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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ROTATING ELECTRICAL MACHINES –

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

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a Technical Specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

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 Specificationis 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.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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*