

Gas-fired instantaneous water heaters for the production of domestic hot water, fitted with atmospheric burners

The European Standard EN 26:1997, incorporating amendments A1:2000, A2:2004 and A3:2006, has the status of a British Standard

ICS 91.140.65

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 26:1997, incorporating corrigendum July 1998 and amendments A1:2000, A2:2004 and A3:2006. It supersedes BS 5386-1:1976, BS 5386-2:1981 (1986) and BS 5386-5:1988, which are withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by **A1** **A1**.

The UK participation in its preparation was entrusted to Technical Committee GSE/29, Domestic and non-domestic gas-fired central heating boilers.

A list of organizations represented on GSE/29 can be obtained on request to its secretary.

The English language ratified text of EN 26:1997 and corrigendum July 1998 contain the incorrect title, incorrect table cross-references (see 5.1.2 and footnotes to Table 2, Table 5 and Table 6) and typographical errors, which have been corrected in BS EN 26:1998.

Delays were experienced in the publication of BS EN 26 because BSI was waiting to publish the EN corrigendum and EN 26 simultaneously.

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

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

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 September 1998

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Amd. No.	Date	Comments
12083	10 October 2001	See national foreword
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Gas-fired instantaneous water heaters for the production of domestic hot water, fitted with atmospheric burners

Appareils de production instantanée d'eau chaude pour usages sanitaires équipés de brûleurs atmosphériques utilisant les combustibles gazeux

Gasbeheizte Durchlauf-Wasserheizer für den sanitären Gebrauch mit atmosphärischen Brennern

This European Standard was approved by CEN on 1996-11-15. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

The European Standards exist 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 Central Secretariat has the same status as the official versions.

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CEN

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

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 48, Domestic gas-fired water heaters, the Secretariat of which is held by AFNOR.

It has been established to deal with the aspects related to:

- safety, rational use of energy; and
- fitness for purpose.

Whilst awaiting common specifications for methods of sampling and measuring NO_x, which are being prepared, this document does not specify particular provisions applicable to these substances. This matter will be dealt with eventually.

This European Standard supersedes EN 26:1977, EN 26:1977/A3:1984 and EN 26:1977/A4:1984, and includes corrigendum 1998.

The different significant technical terms are as follows:

Normative annexes are an integral part of the standard. Informative annexes are only given for information. In this standard, Annexes B, C, D, J, K are normative and annexes A, E, F, G, H, ZA are informative.

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

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

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A1

This amendment EN 26:1997/A1:2000 to EN 26:1997 has been prepared by Technical Committee CEN/TC 48, Domestic gas-fired water heaters, the Secretariat of which is held by AFNOR.

This amendment to the European Standard EN 26:1997 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2001, and conflicting national standards shall be withdrawn at the latest by April 2001.

This amendment does not change requirements and test methods contained in EN 26:1997. It modifies EN 26:1997 by the addition of requirements and test methods for type testing of type C water heaters with a fan incorporated in the combustion air supply circuit or in the combustion products evacuation circuit.

This amendment to the European Standard EN 26:1997 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 standard.

To fulfil the Gas Appliance Directive, this amendment contains normative paragraphs specifying requirements for combustion products evacuation ducts which are part of a water heater. Constructional requirements may arise from the Construction Products Directive.

In respect of adverse effects on the quality of water intended for human consumption, caused by the product covered by the standard:

- 1) This standard provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA.
- 2) It should be noted that, while awaiting the adoption of verifiable European Criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

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.

Foreword to amendment A2

This document EN 26:1997/A2:2004 has been prepared by Technical Committee CEN/TC 48, Domestic gas-fired water heaters, the secretariat of which is held by AFNOR.

This Amendment to the European Standard EN 26:1997 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2004, and conflicting national standards shall be withdrawn at the latest by December 2004.

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.

With this amendment, the requirements and test methods for type B instantaneous water heaters with fan assisted combustion are introduced in EN 26. In addition requirements and test procedures for resistance to freezing are introduced.

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

Foreword to amendment A3

This document (EN 26:1997/A3:2006) has been prepared by Technical Committee CEN/TC 48 “Domestic gas-fired water heaters”, the secretariat of which is held by AFNOR.

This Amendment to the European Standard EN 26:1997 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2007, and conflicting national standards shall be withdrawn at the latest by April 2007.

This amendment includes requirements relative to the metallic, plastic and other non-metallic materials that are used in water heaters and which come into contact with water intended for human consumption. It is intended to ensure that products of this kind complying with these requirements meet current technological development and requirements which will result from the application of the EAS (European Approval Scheme) of the European Commission, with regard to the service life of water heaters and their physiological suitability.

NOTE As long as no European regulations are enforced (EAS) national regulations stay in force.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, 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 United Kingdom.

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1 Scope

This European Standard defines the specifications and test methods concerning the construction, safety, rational use of energy and fitness for purpose, and also the classification and marking of gas-fired instantaneous water heaters for the production of domestic hot water, hereafter called “water heaters”.

This European Standard applies to water heaters:

- of types A_{AS}, B₁₁, B_{11BS}, B₁₂, B_{12BS}, B₁₃, B_{13BS}, B₁₄, B₂₂, B₂₃, B₃₂, B₃₃, B₄₄, B₅₂, B₅₃, C₁₁, C₁₂, C₁₃, C₂₁, C₂₂, C₂₃, C₃₂, C₃₃, C₄₂, C₄₃, C₅₂, C₅₃, C₆₂, C₆₃, C₇₂, C₇₃, C₈₂ and C₈₃;¹⁾
- fitted with atmospheric burners;
- equipped with atmospheric burners assisted by a fan for the supply of combustion air or evacuation of combustion products or fully premixed burners;
- using one or more combustible gases corresponding to the three gas families in accordance with Table 3 and at the pressures stated in Table 6 and Table 7 of 7.1.4;
- of nominal heat input not exceeding 45 kW;
- with an ignition burner or with direct ignition of the main burner.

This European Standard applies to type C²⁾ water heaters as listed in 4.3.3:

- types C₁, C₃ and C₅ water heaters including their combustion air supply and combustion products evacuation ducts and their terminal(s);
- types C₂ and C₄ water heaters including their connection ducts but without the shared duct system; this shared duct system is part of the building;
- type C₆ water heaters without any ducts; the ducts are separately approved and marketed;
- type C₇ water heaters up to the draught diverter/air inlet but without the secondary flue;
- type C₈ water heaters with their connecting ducts but without the chimney, which is part of the building.

In this European Standard, the heat inputs are expressed in relation to the net calorific value (H_i):

- water heaters of types B₂₁, B₃₁, B₄₁, B₄₂, B₄₃ and B₅₁.

This standard only covers water heaters where the fan, if any, is an integral part of the appliance.

This European Standard does not contain all the requirements necessary for:

- boiling water appliances;
- appliances intended to be connected to a mechanical means of evacuating the combustion products;
- appliances which fulfil a dual role of space heating and heating water for the production of domestic hot water;
- appliances making use of the heat of condensation of the water contained in the combustion products.

This European Standard:

- does not apply to appliances not intended to be connected to a flue when they are not fitted with an atmosphere sensing device;
- takes account of the information given in Technical Report CR 1472 with respect to marking;
- only covers type testing.

Matters which relate to quality assurance systems, production tests and the certification of auxiliary controls are not dealt with in this European Standard.

If the manufacturer indicates that the appliance has been tested in accordance with EN 26, the appliance must conform completely with the requirements of this European Standard.

Type B appliances shall be fitted with a combustion products discharge safety device to comply with essential requirement 3.4.3 of the EC Directive. In this European Standard, the appliance is identified as type B_{11BS}.

¹⁾ National installation regulations may specify further requirements and may limit the modes of installation permitted in the territory of a CEN member state.

²⁾ Except for type C₆ water heaters, type C water heaters are marketed with ducts. Combustion products evacuation ducts in areas of the building other than the room in which the water-heater is installed or ducts or chimneys which are part of the building are also subject to the Construction Products Directive. National installation regulations may specify further requirements and may limit the modes of installation permitted in the territory of a CEN member state.

Appliances intended to be installed outdoors or in a room separate from inhabited rooms and provided with appropriate ventilation are not required to have this combustion products discharge safety device but, in this case, appropriate warnings on the packaging, and in the instructions shall clearly define the limited authorized use for this type of appliance. In this European Standard, the appliance is identified as type B₁₁.

The main symbols used in this European Standard are summarized in Annex F.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 88:1991, *Pressure governors for gas appliances for inlet pressures up to 200 mbar*.

EN 125:1991, *Specification for flame supervision devices for gas burning appliances — Thermoelectric types*.

EN 126:1993, *Multifunctional controls for gas burning appliances*.

EN 161:1991, *Automatic shut-off valves for gas burners and gas appliances*.

EN 549:1995, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*.

EN 298:1993, *Automatic gas burner systems for gas burners and gas burning appliances with or without fans*.

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

EN 1443:1993, *Chimneys — General requirements*.

CR 1472:1994, *General guidance for the marking of gas appliances*.

CR 1749:2001, *European scheme for the classification of gas appliances according to the method of evacuation of the products of combustion (Types)*.

prEN 1856-1, *Chimneys — Requirements for metal chimneys — Part 1: System chimney products*.

prEN 1856-2, *Chimneys — Requirements for metal chimneys — Part 2: Metal liners and connecting flue pipes products*.

EN 1859, *Chimneys — Metal chimneys — Test methods*.

EN 12067-1, *Gas/lair ratio controls for gas burners and gas burning appliances — Part 1: Pneumatic types*.

prEN 50165:1995, *Electrical equipment of non-electric heating appliances for household and similar purposes — Safety requirements*.

EN 60335-1:1991, *Safety of household and similar electrical appliances — Part 1: General requirements*.

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

EN 60730-2-9:1994, *Automatic electrical controls for household and similar use — Part 2-9: Particular requirements for heat sensing controls*.

EN 60742:1989, *Isolating transformers and safety isolating transformers — Requirements*.

ISO 7-1:1982, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Designation, dimensions and tolerances*.

ISO 228-1:1982, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Designation, dimensions and tolerances*.

ISO 262:1973, *ISO general purpose metric screw threads — Selected sizes for screws, bolts and nuts*.

ISO 274:1975, *Copper tubes of circular section — Dimensions*.

ISO 301:1981, *Zinc alloy ingots intended for casting*.

ISO 1817:1985, *Rubber, vulcanized — Determination of the effects of liquids*.

EN 23166:1988, *Codes for the representation of names of countries*.

ISO/DIS 6976:1992, *Natural gas — Calculation of the calorific value, volumetric mass and density.*

ISO 7005: 1992, *Metallic flanges.*

IEC 335-2-14:1994, *Safety of household and similar electrical appliances — Part 2-14: Particular requirements for electric kitchen machines.*

IEC 479-1:1984, *Effects of current passing through the human body — Part 1: General aspects — Chapter 1: Electrical impedance of the human body — Chapter 2: Effects of alternating current in the range 15 Hz to 100 Hz — Chapter 3: Effects of direct current.*

IEC 479-2:1987, *Effects of current passing through the human body — Part 2: Special aspects — Chapter 4: Effects of alternating current with frequencies above 100 Hz — Chapter 5: Effects of special waveforms of current — Chapter 6: Effects of unidirectional single impulse currents of short duration.*

3 Definitions

For the purpose of this European Standard, the following definitions apply:

3.1 instantaneous water heater

appliance where the heating of water is directly dependent on the draw off

3.1.1

instantaneous water heater with fixed output

appliance where the burner operates at a fixed heat input

3.1.2

instantaneous water heater with adjustable output

appliance where the heat input can be reduced by operation of the manual gas rate control incorporated in the appliance

3.1.3 instantaneous water heater with automatic output variation (AVO)

appliance where the gas rate varies automatically so as to keep the hot water temperature within a predetermined range when the water delivery rate varies

Depending on the method of automatic control, two distinct kinds of appliances with automatic output variation are recognized:

3.1.3.1

thermostatic appliance

appliance where the gas rate is varied by a thermostatic device controlling the water temperature, the set point of this device being adjustable or non-adjustable

3.1.3.2

proportioning appliance

appliance where the gas rate is varied proportionally to the water rate, the factor of proportionality may be adjustable

3.1.4

range of automatic output variation

range of the manufacturer's declared useful outputs of an appliance with automatic output variation inside which the subordination of the gas rate to the water rate maintains the hot water temperature with a predetermined range when the water rate varies

3.2 characteristics of the gas and electricity supplies

3.2.1

reference conditions

dry gas at a temperature of 15 °C, at an absolute pressure of 1 013,25 mbar

3.2.2 test gases

gases intended to check the operational characteristics of the appliances using combustible gases. They comprise reference and limit gases

Table 2 of this European Standard gives the characteristics of the reference and limit gases.

3.2.2.1

reference gases

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

3.2.2.2

limit gases

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

3.2.3

calorific value

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

A distinction is made between two types of calorific value:

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

Units:

- either megajoules per cubic metre of dry gas taken under reference conditions (MJ/m³);
- or megajoules per kilogram of dry gas (MJ/kg).

3.2.4

relative density

ratio of the masses of equal volumes of gas and dry air under reference conditions

Symbol: d .

3.2.5

Wobbe number

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

Symbols:

- gross Wobbe number W_g ;
- net Wobbe number W_i .

Units:

- either megajoules per cubic metre of dry gas taken under reference conditions (MJ/m³);
- or megajoules per kilogram of dry gas (MJ/kg).

3.2.6 gas pressures

all the pressures are static pressures of the moving gas, relative to the atmospheric pressure, measured at right angles to the direction of flow of the gas

Symbol: p .

Unit: millibar (mbar).

NOTE 1 mbar = 10^2 Pa.

3.2.6.1

test pressures

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

The test pressures are given in Table 6 and Table 7 of 7.1.4.

3.2.6.2

normal pressure

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

Symbol: p_n .

3.2.6.3

limit pressures

pressures representative of the extreme variations in the appliance supply pressures

Symbols:

- maximum pressure: $p_{\max}$;
- minimum pressure: $p_{\min}$.

3.2.6.4

pressure couple

set of two distinct gas distribution pressures applied because of the big difference that exists between the Wobbe numbers within a single family or group:

- the higher pressure corresponds only to the low Wobbe number gases;
- the lower pressure corresponds to the high Wobbe number gases

3.2.7

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 appliances shall be capable of operating, without adjustment or modification, with one of the gases distributed in the country concerned, at the appropriate supply 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.

3.2.8

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 used safely and correctly in this country

3.2.9

rated voltage

voltage or range of voltages specified by the manufacturer at which the appliance will operate normally

3.3

gas circuit

all the parts of the appliance conveying or containing the combustible gas, included between the appliance gas supply connection and the burner(s)

3.4 adjusting, control and safety devices

3.4.1
restrictor
device comprising of one or more orifices that is placed in the gas circuit in such a way as to create a pressure drop and thus reduce the gas pressure at the burner to a predetermined value for a given supply pressure and given rate

3.4.2
preset gas rate adjuster
component allowing the gas rate of the burner to be set to a predetermined value according to the supply conditions

3.4.3
locking a preset adjuster
immobilization of the preset gas rate adjuster by some means (screw, etc.) in a position after adjustment

3.4.4
sealing a preset adjuster
arrangements made to make evident any change to the adjustment, for example breakage of the device or sealing material

3.4.5
putting a preset adjuster or a control out of service
putting a preset adjuster or a control (of rate, pressure, etc.) out of operation and sealing it in this position. The appliance functions as if this device has been removed

3.4.6
gas pressure governor
device that maintains the downstream pressure between fixed limits independent of variations, within a given range, of the upstream pressure and the gas rate

3.4.7
gas volume governor
device that maintains a rate between fixed limits independent of variations, within a given range, of the upstream and downstream pressures

3.4.8
control knob
component intended to be moved by hand in order to operate an appliance control, for example tap or temperature selector

3.4.9
manual shut-off valve
component that permits manual interruption of the gas rate to the burner and ignition burner (if any)

3.4.10
manual gas rate adjuster
device that allows the user to reduce the gas rate to the burner
This device may be the shut-off valve.

3.4.11
automatic shut-off valve³⁾
valve designed to open on an electrical signal. It closes automatically in the absence of electricity

³⁾ Automatic shut-off valves are classified in accordance with EN 161 into classes A (not required in the current standard), B and C. Automatic shut-off valves that comply with the safety and operational requirements of this standard and which are integral parts of the water heater are designated as class B' and C', respectively. 

3.4.12**automatic water-operated gas valve**

automatic device that subordinates the admission of gas to the main burner to the flow of water through the appliance

3.4.13**electrical ignition device**

electrical device that ignites a mixture of air and gas in the combustion zone of a burner. A distinction is made between:

- a manually operated ignition device for the ignition burner;
- an automatically controlled ignition device for the ignition burner;
- an automatically controlled ignition device for the main burner

3.4.14**flame supervision device**

device that, in response to a signal from the flame detector, keeps the gas supply open and shuts it off in the absence of the supervised flame

3.4.15**multifunctional control**

device having at least two functions, one of which is a shut-off function, integrated in one housing, whereby the constituent elements cannot operate if separated

3.4.16**programming unit**

device that reacts to signals from control (water flow) and safety devices, supervises the burner operation and causes controlled shutdown and, if necessary, safety shutdown with lockout. The programming unit follows a predetermined sequence of actions, and always operates in conjunction with the flame detector device

3.4.17**automatic burner control system**

system that comprises at least a programming unit and all the elements that make up a flame supervision device

3.4.18**atmosphere sensing device**

device intended to interrupt the gas supply to the burner and permanent ignition burner of a type A_{AS} water heater before vitiation of the atmosphere of the room in which it is installed, by combustion products from the appliance, reaches a predetermined threshold value

3.4.19**combustion products discharge safety devices**

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 B_{11BS} water heaters

3.5 stages of operational and safety sequences

3.5.1

programme

sequence of the operations determined by the programming unit to assure the start-up, supervision and shutdown of the burner

3.5.2

spark restoration

automatic process by which, following disappearance of the flame signal, the ignition device is switched on again without the gas supply having been interrupted

3.5.3

recycling

automatic process by which, after loss of flame during operation, the gas supply is interrupted, at least to the main burner, and the full start procedure is re-initiated automatically

3.5.4

safety shutdown

process which is initiated immediately in response to the signal from a temperature limiting device or sensor and which causes the burner to shut down. The appliance returns to its start position

3.5.5

locking out

interruption of the complete gas supply, with lockout

3.5.6

non-volatile lockout

arrangement such that a restart can only be accomplished by a manual reset

3.5.7

volatile lockout

arrangement such that a restart can only be accomplished either by manual intervention or by restoration of the electrical supply after its loss

3.6 burners

3.6.1

injector

component that admits gas into an atmospheric burner

3.6.2

burner

component that provides the air-gas mixture and ensures the combustion of the gas

3.6.3

main burner

burner that is intended to assure the thermal function of the appliance and is generally called “the burner”

3.6.4 ignition burner

burner intended to ignite a main burner

3.6.4.1

permanent ignition burner

ignition burner that remains alight during the periods that the appliance is ready for use or is operating

3.6.4.2

alternating ignition burner

ignition burner that is extinguished as soon as ignition of the main burner is effected. It re-ignites at the main burner flame just before the latter goes out

3.6.4.3**intermittent ignition burner**

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

3.6.4.4**interrupted ignition burner**

ignition burner that operates only during the ignition sequence

3.6.4.5**intermittent safety ignition burner**

ignition burner functioning while water is being delivered and during the extinction safety time

The intermittent safety ignition burner is ignited by an automatic ignition device when delivery commences.

Ⓐ 3.6.4.6**fully premixed burner**

a burner in which the gas and a quantity of air at least equal to that theoretically necessary for complete combustion are mixed before the flame ports Ⓐ

3.7 combustion circuit

circuit comprising the air supply circuit, combustion chamber, heat exchanger and combustion products circuit up to and including:

- the deflector for type A_{AS} appliances;
- the flue outlet for type B appliances;
- Ⓐ the combustion products evacuation ducts and either the duct adapter (if any) or the connection to the terminal for type C, B₄ and B₅ water heaters. Ⓐ

3.7.1**combustion chamber**

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

3.7.2**deflector**

part of a type A_{AS} appliance that is intended to deflect the combustion products away from the walls against which it is installed

3.7.3**flue outlet**

part of a type B appliance (see 4.3) that is intended to be connected to the flue evacuating the combustion products

3.7.4**draught diverter**

part of a type B₁₁ or B_{11BS} appliance (see 4.3), placed in the combustion products circuit to reduce the influence of updraught and to prevent that of downdraught on the stability of the burner flames and on combustion

3.7.5**terminal**

Ⓐ a device outside of the building, to which is(are) connected:

- the air supply and combustion products evacuation ducts for types C₁ and C₃ water heaters (one or two devices);
- the air supply duct and the combustion products evacuation ducts for type C₅ water heaters (two devices);
- the air supply duct for type C₈ water heaters, (one device)
- Ⓐ the combustion products evacuation duct for types B₄ and B₅ water heaters Ⓐ

This device is intended to maintain the quality of combustion in the event of wind. Ⓐ

A1 3.7.6

protected combustion chamber

a combustion chamber which is constructed such that an ignition in the combustion chamber does not ignite an air/gas mixture outside the combustion chamber

3.7.7 air supply and combustion products evacuation circuits

3.7.7.1

air supply and combustion products evacuation ducts

means for transporting combustion air to the burner and combustion products to the terminal or duct adapter

This standard differentiates between:

- completely surrounded ducts: the combustion products evacuation duct is surrounded by combustion air throughout its length;
- separate ducts: the combustion products evacuation duct and the combustion air supply duct are neither concentric nor the combustion products evacuation duct completely surrounded by the air supply duct.

3.7.7.2

terminal guard

the device that protects the terminal from mechanical damages from outside influences

3.7.7.3

duct adapter

a device which allows the fitting of:

- the air supply and combustion products evacuation ducts to a single shared duct for type C₂ water heaters;
- the air supply and combustion products evacuation ducts to two ducts of a shared system for type C₄ water heaters;
- for type C₆ water heaters to a system for air supply and combustion products evacuation that is approved and marketed independently from the water heater;
- the combustion products evacuation duct to a chimney that is part of the building for type C₈ water heaters

The duct adapter may be part of the water heater or of the air supply and/or combustion products evacuation system.

3.7.7.4

roof space

a ventilated part of a building between the uppermost habitable space of the building and the roof

3.7.7.5

secondary flue

the part of the flue of a type C₇ water heater between the draught diverter located in the roof space and the combustion products outlet above the roof **A1**

3.8 water circuit

3.8.1

preset water rate adjuster

component allowing adjustment of the water rate to a predetermined value according to the water supply conditions

3.8.2

water rate or water pressure governor

device that maintains a controlled water pressure or rate independently of fluctuations in the supply pressure

3.8.3**water temperature selector**

device allowing the water rate to be adjusted so as to obtain the desired delivery temperature

3.8.4**summer–winter switch**

manual or automatic device that allows the seasonal temperature variation of the cold water to be compensated for

3.8.5**water supply pressure**

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

Unit: bar.

NOTE 1 bar = 10^5 Pa.

3.9 soundness of the gas circuit**3.9.1****external soundness**

soundness, with respect to the atmosphere, of an enclosure containing gas

3.9.2**internal soundness**

soundness of a closure member in the closed position and isolating an enclosure containing gas from another enclosure or from the outlet of the valve

3.9.3**sealing force**

force acting on the valve seat when the closure member is in the closed position, independent of the force provided by the fuel gas pressure

3.10 operation**3.10.1 gas rates****3.10.1.1****volumetric rate**

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

Symbols:

- V expressed under the test conditions;
- V_r expressed under the reference conditions.

Unit: cubic metres per hour (m^3/h).

3.10.1.2**mass rate**

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

Symbol: M .

Unit: kilograms per hour (kg/h).

3.10.1.3**nominal gas rate**

gas rate stated by the manufacturer corresponding to nominal operating conditions expressed under reference conditions

Symbol: V_n or M_n .

3.10.2

minimum water rate

smallest water rate stated in the manufacturer's instructions that allows gas to be admitted to the burner

Symbol: D_m .

Unit: litres per minute.

3.10.3 heat inputs

3.10.3.1

heat input

product of the volumetric rate or the mass rate and the net calorific value of the gas referred to the same reference conditions

Symbol: Q .

Unit: kilowatt (kW).

NOTE In this European Standard, the heat inputs are expressed with respect to the net heat input (H_i).

3.10.3.2

nominal heat input

maximum value of heat input, declared by the manufacturer

Symbol: Q_n .

3.10.3.3

minimum heat input

heat input declared by the manufacturer corresponding to the useful minimum output of an appliance with manual adjustment of the gas rate or automatic output variation

Symbol: Q_m .

3.10.3.4

corrected heat input

heat input that would be obtained if the appliance were supplied with dry reference gas at the normal supply pressure and a temperature of 15 °C, with an atmospheric pressure of 1 013,25 mbar, (see 7.3.1.2)

Symbol: Q_c .

3.10.4 useful outputs

3.10.4.1

useful output

quantity of heat transmitted to the water in unit time

Symbol: P .

Unit: kilowatt (kW).

3.10.4.2

nominal useful output

useful output declared by the manufacturer to be obtained when the appliance operates at the nominal heat input and water temperature specified in 7.1.5.5.2a)

Symbol: P_n .

3.10.4.3

minimum useful output

smallest useful output declared by the manufacturer, obtained by automatic or manual reduction of the gas rate

Symbol: P_m .

3.10.5**efficiency**

ratio of the useful output to the heat input in percent (%)

Symbol: η_u

3.10.6 gas combustion**3.10.6.1****combustion**

combustion is said to be “complete” if there are no more than traces of combustible constituents (hydrogen, hydrocarbons, carbon monoxide, carbon, etc.) in the combustion products.

Conversely, combustion is said to be “incomplete” if at least one combustible constituent is present in significant proportions in the combustion products.

The amount of carbon monoxide, CO, in the dry, air-free combustion products is used as the criterion to distinguish between “hygienic” and “non-hygienic” combustion

This European Standard specifies maximum CO limits according to the circumstances of use or of test. In each case, the combustion is regarded as hygienic if the CO content is below or equal to the permitted limit but unsatisfactory if it is above the limit.

3.10.6.2**flame stability**

characteristics of flames which remain on the burner ports or in the flame retention zone

3.10.6.3**flame lift**

total or partial lifting of the base of the flames from the burner ports or the flame retention zone

3.10.6.4**lightback**

entry of a flame into the body of a burner

3.10.6.5**lightback at the injector**

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

3.10.6.6**yellow tipping**

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

3.10.6.7**sooting**

appearance of deposits of soot on the parts of the appliance in contact with the combustion products or with the flame

3.10.7 response times**3.10.7.1****ignition opening time**

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

Abbreviation: T_{IA} .

Unit: second (s).

3.10.7.2**ignition safety time**

time that elapses between the order to open the gas supply to the burner and the gas supply being shut off in the event of the presence of flame not being detected

Abbreviation: T_{SA} .

Unit: second (s).

3.10.7.3**maximum ignition safety time**

ignition safety time measured under the most unfavourable conditions of temperature and supply voltage

Abbreviation: T_{SAmax} .

Unit: second (s).

3.10.7.4**extinction delay time**

for a thermoelectric flame supervision device, the time which elapses between extinction of the supervised flame and interruption of the gas supply concerned

Abbreviation: T_{IE} .

Unit: second (s).

3.10.7.5**extinction safety time**

time that elapses between extinction of the supervised flame and the gas supply at least to the main burner being shut off

Abbreviation: T_{SE} .

Unit: second (s).

3.10.8**ignition input**

ratio of the average heat input during the ignition safety time and the maximum nominal heat input, in percent

Symbol: Q_{IGN} .

3.10.9 water temperature deviations**3.10.9.1****variation of the temperature according to the water rate**

variation of the mean hot water temperature consequent upon variations in the demand for useful output

3.10.9.2**temperature fluctuation**

difference between the minimum and maximum water temperatures that can occur during delivery of water at a constant rate

3.10.10**device monitoring the air supply or combustion products evacuation**

a device intended to cause safety shutdown in the event of abnormal conditions of air supply or of combustion products evacuation 

[A₁] 3.10.11**gas/air ratio control**

a device that automatically adapts the combustion air rate to the gas rate or vice versa [A₁]

4 Classification of water heaters

Water heaters are classified:

- into categories, according to the gases capable of being used, as given in EN 437;
- into types, according to the modes of supply of the combustion air and evacuation of the combustion products;
- according to the maximum water service pressure.

4.1 Classification of gases

The gases are classified into three families, possibly divided into groups (for those possibly divided into ranges, see Annex A), depending on the Wobbe number, according to the values given in Table 1.

Table 1 — Classification of gases

Gas families and groups	Gross wobbe number at 15 °C and 1 013,25 mbar (MJ/m ³)	
	Minimum	Maximum
First family		
Group a	22,4	24,8
Second family		
Group H	39,1	54,7
Group L	45,7	54,7
Group E	39,1	44,8
Group P	40,9	54,7
Third family		
Group B/P	72,9	87,3
Group P	72,9	87,3
	72,9	76,8

4.2 Appliance categories**4.2.1 General**

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

The definition of the categories results from 4.2.2, 4.2.3 and 4.2.4.

In each country, only some of the categories defined in 4.2.2, 4.2.3 and 4.2.4 are marketed, in view of the local conditions of gas distribution (gas composition and supply pressures).

The situations concerning the marketing of these appliance categories in each country, and their corresponding supply pressures are given in Table A.1, Table A.2 and Table A.3 (see A.4 for the particular categories marketed locally and nationally, corresponding to the gases and specific supply pressures specified in Table A.5; A.6 gives conditions specific to certain countries).

4.2.2 Category I

Category I appliances are designed exclusively to use gases of a single family or of a single group.

4.2.2.1 Appliances designed to use first family gases only

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

4.2.2.2 Appliances designed to use second family gases only

Category I_{2H}: appliances using only second family gases of group H at the fixed supply pressure.

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

Category I_{2E}: appliances using only second family gases of group E, at the fixed supply pressure.

Category I_{2E+}: appliances using only second family gases of group E and operating with a pressure couple without interference with the appliance. The gas pressure regulating device (if any) on the appliance is not operational in the band of the two normal pressures of the pressure couple.

4.2.2.3 *Appliances designed to use third family gases only*

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

Category I₃₊: appliances capable of using the third family gases (propane and butane) and operating with a pressure couple without interference with the appliance. The gas pressure regulating device (if any) on the appliance is not operational in the band of the two normal pressures of the pressure couple.

Category I_{3P}: appliances using only third family gases of group P (propane).

4.2.3 *Category II*

Category II appliances are designed to use gases of two families.

4.2.3.1 *Appliances designed to use first and second family gases*

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

4.2.3.2 *Appliances designed to use second and third family gases*

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

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

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

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

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

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

Category II_{2E3P}: appliances capable of using second family gases of group E and third family gases of group P. Second family gases are used under the same conditions as for category I_{2E}. Third family gases are used under the same conditions as for category I_{3P}.

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

4.2.4 *Category III*

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

This category is not generally used.

The category III appliances which are permitted in certain countries are given in Annex A (see A.3).

4.3 Mode of supply of the combustion air and evacuation of the combustion products (appliance types)

Appliances are classified into several types according to the mode of evacuation of the combustion products and admission of the combustion air ^[A1] (see examples in informative Annex L).

The classification used in this document is taken from Technical Report CR 1749, European scheme for the classification of gas appliances according to the method of evacuation of the products of combustion (types). ^[A1]

4.3.1 Type A_{AS}

Appliance not intended to be connected to a flue or other device for evacuating the combustion products outside the room where the appliance is installed and fitted with a device for detecting vitiation of the atmosphere and fouling of the heater body.

4.3.2 Type B

Appliance intended to be connected to a flue evacuating the combustion products outside the room, with the combustion air being drawn directly from the room where the appliance is installed.

^[A2] Type B water heaters are classified into several types according to the mode of evacuation of the combustion products.

The types are defined by two subscripts.

- a) The first subscript number is based upon the possible installation of the water heater with respect to the mode of air supply and evacuation of the combustion products.
- b) The second subscript number is based upon the presence and position of an integral fan in the water heater, as shown below:

A type B water heater intended to operate with a pressurized flue duct shall be identified by an extra subscript "P". This subscript "P" is only used when installation in accordance with the water heater manufacturer's instructions on a flue specified by the water heater manufacturer results in the flue operating at a positive pressure⁴⁾. ^[A2]

4.3.2.1 Type B₁

Type B appliance fitted with a draught diverter in the combustion products circuit.

4.3.2.1.1 Type B₁₁

Type B₁ appliance without a fan in the combustion products circuit or air inlet.

4.3.2.1.1.1 Type B_{11BS}

Type B₁₁ appliance factory fitted with a combustion products discharge safety device.

4.3.2.2 ^[A2] Type B₂

A type B water heater without a draught diverter.

4.3.2.3 Type B₃

A type B water heater without a draught diverter, which is designed for connection to a common duct system. This common duct system consists of a single natural draught flue. All pressurized parts of the water heater containing products of combustion are completely enclosed by parts of the water heater supplying combustion air. Combustion air is drawn into the water heater from the room by means of a concentric duct, which encloses the flue. The air enters through defined orifices situated in the surface of the duct.

4.3.2.4 Type B₄

A type B water heater incorporating a draught diverter, that is designed for connection via its flue duct to its flue terminal. ^[A2]

^[A2] ⁴⁾ This identification "P" is in accordance with the designation of the classes of tightness in positive pressure, agreed by CEN/TC 166, Chimneys, depending on the pressure of operation of the duct (e.g. see EN 1443). ^[A2]

4.3.2.5 Type B₅

A type B water heater without a draught diverter, that is designed for connection via its flue duct to its flue terminal.

4.3.2.6 Presence and position of a fan

- A type B water heater that does not incorporate a fan is identified by the second subscript number “1” (e.g. B₁₁).
- A type B water heater that incorporates a fan downstream of the combustion chamber/heat exchanger and upstream of the draught diverter, is identified by the second subscript number “2” (e.g. B₁₂).
- A type B water heater that incorporates a fan upstream of the combustion chamber/heat exchanger is identified by the second subscript number “3” (e.g. B₁₃).
- A type B water heater that incorporates a fan downstream of both the combustion chamber/heat exchanger and the draught diverter is identified by the second subscript number “4” (e.g. B₁₄). **A2**

4.3.3 Type C

A1 Type C water heaters are water heaters in which the combustion circuit is sealed with respect to the habitable areas of the building in which the water heater is installed.

The air supply and the combustion products evacuation ducts and the terminal, including any duct adapter which is used to connect the water heater to a chimney or duct system, are part of the water heater unless otherwise stated. They admit fresh air from outside the habitable areas of the building to the burner as well as discharge the products of combustion to the outside.

Water heaters with sealed combustion circuit with respect to the habitable areas of the building are classified into several types according to the mode of supply of the combustion air and of the evacuation of the combustion products (see examples in Annex L).

The types are defined by two subscripts⁵⁾.

The first subscript number is based upon the possible installation of the water heater with respect to the mode of air supply and evacuation of the combustion products.

4.3.3.1 Type C₁

A type C water heater which is connected via its ducts to a horizontally installed terminal at the wall or on the roof. The orifices of the ducts are either concentric or close enough to come under similar wind conditions.

4.3.3.2 Type C₂

A type C water heater which is fitted via its ducts possibly by means of a duct adapter to a shared duct system consisting of a single duct for both supply of the combustion air and discharge of the combustion products.

4.3.3.3 Type C₃

A type C water heater which is connected via its ducts to a vertically installed terminal. The orifices of the ducts are either concentric or close enough to come under similar wind conditions.

4.3.3.4 Type C₄

A type C water heater which is fitted via its duct possibly by means of a duct adapter to a shared duct system consisting of a duct for supply of the combustion air and a duct for the discharge of the combustion products. The orifices of this shared duct system are either concentric or close enough to come under similar wind conditions.

4.3.3.5 Type C₅

A type C water heater which is connected via its separate ducts to two terminals in zones of different pressure. **A1**

⁵⁾ Water heaters in which the combustion products circuit is under positive pressure and is surrounded by the combustion air circuit may require identification by an additional subscript, in accordance with national regulations, if they are intended to be installed in non-ventilated areas.

4.3.3.6 Type C₆

A type C water heater which is intended to be connected to a separately approved and marketed system for the supply of combustion air and discharge of the combustion products.

4.3.3.7 Type C₇

A type C water heater which is connected via its vertical ducts, and a draught diverter located in the roof space, to a secondary flue. The combustion air is taken from the roof space.

4.3.3.8 Type C₈

A type C water heater which is fitted via its ducts possibly by means of a duct adapter to an air supply terminal and to an individual or shared chimney.

4.3.3.9 Presence and position of a fan

The second subscript number is based upon the presence and position of an integral fan in the water heater:

- a type C water heater that does not incorporate a fan is identified by the second subscript number “1” (e.g. C₁₁);
- a type C water heater that does incorporate a fan downstream of the combustion chamber/heat exchanger is identified by the second subscript number “2” (e.g. C₁₂);
- a type C water heater that does incorporate a fan upstream of the combustion chamber/heat exchanger is identified by the second subscript number “3” (e.g. C₁₃). 

4.4 Water pressure

Appliances are differentiated according to the maximum water service pressure.

4.4.1 Low pressure appliances

The maximum service pressure is 2,5 bar.

4.4.2 Normal pressure appliances

The maximum service pressure is 10 bar.

4.4.3 High pressure appliances

The maximum service pressure is 13 bar.

5 Marking and instructions

5.1 Appliance marking

5.1.1 Data plate

Each appliance shall carry an indelible data plate which is visible on installation, possibly after removal of part of the case, which is solidly fixed and durable, carrying at least the following information:

- the name of the manufacturer⁶⁾ and/or his identifying symbol;
- the serial number or year of manufacture;
- the trade name of the appliance;
- if necessary, the CE mark with:
 - the identification numbers of the appliance;
 - the last two numbers of the year when the CE mark was granted;
 - the direct and indirect country(ies) of destination. In accordance with EN 23166, the names of countries shall be represented by the following symbols:

Austria	AT	Greece	GR
Belgium	BE	Ireland	IE
Switzerland	CH	Iceland	IS
Germany	DE	Italy	IT
Denmark	DK	Luxembourg	LU
Spain	ES	Netherlands	NL
Finland	FI	Norway	NO
France	FR	Portugal	PT
United Kingdom	GB	Sweden	SE

- the gas supply pressures in millibars, if several normal pressures can be used for the same gas group. They are indicated by their numerical value and the unit, mbar;
- the appliance type(s). The appliance type shall be specified in accordance with 4.3;
- the nominal useful output and, for appliances with automatic output variation, the minimum useful output in kilowatts, given by the symbol P , followed by the equals sign, the numerical value(s) and the unit, kW;
- the nominal heat input and, for appliances with automatic output variation and appliances with adjustable output, the minimum heat input, in kilowatts given by the symbol Q , followed by the equals sign, the numerical value(s) and the unit, kW;
- the maximum water pressure and, for low water pressure appliances the minimum water pressure, at which the appliance can be used, in bars given by the symbol p_w , followed by the equals sign, the numerical value(s) and the unit, bar;
- if necessary, the protection factor in accordance with EN 60529;
- the type and voltage of the electrical supply, in volts (V), where applicable. Information relating to the electrical values shall be in accordance with EN 60335-1.

The indelibility of markings shall be checked by a test carried out in accordance with 7.14 of EN 60335-1:1991.

⁶⁾ "Manufacturer" means the organization or company which assumes responsibility for the product.

Table 2 — Symbols for indicating types of gas^{1) 2) 3)}

Gas family	Category index	State of adjustment			Marking for categories of first I, second II and triple III followed with the index corresponding to each category mentioned under (see 4.2 or A.3)
		Gas group or range of gases	Symbol of gas type	Gas pressure(s) (mbar)	
First	1a	1a	G 110	8	1a – G 110 – 8 mbar
Second	2H	2H	G 20	20	2H – G 20 – 20 mbar
	2L	2L	G 25	25	2L – G 25 – 25 mbar
	2E	2E	G 20	20	2E – G 20 – 20 mbar
	2E+	2E+	G 20/G 25	20/25	2E+ – G 20/G 25 – 20/25 mbar
Third	3B/P	3B	G 30	30	3B – G 30 – 30 mbar
		3B	G 30	50	3B – G 30 – 50 mbar
	3P	3P	G 31	37	3P – G 31 – 37 mbar
		3P	G 31	50	3P – G 31 – 50 mbar
	3+	3+	G 30/G 31	28 – 30/37	3+ – G 30/G 31 – 28-30/37 mbar
		3+	G 30/G 31	50/67	3+ – G 30/G 31 – 50/67 mbar

¹⁾ Annex J gives examples of the application of this table.
²⁾ For the marking of gas types in national or local situations, see Table A.6.
³⁾ The appliance and the packaging can include a precise description of the gas type as well as its symbol, in accordance with the declared use (see Annex K).

5.1.2 Supplementary markings

On an additional plate, the appliance shall carry visible and indelible information relating to its state of adjustment:

- the direct country(ies) of destination in accordance with the symbols in 5.1.1;
- the gas group or range, the symbol of gas type, the gas supply pressure and/or the pressure couple in accordance with the column on “marking” in Table 2 and Table A.6;
- the gas supply pressure and/or the pressure couple (where applicable) for which the appliance has been adjusted by the manufacturer.

This information may be carried on the data plate.

The indelibility of markings shall be checked by a test carried out in accordance with 7.14 of EN 60335-1:1991.

5.1.3 Packaging

The packaging shall carry the category(ies), the appliance type and information given on the additional data plate (see 5.1.2) as well as warnings in accordance with 5.1.4.

5.1.4 Warnings on the appliance and the packaging

One or more labels shall give at least the following warnings, such that they are visible and readable.

Warnings carried on the appliance shall be visible to the user.

5.1.4.1 For all appliances

- “Read the technical instructions before installing the appliance”;
- “Read the user’s instructions before lighting the appliance”.

5.1.4.2 For type A_{AS} appliances

- “Appliance fitted with atmosphere sensing device”;
- “Important:
 - this appliance shall not be connected to a flue;
 - this appliance shall only be used for short delivery periods”.

5.1.4.3 A_2 For type B_{11} , B_{12} and B_{13} appliances A_2

- “This appliance shall only be installed outside or in a room separated from inhabited rooms, incorporating appropriate ventilation”.

5.1.4.4 A_2 For type A_{AS} , B_{11BS} , B_{12BS} and B_{13BS} appliances A_2

- “This appliance may only be installed in a room if the room meets the appropriate ventilation requirements”.

5.1.5 Other information

No other information shall be carried on the appliance or the packaging if it is likely to create confusion in relation to the actual state of adjustment of the appliance, the corresponding category or categories and the direct country or countries of destination.

5.2 Instructions

5.2.1 Technical instructions

Each appliance shall be accompanied by technical instructions intended for the installer.

These instructions shall at least include the following instructions.

5.2.1.1 General

- The information on the data plate, with the exception of the serial number and the year of manufacture;
- the meaning of the symbols used on the appliance and its packaging, in accordance with 5.1.1 and 5.1.2;
- reference to certain European Standards and/or particular regulations if these prove to be necessary for the correct installation and use of the appliance;
- where appropriate, the minimum distances to be met from inflammable materials;
- if necessary, information that walls sensitive to heat, for example wood, shall be protected by suitable insulation, such that the clearance between the wall on which the appliance is installed and the hot parts on the outside of the boiler are observed;
- a general description of the appliance, with an illustration of the principal parts (sub-assemblies) which shall be removed to rectify operational faults;
- for electrical installation:
 - the obligation to earth appliances incorporating mains supplied electrical equipment;
 - a circuit diagram with terminals (including those for external control);
 - the recommended method for cleaning the appliance;
 - information on the necessary servicing;
- the instructions shall also specify the air rate necessary for combustion stating that the appliance is to be installed in a suitably ventilated room, in accordance with the regulations in force.

5.2.1.2 For installation and adjustment of the gas circuit

- Checks that the information of 5.1.2 concerning the state of adjustment given on the data plate or the additional plate shall be compatible with the local supply conditions;
- adjustment instructions for appliances which are adjustable by the installer, incorporating an adjustment table in which the volume or mass rates in metres cubed per hour (m^3/h) or kilograms per hour (kg/h) are stated, or the burner pressure in relation to the possible adjustment data in accordance with the category(ies). The reference conditions for the volume rates are 15 °C; 1 013,25 mbar, dry gas.

5.2.1.3 *For installation of the domestic hot water*

- The minimum water pressure at which the appliance can operate;
- the minimum water rate for appliances with automatic output variation;
- the maximum pressure for which the appliance is designed, stating that even with the effects of water dilation, the water pressure in the appliance shall not exceed this value.

5.2.1.4 *For installation of the combustion products circuit*

a) For type A_{AS} appliances:

- give the necessary information concerning maintenance of the atmosphere sensing device and explain the means of identification appearing on the parts likely to be replaced;
- state the appliance maintenance operations necessary to enable it to be put back into service after these devices have operated;
- explain that if these devices or one of their parts are dismantled, as authorized by the manufacturer, previously existing seals shall be re-made;
- state that only manufacturer's original parts shall be used for replacements;
- state that the safety device shall not be put out of operation;
- draw attention to the seriousness of inappropriate interference with the safety device.

b) For type B₁₁, B_{11BS}, B_{12BS} and B_{13BS} appliances:

- the diameter(s) of the flues which can be used, in accordance with A.9, possibly with an adapter;
- for flue calculations, the mass rate of combustion products, in g/s, and their average temperature measured under the conditions of 8.2.2;
- state clearly that type B₁₁ appliances shall only be installed in the open air or in a room which is separated from inhabited rooms and supplied with appropriate ventilation directly to the outside.

c) For type B_{11BS}, B_{12BS} and B_{13BS} appliances:

- give a technical description of the combustion products discharge safety device;
- specify that the combustion products discharge safety device shall not be put out of operation;
- draw attention to the seriousness of untimely interference with the combustion products discharge safety device;
- give instructions on the mounting of the combustion products discharge safety device and the replacement of defective parts, specify that only the manufacturer's original parts shall be used, and describe the test for the correct operation of the device which shall be carried out after servicing;
- draw attention to the fact that in the case of repeated shutdown of the appliance, it will be necessary to take appropriate action to remedy the discharge fault;
- indicate the actual waiting time for appliances with an automatic reset.

d) For type C₁₁ and C₂₁ appliances:

- state the nature of the air supply and combustion products discharge system to which the appliances can be fitted;
- give the particular characteristics of the terminal guard and information on its installation relative to the terminal;
- state the maximum number of bends to be used and the maximum length of the air supply and combustion products discharge ducts.

A₁ e) For type C appliances with a fan:

- information about the type of installation for which the water heater is approved;
- give the instruction that the water heater has to be installed with the necessary accessories (e.g. ducts, terminal, duct adapter) supplied with the water heater or give the specification of the necessary accessories that must be applied;
- give the instruction for the installation of parts intended to be fitted to the water heater;
- state the maximum number of bends to be used and the maximum length and, if necessary, the minimum length of the air supply and combustion products evacuation ducts;
- give the particular characteristics of the terminal guard, where provision for this is made, and information on its installation relative to the terminal;
- in case of separated air supply and combustion products evacuation ducts, and if their tightness characteristics are different, indicate the way of identifying the ducts;
- for type C₁ water heaters, the installation instructions shall state:
 - if the terminal can be installed on the wall and/or on the roof;
 - that the terminal outlets from separate ducts must fit inside a square of 50 cm;
- for type C₂ water heaters, the installation instruction shall state:
 - the characteristics of the shared duct systems to which the water heater can be connected;
- for type C₃ water heaters, the installation instructions shall state:
 - that the terminal outlets from separate ducts must fit inside a square of 50 cm;
- for type C₄ water heaters, the installation instructions shall state:
 - the minimum and maximum pressure losses permitted in the air supply and combustion products evacuation ducts, or the minimum and maximum lengths of these ducts;
 - the combustion products temperature and mass rate at the maximum and minimum heat input with the maximum lengths of ducts, if necessary;
 - the characteristics of the shared duct systems to which the water heater can be connected;
- for type C₅ water heaters, the installation instructions shall state:
 - if the terminals for the supply of combustion air and for the evacuation of combustion products are to be installed on opposite or adjacent walls of the building; this can only be on the condition that the ignition, cross-lighting, flame stability have been tested with an overpressure on the combustion products evacuation duct (see 7.7.7.2);
- for type C₆ water heaters, the installation instructions shall state:
 - the minimum and maximum pressure losses permitted in the air supply and combustion products evacuation ducts, or the minimum and maximum lengths of these ducts;
 - the combustion products temperature and mass rate at the maximum and minimum heat inputs;
 - that the water heater is to be installed with terminals that comply with the requirements of prEN 1856 and EN 1859, and whose openings are in zones of similar pressure;
 - the method of calculating the pressure loss in the air supply and combustion products evacuation ducts, starting from the values of the temperature and the mass rate of the combustion products in relation to the CO₂ content;
- for type C₇ water heaters, the installation instructions shall state:
 - that the draught diverter and the air intake have to be installed in the roof space of the building;
 - that the water heater is not intended to be installed in cases where the roof space is in use, or to be used, as living accommodation;
- for type C₈ water heaters, the installation instructions shall state:
 - the characteristics of the chimney to which the water heater is to be connected. **A₁**

A₂ f) for type B₂ appliances

- the diameter(s) of the flues which can be used, in accordance with Table A.9, possibly with an adapter;
- for flue calculations, information on the mass rate of combustion products in g/s and the average temperature measured under the conditions of 8.2.2. **A₂**

Ⓐ₂ g) for types B₄ and B₅ appliances

- information about the type of installation for which the water heater is approved;
- give the instruction that the water heater has to be installed with the necessary accessories (e.g. ducts, terminal, fitting piece) supplied with the water heater or give the specification of the necessary accessories that shall be fitted;
- give the instruction for the installation of parts intended to be fitted to the water heater;
- indicate the maximum number of bends to be used and the maximum length and, if necessary, the minimum length of the air supply and combustion products evacuation ducts;
- give the particular characteristics of the terminal guard, where provision for this is made, and information on its installation relative to the terminal. Ⓐ₂

5.2.2 User's instructions

Each appliance shall be accompanied by instructions for the user. They shall include the necessary information on using and maintaining the appliance and incorporate at least the following.

5.2.2.1 General

- Point out that an installer should be called on to install and adjust the appliance, where appropriate. Conversion to other gases shall be carried out by either a qualified installer or a gas distributor, according to the practice in the country where the appliance is installed.
- Specify the operations to start and stop the appliance.
- Specify that it is necessary to abide by the warnings.
- Explain the operations necessary for normal operation, cleaning and day-to-day maintenance of the appliance.
- Explain any necessary precautions to be taken against frost.
- Warn against incorrect use.
- Forbid any interference with a sealed component.
- Point out that appliances should be checked and maintained periodically by a competent person.
- If necessary, draw the user's attention to the risks of burning if in direct contact with the viewing window, or its immediate surroundings, or other parts likely to reach temperature rises greater than 40 K under the conditions of 7.6.2.

In addition the instructions shall:

5.2.2.2 For type A_{AS} appliances

- Point out the role of the atmosphere sensing device;
- explain the normal conditions of use of appliances not connected to a flue, in particular, specify that the use shall be intermittent;
- draw attention to the need to have this device periodically maintained by a specialist;
- state the conditions under which an attempt can be made to put the appliance back into service after shutdown caused by the atmosphere sensing device (in particular state that the room in which the appliance is installed shall then be ventilated);
- explain that only a specialist may attend to the appliance if it persistently cannot be put back into service;
- specify that in the event of repeated locking out or of difficulties in putting the appliance back into service, the ventilation needs to be checked and a specialist called.

5.2.2.3 For type Ⓐ₂ B_{11BS}, B_{12BS}, B_{13BS} Ⓐ₂ appliances

- State that the device interrupts the admission of gas to the burner if the evacuation of the combustion products is disturbed;
- describe the restart procedure;
- recommend that a specialist is called if there are repeated interruptions.

5.2.2.4 For type C appliances

For type C appliances with manual ignition, mention the precautions to be taken before carrying out new ignition attempts. **A1** Mention that a water heater of type C₇ is not intended to be installed in cases where the roof space is in use, or to be used, as living accommodation. **A1**

5.2.3 Conversion instructions

Parts intended for conversion to another gas family, another group, another range and/or another supply pressure, shall be accompanied by conversion instructions intended for the specialist.

The instructions shall:

- specify the parts necessary to carry out the conversion and their means of identification;
- clearly specify the operations necessary to change the parts and make the correct adjustment, where appropriate;
- specify that any broken seals shall be re-made and/or any adjusters shall be sealed;
- state that for appliances operating with a pressure couple, any governor shall either be made inoperative within the range of normal pressures, or be put out of operation and sealed in that position;
- for type A_{AS} appliances, describe the measures to be taken with respect to the vitiation sensing device.

A self-adhesive label which is intended to be fitted on the appliance shall be supplied with the parts and the conversion instructions. The supplementary marking specified in 5.1.2, indicating the appliance conversion, shall be stated on the label.

5.3 Presentation

All the information of 5.1 and 5.2 shall be given in the official language(s) of the country or countries in which the appliance can be installed.

6 Constructional requirements

Except where otherwise stated the constructional safety is verified by inspection of the appliance and its technical literature.

6.1 General

6.1.1 Conversion to different gases

The operations allowed in order to convert from a gas of one family or group to a gas of another family or group and/or to adapt to the normal supply pressure to which the appliance will be installed, are given below:

- adjustment of the gas rate to the main burner and the ignition burner (except for 6.2.9);
- change of injectors or restrictors;
- change of ignition burner or its components;
- change of adjusting and/or control devices specific to appliances with automatic output variation;
- possibly:
 - change of the automatic water operated gas valve or its components;
 - removal, putting out of operation or change of the gas pressure governor or its components.

These operations shall be possible without having to interfere with the connections of the appliance to its pipework (gas, water, air supply, flue system, if any).

The conditions to be observed are given in 4.2, 6.2.3, 6.2.4 and 6.3.

6.1.2 Materials

A3 6.1.2.1 General **A3**

When the appliances are installed according to the technical instructions, the quality and thickness of the materials used in their construction shall be such that, under normal conditions of use, maintenance and adjustment, these materials shall withstand the mechanical, chemical and thermal conditions to which they may be subjected during a reasonable life.

Sheet metal parts, when they are not made of corrosion-resistant materials, shall be enamelled or be coated with another effective protection against corrosion.

Zinc alloys in contact with gas may only be used if they are of quality ZnAl4, in accordance with ISO 301 and if the parts are not liable to be exposed to a temperature above 80 °C under the conditions of 7.5.2. Only external threads in accordance with ISO 228-1 are acceptable for principal inlet and outlet connections made of zinc alloy.

Parts of the body which separate a gas containing chamber from the atmosphere shall be made from metallic materials.

The use of asbestos-based materials is forbidden.

A3 6.1.2.2 *Metallic materials*

6.1.2.2.1 *Corrosion resistance*

Provided that the water heater is used in accordance with the manufacturer's instructions:

- the functioning of components manufactured from corrosion-resistant metallic materials shall not be affected by corrosion within the expected service life of the water heater, and
- no special maintenance shall be required to keep the components in good working order.

6.1.2.2.2 *Requirements*

Materials that come into contact with water intended for human consumption shall withstand the mechanical, chemical and thermal stresses to which they are exposed during the service life of the water heater and shall not contaminate the water supplied.

Metallic materials shall be corrosion-resistant. Metallic materials are considered to satisfy the requirements with respect to corrosion protection:

- if the material used is enamelled (one or more layers) and equipped with cathodic corrosion protection, or
- where types of stainless steel containing a minimum of 16 % chrome are used, or
- where they are assessed as acceptable to the national regulations in force.

Examples for the selection of metallic materials (steel, copper and copper alloys) are given in P.2 and P.3.

6.1.2.3 *Non-metallic materials*

6.1.2.3.1 *Plastic materials*

Due to the many different types of plastic in components used in the drinking water sector, many different material properties need to be taken into consideration e.g. longitudinal expansion, joining and fixing techniques, temperature effects, effect of light (UV resistance), ageing, internal pressure, internal and external corrosion (for example as a result of using cleaning products) and also transport and storage conditions.

6.1.2.3.2 *Requirements of plastic materials*

In the manufacture of water heaters and their components, only those plastic materials that meet mechanical, chemical and thermal demands as well as physiological and hygiene requirements throughout the life of the equipment shall be used in contact with water intended for human consumption. This means they shall be suitable for coming into direct contact with food and not pose any health threat. Special attention shall be paid to the microbiological properties of the plastic materials used and to the prevention of substances leaching out.

Examples for the selection of the plastic materials are given in P.4.

6.1.2.3.3 *Other non-metallic operating and auxiliary materials*

These materials include rubber, sealant, adhesives and also lubricants on moving parts that come into contact with the water intended for human consumption. These materials shall satisfy the physiological and hygiene requirements in force. Their use is to be limited to what is technically necessary. **A3**

6.1.3 *Design — Assembly — Strength*

All the constituent parts shall be constructed and assembled in such a way that the operating characteristics of the appliance are not altered significantly during a reasonable life and under normal conditions of installation and use.

The screws of preset adjusters shall be arranged such that they cannot fall inside the pipes. In addition, their threads shall not deteriorate even after several successive manipulations.

Appliances shall be designed so as to avoid any spillage of condensate from the appliance. However, for type C₁₁ appliances, a spillage of condensate from the flue is permitted at start-up.

The construction of the appliance shall be such that condensate which may be produced during start-up or in operation does not affect safety.

If an appliance has two draw-off taps, the hot water tap (marked in red) shall be placed on the left and the cold water tap (marked in blue) on the right of the appliance, looking at the front face.

The gas and water connections shall be sufficiently distant from the wall and far enough apart from each other to permit the easy use of a commercially available tool, in accordance with the technical instructions.

6.1.4 Accessibility — Ease of maintenance — Fitting and removal

It shall be possible to clean the combustion circuit by following the manufacturer's instructions.

It shall not be possible to replace parts that have to be removed for maintenance in such a way that the operational safety of the appliance is compromised. In particular, the soundness of the combustion chamber, as defined in 7.2.2, shall be maintained after refitting following cleaning or maintenance operations.

Appliances shall have a case that protects the heating body and the burner. Removable components, for example the burner or the heating body, shall be able to be removed with existing commercially available tools and with the appliance remaining in position.

6.1.5 Gas connections

The appliance gas inlet connection shall permit a rigid connection.

If the appliances have a threaded inlet connection, this shall comply with ISO 228-1 or ISO 7-1. In the first case (ISO 228-1), the end of the appliance inlet connection shall be flat and sufficiently broad to allow the use of a sealing washer.

If flanges are used, they shall comply with ISO 7005 and the manufacturer shall supply the counter-flanges and sealing gaskets.

For category I₃ appliances, the connection may be made either by a compression union, or a conical joint or a flat joint.

If the inlet connection consists of a plain copper tube, this shall have a straight section at least 5 cm long and shall comply with ISO 274.

For the types of gas connection commonly used in the various countries, see Table A.7.

6.1.6 Means of achieving soundness

6.1.6.1 Soundness of the gas circuit

Holes for screws, fixing studs, etc., intended for the assembly of parts shall not open into gasways. Furthermore, it shall not be possible for water to penetrate at these points.

The soundness of parts located in the gas circuit and likely to be dismantled for normal maintenance shall be assured by mechanical means, e.g. metal to metal joints or O-ring joints, i.e. excluding the use of all thread sealing materials (liquids, jointing pastes, tapes, etc.). This soundness shall be maintained even after dismantling and reassembly.

However, sealing materials may be used for permanent assemblies. The sealing materials shall remain effective under normal conditions of appliance use.

The soundness of unthreaded assemblies in the gas circuit shall not be achieved by means of soft soldering nor by means of adhesives.

Rubbers in contact with gas shall comply with the requirements of EN 549, whichever are applicable.

6.1.6.2 Soundness of the combustion circuit

6.1.6.2.1 Type B₁₁ and B_{11BS} appliances

The soundness of the combustion circuit, up to the draught diverter shall be achieved only by mechanical means, except for assemblies not intended to be dismantled during routine maintenance: these may be jointed using mastics or pastes in such a way that permanent soundness is assured in continuous service under normal conditions of use.

6.1.6.2.2 Type C appliances

The sealing of the combustion circuit up to the connection with the terminal [type C₁₁, C₁₂, C₁₃, C₃₂, C₃₃, C₅₂, C₅₃, (if necessary C₆₂, C₆₃,) C₈₂ and C₈₃], or to the common duct or to the duct adapter [type C₂₁, C₂₂, C₂₃, C₄₂, C₄₃, (if necessary C₆₂, C₆₃,) C₈₂ and C₈₃], except for parts permanently fixed to the common duct [type C₂₁, C₂₂, C₂₃, C₄₂, C₄₃, (if necessary C₆₂, C₆₃,) C₈₂ and C₈₃], shall be achieved only by mechanical means, excluding mastics and pastes. 

However, assemblies not intended to be dismantled during routine maintenance may be jointed using mastics, pastes or appropriate tapes in such a way that permanent soundness is assured in continuous service under normal conditions of use.

The appliance shall be constructed in such a way that the soundness requirements of 7.2.2.2.1 are observed.

6.1.7 Supply of combustion air and evacuation of the combustion products

6.1.7.1 All appliances

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.

6.1.7.2 Type A_{AS} appliances

Type A_{AS} appliances shall be fitted with a deflector.

The openings provided for evacuation of the combustion products shall be designed and arranged so that they cannot be easily obstructed by a pan or similar object.

6.1.7.3 Type B appliances

Type B appliances shall be fitted with a draught diverter, integral with the appliance.

The outlet connection of the draught diverter shall be female. The manufacturer supplies an adapter 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.9.

It shall be possible to insert the flue to a depth of at least 15 mm. When inserted as far as possible, the evacuation of the combustion products shall not be impaired.

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

6.1.7.3.1 General

 The outlet connection shall be female. Except for types B₄ and B₅ water heaters, the flue outlet shall be designed such that, if necessary by means of an adapter supplied with the water heater, it allows connection to a flue pipe whose diameter complies with the standards or practices in force in the country where the water heater is to be installed (see Table A.9). The connection shall not impair the evacuation of the combustion products.

It shall be possible to insert the flue to a depth of at least 15 mm. When inserted as far as possible, the evacuation of the combustion products shall not be impaired.

The minimum and maximum flue diameters for which the water heater is designed shall be stated in the installation instructions. 

A2 For a separate combustion products evacuation duct which is supplied with a type B₄ or B₅ water heater, the requirements given in **6.1.7.4**, in accordance with EN 1443 apply as well as the applicable requirements of EN 1856-1, prEN 1856-2 and EN 1859.

The water heater shall not be fitted with manual or automatic devices for the adjustment of the supply of combustion air and/or the evacuation of the combustion products, except for water heaters without draught diverter and for water heaters with gas/air ratio controls.

6.1.7.3.2 Water heaters with a draught diverter (water heaters of types B₁₁, B_{11BS}, B₁₂, B_{12BS}, B₁₃, B_{13BS}, B₁₄, and B₄₄)

The draught diverter shall be part of the water heater. Downstream of this draught diverter the water heater shall incorporate a female flue outlet that allows the connection to a flue duct.

The operation of the water heater shall be tested with the appropriate flue sizes specified by the manufacturer.

6.1.7.3.3 Water heaters without a draught diverter (water heaters of type B₂₂, B₂₃, B₃₂, B₃₃, B₅₂, and B₅₃)

The combustion circuit of these water heaters may be fitted with an adjusting device to adjust the water heater to pressure losses of the installation. This adjustment can be effected either by means of restrictors or by adjustment, which requires the use of tools, to a predetermined position given in the installation instructions. **A2**

A2 6.1.7.4 Separate combustion products evacuation duct

Text deleted

6.1.7.4.1 Stability under mechanical loading

The combustion products evacuation duct shall be capable of withstanding horizontal and vertical loads. The following requirements shall be considered:

- compressive strength;
- tensile strength;
- where applicable, resistance to lateral load which corresponds to a reference wind velocity pressure of 1,5 kN/m².

6.1.7.4.2 Stability under exposure to heat

The stability of the walls of the evacuation duct shall be ensured during and after exposure to heat occurring under all operating conditions of the water heater.

6.1.7.4.3 Corrosion resistance

The evacuation duct shall keep its essential characteristics in the presence of the corrosion load corresponding to all operating conditions of the water heater.

6.1.7.4.4 Resistance to condensates and moisture under normal operating conditions

The evacuation duct shall keep its essential characteristics in the presence of condensate and moisture under normal operating conditions.

6.1.7.5 Type C appliances

6.1.7.5.1 General

All water heaters shall be designed so that there is an adequate supply of combustion air during ignition and over the whole range of possible heat inputs stated by the manufacturer. A gas/air ratio control is permitted.

Unless otherwise stated, water heaters with a fan may be fitted with a means of adjustment in the combustion circuit intended to adapt the water heater to the installation conditions. This adjustment is effected either by restrictors or by setting a means of adjustment to predetermined positions in accordance with detailed instructions from the manufacturer.

According to the water heater type, the manufacturer shall supply any terminal and/or duct adapter, with the water heater for test. **A1**

A1 6.1.7.5.2 *Air supply and combustion products evacuation ducts*

The assembly of the various parts during installation shall be such that no work is necessary other than adjusting the length of the air supply and combustion products evacuation ducts (possibly by cutting them). Such adaptation shall not impair the correct operation of the water heater.

It shall be possible to connect the water heater, the air supply and combustion products evacuation ducts and the terminal or the duct adapter using ordinary tools if necessary. All necessary accessories and the fitting instructions shall be supplied by the manufacturer.

The terminal outlets from separate ducts for the supply of combustion air and the evacuation of combustion products:

- shall fit inside a square of 50 cm for type C₁ and C₃ water heaters;
- may terminate in zones of different pressure for type C₅ water heaters.

Separate air supply and combustion products evacuation ducts, whose tightness characteristics are different, have to be marked so as to be clearly identifiable.

6.1.7.5.3 Terminal

No opening in the external surfaces of the terminal shall permit the entry in the ducts of a 16 mm diameter ball applied with a force of 5 N.

Any horizontal terminal shall be designed in such a way that any condensate is discharged outwards from the wall.

6.1.7.5.4 Terminal guard

If the manufacturer describes, in the installation instructions, a protective guard for the terminal for use when the outlets for evacuation of the combustion products open on to a walkway, this device shall be supplied to the laboratory for test. The dimensions of the terminal guard, when installed in accordance with the manufacturer's instructions, shall be such that the distance between any part of the guard and the terminal, except the wall plate, exceeds 50 mm. The guard shall not have any sharp edges likely to cause injury.

6.1.7.5.5 Duct adapter

For type C₂, C₄ and C₈ water heaters, the duct adapter shall be designed so that it is possible to obtain the distances specified by the manufacturer for the projection of the ends of the combustion air supply and combustion products discharge ducts into the shared duct, whatever the total thickness (flue and cladding) of the shared duct.

6.1.7.6 Special requirements for certain components of water heaters with a fan**6.1.7.6.1 Fan**

Direct access to the rotating parts of a fan shall be prevented. The parts of a fan in contact with combustion products shall be effectively protected against corrosion unless they are of corrosion resistant material; furthermore they shall withstand the temperature of the combustion products.

6.1.7.6.2 Air proving device

Before each fan start or at the end of a delivery, it shall be checked that there is no simulation of air flow in the absence of air flow. If there is an isolated demand then this proving shall occur either at the start, or not more than one minute after the end of that demand. If there is a series of demands each separated by less than one minute then the proving shall occur either at the start or not less than one minute after the end of that series of demands. This requirement does not apply to water heaters fitted with gas/air ratio controls.

The air proving device shall detect the presence of a sufficient air supply within 10 s. **A1**

A) The supply of combustion air shall be checked by one of the following.

- a) Supervision of the combustion air pressure or the combustion products pressure.

This supervision of pressure is only allowed for water heaters fitted with a constant speed fan during the operation of the main burner and where the combustion products duct is completely surrounded by combustion air throughout its length which shall not exceed 3 m. In addition the following requirements shall be fulfilled:

- the ducts shall not have adjustable or removable restrictions; and
- the pressure loss of the heat exchanger shall not exceed 0,05 mbar.

- b) Continuous supervision of the combustion air rate or the combustion products rate.

In this system, the supervision device is activated directly by the flow of combustion air or combustion products.

This is also valid for water heaters with more than one fan speed, in which the flows associated with each fan speed are monitored by separate supervision devices.

- c) Gas/air ratio control.

The following proving systems are only allowed for water heaters where the combustion products circuit is completely surrounded by the air supply circuit or for separate ducts when the leakage rate of the combustion products evacuation ducts meets the requirements of **7.2.2.3.4** both inside and outside the room where the water heater is installed.

- d) Indirect supervision (e.g. fan speed supervision) when there is an air providing device which proves the supply of combustion air at least once at each start.

- e) Supervision of the minimum and maximum air or combustion products rates with two rate supervision devices.

6.1.7.6.3 Gas/air ratio control

Gas/air ratio control shall be designed and constructed so that reasonably foreseeable damage does not give rise to a change capable of affecting safety.

Control tubes may be made of metal with suitable mechanical connections or of other materials with at least equivalent properties. In this case, they are considered immune to breakage, accidental disconnection and leakage after initial soundness checks. As such they are not subject to the tests in **7.7.12.4.2.2**.

When such control tubes are made of materials with less than equivalent properties, their disconnection, breakage or leakage shall not lead to an unsafe situation. This implies either locking out or safe operation with no leakage of gas outside the water heater.

Control tubes for air or combustion products shall have a minimum internal cross-sectional area of 12 mm² with a minimum internal dimension of 1 mm. They shall be located and fixed so that any retention of condensate is avoided and positioned such that creasing, leakage or breakage is prevented. Where more than one control tube is used the relevant connection position for each shall be obvious. Provided that evidence is given and precautions are taken to avoid condensation in the control tubes, the minimum cross-sectional area of air control tubes shall be 5 mm².

Gas/air ratio controls comply with the relevant requirements of EN 12067-1. The operational tests will be achieved in accordance with this standard. **A1**

6.1.8 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 **7.2.2**, is maintained.

This 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 another 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.

6.1.9 Drainage

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

6.1.10 Mains supplied electrical equipment

The electrical equipment of the appliance shall comply with the relevant requirements of EN 60335-1, except where reference is made to another electrotechnical standard in **6.2**.

Electric shock protection is not necessary in respect of the high voltages of ignition devices if the energy content of each impulse, the number of impulses and the delay between each impulse comply with the limits set by CENELEC (see Annex H).

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

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

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

Electrical contacts shall be designed for their intended use.

6.1.11 Operational safety in the event of failure of the auxiliary energy

If the appliance uses auxiliary energy, its design shall be such that no abnormal risk can occur in the event of failure of the auxiliary energy or following its restoration.

6.2 Adjusting, control and safety devices

6.2.1 General

The operation of safety devices shall not be overruled by preset adjusters and control devices.

There shall be no shaft or lever capable of being operated outside the body that could prevent correct closure of the gas shut-off valve.

Preset adjusters, control and safety devices which are certified in accordance with EN 88, EN 125, EN 126 and EN 161 are deemed to satisfy the requirements of this European Standard.

If the appliance is fitted with temperature sensing controls for safety purposes, these controls shall comply with the requirements of European Standard EN 60730-2-9.

Screwed fastenings that have to be removed for servicing of the device shall have a metric thread complying with ISO 262 unless a different thread is essential for the correct functioning and adjustment of the device.

Thread-forming screws that form a thread and do not produce swarf may be used. It shall be possible to replace them by metric machine screws complying with ISO 262.

Self-tapping screws that cut a thread and produce swarf shall not be used for the assembly of gas-carrying parts or of parts that may be removed for servicing.

The operation of moving parts (e.g. diaphragms) shall not be impaired by other components. Packing glands that are adjusted and sealed at the factory may be used for sealing moving parts.

Manually adjustable packing glands shall not be used.

A device to protect against dust shall be positioned before the first control or shut-off device at the gas inlet. The maximum dimension of the mesh of the strainer shall not exceed 1,5 mm; furthermore the mesh shall not allow passage of a 1 mm pin gauge.

All the devices specified in **6.2** or the multifunctional control in which they might be fitted shall be removable or exchangeable if this is necessary for cleaning or replacement of the device.

The control knobs shall be designed and placed so that they can neither be fitted in an incorrect position nor be capable of moving of their own accord.

When there are several control knobs (taps, temperature selectors, etc.), they shall not be interchangeable if this could prejudice safety.

6.2.2 *Manual shut-off valves and/or gas rate adjusters*

In addition, the gas circuit shall include a manual shut-off valve which may interrupt the gas rate directly, or by means of a closure valve or an automatic shut-off valve specified in 6.2.12b). This device shall be designed and fixed in such a way that its operation is easy.

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

— Off:	full disc	●
— Ignition:	stylized spark	✱
— Full rate of the burner:	large stylized flame	🔥
— Minimum rate (if any):	small stylized flame	🔥

However, where a single button operates a safety device with flame supervision on the burner and ignition burner, if any, no marking is required if incorrect operation is made impossible.

Control knobs that operate by turning shall turn off in a clockwise direction as seen by an observer facing the knob.

The reduced gas rate control, if any, shall have a stop or notch such that this position is clearly perceptible to the user.

6.2.3 *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 may be continuous (adjusting screw) or discrete (change of restrictors).

The adjuster of an adjustable gas governor 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 commercially available tools.

6.2.4 *Gas governor*

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.

6.2.5 Pressure test points

All appliances shall incorporate a gas pressure test point orifice which allows the pressure at the appliance inlet to be measured.

For appliances which require the burner pressure to be measured, in accordance with the installation or conversion instructions, a second pressure test point shall be provided downstream of any adjuster or preset adjuster.

For type C₁₁ and C₂₁ appliances, the measurement shall be possible without opening the combustion circuit.

The pressure test points shall have an external diameter of $9,0_{-0,5}^0$ mm and a length of at least 10 mm to enable a rubber tube to be fitted.

The diameter of the bore of the pressure test point shall not exceed 1 mm at the narrowest place.

6.2.6 Automatic water-operated gas valve

The automatic water operated gas valve shall subordinate the admission of gas to the main burner to the water flow through the appliance.

In the event of leakage at the joint sealing the water circuit, it shall not be possible for water to penetrate into the gas circuit. To this end, a space shall be provided between the gas-carrying and water-carrying parts of the automatic water-operated gas valve. This space shall be ventilated to atmosphere by a vent having an area of at least 19 mm². It may consist of one or more orifices of which the smallest transverse dimension shall not be less than 3,5 mm.

6.2.7 Ignition devices

6.2.7.1 Ignition burner

The ignition burner shall be arranged such that its combustion products are evacuated with those of the main burner.

It shall not be possible for the relative positions of the ignition burner and the main burner to change.

If the ignition burners or the injectors differ according to the nature of the gas used, they shall be marked and be easily substituted one for another. They shall be capable of being fitted in accordance with the technical instructions.

The ignition burner jet shall be made of a material that cannot deteriorate under normal conditions of use.

For ignition burners that form part of the atmosphere sensing device of type A_{AS} appliances, the admission of air may be varied automatically in order to permit easy ignition when cold.

The diameter or the smallest transverse dimension of the primary air orifice shall not be less than 4 mm for permanent ignition burners of type A_{AS} appliances.

Where the ignition burner rate is not governed, the provision of a preset gas rate adjuster on the ignition burner is forbidden for:

- any ignition burner which is part of an atmosphere sensing device;
- and/or for any ignition burner operating on third family gases.

6.2.7.2 Manual ignition of the ignition burner

It shall be possible to light, in a simple manner, ignition burners that are directly ignited by hand, either by a match or by an appropriate ignition device.

Ignition devices for the ignition burner shall be designed and fitted so that they are correctly located in relation to the components and to the ignition burner. The ignition device of the ignition burner or the ignition burner/ignition device assembly shall be able to be installed or removed using currently available tools.

For type C appliances, special ignition devices shall be provided (e.g. electrical igniter). It shall always be possible to light the permanent ignition burner of these appliances with the combustion chamber closed.

6.2.7.3 Automatic ignition device

All appliances without a permanent or alternating ignition burner shall be fitted with an automatic ignition device ensuring:

- either ignition of:
 - an intermittent safety ignition burner; or
 - an intermittent ignition burner; or
 - an interrupted ignition burner; or
 - direct ignition of the main burner.

The relative positions of the burner or ignition burner on one hand and the ignition electrode on the other hand shall not change.

The electrical output of the ignition device shall be adequate for the whole range of heat inputs.

6.2.8 Flame supervision device

6.2.8.1 General

Every appliance shall be fitted with a flame supervision device, namely:

- a thermoelectric device for the permanent ignition burner; or
- a flame supervision device with intermittent safety ignition burner; or
- the flame supervision device of an automatic burner control system.

Thermoelectric devices and flame supervision devices of automatic burner control systems with ignition of the main burner shall supervise all gas supplies.

The gas supply of intermittent safety ignition burners in which the heat input does not exceed 0,250 kW need not be supervised. This does not apply to type C appliances using third family gases.

Where the sensing element or the link between the sensing element and the operational control are destroyed, the supply to the main burner shall be prevented.

The use of deformable bimetallic thermal detectors is forbidden.

6.2.8.2 Thermoelectric device of a permanent ignition burner

With the appliance out of operation, during ignition of the ignition burner the gasway to the main burner shall be closed. Gas may only be admitted to the main burner if there is a signal that a flame is present at the permanent ignition burner.

6.2.8.3 Flame supervision device of an appliance with an intermittent safety ignition burner

The electrical spark igniter shall start to operate at the latest when gas is supplied to the intermittent safety ignition burner and shall continue at least until flame presence is detected.

Gas shall only be admitted to the main burner when there is a signal that a flame is present at the intermittent safety ignition burner.

Flame failure shall cause at least shutdown of the main burner.

However, if in the event of flame failure, there is an attempt at automatic re-ignition of the ignition burner, the ignition device shall be re-energized within 1 s and shall remain energized until re-ignition.

If, in the event of flame failure, there is no attempt at automatic spark restoration of the ignition burner, it shall not be possible for the ignition device to be re-energized during the extinction safety time nor before water delivery has ceased. The ignition procedure shall start again from the beginning.

[A1] 6.2.8.4 *Flame supervision devices for automatic burner control systems*

Flame supervision devices for automatic burner control systems shall comply with the relevant operational requirements of EN 298, except for the degree of electrical protection, endurance, markings and instructions. In case of flame failure, the system shall result in, at least:

- re-ignition; or
- recycling; or
- volatile lockout.

In the case of spark restoration or recycling, an absence of flame at the end of the ignition safety time (T_{SA}) shall result in, at least locking out with volatile lockout.

6.2.9 Atmosphere sensing device for type A_{AS} appliances

Type A_{AS} appliances shall be factory-fitted with an atmosphere sensing device. This device, including the ignition burner which forms part of it, shall not be adjustable. Any adjusters that may be necessary in manufacture shall be sealed by the manufacturer.

Interference with the device shall be made evident for example by breakage of a seal, distortion of a part, etc.

The device shall be designed and made so as to permit easy maintenance, particularly the removal of dust. Its correct operation shall in no case be compromised by this maintenance.

It shall be possible, when the manufacturer's instructions are followed, to replace parts essential for the correct operation of the atmosphere sensing device by identical parts. Effective measures shall be employed, e.g. in construction or by a means of identification clearly noted in the instructions, to guard against replacement by non-identical parts.

The device shall be designed and made in such a way that deterioration of the sensing element and the means of transmission of the closure signal results in a complete interruption of the gas supply.

It shall also be designed so that either fouling of the device is not possible or complete interruption of the gas supply is caused under the conditions of simulated fouling of the second paragraph of 7.8.10.3.2.

After complete interruption of the gas supply by the action of the atmosphere sensing device, manual intervention shall be required to put the appliance back into service.

Interruption of the link between the sensor and the device responding to its signal or destruction of the control sensor shall cause at least safety shutdown, possibly after a waiting time.

6.2.10 [A2] Combustion products discharge safety device for type B_{11BS} , B_{12BS} and B_{13BS} appliances [A2]

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

[A2] For type B_{11} , B_{12} and B_{13} water heaters, this can be achieved with a combustion products discharge safety device (in this case type B_{11} , B_{12} , and B_{13} water heaters are designated respectively as type B_{11BS} , B_{12BS} , and B_{13BS} water heaters). [A2]

Only appliances which are intended to be installed outdoors or in a room separate from inhabited rooms and provided with appropriate ventilation are not required to have this safety device ([A2] in this case, they are designated as type B_{11} , B_{12} or B_{13} [A2]).

The safety device shall not have any adjustment. Adjustable components shall be sealed by the manufacturer.

The safety device shall be so designed that it cannot be dismantled without a tool.

Incorrect refitting, after servicing, shall be made difficult.

[A1] Interruption of the link between the sensor and the device responding to its signal shall at least cause safety shutdown, if necessary after a waiting time. [A1]

If the control and its link are arranged such that they shall be removable or they can be damaged during maintenance, the instructions shall specify the test which shall be carried out to check the operation of the control after servicing.

6.2.11 Protection against accidental overheating of thermostatic appliances

Thermostatic appliances shall be designed so that thermostat failure does not cause the water to overheat under the conditions of 7.8.9. When the requirement is met by means of an overheat protection device, this shall, on thermostat failure, close the gas supply to at least the burner by actuating a shut-off component independent of that of the control device. Re-establishment of the gas supply shall be achieved only by manual intervention.

6.2.12 Composition of the gas circuit

The main burner gas circuit shall include at least two valves in series:

- a) an automatic water-operated gas valve which subordinates the main burner gas supply to the water flow; and
- b) a closure valve as part of the flame supervision device or an automatic shut-off valve of at least class C or C' operated by the flame supervision device.

These closure valves may also be operated by an overheat device and/or by an atmosphere sensing device and/or by a combustion products discharge safety device.

A1 Or

For water heaters with a fan:

- c) the main burner gas circuit shall include at least two valves in series:
 - an automatic water-operated gas valve which subordinates the main burner gas supply to the water flow; and
 - a closure valve as part of the flame supervision device or an automatic shut-off valve of at least class C or C' operated by the flame supervision device.

These closure valves may also be operated by an overheat device and/or by an atmosphere sensing device and/or by a combustion products discharge safety device.

For water heaters with a fan, this solution is only applicable with a permanent ignition burner.

Or

- d) the main burner gas circuit shall include at least two valves of at least class C or C'. The operation of one of the valves depends on the water flow detected by any suitable device and is controlled by the flame supervision device. The opening of the valves can be made simultaneously or not but the closure shall be simultaneous. If the delay between the signals to close the two valves is not greater than 5 s, the signals are considered to be simultaneous.

In addition, at least one of these valves shall be controlled by an overheat device. **A1**

6.3 Main burner

The cross-section of the injectors and the flame ports shall not be adjustable.

When conversion from one gas to another is effected by changing the injectors, these shall carry an indelible means of identification preventing any confusion.

The location of the burners shall be well defined and their fixing such that it is impossible to put them in an incorrect position. In particular, the burners shall be correctly positioned in relation to the heating body and it shall only be possible to fix them in that position, following the manufacturer's instructions.

Appliances shall be designed so that the cross-section of the primary air orifice is not adjustable.