UL 1004-6

STANDARD FOR SAFETY

Servo and Stepper Motors

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UL Standard for Safety for Servo and Stepper Motors, UL 1004-6

Second Edition, Dated June 6, 2012

Summary of Topics

This reaffirmation of ANSI/UL 1004-6 dated August 7, 2026 is issued to update the title page to reflect the most recent designation as a Reaffirmed American National Standard (ANS). No technical changes have been made.

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

The requirements are substantially in accordance with Proposal(s) on this subject dated June 19, 2026.

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JUNE 6, 2012
(Title Page Reprinted: August 7, 2026)

ANSI/UL 1004-6-2012 (R2026)

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UL 1004-6

Standard for Servo and Stepper Motors

First Edition – December, 2009

Second Edition

June 6, 2012

This ANSI/UL Standard for Safety consists of the Second Edition including revisions through August 7, 2026.

The most recent designation of ANSI/UL 1004-6 as a Reaffirmed American National Standard (ANS) occurred on August 7, 2026. 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 ULSE at any time. Proposals should be submitted via a Proposal Request in the 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 servo and stepper motors. The requirements in this Standard are intended to evaluate the suitability of the motor for normal use when fed from an appropriate controller (drive) through its manufacturer declared normal operating region.

1.3 This Standard does not address:

a) The efficacy of motor overtemperature protection under normal or abnormal conditions; nor

b) 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 CONTINUOUS STALL CURRENT – A maximum value of current specified by the manufacturer which when conducted by the motor windings under stalled (locked-rotor) conditions will not cause motor temperature to exceed its rated temperature rise.

2.3 HOLDING TORQUE – The maximum static torque that can be applied to the shaft of a stepping motor, excited with rated current, without causing rotation.

2.4 PULLOUT TORQUE – The maximum torque that a stepper motor is capable of delivering at a given speed before slipping out of synchronization.

2.5 SERVO MOTOR – A motor specially designed and built, having a high speed of response and designed for use in a feedback control system, typically for precision positioning.

2.6 SOAC – A curve on a servo motor torque/speed chart, which defines the limit of the Safe Operating Area for Continuous operation for the given motor.

2.7 STEPPING (STEPPER) MOTOR – An electromagnetic machine designed to convert a series of input electrical pulses into a series of discrete mechanical angular movements. When not slewing, the machine maintains a discrete holding position.

PERFORMANCE

3 Rating and Temperature Tests

3.1 General

3.1.1 This Section replaces 31.2 and 32.1 in UL 1004-1.

3.2 Servo motors

3.2.1 The Rating and Temperature Tests are to be conducted at two points on the SOAC curve:

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