SLOVENSKI STANDARD
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Toplotna črpalka s plinsko gnanim motorjem z notranjim zgorevanjem - 3. del: Preskusni pogoji

Gas-fired endothermic engine driven heat pumps - Part 3: Test conditions

Gasbefeuerte endothermische Motor-Wärmepumpen - Teil 3: Prüfbedingungen

Pompes à chaleur à moteur endothermique alimenté au gaz - Partie 3 : Conditions d'essai

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27.080	Toplotne črpalke	Heat pumps

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This European Standard was approved by CEN on 9 January 2017.

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

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European foreword

This document (EN 16905-3:2017) 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of an identical text or by endorsement, at the latest by September 2017, and conflicting national standards shall be withdrawn at the latest by September 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA and Annex ZB, which are integral parts of this document.

This standard comprises the following parts under the general title, *Gas-fired endothermic engine driven heat pumps:*

— *Part 1: Terms and definitions*;

— *Part 2: Safety* (WI 00299025, currently in preparation);

— *Part 3: Test conditions*;

— *Part 4: Test methods*;

— *Part 5: Calculation of seasonal performances in heating and cooling mode* (currently being voted).

EN 16905-1, prEN 16905-2, EN 16905-3, EN 16905-4 and EN 16905-5 have been prepared to address the essential requirements of the European Directive 2009/142/EC relating to appliances burning gaseous fuels (see prEN 16905-2:201X, Annex ZA for safety aspects and EN 16905-5:2017, Annex ZA 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/535; (see EN 16905-3:2017, Annex ZA, EN 16905-4:2017, Annex ZA, EN 16905-5:2017, Annex ZA and prEN 16905-2:201X, Annex ZB).

These documents will be reviewed whenever new mandates could apply.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

1.1 Scope of EN 16905 series

This European Standard specifies the requirements, test methods and test conditions for the rating and performance calculation of air conditioners and heat pumps using either air, water or brine as heat transfer media, with gas-fired endothermic engine driven compressors when used for space heating, cooling and refrigeration, hereafter referred to as “GEHP appliance”.

This European Standard only applies to appliances with a maximum heat input (based on net calorific value) not exceeding 70 kW at standard rating conditions.

This European Standard only applies to appliances under categories I_{2H}, I_{2E}, I_{2Er}, I_{2R}, $I_{2E(S)B}$, I_{2L}, I_{2LL}, I_{2ELL}, $I_{2E(R)B}$, I_{2ESi}, $I_{2E(R)}$, I_{3P}, I_{3B}, $I_{3B/P}$, II_{2H3+}, II_{2Er3+}, $II_{2H3B/P}$, $II_{2L3B/P}$, $II_{2E3B/P}$, $II_{2ELL3B/P}$, II_{2L3P}, II_{2H3P}, II_{2E3P} and II_{2Er3P} according to EN 437.

This European Standard only applies to appliances having:

a) gas fired endothermic engines under the control of fully automatic control systems;

b) closed system refrigerant circuits in which the refrigerant does not come into direct contact with the fluid to be cooled or heated;

c) where the temperature of the heat transfer fluid of the heating system (heating water circuit) does not exceed 105 °C during normal operation;

d) where the maximum operating pressure in the

   1) heating water circuit (if installed) does not exceed 6 bar;

   2) domestic hot water circuit (if installed) does not exceed 10 bar.

This European Standard applies to appliances only when used for space heating or space cooling or for refrigeration, with or without heat recovery.

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

Packaged units, single split and multisplit systems are covered by this European Standard. Single duct and double duct units are covered by this European Standard.

The above appliances can have one or more primary or secondary functions.

This European Standard 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), this European Standard applies only to those designed and supplied as a complete package.

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

1.2 Scope of EN 16905-3

This part of the EN 16905 series specifies the test conditions for the rating of energy parameters of gas-fired endothermic engine driven heat pumps for heating and/or cooling mode including the engine heat recovery.

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 16905-1, *Gas-fired endothermic engine driven heat pumps — Part 1: Terms and definitions*

EN 16905-4:2017, *Gas-fired endothermic engine driven heat pumps — Part 4: Test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16905-1 apply.

4 Test conditions

4.1 Environmental conditions and electrical power supply requirements

The tests shall be carried out under the environmental conditions specified in Table 1 or Table 2 depending on the location of the unit.

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

Table 1 — Environmental conditions and electrical power supply requirements for units designed for installation indoors

Type	Measured quantities	Rating test
Water-to-water and brine-to-water units [a]	Dry bulb temperature	15 °C to 30 °C
Water-to-air and brine-to-air units with duct connection on the air inlet and outlet side	Dry bulb temperature	15 °C to 30 °C
Water-to-air and brine-to-air units without duct connection on the air inlet side	Dry bulb temperature Wet bulb temperature	Inlet temperature (see Table 6 and Table 7)
Air-to-water units with duct connection on the air inlet and outlet side	Dry bulb temperature	15 °C to 30 °C
Air-to-water units without duct connection on the air inlet side	Dry bulb temperature Wet bulb temperature	Inlet temperature (see Tables 12 to 15)
Air-to-air units with duct connection on the outdoor air inlet and outlet side	Dry bulb temperature	15 °C to 30 °C
Air-to-air units without duct connection on the outdoor air inlet and outlet side	Dry bulb temperature Wet bulb temperature	As inlet temperature see Table 3 and Table 4
All appliances	Voltage	Rated voltage
All appliances	Frequency	Rated frequency
[a] Rating conditions for water to water or water to brine appliances can be extended to brine to water and brine to brine appliances respectively (e.g. for reversible applications).		

Table 2 — Environmental conditions and electrical power supply requirements for units designed for installation outdoors

Type	Measured quantities	Rating test
Air-to-water units	Dry bulb temperature Wet bulb temperature	Inlet temperature (see Tables 12 to 14 and Table 15)
Water-to-air units	Dry bulb temperature Wet bulb temperature	Inlet temperature (see Table 6 and Table 7)
Water-to-water and brine-to-water operating in cooling mode [a]	Dry bulb temperature	15 °C to 30 °C
Water-to-water and brine-to-water operating in heating mode	Dry bulb temperature	0 °C to 7 °C
Air-to-air units with duct connection on the indoor air inlet and outlet side	Dry bulb temperature Wet bulb temperature	Inlet temperature (see Table 3 and Table 4)
All appliances	Voltage	Rated voltage
All appliances	Frequency	Rated frequency

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

4.2 Rating conditions in cooling and in heating

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

— Table 3 for air-to-air units and air-cooled multisplit systems in heating mode;

— Table 4 for air-to-air units and air-cooled multisplit systems in cooling mode;

— Table 5 for air-to-air simultaneous heating and cooling mode multisplit systems;

— Table 6 for water-to-air, brine-to-air units and water-cooled multisplit systems in heating mode;

— Table 7 for water-to-air, brine-to-air units and water-cooled multisplit systems in cooling mode;

— Tables 8 to 10 for water-to-water and brine-to-water units in heating mode, depending on the temperature applications;

— Table 11 for water-to-water, brine-to-water, water-to-brine and brine-to-brine units in cooling mode;

— Tables 12 to 14 for air-to-water units in heating mode, depending on the temperature applications;

— Table 15 for air-to-water and air-to-brine units in cooling mode.

For units with brine, the test shall be carried out with the brine specified in the instruction, see EN 16905-4:2017, 4.5.1.6.

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

NOTE 2 For comparison purposes between reverse cycle and non reverse cycle units, 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 — Air-to-air units and air-cooled multisplit systems - Heating mode

		Outdoor heat exchanger		Indoor heat exchanger	
		Inlet dry bulb temperature °C	**Inlet wet bulb temperature °C**	**Inlet dry bulb temperature °C**	**Inlet wet bulb temperature °C**
Standard rating conditions	Outdoor air / recycled air (split units and air-cooled multisplit systems)	7	6	20	15 max
	Exhaust air / recycled air (e.g. single duct heat pump)	20	12	20	12
	Exhaust air / outdoor air	20	12	7	6
Application rating conditions	Outdoor air / recycled air (split units and air-cooled multisplit systems)	2	1	20	15 max.
	Outdoor air / recycled air (split units and air-cooled multisplit system)	−7	−8	20	15 max.
	Outdoor air / recycled air (split units and air-cooled multisplit system)	−15	-	20	1 5 max.
	Outdoor air / recycled air (split units and air-cooled multisplit system)	12	11	20	15 max.
	Exhaust air / outdoor air	20	12	2	1
	Exhaust air /outdoor air	20	12	−7	−8

Table 4 — Air-to-air units and air-cooled multisplit systems - Cooling mode

		Outdoor heat exchanger		Indoor heat exchanger	
		Inlet dry bulb temperature °C	Inlet wet bulb temperature °C	Inlet dry bulb temperature °C	Inlet wet bulb temperature °C
Standard rating conditions	Comfort (outdoor air / recycled air) (split units) and air-cooled multisplit systems	35	24 [a]	27	19
	Comfort (outdoor air / recycled air) (split units) and air-cooled multisplit systems	27	19	27	19
	Comfort (exhaust air / outdoor air)	27	19	35	24
	Single duct [b, c]	35	24	35	24
	Control cabinet	35	24	35	24
	Close control	35	24	24	17
Application rating conditions	Comfort (outdoor air / recycled air) (split units and air-cooled multisplit systems)	27	19 [a]	21	15
	Single duct [b, c]	27	19	27	19
	Comfort (outdoor air / recycled air) (split units and air-cooled multisplit systems	46	24 [a]	29	19
	Control cabinet	50	30	35	24
	Close control	27	19	21	15

[a] The wet bulb temperature condition is not required when testing units which do not evaporate / condensate.

[b] When using the calorimeter room method, pressure equilibrium between indoor and outdoor compartments shall be obtained by introducing into indoor compartment, air at the same rating temperature conditions.

[c] The pressure difference between the two compartments of the calorimeter room shall not be greater than 1,25 Pa. This pressure equilibrium can be achieved by using an equalizing device or by creating an open space area in the separation partition wall, which dimensions shall be calculated for the maximum airflow of the unit to be tested. If an open space is created in the partition wall, an air sampling device or several temperature sensors shall be used to measure the temperature of the air from the outdoor compartment to the indoor compartment.

Table 5 — Simultaneous heating and cooling mode multisplit systems

			Three room calorimeter or air enthalpy		Two room air enthalpy	
			Dry bulb temperature °C	Wet bulb temperature °C	Dry bulb temperature °C	Wet bulb temperature °C
Application rating conditions	Outdoor side		7	6	7	6
	Indoor side	Heating	20	-	20	19
		Cooling	27	19	20	19

Table 6 — Water-to-air, brine-to-air units and water-cooled multisplit systems - Heating mode

		Outdoor heat exchanger		Inlet heat exchanger	
		Inlet temperature °C	Outlet temperature °C	Inlet dry bulb temperature °C	Inlet wet bulb temperature °C
Standard rating conditions	Water [a]	10	7	20	15 max.
	Brine	0	−3	20	15 max.
	Water loop	20	17	20	15 max.
Application rating conditions	Water	15	b	20	15 max.
	Brine	5	b	20	15 max.
	Brine [c]	−5	b	20	15 max.

[a] The term “water”include indifferently water from a river or a lake, round water or water in a close water loop.

[b] The test is performed at the flow rate obtained during the test at the corresponding standard.

[c] Test condition only for water-cooled multisplit systems.