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INDUSTRY STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

JB/T 4119-2013

Replacing JB/T 4119-1991

Solenoid valve for refrigeration equipment

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Foreword

This Standard is drafted according to the rules specified in GB/T 1.1-2009.

This Standard replaces GB/T 4119-1991 “Solenoid Valve For Refrigeration Equipment”. Compared with GB/T 4119-1991, main technical changes are as follows:

- Revise the rang of application (see chapter 1, chapter 1 in edition 1991);
- Revise terms and definitions (see chapter 3, chapter 3 in edition 1991);
- Revise the basic parameters of solenoid valve;
- Increase the requirements on dimension, material, appearance, level of protection, high temperature resistance, low temperature resistance, corrosion resistance, cleanliness, noise, breaking strength;
- Revise the requirements on tightness, maximum opening pressure differential, internal leakage rate, insulation resistance, electrical strength, heat and humidity resistance, vibration resistance, durability and flow rate;
- Revise the tightness, maximum opening pressure differential, internal leakage rate, insulation resistance, insulation resistance, electrical strength, heat and humidity resistance, durability and flow rate test method.

This Standard was proposed by China Machinery Industry Federation.

This Standard shall be under the jurisdiction of National Technical Committee on Refrigeration & Air-Conditioning Equipment of Standardization (SAC/TC238).

Responsible drafting organizations of this Standard: Zhejiang Dunan Artificial Environment Co., Ltd., and Hefei General Machinery Research Institute.

Participating drafting organizations of this Standard: Zhejiang Hongsen Machinery Co., Ltd., and Zhejiang Hengsen Industry Group Co., Ltd.

Main drafters of this Standard: Li Weicao, Chen Huafeng, Zhang Mingsheng, Zhou Shuigen, and He Yongshui.

Previous version replaced by this Standard is as follows:

- JB/T 4119-1991.

Solenoid Valve for Refrigeration Equipment

1 Scope

This Standard specifies terms and definitions, types, models and basic parameters, requirements, test methods, inspection rules, marking, packaging, transportation, and storage of solenoid valve for refrigeration equipment (hereinafter referred to as “solenoid valve”).

This Standard applies to solenoid valve, of which the nominal diameter is not greater than 40 mm, and of which the pipes, high-and-low pressure steam pipes use R22, R134a, R404A, R407C and R410A as the refrigerants. Solenoid valves of using other refrigerants may reference to this Standard for use.

2 Normative references

The articles contained in the following documents have become part of this document when they are quoted herein. For the dated documents so quoted, all the modifications (Including all corrections) or revisions made thereafter shall be applicable to this document.

GB/T 191 Packaging - Pictorial marking for handling of goods

GB/T 2423.1 Environmental testing - Part 2: Test methods - Tests A: Cold

GB/T 2423.2 Environmental testing - Part 2: Test methods - Tests B: Dry heat

GB/T 2423.3 Environmental testing for electric and electronic products - Part 2: Testing method test Cab: Damp heat Steady state

GB/T 2423.17 Environmental testing for electric and electronic products - Part 2: Test method - Test Ka: Salt mist

GB/T 2624(All parts) Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full

GB/T 10567.2 Wrought copper and copper alloys - Detection of residual stress - Ammonia test

GB/T 13306 Plates

GB 14536.1 Automatic electrical controls for household and similar use - Part 1:

General requirements

JB/T 5296 Valves for general purposes - Test method of flow coefficient and flow resistance coefficient

3 Terms and definitions

Following terms and definitions apply to this document.

3.1

Solenoid valve for refrigeration equipment

The valve that utilizes the electromagnetic force generated by the coil energized excitation to drive the valve element to open or close.

3.2

Direct action-type solenoid valve

The valve that is opened and closed by utilizing the electromagnetic force generated by coil energized excitation to directly drive the valve element to realize open-close.

3.3

Pilot-type solenoid valve

The valve that utilizes the electromagnetic force generated by the coil energized excitation to drive pilot valve; then through the pilot pressure, open and close the main valve by the pressure differential of upper-lower parts of valve element.

3.4

Normally closed solenoid valve

The valve that is closed when coil is not energized, and opened when coil is energized.

3.5

Normally open solenoid valve

The valve that that is opened when coil is not energized, and closed when coil is energized.

3.6

Maximum working pressure

The allowable maximum working pressure when solenoid valve is operated.

3.7

Maximum opening pressure differential

The maximum pressure differential, between valve inlet and outlet, that enables solenoid valve to open reliably.

3.8

Minimum opening pressure differential

The minimum pressure differential, between valve inlet and outlet, that enables solenoid valve to open reliably.

3.9

Pressure drop

The pressure differential that refrigerant passes inlet and outlet of solenoid valve.

3.10

Internal leakage rate

Under specified test conditions, the flow rate when test medium passes through valve's close-position.

3.11

Flow rate

The volume that test medium passes through open-position of solenoid valve in unit time.

4 Type, model and basic parameters

4.1 Type

4.1.1 Divided according to open-type: normally closed and normally open.

4.1.2 Divided according to structure-type: Direct action type and pilot type.

4.2 Model

See annex A for solenoid valve model representation method.

5.3.3 Sealing material for solenoid shall meet following requirements:

- Non-metallic sealing material shall be resistant to changes of temperature and pressure;

- Non-metallic sealing material shall have good compatibility with refrigerant, lubricant, corresponding materials and mixtures;

- Solenoid valve shall be enabled to maintain good tightness during use.

5.4 Appearance requirements

Solenoid valve surface shall be clean and without inclusions, bumps, scratches etc.; weld joint shall not have obvious pores, visible slag, spatters etc.; fasteners shall not be loose or damaged; nameplate is distinct.

5.5 Performance requirements

5.5.1 Tightness

Tightness may be inspected through water or nitrogen:

a) Water inspection: Under maximum operating pressure for 1 min, external of solenoid valve and connections shall have no leakage.

b) Nitrogen inspection: Leak rate of solenoid valve shall not be greater than 6.4×10^{-6} mbar • L/s.

5.5.2 Maximum open-valve pressure differential

Solenoid valve shall be able to normally open and close when maximum pressure differential of solenoid valve action is 2.1 MPa (R22, R134a, R404A, R407C) and 3.1 MPa (R410A) AND the voltage is 85% of rated voltage.

5.5.3 Minimum open-valve pressure differential

Minimum pressure differential of normal solenoid valve action: Solenoid valve shall be able to normally open and close when direct action-type solenoid valve is 0 MPa, pilot-type solenoid valve is not greater than 0.03 MPa AND the voltage is 85% of rated voltage.

5.5.4 Internal leakage rate

Specific internal leakage rate of solenoid valve is determined by manufacturer. However, it shall not exceed 1% of rated value *K*v within range of application.

Note: Contract requirements may be followed if customer has special requirements.

requirements in 5.5.6.1, 5.5.6.2 and 5.5.6.3.

5.5.9 Vibration resistance

During vibration test of solenoid valve, solenoid valve's coil shall not loosen; weld joint shall not fall off or break; fasteners shall not loosen; connecting pipe shall not deform or break. Solenoid valve after test shall meet the requirements in 5.5.1 ~ 5.5.5, 5.5.6.1 and 5.5.6.2.

5.5.10 High temperature resistance

After high temperature test, solenoid valve shall meet the requirements in 5.5.1 ~ 5.5.5, 5.5.6.1 and 5.5.6.2.

5.5.11 Low temperature resistance

After low temperature test, solenoid valve shall meet the requirements in 5.5.1 ~ 5.5.5, 5.5.6.1 and 5.5.6.2.

5.5.12 Corrosion resistance

Corrosion resistance requirements are as follows:

a) After salt spray test, solenoid valve shall meet the requirements in 5.5.1, 5.5.6.1 and 5.5.6.2.

b) After ammonia test, solenoid valve shall meet the requirements in 5.5.1.

5.5.13 Durability

After durability test, solenoid valve shall meet the requirements in 5.5.2 and 5.5.3; the internal leakage rate shall not exceed 2 times the value specified in 5.5.4.

5.5.14 Flow rate

The water flow rate, when pressure differential of solenoid valve is equal to 0.1 MPa, shall meet the requirements for *K*v value in Table 1.

5.5.15 Cleanliness

Internal impurity content of solenoid valve shall not be greater than 80 mg/m^2.

5.5.16 Noise

Noise level of solenoid valve under normal operation shall not be greater than 45 dB(A).

5.6 Breaking strength

amplitude is 1.5mm. After the test, it shall meet the requirements of 5.5.9.

6.5.10 High temperature test

It shall be according to the method of “Test Ad: heat-dissipation test sample temperature gradually-varied high-temperature test” specified in GB/T 2423.2. Block the adapter tube at two ends of solenoid valve; after flushing corresponding refrigerant and refrigeration oil mixing medium of 7:3 (weight ratio) valve from the inlet opposite to the flow direction of solenoid valve, place in thermostat of 120°C± 2°C for 96h, and then put it under atmospheric conditions for 2h. Conduct visual inspection and test from 6.5.l to 6.5.4 immediately after the test, which shall meet the requirements of 5.5.10.

6.5.11 Low temperature test

According to the method of “Test Ad: heater dissipation test sample temperature gradually varied low-temperature test” specified in GB/T 2423.1. Block the nozzle-mouths at two ends of solenoid valve. After flushing the mixing medium of corresponding refrigerant and refrigeration in 7:3 (weight ratio) from the inlet opposite to the specified flow direction of solenoid valve, place in thermostat of -30°C±2°C for 96h. Then put it under atmospheric conditions for 2h. After the test, immediately conduct visual inspection and test 6.5.1 ~ 6.5.4. It shall meet the requirements of 5.5.11.

6.5.12 Corrosion resistance test

Corrosion resistance test requirements are as follows:

a) Salt spray test: Conduct 72 h continuous test according to provisions of GB/T 2423.17, under the conditions that solenoid valve is not-energized, unloaded and not-pressurized. It shall meet requirements of 5.5.12 a) after test.

b) Ammonia test: Conduct test according to provisions of GB/T 10567.2, under the conditions that solenoid valve is not-energized, unloaded and not-pressurized. It shall meet requirements of 5.5.12 b) after test.

6.5.13 Durability test

Make the specified flow direction of solenoid valve to be same as that of test system’s medium. Access into the 1.5 MPa gas under normal temperature environment. The outlet is connected to atmosphere. Use transmitting device to send electrical control on-off signal to open and close the valve. Open and close solenoid valve, of which the frequency is 15 times/min ~ 30 times/min and drift diameter is less than 25mm, to conduct continuous opening and closing test for over 100,000 times. For solenoid valve of which the drift diameter is greater than or equal to 25mm, conduct continuous opening and closing test for not less than 60,000 times. If test is suspended due to accident, action times may be calculated accumulatively. Solenoid valve after test shall meet the requirements of 5.5.13.

- Manufacturer's name and trademark;

- Product serial number or production date.

8.1.2 Valve body marking:

Solenoid valve body shall be marked with arrow indicating the flow of medium.

8.2 Packaging

8.2.1 Solenoid valve packing manner and method are decided by manufacturer according to the provisions of transportation department or through negotiation with purchasing organization. However, it shall be ensured that products are not damaged during normal transportation. Dust cap shall be worn at inlet and outlet; and shall be clean, damp-proof, mold-proof and sealed.

8.2.2 Each packing box shall be marked with:

- Product name, specifications, model and quantity;

- Manufacturer's name and address;

- Product standard number;

- Consignee;

- Appearance dimension;

- It shall be printed with "UP, HANDLE WITH CARE, NO WETTING, and STACKING LIMIT" and other words and patterns. The patterns shall comply with provisions in GB/T 191.

8.2.3 Solenoid valve shall be supplied together with following technical document: Product conformance certificate.

8.3 Transportation

Solenoid valve shall avoid collision, throwing, dropping, direct rain, and chemical pollution during transportation.

8.4 Storage

Solenoid valve shall be stored in warehouse that is clean, dry, ventilated, and has no corrosive gas.

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