	
Gases of the second family	Range Es of Group E	Reference	G 20[2)]	CH_4 = 100	45,67	34,02	50,72	37,78	0,555	p_n = 20	FR
		Incomplete combustion Sooting	G 21	CH_4 = 87 C_3H_8 = 13	49,60	41,01	54,76	45,28	0,684	p_{min} = 17	
		Light back	G 222	CH_4 = 77 H_2 = 23	42,87	28,53	47,87	31,86	0,443	p_{max} = 25	
		Lift limit	G 26	CH_4 = 80 C_3H_8 = 7 N_2 = 13	40,52	33,36	44,83	36,91	0,678		
	Range Ei of Group E	Reference Light back	G 25 [b]	CH_4 = 86 N_2 = 14	37,38	29,25	41,52	32,49	0,612	p_n = 25	
		Incomplete combustion Sooting	G 26	CH_4 = 80 C_3H_8 = 7 N_2 = 13	40,52	33,36	44,83	36,91	0,678	p_{min} = 20 p_{max} = 30	
		Lift limit	G 231	CH_4 = 85 N_2 = 15	36,82	28,91	40,90	32,11	0,617		

a Composition of the air (%): 02 = 20,95; N2 = 79,05.

b For the characteristics of the reference gases G 20 and G 25, see Table 4.

c Gases G 2.302 and G 1.251 have the same composition but different pressure.

A.6 Gas connections in the various countries

Table A.6 shows the national situations concerning the various types of gas connection specified in 5.1.6.

Table A.6 — Permitted inlet connections

	Category I_{3+}, I_{3P}, I_{3B}, $I_{3B/P}$			**Other categories**		
	Threaded connections		**Other**	**Threaded connections**		**Other**
Country	EN 10226-1:2004 EN 10226-2:2005	EN ISO 228-1:2003	connections	EN 10226-1:2004 EN 10226-2:2005	EN ISO 228-1:2003	connections
AT	Yes	—	Yes	Yes	—	—
BE	Yes	Yes	Yes	—	Yes	—
BG	—	—	—	—	—	—
CH	Yes	Yes	Yes	Yes	Yes	—
CY	—	—	—	—	—	—
CZ	—	—	—	—	—	—
DE	Yes	—	Yes	Yes	—	—
DK	Yes	Yes	Yes	—	Yes	—
EE	—	—	—	—	—	—
ES	—	—	—	—	—	—
FI	Yes	Yes	Yes	Yes	Yes	—
FR	—	Yes	Yes	—	Yes	—
GB	Yes [a b]	—	Yes	Yes [a b]	—	Yes
GR	Yes	—	Yes	Yes	—	—
HU	—	—	—	—	—	—
IE	Yes	—	Yes	Yes	—	Yes
IS	—	—	—	—	—	—
IT	Yes	—	Yes	Yes	—	—
LT	—	—	—	—	—	—
LU	—	—	—	—	—	—
LV	—	—	—	—	—	—
MT	—	—	—	—	—	—
NL	Yes	—	—	Yes	—	—
NO	Yes	Yes	Yes	—	—	—
PL	Yes [b]	Yes	Yes	Yes [b]	Yes	—
PT	Yes	Yes	Yes	Yes	Yes	Yes
RO	—	—	—	—	—	—
SE	—	—	—	—	—	—
SI	—	—	—	—	—	—
SK	—	—	—	—	—	—

[a] taper – taper threads

[b] taper – parallel threads

A.7 Equivalence rules[4)]

A.7.1 General

Table A.5 is applied with the help of the following equivalence rules.

A.7.2 Conversion to categories within a restricted Wobbe index range

An appliance belonging to one category may be marketed as an appliance covering a more restricted range of Wobbe index provided that the conversion requirements set out in 5.1.1 are satisfied, that its state of conversion corresponds to that of the country where it will be marketed and that the information on the data plate agrees with its adjustment.

In principle, this equivalence is recognized without the appliance having to undergo new tests.

However, in the following cases:

— when the supply pressures in the country where the appliance has been examined differ from those in the country where it is to be marketed;

— when an appliance fitted with adjusters, whether sealed or not, has been tested in the conditions of the original category with test gases different from those of the country where it is to be marketed; complementary tests may be carried out for the pressures and with the test gases valid in the country where the appliance is to be marketed. In all cases, these complementary tests are at most those stated in 6.1.5.1.

This equivalence is recognized without the appliance having to undergo new tests, except where the supply pressures differ. In this case, the tests stated in 6.1.5.1 are carried out for the new pressures.

A.7.3 Conversion to categories within an identical Wobbe index range

An appliance belonging to one category may be sold as an appliance in another category covering an identical range of Wobbe index provided that the conversion requirements set out in 5.1.1 are satisfied, that its state of conversion corresponds to that of the country where it is to be marketed and that the information on the label provided at the time of delivery corresponds to its adjustment.

In principle, this equivalence is recognized without the appliance having to undergo new tests.

However, in the following cases:

— when the supply pressures in the country where the appliance has been examined differ from those in the country where it is to be marketed;

— when an appliance fitted with adjusters, whether sealed or not, has been tested in the conditions of the original category with test gases different from those of the country where it is to be marketed;

complementary tests may be carried out for the pressures and with the test gases valid in the country where the appliance is to be marketed. In all cases, these complementary tests are at most those stated in 6.1.5.1.

Any adjusters are set and sealed in the appropriate positions.

4) Throughout A.7 the word 'adjuster' refers to gas rate adjusters.

A.7.4 Conversion to categories within a wider Wobbe index range

An appliance belonging to one category may only be marketed as an appliance in a category covering a wider range of Wobbe index if it complies with all the constructional requirements of the new category and the operational requirements corresponding to the tests stated in 6.1.5.1 using the test gases for the intended new category and the corresponding test pressures.

Annex B
(normative)

Special national conditions

B.1 Special national conditions

Special national conditions are National characteristics or practice that cannot be changed even over a long period (e.g. climatic conditions, electrical earthing conditions). If it affects harmonization, it forms part of the European Standard or Harmonization Document.

For the countries in which the relevant special national conditions apply these provisions are normative, for other countries they are informative.

B.2 Belgium

Appliances of categories I_{2E+}, $I_{2E(R)B}$ and $I_{2E(S)B}$ marketed in Belgium have to undergo a test for ignition, crosslighting and flame stability with the limit gas G 231 at the minimum pressure of 15 mbar.

B.3 Italy

Appliances of categories $I_{3B/P}$, $II_{2H3B/P}$ and $III_{1a2H3B/P}$ without pressure regulators marketed in Italy shall have successfully undergone a test for flame stability with the limit gas G 31 at the pressure of 45 mbar.

B.4 Poland

Appliances of categories with index 3B/P shall be tested with the test gases for 3B/P given in Table 7 but with the following pressures: p_n = 37 mbar, p_{min} = 25 mbar and p_{max} = 45 mbar.

Additional information for gases used in Poland for

Table B.1 — Percentage by volume of CO_2 (dry products of neutral combustion)

Designation of gas	**G27**	**G 2.411**	**G 2.412**	**G 2.350**	**G 2.351**	**G 2.352**	**G 2.300**	**G 2.301**	**G 2.302** **G 1.251**	**G 1.250**	**G 1.252**
% $(CO_2)_N$ (neutral combustion)	11,5	11,6	11,3	11,2	11,3	11,1	11,0	11,1	10,8	10,7	10,5

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2009/142/EC on the approximation of the laws of Member States concerning gas appliances

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

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

The following clauses of this standard, in Table ZA.1, are likely to support requirements of EU Directive 90/396/EEC.

Table ZA.1 — Identification form on the compliance of EN 1458-1 with the essential requirements of the EU Directive 2009/142/EC on the approximation of the laws of Member States concerning gas appliances)

Clause(s)/sub-clause(s) of this EN	**Essential Requirements (ERs) of Directive 90/396/EEC**	**Qualifying remarks/Notes**
--	1.	ANNEX I General conditions
1, 5	1.1.	Safe design and construction
 7.4.2 7.4.3 7.1.1, 7.1.2 7.2 7.4.1, 7.5	1.2.	Instructions - installer - user Warning notices - appliance - packaging Official language

Table ZA.1 *(continued)*

	1.2.1.	Instructions installer contain:
7.4.2		Type of gas used
7.4.2		Gas supply pressure
		Flow of fresh air
7.4.2		- for combustion supply
NA		- danger unburned gas (3.2.3)
7.4.2		Dispersal combustion products
NA		Forced draught burners
	1.2.2.	User instructions contain:
7.4.3		- all instructions
7.4.3		- restrictions on use
	1.2.3.	Warning notices state
7.1, 7.2		- type of gas
7.1, 7.2		- gas supply pressure
7.4.3, 7.1.2		- restrictions on use
5	1.3.	Fittings
5.2.5		- regulators
5.2.2		- automatic shut-off valves
5.2.3		- multifunctional controls
5.2.4.1		- flame supervision devices
		- thermoelectric flame
5.2.4.2		supervision devices
		- automatic burner
5.2.7, 6.3		control system
5.7.1		- mechanical thermostats
5.7.1		- electrical thermostats
NA		Instructions
--	2.	Materials
5.1.2, 5.1.5	2.1.	Appropriate for their purpose
See under Annex II	2.2.	Properties of materials
--	3.	Design and construction
--	3.1.	General
5.1.2	3.1.1.	Safety of construction
5.1.2	3.1.2.	Condensation
5.1.2, 5.1.7	3.1.3.	Explosion risk
NA	3.1.4.	Air/water penetration

Table ZA.1 *(continued)*

5.1.13, 6.16	3.1.6.	Abnormal auxiliary energy fluctuation
5.1.11.1, 5.3.1	3.1.7.	Electrical hazards
NA	3.1.8.	Pressurized parts
5.2.4 5.2.4.3 5.2.2 5.1.14 5.7 NA NA 5.2.7, 6.3 5.2.5 5.2.3	3.1.9.	Failure of devices in gas circuit: - flame supervision device - flame detector of the automatic burner control system - automatic shut-off valves - air proving device - thermostats/overheat protection - atmosphere sensing device - combustion products discharge safety device - automatic burner control system - regulators - multifunctional controls
5.2.1, 5.7	3.1.10.	Overruling of safety devices
5.2.5, 5.2.6	3.1.11.	Adjustment protection
5.1.4	3.1.12.	Levers and setting devices
--	3.2.	Unburned gas release
5.1.7, 6.6	3.2.1.	Risks of gas leakage
6.14.1, 6.14.2.1 5.2.4, 5.5.2 6.14.1, 6.14.2.2	3.2.2.	Gas release during - ignition - re-ignition - extinction
5.2.4 NA	3.2.3.	Unburned gas accumulation - safety device present - used in rooms with sufficient ventilation
6.13.1 6.13.1 6.13.1	3.3.	Ignition - ignition - re-ignition - cross-lighting
--	3.4.	Combustion

Table ZA.1 *(continued)*

6.13.2, 6.13.3 6.16	3.4.1.	Flame stability Unacceptable concentrations harmful to health
5.1.8	3.4.2.	No accidental release of combustion products
NA	3.4.3.	Combustion products release in abnormal draught conditions
NA	3.4.4.	CO concentration
Foreword, EN 1458-2	3.5.	Rational use of energy
--	3.6.	Temperatures
6.10	3.6.1.	Floor and adjacent walls
6.9	3.6.2.	Knobs and levers
6.9	3.6.3.	External parts
NA	3.7.	Foodstuffs and water used for sanitary purposes
ANNEX II - Certification This draft standard applies only for type-examination. This part is not taken into account.		
ANNEX III - Data plate 7.1.1: - name of the manufacturer or identification symbol : mentioned - trade name of the appliance : mentioned - type of electrical supply used : mentioned - appliance category : mentioned		

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

Bibliography

[1] EN 437:2003+A1:2009, *Test gases — Test pressures — Appliance categories*

[2] EN 60034-5, *Rotating electrical machines — Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) — Classification (IEC 60034-5:2000)*

[3] EN 60529:1991, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

[4] EN ISO 6976:2005, *Natural gas — Calculation of calorific values, density, relative density and Wobbe index from composition (ISO 6976:1995 including Corrigendum 1:1997, Corrigendum 2:1997 and Corrigendum 3:1999)*

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