

Specification for

Gas burning appliances —

Part 1: Gas burning appliances for instantaneous production of hot water for domestic use

This European Standard EN 26 was given, as from 30 September 1976, the status of a British Standard and will replace the corresponding requirements of BS 1250 and BS 2883.

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National foreword

The following conditions apply only to appliances manufactured for sale within the United Kingdom. If either or both of the conditions are invoked, compliance may be claimed with this specification as a British Standard, i.e. BS 5386-1, but not with this specification as a European Standard, i.e. EN 26.

- a) Notwithstanding the requirements given in this standard, any new designs, materials and methods of assembly giving at least equivalent results may be considered as complying with this standard when approved by a representative and recognized authority.
- b) Any new features incorporated in an appliance for which no provision for testing is made in this standard shall be examined and approved by a recognized and representative authority in the light of the manufacturer's claims.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, the EN title page, pages 2 to 44, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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English version

Gas burning appliances for instantaneous production of hot water for domestic use

(includes amendments A3:1984 + A4:1984)

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

(inclut les amendements A3:1984 + A4:1984)

Durchlauf-Wasserheizer für sanitäre
Brauchwasserbereitung mit gasförmigen
Brennstoffen

(enthält Änderungen A3:1984 + A4:1984)

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

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Brief history

European Standard EN 26 was drawn up by CEN Technical Committee CEN/TC 48 Gasfired Domestic Water Heaters, the secretariat of which was held by AFNOR.

A first edition of this standard then a second, including a Modification and an Addendum, were accepted by CEN on 1974-10-30 and on 1975-09-30, respectively.

This third edition, modified to take the amendment of February 1977 into account, was adopted by CEN on 1977-09-02 following its acceptance by the following member countries:

Belgium, Denmark, France, Germany, Ireland, Italy, Spain, United Kingdom.

Brief history

This amendment 3 of the European Standard EN 26 was drawn up by Technical Committee CEN/TC 48 "Domestic gas-fired water heaters, central heating boilers derived from these appliances and appliances combining these two types", the Secretariat of which was held by AFNOR.

It was adopted by CEN on 1984-03-09 following its acceptance by the following Member countries: Belgium, France, Germany, Greece, Ireland, Italy, Spain, United Kingdom.

Brief history

This amendment 4 of the European Standard EN 26 was drawn up by Technical Committee CEN/TC 48 "Domestic gas-fired water heaters, central heating boilers derived from these appliances combining these two types", the Secretariat of which was held by AFNOR.

It was adopted by CEN on 1984-03-09 following its acceptance by the following Member countries: Belgium, France, Germany, Greece, Italy, Portugal, Spain, United Kingdom.

1 General

1.1 Scope

This standard defines the main constructional and performance characteristics of gas burning appliances for the instantaneous production of hot water for domestic use.

It also sets out the appropriate test methods for evaluating these characteristics.

1.2 Field of application

This standard deals with appliances for the instantaneous production of hot water for domestic use, for which the nominal useful output is equal to or less than 28 kW, and meets the requirements of 1.4.3, capable of operating with the different gases specified in 1.4.1 and for which the method of evacuation of products of combustion conforms to 1.4.2.

For the purposes of this standard an appliance for the instantaneous production of hot water is one where the heating of the water is directly dependent upon the water flow.

The present standard does not apply:

- to boiling water appliances;
- to appliances fitted with a burner utilizing a fan;
- to appliances designed to be connected with mechanical extraction of the products of combustion;
- to appliances which serve the double function of space heating of buildings and the provision of domestic hot water.

1.3 Terminology

aerated flame, blue flame

the flame obtained by the combustion of gas previously mixed with air

appliance with sealed combustion circuit (room sealed appliance)

an appliance in which the combustion circuit (air intake, combustion chamber, exchanger, products outlet) is sealed in relation to the place where the appliance is installed

the appliance is:

- either connected to a special device in the outer wall by two ducts, one bringing in the combustion air and one evacuating the products (balanced flue);
- or connected to a common duct bringing in the combustion air and evacuating the products (Se-duct).

auxiliary equipment

embraces the accessory devices of an appliance, e.g. taps, flame failure and ignition devices, governors, thermostats, etc.

burner

a component which effects the gas/air mixing and ensures the gas combustion

it may be one of two types:

- aerated burner*: a burner in which all or part of the air necessary for combustion, called primary air, is entrained by the gas jet and is mixed with the gas before the burner port; the complement of air entrained at the port is called secondary air;
- non-aerated burner*: a burner in which the air necessary for combustion is entrained entirely direct from the atmosphere at the burner port.

draught-diverter

a device placed in the combustion products circuit of an appliance to reduce the influence of draught and down-draught on the burner performance and combustion

efficiency

the ratio of the useful output to the heat input, these two quantities being expressed in the same unit
symbol: η

electrical equipment

embraces the parts of an appliance, including their connections, which work by electricity

flame failure device

a device including a sensing element which causes the gas supply to a burner to be opened or closed according to the presence or absence of the flame which activates the sensing element

flame lift

a phenomenon characterized by the total or partial separation of the base of the flame from the burner port

flame stability

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

flue socket

the part of an appliance for connection to the flue, for evacuating the combustion products

gas governor

a device which provides a sensibly constant pressure or gas rate downstream when the upstream pressure is variable

gas rates

volume rate. The volume of gas passed in unit time, corrected to reference conditions i.e. dry, 15 °C and 1 013 mbar.

mass rate. The mass of gas passed in unit time under reference conditions.

these rates are determined in the steady state condition, when all the parts have reached thermal equilibrium

gas rate adjuster

a device allowing the gas rate to a burner to be set at a predetermined value according to the supply conditions

the operation of changing the setting of this device is called the adjustment of the gas rate

gas supply pressure, test pressure

the relative static pressure measured at the gas inlet connection of the appliance

gas-tap

a component allowing manual interruption of the supply of gas to a burner and pilot

gross calorific value (gross C.V.)

the quantity of heat produced by the combustion, at a constant pressure, of unit (volume or mass) of the gas considered, the combustion water condensed, under the same reference conditions as for the net C.V. it is expressed in MJ per m³ of dry gas, measured at 0 °C, 1 013 mbar, or per kg of dry gas

symbol: P_p

heat input

the product of the volume or mass rate and the calorific value (gross or net) of the gas brought to the same reference conditions

ignition device

a device to ignite one or more burners

it may be, for example:

either electric (resistance, spark, etc.);

or thermal (pilot).

injector

a component part which admits the gas into an aerated burner

light-back

the combustion of a flame in the body of a burner

mechanical joint (or mechanical means of obtaining soundness)

a connection device assuring soundness in an assembly of several parts, generally of metal, e.g. conical joints, O-rings or flat joints

net calorific value (net C.V.)

the quantity of heat produced by combustion at constant pressure of unit (volume or mass) of gas, the combustion products brought to 0 °C, but supposed to contain the water of combustion in the vapour state and the air necessary for the combustion considered as previously dry at 0 °C, the gas measured dry at 0 °C and under a pressure of 1 013 mbar

it is expressed in MJ per m³ of dry gas, measured at 0 °C, 1 013 mbar, or per kg of dry gas

symbol: l_p

nominal heat input

the heat input calculated from the nominal useful output, assuming a conventional efficiency of 0.84 (on net C.V.) and of 0.75 (on gross C.V.)

nominal useful output

the useful output declared by the manufacturer and having a value within one of the ranges stated in 1.4.3

nominal water rate

the rate obtained with the nominal useful output of the appliance, for a temperature rise of 25 °C

non-aerated, diffuse flame

the flame obtained by the combustion of gas which comes into contact with air at the moment of combustion

pilot

a small burner which ignites a main burner by means of a flame

relative density (relative to air)

the ratio of the masses of equal volumes of gas and air (dry, at 0 °C and at a pressure of 1 013 mbar)

symbol: d

restrictor

a device with a calibrated orifice, which is placed in the path of the gas flow between the inlet connection of the appliance and a burner, to create a pressure drop and thus reduce the gas pressure at the burner to a predetermined value for a given supply pressure

tap handle

a manually operated component used to open, partially open or close a tap

temperature selector

a device which allows the selection of the desired water flow temperature

useful output

the quantity of heat absorbed by the water drawn off, during unit time

water pressure

the relative static pressure measured at the water inlet connection of the appliance

water rate adjuster

a device allowing the water rate to be preset to a predetermined value according to supply conditions

wobbe number

the ratio of the calorific value of the gas to the square root of the relative density of the same gas

yellow tipping

a phenomenon characterized by the appearance of yellow coloration at the top of the blue cone of aerated flames

1.4 Classification

Appliances are classified according to:

- the nature of the gases used (categories);
- the method of products evacuation (types);

the nominal useful output;
the service water pressure.

1.4.1 Nature of the gases used (categories)

1.4.1.1 Classification of gases. Gases likely to be used are classified into three families according to the value of their Wobbe number (see terminology, 1.3).

1st family (manufactured gas of groups a and b)

Wobbe number between

23.8 and 31.4 MJ/m³ on gross C.V.

21.5 – 28.7 MJ/m³ on net C.V.

2nd family (natural gas of groups H and L)

Wobbe number between

41.3 and 57.9 MJ/m³ on gross C.V.

37.1 – 52.4 MJ/m³ on net C.V.

The family is sub-divided into two groups:

Group H

Wobbe number between

48.1 and 57.9 MJ/m³ on gross C.V.

43.4 – 52.4 MJ/m³ on net C.V.

Group L

Wobbe number between

41.3 and 47.3 MJ/m³ on gross C.V.

37.1 – 42.7 MJ/m³ on net C.V.

3rd family (LPG)

Wobbe number between

77.4 and 92.4 MJ/m³ on gross C.V.

72.0 – 85.3 MJ/m³ on net C.V.

1.4.1.2 Classification of appliances. Appliances are classified in categories according to the gases which they are designed to use. However, in each country, only some of the following categories are marketed, on account of the local conditions of gas distribution (gas nature and supply pressure). Requirements different from those defined in this standard for these categories shall not be specified.

Section 6 sets out the gas distribution and connection conditions applicable to each country and the equivalence rules for appliance categories from one country to another.

1.4.1.2.1 Categories I. Appliances designed exclusively to use gases in a single family and possibly only the gases of a single group at the prescribed inlet pressures.

a) *Appliances designed for 2nd family gases*

category I₂: an appliance capable of using all 2nd family gases; replacing a group H gas with a group L gas, or vice versa, shall not require any change to the appliance (not even a burner adjustment), but is accompanied by a modification of the supply pressure at the appliance inlet in order to maintain a constant heat input within $\pm 5\%$.

category I_{2HL}: an appliance capable of using all 2nd family gases, replacing a group H gas with a group L gas, or vice versa, requires an adjustment to the burners and possibly a change of injectors, the inlet supply pressure being kept constant or possibly changed.

category I_{2H}: an appliance for use with gases in group H of the 2nd family only.

category I_{2L}: an appliance for use with gases in group L of the 2nd family only.

b) *Appliances designed for 3rd family gases*

category I₃: an appliance capable of using all 3rd family gases (propane and butane).

1.4.1.2.2 Categories II. Appliances designed to use gases of two families at the prescribed inlet pressures.

a) *Appliances designed for 1st and 2nd family gases*

category II₁₂: an appliance capable of using all 1st and 2nd family gases (the utilization of 2nd family gases being under the same conditions as those in category I₂).

category II_{12HL}: an appliance capable of using all 1st and 2nd family gases (the utilization of 2nd family gases being under the same conditions as those in category *I_{2HL}*).

category II_{12H}: an appliance capable of using 1st family gases and those in group H of the 2nd family.

category II_{12L}: an appliance capable of using 1st family gases and those in group L of the 2nd family.

b) *Appliances designed for 2nd and 3rd family gases*

category II₂₃: an appliance capable of using all 2nd and 3rd family gases (the utilization of 2nd family gases being under the same conditions as those in category *I₂*).

category II_{2HL3}: an appliance capable of using all 2nd and 3rd family gases (the utilization of 2nd family gases being under the same conditions as those in category *I_{2HL}*).

category II_{2H3}: an appliance capable of using gases in group H of the 2nd family and all 3rd family gases.

category II_{2L3}: an appliance capable of using gases in group L of the 2nd family and all 3rd family gases.

1.4.1.2.3 Category III. Appliances designed to use the gases of all three families at the prescribed inlet pressures.

1.4.2 Method of products evacuation (types). Appliances are classified into several types, according to the method of evacuating the products of combustion and admitting the combustion air:

type A^a: an appliance not connected to a flue or other device for evacuating the products of combustion

type B: an appliance designed to be connected to a flue

type C: an appliance with a sealed combustion circuit

type C₁: an appliance with a sealed combustion circuit connected directly to the air outside the room by means of a balanced flue terminal

type C₂: an appliance with a sealed combustion circuit connected indirectly to the air outside the room by means of a common duct bringing in the combustion air and evacuating the products

^a Only small water heaters defined in 1.4.3 may be of type A (see 2.1.7.1).

1.4.3 Nominal useful output¹⁾. Appliances are classified according to their nominal useful output:

small water heater: an appliance which has a nominal useful output between 8 and 9 kW^a;

large water heater (bath water heater): an appliance which has a nominal useful output within one of the following ranges:

17 – 18 kW

21 – 23 kW

26 – 28 kW.

^a In anticipation of the possible standardization of a second value of nominal useful output of small water heaters, national authorities may standardize nominal useful outputs between 9 and 17 kW provided that such outputs correspond to the current practice in the particular country (see 6.5).

Such an appliance is subject to all the clauses in the present specifications for small water heaters, but referred to the nominal useful output at which it is sold.

1.4.4 Water pressure. Appliances are classified according to the water pressure in the appliance as:

1.4.4.1 Inlet control appliance. The draw off tap is placed upstream of the appliance which is designed to deliver a free flow of water.

1.4.4.2 Low pressure appliance. The draw off tap is placed downstream of the appliance which is designed to be connected to the water supply at a pressure not exceeding 2.5 bar.

1.4.4.3 Normal pressure appliance. The draw off tap is placed downstream of the appliance which is designed to be connected to the water supply at a maximum pressure of 10 bar.

1.4.4.4 High pressure appliance. The draw off tap is placed downstream of the appliance which is designed to be connected to the water supply at a maximum pressure of 13 bar.

¹⁾ In those countries where the outputs have not been standardized and where standardized outputs exist but do not correspond to those given here, this clause is not mandatory until 1 January 1978.

2 Constructional characteristics

2.1 General

2.1.1 Conversion to different gases. In accordance with the definitions given in 1.4.1.2.1, 1.4.1.2.2 and 1.4.1.2.3, the only acceptable operations for converting from a gas of one group or family to a gas of another group or family and/or for adapting to the different gas distribution pressures are given below for each category.

The operations should be possible without disconnecting the appliance.

2.1.1.1 Categories I

category I₂: no alteration to the appliance.

category I_{2HL}: adjustment of the gas rate, with if necessary a change of injectors or restrictors.

Adjustment of the gas rate of ignition pilots of safety devices either by regulating an adjuster or by replacement of injectors or calibrated orifices.

categories I_{2H} and I_{2L}: no alteration to the appliance.

category I₃: change of injectors or restrictors, but only to convert from one pressure couple to another (for example: 28 mbar/37 mbar $\rightleftharpoons$ 50 mbar/67 mbar).

2.1.1.2 Categories II

categories II₁₂, II_{12HL}, II_{12H} and II_{12L}: adjustment of gas rate with, if necessary, a change of injectors or restrictors.

Adjustment of the gas rate of ignition pilots of safety devices either by regulating an adjuster or by a change of injectors or calibrated orifices and if necessary complete change of pilot, ignition burners, filament ignition device, or some of their parts.

Immobilizing the governor for gases of the 2nd family is mandatory in the case of appliances in category II₁₂ but optional for other categories.

These adjustments or change of parts are only acceptable when converting from a 1st family gas to a 2nd family gas, or vice versa. For category II_{12HL} they are also acceptable in converting within the same family from a gas of one group to a gas of the other group.

categories II₂₃, II_{2HL3}, II_{2H3} and II_{2L3}: changes of injectors or restrictors. Change of pilot injector and calibrated orifices and, if necessary, complete change of pilot, ignition burners, filament ignition device, or of some of their parts.

For 3rd family gases it is mandatory to immobilize the governor and the burner and pilot gas rate adjusters, where present. Possible change of the automatic valve.

These adjustments or replacements of parts are only acceptable:

- to convert from a gas of one family to a gas of another family;

- to convert from one butane, propane pressure couple

- to another, for example:

- 28 mbar/37 mbar $\rightleftharpoons$ 50 mbar/67 mbar;

For category II_{2HL3} adjustments of the burner and pilot gas rate by the appropriate adjusters are acceptable for 2nd family gases.

2.1.1.3 Category III.

Adjustment of gas rate with, if necessary, a possible change of injectors or restrictors.

Adjustment of the gas rate of safety ignition pilots either by an adjuster or by a change of injectors or calibrated orifices and, if necessary, a complete change of pilot, ignition burners, filament ignition device, or of some of their parts.

Immobilizing the governor is mandatory for 3rd family gases, but optional for gases of the 2nd family.

For gases of the 3rd family, immobilizing the pilot and burner gas rate adjusters, where present.

These operations are acceptable for converting from a gas of one family to a gas of another family, and in 1st and 2nd families for converting from a gas of one group to a gas of the other group.

Within the 3rd family a change of parts is also acceptable for converting from one pressure couple to another (for example: 28 mbar/37 mbar $\rightleftharpoons$ 50 mbar/67 mbar).

2.1.2 Materials. Provided that the appliance is installed according to the instructions, the quality and thickness of the materials used in its manufacture shall be such that under normal conditions of use, maintenance or adjustment, they shall withstand the mechanical, chemical and thermal conditions to which they may be submitted during a reasonable working life.

Sheet metal parts not made of corrosion-resistant material shall be enamelled or coated with another effective protection against corrosion.

Parts in contact with water shall be made of materials of such quality as will not pollute the water.

2.1.3 Assembly: strength. All parts shall be made and so assembled that the performance characteristics of an appliance will not alter significantly during a reasonable life and in normal conditions of installation and use.

2.1.4 Accessibility: ease of maintenance: removal and replacement. It shall be possible to clean without difficulty the combustion chamber and walls in contact with the products of combustion.

Appliances shall be designed so as to avoid any leak of condensate.

It shall not be possible to replace parts which are removable for maintenance in a way that could impair the safe performance of the appliance.

In particular the soundness of the combustion chamber, as defined in 3.1.2, shall be assured after re-assembly following maintenance or cleaning.

It shall be possible to install an appliance intended to be fixed to a wall with an appropriate means of fixing, such as clamps, hooks, screws, etc. Appliances, with the exception of those of type C, shall be supplied with a case. Where a case is present it shall protect, at least, the heating body and the burner. Removable parts, for example the burner or the heating body, shall be dismountable with the appliance remaining in position, using ordinary tools such as a screwdriver or spanner.

2.1.5 Connections

2.1.5.1 Internal connections and screws. Whenever possible, threads conforming to ISO/R 7:1954 ²⁾ or ISO/R 228:1961 ²⁾ should be used for all connections on internal gasways and waterways.

The use by the manufacturer of ISO metric screw threads on the appliance is recommended.

2.1.5.2 Gas connections. The gas inlet connection shall permit a rigid connection.

If the inlet connection is threaded, the threads shall conform to ISO/R 228:1961 (connections without pressure tight joints made on the thread) or to ISO/R 7:1954 (connections with pressure tight joints made on the thread). In the former case, the end of the inlet connection shall be sufficiently flat to allow the inter-position of a sealing washer.

In all cases the thread dimensions of the connection shall be chosen in relation to the nominal useful output of the appliance and of its category.

Table 1 gives the usual size of thread to be used. The sizes agree with those given in ISO/R 228:1961 or ISO/R 7:1954 (diameter, pitch, depth of thread).

It shall be possible to connect a category I₃ appliance either by a compression union, a conical joint or a flat joint, using pipe of internal diameter 6 mm and external diameter 8 mm for a small water heater and internal diameter 10 mm, external diameter 12 mm for a large water heater.

If the inlet connection is a straight copper tube, it shall be at least 5 cm long conforming to the dimensions given in Table 2.

²⁾ ISO/R 7:1954 "Pipe threads for gas list tubes and screwed fittings where pressure-tight joints are made on the threads ($\frac{1}{8}$ in to 6 in)

ISO/R 228:1961 "Pipe threads where pressure-tight joints are not made on the threads ($\frac{1}{8}$ in to 6 in)".

Table 1 — Gas connection thread sizes (see 2.1.5.2)

	Usual size of thread (definitions are given in ISO/R 228:1961 or ISO/R7:1954 ^a)	
	Categories II ₁₂ , II _{12HL} , II _{12H} , II _{12L} and III	Categories I ₂ , I _{2HL} , I _{2L} , I _{2H} , II ₂₃ , II _{2HL3} , II _{2H3} and II _{2L3}
Small water heater 8 to 9 kW	1/2	1/2
Large water heater 17 to 18 kW 21 to 23 kW 26 to 28 kW	3/4 1 1	1/2 1/2 3/4

^a ISO/R 7:1954 "Pipe threads for gas list tubes and screwed fittings where pressure-tight joints are made on the threads (1/8 in to 6 in)"
ISO/R 228:1961 "Pipe threads where pressure-tight joints are not made on the threads (1/8 in to 6 in)".

Table 2 — Gas connection copper tube sizes (see 2.1.5.2)

	Size of copper tubes (for definitions see ISO/R 274:1962 ^a)			
	Categories II ₁₂ , II _{12HL} , II _{12H} , II _{12L} and III		Categories I ₂ , I _{2HL} , I _{2L} , I _{2H} , II ₂₃ , II _{2HL3} , II _{2H3} and II _{2L3}	
	dia.	thickness	dia.	thickness
Small water heater 8 to 9 kW	15 mm	0.7 mm	15 mm	0.7 mm
Large water heater 17 to 18 kW 21 to 23 kW 26 to 28 kW	22 mm 22 mm 22 mm	0.9 mm 0.9 mm 0.9 mm	15 mm 15 mm 22 mm	0.7 mm 0.7 mm 0.9 mm

^a ISO/R 274:1962 "Copper tubes of circular section. Dimensions: metric series"

2.1.5.3 Water connections. If the connection to the water supply is made by threads they shall meet the requirements given in Table 3.

Table 3 — Water connection thread sizes (see 2.1.5.3)

	Water connection	Designation of connections (see ISO/R 228:1961)
Small water heater 8 to 9 kW	Inlet connection Any additional outlet connection	1/2 3/8
Large water heater 17 to 18 kW, 21 to 23 kW and 26 to 28 kW	Inlet connection Outlet connection	1/2 1/2

NOTE A low pressure appliance with an output of 21 to 23 kW or 26 to 28 kW
* ISO/R 228:1961 "Pipe threads where pressure-tight joints are not made on the threads (1/8 in to 6 in)"

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.

If the connection is a straight copper tube, it shall be at least 5 cm long conforming to the dimensions given in Table 4.