
**Plinske gospodinjske naprave za pripravo tople sanitarne vode - 6. del:
Ocenjevanje zmogljivosti rabe energije adsorpcijskih in absorpcijskih toplotnih
črpalk**

Gas-fired domestic appliances producing hot water - Part 6: Assessment of energy consumption of adsorption and absorption heat pumps

Gasbeheizte Geräte für die sanitäre Warmwasserbereitung für den Hausgebrauch - Teil 6: Bewertung des Energieverbrauchs von gasbeheizten Sorptionswärmepumpen

Appareils domestiques produisant de l'eau chaude sanitaire utilisant les combustibles gazeux - Partie 6 : Évaluation de la consommation énergétique des pompes à chaleur à ad-sorption et ab-sorption

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EN 13203-6:2018 (E)**European foreword**

This document (EN 13203-6:2018) 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of an identical text or by endorsement, at the latest by February 2019, and conflicting national standards shall be withdrawn at the latest by February 2019.

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, ZB, ZC or ZD, which are integral parts 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.

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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Introduction

The safety operation of the boiler or water heater is not covered by this standard. Safety should be proved by means of the essential safety requirements of the Gas Appliances Directive 2009/142/EC. This may be achieved by compliance with the appropriate existing harmonized standards.

NOTE Useful standards are series EN 15502 and series EN 12309.

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EN 13203-6:2018 (E)**1 Scope**

This European Standard is applicable to gas-fired appliances producing domestic hot water. It applies to sorption heat pumps connected to or including a domestic hot water storage tank. It applies to a package marketed as single unit or fully specified that have:

- a heat input not exceeding 400 kW; and
- a hot water storage tank capacity (if any) not exceeding 2000 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.

EN 13203-1 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 defines a number of 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.

Horizontal ground heat sources are not covered by the scope of the present European Standard.

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 14511-1:2018, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling - Part 1: Terms, definitions and classification*

EN 14511-2:2018, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling - Part 2: Test conditions*

EN 14511-3:2018, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling - Part 3: Test methods*

EN 14511-4:2018, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling - Part 4: Operating requirements, marking and instructions*

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 <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://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 for the production of domestic hot water stated in the instructions, the symbol of which is Q_{nw} and the unit of which is 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

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

stand by 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 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

EN 13203-6:2018 (E)**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**water temperature rise in K**

ΔT_m

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

3.16**water temperature rise for basin draw-off types in K**

ΔT_p

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. [SIST EN 13203-6:2019](https://standards.iteh.ai/catalog/standards/sist/93563691-215b-4363-9687-0ef5969f7f8c/sist-en-13203-6-2019)

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3.17**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 about 1 s, when the sensor is plunged into still water.

3.18**indoor ambient air**

heat source for a heat pump which absorbs heat by a heat exchanger in direct contact with the air inside a building without any dedicated duct

3.19**brine**

heat transfer medium which has a freezing point depressed relative to water

3.20**sorption heat pump**

encased assembly or assemblies designed as an appliance whose primary function is delivery of domestic hot water or domestic hot water and heating, where the primary function is dependent on circulation of fluid (refrigerant and/or solution) within the absorption, adsorption or refrigerant circuit(s)

3.21**gas-fired sorption heat pump combined with a gas-fired appliance**

appliance which is either placed on the market or specified as a complete package to deliver safely and effectively domestic hot water and/or heating, comprising as relevant:

- gas-fired sorption heat pump;
- gas-fired appliance;
- ducts if appropriate;
- thermal store

3.22**ground heat source**

heat source of a sorption heat pump for which a heat exchanger, vertically embedded into the ground, is used to extract heat from the surrounding soil or rock by way of a brine circuit through the evaporator

3.23**solar collector source**

heat source of a sorption heat pump for which a solar thermal collector is used to capture radiation energy from the sun by way of a brine circuit through the evaporator

3.24**external static pressure difference** **Δp_{ext}**

positive pressure difference measured between the air (or water) outlet section and the air (or water) inlet section of the unit, which is available for overcoming the pressure drop of any additional ducted air (or water) circuit

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3.25**internal static pressure difference** **Δp_{int}**

negative pressure difference measured between the air (or water) outlet section and the air (or water) inlet section of the unit, which corresponds to the total pressure drop of all components on the air (or water) side of the unit

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: $(2 \pm 0,1)$ bar;
- ambient air temperature: 20 °C;
- maximum average variation over the test period ± 2 K;
- maximum variation during the tests ± 2 K;

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— electrical supply voltage: (230 ± 2) V (single phase).

4.2 Specific heat source conditions

The tests shall be carried out at the test conditions specified in Table 1 as appropriate.

Table 1 — Test conditions for particular types of systems

Type of heat source	Heat source temperature (°C)	Range of ambient temperature for heat pump (°C)	Ambient temperature of storage tank ^{a)} (°C)
Outside air (heat pump indoor) with air duct	$7 \pm 0,2$ ($6 \pm 0,3$)	20 ± 3	20 ± 3
Outside air (heat pump outdoor)	$7 \pm 0,2$ ($6 \pm 0,3$)	7 ± 3	20 ± 3
Exhaust air	$20 \pm 0,2$ ($12 \pm 0,3$)	20 ± 3	20 ± 3
Water (inlet)	$10 \pm 0,15$	20 ± 3	20 ± 3
Brine (inlet)	$0 \pm 0,15$	20 ± 3	20 ± 3
Ground heat source ^{b)} (Brine, inlet)	$7 \pm 0,2$	20 ± 3	20 ± 3
Solar collector source ^{c)} (Brine, inlet)	$12 \pm 0,2$	20 ± 3	20 ± 3

a) In case of outside storage tank the temperature shall be $7 \pm 0,2$ °C.

b) Applies to vertical ground heat exchanger with extraction rates lower than 35 W/m, for which brine return temperatures don't fall below 4°C after 25 years of operation (VDI 4046-2:2001).

c) Applies to aperture area to heat extraction ratios of $> 3 \text{ m}^2/\text{kW}$ for flat plate collectors and $> 2 \text{ m}^2/\text{kW}$ for vacuum tube collectors.

NOTE 1 All heat source temperatures are inlet temperatures in °C.

NOTE 2 All air temperatures in (brackets) are wet bulb temperatures in °C.

4.3 Measurement uncertainties

4.3.1 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: $\pm 1 \text{ K}$;
 - air as heat source dry bulb temperature: $\pm 0,2 \text{ K}$;
 - air as heat source wet bulb temperature: $\pm 0,3 \text{ K}$;
 - water/brine as heat source: $\pm 0,15 \text{ K}$
 - brine from ground or solar source: $\pm 0,2 \text{ K}$
 - 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: $\pm 2 \%$.

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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 as defined by 4.3.2.

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

4.3.2 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.

4.4 Test conditions

4.4.1 General

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

The tests shall be carried out only in summer mode as defined in 3.3, and the appliance shall be set in summer mode.