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Water-source High Temperature Heat Pumps Using the Vapor Compression Cycle

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Water-source High Temperature Heat Pumps Using the Vapor Compression Cycle

1 Scope

This document specifies the type and basic parameters, technical requirements, test methods, inspection rules, marking, packaging, transportation and storage of water-source high temperature heat pumps using the vapor compression cycle (hereinafter referred to as the "units").

This document is applicable to water-source heat pump units for industrial and commercial purposes, using vapor compression systems driven by electric motors, and with an outlet water temperature on the use-side of not less than 55 °C.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 191 Packaging-Pictorial Markings for Handling of Goods

GB 2894-2008 Safety Signs and Guideline for the Use

GB 4706.32-2012 Household and Similar Electrical Appliances - Safety - Particular Requirements for Electrical Heat Pumps, Air-conditioners and Dehumidifiers

GB/T 6388 Transport Package Shipping Mark

GB/T 9237 Refrigerating Systems and Heat Pumps - Safety and Environmental Requirements

GB/T 10870-2014 The Methods of Performance Test for Water Chilling (heat pump) Packages Using the Vapor Compression Cycle

GB/T 13306 Plates

GB/T 18430.1-2007 Water Chilling (heat pump) Packages Using the Vapor Compression Cycle - Part 1: Water Chilling (heat pump) Packages for Industrial & Commercial and Similar Application

GB 25131 Safety Requirements for Water Chillers (heat pump) Using the Vapor Compression Cycle

GB/T 26572 Requirements of Concentration Limits for Certain Restricted Substances in Electrical and Electronic Products

JB/T 4330-1999 Determination of Noise Emitted by Refrigerating and Air Conditioning Equipment

JB/T 7249 Refrigeration and Air Conditioning Apparatus - Terminology

3 Terms and Definitions

The terms and definitions defined in JB/T 7249 and GB/T 10870-2014, and the following are applicable to this document.

3.1 water-source high temperature heat pumps using the vapor compression cycle

Water-source heat pump units that use the vapor compression refrigeration cycle driven by electric motors to produce hot water of not less than 55 °C.

4 Types and Basic Parameters

4.1 Types

In accordance with the nominal operating conditions of the units, the hot water outlet temperature is classified into:

a) H1N type: nominal outlet temperature is 55 °C;

b) H2N type: nominal outlet temperature is 60 °C;

c) H3N type: nominal outlet temperature is 70 °C;

d) H4N type: nominal outlet temperature is 80 °C;

e) H5N type: nominal outlet temperature is 90 °C.

NOTE: where N is a, b, c, d or e, indicating the sub-division in accordance with the water source temperature (on the heat source side), please refer to Table 2 for details.

4.2 Basic Parameters

4.2.1 The temperature range of the unit water source is shown in Table 1.

5.1.8 The insulation layer of the units shall have good insulation performance, and be non-toxic, odorless and flame-retardant.

5.1.9 The units shall have protection functions, such as motor overload protection, phase loss protection (three-phase power supply), water system water failure protection, antifreeze protection, and high- and low-pressure protection of the refrigeration system, etc. Various control functions are normal, and various protection devices shall meet the design requirements and be sensitive and reliable.

5.1.10 The heat exchange equipment shall have the corresponding anti-corrosion performance, and the units shall not contaminate the water source during use.

5.1.11 The outer surface of the units shall be clean and the painted surface shall be smooth. Pipeline accessories shall generally be installed horizontally and vertically. Before filling the refrigerant, the surface in the units that comes into contact with the refrigerant and lubrication shall be kept clean and dry.

5.1.12 The materials of the refrigeration system components of the units shall not deteriorate under the action of refrigerant, lubricating oil and their mixtures, and shall ensure the normal operation of the whole units.

5.1.13 The regulating device of the units with energy regulation shall be sensitive and reliable.

5.2 Performance Requirements

5.2.1 Air tightness, vacuum and pressure test

5.2.1.1 The air tightness requirements for the units shall comply with the provisions of 5.2.1 in GB/T 18430.1-2007.

5.2.1.2 The vacuum requirements for the units shall comply with the provisions of 5.2.2 in GB/T 18430.1-2007.

5.2.1.3 The pressure test requirements for the units shall comply with the provisions of 5.2.3 in GB/T 18430.1-2007.

5.2.2 Operation

When the units are normally operating, the inspection items shall meet the design requirements.

5.2.3 Nominal heating capacity

The measured nominal heating capacity of the units shall not be less than 95% of the indicated value.

5.2.4 Nominal heating power consumption

The measured nominal heating power consumption of the units shall not be greater than 110%

6.3.1 Air tightness, vacuum and pressure tests

6.3.1.1 The air tightness test of the units shall be carried out in accordance with the provisions of "air tightness test" in 6.3.1 of GB/T 18430.1-2007.

6.3.1.2 Vacuum test: after passing the air tightness test, vacuumize the units to 80 Pa and maintain the pressure for at least 30 minutes.

6.3.1.3 The pressure test shall be carried out in accordance with the provisions of "pressure test" in 6.3.1 of GB/T 18430.1-2007.

6.3.2 Operation test

The units shall be operated under conditions approximate to the nominal heating conditions, and the operating conditions of the units, the sensitivity and reliability of the safety protection devices shall be checked, and the actions of the temperature, electrical appliances and other control elements shall be checked to see whether they are normal.

6.3.3 Nominal heating capacity test

The nominal heating capacity of the units shall be tested under the nominal heating conditions specified in Table 4 in accordance with the refrigerant method in GB/T 10870-2014.

6.3.4 Nominal heating power consumption test

When the units are tested under the nominal heating capacity, the input power and current of the units shall be measured.

6.3.5 Test of coefficient of performance for heating

The coefficient of performance for heating of the units is calculated based on the data measured in tests of 6.3.3 and 6.3.4 in accordance with the provisions of GB/T 10870-2014.

6.3.6 Maximum heating operation test

The maximum heating operation test of the units shall be carried out in accordance with the following provisions:

a) The test voltage is the rated voltage (not exceeding the rated voltage ±10%). After the operation under the maximum heating operation conditions specified in Table 4 becomes stable, during the entire test process, the units shall normally operate without any faults;

b) The units shall be able to continuously operate, and the motor overload protection device or other protection devices shall not operate;

c) When the units are shut down for 10 minutes, re-start and continuously operate them for 1 hour, but the motor overload protector is allowed to trip off within the first 5

minutes of the startup operation, and it is not allowed to action thereafter; if the motor overload protector that trips off within the first 5 minutes of the re-started continuous operation is not reset, and reset within more than 30 minutes of shutdown, the units shall continuously operate for 1 hour.

6.3.7 Minimum heating operation test

The units shall continuously operate for at least 30 minutes at the rated voltage in accordance with the minimum operation heating conditions specified in Table 4.

6.3.8 Noise test

The units are tested at the rated voltage and rated power and approximate to the nominal heating conditions in accordance with the rectangular hexahedron measurement method in JB/T 4330-1999. The sound pressure level is calculated in accordance with the surface average sound pressure level method in JB/T 4330-1999.

6.3.9 Water system pressure loss test

The pressure loss test of the water system shall be carried out in accordance with the requirements of Appendix B in GB/T 18430.1-2007.

6.3.10 Variable operation test

Change a certain condition in the variable operation specified in Table 4, and the other conditions shall subject to the flow and temperature conditions under the nominal operating conditions. The test shall include the corresponding nominal operating conditions, maximum operating conditions, and minimum operating temperature condition points specified in Table 2. The test results are plotted into curves or tables, and each curve or table shall contain the data of not less than 4 measurement points.

7 Inspection Rules

7.1 Exit-factory Inspection

Each unit shall receive the exit-factory inspection, and the inspection items, technical requirements and test methods shall be in accordance with the provisions of Table 7.

7.2 Sampling Inspection

7.2.1 The units shall be sampled from the products that have passed the exit-factory inspection, and the inspection items and test methods shall be in accordance with the provisions of Table 7.

Table 7 -- Inspection Items

No.	Item	Exit-factory Inspection	Sampling Inspection	Type Inspection	Technical Requirements	Test Methods

b) Product name and model;

c) Unit type;

d) Main technical performance parameters (nominal heating capacity, refrigerant type and volume of filling, rated voltage, frequency and number of phases, total input power, overall dimensions of the unit, and mass, etc.);

e) Product exit-factory No.;

f) Manufacturing date.

8.1.2 The units shall have a marking indicating the operating status, direction, water flow direction, liquid level and oil level mark, etc.

8.1.3 The units shall be accompanied by technical documents, such as product certificate, instruction manual and packing list, etc.

The contents of the product certificate shall include:

a) Product model and name;

b) Product exit-factory No.;

c) Inspection conclusion;

d) Signature or seal of the inspector;

e) Inspection date.

The contents of the product instruction manual shall include:

a) Product model and name, scope of application, serial No. of this document, noise and water system pressure loss;

b) Product structural diagram, electrical schematic diagram and wiring diagram;

c) Installation instructions and requirements (the installation of units using flammable refrigerants shall comply with the requirements of GB/T 9237);

d) Instructions for use, maintenance and care precautions (for units using flammable refrigerants, the maintenance and care shall comply with the requirements of Appendix DD in GB 4706.32-2012 in addition to meeting the requirements of GB/T 9237).

8.1.4 If the units use flammable refrigerants, then, it shall be permanently marked in a prominent position of the units in accordance with the color and style of the 2-2 warning symbol “Beware of Fire” in GB 2894-2008, and the vertical height of the marking symbol shall be not less than 30 mm.

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