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Interested committees:

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 19967-3

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

Part 3: Combined hot water supply with space heating and/or space cooling

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ISO/TC 86/SC 6

Secretariat: JISC

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2025-02-20

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2025-05-15

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. (see <https://www.iso.org/directives>)

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see <https://www.iso.org/iso/foreword.html>.

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.

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 <https://www.iso.org/members.html>.

The parts of ISO 19967 are given as below:

- Part 1: Heat pump water heaters for hot water supply
- Part 2: space heating and/or space cooling
- Part 3: combined hot water supply with space heating and/or space cooling

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

Part 3: Combined hot water supply with space heating and/or space cooling

1 Scope

The scope of this document covers air to water heat pumps which main principle is to produce both hygienic hot water and hydronic space conditioning at the same time. When the heat pump is operating, heat is produced to the hygienic hot water and hydronic space heating is produced at the same time, or heat is produced to the hygienic hot water and hydronic space cooling is produced at the same time.

The purpose of this document is to rate and test the combined performance of the product. This document applies only to those supplied as a complete package.

2 Normative references

The following documents, in whole or in part, are normative 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.

ISO 19967-1:2019, *Heat pump water heaters — Testing and rating for performance — Part 1: Heat pump water heater for hot water supply*

ISO 19967-2:2024, *Air to water heat pumps — Testing and rating for performance — Part 2: Space heating and/or space cooling*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 19967-1, ISO 19967-2 and the following terms and definitions apply.

ISO and IEC maintain terminological 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 pump

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

3.2

combined coefficient of performance

C_{OPcomb}

coefficient of performance of heat pump water heater combined hygienic hot water supply with hydronic space heating supply, determined by [clause 7](#) and the use of reference load profiles in [Annex D](#) in this document

3.3

combined energy efficiency ratio

E_{ERcomb}

energy efficiency ratio of heat pump water heater combined hygienic hot water supply with hydronic space cooling supply, determined by [clause 7](#) and the use of reference load profiles in [Annex D](#) in this document

3.4

cooling capacity

q_{sp-c}

heat removed by the unit to the heat transfer medium per unit of time

Note 1 to entry: cooling capacity is expressed in W.

3.5

dry motor pump

pump with the rotor directly coupled to the impeller and which is cooled by the ambient air

3.6

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;
- power input for keeping the water outlet temperature higher than the set value of the unit

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

3.7

glandless circulator

circulator with the rotor directly coupled to the impeller and the rotor immersed in the pumped medium

3.8

heating capacity

q_{sp-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 W.

Note 2 to entry: If heat is removed by the indoor heat exchanger for defrosting, it is taken into account.

3.9

hygienic hot water

water heated for human daily household or similar purposes

3.10

hygienic hot water draw-off

given combination of useful hygienic hot water flow rate, useful water temperature, useful energy content and hygienic hot water target temperature

3.11

hygienic hot water reference energy of the load profile

Q_{ref}

sum of the useful hygienic hot water energy content of water draw-offs in a particular load profile

3.12

hygienic hot water target temperature

T_p

minimum water temperature to be achieved during hygienic hot water draw-off calculated as the mean value over the hygienic hot water draw off

3.13

load profile

given sequence of hygienic hot water draw-offs

Note 1 to entry: See ISO 19967-1:2019 Annex A.

3.14

nominal volume

V_n

volume of hygienic hot water that is assigned to the storage tank by the manufacturer and that is marked on the tank

3.15

reference hot water temperature

θ'_{WH}

temperature determined as the mean temperature value of the average temperatures during the single hygienic hot water draw-off which ends at hot water temperature below 40 °C

3.16

simultaneous cooling and hydronic hot water production

the production of cooling for the needs of space cooling and the production of heating for the needs of domestic hot water that occurs during the same period of operation of heat pump

3.17

simultaneous heating and hydronic hot water production

the production of heating for the needs of space heating and the production of heating for the needs of domestic hot water that occurs during the same period of operation of heat pump

3.18

storage volume

V_m

measured volume of hygienic hot water that can be contained in the storage tank

3.19

useful hygienic hot water energy content

Q_{tap}

energy content of hygienic hot water provided at a temperature equal to, or above, the useful hygienic hot water temperature, and at water flow rates equal to, or above, the useful water flow rate

3.20

useful hygienic hot water flow rate

$f(t)$

minimum flow rate for the hygienic hot water draw-off of the load profile

3.21

useful hygienic hot water temperature

T_m

minimum hygienic hot water temperature for the draw-off of the load profile

3.22

volume of mixed water at 40 °C

 V_{40}

volume of hygienic hot water at 40 °C, which has the same heat content (enthalpy) as the hygienic hot water which is delivered above 40 °C at the output of the air to water heat pump

4 Symbols and abbreviated terms

Symbol	Description	Units
C_{OPcomb}	Combined coefficient of performance	W/W
$c_p(T)_{water}$	Specific heat capacity of water	J/(kg·K)
E_{ERcomb}	Combined energy efficiency ratio	W/W
E_{EI}	Energy Efficiency Index equal to 0,23	-
f	Minimum flow rate for which hot water is contributing to the reference energy	l/min
f_{max}	Maximum flow rate of considered load profile	l/min
$f(t)$	Useful hygienic hot water flow rate	l/min
I_E	Motor efficiency	-
m_{act}	Difference of the two weights (filled/empty) of the hygienic hot water storage tank	kg
n_{tap}	Number of hygienic hot water draw-offs during the load profile	-
P_{hyd}	The measured hydraulic power of the pump	W
Q_{c-LP}	Total energy gain under hygienic hot water supply combined with space cooling	Wh
$Q_{corr(pump)}$	Capacity corrections due to liquid pump	Wh
$Q_{c[Stage F]}$	Hydronic space cooling capacity during [Stage F]	Wh
$Q_{c[Stage H]}$	Hydronic space cooling capacity during the hygienic hot water draw-offs	Wh
Q_{EL-LP}	Heat energy produced by electrical heater during the whole load profile	Wh
Q_{EL-tap}	Heat energy produced by electrical heater to reach the required tapping temperature	Wh
Q_{hh}	Total energy gain for hygienic hot water supply during [Stage G]	Wh
Q_{h-LP}	Total energy gain under hygienic hot water supply combined with space heating	Wh
Q_{HP-tap}	Useful energy during one hygienic hot water single draw-off	Wh
$Q_{h[Stage E]}$	Hydronic space heating capacity during [Stage E]	Wh

$Q_{h[\text{Stage G}]}$	Hydronic space heating capacity during the hygienic hot water draw-offs	Wh
Q_{LP}	Total useful energy content during the hygienic hot water whole load profile	Wh
Q_{ref}	Reference energy of the considered load profile	Wh
Q_{sc}	Total energy gain for space cooling during [Stage E]	Wh
Q_{sh}	Total energy gain for space heating during [Stage E]	Wh
Q_{tap}	Energy content of hot water provided at a temperature equal to, or above, the useful water temperature, and at water flow rates equal to, or above, the useful water flow rate	Wh
$q_{c[\text{Stage F}]}$	The space cooling capacity during [Stage F]	W
$q_{c[\text{Stage H}]}$	The space cooling capacity during [Stage H]	W
$q_{h[\text{Stage E}]}$	The space heating capacity during [Stage E]	W
$q_{h[\text{Stage G}]}$	The space heating capacity during [Stage G]	W
q_{sp-c}	Cooling capacity	W
q_{sp-h}	Heating capacity	W
q_{water}	Warm or cool water volume flow rate for space conditioning	m ³ /s
T_m	Useful water temperature at which hot water starts contributing to the reference energy	°C
T_p	Target water temperature to be achieved during water draw-off	°C
t	Time	s
t_{40}	Time from starting the draw-off until θ_{WH} is less than 40 °C	s
t_d	Test phase duration	s
t_{es}	Duration of the last on-off cycle of the air to water heat pump	s
t_h	Heating up time	s
$t_{h[\text{Stage C}]}$	The elapse time interval at Stage C	s
$t_{h[\text{Stage D}]}$	The elapse time interval at Stage D	s
$t_{h[\text{Stage G}]}$	The elapse time interval at Stage G	s
$t_{h[\text{Stage H}]}$	The elapse time interval at Stage H	s
t_{TTC}	Load profile time / duration	s
V_{40}	Volume of mixed water at 40 °C	l
V_{air}	Nominal air volume flow rate	m ³ /s
V_m	Measured volume of a hot water storage tank	l
V_n	Nominal volume	l

$W_{\text{eh-HP}}$	Total electricity consumption during the test duration t_h	Wh
$W_{\text{eh-HP(fan)}}$	The energy consumption for fan side	Wh
$W_{\text{eh-HP(pump)}}$	The measured electricity consumption use for hydronic space conditioning during the test duration $t_{h(\text{Stage C})}$	Wh
$W_{\text{eh-M}}$	Measured electricity consumption during the test duration t_h	Wh
$W_{\text{EL-Corr}}$	Correction due to electricity consumption of fan/liquid pump	Wh
$W_{\text{EL-corr(fan)}}$	Correction of fan electricity consumption due to exclude from the total power absorbed by the air to water heat pump	Wh
$W_{\text{EL-corr(no fan)}}$	Correction of fan electricity consumption due to include in the total power absorbed by the air to water heat pump	Wh
$W_{\text{EL-corr(no pump)}}$	Correction of pump electricity consumption due to include in the total power absorbed by the air to water heat pump	Wh
$W_{\text{EL-corr(pump)}}$	Correction of pump electricity consumption due to exclude from the total power absorbed by the air to water heat pump	Wh
$W_{\text{EL-LP}}$	Total electrical energy consumption during the whole load profile	Wh
$W_{\text{EL-OFF}}$	Calculated energy consumption for off-peak products	Wh
$W_{\text{es-HP}}$	Total energy input during the last on-off-cycle	Wh
$W_{\text{es-M}}$	Measured energy consumption during the last on-off cycle	Wh
$W_{\text{LP(c+s)}}$	Total electrical energy input for hygienic hot water supply combined with hydronic space cooling during [Stage E]	Wh
$\Delta P_{\text{e(air)}}$	Measured external air static pressure difference on air side	Pa
$\Delta P_{\text{e(water)}}$	Measured external water static pressure difference on waterside	Pa
$\Delta P_{\text{i(air)}}$	Measured internal air static pressure difference on air side	Pa
$\Delta P_{\text{i(water)}}$	Measured internal water static pressure difference on water side	Pa
Δt_{spw}	Difference between inlet and outlet temperatures of hydronic space conditioning	K
η	Efficiency of the fan or the pump	-
θ_{WC}	Incoming cold water temperature use for hygienic hot water	°C
θ_{WH}	Outgoing hygienic hot water temperature	°C
θ'_{WH}	Reference hygienic hot water temperature	°C
$\rho(T)_{\text{water}}$	Density of water at temperature T	kg/m ³

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 to ensure that the measured results are not significantly influenced.

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

If the manufacturer indicates a value for the temperature set on the control device in the instructions, keep the hygienic hot water tank environment temperature at highest temperature on the unit/system control device when performing measurements.

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

For free air intake 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 complemented by four sensors for checking uniformity if the surface area is greater than 1 m².

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 an integral unit, water inlet and outlet temperature measurements shall be taken at the inlet and outlet of this unit.

For water and brine, the density and specific heat 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 rate	l/min	1 %
Static pressure difference	kPa	1 kPa ($\Delta P \leq 20$ kPa) 5 % ($\Delta P > 20$ kPa) 5 % (> 20 kPa)
Concentration (for brine)	%	2 %
Air		
Dry bulb temperature	°C	0,2 K
Wet bulb temperature	°C	0,4 K
Volume flow rate	m ³ /h	5 %
Static pressure difference	Pa	5 Pa ($\Delta P \leq 100$ Pa) 5 % ($\Delta P \geq 100$ Pa)
Electrical quantities		