

Direct gas — fired washing machines of nominal heat input not exceeding 20 kW —

Part 1. Safety

The European Standard EN 12244-1: has the status of a
British Standard

ICS 97.060

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The preparation of this British Standard was entrusted to Technical Committee GSE/37, Gas — fired sorption and laundering appliances, upon which the following bodies were represented:

- British Gas plc
- British Standards Institution
- Calor Appliances Testing Laboratories
- Consumer Policy Committee — BSI
- Department of Trade and Industry — STRD
- Electricity Association
- Gas Consumers Council
- Society of British Gas Industries
- Society of Laundry and Allied Trades

Summary of pages

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National foreword

This Part of BS EN 12244 has been prepared by Technical Committee GSE/37, and is the English language version of EN 12244-1, published by the European Committee for Standardization (CEN).

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Descriptors: household appliances, washing machines, gas appliances, definitions, classifications, equipment specification, performance evaluation, tests, safety, marking, technical notices, utilization, maintenance

English version

Direct gas-fired washing machines, of nominal heat input not exceeding 20 kW — Part 1: Safety

Machines à laver utilisant les combustibles gazeux,
de débit calorifique nominal ne dépassant pas
20 kW — Partie 1: Sécurité

Direkt Gasbefeuerte Waschmaschinen mit einer
Nennwärmebelastung bis 20 kW — Teil 1: Sicherheit

This European Standard was approved by CEN on 21 August 1997.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 299, Gas-fired sorption appliances and domestic gas-fired washing and drying appliances, the secretariat of which is held by AENOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 1998, and conflicting national standards shall be withdrawn at the latest by September 1998.

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

For relationship with EU Directives, see informative annex ZA, which is an integral part of this standard.

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

The marking requirements in this European Standard take into account CR 1472 *“General guidance for the marking of gas appliances”*.

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.

During consideration of this standard, it was agreed that a test for NO_x emissions was not considered necessary due to the intermittent pattern of use of these appliances.

This 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Contents

	Page
Foreword	2
1 Scope	5
2 Normative references	5
3 Definitions	5
3.1 Direct gas-fired washing appliance	5
3.2 Gases	6
3.3 Appliance construction	7
3.4 Immobilizing an adjuster or a control	8
3.5 Appliance performance	8
3.6 Marking of the appliance and packaging	10
4 Classification	10
4.1 Classification of gases	10
4.2 Classification of appliances	10
5 Construction and design requirements	11
5.1 General	11
5.1.1 Conversion to different gases	11
5.1.2 Materials and method of construction	12
5.1.3 Screws	12
5.1.4 Maintenance and use	12
5.1.5 Thermal insulation	13
5.1.6 Connections	13
5.1.7 Supply of combustion air and evacuation of combustion products	13
5.1.8 Soundness	14
5.1.9 Water filter	14
5.1.10 Checking the state of operation	14
5.1.11 Electrical equipment	14
5.1.12 Motors	15
5.1.13 Operational safety in the event of fluctuation, interruption and restoration of the auxiliary energy	15
5.2 Requirements for adjusting, control and safety devices	15
5.2.1 General	15
5.2.2 Automatic shut-off valves	15
5.2.3 Multifunctional controls	15
5.2.4 Flame supervision devices	16
5.2.5 Governors	16
5.2.6 Gas rate adjusters	16
5.2.7 Automatic burner control systems	16
5.2.8 Gas strainers	16
5.2.9 Atmosphere sensing device	16
5.2.10 Spillage monitoring device	17
5.3 Ignition devices	17
5.3.1 General	17
5.3.2 Ignition device for the main burner	17
5.3.3 Ignition burners	17
5.4 Ignition burner or start-gas flame establishment	17
5.5 Main flame establishment	17
5.5.1 Establishment by means of an ignition burner or start-gas flame	17
5.5.2 Direct establishment of the main flame e.g. spark ignition hot surface igniter	18

	Page		Page
5.6 Burners	18	6.9 Burners	26
5.7 Thermostats and control of water temperature	18	6.9.1 Resistance to overheating	26
5.7.1 General requirements	18	6.9.2 Escape of unburnt gas	26
5.7.2 Temperature limiting device	18	6.10 Limiting temperature of various parts of the appliance	26
5.8 Water level control device	18	6.10.1 Requirements	26
5.9 Clocks and timing devices	18	6.10.2 Tests	26
5.10 Pressure test points	18	6.11 Limiting temperature of floor, walls and worktop	27
5.11 Mechanical hazards	18	6.11.1 Requirements	27
5.11.1 General	18	6.11.2 Tests	27
5.11.2 Requirements for appliances with an opening dimension exceeding 30 cm and a drum having a volume exceeding 100 dm ³	18	6.12 Limiting temperature of components	27
5.12 Appliance stability	18	6.12.1 Requirements	27
6 Operational safety	19	6.12.2 Tests	27
6.1 General	19	6.13 Motor limiting temperatures	27
6.1.1 Characteristics of test gases: reference and limit gases	19	6.13.1 Motor bearings	27
6.1.2 Conditions for preparation of test gases	19	6.13.2 Motor windings	27
6.1.3 Practical application of test gases	20	6.14 Flue gas temperature	28
6.1.4 Test pressures	20	6.14.1 Requirements	28
6.1.5 Test procedures	21	6.14.2 Tests	28
6.1.6 Test room	22	6.15 Ignition, cross-lighting and flame stability	28
6.1.7 Preparation of the appliance	22	6.15.1 Ignition and cross-lighting	28
6.1.8 Test conditions	22	6.15.2 Flame stability	29
6.2 Screws	22	6.15.3 Effect of room draughts	29
6.2.1 Requirements	22	6.16 Flame supervision devices	29
6.2.2 Tests	22	6.16.1 Manual devices	29
6.3 Manually operated devices of the automatic burner control system	23	6.16.2 Automatic devices	29
6.3.1 Requirements	23	6.17 Governors	30
6.3.2 Tests	23	6.17.1 Requirements	30
6.4 Mechanical hazards	23	6.17.2 Tests	30
6.4.1 General	23	6.18 Atmosphere sensing device	30
6.4.2 Additional requirements for appliances with an opening dimension exceeding 30 cm and a drum having a volume exceeding 100 dm ³	23	6.18.1 Requirements	30
6.5 Stability of appliances	23	6.18.2 Tests	30
6.5.1 Requirements	23	6.19 Spillage monitoring device	30
6.5.2 Tests	24	6.19.1 General test conditions	30
6.6 Soundness	24	6.19.2 Unintentional shutdown	30
6.6.1 Soundness of the gas circuit	24	6.19.3 Shutdown time	31
6.6.2 Soundness of the water circuit	24	6.20 Combustion	31
6.6.3 Soundness of the combustion circuit and correct evacuation of the combustion products for type B appliances	24	6.20.1 Requirements	31
6.7 Nominal heat input	24	6.20.2 Tests	31
6.7.1 General	24	6.21 Soot deposition	32
6.7.2 Requirements	25	6.21.1 Requirements	32
6.7.3 Tests	25	6.21.2 Tests	32
6.8 Heat input of ignition burners	26	6.22 Cyclic operation	33
6.8.1 Requirements	26	6.22.1 Requirements	33
6.8.2 Tests	26	6.22.2 Tests	33
		6.23 Temperature limiting device	33
		6.23.1 Requirements	33
		6.23.2 Tests	33
		6.24 Water level control device	33
		6.24.1 Requirements	33
		6.24.2 Tests	33
		7 Marking	33
		7.1 Marking of the appliance	33
		7.1.1 Data plates	33
		7.1.2 Warning notices	34
		7.1.3 Other marking	34
		7.2 Marking of the packaging	34

	Page		Page
7.3 Utilization of symbols on the appliance and packaging	34	Annex A (Informative) National situations	48
7.3.1 Electrical supply	34	A.1 Categories listed in the body of the standard marketed in the different countries	48
7.3.2 Type of gas	34	A.2 Appliance supply pressures corresponding to the categories given in A.1	49
7.3.3 Gas supply pressure	34	A.3 Special categories marketed nationally or locally and corresponding test gases	49
7.3.4 Country of destination	35	A.4 Test gases corresponding to the special categories given in A.3	50
7.3.5 Category	35	A.5 Gas connections in the various countries	53
7.4 Instructions	35	A.6 Water connection conditions in common use in the various countries	53
7.4.1 General	35	A.7 Flue connections in the various countries	54
7.4.2 Technical instructions for installation and adjustment	35	A.8 Equivalence rules	54
7.4.3 Instructions for use and maintenance	35	Annex B (normative) Protection against electric shock for high voltage ignition devices	55
7.5 Presentation	37	B.1 Protection against accessibility to live parts	55
Tables		B.2 Requirements	55
1 Classification of gases	10	B.3 Test	55
2 Characteristics of the test gases	19	B.4 Measurement	56
3 Calorific values of the test gases of the third family	20	B.5 Protection	56
4 Test gases corresponding to the appliance categories	21	Annex C (normative) Description of the sealed room for the test appliances with atmosphere sensing devices	56
5 Test pressures where no pressure couple exists	21	C.1 Configuration of the sealed room	56
6 Test pressures where a pressure couple exists	22	C.2 Soundness of the room	56
7 Torque values for screws	23	C.3 Effectiveness of mixing	56
8 Maximum temperature rise in parts of the appliance that are likely to be touched accidentally	26	Annex D (normative) Special national conditions	56
9 Shutdown time as a function of the blockage	31	Annex ZA (Informative) Clauses of this European Standard addressing essential requirements or other provisions of EU Directives	58
10 V_{CO_2} , N values	32		
11 Symbols of the reference gases	34		
Figures			
1 Test flue	37		
2a Test corner for measuring floor and wall temperatures	38		
2b Apparatus for measuring floor and wall temperatures	39		
2c Test board for measuring worktop temperatures	40		
3 Probe for measuring surface temperature	40		
4 Probe for sampling and measuring the temperature of the combustion products	41		
5 Abnormal draught conditions (type B appliances)	42		
6 Spillage monitoring device (test apparatus)	43		
7 Device for sampling the combustion products above the deflector for type A appliances	44		
8 Sampling probe for test flues of diameter equal or greater than DN 100	45		
9 Sampling probe for test flues of diameter less than DN 100	46		
10 Probe for sampling the combustion products for appliances of type B ₁₁	47		

1 Scope

This part 1 of the standard EN 12244 specifies the requirements and test methods for the construction, safety and marking of direct gas-fired washing appliances with or without heat exchanger, with or without spin dryer, of types:

- A₁ and A_{1AS} not exceeding a heat input of 6 kW;
- B₁₁, B_{11AS} and B_{11BS} not exceeding a heat input of 20 kW;

hereafter referred to as “appliances”.

This standard does not apply to:

- a) catalytic combustion appliances;
- b) appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere;
- c) appliances intended to be used in vehicles or on board ships or aircraft.

This standard covers type testing only.

2 Normative references

This standard includes the provisions of other publications by dated or undated reference. These normative references are quoted in appropriate places in the text and the publications are listed below. For the dated references, amendments or revisions later than any of these publications apply to this standard only where they have been incorporated in it by amendment or revision. For the undated references, the latest edition of the publication to which reference is made applies.

EN 88, *Pressure governors for gas appliances for inlet pressure up to 200 mbar*.

EN 125, *Flame supervision devices for gas-burning appliances — Thermoelectric flame supervision devices*.

EN 126, *Multifunctional controls for gas burning appliances*.

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

EN 257, *Mechanical thermostats for gas burning appliances*.

EN 298, *Automatic gas burner control systems for gas burners and gas burning appliances*.

EN 437:1993, *Test gases, test pressures, appliance categories*.

EN 1057, *Copper and copper alloys — Seamless, round copper tubes for water and gas in sanitary and heating applications*.

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

EN 60068-2-63, *Environmental testing, test methods, test equipment: impact, spring hammer*.

EN 60335-1, *Safety of household and similar electrical appliances — Part 1: General requirements*.

EN 60335-2-7, *Safety of household and similar electrical appliances — Part 2: Particular requirements for washing machines*.

EN 60529, *Degrees of protection provided by enclosures*.

EN 60584-1, *Thermocouples — Part 1: Reference tables*.

EN 60730-1, *Automatic electrical controls for household and similar use — Part 1: General requirements*.

EN 60730-2-9, *Automatic electrical controls for household and similar use — Part 2: Particular requirements for temperature sensing controls*.

EN 61058-1, *Switches for appliances — Part 1: General requirements*.

CR 1472, *General guidance for the marking of gas appliances*.

IEC 479-1, *Effects of current passing through human body — Part 1: General aspects*.

IEC 479-2, *Effects of current passing through human body — Part 2: Special aspects*.

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Designation, dimensions and tolerances*.

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

ISO 1182, *Fire tests — Building materials — Non-combustibility test*.

ISO 6976, *Natural gas — Calculation of the calorific value, the density and the relative density*.

3 Definitions

For the purpose of this standard, the following definitions apply:

3.1

direct gas-fired washing appliance

appliance in which textile material is treated discontinuously in one operation cycle by wetting, preliminary washing, cleanwashing and rinsing and, due to construction, also centrifuging

3.1.1

direct gas-fired washing appliance without heat exchanger

appliance in which the water is heated directly in the drum

3.1.2

direct gas-fired washing appliance with heat exchanger

appliance in which the water is heated in an integral heat exchanger

3.2

Gases

3.2.1

reference conditions

15 °C, 1 013,25 mbar, unless otherwise specified

3.2.2

calorific value

quantity of heat produced by the complete combustion, at a constant pressure of 1 013,25 bar, of 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 in which the water produced by combustion is assumed to be condensed;

symbol: H_g

— the net calorific value in which the water produced by combustion is assumed to be in the vapour state

symbol: H_i

units: either

— megajoule per cubic metre (MJ/m³) of dry gas at the reference conditions

or

— megajoule per kilogram (MJ/kg) of dry gas
(EN 437:1993)

3.2.3

relative density

ratio of the masses of equal volumes of dry gas and dry air at the same conditions of temperature and pressure: 15 °C (or 0 °C), 1 013,25 mbar

symbol: d

3.2.4

Wobbe index

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

symbol: gross Wobbe index: W_g ; net Wobbe index: W_i

units: either

— megajoule per cubic metre (MJ/m³) of dry gas at the reference conditions

or

— megajoule per kilogram (MJ/kg) of dry gas
(EN 437:1993)

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 gases

gases intended for the verification of the operational characteristics of appliances using combustible gases. They consist of reference gases and limit gases
(EN 437:1993)

3.2.7

reference gases

test gases on which appliances operate under nominal conditions when they are supplied at the corresponding normal pressure (EN 437:1993)

3.2.8

limit gases

test gases representative of the extreme variations in the characteristics of the gases for which appliances have been designed (EN 437:1993)

3.2.9

test pressures

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

unit: millibar (mbar)

NOTE 1 mbar = 10² Pa

(EN 437:1993)

3.2.10

normal pressure

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

symbol: p_n

(EN 437:1993)

3.2.11

limit pressures

pressures representative of the extreme variations in the appliance supply conditions

symbols: maximum pressure: p_{max} ;

minimum pressure: p_{min}

(EN 437:1993)

3.2.12

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 437:1993)

3.3

appliance construction

3.3.1

The gas circuit

3.3.1.1

gas circuit

part of an appliance between the gas inlet connection and the burner(s) conveying or containing the gas. The circuit may comprise several components, e.g. restrictors, gas rate adjusters, gas rate controls, injectors

3.3.1.2

mechanical joint

connection device assuring soundness in an assembly of several parts, generally of metal, e.g. cone seated joint, O-ring joint, flat faced washered joint

3.3.1.3

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

3.3.1.4

gas rate adjuster

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

the adjustment may be progressive (screw adjuster) or discontinuous (changing restrictors)

the adjuster of an adjustable governor is regarded as a gas rate adjuster

the action of setting this device is called "setting the gas rate"

3.3.1.5

gas rate control

component intended for the user to open or close the gas supply to one or more burners. It may also be used to adjust the gas rate of certain burners to a predetermined value, called the "reduced rate"

3.3.1.6

injector

component that admits the gas into an aerated burner

3.3.2

The burner

3.3.2.1

main burner

burner that assures the thermal function of an appliance. It is usually called simply "burner"

3.3.2.2

ignition device

device that ignites one or more burners. Such a device may be, for example, an ignition burner

3.3.2.3

ignition burner (pilot)

small burner, usually called a "pilot", that ignites the main burner by means of a flame. When this ignition burner also actuates a flame detection device, it is called a "safety ignition burner (pilot)"

3.3.2.4

fixed primary aeration restrictor

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

3.3.3

The combustion circuit

3.3.3.1

combustion circuit

circuit comprising the air supply circuit, combustion chamber, heat exchanger and combustion- products circuit, up to and including the flue outlet for type B appliances

3.3.3.2

combustion chamber

enclosure inside which combustion of the air-gas mixture takes place

3.3.3.3

flue outlet

part of a type B appliance that is intended to be connected to the flue duct evacuating the combustion products

3.3.3.4

draught diverter

device placed in the combustion products circuit to reduce the influence of flue-pull and that of downdraught on the burner performance and combustion

3.3.4

Auxiliary equipment

3.3.4.1

governor

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

3.3.4.2

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

3.3.4.3

control knob

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

3.3.4.4

programming unit

unit which reacts to impulses from control and safety devices, gives control commands, controls the start up programme, supervises the burner operation and causes controlled shut-down, safety shut-down and lock out if necessary. The programming unit follows a predetermined sequence of actions and operates in conjunction with a flame detector device

3.3.4.5

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 may be in one or more housings

3.3.4.6

control thermostat

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

3.3.4.7

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

3.3.4.8

atmosphere sensing device

device designed to shut off the gas supply to the burner(s) completely before the concentration of the combustion products in surrounding atmosphere reaches a set value

3.3.4.9

spillage monitoring device

device that causes at least safety shutdown of the main burner when there is an unacceptable spillage of combustion products from the draught diverter of type B₁₁BS appliances

3.3.5

water pump

pump which circulates water between the drum and the heat exchanger when it exists

3.4

Immobilizing an adjuster or a control

3.4.1

setting an adjuster

procedure by which an adjuster is immobilized in a position by some means such as a screw etc.

3.4.2

sealing an adjuster

procedure by which changing the setting of an adjuster breaks the sealing material and makes the interference with the adjuster apparent

a factory sealed pre-set adjuster is considered to be non-existent

a governor is considered to be non-existent if it has been factory sealed in the fully opened position

3.4.3

putting out of service of a control

procedure by which a control (of temperature, pressure, etc.) is put out of action and sealed in this position. The appliance then functions as if this device had been removed

3.5

Appliance performance

3.5.1

gas rates

3.5.1.1

volume flow rate

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

practical unit: cubic metre per hour (m³/h), litre per minute (l/min), cubic decimetre per hour (dm³/h)

symbol: *V*

3.5.1.2

mass flow rate

mass of gas consumed by the appliance in unit time

practical units: kilogram per hour (kg/h) or gram per hour (g/h)

symbol: *M*

3.5.1.3

heat input

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

practical unit: kilowatt (kW)

symbol: *Q*

3.5.1.4

nominal heat input

value of the heat input declared by the manufacturer:

symbol: *Q_n*

3.5.2

Gas combustion

3.5.2.1

flame stability

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

3.5.2.2

flame lift

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

3.5.2.3

light-back

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

3.5.2.4

light-back at the injector

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

3.5.2.5

sooting

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

3.5.2.6

yellow tipping

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

3.5.2.7

ignition opening time

time interval between ignition of the supervised flame and the moment when the valve is held open

3.5.2.8

first safety time¹⁾

timespan between the ignition burner (pilot) gas valve being energized to the time that the flame detector is required to monitor the presence of that ignition burner (pilot) gas flame

3.5.2.9

second safety time

timespan between the main gas valve being energized to the time that the flame detector is required to monitor the presence of the main flame alone

3.5.2.10

extinction safety time

time interval between extinction of the supervised flame and the gas supply being shut off:

- to the main burner;
- and/or to the ignition burner

3.5.2.11

start gas flame

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

3.5.2.12

ignition interlock

part which prevents the operation of the igniter as long as the main gasway is open

3.5.2.13

re-start interlock

mechanism which prevents the re-opening of the gasway to the main burner, or to the main burner and ignition burner, until the armature plate has separated from the magnetic element

3.5.3

controlled shut-down

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

3.5.4

safety shut-down

process which is effected immediately following the response of a safety limiter or sensor or the detection of a fault in the burner control system and which puts the burner out of operation by immediately removing the power to the gas shut-off valve(s) and the ignition device

3.5.5

Lock-out

3.5.5.1

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

3.5.5.2

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 a failure of the main power and its subsequent restoration

3.5.6

spark restoration

process by which, after disappearance of the flame signal in the running condition, 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 volatile or non-volatile lock-out

3.5.7

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

¹⁾ Where there is no second safety time, this is called the safety time.

3.5.8
heating-up time

time necessary to attain a given rise in the water temperature in the drum

3.6
Marking of the appliance and packaging

3.6.1
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 shall be capable of operating, without adjustment or modification, with one of the gases distributed in the country concerned, at the appropriate normal pressure

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

3.6.2
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

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 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

Appliances can be classified according to:
— the gases they use;
— the mode of evacuation of combustion products.

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.1 and A.2 (see also A.3 for the categories marketed locally and nationally, corresponding to the test gases and test pressures given in table A.4; annex D gives the particular conditions specific to one country).

4.2.1.2 Category I

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

4.2.1.2.1 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).

4.2.1.2.2 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 pressure.

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

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

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.

4.2.1.2.3 Appliances designed for use on third family gases only

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

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

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

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

4.2.1.3 Category II

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

4.2.1.3.1 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}.

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

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

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

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

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

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

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

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

4.2.1.4 Category III

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

This category is not in general use.

Category III appliances admitted in certain countries are given in A.3.

4.2.2 Classification according to the mode of supply of the combustion air and evacuation of the combustion products (Appliance types)

Appliances are classified into types according to the method of evacuation of the products of combustion and of admitting the combustion air.

4.2.2.1 type A: An appliance not intended for connection to a flue or to a device for evacuating the products of combustion to the outside of the room in which the appliance is installed.

4.2.2.2 type A₁: A type A appliance without a fan.

4.2.2.3 type A_{1AS}: A type A₁ appliance fitted with an atmosphere sensing device.

4.2.2.4 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.

4.2.2.5 type B₁: A type B appliance incorporating a draught diverter.

4.2.2.6 type B₁₁: A natural draught B₁ appliance.

4.2.2.7 type B_{11AS}: A type B₁₁ appliance fitted with an atmospheric sensing device.

4.2.2.8 type B_{11BS}: A type B₁₁ appliance fitted with a spillage monitoring device.

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 to different gas supply pressures are given below for each category.

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

5.1.1.1 Category I

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

- Adjustment of the gas rate with, if necessary, a change of injector, restrictors or governor;
- 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 governor 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.

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

- Adjustment of the gas rate with, if necessary, a change of injector, restrictors or governor;
- 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 governor 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.

These adjustments or component changes are only acceptable when

converting from a gas of the 2nd family to a gas of the 3rd family or vice versa;

converting from one butane/propane pressure couple to another, (e.g. 28-30/37 mbar $\Leftrightarrow$ 50/67 mbar).

5.1.1.3 Category III

Category III appliances admitted in certain countries and the conversion criteria are also given in 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 may 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.

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

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

Condensation produced at the start-up and/or during use shall not affect the safety of the appliance and shall not drop on the floor. Also, no overflow shall occur.

In case of a lubricated surface of those orifices, the protection shall be done by an appropriate device.

It shall be possible, when necessary, to drain the appliance manually or with the aid of currently available tools.

5.1.3 Screws

Screws affecting electrical safety shall conform to the relevant requirements of EN 60335-2-7.

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 heat exchanger) shall be dismountable for maintenance by a service engineer using common 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.

Connection to the exhaust duct, if appropriate, shall be possible when the appliance is installed in accordance with the manufacturer's instructions.

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 Connections

5.1.6.1 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 may 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.5.

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

- a) a thread conforming to ISO 228-1. In this case the end of the gas inlet connection shall have a flat annular surface at least 3 mm wide for thread sizes 1/2 and 3/8 and at least 2,5 mm wide for thread size 1/4, to allow the interposition of a sealing washer; 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 ISO 7-1;
- c) a compression fitting suitable for copper tube conforming to EN 1057;
- 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 may 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 in which the appliance is to be sold. 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.5.

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

5.1.6.2 Water connections

If the connection to the water supply is made by means of a threaded connection, this shall conform to ISO 228-1 or ISO 7-1.

If the connection consists of a plain copper tube, this shall have a straight section at least 5 cm long and shall conform to EN 1057.

If materials other than metallic materials are used, the manufacturer shall supply suitable justification of suitability for the conditions of use.

For water connection conditions in common use in the various countries, see table A.6.

5.1.7 Supply of combustion air and evacuation of combustion products

5.1.7.1 General

The cross-section of the airway to the combustion chamber and the cross-section of the flueway shall not be adjustable.

Every appliance shall be so constructed that the supply of combustion air is assured under normal conditions of use and maintenance.

5.1.7.2 Type A appliances

Appliances designed to be built in shall be constructed in such a way that by approaching the appliance to the lateral or rear walls, no reduction of the free cross-section for the flue gas might occur. The sufficient cross-section for the flue gas shall be ensured. The openings for the flue gas shall be positioned in a way that the user is not hampered nor endangered.

It shall not be possible to connect type A appliances to a flue unless the manufacturer constructs the appliance expressly to permit the option of conversion to type B. In this case, the appliance shall be submitted, suitably modified, for additional verification as type B and shall meet all the relevant requirements for type B.

5.1.7.3 Type B appliances

Type B₁₁, B_{11AS} and B_{11BS} appliances shall be fitted with a draught diverter, integral with the appliance.

The outlet connection of the draught diverter shall be female. It is admissible for the manufacturer to supply an adaptor to permit the connection between the draught diverter outlet and the flue to which the appliance is connected. The diameters of the flues in force in the various countries appear for information purposes in table A.7.

It shall be possible to insert a flue pipe into the flue outlet to a depth of at least equal to:

- 30 mm for a horizontal connection;
- 15 mm for a vertical connection.

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

The minimum and maximum flue diameters for which the appliance is designed shall be stated in the technical instructions.

5.1.8 Soundness

5.1.8.1 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 may 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.

5.1.8.2 Soundness of the combustion circuit for type B appliances

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

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

5.1.9 Water filter

A filter or other means shall be provided for minimizing fouling matter in the water circuit.

5.1.10 Checking the state of operation

The installer shall be able to observe the correct ignition and operation of the burner(s) and also the length of the flame(s) of the ignition burner, if any. A door may be opened or a case removed provided that the soundness of the combustion circuit, as specified in 6.6.3 is maintained.

The visibility shall continue to be assured and shall not deteriorate under the effect of heat, particularly where there is a viewing window. In addition, mirrors, sight glasses, etc., shall continue to retain their optical properties.

However, when the main burner is fitted with its own flame detector, an indirect means of indication (e.g. an indicator light) is allowed. The means of indicating presence of a flame shall not be able to be confused with the indication of any other fault, except for a fault in the operation of the actual means of checking the flame which shall result in an indication that there is no flame.

It shall be possible for the user, perhaps after opening a door, to check at any time that the appliance is operating, either by visual observation of the flame or by some other indirect means.

5.1.11 Electrical equipment

5.1.11.1 General

The electrical equipment of the appliance shall conform to EN 60335-1, EN 60730-1 and EN 61058-1.

The electrical safety of high voltage ignition circuits shall be assessed in accordance with annex B.

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

If the manufacturer specifies the nature of the electrical protection of the appliance on the data plate, this specification shall conform to EN 60529:

- to give the degree of personal protection against contact with dangerous electrical components inside the appliance case;
- to give the degree of personal protection, inside the case, against harmful actions due to water penetration.

5.1.11.2 Supply voltage tolerance

The electrical circuits and components of the appliance shall function safely when the appliance is connected to a supply of 85 % the minimum rated voltage and of 110 % the maximum rated voltage. This shall be verified by the test described in 6.20.2.3.

5.1.11.3 Internal conductors

Solid or rigid internal conductors shall not be used where they are subject to vibration, repeated bending or undue strain.

5.1.12 Motors

Motors 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 60529: IP 20). 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, positioned or guarded as to afford protection to the operator.

Means shall be provided 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 may use a self-tensioning spring system.

Motors 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 shutdown 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 non-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 6.20.2.3.

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 conform to EN 161.

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.

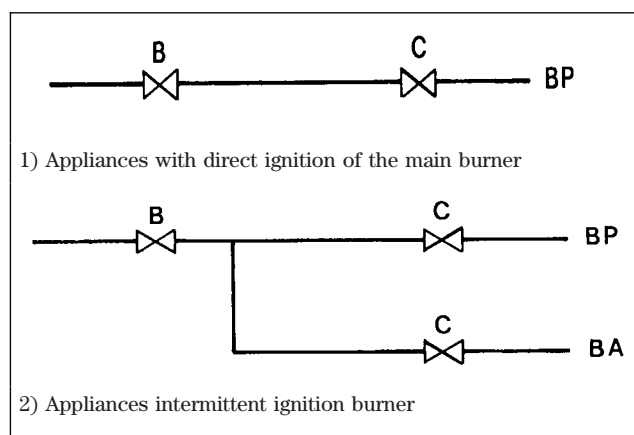
The gas line shall be fitted with a Class A valve or Class B valve to shut off the gas supply to the main burner and ignition burner, if any; the overheat cut-off device, the safety temperature limiter and also the flame detector can operate on this valve.

An appliance shall have 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



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 conform to EN 126.

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

Heat sensitive flame supervision devices shall conform to EN 125.

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 conform to EN 298.

5.2.5 Governors

Any governor shall conform to EN 88.

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

A governor 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 governor is permitted for the ignition burner.

The design and accessibility of the gas governor shall be such that it can be easily adjusted or put out of service or, possibly, the governor 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 Gas rate adjusters

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

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

The adjuster of an adjustable gas governor is regarded as a gas rate 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 conform to EN 298.

The manufacturer shall specify the safety time. This time shall not exceed 10 s.

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 may 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 allow the penetration of a pin gauge > 1 mm.

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

Where a governor is fitted upstream of the safety shut-off system, the strainer shall be fitted upstream of the governor.

5.2.9 Atmosphere sensing devices

Type A_{1AS} and B_{11AS} appliances shall be factory-fitted with an atmosphere sensing device. The fitting of such a device shall be indicated on the data plate (see 7.1.1).

This device, including the ignition burners which form part of them, shall not be adjustable. Any adjusters that may be necessary in manufacture shall be factory-sealed.