SLOVENSKI STANDARD
SIST EN 13203-4:2017

01-april-2017

Plinske gospodinjske naprave za pripravo tople sanitarne vode - 4. del: Ocenjevanje porabe energije plinskih naprav za soproizvodnjo tople vode in elektrike (mCHP)

Gas-fired domestic appliances producing hot water - Part 4: Assessment of energy consumption of gas combined heat and power appliances (mCHP) producing hot water and electricity

Gasbeheizte Geräte für die sanitäre Warmwasserbereitung für den Hausgebrauch - Teil 4: Bewertung des Energieverbrauchs von Gasgeräten mit Kraft-Wärme-Kopplung (Mikro-KWK) zur Warmwasserbereitung und Stromerzeugung

Appareils domestiques produisant de l'eau chaude sanitaire utilisant les combustibles gazeux - Partie 4: Évaluation de la consommation énergétique des appareils à gaz de production combinée de chaleur et d'électricité (mCHP) produisant de l'eau chaude et de l'électricité

Ta slovenski standard je istoveten z: **EN 13203-4:2016**

ICS:

91.140.65 Oprema za ogrevanje vode Water heating equipment

SIST EN 13203-4:2017 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13203-4

October 2016

ICS 91.140.65

English Version

Gas-fired domestic appliances producing hot water - Part 4: Assessment of energy consumption of gas combined heat and power appliances (mCHP) producing hot water and electricity

Appareils domestiques produisant de l'eau chaude sanitaire utilisant les combustibles gazeux - Partie 4: Évaluation de la consommation énergétique des appareils à gaz de production combinée de chaleur et d'électricité (mCHP) produisant de l'eau chaude et de l'électricité

Gasbeheizte Geräte für die sanitäre Warmwasserbereitung für den Hausgebrauch - Teil 4: Bewertung des Energieverbrauchs von Gasgeräten mit Kraft-Wärme-Kopplung (Mikro-KWK) zur Warmwasserbereitung und Stromerzeugung

This European Standard was approved by CEN on 6 August 2016.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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

CEN members are the national standards bodies of 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 United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 13203-4:2016 E

Contents

Page

European foreword

This document (EN 13203-4:2016) has been prepared by Technical Committee CEN/TC 109 “Central heating boilers using gaseous fuels”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2017, and conflicting national standards shall be withdrawn at the latest by April 2017.

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 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, B, C or D, which is an integral part of this document.

The safety operation of the boiler is not covered by this standard. Safety is proved by means of the essential safety requirements of the Gas Appliances Directive 2009/142/EC. This way 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, EN 15502–2–2 and EN 50465:2015.

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, 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.

1 Scope

This European Standard is applicable to gas-fired mCHP appliances producing domestic hot water and electricity. The electricity is generated in a process linked to the production of useful heat.

It applies to a mCHP appliances marketed as single unit or as a package fully specified by a manufacturer that have:

— a gas heat input not exceeding 70 kW;

— an electrical output not exceeding 50 kW and

— a hot water storage capacity not exceeding 500 l.

EN 13203-1 sets out in qualitative and quantitative terms the performance in delivery of domestic hot water for a 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 gas fired mCHP appliances. It defines a number of daily tapping cycles 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.

When the mCHP generator does not supply domestic hot water in the summer period, the present standard is not applicable. EN 13203-2 is used for performance assessment of these generators.

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.

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

EN 13203-2, *Gas-fired domestic appliances producing hot water - Part 2: Assessment of energy consumption*

3 Terms and definitions

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

3.1
storage tank
reservoir for domestic hot water and or central heating water

3.2
nominal domestic hot water heat input (Q_{nw})
value of the heat input stated in the appliance instructions for the production of domestic hot water

Note 1 to entry: Q_{nw} is expressed in 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 mCHP appliance supplies energy for the production of domestic hot water and/or space heating

3.5
domestic water test temperature
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, consisting 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 tapping cycles

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 tapping cycles

3.9
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 storage tank (if any) of the domestic hot water circuit at predetermined temperature level no tapping is made.

3.10
off mode
state of an appliance, selected by the user, in which domestic hot water cannot be provided

3.11
mCHP appliance
appliance which is placed on the market either as a complete package or specified as a complete package to deliver safely and effectively the heating, electrical power and the domestic hot water service claimed, comprising as relevant:

— primary heat and power generator;

— supplementary heat generator;

— flue ducts;

— thermal store

3.12
mCHP generator
preferential heat and power generator

3.13
supplementary heat generator
non-preferential heat source providing peak load

3.14
power conditioning and control system
equipment used to change electrical voltage level and waveform, or otherwise alter or regulate the electrical output of the primary heat and power generator to make it suitable and safe for export to other components within or outside the appliance including controls used to operate the primary heat and power generator such a gas valve, safety controls and internal cooling pumps

3.15
electric auxiliary energy ($E_{Auxiliary}$)
electric energy consumed by the mCHP appliance components associated with the supplementary heat generator, thermal management and controls (e.g. pump, fan, valves, control unit)

Note 1 to entry: $E_{Auxiliary}$ is expressed in kWh

3.16
produced electrical energy (E_{CHP})
electrical energy produced by the mCHP generator

Note 1 to entry: E_{CHP} is expressed in kWh

3.17
delivered electrical energy ($E_{delivered}$)
electrical energy delivered by the mCHP appliance to the grid

Note 1 to entry: $E_{delivered}$ is expressed in kWh

3.18
useful water flow rate
flow rate of water delivered at the tap for which the temperature increase is in accordance with the requirement fixed for each individual delivery of the tapping cycles

3.19
useful water temperature
water temperature, expressed in degrees Celsius, delivered at the tap

3.20
appliance flow rate
flow rate delivered by the appliance before the mixing device, if applicable

3.21
appliance water temperature (T_d)
water temperature, expressed in degrees Celsius, delivered by the appliance before the mixing device

4 General test conditions

4.1 Reference conditions

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

— cold water temperature: 10°C

  — maximum average variation over the test period: ± 2 K

— cold water pressure: (2 ± 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;

  — (410 ± 4) V three 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 following deviations take into account the various sources of uncertainty: contribution from the instrument, repeatability, calibration, ambient conditions, etc.

— water rate: ± 1 %;

— gas rate: ± 1 %;

— time: ± 0,2 s;

— temperatures:

  — ambient: ± 1 K;

  — water: ± 0,5 K;

  — gas: ± 0,5 K;

— mass: ± 0, 5 %;

— gas pressure: ± 1 %;

— gas calorific value: ± 1 %;

— gas density: ± 0,5 %;

— electrical auxiliary energy: ± 2 %;

— electrical generated energy: ± 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 ± 2 % under the steady-state conditions.

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

4.3 Test conditions

4.3.1 General

The tests shall be carried out in the summer mode when the mCHP generator of the appliance is producing domestic hot water only.

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

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:

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

— 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.

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 with the appliance.

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 ± 0,5 K.

NOTE This condition can be reached with a gas that 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.

4.3.5 Initial adjustment of the appliance

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

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

The delivered water temperature (T_d) at the appliance outlet shall be 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 cold water inlet temperature.

b) appliances with a fixed temperature: the tests shall be carried out at the temperature specified in the appliance instructions, with a minimum temperature increase equal to or greater than 45 K above cold water inlet temperature.

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

These conditions shall be included in the test report.

4.3.6 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.

4.3.7 Delivered electrical energy

Arrangement shall be made to enable the delivered electrical energy to be measured.

NOTE The delivered electrical energy to be measured may be dissipated by a resistor or exported to the grid.

5 Determination of the energy consumption and electrical energy generation of the appliance

5.1 General

This clause defines the test methods to be employed in determining the energy consumption and electrical energy generation of appliances.

5.2 Tapping cycles

All patterns define 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 defined.

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 increase is 0 K). The average temperature rising (ΔT) to be achieved during tapping, shall be for floor cleaning and bath 30 K and for the dish washes 45 K.

The aim of the “continuous flow” type is to use only the water with a minimum temperature. 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 of 15 K shall be reached.

NOTE 1 The temperature rises (in K) 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 based on 10 °C inlet water temperature.

The tapping flow rates used to perform the different types of tapping of each of the seven tapping cycles defined by Tables 1 to 7.When these tapping rates result in a tapping period of less than 15 s the flow rate should be decreased such that the tapping period is (16 ± 1) s.

In the tapping cycles, the requirements for flow and temperatures are based on the delivery on the taps in a mix of hot and cold water. Under the conditions of the initial adjustment, the appliance itself produces hot water with a minimum temperature rise of 45 K.

To fulfil the requirements stated in Tables 1 to 7 mixing hot water from the appliance with cold water of 10°C at the tap is allowed either by using a mixing device (see Figure B.5) or by recalculating the minimum appliance flow rate (see 3.20) according to the following formula:

$$D_{\min} = D_{\text{useful}(\Delta T)} \cdot \frac{\Delta T_{\text{useful}}}{\Delta T_{\text{d}}} \quad (1)$$

Where:

$D_{\min}$ is the minimum test rig setting for the appliance flow rate of each individual tapping at temperature rise corresponding to ΔT_{d}, in l/min;

$D_{\text{useful}(\Delta T)}$ is the useful water flow rate according to Tables 1 to 7, in l/min;

ΔT_{d} is the delivered water temperature rise with a minimum of 45 K, in K;

ΔT_{useful} is the higher value between the temperature rise to be achieved and the minimum temperature rise for counting the useful energy according to Tables 1 to 7, in K.

The tests shall be performed by using the useful flow rates defined by Tables 1 to 7. If the appliance cannot deliver these flow rates, for instance due to the flow restrictor, it shall be checked that the requirements are fulfilled by checking that $D_{\min}$ is delivered.

If by design the appliance is fitted with a flow restrictor, the tests shall be carried out with this flow restrictor.