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Rotating electrical machines -
Part 30-1: Efficiency classes of line operated AC motors (IE code)

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CONTENTS

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FOREWORD

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This commented version (CMV) of the official standard IEC 60034-30-1:2025 edition 2.0 allows the user to identify the changes made to the previous IEC 60034-30-1:2014 edition 1.0. Furthermore, comments from IEC TC 2 experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

IEC 60034-30-1 has been prepared by IEC Technical Committee 2: Rotating machinery. It is an International Standard.

This second edition of IEC 60034-30-1 cancels and replaces the first edition of IEC 60034-30-1 published in 2014. This edition constitutes a technical revision.

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

a) Table 1 in Clause 4 revised and IE5 efficiency introduced.

b) New efficiency tables (Table 11 and Table 12) added for IE5 nominal efficiency limits.

c) Table 13 for interpolation coefficients revised based on IE5 limits and the coefficients limited from 0,12 kW to 0,75 kW 0,12 kW to 0,55 kW. A linear interpolation shall be applied to obtain minimum efficiency between 0,55 kW and 0,75 kW.

d) Annex A revised and added Figure A.1 showing nominal, rated, minimum efficiency and tolerance.

The text of this International Standard is based on the following documents:

Draft	Report on voting
2/2235/FDIS	2/2279/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard are English and French.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

NOTE A table of cross-references of all IEC TC 2 publications can be found on the IEC TC 2 dashboard 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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,

– withdrawn, or

– revised.

INTRODUCTION

This first part of the IEC 60034-30 series, IEC 60034-30-1, provides for the global harmonization of energy efficiency classes of electric motors. It deals with all kinds of electric motors that are rated for line operation (including starting at reduced voltage). This includes ~~all~~ either 50 Hz or 60 Hz, or both single- and three-phase low voltage induction motors, regardless of their rated voltage ~~and frequency~~, as well as line-start ~~permanent-magnet~~ synchronous motors.

The second part of this standard series (IEC 60034-30-2) ~~will be~~ is prepared for motors rated for variable voltage and frequency supply~~, such as synchronous motors. The second part will also provide for harmonic voltage losses in motors capable of line operation when fed by frequency converters~~.

~~IEC 60034-30-1 widens the product range covered in the first edition of IEC 60034-30 significantly. The power range has been expanded (starting at 0,12 kW and ending at 1 000 kW). All technical constructions of electric motors are covered as long as they are rated for on-line operation and not just three-phase, cage-induction motors as in the first edition.~~

~~The IE4 class is newly included in this standard. The informative definition of IE4, which was previously included in IEC/TS 60034-31:2010, is therefore outdated.~~

~~The new class IE5 is not yet defined in detail but is envisaged for potential products in a future edition of the standard.~~

This second edition of IEC 60034-30-1 introduces a new efficiency class, IE5. It is important to note that International Energy efficiency (IE) class definition is generally independent of the output power – frame size assignment. As standardized dimensions and outputs in the IEC 60072 series are based on today's technology (up to IE4), it can be challenging to implement highest IE classes according to existing frame sizes.

It is possible that motors, especially those with lower output power ratings, are designed and manufactured in one frame size bigger than frame size assigned in IEC 60072-1 to reach IE4 and IE5 efficiency levels. **1**

For a given power and frame size it is generally easier to achieve a higher motor efficiency when the motor is designed for and operated directly on-line with a 60 Hz supply frequency rather than on 50 Hz as explained in Note 1.

NOTE 1 As the utilization and size of motors are related to torque rather than power the theoretical power of single-speed motors increases linearly with supply frequency (and hence with speed), i.e. by 20 % from 50 Hz to 60 Hz.

I^2R winding-losses are dominant especially in small and medium sized induction motors. They basically remain constant at 50 Hz and 60 Hz as long as the torque is kept constant. Although windage, friction and iron losses increase with frequency, they play a minor role especially in motors with a number of poles of four and higher. Therefore, at 60 Hz, the losses increase less than the 20 % power increase when compared to 50 Hz and consequently, the efficiency is improved.

In practice, both 60 Hz and 50 Hz power designations of single-speed motors ~~have to~~ usually conform to standard power levels in accordance with IEC 60072-1 ~~and local standards such as EN 50347~~. Therefore, an increased rating of motor power by 20 % is not always possible. However, the general advantage of 60 Hz still applies when the motor design is optimized for the respective supply frequency rather than just re-rated.

The difference in efficiency between 50 Hz and 60 Hz varies with the number of poles and the size of the motor. In general, the 60 Hz efficiency of three-phase, cage-induction motors in the power range from 0,75 kW up to 375 kW is between 2,5 percentage points to less than 0,5 percentage points greater when compared to the 50 Hz efficiency. Only large 2-pole motors ~~may~~ can experience a reduced efficiency at 60 Hz due to their high share of iron, windage and friction losses.

It is not expected that all manufacturers will produce motors for all efficiency classes, nor all ratings of a given class.