

STANDARD

ANSI/AHRI/ASHRAE ISO Standard 13256-2:1998 (RA 2012)

Reaffirmation of ANSI/ARI/ASHRAE ISO Standard 13256-2:1998

Water-source heat pumps – Testing and rating for performance – Part 2: Water-to-water and brine-to-water heat pumps

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ANSI/AHRI/ASHRAE ISO Standard 13256-2:1998 (RA 2012), Water-source heat pumps—Testing and rating for performance— Part 2: Water-to-water and brine-to-water heat pumps

This standard is an identical national adoption of the ISO standard.

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NOTE

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75% of the member bodies casting a vote.

This part of ISO 13256 was developed by ISO Technical Committee TC 86, Refrigeration, Subcommittee SC 6, Testing and rating of air-conditioners and heat pumps.

ISO 13256 consists of the following parts, under the general title Water-source heat pumps—Testing and rating for performance:

- *Part 1: Water-to-air and brine-to-air heat pumps*
- *Part 2: Water-to-water and brine-to-water heat pumps*

Annexes A and B form an integral part of this part of ISO 13256. Annexes C and D are for information only.

INTRODUCTION

This part of ISO 13256 covers heating and cooling systems which are generally referred to as “water-source heat pumps.” These systems generally include an indoor coil with air-moving means, a compressor, and a refrigerant-to-water or refrigerant-to-brine heat exchanger. A system may provide both heating and cooling, cooling-only, or heating-only functions.

1. SCOPE

1.1 This part of ISO 13256 establishes performance testing and rating criteria for factory-made residential, commercial and industrial, electrically driven, mechanical-compression type, water-to-water and brine-to-water heat pumps. The requirements for testing and rating contained in this part of ISO 13256 are based on the use of matched assemblies.

1.2 Equipment designed for rating at one application under this part of ISO 13256 may not be suitable for rating at all applications covered in this part of ISO 13256.

1.3 This part of ISO 13256 does not apply to the testing and rating of individual assemblies for separate use or to units having two or more indoor sections connected to a single outdoor section. It does not apply to heat pumps covered in ISO 5151, ISO 13253, or ISO 13256-1.

Note: For the purpose of the remaining clauses, the terms “equipment” or “heat pump” may be used to mean “water-to-water heat pumps” or brine-to-water heat pumps,” and the term “liquid” refers to either “water” or “brine.”

2. NORMATIVE REFERENCE

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 13256. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 13256 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 817:2005, *Refrigerants—Designation system*.

3. DEFINITIONS

For the purposes of this part of ISO 13256, the following definitions apply.

3.1 water-to-water and brine-to-water heat pump

heat pump which consists of one or more factory-made assemblies which normally include an indoor-side refrigerant-to-water heat exchanger, compressor(s), and an outdoor-side refrigerant-to-water or refrigerant-to-brine heat exchanger(s), including means to indirectly provide both cooling and heating, cooling-only, or heating-only functions

Notes:

1. When such equipment is provided in more than one assembly, the separated assemblies should be designed to be used together.
2. Such equipment may also provide functions for sanitary water heating.

3.1.1 water-loop-heat pump application

Water-to-water heat pump using liquid circulating in a common piping loop functioning as a heat source/heat sink

Note: The temperature of the liquid loop is usually mechanically controlled within a temperature range of 15°C to 40°C.

3.1.2 ground-water heat pump application

Water-to-water heat pump using water pumped from a well, lake or stream functioning as a heat source/heat sink

Note: The temperature of the water is related to the climatic conditions and may vary from 5°C to 25°C for deep wells.

3.1.3 ground-loop heat pump application

brine-to-water heat pump using a brine solution circulating through a subsurface piping loop functioning as a heat source/heat sink



Notes:

1. The heat exchange loop may be placed in horizontal trenches or vertical bores, or be submerged in a body of surface water.
2. The temperature of the brine is related to the climatic conditions and may vary from -5°C to 40°C .

3.2 cooling capacity

amount of heat that the equipment can remove from the water used to condition the indoor space in a defined interval of time, in watts, as determined by the specified test methods

3.3 net cooling capacity

cooling capacity with indoor-side pump power adjustment (See 4.1.2)

3.4 heating capacity

amount of heat that the equipment can add to the water used to condition the indoor space in a defined interval of time, in watts, as determined by the specified test methods

3.5 net heating capacity

heating capacity with indoor-side pump power adjustment (See 4.1.2)

3.6 rated voltage

voltage shown on the nameplate of the equipment, in volts

3.7 rated frequency

frequency shown on the nameplate of the equipment, in hertz

3.8 energy efficiency ratio (EER)

ratio of the net cooling capacity to the effective power input at any given set of rating conditions, in watts per watt

3.9 coefficient of performance (COP)

ratio of the net heating capacity to the effective power input of the equipment at any given set of rating conditions, in watts per watt

3.10 effective power input

average electrical power input to the equipment within a defined interval of time, in watts; i.e., the sum of:

- the power input for operation of the compressor excluding additional electrical heating devices,
- the power input of all control and safety devices of the equipment, and
- the proportional power input of the conveying devices for the transport of the heat transfer media through the heat pump only (e.g., indoor-side and outdoor-side pumps, whether internal or external, whether provided with the equipment or not)

(See 4.1.2 and 4.1.3)

4. RATING AND TEST CONDITIONS

4.1 Rating conditions for the determination of capacity

4.1.1 Standard ratings

Standard ratings shall be established at the standard rating conditions specified in 4.2, using the test procedures described in clause 6. Standard ratings relating to cooling and heating

capacities shall be net values, including the effects of the circulating-pump heat, but not including supplementary heat. Standard efficiency ratings shall be based on the effective power input as defined in 3.10.

4.1.2 Power input to indoor-side liquid pumps

4.1.2.1 If no indoor-side liquid pump is provided with the heat pump, a pump power adjustment is to be included in the effective power consumed by the heat pump using the following formula:

$$\phi_{pai} = \frac{q \times \Delta p}{\eta}$$

where

- ϕ_{pai} is the pump power adjustment, indoor, in watts;
 $\eta = 0.3 \times 10^3$ by convention;
 Δp is the measured indoor-side internal static pressure difference, in pascals;
 q is the nominal indoor-side liquid flow rate, in litres per second.

This value shall be added to the heating capacity and subtracted from the cooling capacity.

4.1.2.2 If an indoor-side liquid pump is an integral part of the heat pump, only the portion of the pump power required to overcome the internal resistance shall be included in the effective power input to the heat pump. The fraction which is to be excluded from the total power consumed by the pump shall be calculated using the following formula:

$$\phi_{pai} = \frac{q \times \Delta p}{\eta}$$

where

- ϕ_{pai} is the pump power adjustment, indoor, in watts;
 $\eta = 0.3 \times 10^3$ by convention;
 Δp is the measured indoor-side external static pressure difference, in pascals;
 q is the nominal indoor-side liquid flow rate, in litres per second.

This value shall be subtracted from the heating capacity and added to the cooling capacity.

4.1.3 Power input to outdoor-side liquid pumps

4.1.3.1 If no outdoor-side liquid pump is provided with the heat pump, a pump power adjustment is to be included in the effective power consumed by the heat pump, using the following formula:

$$\phi_{pao} = \frac{q \times \Delta p}{\eta}$$

where

- ϕ_{pao} is the pump power adjustment, outdoor, in watts;
 $\eta = 0.3 \times 10^3$ by convention;
 Δp is the measured outdoor-side internal static pressure difference, in pascals;
 q is the nominal outdoor-side liquid flow rate, in litres per second.