



UL 1004-2

STANDARD FOR SAFETY

Impedance Protected Motors

ULNORM.COM : Click to view the full PDF of UL 1004-2 2020

ULNORM.COM : Click to view the full PDF of UL 1004-2 2020

UL Standard for Safety for Impedance Protected Motors, UL 1004-2

Second Edition, Dated January 10, 2014

Summary of Topics

This revision of ANSI/UL 1004-2 dated February 28, 2020 is being 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 UL'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 October 18, 2019.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of UL.

UL provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if UL or an authorized UL representative has been advised of the possibility of such damage. In no event shall UL's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

Users of the electronic versions of UL's Standards for Safety agree to defend, indemnify, and hold UL harmless from and against any loss, expense, liability, damage, claim, or judgment (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic Standard on the purchaser's computer system.

No Text on This Page

ULNORM.COM : Click to view the full PDF of UL 1004-2 2020

JANUARY 10, 2014
(Title Page Reprinted: February 28, 2020)



ANSI/UL 1004-2-2015 (R2020)

1

UL 1004-2

Standard for Impedance Protected Motors

First Edition – September, 2008

Second Edition

January 10, 2014

This ANSI/UL Standard for Safety consists of the Second Edition including revisions through February 28, 2020.

The most recent designation of ANSI/UL 1004-2 as a Reaffirmed American National Standard (ANS) occurred on January 30, 2020. 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>.

UL's Standards for Safety are copyrighted by UL. Neither a printed nor electronic copy of a Standard should be altered in any way. All of UL's Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of UL.

COPYRIGHT © 2020 UNDERWRITERS LABORATORIES INC.

No Text on This Page

ULNORM.COM : Click to view the full PDF of UL 1004-2 2020

CONTENTS**INTRODUCTION**

1 Scope	5
---------------	---

PERFORMANCE

2 General	5
3 Locked-Rotor or No-Load Temperature Test	5
4 Endurance Test	7

MARKINGS

5 General	8
-----------------	---

ULNORM.COM : Click to view the full PDF of UL 1004-2 2020

No Text on This Page

ULNORM.COM : Click to view the full PDF of UL 1004-2 2020

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 motors that rely solely upon the impedance of the motor windings to prevent overheating.

1.3 This Standard applies to motors rated 600 volts or less.

1.4 This Standard does not apply to:

- a) Motors employing a device that serves as a motor protector and a manual motor controller;
- b) Motors employing a motor protector with contacts that control a relay coil in a motor starter;
- c) Sealed (hermetic) type compressor motors; or
- d) Impedance protected motors employing an automatic starting switch.

PERFORMANCE

2 General

2.1 A motor that uses alternate major insulation system component materials shall have each material subjected to the Endurance Test, Section 4. Following the tests, the motor shall not exhibit an increased risk of fire or electric shock.

Exception: It shall not be necessary to repeat the Endurance Test, Section 4, to evaluate the suitability of the alternate material when all the following are met:

- a) The alternate major insulation system component is of the same geometry, the same polymeric class (thermoplastic/thermoset), and is other than the magnet wire;*
- b) The Electrical and Mechanical Tensile Strength RTIs of the alternate material are, at a minimum, equal to the rating of the insulation system; and*
- c) The heat deflection temperature for the alternate material is either as high as or higher than:*
 - 1) The highest temperature plus 10° C recorded during the Locked-Rotor or No-Load Temperature Test, Section 3, conducted on the motor originally; or*
 - 2) The heat deflection temperature for the original material.*

2.2 It shall not be necessary to repeat the Endurance Test, Section 4, for alternate minor insulation system components.

3 Locked-Rotor or No-Load Temperature Test

3.1 *Deleted*

3.2 The three motors are to be stalled, and the locked rotor wattage of each measured. The same three motors are to be run no-load. The sample exhibiting the highest wattage in either condition is then to be either locked in a stationary position using a means of low thermal conductivity or allowed to run no-load (whichever condition results in the highest wattage consumption).

3.3 Testing of a permanent-split capacitor motor is to be conducted with the capacitor either properly connected in the circuit or short-circuited, whichever results in the higher temperature.

Exception No. 1: A motor that employs an integrally mounted and enclosed capacitor is not required to be tested with the capacitor short-circuited.

Exception No. 2: A motor that employs a capacitor evaluated to the construction and testing requirements in the Standard for Capacitors, UL 810, is not required to be tested with the capacitor short-circuited.

3.4 Temperatures are to be measured:

- a) By the change-in-resistance method; or
- b) With a thermocouple applied directly to the actual conductor material, integrally applied conductor insulation, or coil wrap, as applicable.

3.5 Starting at room temperature, the motor is to be energized continuously for 72 hours, during which the winding temperatures are to be monitored continuously until thermal equilibrium is attained and then continuously for the final hour.

Exception: The test may be discontinued when the winding temperatures normalized to 40° C (104° F) stabilize at a constant temperature not exceeding the maximum temperature for the insulation class as specified in Table 32.1 of UL 1004-1. The Endurance Test, Section 4, is not required to be performed.

3.6 During the 72 hours, the motor shall comply with all of the following:

- a) The coil temperature shall not exceed the temperature limits specified in [Table 3.1](#).
- b) The fuse in the grounding conductor shall not open.
- c) The motor shall still be capable of operating electrically. For example, a bearing failure is considered in compliance.
- d) There shall be no electrical or mechanical malfunction of any associated component parts such as capacitors.
- e) A secondary protector shall not have operated.

Table 3.1
Maximum temperatures – Locked rotor or no load temperature test

Motor insulation system	Maximum temperature	
	°C	(°F)
Class A	150	(302)
Class E	165	(329)
Class B	175	(347)

Table 3.1 Continued on Next Page