



BSI Standards Publication

## Rotating electrical machines

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Part 30-2: Efficiency classes of variable speed AC motors (IE-code)

## National foreword

This Published Document is the UK implementation of CLC IEC/TS 60034-30-2:2021. It is identical to IEC TS 60034-30-2:2016. It supersedes PD IEC/TS 60034-30-2:2016, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PEL/2, Rotating electrical machinery.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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English Version

**Rotating electrical machines - Part 30-2: Efficiency classes of  
variable speed AC motors (IE-code)  
(IEC/TS 60034-30-2:2016)**

Machines électriques tournantes - Partie 30-2: Classes de  
rendement des moteurs à courant alternatif à vitesse  
variable (code IE)  
(IEC/TS 60034-30-2:2016)

Drehende elektrische Maschine, Teil 30-2: Wirkungsgrad-  
Klassifizierung von Wechselstrommotoren mit variabler  
Drehzahl (IE-Code)  
(IEC/TS 60034-30-2:2016)

This Technical Specification was approved by CENELEC on 2021-08-16.

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European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

## European foreword

This document (CLC IEC/TS 60034-30-2:2021) consists of the text of IEC/TS 60034-30-2:2016 prepared by IEC/TC 2 "Rotating machinery".

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## Endorsement notice

The text of the International Technical Specification IEC/TS 60034-30-2:2016 was approved by CENELEC as a European Technical Specification without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60034-5	NOTE	Harmonized as EN IEC 60034-5
IEC 60034-12	NOTE	Harmonized as EN 60034-12
IEC/TS 60034-25	NOTE	Harmonized as CLC/TS 60034-25
IEC/TS 60034-31	NOTE	Harmonized as CLC/TS 60034-31
ISO 25745-2	NOTE	Harmonized as EN ISO 25745-2

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## ROTATING ELECTRICAL MACHINES –

## Part 30-2: Efficiency classes of variable speed AC motors (IE-code)

## 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 60034-30-2, which is a technical specification, has been prepared by IEC technical committee 2: Rotating machinery.

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

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
2/1833/DTS	2/1850A/RVC

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.

NOTE A table of cross-references of all IEC TC 2 publications can be found on the IEC TC 2 document 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.

A bilingual version of this publication may be issued at a later date.

## INTRODUCTION

This technical specification provides for the global harmonization of energy-efficiency classes of variable speed electric motors. It deals with all types of AC low-voltage electric motors that are rated for variable speed operation in their constant magnetic-flux speed-range (base speed-range). An electronic frequency converter provides variable voltage and variable frequency.

NOTE For the time being, IEC TS 60034-2-3, which is the testing basis of this document, is limited to induction motors. However, the relevant input-output procedure 3-C is already applicable to all kinds of variable speed AC motors. Future editions of IEC TS 60034-2-3 will have an expanded scope and include testing procedures for synchronous machines.

This technical specification regards energy efficiency classification of AC motors rated for variable voltage and frequency, namely induction motors and synchronous motors not covered in IEC 60034-30-1. It is harmonized with the future standard IEC 61800-9, where IE-classifications of frequency converters (complete drive modules = FDM) and IES-classifications of power drive systems (PDS) are defined.

An efficient motor alone does not necessarily result in an efficient PDS. Users should select the efficiency class in accordance with a given application depending on the actual load / speed operating points and related operating time.

It may not be energy efficient to select very high efficiency S1 motors for intermittent or short time duty or part load applications. The use of the Extended Product Approach (EPA) as described in the future standard series IEC 61800-9 will help applicative sectors for specification of energy efficiency performance of power driver equipment and parts.

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

IE-codes are not limited to motors, but may in future be used to classify other components such as frequency converters and gearboxes. However, it is anticipated that other components are rated with a comparable system: IE1 meaning low efficiency up to IE5 meaning the highest efficiency.

## ROTATING ELECTRICAL MACHINES –

### Part 30-2: Efficiency classes of variable speed AC motors (IE-code)

#### 1 Scope

This part of IEC 60034, which is a technical specification, specifies efficiency classes for variable speed rotating electric machines not covered in IEC 60034-30-1.

The document only applies to machines that:

- have a rated power  $P_N$  from 0,12 kW to 1 000 kW;
- have a rated voltage  $U_N$  above 50 V up to 1 kV;
- have a rated speed  $n_N$  from 600 1/min up to 6 000 1/min regardless of the number of magnetic poles;
- are designed for cooling methods IC4A1A0 (IC410), IC4A1A1 (IC411), IC4A1A6 (IC416), or IC4A1A8 (IC418) according to IEC 60034-6;
- are capable of continuous operation at their rated operating point (torque/power, speed) with a temperature rise within the specified insulation temperature class;

NOTE 1 Most motors covered by this document are rated for duty cycle S1 (continuous duty). However, some motors that are rated for other duty cycles are still capable of continuous operation at their rated power and these motors are also covered. Motors rated between S3 and S10 with a cycle time of 80 % or more may be included.

- are rated for any ambient temperature within the range of – 20 °C to + 60 °C;

NOTE 2 The rated efficiency and efficiency classes are based on 25 °C ambient temperature according to IEC 60034-2-1 and IEC TS 60034-2-3.

NOTE 3 Motors rated for temperatures outside the range – 20 °C and + 60 °C are considered to be of special construction and are consequently excluded from this document.

NOTE 4 Smoke extraction motors with a temperature class of up to and including 400 °C are covered by this document.

- are rated for an operating altitude up to 4 000 m above sea level.

NOTE 5 The rated efficiency and efficiency class are based on a rating for altitudes up to 1 000 m above sea level.

The classification only covers machines designed for operation with sinusoidal fundamental current that are not designed to be operated direct on-line (grid), for example permanent magnet synchronous machines with and without additional reluctance torque, sinusoidal reluctance synchronous machines and synchronous machines with DC field windings. This also includes induction machines that are designed exclusively for variable speed operation.

Switched reluctance synchronous machines are not covered.

The procedures to determine losses at any speed and load point are given in IEC TS 60034-2-3. They apply to all converter operated motors.

No distinction is made between motor technologies, supply voltage or motors with increased insulation even though these motor technologies may not all be capable of reaching the higher efficiency classes. This makes different motor technologies fully comparable with respect to their energy efficiency potential.

The efficiency of power-drive systems (i.e. the combined losses of motor and power supply) and the losses of the driven load are not covered by this document, see IEC 61800-9-2.