

TECHNICAL REFERENCE

Rotating electrical machines

– Part 31 : Selection of energy-efficient motors including variable speed applications – Application guidelines

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(ICS 29.160.01)

TECHNICAL REFERENCE

Rotating electrical machines

– Part 31 : Selection of energy-efficient motors including variable speed applications – Application guidelines

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National Foreword

This Technical Reference (TR) was prepared by the Working Group on Rotating Electrical Machines set up by the Technical Committee on Energy under the purview of the Environment and Resources Standards Committee.

This TR is a revision of TR IEC/TS 60034-31:2017 and is an identical adoption of IEC/TS 60034-31:2021, “Rotating electrical machines – Part 31 : Selection of energy-efficient motors including variable speed applications – Application guidelines”, published by the International Electrotechnical Commission.

NOTE 1 – Where appropriate, the words “Technical Specification / Report” are read as “Technical Reference”.

NOTE 2 – Reference to International/Overseas Standards are replaced by applicable Singapore Standards or Technical References.

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TECHNICAL SPECIFICATION



**Rotating electrical machines –
Part 31: Selection of energy-efficient motors including variable speed
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TECHNICAL SPECIFICATION



**Rotating electrical machines –
Part 31: Selection of energy-efficient motors including variable speed
applications – Application guidelines**

INTERNATIONAL
ELECTROTECHNICAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ROTATING ELECTRICAL MACHINES –**Part 31: Selection of energy-efficient motors including
variable speed applications – Application guidelines**

FOREWORD

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Technical Specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 60034-31, which is a Technical Specification, has been prepared by IEC technical committee 2: Rotating machinery.

This publication contains an attached file titled, "TS 60034-31 Generic Efficiency Interpolation", in the form of an XLS document. This file is intended to be used as a complement and does not form an integral part of this Technical Specifications.

This second edition cancels and replaces the first edition published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) references to relevant standards have been updated;
- b) global market data for industrial motors have been updated;
- c) guidelines and theories about normal industrial applications have been described;
- d) energy efficiency comparison examples have been given.

The text of this Technical Specification is based on the following documents:

DTS	Report on voting
2/2007/DTS	2/2028A/RVDTS

Full information on the voting for the approval of this Technical Specification can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60034 series, published under the general title *Rotating electrical machines*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

This document gives technical and economical guidelines for the use of energy-efficient motors in constant speed and variable speed operations in different applications.

About 50 % of the total global electric energy consumption is converted in electric motors, which are the largest consumers of electricity per component type and industrial motors alone accounting for around 30 % of all electricity in 2016. The wording 'electricity consumption' is commonly used even though most of this energy is doing useful work. Electric motors convert electric energy into mechanical energy where a minor part is converted into heat losses. Therefore, electric motors, and especially motors operated with variable speed drives that enable control of both speed and torque according to varying load requirements, are key components that can achieve significant electricity savings.

A simple measure for reducing energy consumption is of course to invest in electric motors with higher efficiency that normally result in rapid return on investments due to the dominating operational costs through electricity bills. The highest energy saving potentials though can only be identified by taking a holistic system perspective. It is estimated that only 12 % of the installed base of electric motors are controlled by variable frequency drives, even though it is estimated that more than 50 % of these motors would benefit by such control when for instance wasteful mechanical control as throttling for varying the flow of a medium is replaced. This document is intended to give guidance for proper use of constant speed motors and variable speed motors and when to use them in light of actual applications and duty profiles.

Examples of constant torque duty profiles and quadratic torque duty profiles are given and practical implications are described in order to facilitate enhanced understanding around viable customs. Some parts of the document may be applicable for other motors as well.

ROTATING ELECTRICAL MACHINES –

Part 31: Selection of energy-efficient motors including variable speed applications – Application guidelines

1 Scope

This part of IEC 60034 provides a guideline of technical and economical aspects for the application of energy-efficient electric AC motors. It applies to motor manufacturers, OEMs (original equipment manufacturers), end users, regulators, legislators and other interested parties.

This document is applicable to all electrical machines covered by IEC 60034-1, IEC 60034-30-1 and IEC TS 60034-30-2.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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

IEC 60034-2-1, *Rotating electrical machines – Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)*

IEC 60034-2-3:2020, *Rotating electrical machines – Part 2-3: Specific test methods for determining losses and efficiency of converter-fed AC motors*

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

IEC 60034-30-1, *Rotating electrical machines – Part 30-1: Efficiency classes of line operated AC motors (IE code)*

IEC TS 60034-30-2, *Rotating electrical machines – Part 30-2: Efficiency classes of variable speed AC motors (IE-code)*

IEC 60072 (all parts), *Dimensions and output series for rotating electrical machines*

IEC 61800-9-1, *Adjustable speed electrical power drive systems – Part 9-1: Ecodesign for power drive systems, motor starters, power electronics and their driven applications – General requirements for setting energy efficiency standards for power driven equipment using the extended product approach (EPA) and semi analytic model (SAM)*

IEC 61800-9-2:2017, *Adjustable speed electrical power drive systems – Part 9-2: Ecodesign for power drive systems, motor starters, power electronics and their driven applications – Energy efficiency indicators for power drive systems and motor starters*