

Form-wound Squirrel-Cage Induction Motors—500 Horsepower and Larger

ANSI/API STANDARD 541-2003
FOURTH EDITION, JUNE 2004



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Downstream Segment

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Form-wound Squirrel-Cage Induction Motors—500 Horsepower and Larger

1 General

1.1 SCOPE

1.1.1 This standard covers the minimum requirements for form-wound squirrel-cage induction motors 500 horsepower (hp) and larger for use in petroleum industry services.

Note 1: This standard is typically utilized for machines that have one or more of the following characteristics:

1. Is in critical service.
2. Is larger than 3000 hp (2250 kW) for speeds 1800 rpm and below.
3. Is rated 800 hp (600 kW) or greater for two-pole (3000 or 3600-rpm) machines of totally-enclosed construction, or rated 1250 hp (930 kW) or greater for two-pole machines of open or guarded construction (including machines with WP-I or WP-II type enclosures).
4. Drives a high-inertia load (in excess of the load Wk^2 listed in NEMA MG-1 Part 20).
5. Uses an adjustable speed drive as a source of power.
6. Is an induction generator.
7. Is a vertical machine rated 500 hp (375 kW) or greater.
8. Operates in abnormally hostile environments.

Note 2: A round bullet (●) at the beginning of a paragraph indicates that either a decision is required or further information is to be provided by the purchaser. This information should be indicated on the datasheets (see Appendix A); otherwise it should be stated in the quotation request or in the order.

Note 3: A diamond bullet (◆) at the start of a paragraph indicates additional requirements for motors applied with adjustable speed drives (ASDs).

1.1.2 This standard requires the purchaser to specify details and features. The purchaser shall complete the datasheets in Appendix A.

Note: Guidance for completion of the datasheets is provided in Appendix C.

1.2 ALTERNATIVE DESIGNS

The vendor may offer alternative designs (see 6.1.10).

● 1.3 DIMENSIONS AND STANDARDS

1.3.1 Both the SI and U.S. customary system of units and dimensions are used in this standard. Any data, drawings, or hardware (including fasteners) related to equipment supplied to this standard shall use the U.S. customary system.

1.3.2 This document recognizes two different systems of standards for the manufacturing and testing of electrical machines: the North American ANSI, IEEE, and NEMA standards; and the International IEC and ISO standards. The North American Standards are the base documents. When

specified by the purchaser, the corresponding International Standards are acceptable for use as alternatives; however, this must not be construed that they are identical to the North American standards. The selection of which system of standards to be utilized shall depend on the machine's application and site location.

Note: The purchaser should be aware that specific requirements contained within corresponding standards may differ.

1.4 CONFLICTING REQUIREMENTS

In case of conflict between this standard and the inquiry, the inquiry shall govern. At the time of the order, the order shall govern.

1.5 DEFINITION OF TERMS

1.5.1 Breakdown torque of a motor is the maximum torque that will develop with rated voltage applied at rated frequency without an abrupt drop in speed.

1.5.2 Pull-up torque of an AC motor is the minimum torque developed by the motor during the period of acceleration from rest to the speed at which breakdown torque occurs. For motors that do not have a definite breakdown torque, the pull-up torque is the minimum torque developed up to the rated speed.

1.5.3 The locked-rotor torque of a motor is the minimum torque that it will develop at rest for all angular positions of the rotor, with rated voltage applied at rated frequency.

1.5.4 Accelerating torque is the difference between the input torque to the rotor (electromagnetic for a motor or mechanical for a generator) and the sum of the load and loss torque; the net torque available for accelerating the rotating parts.

1.5.5 A cold start is a motor start that occurs when the rotor and stator are initially at ambient temperature.

1.5.6 A hot start is any restart of the motor that occurs when the motor is at a temperature above ambient temperature.

1.5.7 Lateral critical speed is a shaft rotational speed at which the rotor-bearing-support system is in a state of resonance.

Note: The basic identification of critical speeds is made from the natural frequencies of the system and of the forcing phenomena. If the frequency of any harmonic component of a periodic forcing phenomenon is equal to or approximates the frequency of any mode of rotor vibration, a condition of resonance may exist. If resonance exists at a finite speed, that speed is called a critical speed. This standard is concerned with actual resonant speeds rather than various