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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 1032-2023

Replacing GB/T 1032-2012

Test methods for three-phase asynchronous motors

三相异步电动机试验方法

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1 Scope

China's national test code for three-phase asynchronous motors - the induction motor being the workhorse that consumes a very large share of all industrial electricity, and this being the document that decides what its efficiency is. It describes the test requirements and the test methods for three-phase asynchronous motors, including the measurement of insulation resistance, the measurement of DC resistance, the thermal test, the load test, the no-load test, the locked-rotor test, the determination of the losses and the efficiency, the torque-speed characteristic test, the moment of inertia test, the short-time over-torque test and the further tests a motor may be subjected to. It applies to the testing of three-phase

asynchronous motors. The determination of efficiency is the part with consequences. A motor's efficiency can be found by measuring input and output directly, or by measuring the individual losses and subtracting them - and the two do not necessarily agree, because the stray load loss is difficult to measure and has historically been assigned a conventional value rather than determined. Which method a standard prescribes therefore decides what a motor's efficiency is said to be, and by extension whether it meets the mandatory energy efficiency grades set elsewhere. That is why a test code of this kind carries as much commercial weight as the efficiency standard it serves. The rest of the document covers the tests that establish whether the machine is fit at all: the insulation resistance and the withstand voltage, the thermal test that determines the temperature rise and therefore the rating, the locked-rotor and starting characteristics, the torque-speed curve, the vibration and noise, and the over-torque capability. Issued on 7 September 2023 and in force since 1 April 2024, it replaces GB/T 1032-2012. Amendment 1, GB/T 1032-2023/XG1-2025, was issued on 30 June 2025 and forms part of the same document.

This Document describes the test requirements and test methods for three-phase asynchronous motors. Test methods include measurement of insulation resistance, measurement of DC resistance, thermal test, load test, no-load test, locked-rotor test, determination of loss and efficiency, torque speed characteristic test, moment of inertia test, short-time over-torque test, Inter-turn insulation impulse voltage test, power frequency withstand voltage test, rotor open circuit voltage measurement, overspeed test, vibration and noise measurement, shaft voltage and bearing current measurement. This Document applies to three-phase asynchronous motors.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

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

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 10069.1-2006 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

GB/T 21211-2017 Rotating electrical machines - Equivalent loading and super-position techniques - Indirect testing to determine temperature rise

GB/T 22715-2016 Impulse voltage withstand levels of form-wound stator coils for rotating

A.C. machines

3 Terms and Definitions

For the purposes of this Document, the terms and definitions given in GB/T 755-2019 and GB/T 25442-2018, and the following apply.

3.1 Asynchronous machine An A.C. motor, the ratio of its speed under load to the frequency of the connected power grid is not a constant value. [Source: GB/T 2900.25-2008, 411-31-09]

3.2 Motor A motor that converts electrical energy into mechanical energy. [Source: GB/T 2900.25-2008, 411-33-01]

3.3 Type test A test that is carried out on one or more motors manufactured according to a certain design to show that the design complies with certain standards. [Source: GB/T 2900.25-2008, 411-53-01]

3.4 Routine test A test that is conducted on each motor after it is manufactured to determine whether it meets the standards. [Source: GB/T 2900.25-2008, 411-53-02]

3.5 Insulation resistance test A test that measures insulation resistance under specified conditions. [Source: GB/T 2900.25-2008, 411-53-48]

3.6 Thermal test A test that determines the temperature rise of one or several parts of the motor under specified operating conditions.

3.7 Load test A test that determines the load characteristics of the motor under specified operating conditions.

3.8 No-load test A test without effective mechanical output on the shaft when the motor is running.

3.9 Locked-rotor test A test that is carried out to determine the locked-rotor torque and locked-rotor current when the motor is energized and the rotor is blocked. [Source: GB/T 2900.25-2008, 411-53-32]

3.10 Efficiency The ratio of output power to input power, which is usually expressed as a percentage. [Source: GB/T 2900.25-2008, 411-53-08]

3.11 Impulse test A test in which a non-periodic transient voltage is applied to an insulating component. The polarity, amplitude and waveform of the test voltage must comply with predetermined provisions. [Source: GB/T 2900.25-2008, 411-53-55]

4 Denotations

cosphi. Power factor. f. Power supply frequency (Hz). I

5 Test Requirements

5.1 General description The performance of three-phase asynchronous motor is closely related to the supply voltage and frequency; while it is affected by the voltage wave shape, the symmetry of supply power, the frequency deviation and stability. Accurate test data can only be obtained with qualified power supply (see 5.2), test apparatus (see 5.3) and careful measurement.

5.2.1 Voltage

5.2.1.1 Voltage wave shape The harmonic voltage factor (HVF) of the testing voltage shall not exceed the following (see

7.2.1.1 in GB 755-2019). 0.03 - N design electric motors; 0.02 - Other electric motors that are not specified. The harmonic voltage factor (HVF) of the testing voltage during the thermal test shall not exceed 0.015 (according to

8.3.1 specified in GB 755-2019).

5.2.1.2 The symmetry of three-phase power supply The negative sequence component of the 3-phase voltage system shall be less than 0.5% of the positive sequence component; and the effect of zero sequence components shall be eliminated (see

8.3.1 in GB 755-2019).

5.2.2 Frequency During the test and measurement process, the average change in power frequency shall be within ±0.1% of the frequency required for the test (see

5.4.2 in GB/T 25442-2018). This requirement is not applicable to equivalent circuit method (see 12.6).

5.3 Measuring instruments and requirements

5.3.1 General description Environmental conditions shall be within the specified range given by the instrument manufacturer. If possible, temperature correction should be made according to the instrument manufacturer's instructions. Digital instruments should be used wherever possible. The accuracy of analog instruments is usually expressed as a percentage of the full scale. Therefore, the smallest range shall be selected according to the actual situation, and the observed reading should be more than 2/3 of the full scale. The full-scale range of the instrument (especially the current sensor) shall match the relevant parameters of the motor under test. rence shall be taken based on practical experience.

6.1 Measurement of insulation resistance

6.1.1 Measurement of insulation resistance between winding and enclose and mutual windings