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Air to water ~~Heat~~heat pumps~~ ~~— Testing and rating for performance ~~—~~ —

Part~~ ~~2~~ space~~:~~
Space heating and/or space cooling

Chauffe-eau à pompe à chaleur — Essais et classification des performances —

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FDIS stage

Contents

Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 86, *Refrigeration and air-conditioning*, Subcommittee SC 6, *Testing and rating of air-conditioners and heat pumps*.

This second edition cancels and replaces the first edition (ISO 19967-2:2019), which has been technically revised.

The main changes are as follows:

— ~~Title is~~the title has been changed~~.~~;

— ~~Terms~~terms and definitions ~~are~~have been added and clarified~~.~~;

~~— Symbol is followed Title is changed in accordance with ISO/IEC Directives, Part 2, 16.5.4~~

— ~~Test~~test conditions ~~are~~have been defined and added for space cooling and/or space heating;

— ~~Installation~~the installation of test item (object) of several parts ~~is~~has been clarified~~.~~;

— ~~the test report~~ information ~~of Test report is~~has been updated ~~in accordance with ISO/IEC Directives Part 2, 18.5.8~~;

— ~~Annex A Maximum~~the maximum and minimum operation ~~(informative) is~~ annex has been deleted.

A list of all parts in the ISO 19967 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Air to water heat pumps — Testing and rating for performance —

Part 2: ~~space~~ Space heating and/or space cooling

1 Scope

This document specifies test conditions and test procedures for determining the performance characteristics of air to water heat pumps for space heating and/or space cooling with electrically driven compressors with or without supplementary heater. The purpose of this document is to rate the performance of the air to water heat pumps for space heating and/or space cooling.

In the case of air to water heat pumps for space heating and/or space cooling consisting of several parts with refrigerant or water connections, this document applies only to those designed and supplied as a complete package. This document does not apply to large chiller or large liquid chilling package for space cooling and/or heating.

This document does not apply to air to water heat pumps not intended for human comfort.

NOTE Testing procedures for simultaneous operation for hot water supply and space heating and-/or space cooling are not treated in this document. Simultaneous means that hot water supply and space heating and-/or space cooling generation occur at the same time and can interact.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/

3.1
air to water heat pumps
heat pump which consists of one or more factory-made assemblies which normally include at space side refrigerant to water heat exchanger(s) (load side), electrically driven compressor(s), and outdoor-side air-to-refrigerant heat exchanger(s) (source side), including means to provide space heating and/or space cooling functions

Note 1 to entry: It can include a supplementary heater for space heating.

3.2
heating capacity
Φ_H
heat given off by the unit to the heat transfer medium per unit of time

Note 1 to entry: Heating capacity is expressed in watts.

3.3
cooling capacity
Φ_C
heat removed by the unit from the heat transfer medium per unit of time

Note 1 to entry: Cooling capacity is expressed in watts.

3.4
effective power input
average electrical power input of the unit within the defined interval of time obtained from:

— power input for operation of the compressor and any power input for defrosting;

— power input for all control and safety devices of the unit;

— proportional power input of the conveying devices (e.g. fans, pumps) for ensuring the transport of the heat transfer media inside the unit

Note 1 to entry: Effective power input is expressed in watts.

3.5
35 °C application
temperature application where the indoor heat exchanger water outlet temperature of 35 °C is met at design temperature

3.6
45 °C application
temperature application where the indoor heat exchanger water outlet temperature of 45 °C is met at design temperature

3.7
55 °C application
temperature application where the indoor heat exchanger water outlet temperature of 55 °C is met at design temperature

3.8
7 °C application
temperature application where the indoor heat exchanger water outlet temperature of 7 °C is met at design temperature

3.9
18 °C application
temperature application where the indoor heat exchanger water outlet temperature of 18 °C is met at design temperature

3.10
outdoor heat exchanger
Heat exchanger which is designed to remove/add heat from/to the outdoor ambient environment

3.116
internal static pressure difference
Δp_i
negative pressure difference measured between the air (or water) outlet section and air (or water) inlet section of the unit, which corresponds to the total pressure drop of all components on the air (or water) side of the unit

3.127
energy efficiency ratio
EER
ratio of the cooling capacity to the effective power input in the unit

Note 1 to entry: Expressed in units of watt per watt.

3.138
coefficient of performance
COP
ratio of heating capacity to the effective power input of the equipment at any given set of rating conditions

Note 1 to entry: Expressed in units of watt per watt.

4 Symbols and abbreviated terms

Symbol	Definition	Units
C_p	Coefficient of performance	kW/kW
C_{20}	Scaling factor equal to 0,49	—
E_{EI}	Energy Efficiency Index equal to 0,23	—
I_E	Motor efficiency	—
Φ_H	Heating capacity	W
Φ_C	Cooling capacity	W
P_{hyd}	Hydraulic power of the pump	W
q	Volume flow rate	m^3/s
τ	Time	s
ρ	Density of the hot water depending on the temperature at the flow meter	kg/m^3
Δp_e	Measured available external static pressure difference	Pa
Δp_i	Measured internal static pressure difference	Pa
Δt	Difference between inlet and outlet temperatures	K
η	0,3 by convention	—

5 Installation requirements

5.1 Test apparatus and uncertainties of measurement

The test apparatus shall be designed in such a way that all requirements for adjustment of set values, stability criteria and uncertainties of measurement according to this document are fulfilled.

Water systems or other heat transfer liquid systems shall be sufficiently free of entrained gas as to ensure that the measured results are not significantly influenced.

The response time of the temperature sensor and the sampling interval shall be chosen to maintain the uncertainties in Table 1.

Ducted air systems shall be sufficiently airtight to ensure that the measured results are not significantly influenced by exchange of air with the surroundings.

Temperature and pressure measuring points shall be arranged in order to obtain mean significant values.

For free air intake dry bulb temperature measurements, it is required either:

— to have at least one sensor per square meter, with not less than four measuring points and by restricting to 20 the number of sensors equally distributed on the free air surface; or

— to use a sampling device. It shall be completed by four sensors for checking uniformity if the surface area is greater than 1 m^2.

Air dry bulb temperature sensors shall be placed at a distance between 0,15 m and 0,3 m from the free air surface, defined as the minimal enveloping surface containing the coil(s).

For units consisting of a heat pump and a storage tank as a factory made unit, water inlet and outlet temperature measurements shall be taken at the inlet and outlet of this unit.

For water, the density and specific heat in Formulae (1) and (10) shall be determined in the temperature conditions measured near the volume flow measuring device.

For inverter type control units, the setting of the frequency shall be done for each rating condition. The manufacturer shall provide in the documentation information instructions on how to obtain the necessary data to set the required frequencies. If skilled personnel with knowledge of control software is required for the start of the system, the manufacturer or the nominated agent should be in attendance when the system is being installed and prepared for tests.

The uncertainties of measurement shall not exceed the values specified in Table 1. Additionally, the heating and/or cooling capacities measured on the liquid side shall be determined within a maximum uncertainty of 5 % independently of the individual uncertainties of measurements including the uncertainties on the properties of the fluid.

Table 1 — Uncertainties of measurement

Measured quantity	Unit	Uncertainty
Liquid		
Temperature	°C	0,15 K
Temperature difference	K	0,15 K
Volume flow	m^3/s	1 %
Static pressure difference	kPa	1 kPa (≤20 kPa) 5 % (>20 kPa)

Measured quantity	Unit	Uncertainty
Concentration	%	2 %
Air		
Dry bulb temperature	°C	0,2 K
Wet bulb temperature	°C	0,4 K
Volume flow	m^3/s	5 %
Static pressure difference	Pa	5 Pa (ΔP ≤ 100 Pa) 5 % (ΔP ≥ 100 Pa)
Electrical quantities		
Electric power	W	1 %
Electrical energy	kWh	1 %
Voltage	V	0,5 %
Current	A	0,5 %

5.2 Test room for the airside and remote condenser

The size of the test room shall be selected to avoid any resistance to air flow at the air inlet and air outlet orifices of the test object. The air flow through the room shall not be capable of initiating any short circuit between the two orifices, and therefore the velocity of air flow at these two locations shall not exceed 1,5 m/s when the test object is switched off.

Unless otherwise stated by the manufacturer, the air inlet and air outlet orifices shall not be less than 1 m from the surfaces of the test room.

Any direct heat radiation (e.g. solar radiation) onto space heating and/or space cooling units in the test room onto the heat pump or onto the temperature measuring points shall be avoided.

5.3 Installation and connection of the heat pump

The heat pump shall be installed and connected for the test as recommended by the manufacturer in the installation and operation manual. If a supplementary heater is provided in option or not, it shall be switched off or disconnected to be excluded from the testing. Temperature and pressure measuring points shall be arranged in order to obtain representative mean values.

5.4 Installation of heat pumps consisting of several parts

In the case of heat pumps consisting of several refrigeration parts (split heat pumps), the following installation conditions shall be complied with for the tests:

a) each refrigerant line shall be installed in accordance with the manufacturer's instructions; the length of each line shall be 5 m except if the constraints of the test installation make 5 m not possible, in which case a greater length may be used, with a maximum of 7,5 m;

b) the lines shall be installed so that the difference in elevation does not exceed 2,5 m;

c) thermal insulation shall be applied to the lines in accordance with the manufacturer's instructions;

d) unless constrained by the design, at least half of the interconnecting lines shall be exposed to the outdoor conditions with the rest of the lines exposed to the indoor conditions.