



UL 1004-3

STANDARD FOR SAFETY

Thermally Protected Motors

UL Standard for Safety for Thermally Protected Motors, UL 1004-3

Second Edition, Dated February 27, 2015

Summary of Topics

This revision of ANSI/UL 1004-3 dated May 27, 2025 includes the following changes:

- Addition of Annex [A](#) for Motors used in Fans in Unattended Area, [2.5A](#); and***
- Addition of Referenced Publications, Section [2A](#)***

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 new requirements are substantially in accordance with Proposal(s) on this subject dated February 21, 2025.

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UL 1004-3

Standard for Thermally Protected Motors

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Second Edition

February 27, 2015

This ANSI/UL Standard for Safety consists of the Second Edition including revisions through May 27, 2025.

The most recent designation of ANSI/UL 1004-3 as an American National Standard (ANSI) occurred on May 27, 2025. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

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CONTENTS

INTRODUCTION

1 Scope 5

2 Glossary 5

2A Referenced Publications.....6

CONSTRUCTION

3 Spacings 6

4 Thermal Protection Systems 6

5 Intentionally Weak Trace (IWT) 7

PERFORMANCE

6 General 8

7 Motors Additionally Provided with Electronic Protection 9

8 Locked Rotor Temperature Test.....10

 8.1 General 10

 8.2 Automatically reset protectors.....11

 8.3 Manually reset protectors 12

 8.4 Thermal cutoffs 12

 8.5 Self-holding protectors 12

 8.6 Single-operation devices.....13

9 Locked Rotor Endurance Test 13

 9.1 General 13

 9.2 Automatically reset protectors.....13

 9.3 Manually reset protectors 14

 9.4 Self-holding protectors 14

 9.5 Self-holding protector cold reset 14

10 Running Heating Temperature Test.....14

 10.1 General.....14

 10.2 Continuous duty motors 14

 10.3 Polyphase motors.....18

 10.4 Ultimate trip current.....18

 10.5 Intermittent duty motors.....19

 10.6 Air-over motors.....19

 10.7 Polyphase air-over motors.....19

11 Intentionally Weak Trace (IWT) Tests 20

 11.1 General.....20

 11.2 Safety function.....20

 11.3 Rating 20

 11.4 Full range 20

 11.5 Evaluation of functionality 1 IWT 21

 11.6 Evaluation of functionality 2-4 IWT 21

MARKINGS

12 General 23

INSTRUCTIONS

13 General 23

ANNEX A (Normative) – Motors Used in Fans in Unattended Areas

A1 Scope 24

A2 Secondary Protection Devices 24

A3 Motor Heat Aging Test.....24

A4 Motor Failure Analysis Test.....28

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 upon a device (thermal motor protector) to prevent overheating under at least one operating condition. These motors shall be identified as thermally protected motors.

1.3 This Standard applies to motors protected either by electromechanical thermal motor protectors or solid-state thermal motor protectors.

1.4 This Standard applies to impedance protected motors where the manufacturer has provided a supplementary thermal motor protector.

1.5 The requirements in this Standard are intended to evaluate a specific motor/protector combination. When the motor, the protector, or the motor/protector combination is changed, the combination shall be reevaluated.

1.6 This Standard applies to motors provided with coordinated protection where Locked Rotor protection is provided by one means and Running Heating protection is provided by another as required by [7.11](#).

2 Glossary

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

2.2 AUTOMATICALLY RESET PROTECTOR – A device that is calibrated to open the motor circuit upon reaching a certain temperature and automatically closes the circuit once the device has cooled to a lower temperature.

2.3 INTENTIONALLY WEAK TRACE (IWT) – A trace or conductive path provided on a printed-wiring board that is specifically designed to open under overcurrent conditions in order to provide a protective function for circuitry and components.

2.4 MANUALLY RESET PROTECTOR – A device that is calibrated to open the motor circuit upon reaching a certain temperature and requires a manual action to reclose the motor circuit.

2.5 PRIMARY PROTECTOR – A protector that is expected to operate during the abnormal testing of a motor sample.

2.5A SECONDARY PROTECTOR – A single-operation device, thermal cutoff, manual reset thermal protector, or overcurrent protection device (e.g. supplemental fuse, supplementary protector) provided as part of a motor that does not operate during the Locked Rotor Temperature Test, Section [8](#).

2.6 SELF-HOLDING PROTECTOR – A device that is calibrated to open the motor circuit upon reaching a certain temperature but requires both cool down below the calibration point and removal of power for resetting of the protector.

2.7 SINGLE-OPERATION DEVICE – A device that is calibrated to open a motor circuit upon being exposed to a defined temperature and which is reset only upon cooling to -35°C (-31°F) or lower.

2.8 THERMAL CUTOFF – A device that is calibrated to open a motor circuit upon being exposed to a defined temperature.

2.9 THERMAL MOTOR PROTECTOR, THERMAL PROTECTOR, OR PROTECTOR – A device installed integrally within a motor that is responsive to motor current and temperature or temperature only and that, when applied as intended, prevents motor overheating. Types are: thermal cutoff, automatically reset, manually reset, self-holding and single-operation.

2.10 THERMALLY PROTECTED MOTOR – A motor that relies upon a device (protector) to prevent overheating.

2A Referenced Publications

2A.1 Any undated reference to a code or a standard appearing in the requirements of this Standard shall be interpreted as referring to the latest edition of that code or standard.

2A.2 The following publications are referenced in this Standard:

UL 1004-1, *Rotating Electrical Machines – General Requirements*

UL 1004-2, *Impedance Protected Motors*

UL 1004-7, *Electronically Protected Motors*

UL 1077, *Supplementary Protectors for Use in Electrical Equipment*

UL 248-1, *Low-Voltage Fuses – Part 1: General Requirements*

UL 248-14, *Low-Voltage Fuses – Part 14: Supplemental Fuses*

UL 507, *Electric Fans*

UL 508, *Industrial Control Equipment*

UL 60730-1, *Automatic Electrical Controls – Part 1: General Requirements*

CONSTRUCTION

3 Spacings

3.1 Spacings at a protector terminal intended to be used as a field-wiring terminal shall not be less than those specified in the Table for “Minimum acceptable spacings at field wiring terminals for voltages up to 750” or the Table for “Minimum acceptable spacings at field wiring terminals for voltages over 750” of UL 1004-1, as appropriate.

4 Thermal Protection Systems

4.1 Motors where the motor current is so great as to preclude the use of a thermal motor protector may use a combination of thermal motor protector or a temperature sensor and relay or contactor to achieve the functionality of a thermally protected motor provided that all the following are met:

a) The normally closed thermal motor protector is wired in series with the relay/contactors coil so that, in normal operation, the relay is electrically latched and thus any opening of the relay/contactors coil circuit would disable the motor.

b) The relay/contactors has been evaluated and found to comply with the Standard for Industrial Control Equipment, UL 508. Specifically:

- 1) The relay shall undergo 50 cycles of overload testing in accordance with UL 508;
- 2) The relay shall undergo 6,000 cycles of endurance testing in accordance with UL 508; and
- 3) The relay shall undergo the Short Circuit Test of UL 508.

c) The thermal motor protector used to control the relay has a pilot duty rating suitable for the relay to be controlled.

d) The combination (temperature sensing device, relay, wiring, and motor) have been evaluated to the requirements of this Standard.

4.2 Because a solid-state relay is considered a potential single-point of failure (i.e., the relay “contacts” may fail in the shorted condition thus obviating the protective functionality), solid-state relays may only be used in this capacity if either redundancy is provided or the solid-state relay complies with the Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1.

5 Intentionally Weak Trace (IWT)

5.1 A motor, as described in [7.10](#), shall comply with the requirements of this Section and Section [11](#), Intentionally Weak Trace (IWT) Tests

5.2 IWTs shall:

- a) Not be used in lieu of branch circuit overcurrent protection;
- b) Be designed as single use; and
- c) Not be designed or considered to be a user-serviceable part.

5.3 If the IWT opens, the printed-wiring board (PWB) or the entire control shall be replaced or discarded. Bridging of an opened IWT with a fuse or other overcurrent protective device shall not be permitted.

5.4 It shall be established whether reliable performance of the IWT is required to provide a required safety function, i.e., motor overtemperature protection, [11.2](#).

5.5 It shall be established whether the IWT is designed as a full range device, [11.4](#), or is intended to protect against catastrophic, short-circuit, conditions only.

5.6 If the IWT is determined to be designed to function as a full range device, the rating of the IWT shall be established in accordance with [11.3](#).