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Water-source heat pumps — Testing and rating for performance —

Part 2:
Water-to-water and brine-to-water heat pumps

Pompes à chaleur à eau — Essais et détermination des caractéristiques de performance —

Partie 2: Pompes à chaleur eau-eau et eau glycolée-eau

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Contents

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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.

Water-source heat pumps — Testing and rating for performance —

Part 2:
Water-to-water and brine-to-water heat pumps

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 ISO13256-1.

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:—[1)], *Refrigerants — Number designation.*

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.

1) To be published. (Revision of ISO 817:1974)

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;

η = 0,3 x 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;

η = 0,3 x 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;

η = 0,3 x 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.

4.1.3.2 If an outdoor-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:

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

where

ϕ_{pao} is the pump power adjustment, outdoor, in watts;

η = 0,3 x 10^3 by convention;

Δp is the measured outdoor-side external static pressure difference, in pascals;

q is the nominal outdoor-side liquid flow rate, in litres per second.

4.1.4 Liquid flow rates

4.1.4.1 All standard ratings shall be determined at the liquid flow rates described below, expressed as litres per second.

4.1.4.2 Heat pumps with integral liquid pumps shall be tested at the liquid flow rates specified by the manufacturer or those obtained at zero external static pressure difference, whichever provides the lower liquid flow rates.

4.1.4.3 Heat pumps without integral liquid pumps shall be tested at the flow rates specified by the manufacturer.

4.1.4.4 The manufacturer shall specify a single liquid flow rate for the indoor-side and a single liquid flow rate for the outdoor-side for all of the tests required in this part of ISO 13256 unless automatic adjustment of the liquid flow rate is provided by the equipment. A separate control signal output for each step of liquid flow rate will be considered as an automatic adjustment.

4.1.5 Requirements for separated assemblies

In the case of heat pumps consisting of separate matched assemblies, the following installation procedures shall be followed.

a) Each refrigerant line shall be installed in accordance with the manufacturer's instructions with the maximum stated length or 7,5 m, whichever is shorter. If the interconnecting tubing is furnished as an integral part of the equipment and not recommended for cutting the length, the equipment shall be tested with the complete length of tubing furnished.

b) The lines shall be installed without any significant difference in elevation (not more than 2 m).

4.1.6 Requirements for heat pumps with capacity control

4.1.6.1 Part-load conditions shall be used for rating tests at levels or steps less than that of maximum capacity.

4.1.6.2 Heat pumps with fixed steps of capacity control shall be rated at each step of capacity. Heat pumps with variable capacity control shall be rated at no less than two capacity levels, the minimum and the maximum capacities.

4.1.7 Test liquids

4.1.7.1 The test liquid for the indoor-side of all heat pumps shall be water.

4.1.7.2 The test liquid for the outdoor-side of water-loop heat pumps and ground-water heat pumps shall be water.

4.1.7.3 The test liquid for the outdoor-side of ground-loop heat pumps shall be a 15 % solution by mass of sodium chloride in water.

4.1.7.4 The test liquids shall be sufficiently free of gas to ensure that the measured results are not influenced by the presence of gas.

4.2 Standard rating and part-load rating test conditions

4.2.1 The test conditions for the determination of standard and part-load cooling ratings are specified in table 1.

4.2.2 The test conditions for determination of standard and part-load heating ratings are specified in table 2.

Table 1 — Test conditions for the determination of cooling capacity

	Water-loop heat pumps	Ground-water heat pumps	Ground-loop heat pumps
Liquid entering indoor side	12 °C	12 °C	12 °C
Air surrounding unit, dry bulb	15 °C to 30 °C	15 °C to 30 °C	15 °C to 30 °C
Standard rating test Liquid entering heat exchanger	30 °C	15 °C	25 °C
Part-load rating test Liquid entering heat exchanger	30 °C	15 °C	20 °C
Frequency[a]	Rated	Rated	Rated
Voltage[b]	Rated	Rated	Rated

a Equipment with dual-rated frequencies shall be tested at each frequency.

b Equipment with dual-rated voltages shall be performed at both voltages or at the lower of the two voltages if only a single rating is published.

Table 2 — Test conditions for the determination of heating capacity

	Water-loop heat pumps	Ground-water heat pumps	Ground-loop heat pumps
Liquid entering indoor side	40 °C	40 °C	40 °C
Air surrounding unit, dry bulb	15 °C to 30 °C	15 °C to 30 °C	15°C to 30 °C
Standard rating test Liquid entering outdoor-side heat exchanger	20 °C	10 °C	0 °C
Part-load rating test Liquid entering outdoor-side heat exchanger	20 °C	10 °C	5 °C
Frequency[a]	Rated	Rated	Rated
Voltage[b]	Rated	Rated	Rated

a Equipment with dual-rated frequencies shall be tested at each frequency.

b Equipment with dual-rated voltages shall be performed at both voltages or at the lower of the two voltages if only a single rating is published.

4.2.3 Heat pumps intended for a specific application shall be rated at the conditions specified for that application, for example, water-loop, ground-water, or ground-loop, and shall be identified as such (i.e., water-loop pump, ground-water heat pump, or ground-loop heat pump). Heat pumps intended for two or three applications shall be rated at the conditions specified for each of these applications and shall be so identified (see 7.3).

4.2.4 For each test, the equipment shall be operated continuously until equilibrium conditions are attained, but for not less than one hour before capacity test data are recorded. The data shall then be recorded for 30 min at 5 min intervals until seven consecutive sets of readings have been attained within the tolerances specified in 6.4. The averages of these data shall be used for the calculation of the test results.

5 Performance requirements

5.1 General

5.1.1 To comply with this part of ISO 13256, water-to-water and brine-to-water heat pumps shall be designed and produced such that any production unit will meet the applicable requirements of this part of ISO 13256.

5.1.2 For heat pumps with capacity control, the performance requirement tests shall be conducted at maximum capacity.

5.2 Maximum operating conditions test

5.2.1 Test conditions

The maximum operating conditions test shall be conducted for cooling and heating at the test conditions established for the specific applications (see 4.2.3) specified in tables 3 and 4. Heat pumps intended for use in two or more applications shall be tested at the most stringent set of conditions specified in tables 3 and 4.

5.2.2 Test procedures

5.2.2.1 The equipment shall be operated continuously for one hour after the specified temperatures have been established at each specified voltage level.

5.2.2.2 The 110 % voltage test shall be conducted prior to the 90 % voltage test.

5.2.2.3 All power to the equipment shall be cut off for 3 min at the conclusion of the one hour test at 90 % voltage level and then restored for one hour.

Table 3 — Maximum cooling test conditions

	Water-loop heat pumps	Ground-water heat pumps	Ground-loop heat pumps
Liquid[a] entering indoor-side	30 °C	30 °C	30 °C
Air surrounding unit, dry bulb	15 °C to 30 °C	15 °C to 30 °C	15 °C to 30 °C
Liquid[a] entering outdoor-side heat exchanger	40 °C	25 °C	40 °C
Frequency[b]	Rated	Rated	Rated
Voltage	1) 90 % and 110 % of rated voltage for equipment with a single nameplate rating. 2) 90 % of minimum voltage and 110 % of maximum voltage for equipment with dual nameplate voltage ratings.	1) 90 % and 110 % of rated voltage for equipment with a single nameplate rating. 2) 90 % of minimum voltage and 110 % of maximum voltage for equipment with dual nameplate voltage ratings.	1) 90 % and 110 % of rated voltage for equipment with a single nameplate rating. 2) 90 % of minimum voltage and 110 % of maximum voltage for equipment with dual nameplate voltage ratings.

a Liquid flow rates shall be established in 4.1.4.

b Equipment with dual-rated frequencies shall be tested at each frequency.

Table 4 — Maximum heating test conditions

	Water-loop heat pumps	Ground-water heat pumps	Ground-loop heat pumps
Liquid[a] entering indoor-side	50 °C	50 °C	50 °C
Air surrounding unit, dry bulb	15 °C to 30 °C	15 °C to 30 °C	15 °C to 30 °C
Liquid[a] entering outdoor-side heat exchanger	30 °C	25 °C	25 °C
Frequency[b]	Rated	Rated	Rated
Voltage	1) 90 % and 110 % of rated voltage for equipment with a single nameplate rating. 2) 90 % of minimum voltage and 110% of maximum voltage for equipment with dual nameplate voltage ratings.	1) 90 % and 110 % of rated voltage for equipment with a single nameplate rating. 2) 90 % of minimum voltage and 110 % of maximum voltage for equipment with dual nameplate voltage ratings.	1) 90 % and 110 % of rated voltage for equipment with a single nameplate rating. 2) 90 % of minimum voltage and 110 % of maximum voltage for equipment with dual nameplate voltage ratings.

a Liquid flow rates shall be established in 4.1.4.

b Equipment with dual-rated frequencies shall be tested at each frequency.

5.2.3 Test requirements

Heat pumps shall meet the following requirements when operating at the conditions specified in tables 3 and 4.

a) During the entire test, the equipment shall operate without any indication of damage.

b) During the test period specified in 5.2.2.1, the equipment shall operate continuously without tripping any motor overload or other protective devices.

c) During the test period specified in 5.2.2.3, the motor overload protective device may trip only during the first 5 min of operation after the shutdown period of 3 min. During the remainder of the test period, no motor overload protective device shall trip. For those models so designed that resumption of operation does not occur within the first 5 min after initial trip, the equipment may remain out of operation for not longer than 30 min. It shall then operate continuously for the remainder of the test period.

5.3 Minimum operating conditions test

5.3.1 Test conditions

Heat pumps shall be tested at the minimum operating test conditions for cooling and heating at the test conditions established for the specific application (see 4.2.3) specified in tables 5 and 6. Heat pumps intended for use in two or more applications shall be tested at the most stringent set of conditions specified in tables 5 and 6.

5.3.2 Test procedures

For the minimum operating cooling test, the heat pump shall be operated continuously for a period of not less than 30 min after the specified temperature conditions have been established. For the minimum operation heating test, the heat pump shall soak for 10 min with liquid at the specified temperature circulating through the coil. The equipment shall then be started and operated continuously for 30 min.

5.3.3 Test requirements

No protective device shall trip during these tests and no damage shall occur to the equipment.

5.4 Enclosure sweat test

5.4.1 Test conditions

The enclosure sweat test shall be conducted in the cooling mode at the test conditions established for the specific applications specified in table 7. Heat pumps intended for two or more applications shall be tested at the most stringent set of conditions.

Table 5 — Minimum cooling test conditions

	Water-loop heat pumps	Ground-water heat pumps	Gound-loop heat pumps
Liquid[a] entering indoor-side	12 °C	12 °C	12 °C
Air surrounding unit, dry bulb	15 °C to 30 °C	15 °C to 30 °	15 °C to 30 °C
Liquid[a] entering outdoor-side heat exchanger	20 °C	10 °C	10°C
Frequency[b]	Rated	Rated	Rated
Voltage[c]	Rated	Rated	Rated

a Liquid flow rates shall be as established in 4.1.4.
b Equipment with dual-rated frequencies shall be tested at each frequency.
c Equipment with dual-rated voltages shall be performed at the low of the two voltages.

Table 6 — Minimum heating test conditions

	Water-loop heat pumps	Ground-water heat pumps	Ground-loop heat pumps
Liquid[a] entering indoor side	15 °C	15 °C	15 °C
Air surrounding unit, dry bulb	15 °C to 30 °C	15 °C to 30 °C	15 °C to 30 °C
Liquid[a] entering outdoor-side heat exchanger	15 °C	5 °C	−5 °C
Frequency[b]	Rated	Rated	Rated
Voltage[c]	Rated	Rated	Rated

a Liquid flow rates shall be as established in 4.1.4.
b Equipment with dual-rated frequencies shall be tested at each frequency.
c Equipment with dual-rated voltages shall be performed at the low of the two voltages.

Table 7 — Enclosure sweat test conditions

	Water-loop heat pumps	Ground-water heat pumps	Ground-loop heat pumps
Liquid[a] entering indoor-side	12 °C	12 °C	12 °C
Air surrounding unit: dry bulb wet bulb	 27 °C 24 °C	 27 °C 24 °C	 27 °C 24 °C
Liquid[a] entering indoor-side heat exchanger	20 °C	10 °C	10 °C
Frequency[b]	Rated	Rated	Rated
Voltage[c]	Rated	Rated	Rated

a Liquid flow rates shall be as established in 4.1.4.
b Equipment with dual-rated frequencies shall be tested at each frequency.
c Equipment with dual-rated voltages shall be performed at the low of the two voltages.

5.4.2 Test procedures

After establishment of the specified temperature conditions, the heat pump shall be operated continuously for a period of four hours.

5.4.3 Test requirements

No condensed water shall drip or run off the equipment's casing during the test.

6 Test methods

6.1 General

The standard capacity ratings shall be determined by the test methods and procedures established in this clause and annex A. The total cooling and heating capacities shall be the average of the results obtained for the indoor and outdoor sides using the liquid enthalpy test method in annex B. The results obtained by these two methods must agree within 5 % in order for a particular test to be valid. Measurements should be made in accordance with the provisions of annex C.

6.2 Uncertainties of measurement

The uncertainties of measurement shall not exceed the values specified in table 8.

6.3 Data to be recorded

The data to be recorded during the test include the following.

Date

Test room identification

Observer(s)

Equipment nameplate data

Time data was recorded

Total power input to equipment, in watts

Applied voltages(s),in volts

Frequency, in hertz

External static pressure difference, liquid indoor-side (for units with integral pumps), in pascals

Internal static pressure difference, liquid indoor-side (for units without integral pumps), in pascals

External static pressure difference, liquid outdoor-side (for units with integral pumps), in pascals

Internal static pressure difference, liquid outdoor-side (for units without integral pumps), in pascals

Temperature of liquid entering indoor-side, in degrees Celsius

Temperature of liquid entering outdoor-side, in degrees Celsius

Temperature of liquid leaving indoor-side, in degrees Celsius

Temperature of liquid leaving outdoor-side, in degrees Celsius

Liquid flow rate, indoor-side, in litres per second

Liquid flow rate, outdoor-side, in litres per second

6.4 Test tolerances

6.4.1 The maximum permissible variation of any observation during the capacity test is listed in the first column of table 9. The maximum permissible variation of any observation during the performance tests is listed in table 10.

6.4.2 The maximum permissible variations of the average of the test observations from the standard or desired test conditions are shown in table 9, second column.

Table 8 — Uncertainties of measurement for indicated values

Measured quantity	Unit	Uncertainty of measurement[a] of indicated values
Water - temperature - temperature difference - volume flow - static pressure difference	 °C °C l/s Pa	 ±0,1 °C ±0,1 °C ±1 % ±5 Pa ($p \leqslant 100$ Pa) ±5 % (p >100 Pa)
Electrical inputs		±0,5 %
Time		±0,2 %
Mass		±1,0 %

[a] Uncertainty of measurement: an estimate characterizing the range of values within which the true value of a measurand lies (measurand: a quantity subject to measurement).

NOTE — Uncertainty of measurement comprises, in general, many components. Some of these components may be estimated on the basis of the statistical distribution of the results of series of measurements and can be characterized by experimental standard deviations. Estimates of other components can be based on experience or other information.

Table 9 — Variations allowed in capacity test readings

Readings	Maximum variation of individual reading from rating conditions	Variations of arithmetical average values from specified test conditions
Voltage	±2 %	±1 %
Liquid temperature - inlet	±0,5 °C	±0,2 °C
Liquid volume flow rate	±2 %	±1 %
External resistance to liquid flow, Pa	±10 %	±5 %

Table 10 — Variations allowed in performance test readings

Quantity measured	Allowable variations in individual readings from stated performance test conditions
For minimum operating conditions test: - liquid temperatures	 +0,6 °C
For maximum operating conditions test: - liquid temperatures	 – 0,6 °C
For other tests: - liquid temperatures	 ± 0,6 °C

6.5 Test results

The results of a capacity test shall express quantitatively the effects produced upon the indoor-side liquid by the equipment tested. For given test conditions, the capacity test results shall include such of the following quantities as are applicable:

a) cooling capacity (see 6.1), in watts

b) heating capacity (see 6.1), in watts

c) measured power input to equipment, in watts

d) liquid pump power adjustment, indoor-side (see 4.1.2), in watts

e) liquid pump power adjustment, outdoor-side (see 4.1.3), in watts

f) effective power input to equipment or power inputs to all equipment components (see 3.10), in watts

g) net cooling capacity (see 3.3), in watts

h) net heating capacity (see 3.5), in watts

i) energy efficiency ratio (see 3.8), in watts per watt

j) coefficient of performance (see 3.9), in watts per watt

7 Marking provisions

7.1 Nameplate requirement

Each water-to-water and brine-to-water heat pump, whether composed of a single package or separate assemblies shall have a durable nameplate, firmly attached to each separate assembly in a location accessible for reading.

7.2 Nameplate information

The nameplate shall provide the following minimum information in addition to the information required in international safety standards.

a) Manufacturer's name or trademark[2)].

b) Distinctive type or model designation and serial number.

c) Full-load capacity rating (see 7.3). Equipment rated for more than one application shall state capacity ratings for both heating and cooling, as appropriate for each application.

d) Rated voltage(s).

e) Rated frequency(ies).

f) Refrigerant designation and refrigerant mass charge.

The information required in 7.2 a, b, d, e and the refrigerant designation shall be placed on each element (matched assembly) of the system.

7.3 Designation of capacity ratings

The designation of capacity rating shall be established in such a way that the heat transfer media are indicated (IW = indoor-side water, W = outdoor-side water and B = outdoor-side brine), together with their temperatures, followed by their capacities in kilowatts. The capacities shall be stated to the nearest kilowatt. The figure following the first "W" shall be the liquid temperature of the water-loop heat pump; the figure following the second "W" shall be the liquid temperature of the ground-water heat pump; the figure following the "B" shall be the liquid temperature of the ground-loop heat pump.

EXAMPLE: Cooling: IW 12 - W30/W15/B 25 10/12/11 kW
Heating: IW 40 - W 20/W10/B 5 10/9/8 kW

7.4 Refrigerant designation

The refrigerant designation shall be in accordance with ISO 817.

2) The manufacturer is considered to be the firm identified on the nameplate.

8 Publication of ratings

8.1 Standard ratings

8.1.1 Standard ratings shall be published for the net heating capacity, the net cooling capacity, part-load ratings (where applicable), energy efficiency ratio and coefficient of performance, as appropriate, for each heat pump produced in conformance with this part of ISO 13256 for each intended application. These ratings shall be based on data obtained at the established rating conditions in accordance with the testing procedures specified in this part of ISO 13256.

8.1.2 The values of the standard capacities shall be expressed in kilowatts, rounded to the nearest 0,1 kW.

8.1.3 The values of energy efficiency ratios and coefficients of performance shall be rounded to the nearest 0, 01.

8.1.4 Each capacity rating shall be followed by the corresponding voltage and frequency ratings.

8.1.5 Standard ratings are representative of equipment operating at zero external static pressure for liquid flows. Additional calculations using the methods specified in this part of ISO 13256 may be needed to derive performance of specific applications.

8.2 Application ratings

Additional ratings may be published based on conditions other than those specified as standard rating conditions if they are clearly specified and the data is determined by the methods specified in this part of ISO 13256, or by analytical methods which are verifiable by the test methods prescribed in clause 6, and are accompanied by the standard net capacity ratings, energy efficiency ratios, and the coefficients of performance.

Annex A
(normative)

Test procedures

A.1 General test room requirements

A.1.1 The indoor condition test room shall be a room or space in which the desired test conditions can be maintained within the prescribed tolerances.

A.1.2 It is recommended that air velocities in the vicinity of the equipment under test do not exceed 2,5 m/s.

A.2 Equipment installation

A.2.1 The equipment to be tested shall be installed in accordance with the manufacturer's installation instructions using recommended installation procedures and accessories. If the equipment can be installed in several orientations, the tests shall be conducted using the worst possible orientation.

A.2.2 No alterations to the equipment shall be made except for the attachment of required test apparatus and instruments in the prescribed manner.

A.2.3 Where necessary, equipment shall be evacuated and charged with the type and amount of refrigerant specified in the manufacturer's instructions.

A.3 Cooling and heating capacity tests

A.3.1 The test room reconditioning apparatus and the equipment under test shall be operated until equilibrium conditions are attained, but for not less than one hour, before capacity test data are recorded.

A.3.2 Data shall then be recorded for 30 min at 5-min intervals until seven consecutive sets of readings within the tolerances prescribed in 6.4 have been attained. The averages of these data shall be used for the calculation of test results.