



BSI Standards Publication

Gas-fired instantaneous water heaters for the production of domestic hot water

National foreword

This British Standard is the UK implementation of EN 26:2023. It supersedes BS EN 26:2015, which is withdrawn.

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

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English Version

Gas-fired instantaneous water heaters for the production of domestic hot water

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

Gasbeheizte Durchlauf-Wasserheizer für den sanitären
Gebrauch

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European foreword

This document (EN 26:202) has been prepared by Technical Committee CEN/TC 48 “Domestic gas-fired water heaters”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by June 2024, and conflicting national standards shall be withdrawn at the latest by June 2024.

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

This document supersedes EN 26:2015.

The main technical changes compared to EN 26:2015 are the following:

- New or generally reworded requirements:
 - Separation between requirements and test methods in to different clauses;
 - Moving common parts from EN 15502-1 series when relevant and applicable;

prEN 13203-2:2021 provides a means of conforming to the Commission Delegated Regulation (EU) No 812/2013 of 18 February 2013 supplementing Directive 2010/30/UE of the European Parliament and of the Council with regard to energy labelling of water heaters, hot water storage tanks and packages of water heaters and solar service, except on Sound power level (L_{WA}) covered by the present standard, see Clause 11.

prEN 13203-2:2021 provides a means of conforming to the Commission Regulation (EU) No 814/2013 of 2 August 2013 supplementing Directive 2009/125/EC of the European Parliament and of the Council with regard to eco design requirements for water heaters and hot water storage tanks, except on nitrogen oxides emissions (NO_x) covered by the present standard, see Clause 10.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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

1 Scope

This document defines the specifications and test methods and also the classification, marking and energy labelling of gas-fired instantaneous water heaters for sanitary uses, hereafter called “water heaters”.

This document applies to water heaters:

- of types A, B and C as described at the appropriated clauses;

NOTE For more information on the configuration of the types of appliances, see EN 1749:2020.

- using one or more combustible gases corresponding to the three gas families and at the pressures stated in accordance to EN 437:2021;
- of nominal heat input not exceeding 77 kW based on the gross calorific value (GCV);
- with an ignition burner or with direct ignition of the main burner.

In this document, the heat inputs are expressed in relation to the net calorific value (H_i).

This document does not contain all the requirements necessary for:

- boiling water appliances;
- appliances intended to be connected to a mechanical means of evacuating the combustion products;
- appliances which fulfil a dual role of space heating and heating water for sanitary use.

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

This document is not intended to cover appliances designed and constructed to burn gas containing toxic components.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 88-1:2011+A1:2016, *Pressure regulators and associated safety devices for gas appliances — Part 1: Pressure regulators for inlet pressures up to and including 50 kPa*

EN 125:2010+A1:2015, *Flame supervision devices for gas burning appliances - Thermoelectric flame supervision devices*

EN 126:2012, *Multifunctional controls for gas burning appliances*

EN 161:2011+A3:2013, *Automatic shut-off valves for gas burners and gas appliances*

EN 298:2012, *Automatic burner control systems for burners and appliances burning gaseous or liquid fuels*

EN 437:2021, *Test gases - Test pressures - Appliance categories*

EN 513:2018, *Plastics - Poly(vinyl chloride) (PVC) based profiles - Determination of the resistance to artificial weathering*

EN 573-1:2004, *Aluminium and aluminium alloys — Chemical composition and form of wrought products — Part 1: Numerical designation system*

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

EN 1092-1:2018, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 1: Steel flanges*

EN 1092-2:1997, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 2: Cast iron flanges*

EN 1092-3:2003, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 3: Copper alloy flanges*

EN 1092-4:2002, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 4: Aluminium alloy flanges*

EN 1749:2020, *Classification of gas appliances according to the method of supplying combustion air and of evacuation of the combustion products (types)*

EN 1856-1:2009, *Chimneys - Requirements for metal chimneys - Part 1: System chimney products*

EN 1856-2:2009, *Chimneys - Requirements for metal chimneys - Part 2: Metal flue liners and connecting flue pipes*

EN 1859:2009+A1:2013, *Chimneys - Metal chimneys - Test methods*

EN 10088-1:2014, *Stainless steels — Part 1: List of stainless steels*

EN 10226-1:2004, *Pipe threads where pressure tight joints are made on the threads - Part 1: Taper external threads and parallel internal threads - Dimensions, tolerances and designation*

EN 13203-1:2015, *Gas fired domestic appliances producing hot water - Part 1: Assessment of performance of hot water deliveries*

prEN 13203-2:2021, *Gas-fired domestic appliances producing hot water —Part 2: Assessment of the energy consumption*

EN 13216-1:2019, *Chimneys — Test methods for system chimneys — Part 1: General test methods*

EN 13501-1:2018, *Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests*

EN 13611:2019, *Safety and control devices for gas burners and gas burning appliances — General requirements*

EN 14241-1:2013, *Chimneys - Elastomeric seals and elastomeric sealants - Material requirements and test methods - Part 1: Seals in flue liners*

EN 14459:2015, *Safety and control devices for burners and appliances burning gaseous or liquid fuels - Control functions in electronic systems - Methods for classification and assessment*

EN 14471:2013+A1:2015, *Chimneys - System chimneys with plastic flue liners - Requirements and test methods*

EN 15036-1:2006, *Heating boilers - Test regulations for airborne noise emissions from heat generators - Part 1: Airborne noise emissions from heat generators*

EN 60335-1:2012, *Household and similar electrical appliances - Safety - Part 1: General requirements (IEC 60335-1:2010, modified)*

EN 60335-2-102:2016, *Household and similar electrical appliances - Safety - Part 2-102: Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections (IEC 60335-2-102:2004)*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN IEC 60730-2-9:2019, *Automatic electrical controls for household and similar use — Part 2: Particular requirements for heat sensing controls (IEC 60730-2-9:2015)*

EN ISO 178:2019, *Plastics - Determination of flexural properties (ISO 178:2019)*

EN ISO 179-1:2010, *Plastics - Determination of Charpy impact properties - Part 1: Non-instrumented impact test (ISO 179-1:2010)*

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

EN ISO 527-1:2019, *Plastics — Determination of tensile properties — Part 1: General principles (ISO 527-1:2019)*

EN ISO 527-2:2012, *Plastics - Determination of tensile properties - Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2:2012)*

EN ISO 1183-1:2019, *Plastics — Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1:2019)*

EN ISO 1183-2:2019, *Plastics - Methods for determining the density of non-cellular plastics - Part 2: Density gradient column method (ISO 1183-2:2019)*

EN ISO 1183-3:1999, *Plastics - Methods for determining the density of non-cellular plastics - Part 3: Gas pycnometer method (ISO 1183-3:1999)*

EN ISO 3166-1:2020, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes (ISO 3166-1:2020)*

EN ISO 9969:2016, *Thermoplastics pipes - Determination of ring stiffness (ISO 9969:2016)*

ISO 37:2017, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 188:2011, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 262:1998, *ISO general purpose metric screw threads — Selected sizes for screws, bolts and nuts*

ISO 301:2006, *Zinc alloy ingots intended for castings*

ISO 815-1:2019, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures*

ISO 1817:2015, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 2781:2018, *Rubber, vulcanized or thermoplastic — Determination of density*

ISO 6914:2013, *Rubber, vulcanized or thermoplastic — Determination of ageing characteristics by measurement of stress relaxation in tension*

ISO 7619-1:2010, *Rubber, vulcanized or thermoplastic — Determination of indentation hardness – Part 1: Durometer method (Shore hardness)*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

instantaneous water heater

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

3.1.1

instantaneous water heater with fixed output

appliance where the burner operates at a fixed heat input

3.1.2

instantaneous water heater with adjustable output

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

3.1.3

instantaneous water heater with automatic output variation (AVO)

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

3.1.3.1

thermostatic appliance

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

3.1.3.2

proportioning appliance

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

3.1.4

condensing instantaneous water heater

appliance in which under normal operating conditions and for normal inlet water temperatures the water vapour of the combustion products is partially condensed in order to use the latent heat of this water vapour to produce hot water

3.1.5

range of automatic output variation

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

3.1.6

condensate

liquid formed from the combustion products during the condensation process

3.2

characteristics of the gas and electricity supplies

3.2.1

reference conditions

these correspond to 15 °C, 1 013, 25 mbar, unless otherwise specified

[SOURCE: EN 437:2021, 3.9]

3.2.2

test gases

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

[SOURCE: EN 437:2021, 3.2]

3.2.2.1

reference gases

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

[SOURCE: EN 437:2021, 3.3]

3.2.2.2

limit gases

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

[SOURCE: EN 437:2021, 3.4]

3.2.3

calorific value

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

Note 1 to entry: A distinction is made between:

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

Note 2 to entry: The calorific value is expressed:

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

[SOURCE: EN 437:2021, 3.11]

3.2.4

relative density (d)

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

[SOURCE: EN 437:2021, 3.10]

3.2.5

Wobbe number (gross Wobbe index W_s ; net Wobbe index W_i)

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

Note 1 to entry: The Wobbe indices are expressed:

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

[SOURCE: EN 437:2021, 3.12]

3.2.6

gas pressure (p)

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

3.2.6.1

test pressure

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

[SOURCE: EN 437:2021, 3.5]

3.2.6.2

normal pressure (p_n)

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

[SOURCE: EN 437:2021, 3.6]

3.2.6.3

limit pressure (maximum pressure: p_{max} ; minimum pressure: p_{min})

pressures representative of the extreme variations in the appliance supply conditions

[SOURCE: EN 437:2021, 3.7]

3.2.6.4

pressure couple

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

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

[SOURCE: EN 437:2021, 3.8]

3.2.7

rated voltage

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

3.3

gas circuit

assembly of parts of the water heater that carry or contain the combustible gas between the water heater gas inlet connection and the point at which air is admitted

3.4

adjusting, control and safety devices

3.4.1

restrictor

device (with one or more orifices if any) 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

3.4.2

preset gas rate adjuster

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

3.4.3

locking a preset adjuster

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

3.4.4

sealing a preset adjuster

arrangements made to make evident any attempt to change to the adjustment

EXAMPLE breakage of the device or sealing material

3.4.5

putting a preset adjuster or a control out of service

putting out of operation a preset adjuster or a control (of rate, pressure, etc.) and sealing it in this position

Note 1 to entry: The appliance functions as if this device had been removed.

3.4.6

gas pressure regulator

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

3.4.7

gas volume governor

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

3.4.8

control knob

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

3.4.9

manual shut off valve

component that permits manual interruption of the gas rate to the burner and ignition burner (if any)

3.4.10

manual gas rate adjuster

device that allows the user to reduce the gas rate to the burner

Note 1 to entry: This device may be the shut off valve.

3.4.11

automatic shut off valve

valve designed to open when energized by an electrical current and which closes automatically in the absence of the current

3.4.12

automatic water-operated gas valve

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

3.4.13

electrical ignition device

electrical device that ignites a mixture of air and gas in the combustion zone of a burner

Note 1 to entry: A distinction is made between:

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

3.4.14

flame supervision device

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

3.4.15

programming unit

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 or lockout if necessary

Note 1 to entry: The programming unit follows a predetermined sequence of actions, in conjunction with the flame detector.

3.4.16

automatic burner control system

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

3.4.17

atmosphere sensing device

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

3.4.18

combustion products discharge safety device

device that causes at least safety shutdown of the main burner, when an unacceptable spillage of combustion products is detected at the draught diverter of the water heaters (type B_{11BS})

3.5

stages of operational and safety sequences

3.5.1

program

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

3.5.2

spark restoration

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

3.5.3

recycling

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

3.5.4

safety shutdown

process which is effected immediately following the response of a protection device or the detection of a fault and puts the burner out of operation; the resulting state of the system is defined by deactivated terminals for the shut-off valves and the ignition device

Note 1 to entry: See EN 298:2012, 3.17.

3.5.5

locking out

complete interruption of the gas supply with lockout

3.5.6

non-volatile lockout

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

3.5.7

volatile lockout

shutdown condition such that a restart can only be accomplished by restoration of the electrical supply after its loss or any other non-voluntary action

3.6

burners

3.6.1

injector

component that admits gas into an atmospheric burner

3.6.2

burner

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

3.6.3

main burner

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

3.6.4

ignition burner

burner intended to ignite a main burner

3.6.4.1

permanent ignition burner

ignition burner that operates continuously throughout the whole period that the appliance is in use

3.6.4.2

alternating ignition burner

ignition burner that is extinguished as soon as ignition of the main burner is effected and re-igniting at the main burner flame just before the latter extinguishes

3.6.4.3

intermittent ignition burner

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

3.6.4.4

interrupted ignition burner

ignition burner that operates only during the ignition sequence

3.6.4.5

intermittent safety ignition burner

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

Note 1 to entry: The intermittent safety ignition burner is ignited by an automatic ignition device when delivery commences.

3.6.4.6

pre-mixed 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

3.7

combustion circuit

circuit from the air inlet to the combustion products outlet of the appliance

Note 1 to entry: This will include combustion chamber and heat exchanger and depending on the type includes the air supply duct, the combustion products evacuation duct, the fitting piece, the connection to the terminal, the inlet terminal, the outlet terminal.

3.7.1

combustion chamber

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

3.7.2

deflector

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

3.7.3

flue outlet

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

3.7.4

draught diverter

part of a type B₁ appliance placed in the combustion products circuit to reduce the influence of updraught and to prevent that of downdraught on the stability of the burner flames and on combustion

3.7.5

ducts support

accessory used to fix, or transfer the load of, air supply and combustion product evacuation ducts to structural elements (building, etc.)

3.7.6

overheat combustion products temperature

maximum temperature of the combustion products in case of overheat, at the exit of the appliance where it is intended to be connected to a duct, flue or chimney

3.7.7

condensing operation mode of flue system

operation mode where, under normal operation conditions, flue gas condensate is available

3.7.8

terminal

device fitted to the outside of the building, to which are connected:

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

Note 1 to entry: This device is intended to maintain the quality of combustion in the event of wind.

3.7.9

fitting piece

device which allows the fitting of:

- the air supply and combustion products evacuation ducts to a single shared duct for type C₂ appliances;
- the air supply and combustion products evacuation ducts to two ducts of a shared duct system for type C₄ appliances;
- type C₆ appliances to a system for air supply and combustion products evacuation that is approved and marketed independently from the appliance;
- the combustion products evacuation duct to a chimney that is part of the building for type C₈ appliances;
- the air supply duct to a chimney that is part of the building for type C₉ appliances;
- type B₂ appliances to a system for combustion products evacuation that is approved and marketed independently from the appliance;
- the combustion products evacuation duct to a shared duct system for type B₃ appliances

3.7.10

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

3.7.11

air supply and combustion products evacuation circuits

3.7.11.1

air supply and combustion products evacuation ducts

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

Note 1 to entry: This European Standard differentiates between:

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

3.7.11.2

terminal guard

device that protects the terminal from mechanical damage from outside influences

3.7.11.3

duct adapter

device which allows the fitting of:

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

Note 1 to entry: The duct adapter may be part of the water heater or of the air supply and/or combustion products evacuation system.

3.7.11.4

roof space

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

3.7.11.5

secondary flue

part of the flue of a type C₇ water heater between the draught diverter/air inlet in the loft and the combustion products outlet above the roof

3.8 **water circuit**

3.8.1

preset water rate adjuster

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

3.8.2

water rate or water pressure governor

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

3.8.3

water temperature selector

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

3.8.4

summer-winter switch

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

3.8.5

water supply pressure

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

3.8.6

specific rate (*D*)

domestic hot water rate stated in the technical instructions corresponding to a mean temperature rise of 30 K that the appliance can supply in two successive delivery periods

[SOURCE: EN 13203-1:2015]

3.9

soundness of the gas circuit

3.9.1

external soundness

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

3.9.2

internal soundness

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

3.9.3

sealing force

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

3.10 operation

3.10.1 gas rates

3.10.1.1 volumetric rate

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

Note 1 to entry: Symbols:

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

Note 2 to entry: The volumetric rate is expressed in:

- cubic meters per hour (m^3/h).

3.10.1.2 mass rate (M)

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

3.10.1.3 nominal gas rate (V_n or M_n)

gas rate stated in the technical instructions corresponding to nominal operating conditions expressed under reference conditions

3.10.2 minimum water rate (D_m)

smallest water rate that allows gas to be admitted to the burner

3.10.3 heat inputs

3.10.3.1 heat input (Q)

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

3.10.3.2 nominal heat input (Q_n)

value of the heat input stated by the product specifications

3.10.3.3 minimum heat input (Q_{min})

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

3.10.3.4

corrected heat input (Q_c)

heat input that would be obtained if the appliance were supplied with dry reference gas at the normal supply pressure and a temperature of 15 °C, with an atmospheric pressure of 1 013,25 mbar, (see 6.3.1.2)

3.10.4

useful outputs

3.10.4.1

useful output (P)

quantity of heat transmitted to the water in unit time

3.10.4.2

nominal useful output (P_n)

useful output stated in the technical instructions to be obtained when the appliance operates at the nominal heat input and water temperature specified in 6.1.6.6.2.1 a)

3.10.4.3

minimum useful output (P_m)

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

3.10.5

efficiency (η_u)

ratio of the useful output to the heat input

3.10.6

gas combustion

3.10.6.1

combustion

3.10.6.1.1

complete combustion

combustion with no more than traces of combustible constituents (hydrogen, hydrocarbons, carbon monoxide, carbon, etc.)

3.10.6.1.2

incomplete combustion

combustion at which at least one combustible constituent is present in significant proportions in the combustion products

3.10.6.2

flame stability

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

3.10.6.3

flame lift

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

3.10.6.4

light back

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

3.10.6.5

lightback at the injector

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

3.10.6.6

yellow tipping

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

3.10.6.7

sooting

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

3.10.7

response times

3.10.7.1

ignition opening time (T_{IA})

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

3.10.7.2

ignition safety time (T_{SA})

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

3.10.7.3

maximum ignition safety time (T_{SAmax})

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

3.10.7.4

extinction delay time (T_{IE})

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

3.10.7.5

extinction safety time (T_{SE})

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

3.10.8

ignition input (Q_{IGN})

average heat input during the ignition safety time

3.10.9

water temperature deviations

3.10.9.1

variation of the temperature according to the water rate

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

3.10.9.2

temperature fluctuation

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

3.10.10

device monitoring the air supply or combustion products evacuation

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

3.10.11

gas/air ratio control

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

3.10.12

frost protection system

system that actively protects the water in the appliance against freezing

Note 1 to entry: An anti-freeze solution is not considered as an active frost protection system.

3.10.13

appliances intended to be installed in a partially protected place

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

Note 1 to entry: If an appliance is sold with a casing intended to provide protection, this casing is an integral part of the appliance.

3.10.14

appliances intended to be installed in a room separated from inhabited rooms

appliances intended to be installed in a room that has no air communication with any inhabited room

Note 1 to entry: "No air communication" means no doors, nor windows which could be opened between the room and the inhabited areas.

3.11

steady state

condition of the appliance when it has operated for sufficient time to reach thermal stabilization so that the water temperature at the outlet does not vary more than $\pm 0,5$ K

Note 1 to entry: This condition can be reached with a gas which is different from the specified test gas, provided that the appliance is supplied with the specified test gas for at least 5 min before the requirements are verified.

3.12

standby mode

operating state in which the appliance can provide domestic hot water at any time

Note 1 to entry: In the case of an appliance with a control cycle for keeping components and/or the tank (if any) at predetermined temperature level no tapping is made.

3.13

relevant eco-design and labelling regulations terms

3.13.1

electric auxiliary energy for eco-design and labelling regulations

electric energy consumed by components such as fan, valves, heating elements required for the heat generator's designed operation

3.13.2

sound power level (L_{WA})

A-weighted sound power level (power is independent of the device position)

3.14

types of instructions and documentation

3.14.1

installation instructions

instructions that accompany the appliance for installation, intended to be used during the installation procedure

3.14.2

user instructions

instructions that accompany the appliance for use and servicing, intended to be used during use and service

3.14.3

technical documentation

(design) documentation containing the information that is needed for assessing the appliance's or fitting's conformity with the applicable requirements

Note 1 to entry: This documentation is not needed for installation, use or service of the appliance and contains data to establish compliance with both technical and legal criteria

3.15

cold condition

condition when the temperature of all parts of appliance are at ambient temperature

4 Classification

4.1 Gases and appliance categories

Gases are classified into families and groups in accordance with EN 437:2021.

Water heaters are classified into appliance categories in accordance with EN 437:2021.

4.2 Mode of air supply and evacuation of the combustion products

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

NOTE For more information on the configuration of the types of appliances, see EN 1749:2020.

4.3 Water pressure

Water heaters are classified according to their declared maximum water service pressure:

a) Low pressure appliances

The maximum service pressure is 2,5 bar.

b) Normal pressure appliances

The maximum service pressure is 10 bar.

c) High pressure appliances

The maximum service pressure is 13 bar.

5 Constructional requirements

5.1 Conversion to different gases

5.1.1 General

Except where otherwise stated the constructional requirements are verified by inspection of the water heater and its technical documents.

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

- adjustment of the gas rate to the main burner and the ignition burner (except for 5.3.9);
- change of injectors or restrictors;
- change of ignition burner or its components;
- change of adjusting and/or control devices specific to appliances with automatic output variation;

possibly:

- change of the automatic water operated gas valve or its components;
- removal, putting out of operation or change of the gas pressure regulator or its components.

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

The conditions given in 4.2, 5.3.3, 5.3.4 and 5.4 shall be observed.

5.1.2 Permissible operations for changing gases

For appliances of categories I_{2Esi}, II_{1c2E+}, II_{1c2Esi}, II_{Esi3+}, III_{1c2E+3+}, and III_{1c2Esi3+}, the following operations are permitted when changing gas family or group:

- preadjustment of the gas rate to the main burner and the ignition burner;
- change of injectors or restrictors and of the atmosphere sensing device;
- change of ignition burner or its components.

The operations below are only permitted when the gas family is changed:

- change of control devices and/or adjusting devices specific to appliances with automatic output variation;
- if necessary, change of the automatic water operated gas valve or its components.

NOTE For appliances of other categories, 5.1.1 applies.

5.2 Materials

5.2.1 General requirements related to the use of materials in water heaters

5.2.1.1 General

The use of asbestos-based materials is forbidden.

The quality and thickness of the materials used in the construction of the water heater, 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.

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

Only external threads in accordance with EN ISO 228-1:2003 are acceptable for principal inlet and outlet connections made of zinc alloy. Parts of the body which separate a gas containing chamber from the atmosphere shall be made from metallic materials.

The gas circuit shall consist of metallic parts.

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

The soundness of parts and assemblies making up the gas circuit and likely to be dismantled for routine maintenance *in situ* shall be achieved by means of mechanical joints, e.g. 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 water heater 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.

Moreover, parts in contact with water shall be made of materials of quality such that the water cannot be polluted.

For separated air supply and combustion products evacuation ducts connected to a type C, B₂, B₃, B₅ water heater, the requirements given in 5.2.9.4, shall additionally apply.

For appliances 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 technical instructions shall precise the minimum and maximum ambient temperatures at which the appliance is designed to operate (see 9.1).

5.2.1.2 Use of Zinc alloy

5.2.1.2.1 Requirements

Zinc alloys (ZnAl4) for gas carrying parts shall conform to the following:

- DN size shall be $\leq$ DN 50;
- The maximum inlet pressure shall be $\leq$ 20 kPa (200 mbar);
- The maximum ambient temperature shall be 80 °C;
- Quality of ZnAl4 shall conform to ISO 301:2006;

with the following restriction:

Where zinc alloy parts are used in parts upstream of a closure member of automatic shut-off valves (stand-alone or as part of a multifunctional control) which are in contact with gas, this housing upstream of the closure member, including the inlet connection, shall have a melting point (solidus temperature) of at least 427 °C and upon removal of those Zinc Alloy parts upstream of the closure member, the external leakage shall be less than 30 dm³/h.

Parts made of Zinc alloy can be used inside the housing of gas controls.

5.2.1.2.2 Test

Remove all non-metallic parts and zinc alloy parts of the housing upstream of the closure member which separate a gas-carrying compartment from atmosphere, excluding O-rings, gaskets and sealing part of diaphragms. Any breather holes shall be blocked.

Pressurize the inlet and the outlet of the control to the maximum inlet pressure and measure the leakage rate.

5.2.2 Materials in contact with water for human consumption

5.2.2.1 Metallic materials

5.2.2.1.1 Corrosion resistance

Provided that the water heater is used in accordance with the appliance instructions:

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

5.2.2.1.2 Requirements

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

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

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

The selection of metallic materials (steel, copper and copper alloys) are given in H.2 and H.3 (see Annex H).

5.2.2.1.3 Non-metallic materials

5.2.2.1.3.1 Plastic materials

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

5.2.2.1.3.2 Requirements

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

Examples for the selection of the plastic materials are given in H.4 (see Annex H).

5.2.2.1.4 Other operating and auxiliary materials

These materials include rubber, sealant, adhesives and also lubricants on moving parts that come into contact with the water intended for human consumption. Only those materials that meet mechanical, chemical and thermal demands as well as physiological and hygiene requirements throughout the life of the equipment shall be used in contact with water.

5.2.3 Durability against corrosion of combustion product evacuation duct

The durability against corrosion of the combustion product evacuation duct shall be demonstrated by fulfilling either:

- the requirements in Table 1, or
- a corrosion requirement from EN 1856-1:2009, Annex A.

Table 1 — Metallic flue duct material specifications

Material	Symbol	Minimum nominal thickness non-condensing ^{b)} mm	Minimum nominal thickness condensing ^{b)} mm
EN 573-1:2004 Aluminium designation			
EN AW – 4047A	EN AW Al Si 12 (A), and CU < 0,1 %, Zn < 0,15 % (cast aluminium)	0,5	1,5
EN AW – 1200A	EN AW-AL 99,0 (A)	0,5	1,5
EN AW-6060	EN AW-Al MgSi	0,5	1,5
EN 10088-1:2014 Steel number	EN 10088-1:2014 Steel name		
1.4401	X5CrNiMo 17-12-2	0,4	0,4
1.4404 ^{a)}	X2CrNiMo 17-12-2	0,4	0,4
1.4432	X2CrNiMo 17-12-3	0,4	0,4
1.4539	X1NiCrMoCu 25-20-5	0,4	0,4
1.4401	X5CrNiMo 17-12-2	0,11 ^{c)}	0,11 ^{c)}
1.4404 ^{a)}	X2CrNiMo 17-12-2	0,11 ^{c)}	0,11 ^{c)}
1.4432	X2CrNiMo 17-12-3	0,11 ^{c)}	0,11 ^{c)}
1.4539	X1NiCrMoCu 25-20-5	0,11 ^{c)}	0,11 ^{c)}
^{a)} Equivalent for material N° 1.4404 = 1.4571 (symbol X6CrNiMoTi 17-12-2). ^{b)} The condensing column shall be used if, under normal operation conditions, condensate is produced in the combustion products circuit (according to 3.1.4). ^{c)} Flexible liners (when installed in an existing chimney).			

The actual minimum thickness of the materials shall always be greater than 90 % of the minimum nominal thicknesses.

5.2.4 Disassembly, recycling and disposal

Materials shall be selected to optimize product durability and lifetime and consideration shall be made to avoid the selection of rare or hazardous materials.

Consideration shall be made to using recycled or re-used materials, and to the selection of materials which can then be subsequently recycled.

NOTE The possibility of marking components to aid to their sorting for disposal/recycling at end of life shall also be reviewed.

Instructions required specifying how to dismantle the unit at end of life shall be made available.

5.2.5 Design - Assembly - Strength

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

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

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

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

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

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

5.2.6 Accessibility - Ease of maintenance - Fitting and removal

It shall be possible to clean the combustion circuit by following the maintenance instructions.

It shall not be possible to replace parts that have to be removed for maintenance, in such a way that the operational safety of the appliance is compromised. In particular, the soundness of the combustion chamber, as defined in 6.2.2, shall be maintained after refitting following cleaning or maintenance operations.

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

5.2.7 Connection to gas and water pipes

5.2.7.1 Gas connections

It shall be possible to connect the water heater by rigid metallic or flexible metallic means to the gas supply pipe.

If the water heater has no flanges, pipe connection shall comply with EN ISO 228-1:2003, EN 10226-1:2004, EN 10226-2:2005, or EN 1057:2006+A1:2010. In the first case (EN ISO 228-1:2003), the end of the water heater 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 EN 1092-1:2018, EN 1092-2:1997, EN 1092-3:2003 or EN 1092-4:2002 depending on the flange material used and the counter-flanges and sealing gaskets shall be provided together with the water heater and be declared under the service parts clause in the installation instructions.

NOTE For the types of gas connections commonly used in the various countries, see Table A.1.

5.2.7.2 Connection to the water circuit

Threaded connections shall comply with EN ISO 228-1:2003, EN 10226-1:2004 or EN 10226-2:2005.

If copper connections are used, the connecting end of the tube shall comply with EN 1057:2006+A1:2010.

If other than the above connections are used, the technical documentation shall provide justification for their suitability of use.

When the connection to the water supply is made by threaded accessories, these shall comply with EN ISO 228-1:2003 and the end of appliance connection shall be sufficiently flat to allow the use of a sealing washer.

If the connections consist of a plain copper tube this shall have a straight section of at least 5 cm in length and it shall comply with EN 1057:2006+A1:2010.

NOTE For the water connection conditions in force in the various countries, see Table A.1.

5.2.8 Soundness

5.2.8.1 Soundness of the gas circuit

The quality and thickness of the materials used in the construction of the water heaters, 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.

Elastomeric material in contact with gaseous fuels, shall be appropriate for the intended use in the appliance. Elastomeric materials in contact with 1st, 2nd or 3rd family gases, of temperature class E1 and hardness class H2 as defined in EN 549:2019 are suitable for all applications.

5.2.8.2 Soundness of the combustion circuit

5.2.8.2.1 General

If there is a risk of condensation in the combustion products circuit it shall comprise materials which comply with the requirements of 5.4.13.1. Other materials may be used when evidence is provided of their suitability for conditions in which condensation can occur.

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

Requirements for materials and characteristics used for combustion product evacuation ducts, fitting pieces and terminals are specified below.

5.2.8.2.2 Type B₁₁ and B_{11BS} appliances

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

5.2.8.2.3 Type C appliances

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

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

The appliance shall be constructed in such a way that the soundness requirements of 6.2.2.1 are fulfilled.

5.2.9 Supply of combustion air and evacuation of the combustion products

5.2.9.1 All appliances

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

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

5.2.9.2 Type A_{AS} appliances

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

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

5.2.9.3 Type B appliances

5.2.9.3.1 General

The outlet connection shall be female. Except for types B₄ and B₅ water heaters, the installation instructions shall specify clearly the conditions for connecting the flue outlet pipes for which the appliance is intended.

NOTE Flue pipe diameters, available in the various countries, are listed in Table A.2.

The connection shall not impair the evacuation of the combustion products.

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

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

For a separate combustion products evacuation duct which is part of a type B₄ or B₅ water heater, the requirements given in 5.2.8.4, in accordance with EN 1443:2019 apply as well as the applicable requirements of EN 1856-1:2009, EN 1856-2:2009 and EN 1859:2009+A1:2013.

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

5.2.9.3.2 Water heaters with a draught diverter (water heaters of types B₁₁, B_{11BS}, B₁₂, B_{12BS}, B₁₃, B_{13BS}, B₁₄, and B₄)

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

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

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

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

5.2.9.4 Separate combustion products evacuation duct

5.2.9.4.1 Stability under mechanical loading

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

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

5.2.9.4.2 Stability under exposure to heat

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

5.2.9.4.3 Corrosion resistance

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

5.2.9.4.4 Resistance to condensates and moisture under normal operating conditions

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

5.2.9.5 Type C appliances

5.2.9.5.1 General

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

Water heaters with a fan maybe fitted with a means of adjustment in the combustion circuit intended to adapt the water heater to the installation conditions. This adjustment is effected either by restrictors or by setting a means of adjustment to predetermined positions in accordance with the installation instructions.

5.2.9.5.2 Air supply and combustion products evacuation ducts

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

It shall be possible to connect the water heater, the air supply and combustion products evacuation ducts and the terminal or the duct adapter using ordinary tools if necessary.

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

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

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

5.2.9.5.3 Terminal

Terminals on water heaters without a fan shall prevent the intrusion of external objects by having no opening in the external surfaces of the terminal which shall permit the entry of a 16 mm diameter ball when applied with a force of 5 N.

Any horizontal terminal for non-condensing water heaters shall be designed in such a way that any condensate is discharged outwards from the wall

Any horizontal terminal for condensing water heaters shall be designed in such a way that condensate is directed towards the appliance.

5.2.9.5.4 Terminal guard

If the installation instructions, specifies a protective guard for the terminal for use when the outlets for evacuation of the combustion products open on to a walkway, the prescribed dimensions of the guard 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.

5.2.9.5.5 Fitting pieces

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

5.2.9.6 Special requirements for certain components of water heaters with a fan

5.2.9.6.1 Fan

Direct access to the rotating parts of a fan shall be prevented. The parts of a fan in contact with combustion products shall be effectively protected against corrosion unless they are of corrosion resistant material (see 5.2.3); furthermore they shall withstand the temperature of the combustion products.

5.2.9.6.2 Air proving

Appliances with fans shall be fitted with a system for air proving.

Except for appliances 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 system for supervision of the combustion air rate or combustion products rate is activated directly by the flow of combustion air or combustion products. This is also valid for water heaters with more than one fan speed in which the flows associated with each fan speed are monitored.

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

- a) gas/air ratio controls;
- b) continuous supervision of the combustion air rate or combustion products rate;
- c) start up supervision of the combustion air rate or combustion products rate provided that:
 - 1) The combustion products circuit is completely surrounded by the air supply circuit, or the leakage rate of the combustion products circuit meets the requirements of 5.2.8.2 and

2) There is an indirect system for air proving (e.g. fan speed supervision) during operation.

5.2.9.6.3 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.

Pneumatic gas/air ratio controls shall comply with the relevant requirements of EN 88-1:2011+A1:2016.

Electronic gas/air ratio controls shall comply with the relevant requirements of EN 12067-2:2004.

If the instructions for installation state (see 9.2.1.2) that the gas/air ratio control settings are not intended to be adjustable by a gas operative during installation, appliance service or when the gas valve is replaced then the appliance shall incorporate additional provisions to discourage unauthorised interference with the gas/air ratio control settings.

The following examples are considered to be suitable additional provisions:

- a) physical removal of the adjustment screws (or other method of rendering these inoperative);
- b) physically preventing access to the adjustment screws (e.g. filling access holes);
- c) addition of a suitably worded warning label affixed to the gas valve and/or in close proximity to the adjuster screws; this label shall be clearly visible to any gas operative whilst gaining access to the adjuster screws.

NOTE 1 Gas/air ratio controls typically have two adjustments ("throttle" and "offset") and the requirements of this clause apply to both.

If the appliance instructions for installation indicate that the valve can be adjusted, by a suitably qualified gas operative using appropriate instruments, a provision shall be made to indicate that the valve setting has been changed.

NOTE 2 An example of a suitable provision is to use a paint spot on the adjusting device.

The appliance installations shall include instructions on how the settings shall be checked if, at the time of installation or service, there is an indication that the gas/air ratio control settings have been altered. The appliance instructions for installation shall indicate the action to be taken if the settings are found to be incorrect.

If the appliance instructions for installation allow the gas/air ratio controls to be adjusted then the method for adjustment shall be described

Control tubes may be made of metal with suitable mechanical connections or of other materials with at least equivalent properties. In this case, they are considered immune to breakage, accidental disconnection and leakage after initial soundness checks. As such they are not subject to the tests in 6.7.12.4.2.2.

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

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

5.2.10 Checking the state of operation

The construction of the appliance shall be such that the correct ignition and operation of the burner(s) and also the length of the flame(s) of the ignition burner, if any, can be observed.

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 appliance is operating, either by visual observation of the flame or by some other indirect means.

5.2.11 Drainage

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

5.2.12 Electrical and electromagnetic safety

5.2.12.1 General

The water heater shall comply with the relevant requirements of EN 60335-2-102:2016.

If the water heater is fitted with electronic components or electronic systems providing a safety function, these shall comply with the relevant requirements in 5.2.12.2.

If the nature of the electrical protection of the water heater is stated, this statement shall comply with EN 60529:1991.

For water heaters intended to be installed in a partially protected place:

- a) the enclosure protection degree shall be at least IPX4D;
- b) the electrical and/or electronic equipment temperature range shall be suitable for the specified temperature range of the water heater.

5.2.12.2 Controls

5.2.12.2.1 General

In 5.1.12.2.2 controls requirements are specified by reference to existing controls standards. For some clauses, additional requirements and/or deletions are given in 5.2.12.2.2.

NOTE For water heater specific controls designed for a specific water heater, some requirements can be waived, as these are covered by the water heater standard. See 5.2.12.2.2 for details on this.

5.2.12.2.2 Requirements

Control and safety devices shall comply with the following standards as applicable:

- EN 88-1:2011+A1:2016, *Pressure regulators and associated safety devices for gas appliances — Part 1: Pressure regulators for inlet pressures up to and including 50 kPa*
- EN 125:2010+A1:2015, *Thermo-electric flame supervision devices for gas burning appliances*
- EN 126:2012, *Multifunctional controls for gas burning appliances*
- EN 161:2011+A3:2013, *Automatic shutoff valves for gas burners and gas appliances*

- EN 298:2012, *Automatic gas burner control systems*
- EN 13611:2019, *Safety and control devices for gas burners and gas burning appliances - General requirements*
- EN 14459:2015, *Control functions in electronic systems for gas burners and burning appliances – Method for classification and assessment*

NOTE Alternative clause numbers can apply when the product standard (e.g. EN 88 1 or EN 161) is used.

In addition, for water heaters the following applies:

- 1) Valves using auxiliary fluids shall close automatically on reducing the actuating pressure to 15 % of the highest pressure specified in the technical instructions;
- 2) A valve with pneumatic or hydraulic actuating mechanisms is energized at the maximum actuating pressure, and the actuating pressure is reduced slowly to 15 % of the maximum actuating pressure. At this point the valve shall have travelled to the closed position.

For controls being tested in combination with the water heater, the following aspects of the relevant controls standards are not relevant:

- a) Connections: as mentioned in EN 13611:2019, 6.4, 6.4.1, 6.4.2, 6.4.3, 6.4.4, 6.4.5 and 6.4.6;
- b) Rated flow rate: as mentioned in EN 13611:2019, 7.6 (already covered in the nominal heat input/output tests);
- c) EMC/Electrical requirements: as mentioned in EN 13611:2019, 8.1 to 8.10;
- d) Marking: as mentioned in EN 13611:2019, Clause 9;
- e) Protection against environmental influences: as mentioned in EN 298:2012, 8.2 to 8.10;
- f) Marking, installation and operating instructions: as mentioned in EN 298:2012, Clause 9.
- g) EN 13611:2019, 6.4.8, the strainer can also be in the water heater;
- h) EN 13611:2019, 7.1, the control shall work correctly taking into consideration the max. working pressure, as specified for the water heater, is used and for mounting position, the position of the control in the water heater is used;
- i) EN 13611:2019, 7.3, tests are limited to the pressures as defined for the water heater;
- j) EN 13611:2019, 7.4 and 7.5, tests are performed unless it's evident that the control will not have any bending and torque load, for example because of the way of construction or installation in the water heater;
- k) EN 88-1:2011+A1:2016, 7.101.5, correct function is demonstrated on the water heater according the requirements of this standard, comparable with a class C regulator, for the gases specified.

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

If the appliance 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.

5.3 Adjusting, control and safety devices

5.3.1 General

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

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

If the appliance is fitted with temperature sensing controls for safety purposes, these controls shall comply with the requirements of EN IEC 60730-2-9:2019, type 1 or type 2 devices.

Screwed fastenings that have to be removed for servicing of the device shall have a metric thread complying with ISO 262:1998 unless a different thread is essential for the correct functioning and adjustment of the device.

Thread-forming screws that form a thread and do not produce swarf may be used. It shall be possible to replace them by metric machine screws complying with ISO 262:1998.

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

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

Manually adjustable packing glands shall not be used.

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

All the devices specified in 5.3 or the multifunctional control in which they might be fitted shall be removable or exchangeable if this is necessary for cleaning or replacement of the device.

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

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

For appliances intended to be installed in a partially protected place, the devices shall operate correctly at the temperatures to which they are subjected on the basis of:

- the minimum declared installation temperature for appliances in partially protected places;
- eventually the maximum ambient temperature stated by the installation instructions.

5.3.2 Shut off valves and/or gas rate adjusters

In addition, the gas circuit shall include a manual shut-off valve which may interrupt the gas rate directly, or by means of a closure valve or an automatic shut-off valve specified in 5.3.12 b). This device shall be designed and fixed in such a way that its operation is easy.

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

- | | | |
|---------------------------|--------------------------|---|
| - Off | : full disc ; | ● |
| - Ignition | : stylised spark ; | ☆ |
| - Full rate of the burner | : large stylised flame ; | 🔥 |
| - Minimum rate (if any) | : small stylised flame. | 🔥 |

When appropriated, the symbols according to IEC 60417:2016 may be used as follows:

- "ON" (power):



- "OFF" (power):



- Stand by:



- "ON"/"OFF": (push-push)



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

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

5.3.3 Preset gas rate adjusters

Preset gas rate adjusters shall be designed according to EN 126:2012 so that they are protected against accidental maladjustment by the user once the appliance has been put into service.

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

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

The preset adjuster shall be sealed or the installation instructions shall prescribe that the preset adjuster shall be sealed after installations.

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

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

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

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

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

5.3.4 Gas pressure regulator

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

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

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

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

5.3.5 Pressure test points

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

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

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

The pressure test points shall have an external diameter of $(9,0 \pm 0,5)$ mm and a length of at least 10 mm to enable a rubber tube to be fitted.

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

5.3.6 Automatic water-operated gas valve

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

An automatic water operated gas valve shall comply with EN 126:2012, Annex AA.

5.3.7 Ignition devices

5.3.7.1 Ignition burner

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

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

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

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

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

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

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

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

5.3.7.2 Manual ignition of the ignition burner

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

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

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

5.3.7.3 Automatic ignition device

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

either ignition of:

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

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

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

5.3.8 Flame supervision device

5.3.8.1 General

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

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

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

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

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

The use of deformable bimetallic thermal detectors is forbidden.

5.3.8.2 Thermoelectric device of a permanent ignition burner

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

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

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

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

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

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

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

5.3.8.4 Flame supervision devices for automatic burner control systems

Flame supervision devices for automatic burner control systems shall comply with the relevant operational requirements of EN 298:2012, except for the degree of electrical protection, endurance, markings and instructions. In case of flame failure, the system shall result in, at least:

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

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

5.3.9 Atmosphere sensing device for type A_{AS} appliances

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

Interference with the device shall be made evident.

NOTE For example by breakage of a seal, distortion of a part, etc.

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

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

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

It shall also be designed so that either fouling of the device is not possible or complete interruption of the gas supply is caused under the conditions of simulated fouling of the 2nd paragraph of 6.8.10.3.2.

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

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

5.3.10 Combustion products discharge safety device for type B_{11BS}, B_{12BS} and B_{13BS} appliances

Type B₁₁, B₁₂ and B₁₃ water heaters fitted with a combustion products discharge safety device are designated respectively as type B_{11BS}, B_{12BS}, and B_{13BS} water heaters. The safety device shall not have any adjustment. Adjustable components shall be sealed.

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

Incorrect refitting, after servicing, shall be made difficult.

The safety 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 shall at least cause safety shutdown, if necessary after a waiting time

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

NOTE Appliances which are intended to be installed partially protected, or in a room separate from inhabited rooms and provided with appropriate ventilation are not required to have this safety device (in this case, they are designated as type B₁₁, B₁₂ or B₁₃).

5.3.11 Protection against accidental overheating of thermostatic appliances

Thermostatic appliances shall be designed so that a control failure does not cause the water to overheat under the conditions of 6.8.9. When the requirement is met by means of an overheat protection device, this shall, on thermostat failure, close the gas supply to at least the burner by actuating a shut-off component independent of the control device. Re-establishment of the gas supply shall be achieved only by manual intervention.

5.3.12 Composition of the gas circuit

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

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

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

or

For water heaters with a fan and a permanent ignition burner:

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

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

or

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

In addition, at least one of these valves shall be controlled by an overheat device (flue gas or water).

5.3.13 Protection for appliances intended to be installed in a partially protected place

5.3.13.1 Protection against frost

If the minimum ambient temperature stated in the technical instructions is less than 0 °C, an appliance intended to operate in a partially protected place, shall be protected from freezing by a frost protection system.

Under the test conditions of 6.11 the frost protection system, if any, shall act.

The temperature of the water shall remain above 0,5 °C at any point in the appliance during the test of 6.11.

Appliances with minimum installation temperatures greater than 0 °C do not need a frost protection system.

5.3.13.2 Protection against the ingress of rain

The appliance, including its protective casing, if any, shall meet the requirements for the enclosure protection designated as IPX4 in accordance with EN 60529:1991.

Immediately after the test for the protection against water in EN 60529:1991, 14.2.4, which is part of the test programme for the enclosure protection IPX4, the appliance shall start. However, if the appliance does not come in to operation after this test, the appliance fitted with the minimum protection declared in the installation instructions shall start immediately after the tests of 6.12.

5.4 Main burner

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

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

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

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

5.5 Supplementary requirements for condensing water heaters

5.5.1 Materials in contact with condensate

All parts of the heat exchanger(s) and other parts of the appliance likely to come into contact with condensate shall be constructed of sufficiently corrosion resistant materials or materials protected by a suitable coating in order to ensure a reasonable life for a appliance that is installed, used and maintained in accordance with the technical instructions.

NOTE To improve recyclability, corrosion resistant material may be preferred over coated carbon steel materials, especially if coating hinders recycling.

5.5.2 Discharge of condensate

5.5.2.1 Requirements

Condensing appliances shall be fitted with a condensate discharge system of corrosion-resistant material or covered by a durable protection against corrosion.

Where disposal of condensate from the appliance is by gravity the internal diameter of the condensate discharge connection shall be at least 13 mm. If the appliance incorporates some form of pump assisted condensate disposal the size of the discharge from the appliance and connection to any point of gravity discharge shall be specified in the technical instructions. The disposal system, forming part of the appliance or supplied with the appliance, shall be such that:

- it can be easily inspected and cleaned in accordance with the technical instructions;
- it cannot transmit combustion products or let enter air into the room where the appliance is installed; this requirement is satisfied if the disposal system incorporates a water trap.

Surfaces in contact with condensates (except purpose provided drains, water traps and siphons) shall be designed to prevent condensate retention.

It shall be possible to service and clean the system easily. There may be a common condensate drain for flue gas exhaust and the condensing appliance.

5.5.2.2 Test conditions

By measurements, visual inspection or manual tests it is checked whether the requirements for the condensate discharge are fulfilled. It is considered that the requirements are fulfilled if the safety device responds when the flue gas discharge is covered in steps while repeatedly switching on and off the heat demand signal.

5.5.3 Control of the combustion products temperature

If the combustion products circuit contains materials that are likely to be affected by heat or is intended to be connected to a flue (including seals) that is likely to be affected by heat from the combustion products, the appliance shall incorporate a device to prevent the combustion products temperature exceeding the maximum allowable working temperature for the material as stated in the technical instructions.

The device for limiting the combustion products temperature shall be non-adjustable and shall not be accessible without tools.