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Replacing GB/T 9098-1996

Hermetic Motor - Compressors for Refrigerators

电冰箱用全封闭型电动机-压缩机

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Jointly Issued by: **General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China;**
Standardization Administration of the People's Republic of China.

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Foreword

This Standard replaces GB/T 9098-1996 "Hermetic Motor - Compressors for Refrigerators".

Compared with GB/T 9098-1996, the main technical changes in this Standard are as follows:

- the R12 refrigerant compressor in "Application Scope" was replaced by R600a and R134a refrigerant compressors;

- the terms and definitions of rated parameter, variable speed (variable frequency) compressor, and variable capacity compressor were added;

- the classifications of speed control and capacity change were added in the product classification;

- the basic contents of expression methods for compressor specification and model were specified;

- the requirements of product technical specification were added in the technical requirements, indicating the rated parameters and test conditions of technical indexes such as product refrigerating capacity and coefficient of performance (*COP*) of the manufacturer;

- the grading of all performance indexes of compressor by nominal working volume of cylinder was replaced by nominal refrigerating capacity;

- the nominal coefficient of performance (*COP*) of compressor was graded by efficacy level;

- the performance indexes, test methods, and assessment contents of variable speed (variable frequency) compressor were added;

- the requirements of compressor inclining starting test were added;

- the determination methods for residual moisture content and internal impurity content of the complete un-oiled compressor were specified;

- the test methods and assessment contents for capillary tube plugging rate of R134a refrigerant compressor were added;

- the requirements of “motor winding temperature” and “shell temperature” were replaced according to the relevant contents in GB 4706.17 "Household and Similar Electrical Appliances - Safety - Particular Requirements for Motor-Compressors";

- the fire warning sign for combustible refrigerant compressor was added.

This Standard was proposed by China National Light Industry Council.

This Standard shall be under the jurisdiction of National Technical Committee on Household Appliances Condenser of Standardization Administration of China (SAC/TC 46).

Drafting organizations of this Standard: Jiaxipera Compressor Co., Ltd., Huangshi Donper Electric Appliance Co., Ltd., China Household Electric Appliance Research Institute, China Household Electrical Appliances Association, China National Electric Apparatus Research Institute, China Quality Certification Center, Beijing Embraco Compressor Co., Ltd., Guangzhou Refrigerator Co., Ltd., Zanussi Electromechanical Tianjin Compressor Co., Ltd., Shanghai Konor Electric Machinery Co., Ltd., Huayi Compressor Co., Ltd., Jiangsu Baixue Electric Appliance Co., Ltd., Hangzhou Qianjiang Refrigeration Group Industrial Co., Ltd., and Taizhou LG Electronics Refrigeration Co., Ltd.

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The previous editions replaced by this Standard are as follows: GB/T 9098-1988 was firstly issued; GB/T 9098-1996 was the first revision; and this Standard is the second revision.

Hermetic Motor - Compressors for Refrigerators

1 Scope

This Standard specifies the terms and definitions, product classification, technical requirements, test methods, inspection rules and the requirements of marking, packaging, transportation and storage of hermetic motor-compressors for refrigerators. The safety requirements of compressor are detailed in GB 4706.17 "Household and Similar Electrical Appliances - Safety - Particular Requirements for Motor-Compressors".

This Standard is applicable to the hermetic motor-compressors used for low-back-pressure* household and similar electric refrigerators with R600a and R134a refrigerants, and the nominal refrigerating capacity not exceeding 400 W under the specified working conditions in this Standard (hereinafter referred to as “compressor”).

For similar compressors with other types of refrigerants, this Standard may also be referred to.

This Standard is not applicable to vehicular refrigerator compressors.

2 Normative References

The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. For dated references, subsequent amendments (excluding corrections) or revisions of these publications do not apply. However, all parties coming to an agreement according to this Standard are encouraged to study whether the latest editions of these documents are applicable. For undated references, the latest edition applies.

GB/T 1019	General Requirements for the Package of Household and Similar Electrical Appliances
GB/T 2828.1-2003	Sampling Procedures for Inspection by Attributes - Part 1: Sampling Schemes Indexed by Acceptance Quality Limit (AQL) for Lot-by-lot Inspection (ISO 2859-1: 1999, IDT)

* Low-back-pressure refers that the range of vaporization temperature is between -35°C (may be lower if necessary) and -15°C.

GB/T 2829-2002	Sampling Procedures and Tables for Periodic Inspection by Attributes (Apply to Inspection of Process Stability)
GB/T 4214.1-2000	Acoustics - Household and Similar Electrical Appliances - Test Code for Determination of Airborne Acoustical Noise - Part 1: General Requirements (eqv IEC 60704-1: 1997)
GB 4706.17-2004	Safety of Household and Similar Electrical Appliances - Particular Requirements for Motor-Compressors (IEC 60335-2-34: 1999, IDT)
GB/T 5773-2004	Method of Performance Test for Positive Displacement Refrigerant Compressors (ISO 917: 1989, MOD)
GB/T 8059	Household and Similar Refrigerating Appliances
IEC 60335-2-24/A2:2007	Safety of Household and Similar Electrical Appliances - Part: 2-24: Particular Requirements for Refrigerating Appliance, Ice-cream Appliance and Ice Maker

3 Terms and Definitions

For the purposes of this Standard, the following terms and definitions apply.

3.1

Rated parameter

Nominal values in the product technical specification.

3.2

Variable speed (variable frequency) compressor

Compressors that change speed via variable speed (variable frequency) control device.

3.3

Variable capacity compressor

Compressors that change the exhaust capacity by mechanical and (or) electrical methods.

3.4

Coefficient of performance

COP

The ratio of refrigerating capacity and the consumed power by refrigeration when the compressor runs in connection with the refrigerating system, in W/W.

4 Product Classification

4.1 By structural type

a) Reciprocating compressor;

b) Rotary compressor.

4.2 By installation form

a) Horizontal compressor;

b) Vertical compressor.

4.3 By speed control

a) Fixed-speed compressor;

b) Variable speed (variable frequency) compressor.

4.4 By capacity change

a) Constant capacity compressor;

b) Variable capacity compressor.

4.5 Expression methods of specification and model

The expression of specification and model shall at least include the following contents:

a) Nominal refrigerating capacity or cylinder volume;

b) Refrigerant type.

5 Technical Requirements

5.1 Product technical specification

The compressor manufacturer shall provide the product technical specification to the user based on the demand. The product technical specification shall include the refrigerant name (or No.), nominal refrigerating capacity of compressor, *COP*, input

Note: This item is only applicable to R134a refrigerant compressor.

5.3.10 Accelerated life-span test

Test according to the method given in 6.11; the refrigerating capacity and *COP* at the end of test shall not be lower than 95% of the actual measured value prior to test; and the noise value shall not be larger than 3dB(A) of actual measured value prior to test.

5.3.11 Starting durability test

After testing according to the method given in 6.12, the compressor shall be able to work continuously without the following faults:

a) Mechanical damages to the compressor and the test pressure ratio is unable to maintain;

b) The hanging (or supporting) spring is damaged, which increases the noise obviously or causes impact to the machine during startup and shutdown;

c) Electrical short circuit or disconnection in the compressor.

5.4 Other technical requirements

5.4.1 The compressor shall be equipped with appropriate overload protective device.

5.4.2 The compressor shall be equipped with appropriate motor starting device.

5.4.3 The variable speed (variable frequency) compressor shall be equipped with appropriate variable speed (variable frequency) control device.

5.4.4 The compressor shall be equipped with appropriate damping device (such as damping pad, etc.)

5.4.5 The finished compressor shall be enclosed in the dry nitrogen with the pressure not less than 0.13MPa (absolute pressure) or air (with the dew point temperature below -35°C). Vacuuming method may be adopted for R600a refrigerant compressor to make the internal absolute pressure not greater than 0.07MPa.

5.4.6 Generally, the compressor shall be injected with refrigerant oil according to the design requirements and the specified oil injection volume.

5.4.7 The compressor shell shall be coated uniformly without missing coating, scratch, rust stains and other defects.

6 Test Method

6.1 Test conditions

6.1.1 Environment temperature

Unless otherwise specified, the environment temperature for test is generally (20±5)°C.

6.1.2 The tested compressor shall be under normal service condition around; for naturally cooled compressor, the surrounding air flow rate shall not be greater than 0.25m/s; for force-cooled compressor with fan, the surrounding air flow rate shall be the air flow rate of the tested compressor equipped with fan under the normal operating condition; for compressor equipped with oil cooling pipe, the lubricant shall be cooled according to the requirements of the technical document. The compressor shall be free from cold/heat sources that may affect the test within a distance of 500mm around.

6.1.3 The voltage fluctuation and frequency fluctuation of power supply for test shall not be greater than 1%.

6.1.4 The variable speed (variable frequency) control device used for variable speed (variable frequency) compressor refrigerating capacity, *COP*, noise, vibration test and all tests shall be configured according to the requirements of the manufacturer.

6.1.5 The measuring meters shall be used in the approved validity period and provided with calibration certificate; their type and measuring precision shall meet those specified in Table 5.

6.5 Noise test

The noise level of compressor at A-weighted sound power level shall be measured according to the requirements of GB/T 4214.1-2000, and the radius *r* of the measured hemisphere surface shall not be less than 1.0m.

Place the tested compressor in the environment meeting the testing requirements of 4.4.1 in GB/T 4214.1-2000. The testing environment is semi-anechoic room and the compressor shall be equipped with the self-matched damping pad. Place it on the rigid platform at the center ground of semi-anechoic room (without fixed bolt) and the mass of its rigid platform is more than 10 times of that of the tested compressor; connect the compressor to the substitutive refrigerating system outside the semi-anechoic room with non-rigid connection tube (see Figure 2 for the recommended substitutive refrigerating system).

Vacuum the system and fill in the refrigerant applicable to this compressor; operate the compressor and adjust the pressure according to Table 8 to make it remain stable.

After the system is stable (i.e. after the testing system operates stably at least for 30min under the test conditions as specified in Table 8), measure the A-weighted sound pressure level noise value of each point according to the requirements of GB/T 4214.1-2000, then calculate the average A-weighted sound pressure level noise value L_p (A) of the measured surface and calculate the A-weighted sound power level noise value L_W (A) of the compressor.

Note: as for compressor using other refrigerants, the exhaust pressure is the corresponding saturation pressure of this refrigerant at (50±0.5)°C and the suction pressure is the corresponding saturation pressure of this refrigerant at (-20±0.5)°C.

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7.1.2 The sampling scheme for exit-factory inspection is at the sole discretion of the manufacturer's quality inspection department.

7.1.3 See relevant requirements of GB 4706.17 for the technical requirements and test methods for safety parts in exit-factory inspection. The must-inspect items and random-inspect items are at the sole discretion of the manufacturer’s quality inspection department.

7.2 Type inspection

The type inspection for compressor shall be carried out if any one of the following circumstances appears:

a) When trial manufacturing and design appraisal acceptance of new products, or old products are transferred to new plant;

b) When significant changes which may affect the product performance occur in structure, material or process after the product has been launched into production;

c) When a full-year has been passed for continuously produced products from the last type inspection, or it is considered necessary due to unstable quality;

d) Re-producing after more than one year.

7.2.1 Type inspection shall cover all inspection items, except Item 1 and Item 3 in Table 13 of this Standard.

7.2.2 The sample quantity and arrangement for type inspection are detailed in Table 14. All the tested samples, except - one uncapped sample, one locked-rotor sample and two un-oiled samples, shall be randomly taken from the exit-factory products.

7.2.3 See the requirements of Table 15 for the exit-factory inspection, type inspection items and nonconformity classification. See the requirements of Table 16 for the sampling plan, judgment level, sample size, nonconforming quality level, acceptance quantity and nonconformity quantity for type inspection. The unqualified defects number is counted in set.

After the two samples in the first sampling complete performance test, randomly choose one set to do safety test (i.e. the test of critical defect test item). If one set in the safety test is unqualified, this batch of products shall be deemed as unqualified.

For the compressor using combustible refrigerant, fire prevention warning sign shall be indicated on obvious place, as shown in Figure 9. The figure, dimensions and color, etc. of the sign shall meet the requirements of IEC 60335-2-24/A2:2007.

Note: The vertical height of equilateral triangle shall be 15mm at least.

Figure 9 Symbol of Fire Prevention Warning Sign

8.2 Packaging and transportation

The compressor packaging shall comply with the relevant requirements of GB/T 1019, and its packaging and transportation may be handled according to the requirements of order contract. The compressor shall be reliably fixed in the packaging box and be provided with damp-proof and shock-proof measures to guarantee that no damage and bruising occurs in normal loading and unloading of transportation and preservation. The following contents shall be clearly indicated on the outer wall of packaging box with unfading paint:

a) Product name, model and quantity;

b) Product batch number;

c) Net mass (kg) and gross mass (kg);

d) Packaging overall dimensions: (Length×Width×Height) (mm×mm×mm);

e) Manufacturer's name;

f) Storage and transportation precautions: characters or symbols like "Handle With Care", "Do Not Turn Over", "Keep Away From Moisture".

8.3 Storage

8.3.1 Products shall be stored in rain-proof and well-ventilated warehouse, and free from corrosive gas around.

8.3.2 It is allowed to pull out the sealing rubber plug only when the compressor is in use. Plug shedding or looseness shall not appear in transportation and storage.

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