



SLOVENSKI STANDARD

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Plinske gospodinjske naprave za pripravo tople sanitarne vode - 1. del: Ocenjevanje zmogljivosti priprave tople vode

Gas fired domestic appliances producing hot water - Part 1: Assessment of performance of hot water deliveries

Gasbeheizte Geräte für die sanitäre Warmwasserbereitung für den Hausgebrauch - Teil 1: Bewertung der Leistung der Warmwasserbereitung

Appareils domestiques produisant de l'eau chaude sanitaire utilisant les combustibles gazeux - Partie 1 : Évaluation de la performance en puisage d'eau chaude

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EUROPEAN STANDARD

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Gas fired domestic appliances producing hot water - Part 1: Assessment of performance of hot water deliveries

Appareils domestiques produisant de l'eau chaude
sanitaire utilisant les combustibles gazeux - Partie 1 :
Évaluation de la performance en puisage d'eau chaude

Gasbeheizte Geräte für die sanitäre
Warmwasserbereitung für den Hausgebrauch - Teil 1:
Bewertung der Leistung der Warmwasserbereitung

This European Standard was approved by CEN on 14 August 2015.

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COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 13203-1:2015) 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of an identical text or by endorsement, at the latest by March 2016, and conflicting national standards shall be withdrawn at the latest by March 2016.

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

This document supersedes EN 13203-1:2006.

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

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

The main changes in this revision are the following:

- The title of this standard has been changed to: "Gas fired domestic appliances producing hot water — Part 1: Assessment of performance of hot water deliveries";
- "heat input not exceeding 70 kW" was removed from the title but remains unchanged in the scope;
- "300 litres water storage" has been removed from the title and the scope is changed as following: hot water storage capacity (if any) not exceeding 500 l;
- A new Clause 7 is added: "7 Eco design Related Products Data";
- An informative Annex ZA is added for the relationship between this European Standard and the requirements of Commission Regulation (EU) n° 814/2013.

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

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

EN 13203-1:2015 (E)**1 Scope**

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

- heat input not exceeding 70 kW; and
- hot water storage capacity (if any) not exceeding 500 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.

This European Standard 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.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Not applicable.

3 Terms and definitions

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

3.1 control cycle

time cycle for keeping components and/or the hot storage water 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 auxiliary energy) is operating, and an «OFF» duration time during which no heating occurs

3.2 domestic water mean temperature

average temperature of the water delivered during the time Δt

$$T_m = \frac{1}{\Delta t} \int T \cdot dt$$

Note 1 to entry: SYMBOL = T_m

3.3 domestic water test temperature

temperature of the delivered water at which the tests are conducted

3.4 storage tank

reservoir for domestic hot water

3.5**kitchen specific rate**

domestic hot water rate corresponding to a mean temperature rise of 45 K that the appliance can supply

Note 1 to entry: SYMBOL = D_c

Note 2 to entry: D_c is expressed in litre per minute (l/min)

3.6**minimum declared water rate**

lowest water rate stated by the manufacturer maintaining a stable temperature

Note 1 to entry: SYMBOL = D_m

Note 2 to entry: D_m is expressed in litre per minute (l/min)

3.7**nominal domestic hot water heat input**

value of the heat input stated by the manufacturer for the production of domestic hot water

Note 1 to entry: SYMBOL = Q_{nw}

Note 2 to entry: Q_{nw} is expressed in kilowatt (kW)

3.8**overall performance factor**

numerical value used to quantify the overall performance associated with domestic hot water use, corresponding to the sum of the products of the particular performance factors multiplied by the weighting coefficients

Note 1 to entry: SYMBOL = F

$$F = \sum_{i=1}^n a_i \cdot f_i$$

3.9**particular performance factor**

numerical value which quantifies each of the performance criteria listed in Table 1

Note 1 to entry: SYMBOL = f_i

3.10**specific rate**

domestic hot water rate declared by the manufacturer corresponding to a mean temperature rise of 30 K that the appliance can supply in two successive delivery periods

Note 1 to entry: SYMBOL = D

Note 2 to entry: D is expressed in litre per minute (l/min)

3.11**summer mode**

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

EN 13203-1:2015 (E)**3.12****tapping capability**

hot water delivery rate, declared by the manufacturer, at which water can be drawn off for a specified time or times (5 min; 10 min; 20 min or continuous) with a predetermined temperature rise

Note 1 to entry: SYMBOL = R

Note 2 to entry: R is expressed in litre per minute (l/min)

3.13**temperature fluctuation at a constant water rate**

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

Note 1 to entry: SYMBOL = ΔT_2

Note 2 to entry: ΔT_2 is expressed in Kelvin (K)

3.14**temperature fluctuation between successive deliveries**

maximum domestic hot water temperature difference between successive deliveries

Note 1 to entry: SYMBOL = ΔT_3

Note 2 to entry: ΔT_3 is expressed in Kelvin (K)

3.15**temperature stabilization time following a variation of the water flow rate**

time taken to obtain a predetermined fluctuation, following a rapid variation of the water flow rate

Note 1 to entry: SYMBOL = t_s

Note 2 to entry: t_s is expressed in second (s)

3.16**temperature variation according to water rate**

variation of the mean hot water temperature consequent upon variations of the water flow rate

Note 1 to entry: SYMBOL = ΔT_1

Note 2 to entry: ΔT_1 is expressed in Kelvin (K)

3.17**waiting time**

time taken to reach, at appliance outlet, 90 % of the domestic hot water temperature rise of 45 K without subsequently falling below 34 K

Note 1 to entry: SYMBOL = t_m

Note 2 to entry: t_m is expressed in second (s)

3.18**weighting coefficient**

numerical coefficient used to quantify the importance given to each particular performance factor in connection with the use of domestic hot water

Note 1 to entry: SYMBOL = a_i

3.19

rapid response thermometer

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

4 General test conditions

4.1 Reference conditions

Unless otherwise stated, the general test conditions are as follows:

- cold water temperature: 10 °C;
 - maximum average variation over the test period: ± 2 K
- cold water pressure: $(2 \pm 0,1)$ bar;
- ambient air temperature: 20 °C;
 - maximum average variation over the test period ± 1 K
 - maximum variation during the tests ± 2 K
- electrical supply voltage: (230 ± 2) V (single phase).

4.2 Measurement uncertainties

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 take account the various sources of uncertainty: contribution from the instrument, repeatability, calibration, ambient conditions, etc.

- water rate: ± 1 %;
- gas rate: ± 1 %;
- time: $\pm 0,2$ s;
- temperatures:
 - ambient: ± 1 K;
 - water: $\pm 0,5$ K;
 - gas: $\pm 0,5$ K;
- mass: $\pm 0,5$ %;
- gas pressure: ± 1 %;
- gas calorific value: ± 1 %;
- gas density: $\pm 0,5$ %;

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- electrical energy: $\pm 2\%$.

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

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

4.3 Test conditions**4.3.1 General**

Except where otherwise stated, the appliance shall be tested under the following 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.

4.3.3 Water supply

For the tests:

- domestic water pressure is the static inlet pressure under dynamic conditions measured as close as possible to the appliance;
- 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.

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 by the manufacturer.

The hot water temperature shall be measured with a rapid response thermometer.

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

4.3.4 Steady state

Steady state operating conditions shall be regarded as established when the appliance operates for sufficient time to reach thermal stabilization. The steady state is reached when the water temperature at the outlet does not vary by more than $\pm 0,5$ K.

NOTE 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 at least 5 min before the requirements are verified.

4.3.5 Initial adjustment of the appliance

The appliance shall be installed in accordance with the manufacturer's instructions.

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

The delivered water temperature at the appliance outlet is defined as follows (see Figures A.1 and A.2):

- a) appliances with an adjustable temperature: the tests shall be carried out at a temperature not greater than 65 °C, with a minimum temperature increase equal to or greater than 45 K above water inlet temperature.
- b) appliances with a fixed temperature: the tests shall be carried out at the temperature specified by the manufacturer, with a minimum temperature increase equal to or greater than 45 K.

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.

4.3.6 Initial state conditions

All the tests of this standard shall be conducted as follows (see Figures A.3 and A.4):

- when there is no control cycle to consider: at least one hour after the previous delivery;
- when there is a control cycle to consider : after a time corresponding to 20 % (but not exceeding 1 h) of the "OFF" time of the burner. The time is taken from the time the burner turns off in the control cycle.

The same initial state conditions shall be used for all the tests. These conditions shall be included in the test report.

For appliances with a central heating function, tests shall be conducted in summer mode.

4.3.7 Electrical supply

The appliance shall be supplied with the nominal voltage or a voltage included within the range of nominal voltages stated in the installation instructions.

5 Characterisation of the domestic hot water function of appliances

5.1 General

The domestic hot water function shall be characterised in two different ways:

- firstly, according to the domestic hot water specific rates, the tapping capability and the corresponding uses (see 5.2);
- secondly, according to the quality of the domestic hot water produced (see 5.3); obtaining a number of stars corresponding to a determined level of performance.

5.2 Characterisation according to the domestic hot water rates

5.2.1 Specific rate

5.2.1.1 Requirement

The measured value of the specific rate shall be not lower than 95 % of that stated by the appliance documentation.

5.2.1.2 Test

The appliance shall be adjusted to deliver hot water at the rate stipulated by the installation instructions for this test.

The pressure loss across the appliance shall not exceed 2 bar.

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During the measurement of the specific rate, the minimum temperature increase shall be equal to or greater than 30 K.

Before the test, the appliance shall be adjusted in accordance with 4.3.5. A first delivery shall be carried out over a period of 10 min, followed by 20 min with no delivery and then by a second delivery over a period of 10 min (see Figures A.5 and A.6).

Measurements of temperature and flow rate shall be made and recorded, at intervals not exceeding 2 s. A plot of temperature against time is made to obtain the mean water temperature rise during each delivery.

For each delivery the following shall be calculated by the formula:

$$D_i = \frac{m_{i(10)}}{10} \cdot \frac{\Delta T}{30} \quad (1)$$

where

- D_i is the calculated rate for each delivery; D_1 and D_2 are determined respectively during the first and second deliveries, in litre per minute (l/min)
- $m_{i(10)}$ is the quantity of water collected during the first or second delivery with a minimum temperature rise of 30 K, in litre (l);
- ΔT is the mean temperature rise of the collected water, in Kelvins (K) during the first and second deliveries

If the difference between D_1 and D_2 does not exceed numerically 10 % of their average value then

$$D = \frac{D_1 + D_2}{2} \quad (2)$$

where D is the determined specific rate.

If the difference between D_1 and D_2 exceeds numerically 10 % of their average value, then D is the lower value.

The kitchen specific rate (D_C) shall be calculated by the formula:

$$D_C = D \cdot \frac{30}{45} \quad (3)$$

NOTE When the water temperature is adjustable, additional measurement of the specific rate with a delivery temperature can be specified by the appliance documentation.

5.2.2 Tapping capability

5.2.2.1 Requirement

The appliance shall be capable of delivering water at the rate stated in the appliance documentation with a temperature rise not less than 30 K, for the standard time of 10 min and continuously. Additional flow rate times of 5 min and 20 min can be used in accordance to the appliance documentation.

The tapping capability corresponding to these time periods shall be available to the consumer.

The measured tapping capability shall not be more than 5 % below the value stated by the appliance documentation.