SLOVENSKI STANDARD
SIST EN 12309-7:2015

01-marec-2015

Nadomešča:
SIST EN 12309-2:2001

Absorpcijske in adsorpcijske plinske naprave za gretje in/ali hlajenje z grelno močjo do vključno 70 kW - 7. del: Posebne zahteve za hibridne naprave

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

Gasbefeuerte Sorptions-Geräte für Heizung und/oder Kühlung mit einer Nennwärmebelastung nicht über 70 kW - Teil 7: Spezifische Bestimmungen für Hybridanlagen

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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 7: Dispositions spécifiques pour les appareils hybrides

Ta slovenski standard je istoveten z: **EN 12309-7:2014**

ICS:

27.080	Toplotne črpalke	Heat pumps
91.140.30	Prezračevalni in klimatski sistemi	Ventilation and air-conditioning

SIST EN 12309-7:2015 **en,fr,de**

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12309-7

December 2014

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 7: Specific provisions for hybrid appliances

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 7 : Dispositions spécifiques pour les appareils hybrides

Gasbefeuerte Sorptions-Geräte für Heizung und/oder Kühlung mit einer Nennwärmebelastung nicht über 70 kW - Teil 7: Spezifische Bestimmungen für Hybridanlagen

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

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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.

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SIST EN 12309-7:2015

Contents

Page

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 12309-7:2015
https://standards.iteh.ai/catalog/standards/sist/3267b0c6-441b-86be-027c4b089a09/sist-en-12309-7-2015

SIST EN 12309-7:2015

Foreword

This document (EN 12309-7:2014) 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 supersede 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*:

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— *Part 1: Terms and definitions*;

— *Part 2: Safety*;

— *Part 3: Test conditions*;

SIST EN 12309-7:2015
https://standards.iteh.ai/catalog/standards/sist/15ee2367-b0c6-441b-86be-027c4b089a09/sist-en-12309-7-2015

— *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.

SIST EN 12309-7:2015

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.

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(standards.iteh.ai)
SIST EN 12309-7:2015
https://standards.iteh.ai/catalog/standards/sist/15ee2367-b0c6-441b-86be-027c4b089a09/sist-en-12309-7-2015

SIST EN 12309-7:2015

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.

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The above appliances can have one or more primary or secondary functions (i.e. heat recovery - see definitions in EN 12309-1:2014).

SIST EN 12309-7:2015
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In the case of packaged units (consisting of several parts), this 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 7 of EN 12309

This part of EN 12309 deals particularly with the specific provisions of hybrid heating appliances based on gas-driven sorption heat pumps as defined in Part 1.

The heating appliances covered by this European Standard are of a hybrid type, an encased assembly or assemblies combining a direct or indirect-fired sorption heat pump for base load and a peak load condensing boiler with only one flue system, electrical supply cable and human machine interface to the end user. The direct- or indirect-fired sorption heat pump integrated in the hybrid appliances in this European Standard could be intermittent or continuously operating ab or adsorption heat pump.

The control system of hybrid heating appliances decides on the transition between the heat pump operation mode to/from the mixed operation mode (heating by both sorption heat pump as well as the peak boiler) and the direct heating mode (only peak boiler) depending on the heating fluid inlet or return temperature, temperature of brine entering the indoor heat exchanger (evaporator) of the heat pump, the required outlet or supply temperature dependent on the outdoor temperature as well as the target value of the indoor or room temperature. Upon transition from the heat pump operation mode to the mixed operation mode, the control system decides also on the degree of mixing based on the above mentioned parameters.

SIST EN 12309-7:2015

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*

prEN 12309-2:2013[1], *Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW — Part 2: Safety*

EN 12309-3:2014, *Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW — Part 3: Test conditions*

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*

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*

3 Terms and definitions

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

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4 Test conditions

4.1 General

SIST EN 12309-7:2015
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The types of hybrid heating appliances considered in this European Standard are variable capacity delivering a variable heating fluid outlet temperature dependent on the outdoor (ambient air) and the design indoor (room) temperatures as well as the selected heat sink conditions.

Table 1 presents the design temperatures for heating (the dry bulb outdoor coldest temperature) for each reference heating season, the design indoor (room) temperature (T_R) as well as the balance point or heating limit temperature (T_{BP}) for the considered three reference heating seasons (climatic conditions) in EN 12309-6:2014; namely colder (C), average (A) and warmer (W). The heating season "Average" corresponds to the weather conditions of Strasburg, while "Warmer" and "Colder" correspond to the weather conditions of Athens and Helsinki, respectively.

Table 1 — Design temperature, indoor temperature and balance point temperatures for the different reference heating seasons

Reference Heating Season	Dry bulb temperature conditions		
	$T_{designh}$	T_R	T_{BP}
Colder (C)	−22 °C	20 °C	16 °C
Average (A)	−10 °C	20 °C	16 °C
Warmer (W)	+2 °C	20 °C	16 °C

In Table 2, the design outlet (supply) and inlet (return) temperatures to and from the building heating network (heating fluid temperatures from the heating appliance to the heating network and backwards, respectively) are listed as defined in EN 12309-3:2014.

[1] This part of EN 12309 is currently being revised.

SIST EN 12309-7:2015

Table 2 — Design outlet and inlet temperatures for the different heat sink conditions

Reference Heat Sink condition	Dry bulb temperature conditions	
	T_{out-d} °C	T_{in-d} °C
Low temperature application	35	28
Medium temperature application	45	35
High temperature application	55	41
Very high temperature application	65	48

At least one of the given heat sink conditions in Table 2 shall be declared, upon which the seasonal performance can be evaluated according to this document.

The part load ratio at any outdoor temperature can be defined for the building as the ratio between the building part load at any outdoor temperature and the building design heat load. In the same way, the heating appliance part load ratio can be defined as the appliance heating capacity to be delivered at any outdoor temperature divided by the appliance's nominal heating capacity.

The accuracy of estimating the seasonal performance of such hybrid appliances is highly dependent on the uniformity of distributing the reference part load conditions over the building heat demand curve. For hybrid heating appliances, the reference part load ratios of 100 %, 75 %, 60 %, 45 %, 30 % and 15 % have been defined.

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Because of the applied 1 K step in the outdoor temperature in the EN 12309-6:2014, the estimated part load ratios deviate from those values. The closest part load value is allocated as a pivot part load ratio for the estimation of the seasonal performance as given in Table 3.

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SIST EN 12309-7:2015
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Table 3 — Reference and pivot part load ratios for the considered reference heating seasons

Reference test condition	Reference PLR %	Pivot PLR for the Reference Heating Seasons		
		(C)	(A)	(W)
A	**100**	100	100	100
B	**75**	74	73	71
C	**60**	61	58	57
D	**45**	45	46	43
E	**30**	29	31	29
F	**15**	16	15	14

If necessary, at most one more reference test point G between two successive reference test points from A to F may be added. The test conditions should then be linearly interpolated between the two successive standard reference test conditions given in 4.2 and 4.3.

The stated nominal heating capacity of the hybrid heating appliance shall always be higher than or equal to the building design load for heating.

NOTE The measured gas utilization efficiencies at the reference part load conditions are only allowed to be considered in estimating the seasonal performance, if the heating capacity at each reference part load condition is measured within the given deviation limits in EN 12309–4:2014.

SIST EN 12309-7:2015

4.2 Inlet temperatures of the indoor heat exchanger

Fixing the reference test conditions to the part load ratios results in the same indoor heat exchanger inlet and outlet temperatures over the reference heating seasons for every part load ratio. Annex A represents a detailed approach on how to estimate the inlet and outlet temperature into/from the indoor heat exchanger for any part load ratio and reference heating season. The inlet and outlet temperatures have been estimated for the reference test part load ratios defined in 4.1 and presented in Table 4 for both low and medium as well as in Table 5 for both high and very high temperature heat sink conditions, respectively. Annex A gives a more detailed view of this approach.

Table 4 — Inlet and outlet temperatures of the indoor heat exchanger for the reference part load test conditions of the low and medium temperature heat sink applications

Reference test condition	Low temperature application		Medium temperature application	
	Outlet temperature °C	Inlet temperature °C	Outlet temperature °C	Inlet temperature °C
A	35,0	28,0	45,0	35,0
B	31,4	26,2	39,4	31,9
C	29,3	25,1	36,1	30,1
D	27,1	24,0	32,4	28,0
E	24,9	22,8	28,8	25,8
F	22,5	21,5	24,8	23,3

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 12309-7:2015
https://standards.iteh.ai/catalog/standards/sist/...
027c4b089a09/sist-en-12309-7-2015

Table 5 — Inlet and outlet temperatures of the indoor heat exchanger for the reference part load test conditions of the high and very high temperature heat sink applications

Reference test condition	High temperature application		Very high temperature application	
	Outlet temperature °C	Inlet temperature °C	Outlet temperature °C	Inlet temperature °C
A	55,0	41,0	65,0	48,0
B	47,6	37,1	56,0	43,3
C	43,1	34,7	50,4	40,2
D	38,2	31,9	44,3	36,7
E	33,2	29,0	38,0	32,9
F	27,4	25,4	30,5	28,0

The part load measurements at the reference test conditions shall follow the inlet temperature method of the EN 12309-4:2014.

Each reference part load test condition is strictly defined by both part load and the inlet temperatures to both indoor and outdoor heat exchangers. The inlet temperatures to the indoor heat exchangers shall be taken from Table 4 and Table 5, while the inlet temperatures to the outdoor heat exchanger are defined in 4.3 for the different environmental heat sources.

SIST EN 12309-7:2015

The listed outlet temperatures in Table 4 and Table 5 shall be the average outlet temperatures over the cycle. They are given to guide the measurements only in case the nominal (design) heating fluid flow rate is kept constant over all part load conditions. Specially, for the low part load ratios (B to F), the heating fluid flow rate can be decreased to enhance the outlet temperature, in order to increase the measurement accuracy and to reduce the auxiliary electrical power consumption. This is only allowed under the condition that the temperature gradient between outlet and inlet temperatures at any part load condition shall not be higher than the temperature gradient at the corresponding design load condition; namely 7 K for the low temperature heat sink as well as 10 K, 14 K and 17 K for the medium, high and very high temperature heat sink applications, respectively.

The recommendations for the hybrid appliance concerning the allowed deviation(s) in the temperature gradients at each reference part load test condition, as described before, shall be followed.

As the type of integrated gas-driven sorption heat pump can be either intermittent or continuously operating a time share between the heat pump and the peak boiler is required at higher heating capacities, the heating capacity should be averaged either over a very long time period (e.g. 24 h) or over a number of complete operation cycles not less than two. A typical operation cycle of a hybrid appliance can be counted between two successive normal burner operations.

For burners with constant air to fuel ratio control, a burner calibration shall not be counted as a normal burner operation. The test shall wait for two successive operation cycles without any automatic burner calibration operations in between. The cyclic operation of the hybrid appliance shall be described in the operating manual and the automatic burner calibration mode may be suppressed within a test operation mode, to allow the test to be carried out more precisely.

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4.3 Inlet temperatures into the outdoor heat exchanger

4.3.1 Air to water hybrid heating appliance

SIST EN 12309-7:2015
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Based on the definition of the part load ratio (PLR(Toutdoor)) given in EN 12309-6:2014, the dry bulb air temperatures entering the outdoor heat exchanger of air to water hybrid heating appliances have been estimated for the pivot part load test conditions given in Table 3 by applying Formula (1) and are listed in Table 6.

$$T_{outdoor} = 16 + PLR\left(T_{outdoor}\right) \cdot \left(T_{designh} - 16\right) \quad (1)$$

Table 6 — Inlet dry (wet) bulb temperatures of air into the outdoor heat exchangers

Reference test condition	Reference Heating Season °C		
	(C)	(A)	(W)
A	−22 (−23)	−10 (−11)	2 (1)
B	−12 (−13)	−3 (−4)	6 (5)
C	−7 (−8)	1 (0)	8 (7)
D	−1 (−2)	4 (3)	10 (9)
E	5 (4)	8 (7)	12 (11)
F	10 (9)	12 (11)	14 (13)

The wet bulb temperature is set equal to the dry bulb temperature minus 1 K. For temperature below – 10°C, setting of the wet bulb is not mandatory.