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Ocenjevanje rabe energije**

Gas-fired domestic appliances producing hot water - Part 2: Assessment of energy consumption

Gasgeräte für die häusliche Warmwasserbereitung - Teil 2: Bewertung des Energieverbrauchs

Appareils domestiques produisant de l'eau chaude sanitaire utilisant les combustibles gazeux - Partie 2 : Évaluation de la consommation énergétique

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**Gas-fired domestic appliances producing hot water - Part
2: Assessment of energy consumption**

Appareils domestiques produisant de l'eau chaude
sanitaire utilisant les combustibles gazeux - Partie 2 :
Évaluation de la consommation énergétique

Gasgeräte für die häusliche Warmwasserbereitung -
Teil 2: Bewertung des Energieverbrauchs

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EN 13203-2:2022 (E)**European foreword**

This document (EN 13203-2:2022) has been prepared by Technical Committee CEN/TC 109 “Central heating boilers using gaseous fuels”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2023, and conflicting national standards shall be withdrawn at the latest by February 2023.

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 13203-2:2018.

The main technical changes compared to EN 13203-2:2018 are the following:

- improvement of editorial errors;
- incorporation of ECOTESTS results;
- alignment of the text with the relevant Eco-design and Energy Labelling provisions in force.

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

For relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, ZB, ZC or ZD, which is an integral part of this document.

The main purpose of this revision is to provide a means of conforming to requirements of Commission Delegated Regulation (EC) n° 813/2013, (EC) n° 811/2013, (EC) n° 812/2013 and (EC) n° 814/2013.

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, Turkey and the United Kingdom.

Introduction

The safety operation of the boiler or water heater is not covered by this document. Safety is proved by means of the essential safety requirements of the Gas Appliances Regulation 2016/426/UE. This may be achieved by compliance with the appropriate existing harmonized standards.

NOTE Useful standards are EN 26, EN 89, EN 15502-1, EN 15502-2-1 and EN 15502-2-2.

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EN 13203-2:2022 (E)

1 Scope

This document is applicable to gas-fired appliances producing domestic hot water. It applies to both instantaneous and storage tank appliances; waters-heaters and combination boilers that have:

- a heat input not exceeding 400 kW;
- a hot water storage tank capacity (if any) not exceeding 2 000 l.

In the case of combination boilers, with or without storage tank, domestic hot water production is integrated or coupled, the whole being marketed as a single unit.

The water heaters covered by the present standard are considered “conventional water heaters” as defined by the Transitional Methods (Commission Communication 2014/C 207/03) then in the calculation formula for the Annual Electricity Consumption (AEC), Q_{cor} is equal to zero.

In case of the boiler is equipped with an internal or external Passive Flue Heat Recovery Device (PFHRD), the boiler efficiency can be assessed by applying EN 13203-2:2022 in combination with EN 13203-7:2022. In case of a PFHRD, where the technology has the ability to recover energy out of flue gasses during central heating production to be able to preheat the domestic hot water (indirect contribution), to assess this indirect contribution EN 13203-7:2022 applies. EN 13203-2:2022 is applicable for measuring and calculating the direct efficiency (direct contribution) while combining the measuring results of EN 13203-7:2022 the overall efficiency (direct and indirect) can be calculated. EN 13203-1:2015 sets out in qualitative and quantitative terms the performance in delivery of domestic hot water for a selected variety of uses. It also gives a system for presenting the information to the user. The present document sets out a method for assessing the energy performance of the appliances. It specifies a few daily load profiles for each domestic hot water use, kitchen, shower, bath and a combination of these, together with corresponding test procedures, enabling the energy performances of different gas-fired appliances to be compared and matched to the needs of the user. Where other technologies are combined with a gas-fired boiler or a water heater to produce domestic hot water, specific parts of EN 13203 apply.

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 13203-7:2022, *Gas-fired domestic appliances producing hot water — Part 7: Assessment of energy consumption of combination boilers equipped with a passive flue heat recovery device*

3 Terms and definitions

For the purposes 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 <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

storage tank

reservoir for domestic hot water

3.2**nominal domestic hot water heat input (Q_{nw})**

value of the heat input to produce domestic hot water stated in the instructions

— Symbol: Q_{nw}

— Unit: kilowatt (kW)

3.3**summer mode**

conditions during which the appliance supplies energy only for the production of domestic hot water

3.4**winter mode**

conditions during which the combination boiler supplies energy for the production of domestic hot water and space heating

3.5**domestic water test temperature (T_{cold})**

temperature of the delivered water at which the tests are conducted

3.6**control cycle**

time cycle for keeping components and/or the storage tank (if any) of the domestic hot water circuit at predetermined temperature level, consists of an «ON» duration time during which the heating of the domestic hot water (by gas energy and/or auxiliary energy) is operating, and an «OFF» duration time during which no heating occurs

3.7**useful water**

quantity of water delivered at the tap for which the temperature increase is in accordance with the requirement fixed for each individual delivery of the load profiles

3.8**wasted water**

quantity of water delivered at the tap for which the temperature increase is not in accordance with the requirement fixed for each individual delivery of the load profiles

3.9**standby mode**

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

Note 1 to entry: During standby mode appliance may operate to maintain water temperature but no draw-off is made.

3.10**off mode**

state of an appliance, selected by the user, in which domestic hot water cannot be provided

3.11**useful water flow rate (D_{useful})**

quantity of water delivered by unit time at the tap for which the temperature increase is in accordance with the requirement fixed for each individual draw-off of the load profiles

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3.12

useful water temperature

water temperature, expressed in degrees Celsius, delivered at the tap

3.13

appliance flow rate

quantity of water delivered by the appliance by unit time before the mixing device, if applicable

3.14

appliance water temperature (T_d)

water temperature, expressed in degrees Celsius, delivered by the appliance before the mixing device

3.15

appliance water temperature rise (ΔT_d) in K

measured useful temperature rise at the appliance outlet

3.16

water temperature rise (ΔT_m) in K

difference between the useful water temperature and the cold water temperature, at which hot water is contributing to the reference energy as specified in the load profiles

3.17

water temperature rise for basin draw-off types (ΔT_p) in K

difference between the useful water temperature and the cold water temperature, to be achieved during the water draw-offs, with a minimum value as specified in the load profiles

Note 1 to entry: The minimum temperature difference for basin draw-offs as specified in the load profiles shall be achieved at least once during the water draw-offs. [EN 13203-2:2022](https://standards.iteh.ai/catalog/standards/sist/59f376a4-06b5-4087-8794-378734b34b6d/sist-en-13203-2-2022)

3.18

rapid response temperature sensor

measuring instrument with a response time such that 90 % of the final temperature rise, from 15 °C to 100 °C, is obtained within 1 s, when the sensor is plunged into still water

Note 1 to entry: This time is chosen for dynamic measurement and not for steady-state purpose.

4 General test conditions

4.1 Reference conditions

Unless otherwise stated, the general test conditions shall be as follows:

- cold water temperature: 10 °C
 - range over the whole duration of the test: (8 °C to 12 °C),
- cold water pressure: 2 bar
- ambient air temperature: 20 °C
 - range over the whole duration of the test: (18 °C to 22 °C),
- electrical supply voltage: (230 ± 2) V (single phase).

4.2 Measurement uncertainties

4.2.1 General

Except where otherwise stated in the clauses describing the tests, the uncertainties of measurements carried out shall not be greater than the maximum uncertainties indicated below.

The standard deviations shall be evaluated taking into account the various sources of uncertainty: contribution from the instrument, repeatability, calibration, ambient conditions, etc.

- water flow rate: $\pm 1 \%$;
- gas flow rate: $\pm 1 \%$;
- time: $\pm 0,2 \text{ s}$;
- temperatures:
 - ambient: $\pm 1 \text{ K}$,
 - water: $\pm 0,5 \text{ K}$,
 - gas: $\pm 0,5 \text{ K}$;
- gas pressure: $\pm 1 \%$;
- gas calorific value: $\pm 1 \%$;
- gas density: $\pm 0,5 \%$;
- electrical energy: $\pm 2 \%$.

The stated measurement uncertainties relate to individual measurements. For measurements that combine several individual measurements, smaller uncertainties on the individual measurements may be necessary to ensure a total uncertainty within $\pm 2 \%$ under the steady-state conditions as specified by 4.2.2.

These uncertainties correspond to two standard deviations (2σ).

4.2.2 Steady-state conditions

Steady-state operating conditions are regarded as established when the appliance operates for sufficient time to reach thermal stabilization.

To reach the steady-state the water temperature at the outlet of the appliance shall not vary by more than $\pm 0,5 \text{ K}$.

NOTE This condition can be reached with a gas which is different from the reference gas, provided that the appliance is supplied with the reference gas for at least 5 min before the requirements are verified.

4.3 Test conditions

4.3.1 General

Except where otherwise stated, the appliance is tested under the following conditions.

For combination gas boiler, the tests shall be carried out only in summer mode as defined in 3.3, and the appliance shall be set in summer mode.

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For all tests specified by this standard, the same adjustment of the appliance shall be maintained.

The load profile used for the measurement shall be the one declared according to the technical instruction of the appliance (see also Annex C (informative)).

The tests shall be performed in the setting in which the appliance is delivered (out of the box-mode), and which is documented as such in the technical instructions.

If there are temporary user's settings (automatically self-resetting within 24 h), these shall not be active.

Annex A (informative) gives examples of test cycles for different test conditions.

4.3.2 Test room

The appliance shall be installed in a well-ventilated, draught-free room (air speed less than 0,5 m/s).

The appliance shall be protected from direct solar radiation and radiation from heat generators.

Annex B (informative) gives examples of test rig and measurement devices.

4.3.3 Water supply

For the tests:

- the domestic water pressure is the inlet water pressure measured as close as possible to the appliance (see example at Figure B.2);
- the inlet and outlet temperatures of the domestic water shall be measured in the centre of the flow and as close as possible to the appliance (see examples at Figure B.3 and Figure B.4) and always upstream of the electro-valve (tap).

The inlet temperatures shall be measured immediately upstream of the water inlet connection. Except where otherwise stated, the outlet temperatures shall be measured immediately downstream of the outlet connection or, in the case of an appliance with spout delivery, by means of an immersed temperature measuring device, e.g. a u-tube fitted at the outlet of a tube of the same length as the minimum length of the spout normally supplied together with the appliance.

Water temperatures shall be measured with a rapid response temperature sensor.

4.3.4 Initial adjustment of the appliance

The appliance shall be installed in accordance with the installation instructions.

The heat input shall be adjusted to within $\pm 2\%$ of the nominal domestic hot water heat input.

The initial adjustment of the appliance water temperature (T_d) shall be as follows (see Figure A.1 and Figure A.2):

- a) Appliances with an adjustable temperature: the tests shall be carried out at a temperature not greater than $65\text{ }^{\circ}\text{C}$, with a temperature increase equal or greater than 45 K above the water inlet temperature. For the load profile XS the minimum temperature setting shall be equal to or greater than $35\text{ }^{\circ}\text{C}$ ($\Delta T\text{ }25\text{ K}$ above water inlet temperature).
- b) Appliances with a fixed temperature: the tests shall be carried out at the temperature specified in the appliance documentation, with a temperature increase equal or greater than 45 K above the water inlet temperature. For the load profile XS the minimum temperature setting shall be equal to or greater than $35\text{ }^{\circ}\text{C}$ ($\Delta T\text{ }25\text{ K}$ above water inlet temperature).

NOTE The test conditions of 4.3.1 are applicable.

The same conditions of initial adjustment stated in the appliance documentation shall be used for all the tests.

These conditions shall be included in the test report.

4.3.5 Conditions for the determination of the maximum load profile

The measurement of the domestic hot water efficiency shall be performed with the maximum load profile or the one just below this load profile:

- a) instantaneous appliances shall be set to the nominal heat input as stated on the data plate. If the user instructions specify that it is possible to adjust the outlet temperature, this temperature shall be set to the maximum possible value not exceeding 65 °C;
- b) storage appliances shall be set to the nominal heat input as stated on the data plate. If the user instructions specify that different modes are possible to be selected, the one that is able to store more energy and that delivers more hot water during a 24 h period shall be used.

NOTE See Annex C (informative).

In case of declared maximal load profile 3XL or 4XL the load profile for testing should be XXL.

The load profile as used for the domestic hot water performance test shall be stated in the user instructions.

4.3.6 Electrical supply

The appliance shall be supplied with the nominal voltage stated in the installation instructions.

5 Determination of the energy consumption of the appliance

5.1 General

This clause specifies the test methods to be employed in determining the energy consumption of appliances.

5.2 Load profiles

All patterns specify a 24 h measurement cycle and within that cycle the starting times and the total energy content (in kWh equivalent of hot water tapped) of each draw-off are specified.

Furthermore, the draw-off can be characterized in two ways, either “basin” type draw-off, versus “continuous flow” draw-off.

The aim of the “basin” type is to arrive at an average temperature of the tub, so all supplied energy can be considered useful from the very beginning of the draw-off (minimum useful temperature rise is 0 K). The temperature rise (ΔT_p) to be achieved during tapping, shall be 30 K for floor cleaning and bath and 45 K for the dish washes.

The aim of the “continuous flow” type is to use only the water equal and above a fixed useful temperature rise (ΔT_m). For the shower, household cleaning and large draw-offs a temperature rise of 30 K shall be reached before counting the useful energy. For the small draw-offs a temperature rise (ΔT_m) of 15 K shall be reached.

NOTE 1 The temperature rises (in K) based on 10 °C inlet water temperature stated above are equivalent to the temperatures (in °C) given by the load profiles tables in Regulations n° 811/2013, n° 812/2013, n° 813/2013 and n° 814/2013. The tapping flow rates used to perform the different draw-offs of each of the eight load profiles are specified by Tables 1 to 8.