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NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA

ICS 29.160.30

CCS K 22

GB/T 22712-2021

Replacing GB/T 22712-2008

**Technical specification for G series cooling fans applying to
variable frequency motors**

变频电机用 G 系列冷却风机技术规范

Issued on: October 11, 2021

Implemented on: May 01, 2022

**Issued by: State Administration for Market Regulation;
Standardization Administration of the People's Republic of China.**

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Technical specification for G series cooling fans applying to variable frequency motors

1 Scope

This document stipulates the type, basic parameters and dimensions, technical requirements, test methods, inspection rules, marking, packaging and warranty period for G series cooling fans for YVF2 series (IP54) three-phase asynchronous motors powered by frequency converters.

This document applies to G series cooling fans (axial flow) for YVF2 series (IP54) three-phase asynchronous motors powered by frequency converters (hereinafter referred to as “fan”); for other series of three-phase asynchronous motors powered by frequency converters, this document applies as a reference for the selection of fans. It can also be implemented as a reference for all kinds of fans derived from this fan.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 191-2008, Packaging - Pictorial marking for handling of goods

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

GB/T 1032-2012, Test procedures for three-phase induction motors

GB/T 1236-2017, Industrial fan - Performance testing using standardized airways

GB/T 1971-2021, Rotating electrical machines - Terminal markings and direction of rotation

GB/T 1993-1993, Cooling methods for rotating electrical machines

GB/T 2888-2008, Methods of noise measurement for fans blowers compressors and roots blowers

GB/T 4772.1-1999, Dimensions and output series for rotating electrical machines - Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1 080

GB/T 4942-2021, Degrees of protection provided by the integral design of rotating electrical machines (IP code) - Classification

GB/T 5171.1-2014, Small power motors - Part 1: General technical requirements

GB/T 5171.21-2016, Small power motors - Part 21: General test methods

GB/T 10068-2020, Mechanical vibration of certain machines with shaft heights 56 mm and higher - Measurement, evaluation and limits of vibration severity

GB/T 12350, Safety requirements of small power motors

GB/T 12665-2017, Requirements of damp-heat testing of electrical machine for service in general environmental condition

GB/T 22719.1-2008, Interturn insulation of random-wound winding for AC low-voltage electrical machines - Part 1: Test methods

GB/T 22719.2-2008, Interturn insulation of random-wound winding for AC low-voltage electrical machines - Part 2: Test limits

JB/T 6445-2017, Overspeed test for fan impeller

JB/T 9101-2014, Fan rotor balance

3 Terms and definitions

No terms and definitions need to be defined in this document.

4 Types, basic parameters and dimensions

4.1 The type of fans consists of three parts: series code, specification code and design code.

Example:

4.2 The fan is directly connected to the motor, and the motor is of an outer rotor structure, or an inner rotor structure, which is also allowed.

4.3 The cooling method of the motor applied to the fan (hereinafter referred to as the fan motor) is IC01 (according to the regulations of GB/T 1993-1993).

5.2 The deviation of the power supply voltage and frequency from the rated value during the operation of the fan motor shall comply with the provisions of GB/T 755-2019.

5.3 The fan motor adopts 155 (F) class insulation, and the temperature rise (resistance method) of the stator winding is assessed by 80 K.

5.4 When the fan motor is in a hot state and the torque is gradually increased, it shall be able to withstand an over-torque exceeding 60% of the rated torque for 15 s without sudden change in speed or stalling, and the voltage and frequency shall be maintained at the rated value at this time.

5.5 Under no-load conditions, the fan motor shall be able to withstand an increase in speed to 120% of its rated value for 2 minutes without harmful deformation.

5.6 The insulation resistance of the stator winding of the fan motor shall not be lower than 2 M Ω in the hot state, and not lower than 20 M Ω in the normal state.

5.7 The stator winding of the fan motor shall be able to withstand the 1 min voltage withstand testing without breakdown. The frequency of the test voltage is 50 Hz, which shall be as sinusoidal as possible; the effective value of the voltage is 1 760 V. The same fan shall not be subjected to this test repeatedly.

5.8 The stator winding of the fan motor shall be able to withstand the inter-turn impulse withstand voltage test without breakdown, and the peak value of the test impulse voltage of the coil shall comply with the provisions of GB/T 22719.2-2008.

5.9 After the stator winding of the fan motor is tested for 6 cycles according to the 40 °C damp heat cyclic test method specified in GB/T 12665-2017, the insulation resistance shall not be lower than 2 M Ω , and it shall be able to withstand the withstand voltage test specified in 5.7 without breakdown, but the effective value of the test voltage shall be 1 500 V, and the test time shall be 1 min.

5.10 Measure the current (hereinafter referred to as “no-load current of the fan”) under the condition of rated voltage, rated frequency, and fan motor with impeller. The value shall be within a certain range and shall be lower than the rated current of the fan motor.

5.11 When the three-phase power supply is balanced, the deviation between any phase of the three-phase no-load current of the fan and the average value of the three phases shall not exceed 10% of the average value of the three phases. The deviation between any phase of the DC resistance of the three-phase stator winding of the motor and the average value of the three phases in the actual cold state shall not be greater than $\pm 2\%$ of the average value.

5.12 The fan motor shall be able to start directly when the terminal voltage is not lower than 85% of the rated voltage.

5.19 The fan shall be provided with an independent junction box, and it shall be placed in the same direction as the junction box of the equipped motor. The junction box is equipped with a grounding terminal and a grounding mark, which shall be guaranteed to be indelible throughout the entire service life of the fan. When the variable frequency motor is attached with other devices such as encoder or brake, the fan shall be separately installed with a junction box, and the number of terminals in the junction box shall meet the requirements of the additional device (negotiated by the user and the manufacturer).

5.20 When the variable frequency motor is provided with oil filling and oil draining devices, the outer cover of the fan shall have holes for oil filling and draining, and shall be set with dustproof plugs.

5.21 When the variable frequency motor is equipped with other devices such as encoder or brake, the outer cover of the fan shall have holes that meet the encoder outlet or the stroke of the brake handle (negotiated by the user and the manufacturer).

5.22 The rotation direction of the fan shall be marked at a conspicuous position on the outer cover, and the mark shall be clear and indelible during the entire service life of the fan. And it shall be ensured that it can still be checked clearly after installation.

5.23 The outer cover material of the fan shall have good tensile strength and flexural strength.

5.24 The outer cover of the fan shall be flat in shape, firmly welded, and free from defects such as desoldering, false welding, and lack of riveting.

5.25 The rotor assembly of the fan shall be subjected to a static or dynamic balance test. The balance quality grade of the impeller is $G \leq 5.6$ mm/s (according to the regulations of JB/T 9101-2014). The balance quality grade G is represented by the value obtained by dividing the product of the rotor mass eccentricity ε and the rotor's maximum operating angular velocity ω by 1000.

5.26 The impeller of the fan shall be subjected to the impeller overspeed test according to the provisions of JB/T 6445-2017.

5.27 The riveting of the impeller of the fan shall be firm, and the surface of the riveting and the head of the rivet shall be smooth and flat, and shall be free of defects such as cracks, skew, or lack of riveting.

5.28 The mechanical inspection items of fans include:

- a) Operation inspection: When the fan impeller rotates, it shall be smooth and brisk without stagnation;
- b) Appearance inspection: Check whether the assembly of the fan is complete and correct, and the paint on the surface of the fan shall be dry, complete, uniform, and free from stains, bumps, cracks, etc.;

- c) Inspection of installation dimensions and overall dimensions: The installation dimensions and overall dimensions shall comply with the provisions of 4.10.

6 Test methods

6.1 The heat test shall be carried out in accordance with the provisions of GB/T 5171.21-2016.

6.2 The aerodynamic performance test shall be carried out in accordance with the provisions of GB/T 1236-2017.

6.3 The 40 °C damp heat cyclic test shall comply with the provisions of GB/T 12665-2017.

6.4 The noise test method shall be carried out according to the provisions of GB/T 2888-2008.

6.5 The test method of vibration shall be carried out in accordance with the provisions of GB/T 10068-2020.

6.6 The test method of leakage current shall be carried out according to the provisions of GB/T 12350.

6.7 The measurement of the insulation resistance between the fan motor stator winding and the casing and the withstand voltage test of the fan motor winding shall be carried out in accordance with the provisions of GB/T 5171.21-2016.

6.8 The measurement of the DC resistance of the fan motor stator winding in the actual cold state, the measurement of the no-load current of the fan motor, and the short-term over-torque test shall be carried out in accordance with the provisions of GB/T 1032-2012.

6.9 The inter-turn impulse withstand voltage test of fan motor windings shall be carried out in accordance with the provisions of GB/T 22719.1-2008.

6.10 The overspeed test of the fan impeller shall be carried out in accordance with the provisions of JB/T 6445-2017.

6.11 The test method for the protection grade of the enclosure shall be carried out in accordance with the provisions of GB/T 4942-2021.

7 Inspection rules

7.1 Motor inspection is divided into ex-factory inspection and type inspection.

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