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

GB/T 1029-2021

Replacing GB/T 1029-2005

Test procedures for three-phase synchronous machines

三相同步电机试验方法

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1 Scope

GB/T 1029-2021 is the Chinese national standard on test procedures for three-phase synchronous machines, in the field of electrical engineering. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 21 May 2021 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 December 2021. Classification: ICS 29.160.01, CCS K21. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This document describes the test methods for three-phase synchronous motors, including general test, efficiency determination, thermal test, voltage regulation performance determination during self-excitation constant voltage, determination of rotation and torque inertia, overcurrent and mechanical strength tests, negative sequence current bearing capacity test, determination of dynamic characteristics of stator winding terminals, and tests for determining various parameters, etc. This document is applicable to three-phase synchronous motors with a rated power of 1 kW (kVA).

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 755-2019 Rotating Electrical Machines - Rating and Performance

GB/T 7409.3 Excitation System for Synchronous Electrical Machines - Technical Requirements of Excitation System for Large and Medium Synchronous Generators

GB/T 10068 Mechanical Vibration of Certain Machines with Shaft Heights 56 mm and Higher - Measurement, Evaluation and Limits of Vibration Severity

GB/T 10069.1 Measurement of the 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 10585 Fundamental Requirements of Excitation Systems for Medium and Small Synchronous Machines

GB/T 15548 General Specification for Three-phase Synchronous Generators Driven by Reciprocating Internal Combustion Engine

3 Terms and Definitions

The terms and definitions defined in GB/T 755-2019, GB/T 25442 and GB/T 34861, and the following are applicable to this document.

3.1 routine test A test performed on each motor during manufacture or after completion of manufacture to determine whether it complies with the standards. [Source: GB/T 2900.25-2008, 411-53-02]

3.2 load At a given moment, the value of all electrical (generator) and mechanical (electric motor) quantities applied to a motor through an electrical circuit or mechanical device.

3.3 no-load The motor is in a rotating state with zero power output (with the others in normal operation conditions).

3.4 thermal equilibrium A state, in which, the temperature rise of the motor's heating components does not exceed 1 K within

0.5 h.

3.5 efficiency The ratio of output power to input power expressed in the same unit.

3.6 initial starting impedance (synchronous motors) When the motor is stationary, the ratio of the applied armature voltage to the steady-state average armature current.

4 Symbols

The following symbols are applicable to this document. f. frequency, expressed in (Hz) fN. rated frequency, expressed in (Hz) G(js). excitation factor frequency response characteristics complex number H. stored energy constant, expressed in (s) I, i. current, expressed in (A) Ifk. excitation current, corresponding to the rated armature short-circuit current, expressed in (A) IfN. rated excitation current, expressed in (A) IN. rated current, expressed in (A) Kc. short circuit ratio n. operating speed, expressed in (r/s) P. power, expressed in (W) P0.no-load input power, expressed in (W) P1.input power, excluding

excitation power₁), expressed in (W) P₂. output power, expressed in (W) P_b. brush power loss, expressed in (W) P_e. excitation circuit loss, expressed in (W) P_{1E}. separately excited excitation power, expressed in (W) P_{Ed}. exciter loss, expressed in (W) P_{el}. electric power, excluding excitation power, expressed in (W) P_f. excitation winding loss, expressed in (W)

5 Basic Requirements

5.1 Motor Status during Test In order to make the test conditions equivalent to or extremely approximate to normal operating conditions, the test shall be carried out on the motor with the main components installed and assembled.

5.2 Power Supply

5.2.1 Voltage The power supply voltage shall comply with the requirements of 7.1, 7.3 in GB/T 755- 2019.

5.3 Test Instruments

5.3.1 General requirements The environmental conditions shall be within the range specified by the instrument manufacturer, and temperature corrections should be performed in accordance with the instrument manufacturer's instructions.

5.3.2 Electricity meter The measurement instruments used in the test and their accessories, such as. measurement transformers, shunts and electric bridges, shall have Class

0.5 accuracy as specified in IEC 60051. When the efficiency test is determined by the direct method, the electricity meter shall have Class

0.2 accuracy as specified in IEC 60051; when the power factor is 1.0, the total uncertainty shall reach Class 0.2. If a transformer or sensor is used, all its errors shall be included.

5.4 Resistance

5.4.1 General requirements DC resistance shall be directly measured at the winding terminals with the rotor at rest. The armature winding resistance shall be respectively measured for each phase. If for some reason, the phase resistance cannot be directly measured, then, it shall be measured between each pair of terminals of the armature winding. The identification No. of the test instrument shall be recorded, so that the same test instrument can be used for thermal test.

5.4.3 Winding temperature The winding test temperature shall be determined in accordance with one of the following methods (in the listed sequence).

5.4.4 Correction to the reference cooling medium temperature The temperature correction coefficient of the winding resistance shall be determined in accordance with Formula (2).