

Gas-fired central heating boilers — Type B₁₁ and B₁₁BS boilers fitted with atmospheric burners of nominal heat input not exceeding 70 kW

The European Standard EN 297:1994, with the incorporation of amendments A1:1995, A2:1996, A3:1996, A4:2004, A5:1998 and A6:2003, has the status of a British Standard

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Cooperating organizations

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United Kingdom	British Standards Institution

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National foreword

This British Standard has been prepared under the direction of the Gas Standards Policy Committee and is the English language version of EN 297:1994, *Gas-fired central heating boilers Type B₁₁ and B_{11BS} boilers fitted with atmospheric burners of nominal heat input not exceeding 70 kW*, including amendments A1, A2, A3, A4, A5 and A6 and corrigendum June 2006, published by the European Committee for Standardization (CEN).

This standard partially supersedes BS 5258-1:1986 and BS 6332-1:1988. Conflicting national standards will be withdrawn once the series of domestic boiler standards being prepared by CEN/TC 109 have been published.

EN 297 was produced as a result of international discussion in which the UK took an active part.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 134, an inside back cover and a back cover.

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Sidelining in this document indicates the most recent changes by amendment.

Descriptors: Heaters, central heating, boilers, gas appliances, burners, heat balance, equipment specifications, performance evaluation, safety, tests, verification, marking, name plate

English version

Gas-fired central heating boilers — Type B₁₁ and B_{11BS} boilers fitted with atmospheric burners of nominal heat input not exceeding 70 kW

(includes amendments A1:1995, A2:1996, A3:1996, A4:2004, A5:1998 and A6:2003)

Chaudières de chauffage central utilisant les combustibles gazeux — Chaudières des types B₁₁ et B_{11BS} équipées de brûleurs atmosphériques dont le débit calorifique nominal est inférieur ou égal à 70 kW (inclut les amendements A1:1995, A2:1996, A3:1996, A4:2004, A5:1998 et A6:2003)

Heizkessel für gasförmige Brennstoffe — Heizkessel der Typ B₁₁ und B_{11BS} mit atmosphärischen Brennern mit einer Nennwärmebelastung kleiner als oder gleich 70 kW (enthält Änderungen A1:1995, A2:1996, A3:1996, A4:2004, A5:1998 und A6:2003)

This European Standard was approved by CEN on 1994-05-18, amendment A1 was approved by CEN on 1995-08-15, amendment A2 on 1995-11-12, A3 on 1996-09-20, A4 on 2003-11-14, A5 on 1997-06-29, A6 on 2002-12-06. 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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of 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.

CEN

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

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

Foreword

The European Standard EN 297 has been prepared by the Technical Committee CEN/TC 109, Gas-fired central heating boilers, the secretariat of which is held by the IBN.

It was established to deal with aspects related to:

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

Other types of boilers, and those of higher nominal heat input excluded from this standard, are dealt with in separate standards.

Amendment 1, dealing with combustion products discharge safety devices, has been included in this standard.

Other amendments are being prepared and will complete EN 297 eventually.

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

This standard covers only type testing.

Matters related to quality assurance systems, tests during production and to certificates of conformity of auxiliary devices are not currently dealt with in this standard.

If the manufacturer indicates that the boiler has been tested in accordance with EN 297, the boiler must comply completely with the requirements of this standard,

Type B₁₁ boilers must be fitted with a combustion products discharge safety device in order to meet the Essential Requirement of Clause 3.4.3 of the Directive 90/396/EEC. In this standard these boilers, are designated as type B_{11BS}.

However, boilers intended to be installed:

- either in the open air
- or in a room separated from living rooms and provided with appropriate ventilation directly to the outside,

need not carry such a device, but in this case, appropriate warnings on the packaging and in the instructions must clearly indicate the limit on the use of this type of boiler. In this standard these boilers are designated as type B₁₁.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 1995, and conflicting national standards shall be withdrawn at the latest by December 1995.

According to the CEN/CENELEC Internal Regulations, 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, United Kingdom.

Foreword to amendment A2

This Amendment EN 297:1994/A2:1996 to EN 297:1994 has been prepared by Technical Committee CEN/TC 109, Central heating boilers using gaseous fuels, the secretariat of which is held by NNI.

This Amendment to the European Standard EN 297:1994 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 1996, and conflicting national standards shall be withdrawn at the latest by November 1996.

This Amendment modifies European Standard EN 297:1994. It has been prepared to incorporate the Directive 92/42/EEC on efficiency requirements in EN 297:1994.

This Amendment of the European Standard EN 297:1994 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 G, which is an integral part of this standard.

Member States shall take all necessary measures to ensure that boilers cannot be put into service unless they satisfy the efficiency requirements set out in this Amendment.

However, Member States where back-boilers and/or boilers that are to be installed in the living space, are widely adopted at the date of the adoption of Directive 92/42/EEC, shall continue to authorize their entry into service, provided that their efficiency both at rated output and at 30 % part load is not more than 4 % below the requirements laid down in this Amendment.

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

Foreword to amendment A3

This Amendment EN 297:1994/A3:1996 to EN 297:1994 has been prepared by Technical Committee CEN/TC 109, Central heating boilers using gaseous fuels, the secretariat of which is held by NNI.

This Amendment to the European Standard EN 297:1994 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 1997, and conflicting national standards shall be withdrawn at the latest by April 1997.

This Amendment modifies EN 297:1994. It has been prepared to incorporate requirements and test methods concerning NO_x-emissions of boilers. In future the requirements given in this amendment will be reviewed and will be more stringent.

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

Foreword to amendment A4

This document (EN 297:1994/A4:2004) has been prepared by Technical Committee CEN/TC 109 "Central heating boilers using gaseous fuels", the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2005, and conflicting national standards shall be withdrawn at the latest by April 2005.

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.

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).

With this amendment, the requirements and test methods for type B boilers with fan-assisted combustion are introduced in EN 297. In addition requirements and test procedures for non-fanned appliances are modified.

Foreword to amendment A5

This Amendment EN 297:1994/A5:1998 to EN 297:1994 has been prepared by Technical Committee CEN/TC 109, Central heating boilers using gaseous fuels, the secretariat of which is held by NNI.

This Amendment to the European Standard EN 297:1994 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 1998, and conflicting national standards shall be withdrawn at the latest by December 1998.

This Amendment to the European Standard EN 297:1994 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).

According to CEN/CENELEC Internal Regulations, 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 A6

This document (EN 297:1994/A6:2003) has been prepared by Technical Committee CEN/TC 109 Central heating boilers using gaseous fuels, the secretariat of which is held by NEN.

This Amendment to the European Standard EN 297:1994 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2003, and conflicting national standards shall be withdrawn at the latest by September 2003.

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).

This Amendment 6 will extend the scope of EN 297 to boilers intended to be installed in a partially protected place.

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

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Section 1. General

1.1 Field of application

This document specifies the requirements and test methods for the construction, safety, fitness for purpose, rational use of energy, classification and marking of gas-fired central heating boilers, hereafter referred to as “boilers”.

This document applies to type B₁₁, B_{11BS}, B₁₂, B_{12BS}, B₁₃, B_{13BS}, B₁₄, B₂₂, B₂₃, B₃₂, B₃₃, B₄₄, B₅₂ and B₅₃ boilers as listed in 1.4.2.2¹⁾:

- that use gases corresponding to the three gas families and to the pressures stated in 4.1.4;
- that have a nominal heat input not exceeding 70 kW (on net calorific value);
- where the temperature of the water does not exceed 95 °C during normal operation;
- where the maximum water-side operating pressure does not exceed 6 bar;
- fitted with atmospheric burners, atmospheric burners assisted by a fan for the supply of combustion air or the evacuation of combustion products or premixed burners;
- and that may be fitted with electrically operated mechanical flue dampers that are positioned downstream of the heat exchanger and tested as an integral part of the boiler.

This document does not contain all the necessary requirements for:

boilers:

- intended to be installed in the open;
- having multiple heating units with a single draught-diverter;
- of the condensing type;
- intended to be connected to a common flue having mechanical extraction;
- fitted with manual means of adjusting the air supply and/or adjusting the evacuation of the combustion products;
- of the combination type (central heating and domestic hot water production);
- without a draught-diverter and not incorporating a fan;
- specifically of the types B₂₁, B₃₁, B₄₁, B₄₂, B₄₃ and B₅₁;

nor for appliances:

- combining the functions of an independent space heater and a hot water generator for central heating.

This document only covers appliances where the fan, if any, is an integral part of the appliance.

This document only covers appliances where the flue damper, if any, is an integral part of the appliance.

This document only covers type testing.

1.2 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, *Pressure governors for gas appliances for inlet pressures up to 200 mbar.*

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

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

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

EN 278, *Rubber materials for diaphragms in domestic appliances using combustible gases up to 200 mbar.*

EN 279, *Homogeneous rubber materials for dynamic seals in domestic appliances using combustible gases up to 200 mbar.*

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

EN 291, *Rubber seals — Static seals in domestic appliances for combustible gas up to 200 mbar — Specification for material.*

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

EN 437, *Test gases — Test pressures — Appliance categories.*

EN 677:1998, *Gas-fired central heating boilers — Specific requirements for condensing boilers with a nominal heat input not exceeding 70 kW.*

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

EN 1443, *Chimneys — General requirements.*

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

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

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

EN 10021, *General technical delivery requirements for steel and iron and steel products.*

EN 10029, *Hot rolled steel plate 3 mm thick or above — Tolerances on dimensions, shape and mass.*

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

EN 24063, *Welding, brazing, soldering and braze welding of metals — Nomenclature of processes and reference numbers for symbolic representation on drawings (ISO 4063:1990).*

EN 50165, *Electrical equipment of non-electric appliances for household and similar purposes — Safety requirements.*

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

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

ISO 185, *Grey cast iron — Classification.*

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

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

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

ISO 857, *Welding, brazing and soldering processes — Vocabulary Bilingual edition.*

ISO 2553, *Welded, brazed and soldered joints — Symbolic representation on drawings.*

ISO 7005, *Metallic flanges.*

IEC 730-2-9, *Automatic electrical controls for household and similar use — Part 2: Particular requirements for electrical controls for household appliances.*

CR 1404, *Determination of emissions from appliances burning gaseous fuels during type testing.*

1.3 Definitions

For the purposes of this standard, the following definitions apply.

1.3.1

reference conditions

dry gas at a temperature of 15°C, and at an absolute pressure of 1013,25 mbar

1.3.2 Combustible gases

1.3.2.1

reference gas — limit gases

in each gas family or group, test gases are defined:

- one or several “reference gas(es)”: gas(es) with which the boilers operate in nominal conditions, when they are supplied at the corresponding normal pressure;
- “limit gases”: gases representative of the extreme variations in the characteristics of the gases capable of being used.

1.3.2.2

calorific value

the quantity of heat produced by the combustion at a constant pressure of 1013,25 mbar of unit volume or mass of gas, the constituents of the combustible mixture being brought to 15°C and 1013,25 mbar, the combustion products being brought to the same conditions

two types of calorific value are identified:

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

units:

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

1.3.2.3

relative density

the ratio of the masses of equal volumes of gas and dry air under the same conditions of temperature and pressure: 15 °C, 1013,25 mbar

symbol: d

1.3.2.4

wobbe index

the ratio of the calorific value of the gas per unit volume to the square root of the density under the same reference conditions 15 °C and 1013,25 mbar. The Wobbe index is called gross or net according to whether the gross or the net calorific value is used

symbols: gross Wobbe index: W_s ; net Wobbe index: W_i .

units:

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

1.3.2.5 gas pressure

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

Units: millibars (mbar).

1.3.2.5.1

test pressure

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

units: millibars (mbar)

1.3.2.5.2

normal pressure

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

symbol: p_n

1.3.2.5.3

limit pressure

pressures representative of the extreme variations of the supply conditions of the boilers

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

1.3.2.5.4

pressure couple

combination of two distinct gas distribution pressures applied because of the important difference that exists between the Wobbe indices within a single gas family or group:

- the highest pressure corresponds only to the low Wobbe index gases,
- the lowest pressure corresponds to the high Wobbe index gases.

1.3.3 Constituent parts of the boiler

1.3.3.1 Gas supply

1.3.3.1.1

gas inlet connection

the part of the boiler intended to be connected to the gas supply

1.3.3.1.2

gas circuit

an assembly of parts of the boiler that carry or contain the combustible gas between the boiler gas inlet connection and the burner(s)

1.3.3.1.3

restrictor

a device with one or more orifices, which is placed in the gas circuit so as to create a pressure drop and thus bring the gas pressure at the burner to a predetermined value for a given supply pressure and given rate

1.3.3.1.4

injector

a component that admits gas into the burner

1.3.3.1.5

gas rate adjuster

a component allowing the gas rate of the burner to be brought to a predetermined value according to the supply conditions

the action of operating this component is called “adjustment of the gas rate”

1.3.3.1.6

range-rating device

a component on the boiler intended to be used by the installer to adjust the nominal heat input of the boiler, within the range of maximum and minimum heat inputs stated by the manufacturer, to suit the actual heat requirements of the installation

1.3.3.1.7

primary aeration adjuster

a device enabling the primary aeration of a burner to be set to the desired value according to the supply conditions

1.3.3.1.8

sealing an adjuster or a control

arrangements made to make evident any attempt to change its adjustment (e.g. breakage of a device or of a sealing material)

a sealed adjuster or control is considered to be non-existent

1.3.3.1.9

putting an adjuster or a control out of service

action intended to put an adjuster or control (rate, pressure, etc.) out of service

1.3.3.1.10 Burner

1.3.3.1.10.1

main burner

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

1.3.3.1.10.2

ignition device

Any means (flame, electrical ignition device or other device) used to ignite the gas admitted to the ignition burner or the main burner.

1.3.3.1.10.2.1

manual ignition device

a device by means of which the burner is ignited following manual intervention

1.3.3.1.10.2.2

automatic ignition device

an automatic device which ignites the ignition burner or the main burner directly

1.3.3.1.10.3

ignition burner

a burner intended to ignite a main burner

those recognized are respectively:

a) *permanent ignition burner*

An ignition burner that operates continuously throughout the whole period that the boiler is in use.

b) *intermittent ignition burner*

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

c) *alternating ignition burner*

An 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.

d) *interrupted ignition burner*

An ignition burner that operates only during the ignition sequence.

1.3.3.1.10.4

premixed burner

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

1.3.3.2 Combustion products circuit

Circuit including the combustion chamber, the heat exchanger and the circuit permitting evacuation of the combustion products to the flue, up to and including the flue outlet

1.3.3.2.1

combustion chamber

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

1.3.3.2.2

flue outlet

the part of the boiler through which the combustion products are evacuated to the flue system

1.3.3.2.3

draught diverter

a device, placed in the combustion products circuit of a boiler, that is intended to maintain the quality of combustion within certain limits and to keep the combustion stable under certain conditions of updraught and downdraught

NOTE For type B14 and B44 boilers the device may only be suitable to compensate for the pressure variations within the flue system. |

1.3.3.2.4

combustion products discharge safety device

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

1.3.3.2.5

protected combustion chamber

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

1.3.3.2.6

combustion circuit

circuit including the air supply circuit, if any, the combustion chamber, the heat exchanger, the combustion products evacuation duct, if any, and either the connection to the flue or to the terminal, if any

1.3.3.2.7

air supply circuit

means for transporting combustion air to the burner

1.3.3.2.8

combustion products evacuation duct

means for transporting combustion products to the flue or to the terminal

1.3.3.2.9

damper

device placed in the air inlet or the flue outlet to control the volume flow

1.3.3.2.10

total passage

cross-sectional area of the air inlet or the flue way that would be available to the combustion air or the flue gases if the closure member of the damper was removed

1.3.3.2.11

terminal

device fitted to the outside of the building, which is connected to the combustion products evacuation ducts of a type B₄ or B₅ boiler

1.3.3.2.12

terminal guard

device that protects the terminal from mechanical damage from outside influences

1.3.3.3 Adjusting, control and safety devices

1.3.3.3.1

pressure governor

A device which maintains the downstream pressure constant to within fixed limits independent of variations, within a given range, of the upstream pressure and the gas rate.

1.3.3.3.1.1

adjustable pressure governor

a pressure governor fitted with a means of adjusting the adjuster of the downstream pressure

this means is considered as an “adjusting device”

1.3.3.3.2

volume governor

a device which maintains a rate between fixed limits, independent of upstream and downstream pressures, within a range of given values

1.3.3.3.3**water rate monitoring device**

a device that shuts off the gas supply to the main burner when the water rate through the boiler is less than a predetermined value and automatically reopens the gas supply when the water rate at least reaches this value

1.3.3.3.4**flame supervision device**

a 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

1.3.3.3.5**control thermostat**

a device enabling the water temperature to be kept automatically, within a given range, at a predetermined value

1.3.3.3.6**adjustable control thermostat**

a control thermostat that permits the user to obtain setting temperatures between a minimum and a maximum value

1.3.3.3.7**limit thermostat**

a device that shuts off the gas supply when a limit value of the temperature is reached, and automatically reopens the gas supply when the temperature returns below the fixed limit

1.3.3.3.8**safety temperature limiter**

a device that causes safety shutdown and non-volatile lockout so as to prevent the water temperature exceeding a preset limit

1.3.3.3.9**overheat cut-off device**

a device that causes safety shutdown and non-volatile lockout before the boiler is damaged and/or before safety is put in question

1.3.3.3.10**temperature sensing element**

a component that detects the temperature of the environment to be supervised or controlled

1.3.3.3.11**control knob**

a component intended to be moved by hand in order to act on a boiler control (tap, thermostat, etc.)

1.3.3.3.12**flame detector**

a device which detects and signals the presence of a flame. It can consist of a flame sensor, an amplifier and a relay for signal transmission

these parts, with the possible exception of the actual flame sensor, may be assembled in a single housing for use in conjunction with a programming unit

1.3.3.3.13**flame signal**

the signal given by the flame detector, normally when its sensor reacts to a flame

1.3.3.3.14**flame simulation**

the condition when a flame signal is given by the flame detector although in reality there is no flame

1.3.3.3.15

programming unit

a device that reacts to impulses from control and safety systems, gives control commands, controls the start-up programme, supervises the burner operation and causes controlled shutdown, safety shutdown or lockout if necessary. The programming unit follows a predetermined sequence of actions and operates in conjunction with the flame detector

1.3.3.3.16

automatic burner control system

a system that comprises a programmer and all the elements of a flame detector. All the functions of an automatic burner control system may be assembled in one or more housings

1.3.3.3.17

start

the start signal causes the boiler to leave its start position and the predetermined programme of the programming unit commences

1.3.3.3.18

programme

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

1.3.3.3.19

automatic valve²⁾

a device that automatically opens, closes or varies a rate on a signal from the control circuit and/or the safety circuit

1.3.3.3.20

multifunctional control

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

1.3.3.3.21

closure member

the movable part of the valve or the thermoelectric device that opens, varies or shuts off the gas way

1.3.3.3.22

breather hole

an orifice that allows atmospheric pressure to be maintained in a compartment of variable volume

1.3.3.3.23

diaphragm

a flexible component that operates the valve by means of a force resulting from a pressure difference

1.3.3.3.24

external soundness

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

1.3.3.3.25

internal soundness

the 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

1.3.3.3.26

sealing force

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

²⁾ In accordance with EN 161, automatic shut-off valves are subdivided into classes A, B, C, D and J. Automatic valves which comply with the safety and operational requirements of this standard and which are integral parts of the boiler are designated respectively as class A', B', C' and D'.

1.3.3.3.27**Frost protection system**

system that actively protects the water in the boiler against freezing

NOTE An anti-freeze solution is not considered as an active frost protection system.

1.3.4 Operation of the boiler**1.3.4.1 Gas rates****1.3.4.1.1****volumetric rate**

the volume of gas consumed by the boiler in unit time during continuous operation, expressed in m³/h

symbol: V (under test conditions);

V_r (under reference conditions).

1.3.4.1.2**mass rate**

the mass of gas consumed by the boiler in unit time during continuous operation, expressed in kilograms per hour (kg/h) or in grams per hour (g/h)

symbol: M (under test conditions);

M_r (under reference conditions).

1.3.4.1.3**heat input**

the product of the volumetric rate or the mass rate and the net calorific value of the gas referred to the same reference conditions, expressed in kilowatts (kW)

symbol: Q

1.3.4.1.4**nominal heat input³⁾**

the heat input stated by the manufacturer expressed in kilowatts (kW)

symbol: Q_n

1.3.4.2 Outputs**1.3.4.2.1****useful output**

the quantity of heat transmitted to the heat carrier in unit time, expressed in kilowatts (kW)

symbol: P

1.3.4.2.2**nominal output**

the useful output stated by the manufacturer, expressed in kilowatts (kW)

symbol: P_n

1.3.4.3**useful efficiency**

the ratio of the useful output to the heat input, expressed in percent

symbol: η_u

³⁾ Boilers fitted with a range-rating device operate at a nominal heat input between the maximum and minimum adjustable heat inputs. Modulating boilers operate between the nominal heat input and the minimum controlled heat input.

1.3.4.4 Gas combustion

1.3.4.4.1

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 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 non-hygienic if it is above the limit

1.3.4.4.2

flame stability

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

1.3.4.4.3

flame lift

a phenomenon characterized by the total or partial lifting of the base of the flame away from the burner port or the flame retention zone

1.3.4.4.4

light-back

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

1.3.4.4.5

light-back at the injector

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

1.3.4.4.6

sooting

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

1.3.4.4.7

yellow tipping

a phenomenon characterized by the yellowing of the tip of the blue cone of an aerated flame

1.3.4.5 Times

1.3.4.5.1

ignition opening time (TIA)

for a thermoelectric flame supervision device, the time that elapses between ignition of the supervised flame and the moment when the closure element is held open by the flame signal

1.3.4.5.2

extinction delay time (TIE)

for a thermoelectric flame supervision device, the time that elapses between the disappearance of the flame and the interruption of the gas supply

1.3.4.5.3 ignition safety time (TSA)

the time that elapses between the order to open the gas supply to the burner and the gas supply being shut off in the event no flame has been detected

1.3.4.5.3.1

maximum ignition safety time (TSA_{MAX})

the ignition safety time measured under the least favourable conditions of ambient temperature and variation in supply voltage

1.3.4.5.4**extinction safety time (TSE)**

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

1.3.4.5.5**closing time**

the time interval between the interruption of the auxiliary energy or the voltage and the achievement of the closed position

1.3.4.6**ignition rate**

average heat input during the ignition safety time.

Symbol: Q_{IGN}

Unit: kilowatt (kW)

1.3.4.7**spark restoration**

the automatic process by which, following flame failure, the ignition device is switched on again without total interruption of the gas supply

1.3.4.8**recycling**

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

1.3.4.9**controlled shutdown**

the process by which a control device (on the boiler or external to it) causes the gas supply to the burner to be stopped immediately; the boiler returns to its start position

1.3.4.10**safety shutdown**

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

1.3.4.11**locking out**

The total interruption of the gas supply, with lockout.

1.3.4.11.1**non-volatile lockout**

a shutdown condition such that a start can only be accomplished by a manual reset

1.3.4.11.2**volatile lockout**

a shutdown condition such that a start can also be accomplished by restoration of the electrical supply after its loss

1.3.4.12**de-energized to trip principle**

the principle according to which neither auxiliary energy nor external action is required to activate a safety device

1.3.4.13**nominal voltage**

the voltage or range of voltages stated by the manufacturer at which the boiler can operate normally

1.3.4.14**purge**

mechanical introduction of air into the combustion products circuit in order to displace any gas/air mixture or combustion product which could remain there. A distinction is made between:

- pre-purge: the purge that takes place between the start command and the ignition device being energised;
- post-purge: the purge that is carried out after burner shutdown

1.3.4.15**air proving device**

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

1.3.4.16**gas/air ratio control**

device that automatically adapts the combustion air rate to the gas rate or vice versa

1.3.4.17**condensate**

liquid formed from the combustion products during the condensation process

Table 1 — Classification of gases

Gas families and groups	Gross Wobbe index at 15 °C and 1013,25 mbar MJ/m ³	
	Minimum	Maximum
First family		
■ Group a	22,4	24,8
Second family	39,1	54,7
■ Group H	45,7	54,7
■ Group L	39,1	44,8
■ Group E	40,9	54,7
Third family	72,9	87,3
■ Group B/P	72,9	87,3
■ Group P	72,9	76,8

1.3.4.19**boilers intended to be installed in a partially protected place⁴⁾**

boilers intended to be installed in the open air, not exposed to the direct action and infiltration of rain, snow or hail

1.3.4.20**boilers intended to be installed indoors and/or in a partially protected place**

boilers intended to be installed:

- either only indoors;
- either only in a partially protected place;
- either indoors or in a partially protected place.

1.3.5**living space dedicated boiler⁵⁾**

a boiler to provide heat to the part of the living space in which it is installed by means of the emission of heat from the casing, having an open expansion chamber, supplying hot water using gravity circulation

⁴⁾ If a boiler is sold with a casing intended to provide protection, this casing is an integral part of the boiler.

⁵⁾ Definition from the Directive 92/42/EEC.

1.4 Classification

1.4.1 Classification of gases

The gases are classified into three families, possibly divided into groups depending on the Wobbe index, according to the values given in Table 1.

1.4.2 Classification of boilers

1.4.2.1 *Classification according to the gases capable of being used*

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

The definition of the categories follows and is given in 1.4.2.1.1 and 1.4.2.1.2. In each country, taking account of the local gas distribution conditions (gas composition and supply conditions), only some of the categories defined in 1.4.2.1.1 and 1.4.2.1.2 are marketed. In addition some of these categories are used only for certain types of boilers as specified in the individual standards.

The conditions concerning the marketing of these boiler categories in each country, and the corresponding supply pressures, are given in Table A.1.1, Table A.1.2 and Table A.2 (see also B.2 for the categories marketed locally and nationally, corresponding to the gases and specific supply pressures given in B.1; B.3 gives the particular conditions to one country).

1.4.2.1.1 *Categories I*

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

1.4.2.1.1.1 *Boilers designed for use on first family gases only*

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

1.4.2.1.1.2 *Boilers designed for use on second family gases only*

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

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

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

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

1.4.2.1.1.3 *Boilers designed for use on third family gases only*

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

Category I₃₊: boilers capable of using gases of the third family (propane and butane) and operating with a pressure couple without adjustment of the appliance. However, for certain type of boilers specified in the particular standards adjustment of the primary combustion air may be permitted when changing from propane to butane and vice-versa. The boiler gas pressure regulating device, if it exists, is not operative in the range of the two normal pressures of the pressure couple.

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

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

1.4.2.1.2 *Category II*

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

1.4.2.1.2.1 *Boilers designed for use on gases of the first and second families*

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

1.4.2.1.2.2 Boilers designed for use on gases of the second and third families

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

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

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

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

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

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

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

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

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

1.4.2.1.3 Category III

Boilers of category III are designed for use on gases of three families.

This category is not in general use.

The categories III accepted in specific countries are given in B.2.

1.4.2.2 Classification according to the method of evacuation of the products of combustion (types)⁶⁾

Boilers are classified into several types according to the mode of evacuation of the combustion products and admission of the combustion air.

1.4.2.2.1 General

A Type B boiler is a boiler intended to be connected to a flue evacuating the combustion products to the outside of the room where the boiler is installed. The combustion air is drawn directly from the room.

Type B boilers are classified into several types according to the mode of evacuation of the combustion products.

The types are defined by two subscripts:

- The first subscript number is based upon the possible installation of the boiler with respect to the mode of air supply and evacuation of the combustion products (see 1.4.2.2.2).
- The second subscript number is based upon the presence and position of an integral fan in the boiler (see 1.4.2.2.3).

⁶⁾ The classification used in this document is based upon the classification of CR 1749, "European scheme for the classification of gas appliances according to the method of evacuation of the products of combustion (types)".

Type B boilers with a combustion products discharge safety device as defined in 1.3.3.2.4, are designated with an extra subscript “BS”.

A type B boiler intended to operate with a pressurised flue duct is identified by an extra subscript “P”. This subscript “P” is only used when installation in accordance with the boiler manufacturer’s instructions on a flue specified by the boiler manufacturer results in the flue operating at a positive pressure⁷⁾.

1.4.2.2.2 Boiler types

1.4.2.2.2.1 Type B₁

A type B boiler incorporating a draught diverter.

1.4.2.2.2.2 Type B₂

A type B boiler without a draught diverter.

1.4.2.2.2.3 Type B₃

A type B boiler 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 pressurised parts of the appliance containing products of combustion are completely enclosed by parts of the appliance supplying combustion air. Combustion air is drawn into the appliance 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.

1.4.2.2.2.4 Type B₄

A type B boiler incorporating a draught diverter, that is designed for connection via its flue duct to its flue terminal.

1.4.2.2.2.5 Type B₅

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

1.4.2.2.3 Presence and position of a fan

— A type B boiler that does not incorporate a fan is identified by the second subscript number “1” (e.g. B₁₁).

— A type B boiler that incorporates a fan downstream of the combustion chamber/heat exchanger and upstream of the draught diverter, if any, is identified by the second subscript number “2” (e.g. B₁₂).

— A type B boiler that incorporates a fan upstream of the combustion chamber/heat exchanger is identified by the second subscript number “3” (e.g. B₂₃).

— A type B boiler 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).

1.4.2.3 Classification according to the maximum water-side operating pressure

Boilers are classified according to their maximum water-side operating pressure (PMS) as:

- pressure class 1: PMS = 1 bar;
- pressure class 2: PMS = 3 bar;
- pressure class 3: 3 bar < PMS ≤ 6 bar.

1.4.2.4 Classification according to the expansion system

Boilers are classified according to the expansion system of the central heating circuit use as:

- a) a boiler intended for a central heating system with an open expansion vessel;
- b) a boiler intended for a central heating system with an open or sealed expansion vessel.

⁷⁾ This identification “P” is in accordance with the designation of the positive pressure classes of tightness, agreed by CEN/TC 166 “Chimneys”, depending on the pressure of operation of the duct (e.g. see EN 1443).

Section 2. Constructional requirements

2.1 General

Unless otherwise indicated, construction requirements are checked by examination of the boiler and its technical documentation.

2.1.1 Conversion to different gases

The following operations are permitted when converting from a gas of one group or family to a gas of another group or family (see 2.2.2.1, 2.2.4 and 2.3):

- adjustment of the gas rate to the main burner and the ignition burner;
- change of injectors or restrictors;
- change of ignition burner or its components;
- change of system which modulates the gas rate;
- putting out of service and sealing of an adjuster and/or a governor.

These operations shall be possible without having to interfere with the connections of the boiler to its pipework (gas, water, flue system).

2.1.2 Materials and method of construction

2.1.2.1 General

The quality and thickness of the materials used in the construction of the boilers, and the method of assembling the various parts, shall be such that the constructional and operational characteristics are not significantly altered during a reasonable life and under normal conditions of installation and use.

In particular, all the boiler components shall withstand the mechanical, chemical and thermal conditions to which they may be subjected when the boiler is normally used. For boilers intended to be installed in a partially protected place, all materials employed in the construction, including seals, gaskets and sealing pastes, if any, shall function properly in the environmental conditions under which they are expected to operate.

The manufacturer shall declare in the technical instructions for the installer the minimum and maximum ambient temperatures at which the boiler is designed to operate (see 5.2.1).

Materials downstream of the heat exchanger shall be corrosion-resistant or be effectively protected against corrosion.

For a separate combustion products evacuation duct which is supplied with a type B₄ or B₅ boiler, the requirements given in 2.1.2.5, in accordance with EN 1443 apply as well as the applicable requirements of EN 1856-1, prEN 1856-2 and EN 1859.

Asbestos containing materials are forbidden.

If there is a risk of condensation in the combustion products circuit, materials shall comply with the requirements of 4.1 of EN 677:1998. Other materials may be used when evidence is provided of their suitability for conditions in which condensation can occur (for instance for cast iron see Annex P).

2.1.2.2 Materials and thicknesses of walls or tubes under water pressure

For boilers of pressure class 3, the materials and the thicknesses of walls under pressure shall comply with 2.1.2.2.1, 2.1.2.2.2 and 2.1.2.2.3.

If other materials and/or thicknesses are used, the manufacturer shall provide appropriate justification for their suitability of use.

2.1.2.2.1 Materials

Materials for parts under pressure shall be appropriate for their duty and envisaged use. The following materials satisfy these criteria:

- steels that have the properties and chemical composition detailed in Table 2;
- cast irons that have the mechanical properties detailed in Table 3;
- the non-ferrous materials detailed in Table 4 and Table 5.

Table 2 — Mechanical properties and chemical compositions of carbon and stainless steels

Materials	Steel type	Mechanical properties				Chemical compositions									
		Tensile strength	Yield point	Breaking elongation	Breaking elongation	C	P	S	Si	Mn	Cr	Mo	Ni	Ti	Nb/Ta
		R_m N/mm ²	$R_{oH}/R_p\ 0,2$ N/mm ²	$A_5\epsilon L$ at $L_o = 5d_o$ %	$A_5\ \epsilon L$ at $L_o = 5d_o$ %	mass %	mass %	mass %	mass %	mass %	mass %	mass %	mass %	mass %	mass %
Pipes, Sheets	carbon	≤ 520	≤ 0,7 ¹⁾	≤ 20	—	≤ 0,25	≤ 0,05	≤ 0,05	—	—	—	—	—	—	—
	ferritic	≤ 600	≥ 250	≥ 20	≥ 15	≤ 0,08	≤ 0,045	≤ 0,030	≤ 1,0	≤ 1,0	15,5–18	≤ 1,5	—	≤ 7 × % C	≤ 12 × % C
	austenitic	≤ 800	≥ 180	≥ 30	≥ 30	≤ 0,08	≤ 0,045	≤ 0,030	≤ 1,0	≤ 2,0	16,5–20	2,0–3,0	9–15	≤ 5 × % C	≤ 8 × % C
¹⁾ Ratio yield point — tensile strength. An adequate high temperature yield point for the highest possible temperature of the components must be guaranteed.															

Table 3 — Minimum requirements for cast iron

Flake graphite cast iron (ISO/185):	
Tensile strength R_m	$\geq 150 \text{ N/mm}^2$
Brinell hardness	160–220 HB 2,5/187,5
Spheroidal graphite cast iron (annealed ferritic):	
Tensile strength R_m	$\geq 400 \text{ N/mm}^2$
Notch impact strength	$\geq 23 \text{ J/cm}^2$

Table 4 — Parts cast in aluminium and aluminium alloys

	Tensile strength R_m N/mm ²	Temperature range °C
Al 99,5	≥ 75	up to 300
Al Mg2 Mn 0,8	≥ 275	up to 250

Table 5 — Parts cast in copper or copper alloys

	Tensile strength R_m N/mm ²	Temperature range °C
SF — Cu	≥ 200	up to 250
Cu Ni 30 Fe	≥ 310	up to 350

2.1.2.2.2 Thicknesses

The minimum wall thicknesses are given in Table 6 and Table 7.

For rolled steel the tolerances are given in EN 10029.

Table 6 — Minimum thicknesses for rolled parts

Carbon steels, aluminium			Protected steels, stainless steels, copper		
a mm	b mm	c mm	a mm	b mm	c mm
4	3	2,9	2	2	1
Column a)	for walls of combustion chambers exposed to water and fire, and for horizontal walls of convection heating surfaces.				
Column b)	for walls exposed only to water and for rigid shapes, for example convection heating surfaces outside the combustion chamber.				
Column c)	tubes of convection heat exchangers.				

Table 7 — Nominal minimum thicknesses of boiler sections of cast materials under water pressure

Nominal heat input Q_n (kW)	Flake graphite cast iron, aluminium mm	Spheroidal graphite (annealed ferritic) cast iron, copper mm
≤ 35	3,5	3,0
> 35	4,0	3,5

The thicknesses of cast walls given in the production drawings shall not be less than the nominal minimum thicknesses given in Table 7 for parts of cast iron or of cast materials which are subjected to pressure. The actual minimum thickness of the boiler sections and of parts subjected to pressure shall be greater than 0,8 times those given in the drawings.

2.1.2.2.3 Welding seams and welding fillers

Materials shall be suitable for welding. The materials in accordance with Table 2 are suitable for welding and do not require additional heat treatment after welding.

The welded seams shall not show any cracks or bonding faults and shall be defect free over the whole cross-section for butt welds.

One-sided fillet welds and half Y-welds which have been welded through, shall be kept substantially free from bending stresses. Smoke tubes, inserted stays and similar components need not be counterwelded. Double fillet welds are only permissible when sufficiently cooled. Projections into the flue gas side in areas of high thermal stresses shall be avoided.

Corner welds, edge welds and similar welded connections which are subjected to high bending stresses during production and operation are to be avoided.

For welded in longitudinal stay bolts or stay tubes the shearing cross-section of the fillet weld should be 1.25 times the required stay bar or stay tube cross-sectional area.

See Table 8 (dimensions in mm) for details on the welding seams mentioned. Welding fillers shall be suitable for the material being used.

The terms given in Table 8 are in accordance with ISO 2553; the reference numbers of welding processes are respectively in accordance with ISO 857 and EN 24063.

2.1.2.3 Thermal insulation

Any thermal insulation shall withstand a temperature of at least 120 °C without deformation and shall retain its insulating properties under the influences of heat and ageing.

The insulation shall withstand the normally expected thermal and mechanical stresses.

The insulation shall be of non-combustible material. However inflammable materials are permitted provided that:

- either the insulation is applied to surfaces in contact with water;
- or the temperature of the surface to which it is applied does not exceed 85 °C in normal operation;
- or the insulation is protected by a non-combustible case having an appropriate wall thickness.

If flame can come into contact with the insulation or if the insulation is applied close to the combustion products outlet, the insulation shall be non-combustible or protected by a non-combustible case having an appropriate wall thickness.

2.1.2.4 Control and safety devices

2.1.2.4.1 Housing

The parts of the housing that directly or indirectly separate from the atmosphere an enclosure containing gas shall be made only of metallic materials.

Zinc alloys may be used only if they are of quality ZnAl 4, in accordance with ISO 301, and if the parts are not liable to be exposed to a temperature above 80 °C. Only external threads in accordance with ISO 228-1 are accepted for principal inlet and outlet connections made of zinc alloy.

Nevertheless, an enclosure part containing gas may be made of non-metallic materials provided that in the event of this non-metallic part being detached or broken, under any circumstances, no more than 30 dm³/h of air can escape at the highest normal pressure. This requirement does not apply to toroidal seals, governor diaphragms, sealing gaskets and other means of sealing.

2.1.2.4.2 Spring(s) providing the closing force and the sealing force

The closing force and the sealing force shall be assured by the action of a spring or springs. The spring(s) assuring the closing force and the sealing force shall be designed for oscillatory action and shall withstand fatigue.

Springs shall be made from corrosion resistant material.

2.1.2.4.3 Resistance to corrosion and surface protection

All parts in contact with gas or with the ambient atmosphere, as well as springs other than those specified in 2.1.2.4.2, shall be made of corrosion-resistant materials or be suitably protected. Moving parts shall not be affected by movement, of any sort, of the parts.

2.1.2.4.4 Impregnation of the body

A treatment process during manufacture (impregnation) by an appropriate procedure, for example treatment under vacuum or internal pressure, using suitable sealing products is permitted.

2.1.2.5 Separate combustion products evacuation duct

2.1.2.5.1 Stability under mechanical loading

The duct shall be capable of withstanding horizontal and vertical loads. The following aspects shall be considered:

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

2.1.2.5.2 Stability under exposure to heat

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

2.1.2.5.3 Corrosion resistance

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

2.1.2.5.4 Resistance to condensate and moisture under normal operating conditions

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

2.1.3 Design

The boiler shall be designed such that when it is installed and used according to the manufacturer's instructions, it shall be possible to vent the air from the boiler waterways, if it is not self-venting.

In addition, the boiler shall be designed in such a way that there is no condensation at the operating temperature provided by the controls.

If condensation is produced at start-up, this shall not:

- affect the operational safety;
- drop outside the appliance.

Constructional parts accessible during use and servicing, in accordance with the manufacturer's instructions, shall be free from sharp edges and corners that might cause damage or personal injury during use and servicing.

2.1.4 Use and servicing

The user shall be able to gain access to and operate all control knobs and buttons necessary for normal use of the boiler without having to remove any part of the case. However, part of the case may be removed provided that this part can be handled easily and safely by the user, that this part can be removed without the use of tools and that incorrect replacement is difficult (e.g. by the provision of stops).

All markings intended for the user shall be easily visible and shall be made in a clear and indelible manner.

Parts which are required to be inspected or removed for servicing shall be easily accessible, possibly after removal of the case, in accordance with the manufacturer's instructions.

Removable parts shall be designed or marked so that they are difficult to re-assemble incorrectly.

In accordance with the manufacturer's instructions, it shall be possible to clean the burner, combustion chamber and parts in contact with combustion products easily and/or remove them easily for servicing; this shall not involve disconnection of the boiler from the gas or water pipes, or the use of other than commercially available tools.

The gas circuit shall be designed so as to permit separate removal of the burner or of the burner and control assembly.

2.1.5 Connections to the gas and water pipes

2.1.5.1 General

The boiler connections shall be easily accessible. They shall be clearly identified in the installation instructions and possibly on the boiler.

The clearance around the connections, after removing the case if necessary, shall be adequate to allow easy use of the tools required to make the connection. It shall be possible to make all the connections without special tools.

2.1.5.2 Connection to the gas pipe

It shall be possible to connect the boiler by rigid metallic means to the gas supply pipe.

If the boiler has a threaded connection, this thread shall comply with ISO 228-1 or ISO 7-1. In the first case (ISO 228-1), the end of the boiler inlet connection shall offer a sufficiently flat annular surface to allow the use of a sealing washer. If flanges are used, they shall comply with ISO 7005 and the manufacturer shall provide the counter-flanges and sealing gaskets.

The different national gas connection conditions are given in **A.4**.

2.1.5.3 Connections to the central heating circuit

Threaded connections shall comply with ISO 228-1 or ISO 7-1.

If copper connections are used, the connecting end of the tube shall comply with prEN 1057.

If other than metallic materials are used, the manufacturer shall provide the appropriate justification for their suitability of use.

2.1.6 Soundness

2.1.6.1 Soundness of the gas circuit

The gas circuit shall consist of metallic parts.

Holes for screws, studs, etc., intended for the assembly of parts shall not open into gasways. The wall thickness between drillings and gasways shall be at least 1 mm. This does not apply to orifices for measurement purposes. It shall not be possible for water to penetrate into the gas circuit.

The soundness of parts and assemblies making up the gas circuit and likely to be dismantled during a normal routine servicing operation in situ or during gas conversion shall be achieved by means of mechanical joints, for example metal to metal joints, gaskets or toroidal seals, i.e. excluding the use of all sealing materials such as tape, paste or liquid. However, the sealing materials mentioned above may be used for permanent assemblies. These sealing materials shall remain effective under normal conditions of boiler use.

Where parts of the gas circuit are assembled without threads, soundness of the assembly shall not be achieved by means of soft solder or by means of adhesives.

2.1.6.2 Soundness of the combustion circuit

The combustion circuit shall be constructed so as to prevent any leakage of combustion products.

Any means used to achieve soundness of the combustion circuit shall be such that it remains effective under normal conditions of use and servicing.

The soundness of parts likely to be removed during routine servicing shall be achieved by mechanical means, excluding pastes, liquids and tapes. The replacement of seals in accordance with the manufacturer's instructions is permitted.

2.1.7 Supply of combustion air and evacuation of the combustion products

2.1.7.1 General

The boiler shall be designed so that there is an adequate supply of combustion air during ignition and over the whole range of possible heat inputs declared by the manufacturer.

The boiler 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 boilers in accordance with 2.1.7.2.2 and for boilers with gas/air ratio controls in accordance with 2.1.7.4 or control dampers in accordance with 2.1.7.5.

2.1.7.2 Connection to the combustion products evacuation system

2.1.7.2.1 Boilers with a draught diverter

The draught diverter shall be part of the boiler. Downstream of this draught diverter the boiler shall incorporate a female flue outlet that allows, if necessary by means of an adapter supplied with the boiler, connection to a flue pipe whose diameter complies with the standards or practices in force in the country where the boiler is to be installed (see A.3).

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

It shall be possible to insert into the flue outlet or adapter of diameter D a flue pipe of external diameter $(D-2)$ mm to a depth of at least $D/4$, but not so far that the evacuation of the combustion products is impaired. However, for a vertical connection, the depth of insertion may be reduced to 15 mm.

2.1.7.2.2 Boilers without a draught diverter

The combustion circuit of these boilers may be fitted with an adjusting device to adjust the boiler 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.

The flue outlet shall be designed such that, if necessary by means of an adapter supplied with the boiler, it allows connection to a flue pipe whose diameter complies with the standards or practices in force in the country where the boiler is to be installed (see A.3). The connection shall not impair the evacuation of the combustion products.

2.1.7.3 Boilers with a fan

2.1.7.3.1 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.

2.1.7.3.2 Proof of air flow

Except for boilers with gas/air ratio controls, before each fan start it shall be checked that there is no simulation of air flow in the absence of air flow.

The supply of combustion air shall be checked by one of the following methods:

- 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 boilers with more than one fan speed in which the flows associated with each fan speed are monitored by separate supervision devices;
- gas/air ratio control.

Only for boilers where the combustion products circuit is completely surrounded by the air supply circuit the following two indirect supervision methods are also allowed:

- indirect supervision (e.g. fan speed supervision) when there is an air proving device which proves the supply of combustion air at least once at each start up;
- supervision of the minimum and maximum air or combustion products rates with two rate supervision devices, which prove the supply of combustion air at least once at each start up.

2.1.7.4 Boilers having a gas/air ratio control

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

Gas/air ratio controls of the mechanical type shall comply with the relevant requirements of EN 12067-1.

Control tubes may be made of metal with suitable mechanical connections or of other materials with at least equivalent properties and in this case are considered immune to breakage, accidental disconnection and leakage after initial soundness checks. As such, they are not subject to the tests in 4.5.9.3.2.

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 boiler.

Control tubes for air or combustion products shall have a minimum 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.

2.1.7.5 Control dampers in the air duct or combustion products circuit

Moveable components of the damper shall interlock and shall have no relative motion with respect to one another.

The damper system shall be provided with a means of proving that the position of any interlocks is correct prior to the damper being operated. This requirement is deemed to be met by limit switches which are protected against the effects of short circuits by suitable protective devices. These devices shall operate before the short circuit current exceeds 50 % of the rated current of the switches.

At the start-up and at every operating state, it shall be ensured that the damper is or has been moved to a position in which the air flow rate and heat input are in the specified ratios.

If the ratio of heat input to air flow rate is not as specified or if there is a fault in the switching system:

- either the damper shall be moved to a position which increases the excess air;
- or there shall be a safety shutdown of the gas supply to the main burner.

2.1.7.6 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 combustion products evacuation duct (possibly by cutting it). Such adaptation shall not impair the correct operation of the boiler.

It shall be possible to connect the boiler, the combustion products evacuation ducts and the terminal using ordinary tools if necessary. All necessary accessories and the fitting instructions shall be supplied by the manufacturer.

2.1.7.7 Terminal

No opening in the external surfaces of the terminal shall permit the entry 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 away from the wall.

2.1.7.8 Terminal guard

If the manufacturer prescribes, 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.

2.1.8 Checking the state of operation

The ignition and operation of the burner(s) and also the length of the flame(s) of the ignition burner, if any, shall be able to be observed visually by the installer. The momentary opening of a door or the removal of a case shall not disturb the operation of the burners.

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 indication of flame presence shall not be used to indicate any fault, except for a fault in the operation of the means of checking the flame itself 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 boiler is operating, either by visual observation of the flame or by some other indirect means.

2.1.9 Drainage

If it is not possible to drain the boiler by means of the water connections, it shall carry a device that enables it to be drained and can be operated by means of a tool such as a spanner or screwdriver.

Adequate directions for drainage shall be included in the instructions.

2.1.10 Electrical equipment

The electrical equipment of the boiler shall comply with the electrical safety requirements of EN 50165, except where reference is made to another electrical standard in **2.2**.

If the manufacturer specifies the nature of the electrical protection of the boiler 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 boiler case;
- to give the degree of electrical protection, inside the boiler case, against harmful actions due to water penetration.

For boilers intended to be installed in a partially protected place:

- the enclosure protection degree shall be at least IPX4D, in accordance with EN 60529;
- the electrical and/or electronic equipment shall be applied within its specified temperature range.

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

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

2.2 Requirements for adjusting, control and safety devices

2.2.1 General

Safety systems shall be designed in accordance with the de-energized to trip principle.

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

The design of the control and safety system shall be such that it is never possible to perform two or more actions which would be unacceptable in combination. The order of the actions shall be fixed in such a manner that it is not possible to change it.

All the following devices 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. Adjusters for the devices shall not be interchangeable if this could result in confusion.

When there are several control knobs (taps, thermostats, etc.), they shall not be interchangeable if this could lead to confusion and their function shall be clearly indicated.

Rubbers used in adjusting, control and safety devices shall comply with the relevant requirements of EN 278, EN 279 or EN 291.

Control and safety devices that comply with EN 88, EN 125, EN 126, EN 161 are presumed to comply with the relevant requirements of this standard.

2.2.2 Adjusters and range-rating devices

2.2.2.1 General

Any parts of a boiler which are not intended to be altered by the user or the installer shall be protected in an appropriate manner. Paint may be used for this purpose provided that it withstands the temperature to which it is subjected during normal operation of the boiler.

The adjusting screws shall be arranged such that they cannot fall into the gasways.

The soundness of the gas circuit shall not be put at risk by the presence of adjusters and range-rating devices.

Adjustment of the adjuster and/or of the range-rating device may be continuous (e.g. use of an adjusting screw) or discrete (e.g. change of restrictors).

2.2.2.2 Adjuster

Gas rate adjusters are mandatory for boilers using several groups of 1st family gas and optional for other boilers.

An adjuster shall:

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

For boilers in a category which include a “+” sign, the adjusters shall be sealed by the manufacturer.

2.2.2.3 Range-rating devices

The boiler may have a range-rating device.

If the gas rate adjuster and the range-rating device are one and the same, the manufacturer shall give suitable instructions for the use of the adjuster in his installation instructions.

2.2.3 Gas circuit

2.2.3.1 General

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 the above-mentioned ISO standard.

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.

Breather holes shall be so designed that, if the diaphragm is perforated, the air leakage rate does not exceed 70 dm³/h at the maximum upstream pressure. This requirement is satisfied if, for a maximum gas supply pressure of 30 mbar, the diameter of the breather hole does not exceed 0,7 mm.

The use of bellows as the sole sealing element against the atmosphere shall only be permitted if the air leakage rate in the event of fracture does not exceed 70 dm³/h at the maximum upstream pressure.

Breather holes shall be protected against blockage or shall be located so that they cannot be easily blocked. They shall be so arranged that the diaphragm cannot be damaged by a device inserted for cleaning purposes.

Seals for moving parts which pass through the body to atmosphere and the seals for the closure member shall only be made of solid material (e.g. synthetic materials with proper mechanical support and of proper mechanical stability) of a type which does not deform permanently (e.g. no sealing paste).

Manually adjustable packing glands shall not be used for sealing moving parts. An adjustable gland adjusted only by the valve manufacturer and protected against further adjustment and which need not be readjusted is not considered adjustable.

There shall be no accessible shafts or operating levers that could be interfered with in such a way as to prevent closure of the valves.

A device to protect against dust shall be positioned near the gas inlet. The maximum dimension of the mesh of the filter shall not exceed 1,5 mm; furthermore the mesh shall not allow passage of a 1 mm pin gauge. However if the gas line includes a class D or D' automatic valve, the maximum diameter of the pin gauge is 0,2 mm.

2.2.3.2 Control devices

Every boiler shall be provided with at least one device to enable the user to control the gas supply to the burner and to the ignition burner, if any.

The shut-off shall be effected without delay, for example it shall not be subject to the delay time of the thermoelectric flame supervision device.

No markings are required if incorrect operation is impossible, for example when a single button controls a flame supervision device for the burner and ignition burner. However, where it is necessary to use markings, the following symbols shall be used:

— Off	: full disc	
— Ignition	: stylized star	
— Full rate of the burner	: stylized flame	

If the boiler has two distinct gas rate controls, one for the burner and one for the ignition burner, the operation of these devices shall be interlocked in such a way that it is impossible for the burner to be supplied before the ignition burner.

If the burner and ignition burner are served by a single tap, the position for ignition of the latter shall have a stop or notch making this position clearly perceptible to the user. It shall be possible to carry out the unlatching operation (if any) with one hand.

If the only control to cut off the gas supply operates by turning, it shall turn off in a clockwise direction as seen by an observer facing the knob.

2.2.3.3 Composition of the gas circuit

The main burner gas circuit, and that of the ignition burner if its heat input exceeds 0,250 kW, shall be fitted with at least two valves in series:

- a first valve of class C' or a thermoelectric flame supervision device;
- a second valve of class D' or J.

Additional requirements for the composition of the gas circuit of fan-assisted boilers for which a pre-purge is not mandatory are given in 3.4.3.

When the heat input of the ignition burner is not greater than 0,250 kW, the gas circuit shall comprise at least one class C' valve or a thermoelectric flame supervision device.

Safety devices which cause non-volatile lockout to occur shall give rise to simultaneous signal to close the two valves. However, for a thermoelectric device, the safety devices may act only on this device.

In the case of direct ignition of the main burner and if the order to close in response to a control device is not given simultaneously to the two valves, the two valves shall be class C'.

In response to a control device, if the delay between the orders to close the two valves is not greater than 5 s, the signals are considered to be simultaneous.

A class C' valve may be replaced by a class C, a class B, a class B' or a class A valve; a class D' valve may be replaced by a class D valve with a closure time of not greater than 5 s or by a class C, a class C', a class B, a class B' or a class A valve.

Illustrations of the composition of the gas circuit are given in informative Annex F.

2.2.4 Gas governor

Boilers intended to operate with 1st family gases shall have a gas governor; for other boilers a governor is optional.

A governor intended for operation with a pressure couple shall be or shall be able to be adjusted in a manner such that it cannot operate between the two normal pressures.

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

The design and accessibility of the governor shall be such that it can be easily adjusted and put out of operation when another gas is supplied, but precautions shall be taken to make unauthorized interference with the adjuster difficult.

2.2.5 Ignition devices

2.2.5.1 Ignition of the ignition burner

It shall be possible to light, in a simple manner, ignition burners that are directly ignited by hand.

Ignition devices for the ignition burner shall be designed and fitted in such a way that they are located correctly in relation to the components and the ignition burner. It shall be possible to fit or remove the ignition device for the ignition burner, or the ignition burner-ignition device assembly, using commonly available tools.

2.2.5.2 Ignition device for the main burner

Main burners shall be fitted with an ignition burner or a device for direct ignition. Direct ignition shall not cause deterioration of the burner.

2.2.5.2.1 Ignition burners

Ignition burners shall be designed and fitted in such a way that they are located correctly in relation to the components and to the burners which they ignite. If different ignition burners are used for the different gases, they shall be marked, easy to substitute for one another and easy to fit. The same applies to injectors where only they have to be changed.

If the rate of the ignition burner is not governed, a gas rate adjuster is mandatory for boilers operating on first family gases and optional for second family and third family gases. However, it is forbidden for second and third family gases if a pressure couple is used. The adjuster may be omitted if ignition burners and/or injectors suiting the characteristics of the gas used can be changed easily.

2.2.5.2.2 Direct ignition

Direct ignition devices shall ensure safe ignition even if the voltage is varied from 85 % to 110 % of the nominal voltage. The order to energize ignition devices shall be given no later than the order to open the automatic valve controlling the gas to be ignited. Excluding flame detection, the ignition device shall be de-energized no later than the end of the ignition safety time.

2.2.6 Flame supervision devices

2.2.6.1 General

The presence of a flame shall be detected:

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

At least one flame detector is required.

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

2.2.6.2 Thermoelectric flame supervision device

The device shall cause non-volatile lockout of the boiler in the event of flame failure and in the event of damage to the sensing element or to the connection between the sensing element and the shut-off valve.

2.2.6.3 Automatic burner control system

Automatic burner control systems shall comply with the appropriate requirements of EN 298, with the exception of requirements for degree of electrical protection, endurance, marking and instructions.

In case of flame failure, the system shall result in, at least:

- either spark restoration;
- 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 (TSA) shall result in, at least, volatile lockout.

2.2.7 Thermostats and water temperature limiting devices

2.2.7.1 General

Boilers shall be fitted with a fixed setting or adjustable control thermostat complying with 2.2.7.2.

In order to avoid the water flow temperature exceeding 110 °C following failure of the control thermostat, boilers shall be fitted with additional temperature limiting devices specified below.

2.2.7.1.1 Boilers only intended for central heating systems with an open expansion vessel

Temperature limiting devices are not required when the boiler is designed to be installed exclusively with an open expansion vessel and when a failure of the control thermostat does not cause a dangerous situation for the user or damage to the boiler. Appropriate information shall be given in the technical instructions.

2.2.7.1.2 Boilers intended for central heating systems with open or sealed expansion vessels

2.2.7.1.2.1 Boilers of pressure class 1 and 2

A limit thermostat complying with 2.2.7.3 and an overheat cut-off device complying with 2.2.7.4 is required. Instead of a limit thermostat, other devices (e.g. water rate monitoring device, low water detector) are possible in as much as the tests of 3.5.7 are carried out.

Boilers fitted with a device complying with the requirements of 2.2.7.1.2.2 are considered to comply with the requirements of this clause.

2.2.7.1.2.2 Boilers of pressure class 3

A safety temperature limiter in accordance with 2.2.7.5 is required.

2.2.7.2 Control thermostat

The control thermostat shall comply with the requirements of IEC 730-2-9 for type 1 devices.

If the control thermostat is adjustable, the manufacturer shall at least state the maximum temperature in the instructions. The positions of the temperature selector shall be easy to establish and it shall be possible to ascertain in which direction the water temperature rises or falls. If numbers are used for this purpose, the highest number shall correspond to the highest temperature.

At its maximum setting, it shall cause at least controlled shut-down before the water flow temperature exceeds 95 °C.

2.2.7.3 Limit thermostat

The limit thermostat shall comply with the requirements of IEC 730-2-9 for type 1 devices.

The limit thermostat shall cause at least safety shut-down before the water flow temperature exceeds 110 °C.

The maximum set point temperature of this device shall not be able to be adjusted.

When the water temperature falls below its set point, the gas supply to the burner may be restored automatically.

2.2.7.4 Overheat cut-off device

The overheat cut-off device shall comply with the requirement of IEC 730-2-9 for type 2 devices.

This device shall cause non-volatile lockout before the boiler is damaged and/or a dangerous situation for the user occurs.

This device shall not be adjustable and normal operation of the boiler shall not give rise to a change in its set point temperature.

Interruption of the link between the sensor and the device responding to its signal shall cause at least safety shutdown.

2.2.7.5 Safety temperature limiter

The safety temperature limiter shall comply with the requirements of IEC 730-2-9 for type 2 devices.

In addition to the requirements stated in **2.2.7.4**, the safety temperature limiter shall cause non-volatile lockout before the water flow temperature exceeds 110 °C.

2.2.7.6 Sensors

Thermostats, limit thermostats, safety temperature limiters and overheat cut-off devices shall have independent sensors; with an electronic system, thermostats and limit thermostats may have the same sensor provided that failure of the sensor cannot give rise to a dangerous situation for the user or damage to the boiler.

The sensors shall withstand the thermal overload resulting from an overheat condition specified in this standard without the predetermined set point being affected.

2.2.8 Remote control

The boiler shall be designed so that it can be controlled remotely (for example by a room thermostat, a clock,...), except when the boiler operates without using electrical energy.

Connection of any remote controls recommended by the manufacturer shall be possible without disturbing the internal electrical connections except for purpose-designed removable links.

2.2.9 Expansion vessel and pressure gauge

If the boiler incorporates a sealed system expansion vessel, this shall be located or protected in such a way that heat cannot damage the diaphragm and the boiler shall be fitted with a pressure gauge stating the maximum water-side operating pressure (PMS).

2.2.10 Combustion products discharge safety device

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

For type B₁₁, B₁₂ and B₁₃ boilers, this can be achieved with a combustion products discharge safety device (in this case type B₁₁, B₁₂, and B₁₃ boilers are designated respectively as type B₁₁BS, B₁₂BS, and B₁₃BS boilers).

However, type B₁₁, B₁₂ and B₁₃ boilers to be installed:

- in the open air;
- or in a partially protected place;
- or in a room separated from living rooms and provided with appropriate ventilation directly to the outside.

may not be fitted with such a device but in this case, appropriate warnings on the packaging and in the instructions shall clearly indicate the limit on the use of this type of boiler; in this case the boiler is designated as a type B₁₁ boiler.

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

The device shall be so designed that it cannot be dismantled without a tool. Incorrect refitting, after servicing, shall be made difficult.

The device shall be designed so that the electrical insulation withstands the thermal stresses resulting from spillage of the combustion products.

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

2.2.11 Control dampers in the air duct or combustion products circuit

2.2.11.1 *General*

If the appliance and damper are packed separately, they shall be so designed that they cannot be assembled incorrectly. The installation instructions shall refer to this means of assembly.

If the auxiliary energy is interrupted or if some part that is necessary for the operation of the damper fails, it shall not be possible for the main burner to remain alight with the damper closed.

The gas supply to the main burner of the appliance shall not be released before the closure member of the damper has gone through 90 % of its total movement.

The connections between the damper and the shaft of the electric motor shall be rigid.

The connections between the closure member of the damper and the switch actuating the gas supply to the main burner shall be such that they cannot work loose. The switch controlling the gas supply to the main burner shall be actuated directly by the damper position or it shall be safeguarded in some other, at least equivalent way.

Limit switches shall be so constructed and connected that a false "open position" signal cannot occur. The position of the damper switch shall be proved prior to the operation of the burner.

2.2.11.2 *Visual indication*

An indication of the position of the damper shall be visible to the user.

2.2.11.3 *Safety shut-off valve*

The damper shall actuate an automatic shut-off valve of class A, B or C.

2.2.11.4 *Minimum passage*

For appliances with permanent or semi-permanent ignition burners, the minimum passage of the damper in a closed position shall be such that satisfactory ignition burner performance is ensured and that no condensation is formed from the combustion products.

2.3 Burners

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

Every removable injector and/or restrictor shall carry an indelible means of identification preventing any confusion. In the case of non-removable injectors and/or restrictors, the marking may be on the manifold.

It shall be possible to change injectors and restrictors without the need to disconnect the boiler. When the injectors and restrictors are removable, their position shall be well defined and their method of fixing such that it is difficult to position them incorrectly.

Burners shall be accessible without the need to dismantle a major part of the boiler. If burners or parts of burners are removable, their position shall be well defined and their method of fixing such that it is difficult to position them incorrectly.

Aeration adjusters are not allowed.

2.4 Pressure test points

Boilers shall be fitted with at least two pressure test points. The test points shall be fitted in a position carefully selected so as to permit the measurement of the inlet pressure and the burner pressure.

The test points shall have an external diameter of 9–0,5 mm and a useful length of at least 10 mm to enable a tube to be fitted. The minimum diameter of the bore of the test point shall not exceed 1 mm.

2.5 Chemical composition of the condensate

The manufacturer shall communicate the possible chemical composition of the condensate (pH, heavy metals, etc.) to the notified body, if the composition is required by the national regulations.

