



UL 1004-8

STANDARD FOR SAFETY

Inverter Duty Motors

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UL Standard for Safety for Inverter Duty Motors, UL 1004-8

Second Edition, Dated November 13, 2013

Summary of Topics

This revision of ANSI/UL 1004-8, the Standard for Inverter Duty Motors, has been issued to update the reaffirmation of ANSI approval. No changes in requirements have been made.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

These requirements are substantially in accordance with Proposal(s) on this subject dated September 28, 2018.

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UL 1004-8

Standard for Inverter Duty Motors

First Edition – September, 2009

Second Edition

November 13, 2013

This ANSI/UL Standard for Safety consists of the Second Edition including revisions through December 6, 2018.

The most recent designation of ANSI/UL 1004-8 as a Reaffirmed American National Standard (ANS) occurred on December 6, 2018. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <https://csds.ul.com>.

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INTRODUCTION

1 Scope

1.1 This Standard is intended to be read together with the Standard for Rotating Electrical Machines – General Requirements, UL 1004-1. The requirements in this Standard supplement or amend the requirements in UL 1004-1. The requirements of UL 1004-1 apply unless modified by this Standard.

1.2 This Standard applies to squirrel cage polyphase induction motors intended for use with variable voltage and variable frequency controls, commonly referred to as inverters. The requirements in this Standard are intended to evaluate the suitability of the motor for normal use when fed from an inverter supply through a manufacturer declared range of operating conditions.

1.3 This Standard does not address:

- a) The efficacy of motor overtemperature protection under abnormal conditions;
- b) The operation of a motor under unusual service conditions as described in NEMA MG-1, Standard for Motors and Generators, Part 31; nor
- c) The operation of a motor in hazardous (Classified) locations.

2 Glossary

2.1 For the purpose of this Standard, the following definitions apply.

2.2 **BASE RATING (MOTOR)** – The rating (i.e., torque, horsepower, speed, current, etc.) measured at the upper end of the constant torque range (operating point 3 of Figure 8.1) of the motor's torque/speed curve. This is the rating to be used for the required motor markings specified in Section 9, General.

2.3 **BREAKAWAY TORQUE** – The torque produced at zero speed, also known as starting torque or locked rotor torque.

2.4 **BREAKDOWN TORQUE** – The maximum torque before a sudden loss of speed.

CONSTRUCTION

3 Overspeeds

3.1 Motors covered by this Standard shall be so constructed that, in an emergency not to exceed 2 minutes, they shall withstand without mechanical damage or without posing a risk of electric shock or fire, overspeeds above the maximum declared operating speed in accordance with Table 3.1.

Table 3.1
Overspeeds

Maximum declared operating speed	Overspeed percent of maximum declared operating speed
1800 and below	25%
1801 – 3600	20%
3601 and over	15%

PERFORMANCE

4 Declared Operating Point Temperature Test

4.1 Temperature tests shall be conducted at representative defined operating points, typically one at each of the four operating points declared by the manufacturer in accordance with 8.2.

4.2 Since not all motors have four defined operating points, in such cases, the required temperature tests are to be reduced to the number of defined points declared by the manufacturer.

4.3 Each temperature test is to be conducted and results evaluated as specified in 32.2 – 32.11 of UL 1004-1.

5 Breakaway Torque

5.1 The motor under test is to be coupled to an instrument or device suitable and capable of measuring and displaying torque and to an instrument capable of measuring locked rotor current. The breakaway torque and current are to be measured.

5.2 The breakaway torque shall be at least 140 percent of the base torque and the current at that torque shall be not more than 150 percent of the base current.

6 Breakdown Torque

6.1 The motor under test is to be coupled to a dynamometer suitable and capable of measuring and displaying torque and to a variable frequency, variable voltage source of sufficient current rating to provide the current required at 150 percent rated torque at each test frequency.

6.2 The breakdown torque at any frequency within the defined frequency range shall not be less than 150 percent of the rated torque when rated voltage for that frequency is applied.

7 Overspeed Test

7.1 The motor is to be driven to an overspeed consistent with its maximum rated speed and in accordance with Table 3.1. The motor is to be maintained at that speed for 2 minutes and then allowed to coast to a stop.

7.2 A dielectric voltage withstand test in accordance with Section 37, Dielectric Voltage-Withstand Test, of UL 1004-1 is to be applied.

7.3 At the conclusion of the dielectric voltage withstand test, the motor is to be disassembled and examined for evidence of mechanical damage or failure.

7.4 The motor shall not exhibit either a dielectric breakdown as a result of the test described in 7.2 nor shall it exhibit evidence of mechanical damage or failure.

RATINGS

8 General

8.1 Motors covered by this Standard shall be evaluated based upon identification of the four load points illustrated in Figure 8.1.

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