BS EN 12309-3:2014

BSI Standards Publication

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

## Part 3: Test conditions

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## National foreword

This British Standard is the UK implementation of EN 12309-3:2014. Together with BS EN 12309-1:2014, BS EN 12309-4:2014, BS EN 12309-5:2014, BS EN 12309-6:2014 and BS EN 12309-7:2014, it supersedes BS EN 12309-2:2000, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GSE/37, Gas fired sorption and laundering appliances.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.


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EUROPEAN STANDARD

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# EN 12309-3

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ICS 27.080; 91.140.30

Supersedes EN 12309-2:2000

English Version

# Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW - Part 3: Test conditions

Appareils à sorption fonctionnant au gaz pour le chauffage et/ou le refroidissement de débit calorifique sur PCI inférieur ou égal à 70 kW - Partie 3: Conditions d'essai

Gasbefeuerte Sorptions-Geräte für Heizung und/oder Kühlung mit einer Nennwärmebelastung nicht über 70 kW - Teil 3: Prüfbedingungen

This European Standard was approved by CEN on 18 October 2014.



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

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



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# Contents

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# Foreword

This document (EN 12309-3:2014) 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 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of an identical text or by endorsement, at the latest by June 2015, and conflicting national standards shall be withdrawn at the latest by June 2015.

This document supersedes EN 12309-2:2000.

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 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 and Annex ZB, which are integral parts of this document.

This standard 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*.

EN 12309-1 and EN 12309-2 supersede EN 12309-1:1999, whereas EN 12309-1, EN 12309-3, EN 12309-4, EN 12309-5, EN 12309-6, and EN 12309-7 supersede EN 12309-2:2000.

EN 12309-1, EN 12309-2, EN 12309-3, EN 12309-4, EN 12309-5, EN 12309-6, and EN 12309-7 have been prepared to address the essential requirements of the European Directive 2009/142/EC relating to appliances burning gaseous fuels (see Annex ZA of prEN 12309-2:2013 for safety aspects and Annex ZA of EN 12309-5:2014 for rational use of energy aspects).

These documents are linked to the Energy Related Products Directive (2009/125/EC) in terms of tests conditions, tests methods and seasonal performances calculation methods under Mandate M/495 (see EN 12309-3:2014, Annex ZA; EN 12309-4:2014, Annex ZA; EN 12309-6:2014, Annex ZA and EN 12309-7:2014, Annex ZA and prEN 12309-2:2013, Annex ZB and EN 12309-5:2014, Annex ZB).

These documents will be reviewed whenever new mandates could apply.

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

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.

# 1 Scope

## 1.1 Scope of EN 12309

Appliances covered by this European Standard include one or a combination of the following:

— gas-fired sorption chiller;

— gas-fired sorption chiller/heater;

— gas-fired sorption heat pump.

This European Standard applies to appliances designed to be used for space heating or cooling or refrigeration with or without heat recovery.

This European Standard 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 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 12309-1:2014).

In the case of packaged units (consisting of several parts), this European 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 EN 12309.

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

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

## 1.2 Scope of this Part 3 of EN 12309

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

## 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 12309-1:2014, *Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW – Part 1: Terms and definitions*

EN 12309-4:2014, *Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW – Part 4: Test methods*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12309-1:2014 apply.

## 4 Test conditions

### 4.1 Environmental conditions and electrical power supply requirements

The test shall be carried out under the environmental conditions and electrical power supply requirements specified in Table 1 and Table 2 depending on the location of the appliance.

For all appliances, electrical power voltage and frequency shall be stated in the instructions.

**Table 1 — Environmental conditions and electrical power supply requirements for appliances designed for indoor installations**

| Type | Measured quantities | Rating test |
|---|---|---|
| Water-to-water and brine-to-water appliances [a] | Ambient temperature (Dry bulb temperature) | 15 °C to 30 °C |
| Air-to-water appliances with duct connection on the air inlet and outlet side | Ambient temperature (Dry bulb temperature) | 15 °C to 30 °C |
| Air-to-water appliances without duct connection on the air inlet side | Air inlet temperature (Dry/Wet bulb temperature) | According to Table 3 and Table 4 or Table 5 |
| All appliances | Voltage | Nominal voltage |
| All appliances | Frequency | Nominal frequency |
| [a] Rating conditions for water to water or brine to water appliances can be extended to water to brine and brine to brine appliances respectively (e.g. for reversible applications). | | |

**Table 2 — Environmental conditions and electrical power supply requirements for appliances designed for outdoor installations**

| Type | Measured quantities | Rating test |
|---|---|---|
| Water-to-water and brine-to-water appliances in cooling mode [a] | Ambient temperature (Dry bulb temperature) | 25 °C to 35 °C |
| Water-to-water and brine-to-water appliances in heating mode | Ambient temperature (Dry bulb temperature) | 0 °C to 7 °C |
| Air-to-water appliances | Air inlet temperature (Dry/Wet bulb temperature) | According to Table 3 and Table 4 or Table 5 |
| All appliances | Voltage | Nominal voltage |
| All appliances | Frequency | Nominal frequency |
| [a] Rating conditions for water to water or brine to water appliances can be extended to water to brine and brine to brine appliances respectively (e.g. for reversible applications). | | |

## 4.2 Rating conditions

For the rating tests, the appropriate test conditions shall be applied in accordance with:

— Table 3 for water-to-water, water-to-brine, air-to-water and air-to-brine appliances in cooling mode;

— Table 4 for appliances operating in cooling mode with heat recovery;

— Table 5 for air-to-water and air-to-brine appliances operating in the heating mode;

— Table 6 for water-to-water and brine-to-water appliances operating in the heating mode;

The prescribed test conditions shall be applied at full load of tested appliances.

For appliances with brine, the test shall be carried out with the brine specified in the instructions, see EN 12309-4:2014, 4.5.

NOTE 1 For air-to-water, brine-to-water and water-to-water appliances, the instructions may declare the water temperatures levels (lower, medium, high and very high) applicable to the heating mode.

NOTE 2 For comparison purposes between reverse cycle and non-reverse cycle appliances, the conditions on the water side are given by the inlet and outlet water temperatures, possibly leading to different water flow rates in heating and cooling modes.

**Table 3 — Rating test conditions for cooling mode of water-to-water [a], water-to-brine [a], air-to-water and air-to-brine appliances in cooling mode**

| | Type of appliance | Outdoor heat exchanger | | Indoor heat exchanger | |
|---|---|---|---|---|---|
| | | Inlet temperature °C | Outlet temperature °C | Inlet temperature °C | Outlet temperature °C |
| Standard rating conditions | Water-to-water appliances from cooling tower (for low temperature heating application - *reversible appliances*) [a] | 30 [b] | 35 | 23 | 18 |
| | Water-to-water appliances from cooling tower (for medium temperature heating application - *reversible appliances*) [a] | 30 [b] | 35 | 12 | 7 |
| | Water-to-brine appliances from cooling tower [a] | 30 [b] | 35 | 0 | −5 |
| | Air -to-water appliances (for low temperature heating application - *reversible appliances*) | 35 [c] | / | 23 | 18 |
| | Air-to-water appliances (for medium temperature heating application - *reversible appliances*) | 35 [c] | / | 12 | 7 |
| | Air-to-brine appliances | 35 [c] | / | 0 | −5 |
| Application rating conditions | Air-to-water appliances (for low temperature heating application - *reversible appliances*) | 27 [c] | / | [d] | 18 |
| | Air-to-water appliances (for medium temperature heating application - *reversible appliances*) | 27 [c] | / | [d] | 7 |
| | Air-to-water appliances (for medium temperature heating application) | 46 [c] | / | [d] | 7 |
| | Air-to-brine appliances | 27 [c] | / | [d] | −5 |
| | Air-to-brine appliances | 46 [c] | / | [d] | −5 |

NOTE The heater of a reversible unit (chiller/heater unit) is not operated during this test. In addition, for an appliance with a heat recovery heat exchanger, no heat recovery medium is circulating during the test.

[a] Rating conditions for water to water or brine to water appliances can be extended to water to brine and brine to brine appliances respectively (e.g. for reversible applications).

[b] The water shall contain any additives specified in instructions, but the test conditions remain the same as for water.

[c] Dry bulb temperature.

[d] The tests shall be carried out with the flow rate obtained during the test at the corresponding standard rating conditions.

**Table 4 — Rating test conditions for cooling capacity of appliances with heat recovery**

| | Outdoor heat exchanger | | Indoor heat exchanger | | Heat recovery water heat exchanger | |
|---|---|---|---|---|---|---|
| **Standard rating conditions** | **Inlet temperature** °C | **Outlet temperature** °C | **Inlet temperature** °C | **Outlet temperature** °C | **Inlet temperature** °C | **Outlet temperature** °C |
| Water-to-water [b] | 30 | / | / | 7 | 40 | 50 |
| Water-to-brine [b] | 30 | / | / | −5 | 40 | 50 |
| Air -to-water [a] | 35 | / | / | 7 | 40 | 50 |
| Air-to-brine [a] | 35 | / | / | −5 | 40 | 50 |

NOTE With the flow rate as determined during the test at the corresponding standard rating conditions (see Table 3).

[a] If the air cooled condenser is ducted then the test shall be conducted at the minimum flow rate specified in the instructions.

[b] At the minimum flow rate specified in the instructions.

**Table 5 — Rating test conditions for air-to-water and air-to-brine appliances in the heating mode**

| | Type of appliance | Outdoor heat exchanger | | Indoor heat exchanger | |
|---|---|---|---|---|---|
| | | **Inlet dry bulb temperature** °C | **Inlet wet bulb temperature** °C | **Inlet temperature** °C | **Outlet temperature** °C |
| Standard rating conditions | **Outdoor air** | | | | |
| | low temperature | 7 | 6 | [a] | 35 |
| | medium temperature | 7 | 6 | [a] | 45 |
| | high temperature | 7 | 6 | [a] | 55 |
| | very high temperature | 7 | 6 | [a] | 65 |
| | **Exhaust air** | | | | |
| | low temperature | 20 | 12 | [a] | 35 |
| | medium temperature | 20 | 12 | [a] | 45 |
| | high temperature | 20 | 12 | [a] | 55 |
| | very high temperature | 20 | 12 | [a] | 65 |
| Application rating conditions | **Outdoor air** | | | | |
| | low temperature | 12 | 11 | [b] | 35 |
| | | 2 | 1 | [b] | 35 |
| | | −7 | −8 | [b] | 35 |
| | | −15 | / | [b] | 35 |
| | medium temperature | 12 | 11 | [b] | 45 |
| | | 2 | 1 | [b] | 45 |
| | | −7 | −8 | [b] | 45 |

| | | | | | |
|---|---|---|---|---|---|
| | | −15 | / | [b] | 45 |
| | high temperature | 12 | 11 | [b] | 55 |
| | | 2 | 1 | [b] | 55 |
| | | −7 | −8 | [b] | 55 |
| | | −15 | / | [b] | 55 |
| | very high temperature | 12 | 11 | [b] | 65 |
| | | 2 | 1 | [b] | 65 |
| | | −7 | −8 | [b] | 65 |
| | | −15 | / | [b] | 65 |

[a] All tests shall be carried out with nominal flow rates indicated in the instructions in cubic meter per second, provided that the difference between the inlet and outlet temperatures at the indoor heat exchanger is lower than a maximum temperature difference ($\Delta T_{max}$) calculated using the following formula:

$$\Delta T_{max} = 7 + \left(\frac{T_{out} - 35}{30}\right) \cdot 10$$

In case this condition is not respected, the flow rate shall be increased till when the $\Delta T$ is equal to $\Delta T_{max}$. If a nominal flow rate is not indicated in the operating instructions and/or only a range of flow rates is given, test shall be carried out at the minimum value provided on the condition that the $\Delta T$ is equal to $\Delta T_{max.}$

[b] The tests shall be carried out with the flow rate given by the control system of the appliance or, by default, with the flow rate obtained during the test at the corresponding standard rating conditions provided that, in both cases, the condition expressed in the subscript “a” on the maximum $\Delta T$ is respected. It is intended that the control system of the appliance has the control on pumps such as for the internal pumps.

**Table 6 — Rating test conditions for water-to-water and brine-to-water appliances in the heating mode**

| | Type of appliance | Outdoor heat exchanger | | Indoor heat exchanger | |
|---|---|---|---|---|---|
| | | Inlet temperature °C | Outlet temperature °C | Inlet temperature °C | Outlet temperature °C |
| Standard rating conditions | **Water-to-water** | | | | |
| | low temperature | 10 | 7 | [a] | 35 |
| | medium temperature | 10 | 7 | [a] | 45 |
| | high temperature | 10 | 7 | [a] | 55 |
| | very high temperature | 10 | 7 | [a] | 65 |
| | **Brine-to-water** | | | | |
| | low temperature | 0 | −3 | [a] | 35 |
| | medium temperature | 0 | −3 | [a] | 45 |
| | high temperature | 0 | −3 | [a] | 55 |
| | very high temperature | 0 | −3 | [a] | 65 |
| Application rating conditions | **Water-to-water** | | | | |
| | low temperature | 15 | [b] | [b] | 35 |
| | medium temperature | 15 | [b] | [b] | 45 |
| | high temperature | 15 | [b] | [b] | 55 |
| | very high temperature | 15 | [b] | [b] | 65 |
| | **Brine-to-water** | | | | |
| | low temperature | 5 | [b] | [b] | 35 |
| | | −5 | [b] | [b] | 35 |
| | medium temperature | 5 | [b] | [b] | 45 |
| | | −5 | [b] | [b] | 45 |
| | high temperature | 5 | [b] | [b] | 55 |
| | | −5 | [b] | [b] | 55 |
| | very high temperature | 5 | [b] | [b] | 65 |
| | | −5 | [b] | [b] | 65 |

[a)] All tests shall be carried out with nominal flow rates indicated in the instructions in cubic meter per second, provided that the difference between the inlet and outlet temperatures at indoor heat exchanger is lower than a maximum temperature difference ($\Delta T_{max}$) calculated using the following formula:

$$\Delta T_{max} = 7 + \left(\frac{T_{out} - 35}{30}\right) \cdot 10$$

In case this condition is not respected, the flow rate shall be increased till when the $\Delta T$ is equal to $\Delta T_{max}$. If a nominal flow rate is not indicated in the operating instructions and/or only a range of flow rates is given, test shall be carried out at the minimum value provided on the condition that the $\Delta T$ is equal to $\Delta T_{max}$

[b] The tests shall be carried out with the flow rate given by the control system of the appliance or, by default, with the flow rate obtained during the test at the corresponding standard rating conditions provided that, in both cases, the condition expressed in the subscript “a” on the maximum $\Delta T$ is respected
It is intended that the control system of the appliance has the control on pumps such as for the internal pumps.

If liquid heat transfer media other than water is used, the specific heat capacity and the density of such heat transfer media is determined and taken into consideration in the evaluation.

# Annex ZA
(informative)

## Relationship between this European Standard and the requirements of Commission Regulation (EC) No 813/2013

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to requirements of *Commission Regulation (EC) No 813/2013 of 6 September 2013 implementing Directive 2005/32/EC* [1)] */ 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for space heaters and combination heaters.*

Once this standard is cited in the Official Journal of the European Union under that Commission Regulation, compliance with the clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding requirements of that and associated EFTA regulations.

**Table ZA.1 — Correspondence between this European Standard and Commission Regulation (EC) No 813/2013**

| Clauses and subclauses of this EN | Requirements of Commission Regulation (EC) No 813/2013 | Qualifying remarks/Notes |
|---|---|---|
| Not applicable | Annex II.1 (a) and (b) | |
| Not applicable | Annex II.2 (a) and (b) | |
| Not applicable | Annex II.3 | |
| Not applicable | Annex II.4 | |
| Not applicable | Annex II.5 (a), (b) and (c) | |
| Not applicable | Annex II Table 1 | |
| Not applicable | Annex II Table 2 | |
| | | |
| 4.1 Table 1 (indoor installations) and Table 2 (outdoor installations) | Annex III.2 | |
| Not applicable | Annex III.3 | |
| Not applicable | Annex III.4 | |
| Not applicable | Annex III.5 | |
| 4.1 Tables 5 and 6 | Annex III Table 3 | |
| Not applicable | Annex III Table 4 | |
| Not applicable | Annex III Table 5 | |
| Not applicable | Annex III Table 6 | |
| Not applicable | Annex III Table 7 | |

**WARNING —** Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

1) The Directive was replaced by the Directive 2009/125/EC.

# Annex ZB
(informative)

# Relationship between this European Standard and the requirements of Commission Regulation (EC) No 811/2013

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to requirements of *Commission Regulation (EC) No 811/2013 of 6 September 2013 implementing Directive 2005/32/EC* [2)] */ 2009/125/EC of the European Parliament and of the Council with regard to energy labelling of space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device.*

Once this standard is cited in the Official Journal of the European Union under that Commission Regulation, compliance with the clauses of this standard given in Table ZB.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding requirements of that and associated EFTA regulations.

**Table ZB.1 — Correspondence between this European Standard and Commission Regulation (EC) N° 811/2013**

| Clauses and subclauses of this EN | Requirements of Commission Regulation (EC) No 811/2013 | Qualifying remarks/Notes |
|---|---|---|
| Not applicable | Article 3, 1(a), Annex II, 1 | Energy efficiency classes |
| Not applicable | Article 3, 1(a), Annex II, 2 | Water heating energy classes |
| Not applicable | Article 3, 1(a), Annex III and IV | Sound power level |
| 4.1 Table 1 (indoor installations) and Table 2 (outdoor installations) | Article 3, 1(a), Annex III, 1.1 and Annex III, 3. | Tests conditions for measuring the rated heat output to be inserted in the Energy label for space heater |
| 4.1 Table 1 (indoor installations) and Table 2 (outdoor installations) | Article 3, 1(b), Annex IV, 1 and Annex IV, 5. | Tests conditions for measuring the data to be inserted in the product fiche for space heater |
| Not applicable | Article 3, 1(c), Annex V, 1. | Technical documentation for space heater |
| Not applicable | Article 3, 2(a), Annex III, 2.1 and Annex III, 4. | Energy label for combination heater |
| Not applicable | Article 3, 2(b), Annex IV, 2 and Annex IV, 6. | Product fiche for combination space heater |
| Not applicable | Article 3, 2(c), Annex V, 2 | Technical documentation for combination heater |

**WARNING —** Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

2) The Directive was replaced by the Directive 2009/125/EC.

# Bibliography

[1] CEN/TR 1749, *European scheme for the classification of gas appliances according to the method of evacuation of the combustion products (types)*

[2] prEN 12309-2:2013[3] *Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW – Part 2: Safety*

[3] EN 12309-5:2014, *Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW – Part 5: Requirements*

[4] EN 12309-6:2014, *Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW – Part 6: Calculation of seasonal performances*

[5] 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*

3) This part of standard is currently being revised.

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