Australian Standard®

Rotating electrical machines

Part 11: Thermal protection

This Australian Standard® was prepared by Committee EL-009, Rotating Electrical Machinery. It was approved on behalf of the Council of Standards Australia on 11 June 2009. This Standard was published on 15 July 2009.

The following are represented on Committee EL-009:

- Airconditioning and Refrigeration Equipment Manufacturers Association of Australia
- Australian Chamber of Commerce and Industry
- Australian Electrical and Electronic Manufacturers Association
- Australian Greenhouse Office, Department of the Environment and Water Resources
- Australian Industry Group
- Bureau of Steel Manufacturers of Australia
- Department of Defence (Australia)
- Electrical Apparatus Service Association
- Energy Efficiency and Conservation Authority of New Zealand
- Engineers Australia
- Ministry of Economic Development (New Zealand)
- Registered Master Builders

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Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

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Rotating electrical machines

Part 11: Thermal protection

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-009, Rotating Electrical Machinery.

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee EL-009. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this Standard is to specify requirements for thermal detectors and protectors used for the protection of cage motors designed in accordance with AS 60034.12.

This Standard is identical with, and has been reproduced from IEC 60034-11, Ed. 2 (2004), *Rotating electrical machines – Part 11: Thermal protection*.

This Standard is Part 11 of a Series dealing with rotating electrical machinery. Additional parts will be added from time to time. This Series when complete will consist of the following parts:

AS	
1359.102.2	Rotating electrical machines—Methods for determining losses and efficiency of rotating electrical machinery from tests—Measurement of losses by the calorimetric method
60034	Rotating electrical machines
60034.1	Part 1: Rating and performance
60034.2.1	Part 2.1: Methods for determining losses and efficiency from tests (excluding machines for traction vehicles)
60034.3	Part 3: Specific requirements for synchronous generators driven by steam turbines or combustion gas turbines
60034.4	Part 4: Methods for determining synchronous machine quantities from tests
60034.5	Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code)—Classification
60034.6	Part 6: Method of cooling (IC code)
60034.7	Part 7: Classification of types of construction, mounting arrangements and terminal box position (IM code)
60034.8	Part 8: Terminal markings and direction of rotation
60034.9	Part 9: Noise limits
60034.11	Part 11: Thermal protection (this Standard)
60034.12	Part 12: Starting performance of single-speed three-phase cage induction motors
60034.14	Part 14: Mechanical vibration of certain machines with shaft heights 56 mm and higher—Measurement, evaluation and limits of vibration severity
60034.15	Part 15: Impulse voltage withstand levels of rotating a.c. machines with form-wound stator coils
60034.16	Part 16: Excitation systems for synchronous machines (all parts)
60034.17	Part 17: Cage induction motors when fed from converters—Application guide
60034.18	Part 18: Functional evaluation of insulation systems (all parts)
60034.19	Part 19: Specific test methods for d.c. machines on conventional and rectifier-fed supplies
60034.20.1	Part 20.1: Control motors—Stepping motors
60034.22	Part 22: AC generators for reciprocating internal combustion (RIC) engine driven generating sets
60034.23	Part 23: Specification for the refurbishing of rotating electrical machines
60034.25	Part 25: Guidance for the design and performance of a.c. motors specifically designed for converter supply

AS	
60034.26	Part 26: Effects of unbalanced voltages on the performance of three-phase cage induction motors
60034.27	Part 27: Off-line partial discharge measurements on the stator winding insulation of rotating electrical machines
60034.28	Part 28: Test methods for determining quantities of equivalent circuit diagrams for the three-phase low voltage cage induction motors
60034.29	Part 29: Equivalent loading and superposition techniques—Indirect testing to determine temperature rise.

As this Standard is reproduced from an International Standard, the following applies:

(a) Its number does not appear on each page of text and its identity is shown only on the cover and title page.

(b) In the source text ‘IEC 60034-11’ should read ‘AS 60034.11’.

(c) A full point should be substituted for a comma when referring to a decimal marker.

CONTENTS

Page

INTRODUCTION

Thermal protection systems are based on the principle of protecting or monitoring the vulnerable machine parts against excessive temperatures. This requires the selection of the appropriate thermal protection device to suit both the type of protection required and the machine component to be protected. This standard does not detail the protection methods available or specify the protection method to be used for particular applications but instead it specifies the temperature of the protected parts that should not be exceeded if a fault or machine abuse occurs.

The requirements are not intended to guarantee a "normal" machine life for all conditions of use, but rather to avoid both failure and accelerated premature thermal ageing of the winding insulation. The requirements result from a compromise since the level of protection should neither be set so low that it causes nuisance tripping nor so high that it allows continuous working at temperatures that will seriously affect the life of the winding insulation.

Normal insulation life can only be ensured by correct motor application and maintenance. Frequent operation at above the normal temperature limits, see IEC 60034-1, which cannot be prevented by built-in thermal protection without risking nuisance tripping may lead to a noticeable reduction in machine life. It should be noted that the life of the winding insulation is approximately halved for every 8 K to 10 K increase in the continuous operating temperature.

The requirement to incorporate thermal protection in a machine is a matter for agreement. The application of this standard should be a matter of agreement between the user and the machine manufacturer.

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Australian Standard

Rotating electrical machines
Part 11: Thermal protection

1 Scope

This part of IEC 60034 specifies requirements relating to the use of thermal protectors and thermal detectors incorporated into the stator windings or placed in other suitable positions in induction machines in order to protect them against serious damage due to thermal overloads. It applies to machines manufactured in accordance with IEC 60034-12 with the voltage limits specified in IEC 60034-12. The protection of bearings and other mechanical parts is not included.

NOTE 1 Although temperature values given in this standard are higher than those specified in IEC 60034-1, they are not in conflict.

NOTE 2 Additional requirements may apply to particular motor types such as those used in household appliances, or for motors used in explosive atmospheres.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

References to international standards that are struck through in this clause are replaced by references to Australian Standards that are listed immediately thereafter and identified by shading. Any Australian Standard that is identical to the International Standard it replaces is identified as such.

~~IEC 60034-1:2004, *Rotating electrical machines – Part 1: Rating and performance*~~

AS 60034.1, *Rotating electrical machines,* Part 1: *Rating and performance*

~~IEC 60034-12:2002, *Rotating electrical machines – Part 12: Starting performance of single-speed three-phase cage induction motors*~~

AS 60034.12, *Rotating electrical machines,* Part 12: *Starting performance of single-speed three-phase cage induction motors* (identical to IEC 60034.12:2002)

3 Terms and definitions

For the purposes of this part of IEC 60034, the following terms and definitions apply.

3.1
thermal protection
protection of windings of a machine against excessive temperature resulting from conditions of overload or loss of cooling