



SLOVENSKI STANDARD
oSIST prEN 12309-2:2023

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Absorpcijske in adsorpcijske plinske naprave za gretje in/ali hlajenje z grelno močjo do vključno 70 kW - 2. del: Varnost

Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW - Part 2: Safety

Gasbefeuerte Sorptions-Geräte für Heizung und/oder Kühlung mit einer Nennwärmebelastung nicht über 70 kW - Teil 2: Sicherheit

Appareils à sorption fonctionnant au gaz pour le chauffage et/ou le refroidissement de débit calorifique sur PCI inférieur à 70 kW - Partie 2 : Sécurité

Ta slovenski standard je istoveten z: prEN 12309-2

ICS:

27.080	Toplotne črpalke	Heat pumps
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Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW - Part 2: Safety

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Gasbefeuerte Sorptions-Geräte für Heizung und/oder Kühlung mit einer Nennwärmebelastung nicht über 70 kW - Teil 2: Sicherheit

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

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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<https://standards.iteh.ai/catalog/standards/sist/2c6eae1-def4-42ad-8c4d-a7481c54ed73/osist-pren-12309-2-2023>

prEN 12309-2:2023(E)**European foreword**

This document (prEN 12309-2:2023) 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 12309-2:2015.

This document includes the following significant technical changes with respect to EN 12309-2:2015:

- Harmonization to Regulation (EU) 2016/426 (see Annex ZA).
- Clarification of the scope of this part 2 to EN 12309.
- Minimum quality properties of materials (see 5.1.2).
- Minimum dimensions for gas / air ratio control tubes (see 5.1.9.2).
- Minimum IP protection degree (see 5.1.12).
- New requirements for pressurized parts of the appliance (see 5.1.15).
- New requirements for overheat cut-off devices (see 5.10.2).
- New maximum air leakage rate for gas circuits (see 6.1.2).
- New requirements and testing method for maximum component temperature (see 6.3.4 and 7.3.3.5).
- Clarification of the generic test conditions (Tables 5, 6 and 7).
- New tolerance for NO_x emissions (see 7.1.8).
- New safety tests in case of operations at the limit of the temperature operating range (see 7.3.6.2).
- New water temperature for NO_x measurements (see 7.3.11 and Table 13).
- New extreme conditions for checking of the ignition safety time (see Table 14).

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annexes ZA and ZB, which are an integral part of this document.

This document is part of a series of standards under the general title, *Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW*. A list of all parts in a series can be found on the CEN website.

These documents will be reviewed whenever new mandates could apply.

This document deals particularly with the operational safety of the appliance.

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 and cooling with or without heat recovery.

EN 12309 applies to appliances having flue gas systems of type B and C (according to EN 1749:2020) and to appliances designed for outdoor installations, including type A. EN 12309 does not apply to air conditioners, it 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.

The above appliances can have one or more primary or secondary functions (i.e. heat recovery - see definitions in EN 12309-1:2023). In the case of packaged units (consisting of several parts), the standard applies only to those designed and supplied as a complete package.

The appliances having their condenser cooled by air and by the evaporation of external additional water are not covered by this European Standard.

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

NOTE All the symbols given in this text are used regardless of the language used.

1.2 Scope of EN 12309-2

This document deals with the safety of gas-driven sorption heat pumps as defined in EN 12309-1:2023. Only types B12, B13, B22, B23, C12, C13, C32 and C33 and outdoor installations, including type A appliances, are covered in this document. This document does not include specific requirements on surface temperatures of external parts particular to children and elderly people.

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 88-1:2022, *Safety and control devices for gas burners and gas burning appliances - Part 1: Pressure regulators for inlet pressures up to and including 50 kPa*

EN 88-2:2022, *Safety and control devices for gas burners and gas burning appliances - Part 2: Pressure regulators for inlet pressures above 50 kPa up to and including 500 kPa*

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EN 126:2012, *Multifunctional controls for gas burning appliances*

EN 161:2022, *Automatic shut-off valves for gas burners and gas appliances*

EN 257:2022, *Mechanical thermostats for gas-burning appliances*

EN 298:2022, *Automatic burner control systems for burners and appliances burning gaseous or liquid fuels*

EN 378-2:2016, *Refrigerating systems and heat pumps - Safety and environmental requirements - Part 2: Design, construction, testing, marking and documentation*

EN 378-3:2016+A1:2020, *Refrigerating systems and heat pumps - Safety and environmental requirements - Part 3: Installation site and personal protection*

EN 437:2021, *Test gases - Test pressures - Appliance categories*

EN 1057:2006+A1:2010, *Copper and copper alloys - Seamless, round copper tubes for water and gas in sanitary and heating applications*

EN 1092-1:2018, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 1: Steel flanges*

EN 1092-2:1997, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 2: Cast iron flanges*

EN 1092-3:2003/AC:2007, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 3: Copper alloy flanges*

EN 1092-4:2002, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 4: Aluminium alloy flanges*

EN 1254-2:2021, *Copper and copper alloys - Plumbing fittings - Part 2: Compression fittings for use with copper tubes*

CR 1404:1994, *Determination of emissions from appliances burning gaseous fuels during type-testing*

EN 1749:2020, *Classification of gas appliances according to the method of supplying combustion air and of evacuation of the combustion products (types)*

EN 12067-2:2022, *Safety and control devices for burners and appliances burning gaseous or liquid fuels - Control functions in electronic systems - Part 2: Fuel/air ratio control/supervision of the electronic type*

EN 12309-1:2023, *Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW - Part 1: Terms and definitions*

prEN 12309-3:2022, *Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW - Part 3: Requirements, test conditions and test methods*

EN 12309-7:2014, *Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW - Part 7: Specific provisions for hybrid appliances*

EN 13136:2013+A1:2018, *Refrigerating systems and heat pumps - Pressure relief devices and their associated piping - Methods for calculation*

EN 13445-3:2021, *Unfired pressure vessels - Part 3: Design*

EN 13611:2019, *Safety and control devices for burners and appliances burning gaseous and/or liquid fuels - General requirements*

EN 14276-1:2020, *Pressure equipment for refrigerating systems and heat pumps - Part 1: Vessels - General requirements*

EN 14276-2:2020, *Pressure equipment for refrigerating systems and heat pumps - Part 2: Piping - General requirements*

EN 15502-1:2021, *Gas-fired heating boilers - Part 1: General requirements and tests*

EN 60335-1:2012¹, *Household and similar electrical appliances - Safety - Part 1: General requirements (IEC 60335-1:2010, modified)*

EN 60335-2-102:2016, *Household and similar electrical appliances - Safety - Part 2-102: Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections (IEC 60335-2-102:2004, modified)*

EN 60529:1991², *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN IEC 60730-2-9:2019³, *Automatic electrical controls - Part 2-9: Particular requirements for temperature sensing controls (IEC 60730-2-9:2008, modified)*

EN ISO 228-1:2003, *Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation (ISO 228-1:2000)*

EN ISO 3166-1:2020, *Codes for the representation of names of countries and their subdivisions - Part 1: Country code (ISO 3166-1:2020)*

ISO 7-1:1994⁴, *Pipe threads where pressure-tight joints are made on the threads - Part 1: Dimensions, tolerances and designation*

ISO 1182:2020, *Reaction to fire tests for products - Non-combustibility test*

ISO 3864-2:2016, *Graphical symbols - Safety colours and safety signs - Part 2: Design principles for product safety labels*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12309-1:2023 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

¹ As impacted by EN 60335-1:2012/A11:2014, EN 60335-1:2012/A13:2017, EN 60335-1:2012/A1:2019, EN 60335-1:2012/A14:2019, EN 60335-1:2012/A2:2019, EN 60335-1:2012/A15:202.

² As impacted by EN 60529:1991/A2:2013.

³ As impacted by EN IEC 60730-2-9:2019/A1:2019, EN IEC 60730-2-9:2019/A2:2020

⁴ As impacted by ISO 7-1:1994/Cor 1:2007.

prEN 12309-2:2023(E)**3.1****automatic recycling**

automatic process by which, after loss of flame during operation, the gas supply is interrupted and the full start procedure is re-initiated automatically

4 Classification**4.1 General**

Appliances can be classified according to:

- the gases they use;
- the mode of air supply and evacuation of combustion products;
- the temperatures of their heat transfer media;
- their denomination.

4.2 Classification of appliances**4.2.1 Classification of gases**

Gases are classified into three families, divided into groups according to the value of the Wobbe index. Families and groups of gas used in this standard are in accordance with those of the EN 437:2021.

4.2.2 Classification according to the mode of air supply and evacuation of the combustion products

The types of appliances as defined in EN 1749:2020 are applicable.

4.2.3 Classification according to the temperatures of the heat transfer media**4.2.3.1 General**

The classification according to the temperatures of the heat transfer media is formed in such a way that the heat transfer media are indicated together with their temperatures (in °C). A short classification is formed in such a way that a characteristic letter is used for the heat transfer medium: A for air, W for water and B for brine.

For the purposes of this standard, all references to the term “absorber” shall be taken to mean “adsorber” where the function of the appliance is based on adsorption.

4.2.3.2 Cooling mode

When the appliance is operating in the cooling mode, the temperatures indicated in the first place refer to the outdoor heat exchanger and the temperatures in the second place to the indoor heat exchanger.

Air and water/brine temperatures for the outdoor heat exchanger are inlet temperatures. Water/brine temperatures for the indoor heat exchanger are outlet temperatures.

EXAMPLE A27/W7 means an inlet temperature of air for the outdoor heat exchanger of 27 °C and an outlet temperature of water for the indoor heat exchanger of 7 °C.

4.2.3.3 Heating mode

When the appliance is operating in the heating mode, the values indicated in the first place refer to the outdoor heat exchanger and the values in the second place to the indoor heat exchanger.

Air and water/brine temperatures for the outdoor heat exchanger are inlet temperatures. Water/brine temperatures for the indoor heat exchanger are outlet temperatures.

EXAMPLE B0/W50 means an inlet temperature of brine for the outdoor heat exchanger of 0 °C and an outlet temperature of water for the condenser/absorber of 50 °C.

4.2.4 Classification according to denomination

4.2.4.1 Cooling mode

Appliances designed to operate in the cooling mode are denominated in such a way that the heat transfer medium for the outdoor heat exchanger is indicated first, followed by the heat transfer medium for the indoor heat exchanger. Examples of such appliances are given in Table 1.

Table 1 — Examples of appliances designed to provide cooling

Heat transfer medium		Denomination
Outdoor heat exchanger	Indoor heat exchanger	
Air	Water ^a	Air Cooled Liquid Chiller Air Cooled Liquid Chiller Heater
Water ^a	Water ^a	Water Cooled Liquid Chiller Water Cooled Liquid Chiller Heater
Brine	Water ^a	Brine Cooled Liquid Chiller Brine Cooled Liquid Chiller Heater
^a This description also applies where the water contains additives to prevent corrosion as specified in the appliance's instructions.		

4.2.4.2 Heating mode

For the purposes of this standard, appliances designed to operate in the heating mode are denominated in such a way that the heat transfer medium for the outdoor heat exchanger is indicated first, followed by the heat transfer medium for the indoor heat exchanger. Examples of such appliances are given in Table 2.

Table 2 — Examples of appliances designed to provide heating

Heat transfer medium		Denomination
Outdoor heat exchanger	Indoor heat exchanger	
Air	Water ^a	Air/water Heat pump
Water ^a	Water ^a	Water/water Heat Pump
Brine	Water ^a	Brine/Water Heat Pump
^a This description also applies where the water contains additives to prevent corrosion as specified in the appliance's instructions.		

5 Construction and design requirements

5.1 General

5.1.1 Conversion to different gases

The following operations are allowed in order to convert from a gas of one family or group to a gas of another family or group:

- a) adjustment of the gas rate of the main burner and ignition burner;
- b) change of injectors or restrictor;
- c) change of the ignition burner or its components;
- d) change of the gas rate modulation system;
- e) putting out of service and sealing a gas rate adjuster and/or a regulator;
- f) changes of configuration parameters by data exchange (for requirement see EN 13611:2019).

For each of the operations mentioned above the appliance shall be tested with each of the gases. These operations shall be possible without having to interfere with the connections of the appliance to its pipe-work (gas, water, duct system).

5.1.2 Materials and method of construction

When the appliance is installed in accordance with the appliance's instructions, all components, including the heat exchangers and the refrigerant circuit, shall withstand the mechanical, chemical and thermal conditions to which they may be subjected in the course of normal use.

In addition, the appliance shall be designed in such a way that if combustion condensation takes place, this shall not:

- affect the operational safety;
- drop outside the appliance.

This latter requirement does not apply to the flow of condensate which is produced at the outlet of the combustion products evacuation duct or from a purpose made condensate discharge system.

Materials for parts under pressure of the water circuit shall be appropriate for their duty and envisaged use.

The following materials satisfy these criteria:

- a) steels that have the properties and chemical composition as described in EN 15502-1:2021, Annex A;
- b) cast irons that have the mechanical properties as described in EN 15502-1:2021, Annex B;
- c) the non-ferrous materials as described in EN 15502-1:2021, Annex C and Annex D.

For other materials, the technical documentation shall provide proof of the suitability of that material.

Copper shall not be used for gas carrying parts where its temperature is likely to exceed 100 °C.

Compatible material shall be used for the refrigerant carrying parts, as described in 5.1.15.

Asbestos or materials containing asbestos shall not be used.

Solder with a melting point below 450 °C after application shall not be used for gas carrying parts. Hard solder containing cadmium in its formulation shall not be used in the construction of the appliance.

Where appropriate, materials used on the appliance shall be non-combustible in accordance with the requirements of ISO 1182:2020.

5.1.3 Accessibility for maintenance and use

Parts that are intended to be removable for maintenance or cleaning shall be readily accessible, promote assembly and be difficult to assemble incorrectly. Such parts shall be impossible to assemble incorrectly where incorrect assembly would create a hazardous condition or result in damage to the appliance and its controls.

It shall be possible to clean the combustion vessel and the parts in contact with combustion products in accordance with the appliance's instructions without using special tools unless these are supplied as necessary accessories with the appliance.

Access shall be possible to all handles, buttons etc. required during normal use of the appliance, without having to remove any part of the case. For this purpose, the opening of a door or access panel is permitted.

Constructional parts accessible during use and maintenance shall be free from sharp edges and corners that might cause damage or personal injury during use or maintenance.

5.1.4 Thermal insulation

Any thermal insulation shall retain its insulating properties under the influences of temperature and ageing. The insulation shall withstand the normally expected thermal and mechanical stresses. The insulation of parts associated with the combustion products circuit shall be non combustible. All insulation shall be securely located and protected against mechanical damage, condensate and vermin.

5.1.5 Gas connection

The appliance gas inlet connection shall be accessible.

The clearance around the inlet connection, after removing the case if necessary, shall be adequate to allow the use of tools required to make the connection. It shall be possible to make all the connections without special tools.

It shall be possible to connect the appliance by rigid or flexible metallic means to the gas supply.

A compression fitting suitable for copper tube shall comply with EN 1254-2:2021 and EN 1057:2006+A1:2010.

If the appliance has a threaded connection, this thread shall comply with EN ISO 228-1:2003 or ISO 7-1:1994. In the first case (EN ISO 228-1:2003), the end of the appliance inlet connection shall be sufficiently flat to allow the use of a sealing washer.

If flanges are used, they shall comply with EN 1092-1:2018, EN 1092-2:1997, EN 1092-3:2003/AC:2007 or EN 1092-4:2002 as appropriate and the counterflanges and sealing gaskets shall be provided.

5.1.6 Soundness

5.1.6.1 Soundness of the gas circuit

The gas circuit shall consist of metallic parts.

Holes for screws, studs, etc., intended for the assembly of parts shall not open into gasways. The wall thickness between drillings and gasways shall be at least 1 mm. This does not apply to orifices for measurement purposes.

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The soundness of parts and assemblies making up the gas circuit and likely to be dismantled for routine maintenance *in situ* shall be achieved by means of mechanical joints, e.g. metal-to-metal joints, packing, or O-ring joints, i.e. excluding the use of all sealing materials such as tape, paste or liquid. However, the sealing materials mentioned above may be used for permanent assemblies. These sealing materials shall remain effective under all conditions of appliance use. It shall not be possible for water to penetrate into the gas circuit.

Where parts of the gas circuit are assembled without threads, soundness of the assembly shall not be achieved by means of soft solder or by means of adhesives.

5.1.6.2 Soundness of the combustion circuit

The combustion circuit shall be constructed so as to prevent any leakage of combustion products.

Any means used to achieve soundness of the combustion circuit shall be such that it remains effective under normal conditions of use and servicing.

Parts, which have to be removed during routine service and affect the soundness of the appliance and/or its ducts, shall be sealed by mechanical means, excluding pastes, liquids and tapes. The need for replacement of the seal(s), following a cleaning or servicing operation as stated in the technical instructions, is permitted.

Where the appliance case forms part of the combustion circuit and it can be removed without the use of tools, either the appliance shall not operate, or there shall be no leakage of combustion products into the room where the appliance is installed when the case is replaced incorrectly.

However, parts of the assembly that are not intended to be dismantled for maintenance may be joined in such a way, that permanent soundness is ensured during continuous service under normal conditions of use.

The ducts, bends, if any, and the terminal or fitting piece shall fit together correctly and form a stable assembly.

Parts intended to be dismantled for periodic servicing shall be designed and arranged so that soundness is ensured after reassembly.

Any fitting piece shall allow a sound connection to be made to the system intended for the evacuation of combustion products and supply of air.

5.1.7 Air proving

Appliances with fans shall be fitted with a system for air proving.

Except for appliances with gas/air ratio controls, before each fan starts it shall be checked that there is no simulation of air flow in the absence of air flow.

The system for supervision of the combustion air rate or combustion products rate shall be activated directly by the flow of combustion air or combustion products. This is also valid for appliances with more than one fan speed in which the flows associated with each fan speed are monitored.

The supply of combustion air shall be checked by one of the following methods:

- a) gas /air ratio controls;
- b) continuous supervision of the combustion air rate or combustion products rate;
- c) start up supervision of the combustion air rate or combustion products rate provided that for indoor installations:
 - the combustion products circuit is completely surrounded by the air supply circuit, and

- there is a shutdown at least every 24 h ⁵, and
- there is an indirect system for air proving (e.g. fan speed supervision) during operation.

5.1.8 Air proving device

5.1.8.1 General

Depending on the principle of air proving, the applicable requirements are described in the clauses below.

The appliance is installed as stated in 7.1.6.4. The appliance is supplied with one of the reference gases for the category to which it belongs.

The appliance is fitted with the longest combustion air supply and combustion products evacuation ducts stated in the installation instructions. The tests may be carried out without the terminal or fitting piece.

The CO concentration is determined as stated in 7.3.5.

5.1.8.2 Supervision of the combustion air rate or the combustion products rate

Under the test conditions 7.3.13.1 the following requirement shall be met.

At a reduced flow rate the CO concentration (dry, air-free) may not exceed a specific value.

The following methods of flow reduction are to be examined:

- a) progressive blockage of the air inlet;
- b) progressive blockage of the combustion products evacuation ducts;
- c) progressive reduction of the fan speed, for example by reduction of the fan voltage.

There are two alternative supervision strategies for the air proving; a start up supervision or a continuous supervision. Based on the supervision strategy the appliance shall at a reduced flow rate meet one of the following two requirements:

- d) continuous supervision: Shutdown before the CO concentration exceeds
 - 1) 0,2 % over the range of modulation specified in the installation instructions), or
 - 2) $CO_{mes} \times Q / Q_{KB} \leq 0,20$ % below the minimum rate of the modulation range.

where

- Q is the instantaneous heat input, in kW;
- Q_{KB} is the heat input at the minimum rate, in kW;
- CO_{mes} is the measured CO concentration (dry, air free)

d) or

- e) start up supervision: Not start if the CO concentration exceeds 0,1 %.

⁵ Some appliances can be used in a way that it is very likely they can shutdown at least once per 24 h without having a specific function to ensure this.