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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 39631-2020

**General specification for servo motor systems in air
conditioning compressors**

新能源汽车空调压缩机用伺服电动机系统通用规范

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Table of Contents

1	Scope
2	Normative references
3	Terms and definitions...
4	Operating conditions
4.2	Environmental conditions
5	Types and interfaces...
6	Technical requirements and test methods...
6.5	Insulation resistance
6.5.2	Test method Perform the test according to
6.6	Insulation between winding turns
6.6.2	Test method
6.10	No-load speed
6.11	Rated data
6.12	Operating voltage range
6.13	Speed adjustment range
6.18	Protection level
6.19	Internal cleanliness
6.19.2	Test method Test according to
6.25	Mechanical strength
6.25.2	Test method Perform the test according to
6.26	Temperature rise
6.26.2	Test method Perform the test according to
6.27	Voltage fluctuation resistance
6.27.2	Test method Perform the test according to
6.28	Noise
6.29.2	Electromagnetic disturbance
6.30	Durability
6.31	Reliability
7	Safety requirements...
8	Inspection rules...
8.2.4	Evaluation of inspection results
8.3.3	Group C inspection

1 Scope

China's national general specification for the servo motor systems of air conditioning compressors. The variable speed compressor is what made the modern air conditioner efficient. A fixed-speed machine controls temperature by switching on and off, which wastes energy at every start and holds the room within a band rather than at a setpoint; an inverter-driven permanent magnet motor runs continuously at whatever speed the load requires, and the seasonal efficiency roughly doubles. The demands on the drive are specific. It must start reliably against the compressor's varying load without a position sensor, since a sensor cannot survive inside a hermetic shell full of refrigerant and oil; it must run smoothly at very low speeds where a compressor's torque pulsation is worst; and it must do so for fifteen years without maintenance in a sealed enclosure nobody will ever open.

This Standard specifies the terms and definitions, operating conditions, types and interfaces, technical requirements and test methods, inspection rules, and delivery preparations for servo motor system in air conditioning compressor of new energy vehicles. This Standard applies to the servo motor system (hereinafter referred to as the "system") for (semi-)hermetically positive displacement refrigerant compressor of the air conditioning compressor of new energy vehicles, as well as the design, manufacture, inspection and acceptance of servo motors (hereinafter referred to as "motors") and servo motor drives (hereinafter referred to as "drives") that constitute the system. It can be implemented by reference for other structural types of compressor servo motor systems.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated version applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

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

GB/T 755-2019, Rotating electrical machines - Rating and performance

GB/T 2828.1-2012, Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

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

GB/T 7345-2008, General requirements for electrical machine for automatic control system

GB/T 10069.1, Measurement of airborne noise emitted by rotating electrical machines and the noise limits - Part 1: Method for the measurement of airborne noise emitted by rotating electrical machines The fluid medium that realizes the refrigeration cycle in the refrigeration

system.

Note: Usually, it also includes changes in the state of the fluid. It absorbs heat at low temperature and low pressure, and discharges heat at higher temperature and pressure.

3.9 Compatibility The character that when two or more materials and the test working medium (refrigerant + refrigerating machine oil) are used together in a hermetically refrigerant compressor, they will not have harmful effects on each other.

4 Operating conditions

4.1 Electrical operating conditions Unless otherwise specified, the input rated DC voltage is preferably 24 V, 48 V, 60 V, 72 V, 120 V, 192 V, 240 V, 288 V, 320 V, 336 V, 360 V, 380 V, 442 V, 480 V, 500 V, 580 V, 600 V.

4.2 Environmental conditions

4.2.1 Environmental conditions for use Unless otherwise specified, the environmental conditions for the use of the system shall comply with: -- Environmental medium: refrigerant and lubricating oil (refrigerant shall be R134a, R407C, R410A, R1234yf or as specified by product-specific technical conditions; lubricating oil shall be POE, PAG, PVE, FVC or as specified by product-specific technical conditions); -- Operating environment temperature: it is -15 °C ~ 85 °C for common type, -25 °C ~ 85 °C for low temperature type, and -35 °C ~ 85 °C for ultra-low temperature type.

4.2.2 Storage environmental conditions The temperature of the storage environment is -40 °C ~ 35 °C; there shall be measures to prevent moisture and vibration; the storage environment shall be well ventilated, and no corrosive gas is allowed around.

4.2.3 Test environmental conditions If there are no other regulations, each test shall be carried out under the following climatic conditions: The test shall not be repeated. When it is required, a test is allowed after installation and before operation, and the test voltage value shall not exceed 80% of the specified voltage. The inspection test points of the drive shall conform to:

- a) The main circuit and the control circuit share the same reference ground. The inspection test point is the power input terminal of the main circuit. Short-circuit the power input terminal during the test;
- b) The main circuit and the control circuit do not share the same reference ground. The inspection test point includes the power input terminal and the control signal terminal of the main circuit. Short-circuit the power input terminal and the control signal terminal respectively during the test.

6.5 Insulation resistance

6.5.1 Technical requirements Under normal test conditions and the extreme low temperature conditions which are specified in the product-specific technical conditions, the insulation resistance between the motor stator winding and the shell, and between the inspection test point of the driver and the protective ground terminal (the exposed part of the shell) shall not be less than 50 MΩ; under extreme high temperature conditions, the insulation resistance shall not be less than 10 MΩ; the insulation resistance, after being subjected to a constant damp heat test, shall not be less than 2 MΩ. The voltage value of the insulation resistance meter that is selected for the insulation resistance check shall meet the requirements of Table 1.

6.5.2 Test method Perform the test according to

5.18.2 of GB/T 7345-2008. After the test, each loop shall be electrically connected to the grounded part to discharge it.

6.6 Insulation between winding turns

6.6.1 Technical requirements Use the impulse waveform comparison method to test the insulation between winding turns. The amplitude, oscillation period, waveform area difference and area of waveform difference of the test waveform shall meet the requirements of the product-specific technical conditions.

6.6.2 Test method

6.9.2 Test method After the motor reaches a stable non-operating temperature, use a resistance measuring meter to measure the DC phase resistance of the motor stator winding, or use other methods that can ensure accuracy to measure; convert it to the equivalent resistance value at 20 °C.

6.10 No-load speed

6.10.1 Technical requirements The motor runs in a steady state under no-load state; its no-load speed shall meet the requirements of the product-specific technical conditions.

6.10.2 Test method The motor is equipped with a dedicated driver to measure its no-load speed.

6.11 Rated data

6.11.1 Technical requirements When the motor outputs the rated torque, the system rated current (driver input current) and rated speed shall meet the requirements of the product-specific technical conditions.

6.11.2 Test method The motor is equipped with a dedicated driver, and applied with the rated torque, to measure the rated current and rated speed of the motor.