SLOVENSKI STANDARD
oSIST prEN 12309-4:2012

01-oktober-2012

Absorpcijske in adsorpcijske plinske naprave za gretje in/ali hlajenje z grelno močjo do vključno 70 kW - 4. del: Preskusne metode

Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW - Part 4: Test methods

Gasbefeuerte Sorptions-Geräte für Heizung und/oder Kühlung mit einer Nennwärmebelastung nicht über 70 kW - Teil 4: Prüfverfahren

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Appareils à sorption à chauffage direct au gaz pour chauffage et/ou refroidissement d'un débit calorifique sur PCI inférieur à 70 kW - Partie 4: Méthodes d'essais

Ta slovenski standard je istoveten z: prEN 12309-4

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ICS:

23.120	Zračniki. Vetrniki. Klimatske naprave	Ventilators. Fans. Air-conditioners
27.080	Toplotne črpalke	Heat pumps
91.140.30	Prezračevalni in klimatski sistemi	Ventilation and air-conditioning

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EUROPEAN STANDARD

NORME EUROPÉENNE

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ICS 27.080; 91.140.30

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English Version

Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW - Part 4: Test methods

Appareils à sorption à chauffage direct au gaz pour chauffage et/ou refroidissement d'un débit calorifique sur PCI inférieur à 70 kW - Partie 4: Méthodes d'essais

Gasbefeuerte Sorptions-Geräte für Heizung und/oder Kühlung mit einer Nennwärmebelastung nicht über 70 kW - Teil 4: Prüfverfahren

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 299.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (prEN 12309-4:2012) has been prepared by Technical Committee CEN/TC 299 "Gas-fired sorption appliances, indirect fired sorption appliances, gas-fired endothermic engine heat pumps and domestic gas-fired washing and drying appliances", the secretariat of which is held by UNI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 12309-2:2000.

EN 12309 comprises the following parts under the general title «*Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW*»:

— Part 1: Terms and definitions;

— Part 2: Safety;

— Part 3: Test conditions;

— Part 4: Test methods;

— Part 5: Requirements;

— Part 6: Calculation of seasonal performances;

— Part 7: Specific provisions for hybrid appliances;

— Part 8: Environmental aspects.

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Parts 1 and 2 to EN 12309 will supersede EN 12309-1:1999, whereas Part 1 and Parts 3 to 7 of EN 12309 will supersede EN 12309-2:2000. Parts 1 to 7 have been prepared to address the essential requirements of the European Directive 2009/142/EC relating to appliances burning gaseous fuels (see informative Annex ZA of EN 12309-2:20xx for safety aspects and Annex ZA of prEN 12309-5:2012 for rational use of energy aspects).

These documents are linked to the following European Directives:

— Energy Related Products Directive (2009/125/EC) in terms of tests conditions, tests methods and seasonal performances calculation methods under Mandate M/495 (see Annex ZB of prEN 12309-5:2012);

— Promotion of the Use of Renewable Energy Directive (2009/28/EC – Annex VII) (see Annex A of prEN 12309-5:2012).

For the relationship with EU Directive(s), see informative Annexes ZA and ZB in EN 12309-2:20xx and in prEN 12309-5:2012, which are an integral part of this document. These documents will be reviewed whenever new mandates could apply.

Part 8 of EN 12309 ("Environmental aspects") deals with the incorporation of the Resolution BT 27/2008 regarding CEN approach on addressing environmental issues in product and service standards.

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1 Scope

1.1 Scope of EN 12309 series

Appliances covered by EN 12309 include one or a combination of the following:

- gas-fired sorption chiller;
- gas-fired sorption chiller/heater;
- gas-fired sorption heat pump.

EN 12309 applies to appliances only when used for space heating or cooling or refrigeration with or without heat recovery. Appliances can be monovalent, bivalent or hybrid types.

EN 12309 applies to appliances having flue gas systems of type B and C (according to CEN/TR 1749) and to appliances designed for outdoor installations. EN 12309 applies to appliances that can be single ducted or double ducted.

EN 12309 only applies to appliances having

- integral burners under the control of fully automatic burner control systems,
- closed system refrigerant circuits in which the refrigerant does not come into direct contact with the water or air to be cooled or heated,
- mechanical means to assist transportation of the combustion air and/or the flue gas.

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The above appliances can have one or more primary or secondary functions (i.e. heat recovery - see definitions in prEN 12309-1:2012) and EN 12309 applies to all such functions providing that the function concerned is dependent on circulation of fluid (refrigerant and/or solution) within the absorption, adsorption or refrigerant circuit(s).

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NOTE 1 Any appliance function that is not dependent on circulation of the fluid within the absorption, adsorption, or refrigerant circuit(s) should be assessed separately.

EN 12309 is applicable to appliances that are intended to be type tested. Requirements for appliances that are not type tested would need to be subject to further consideration.

In the case of packaged units (consisting of several parts), EN 12309 applies only to those designed and supplied as a complete package.

EN 12309 does not apply to air conditioners.

The appliances having their condenser cooled by air and by the evaporation of external additional water are not covered by EN 12309.

Installations used for heating and/or cooling of industrial processes are not within the scope of EN 12309.

NOTE 2 All the symbols given in this text should be used regardless of the language used.

1.2 Scope of this Part 4 to EN 12309

This part of EN 12309 specifies the test methods for gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW.

This part of EN 12309 deals particularly with test protocols and tools to calculate the capacity, the gas utilization efficiency and the electrical power input of the tested appliance. These data can be used in particular to calculate the seasonal efficiency of the appliance.

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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 437, *Test gases – Test pressures – Appliance categories*

prEN 12309-1:2012, *Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW – Part 1: Terms and definitions*

EN 12309-2:20xx, *Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW – Part 2: Safety*

prEN 12309-3:2012, *Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW – Part 3: Tests conditions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 12309-1:2012 apply.

4 Test methods

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4.1 General

A steady state or transient or cyclical operation test could be applied for full capacity tests or for reduced capacity tests.

4.2 Basic principles

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4.2.1 Heating capacity

4.2.1.1 General

The heating capacity of air-to-water(brine), water(brine)-to-water(brine) chiller/heater or heat pumps shall be determined in accordance with the direct method at the water or brine (indoor) heat exchanger(s), by determination of the volume or mass flow rate of the heat transfer medium, and the inlet and outlet temperatures, taking into consideration the specific heat capacity and density, or the enthalpy change, of the heat transfer medium (see 4.2.1.2, 4.2.1.3, 4.2.1.4, 4.2.1.5).

4.2.1.2 Measured heating capacity

The measured heating capacity shall be determined using the following formula:

$$Q_h = \frac{\sum_{j=1}^{n} (Vm_j * \delta_j * Cp_j * \Delta t_j)}{n}$$

where

j is the scan number;

n is the number of scan of the data collection period;

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Q_j is the measured heating capacity, in kilowatt;

Vm_j is the volume flow rate of the heat transfer medium at the considered scan, in cubic meters per second;

δ_j is the density of the heat transfer medium at flow meter temperature at the considered scan, in kilogram per cubic meter;

Cp_j is the specific heat of the heat transfer medium at constant pressure at mean temperature of the heat transfer medium at the considered scan, in kilojoule per kilogram and kelvin;

Δt_j is the difference between inlet and outlet temperatures of the heat transfer medium at the considered scan, in kelvin.

NOTE 1 The mass flow can be determined directly instead of the term $(Vm_j * \delta_j)$.

NOTE 2 The enthalpy change ΔH_j can be determined directly instead of the term $(Cp_j * \Delta t_j)$.

4.2.1.3 Effective heating capacity

The effective heating capacity is the measured heating capacity corrected for the heat from the pump(s):

a) if the pump(s) is (are) an integral part of the appliance, the capacity correction due to the pump(s), c_{pump}, calculated according to 4.2.5.4.2, which is excluded from the total electrical power input shall also be subtracted from the heating capacity (the correction is negative);

b) if the pump(s) is (are) not an integral part of the appliance, the capacity correction due to the pump(s), c_{pump}, calculated according to 4.2.5.4.3, which is added to the total electrical power input shall be also added to the heating capacity (the correction is positive).

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The effective heating capacity shall be determined using the following formula:

$$Q_{Eh} = Q_h + c_{pump}$$

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where

Q_{Eh} is the effective heating capacity, in kilowatt;

Q_h is the measured heating capacity, in kilowatt;

c_{pump} is the capacity correction due to the pump(s) responsible for circulating the heat transfer medium through the indoor heat exchanger, in kilowatt.

4.2.1.4 Nominal heating capacity

The nominal heating capacity (at full load) shall be determined using the following formula:

$$Q_{Nh} = Q_h * \frac{Q_{\mathrm{gNh}}}{Q_{gmh}} + c_{pump}$$

where

Q_{Nh} is the nominal heating capacity, in kilowatt;

Q_h is the measured heating capacity, in kilowatt;

Q_{gNh} is the nominal heating heat input, in kilowatt;

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Q_{gmh} is the measured heating heat input, in kilowatt;

c_{pump} is the capacity correction due to the pump(s) responsible for circulating the heat transfer medium through the indoor heat exchanger, in kilowatt.

NOTE For more explanation about the capacity correction due to the pump(s) responsible for circulating the heat transfer medium through the indoor heat exchanger, see 4.2.1.3.

4.2.1.5 Rated heating capacity

The rated heating capacity (at full load) shall be determined using the following formula:

$$Q_{Rh} = Q_h * \frac{Q_{grh}}{Q_{gmh}} + c_{pump}$$

where

Q_{Rh} is the rated heating capacity, in kilowatt;

Q_h is the measured heating capacity, in kilowatt;

Q_{grh} is the rated heating heat input, in kilowatt;

Q_{gmh} is the measured heating heat input, in kilowatt;

c_{pump} is the capacity correction due to the pump(s) responsible for circulating the heat transfer medium through the indoor heat exchanger, in kilowatt.

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NOTE 1 The rated heating heat input and the rated cooling heat input could be equal.

NOTE 2 For more explanation about the capacity correction due to the pump(s) responsible for circulating the heat transfer medium through the indoor heat exchanger, see 4.2.1.3.

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NOTE 3 The rated heating heat input could be equal to or different from the nominal heating heat input.

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4.2.2 Cooling capacity

4.2.2.1 General

The cooling capacity of air-to-water(brine), water(brine)-to-water(brine) reversible heat pumps, chillers and chillers/heaters shall be determined in accordance with the direct method at the water or brine (indoor) heat exchanger(s), by determination of the volume or mass flow rate of the heat transfer medium, and the inlet and outlet temperatures, taking into consideration the specific heat capacity and density, or the enthalpy change of the heat transfer medium (see 4.2.2.2, 4.2.2.3, 4.2.2.4, 4.2.2.5).

4.2.2.2 Measured cooling capacity

The measured cooling capacity shall be determined using the following formula:

$$Q_c = \sum_{j=1}^{n} (Vm_j * \delta_j * Cp_j * \Delta t_j)$$

where

j is the scan number;

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n is the number of scan of the data collection period;

Q_c is the measured cooling capacity, in kilowatt;

Vm_j is the volume flow rate of the heat transfer medium at the considered scan, in cubic meters per second;

δ_j is the density of the heat transfer medium at flow meter temperature at the considered scan, in kilogram per cubic meter;

Cp_j is the specific heat of the heat transfer medium at constant pressure at mean temperature of the heat transfer medium at the considered scan, in kilojoule per kilogram and kelvin;

Δt_j is the difference between inlet and outlet temperatures of the heat transfer medium at the considered scan, in kelvin.

NOTE 1 The mass flow can be determined directly instead of the term $(Vm_j * \delta j)$.

NOTE 2 The enthalpy change ΔH_j can be determined directly instead of the term $(Cp_j * \Delta t_j)$.

4.2.2.3 Effective cooling capacity

The effective cooling capacity is the measured cooling capacity corrected for the heat from the pump(s):

a) if the pump(s) is (are) an integral part of the appliance, the capacity correction due to the pump(s), c_{pump}, calculated according to 4.2.5.4.2, which is excluded from the total power input shall be added to the cooling capacity (the correction is positive).

b) if the pump(s) is (are) not an integral part of the appliance, the capacity correction due to the pump(s), c_{pump}, calculated according to 4.2.5.4.3, which is added to the total electrical power input shall be subtracted from the cooling capacity (the correction is negative).

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The effective cooling capacity shall be determined using the following formula:

$$Q_{Ec} = Q_c + c_{pump}$$

where

Q_{Ec} is the effective cooling capacity, in kilowatt;

Q_c is the measured cooling capacity, in kilowatt;

c_{pump} is the capacity correction due to the pump(s) responsible for circulating the heat transfer medium through the indoor heat exchanger, in kilowatt.

4.2.2.4 Nominal cooling capacity

The nominal cooling capacity (at full load) shall be determined using the following formula:

$$Q_{Nc} = Q_c * \frac{Q_{gNc}}{Q_{gmc}} + c_{pumpr}$$

where

Q_{Nc} is the nominal cooling capacity, in kilowatt;

Q_c is the measured cooling capacity, in kilowatt;

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Q_{gNc} is the nominal cooling heat input, in kilowatt;

Q_{gmc} is the measured cooling heat input, in kilowatt;

c_{pump} is the capacity correction due to the pump(s) responsible for circulating the heat transfer medium through the indoor heat exchanger, in kilowatt.

NOTE 1 The nominal heating heat input and the nominal cooling heat input could be equal.

NOTE 2 For more explanation about the capacity correction due to the pump(s) responsible for circulating the heat transfer medium through the indoor heat exchanger, see 4.2.2.3.

4.2.2.5 Rated cooling capacity

The rated cooling capacity (at full load) shall be determined using the following formula:

$$Q_{Rc} = Q_c * \frac{Q_{grc}}{Q_{gmc}} + c_{pump}$$

where

Q_{Rc} is the rated cooling capacity, in kilowatt;

Q_c is the measured cooling capacity, in kilowatt;

Q_{grc} is the rated cooling heat input, in kilowatt;

Q_{gmc} is the measured heat input, in kilowatt;

c_{pump} is the capacity correction due to the pump(s) responsible for circulating the heat transfer medium through the indoor heat exchanger, in kilowatt.

NOTE 1 The rated cooling heat input and the rated heating heat input could be equal.

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NOTE 2 For more explanation about the capacity correction due to the pump(s) responsible for circulating the heat transfer medium through the indoor heat exchanger, see 4.2.2.3.

NOTE 3 The rated cooling heat input could be equal to or different from the nominal cooling heat input.

4.2.3 Heat recovery capacity

4.2.3.1 General

The heat recovery capacity of air-to-water(brine) and water(brine)-to-water(brine) chillers or chillers/heaters shall be determined in accordance with the direct method at the water or brine heat recovery heat exchanger(s), by determination of the volume or mass flow rate of the heat transfer medium, and the inlet and outlet temperatures, taking into consideration the specific heat capacity and density, or the enthalpy change of the heat transfer medium (see 4.2.3.2, 4.2.3.3, 4.2.3.4, 4.2.3.5).

4.2.3.2 Measured heat recovery capacity

The measured heat recovery capacity shall be determined using the following formula:

$$Q_{hr} = \frac{\sum_{j=1}^{n} (Vm_j * \delta_j * Cp_j * \Delta t_j)}{n}$$

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where

j is the scan number;

n is the number of scan of the data collection period;

Q_{hr} is the measured heat recovery capacity, in kilowatt;

Vm_j is the volume flow rate of the heat transfer medium at the considered scan, in cubic meters per second;

δ_j is the density of the heat transfer medium at flow meter temperature at the considered scan, in kilogram per cubic meter;

Cp_j is the specific heat of the heat transfer medium at constant pressure at mean temperature of the heat transfer medium at the considered scan, in kilojoule per kilogram and kelvin;

Δt_j is the difference between inlet and outlet temperatures of the heat transfer medium at the considered scan, in kelvin.

NOTE 1 The mass flow can be determined directly instead of the term ($Vmj \cdot \delta j$).

NOTE 2 The enthalpy change ΔHj can be determined directly instead of the term ($Cpj \cdot \Delta tj$).

4.2.3.3 Effective heat recovery capacity

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The effective heat recovery capacity is the measured heat recovery capacity corrected for the heat from the pump(s):

a) if the pump(s) is (are) an integral part of the appliance, the capacity correction due to the pump(s), c_{pump}, calculated according to 4.2.5.4.2 which is excluded from the total electrical power input shall be also subtracted from the heat recovery capacity (the correction is negative).

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b) if the pump(s) is (are) not an integral part of the appliance, capacity correction due to the pump(s), c_{pump}, calculated according to 4.2.5.4.3, which is added to the total electrical power input shall be also added to the heat recovery capacity (the correction is positive).

The effective heat recovery capacity shall be determined using the following formula:

$$Q_{Ehr} = Q_{hr} + c_{pump}$$

where

Q_{Ehr} is the effective heat recovery capacity, in kilowatt;

Q_{hr} is the measured heat recovery capacity, in kilowatt;

c_{pump} is the capacity correction due to the pump(s) responsible for circulating the heat transfer medium through the heat recovery exchanger, in kilowatt.

4.2.3.4 Nominal heat recovery capacity

The nominal heat recovery capacity shall be determined using the following formula:

$$Q_{Nhr} = Q_{hr} * \frac{Q_{\mathrm{gNhr}}}{Q_{gmhr}} + c_{pump}$$