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**Refrigerant compressor for
automobile air conditioning**

汽车空调用制冷剂压缩机

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Refrigerant compressor for automobile air conditioning

1 Scope

This Standard specifies the terms and definitions, types and basic parameters, technical requirements, test methods, inspection rules, marking, packaging, transport, and storage of refrigerant compressor for automobile air conditioning (hereafter known as “compressor” for short).

This Standard is applicable to various types of refrigerant compressor for automotive air conditioning which use R134a and R407C as refrigerants. Other vehicles or the compressor which uses other environmental-friendly refrigerants may implement this Standard by reference.

2 Normative references

The following documents are indispensable for the application of this document. For the dated references, only the versions with the dates indicated are applicable to this document. For the undated references, the latest version (including all the amendments) are applicable to this document.

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

GB 1922 Petroleum solvents for paints and cleaning

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

GB 4706.17 Household and similar electrical appliances - Safety - Particular requirements for motor-compressors

GB/T 5773 The method of performance test for positive displacement refrigerant compressors

GB/T 6283 Chemical products - Determination of water - Karl-fischer method (general method)

GB/T 13306 Plate

GB/T 22068 Automobile air conditioning electrically driven compressor assembly

lubricating oil used, refrigerating capacity, input power, noise, etc.

5 Technical requirements

5.1 General requirements

The compressor shall be manufactured in accordance with the drawings and technical documents approved by the prescribed procedures (or the agreement between the user and the manufacturer).

For (semi) hermetically compressor, the heating capacity, exciting force, voltage fluctuation resistance, electromagnetic compatibility, alternating heat-humidity of the compressor body, insulation resistance of the stator winding of motor to the housing, voltage resistance of the stator winding of motor to the housing, protection grade of the housing, performance of drive controller, etc. shall comply with the provisions of GB/T 22068.

5.2 Appearance

The paint film of painted parts of the compressor shall be uniform and firm, and shall be free of defects such as bubbles, peeling, grinning, and bruises. The casting surface shall be flat and smooth. The wire sheath of (semi) hermetically compressor shall not be broken, and the connector shall not be deformed or damaged.

5.3 Compression strength

The compressor shall be free from leakage and abnormal deformation.

Note: In this test, the tolerance of rubber seals may not be an assessment requirement.

5.4 Tightness

The leakage of the compressor shall be no more than 14 g/a.

5.5 Internal cleanliness

The internal cleanliness of the compressor shall meet the following requirements:

- a) The cleanliness of open-type compressor shall meet the requirements of Table 1;
- b) The cleanliness of (semi) hermetically compressor shall comply with the provisions of GB/T 22068.

For (semi) hermetically compressor, the thermal cycle test requirements shall comply with the provisions of GB/T 22068.

5.14 Durability

For open-type compressors, after the test of durability, refrigerating capacity, input power, and noise, the measured refrigerating capacity of the compressor shall be reduced by no more than 10%; the measured input power shall be increased by no more than 10%; the measured noise value of swash plate-type compressor shall be increased by no more than 5 dB(A); and the measured noise value of other types of compressor shall be increased by no more than 3 dB(A).

For (semi) hermetically compressor, the durability requirements shall comply with the provisions of GB/T 22068.

5.15 Vibration resistance

For open-type compressors, after the test of vibration resistance, refrigerating capacity, input power, and noise, the measured refrigerating capacity of the compressor shall be reduced by no more than 10%; the measured input power shall be increased by no more than 10%; the measured noise value shall be increased by no more than 2 dB(A).

For (semi) hermetically compressor, the vibration resistance requirements shall comply with the provisions of GB/T 22068.

6 Test methods

6.1 General requirements

The requirements for the test method of refrigerating capacity of the compressor, for the instruments and apparatus used for the test, and for pressure-temperature measurement point shall comply with the provisions of GB/T 5773.

The requirements for noise test instruments shall conform to the provisions of JB/T 4330.

The refrigerant leak detector shall have a sensitivity grade of not less than 14 g/a.

6.2 Test conditions

6.2.1 Nominal conditions

The nominal conditions of open-type compressor shall be in accordance with

oil in the compressor; by the suction-exhaust port, FILL the compressor with the refrigerant to $0.5 \text{ MPa} \pm 0.05 \text{ MPa}$; then, USE dry nitrogen to pressurize it to 1 MPa, and USE an electronic refrigerant leak detection device with an accuracy of measurement of not less than $1 \times 10^{-6} \text{ atm} \cdot \text{cm}^3/\text{s}$ to measure;

b) USE helium as the leak detection medium: POUR out the refrigerant oil in the compressor; by the suction-exhaust port, FILL the compressor with helium (or a certain proportion of helium-nitrogen mixed gas) to test pressure (within the range of 1.2 MPa ~ 1.8 MPa); then, PLACE the compressor on a special device for helium leak detection with an accuracy of measurement of not less than $1 \times 10^{-8} \text{ atm} \cdot \text{cm}^3/\text{s}$, for equivalent measurement of refrigerant leakage.

6.5 Internal cleanliness

The test shall be carried out according to the method of Appendix A.

6.6 Internal moisture content

The test shall be carried out according to the method of Appendix B.

6.7 Test of refrigerating capacity, input power, and refrigeration performance coefficient

Under the nominal conditions specified in 6.2.1, the test shall be carried out in accordance with the provisions of GB/T 5773, to determine the refrigerating capacity, input power, and refrigeration performance coefficient of the compressor.

6.8 Noise test

6.8.1 The refrigerating system outside the test environment shall be provided with conditions for controlling the suction and exhaust pressure of the compressor.

6.8.2 The compressor drive unit outside the measurement environment shall be provided with conditions for controlling the rotational speed of compressor.

6.8.3 INSTALL according to the installation method specified by the compressor manufacturer. When there are several installation methods, the most unfavorable installation method shall be adopted.

6.8.4 Open-type compressor shall be tested under the conditions specified in Table 5; and the test method shall be in accordance with the provisions of JB/T 4330. For (semi) hermetically compressor, the test shall be implemented

coil winding is measured by electric resistance method.

6.11.2 For (semi) hermetically compressor, the test shall be implemented according to the method specified in GB/T 22068.

6.12 Static breakaway torque test

6.12.1 At normal temperature, PLACE the electromagnetic clutch on the compressor (or equivalent clutch clamp).

6.12.2 FIX the torque measuring instrument and the anti-rotation clamp on belt pulley and sucker, respectively; and PROVIDE the electromagnetic clutch with a constant rated voltage by DC power supply.

6.12.3 SWITCH on the electromagnetic clutch; and according to the torque measuring instrument requirements, slowly APPLY acting force to the torque measuring instrument in a direction perpendicular to the compressor axis; when the sucker and the belt pulley rotate relative to each other, READ the reading of torque measurement instrument and RECORD.

6.12.4 REPEAT the method in 6.12.3 for 5 times and TAKE the average of the last 3 times as the measured value of static breakaway torque of the compressor.

6.13 Thermal cycle test

6.13.1 For open-type compressor:

a) Test conditions: After placing at a low temperature of $-30\text{ }^{\circ}\text{C}$ for 3 h, PLACE at normal temperature for 1 h, then PLACE at a high temperature of $120\text{ }^{\circ}\text{C}$ for 1 h, and PLACE at normal temperature for 1 h. Under the above conditions, CYCLE the test for 5 times;

b) After the thermal cycle test is completed, tightness test shall be carried out according to 6.4.

6.13.2 For (semi) hermetically compressor, the test shall be implemented according to the method specified in GB/T 22068.

6.14 Durability test

6.14.1 For open-type compressor, the test shall be carried out according to the following provisions:

a) After the compressor is connected to test system, it is evacuated and filled with an appropriate amount of refrigerant. According to the test conditions specified in Table 6, ADJUST suction-exhaust pressure and running time

7.2.3 If the sampling is unqualified, re-inspection shall be performed in double quantity. If there is still one unqualified, the batch of products shall be inspected one by one.

7.3 Type inspection

7.3.1 In any of the following cases, it shall carry out type inspection:

- a) Trial-manufacture pattern evaluation for plant transfer production of new products or old products;
- b) When there are major changes in compressor design, materials, and processes and the product performance may be affected;
- c) When the production resumes after more than one year of compressor production suspension;
- d) When it is considered necessary because of unstable quality;
- e) The compressor is subjected to type inspection once a year.

7.3.2 The items, technical requirements, and test methods for type inspection shall be in accordance with the provisions of Table 8.

8 Marking, packaging, transport, and storage

8.1 Marking

8.1.1 Each compressor shall be provided with a permanent nameplate in a prominent position. The nameplate shall comply with the provisions of GB/T 13306. The nameplate shall include at least:

- a) Manufacturer name;
- b) Product name and model;
- c) Main technical parameters, the refrigerant used;
- d) Date of manufacture and exit-factory number.

8.1.2 The product shall be marked with the number of the executive standard in the corresponding place (such as nameplate, product manual, etc.).

8.2 Packaging

8.2.1 The compressor manufacturer shall provide the product specification for the user. The product specification content shall include:

A.4.3 Method I: cleaning of components

The cleaning of components is carried out according to the following provisions:

- a) The refrigerating machine oil filled in the compressor is collected into the specified container;
- b) DISASSEMBLE all the components of the detached part of compressor, and USE round brush and flat brush soaked with the cleaning fluid to repeatedly scrub the surface and hole-channel of the components in contact with the refrigerant;
- c) USE pressure washing equipment to flush the cleaning part of each component;
- d) USE a clean cleaning fluid to thoroughly rinse or flush the cleaning part of each component;
- e) COLLECT all turbid liquid after cleaning in a specified container.

A.4.4 Method II: complete machine cleaning

The cleaning of complete machine is carried out according to the following provisions:

- a) USE copper pipe and joint to connect the suction port and the exhaust port;
- b) USE a syringe to inject a sufficient amount of isooctane solvent or liquid halogenated hydrocarbon;
- c) After tightening the oil plug of the compressor, in 1 min, ROTATE the compressor main shaft by hand for 20 turns;
- d) REMOVE the copper pipe, and POUR the internal material (mixture of lubricating oil with isooctane solvent or liquid halogenated hydrocarbon) into a clean beaker;
- e) INJECT sufficient isooctane solvent or liquid halogenated hydrocarbon into the copper pipe, to clean any impurities left in the copper pipe;
- f) Then, from the oil plug and the suction and exhaust ports, INJECT a sufficient amount of isooctane solvent or liquid halogenated hydrocarbon; and immediately SEAL the suction and exhaust ports and oil plug;
- g) SHAKE the compressor 10 times in X, Y, and Z directions, respectively, to thoroughly clean the inside;

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