



**NSAI**  
Standards

Irish Standard  
I.S. EN 60034-30-1:2014

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

**I.S. EN 60034-30-1:2014**

*Incorporating amendments/corrigenda/National Annexes issued since publication:*

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

*This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):*

*NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.*

*This document is based on:*

EN 60034-30-1:2014

*Published:*

2014-06-06

*This document was published under the authority of the NSAI and comes into effect on:*

2014-06-25

ICS number:

29.160

NOTE: If blank see CEN/CENELEC cover page

NSAI  
1 Swift Square,  
Northwood, Santry  
Dublin 9

T +353 1 807 3800  
F +353 1 807 3838  
E standards@nsai.ie  
W NSAI.ie

Sales:  
T +353 1 857 6730  
F +353 1 857 6729  
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

EUROPEAN STANDARD

**EN 60034-30-1**

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2014

ICS 29.160

Supersedes EN 60034-30:2009,  
CLC/TS 60034-31:2011 (partially)

English Version

**Rotating electrical machines - Part 30-1: Efficiency classes of  
line operated AC motors (IE code)  
(IEC 60034-30-1:2014)**

Machines électriques tournantes - Partie 30-1: Classes de  
rendement pour les moteurs à courant alternatif alimentés  
par le réseau (code IE)  
(CEI 60034-30-1:2014)

Drehende elektrische Maschinen - Teil 30-1: Wirkungsgrad-  
Klassifizierung von netzgespeisten Drehstrommotoren  
(IE-Code)  
(IEC 60034-30-1:2014)

This European Standard was approved by CENELEC on 2014-04-10. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

## Foreword

The text of document 2/1729/FDIS, future edition 1 of IEC 60034-30-1, prepared by IEC/TC 2 "Rotating machinery" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60034-30-1:2014.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2015-01-10
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2017-04-10

This document supersedes EN 60034-30:2009 and partially supersedes CLC/TS 60034-31:2011 (Annex A).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

## Endorsement notice

The text of the International Standard IEC 60034-30-1:2014 was approved by CENELEC as a European Standard 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 60034-5.
IEC 60034-12	NOTE	Harmonized as EN 60034-12.
IEC/TS 60034-31:2010	NOTE	Harmonized as CLC/TS 60034-31:2011 (not modified).

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60034-1	-	Rotating electrical machines Part 1: Rating and performance	EN 60034-1	-
IEC 60034-2-1	-	Rotating electrical machines Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)	EN 60034-2-1	-
IEC 60034-6	-	Rotating electrical machines Part 6: Methods of cooling (IC Code)	EN 60034-6	-
IEC 60038	-	IEC standard voltages	EN 60038	-
IEC 60079-0	-	Explosive atmospheres Part 0: Equipment - General requirements	EN 60079-0	-
IEC/TS 60034-2-3	-	Rotating electrical machines Part 2-3: Specific test methods for determining losses and efficiency of converter-fed AC induction motors	-	-
IEC/TS 60034-25	-	Rotating electrical machines Part 25: Guidance for the design and performance of a.c. motors specifically designed for converter supply	CLC/TS 60034-25	-

This page is intentionally left blank



**IEC 60034-30-1**

Edition 1.0 2014-03

# **INTERNATIONAL STANDARD**

# **NORME INTERNATIONALE**

---

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

**Machines électriques tournantes –  
Partie 30-1: Classes de rendement pour les moteurs à courant alternatif  
alimentés par le réseau (code IE)**





## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2014 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

#### IEC Catalogue - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

#### IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 14 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)

More than 55 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [csc@iec.ch](mailto:csc@iec.ch).

### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Catalogue IEC - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

#### Recherche de publications IEC - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 14 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

#### Glossaire IEC - [std.iec.ch/glossary](http://std.iec.ch/glossary)

Plus de 55 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

#### Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [csc@iec.ch](mailto:csc@iec.ch).





**IEC 60034-30-1**

Edition 1.0 2014-03

# **INTERNATIONAL STANDARD**

# **NORME INTERNATIONALE**

---

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

**Machines électriques tournantes –  
Partie 30-1: Classes de rendement pour les moteurs à courant alternatif  
alimentés par le réseau (code IE)**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE  
CODE PRIX

**T**

---

ICS 29.160

ISBN 978-2-8322-1415-2

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	7
2 Normative references .....	8
3 Terms, definitions and symbols .....	9
3.1 Terms and definitions.....	9
3.2 Symbols.....	9
4 Fields of application .....	10
5 Efficiency.....	11
5.1 Determination .....	11
5.1.1 General .....	11
5.1.2 Rated voltages, rated frequencies and rated power .....	11
5.1.3 Auxiliary devices.....	12
5.2 Rating.....	12
5.3 Classification and marking .....	13
5.3.1 General .....	13
5.3.2 Efficiency classification.....	13
5.3.3 Motors below IE1 efficiency .....	13
5.3.4 Marking .....	13
5.4 Nominal limits for efficiency classes IE1, IE2, IE3 and IE4 .....	13
5.4.1 Nominal efficiency limits for IE1 .....	14
5.4.2 Nominal efficiency limits for IE2.....	16
5.4.3 Nominal efficiency limits for IE3.....	18
5.4.4 Nominal efficiency limits for IE4.....	20
5.4.5 Interpolation of nominal efficiency limits of intermediate rated powers for 50 Hz mains supply frequency.....	21
5.4.6 Interpolation of nominal efficiency limits of intermediate rated powers for 60 Hz mains supply frequency.....	23
Annex A (informative) Nominal limits for efficiency class IE5 .....	24
Bibliography.....	25
Table 1 – Motor technologies and their energy-efficiency potential .....	10
Table 2 – IE-Efficiency classification.....	13
Table 3 – Nominal efficiency limits (%) for 50 Hz IE1 .....	14
Table 4 – Nominal efficiency limits (%) for 60 Hz IE1 .....	15
Table 5 – Nominal efficiency limits (%) for 50 Hz IE2.....	16
Table 6 – Nominal efficiency limits (%) for 60 Hz IE2 .....	17
Table 7 – Nominal efficiency limits (%) for 50 Hz IE3 .....	18
Table 8 – Nominal efficiency limits (%) for 60 Hz IE3 .....	19
Table 9 – Nominal efficiency limits (%) for 50 Hz IE4 .....	20
Table 10 – Nominal efficiency limits (%) for 60 Hz IE4 .....	21
Table 11 – Interpolation coefficients for 0,12 kW up to 0,74 kW .....	22
Table 12 – Interpolation coefficients for 0,75 kW up to 200 kW .....	22

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## ROTATING ELECTRICAL MACHINES –

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

## 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60034-30-1 has been prepared by IEC technical committee 2: Rotating machinery.

This first edition of IEC 60034-30-1 cancels and replaces IEC 60034-30 (2008). It also cancels and replaces Annex A of IEC 60034-31 (2010). In the next revision of IEC 60034-31:2010 this annex will be removed from its contents.

The text of this standard is based on the following documents:

FDIS	Report on voting
2/1729/FDIS	2/1739/RVD

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

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

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 publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

## INTRODUCTION

This IEC standard 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 single- and three-phase low voltage induction motors, regardless of their rated voltage and frequency, as well as line-start permanent-magnet motors.

A second part of this standard series (IEC 60034-30-2) will be 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.

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 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 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.

Users should select the efficiency class in accordance with a given application depending on the actual operating hours. It may not be energy efficient to select motors of a high efficiency class for intermittent or short time duty due to increased inertia and start-up losses.

NOTE 2 The application guide IEC/TS 60034-31:2010 gives further information on useful applications of high-efficient electric motors.

In order to achieve a significant market share it is essential for high-efficiency motors to meet national/regional standards for assigned powers in relation to mechanical dimensions (such as frame-size, flanges). There are a number of national/regional frame assignment standards (EN 50347, JIS C 4212, NBR 17094, NEMA MG13, SANS 1804 and others) but there is no

IEC standard. As this standard (IEC 60034-30-1) defines energy-efficiency classes independent of dimensional constraints it may not be possible in all markets to produce motors with higher efficiency classes and maintain the mechanical dimensions of the national/regional standards.

IE codes are not limited to motors but may 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.

Combinations of components (such as power drive systems) will need a combined efficiency rating. That rating should not be an IE code in order to avoid confusion. It will be defined in other IEC standards.

The efficiency levels in this standard for 50 Hz and 60 Hz are not always entirely consistent across all numbers of poles and over the whole power range.

NOTE 3 The efficiency levels for 60 Hz motors were assigned for compatibility with U.S. legal requirements.

NOTE 4 The efficiency levels for 50 Hz motors between 0,75 kW and 375 kW remain unchanged for compatibility with European legal requirements.

## ROTATING ELECTRICAL MACHINES –

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

#### 1 Scope

This part of IEC 60034 specifies efficiency classes for single-speed electric motors that are rated according to IEC 60034-1 or IEC 60079-0, are rated for operation on a sinusoidal voltage supply and:

- 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 2, 4, 6 or 8 poles;
- are capable of continuous operation at their rated power with a temperature rise within the specified insulation temperature class;

NOTE 1 Most motors covered by this standard are rated for duty type 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.

- are marked with any ambient temperature within the range of  $-20\text{ °C}$  to  $+60\text{ °C}$ ;

NOTE 2 The rated efficiency and efficiency classes are based on  $25\text{ °C}$  ambient temperature according to IEC 60034-2-1.

NOTE 3 Motors rated for temperatures outside the range  $-20\text{ °C}$  and  $+60\text{ °C}$  are considered to be of special construction and are consequently excluded from this standard.

NOTE 4 Smoke extraction motors with a temperature class of up to and including  $400\text{ °C}$  are covered by this standard.

- are marked with an 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.

This standard establishes a set of limit efficiency values based on frequency, number of poles and motor power. No distinction is made between motor technologies, supply voltage or motors with increased insulation designed specifically for converter operation even though these motor technologies may not all be capable of reaching the higher efficiency classes (see Table 1). This makes different motor technologies fully comparable with respect to their energy efficiency potential.

NOTE 6 Regulators should consider the above constraints when assigning national minimum energy-efficiency performance standards (MEPS) with respect to any particular type of motor.

The efficiency of power-drive systems is not covered by this standard. In particular, motor losses due to harmonic content of the supply voltage, losses in cables, filters and frequency-converters, are not covered.

Motors with flanges, feet and/or shafts with mechanical dimensions different from IEC 60072-1 are covered by this standard.

Geared motors are covered by this standard including those incorporating non-standard shafts and flanges.

Excluded are:

- Single-speed motors with 10 or more poles or multi-speed motors.

- Motors with mechanical commutators (such as DC motors).
- Motors completely integrated into a machine (for example pump, fan and compressor) that cannot be practically tested separately from the machine even with provision of a temporary end-shield and drive-end bearing. This means the motor shall: a) share common components (apart from connectors such as bolts) with the driven unit (for example, a shaft or housing) and; b) not be designed in such a way as to enable the motor to be separated from the driven unit as an entire motor that can operate independently of the driven unit. That is, for a motor to be excluded from this standard, the process of separation shall render the motor inoperative.

(TEAO, IC418) Totally enclosed air-over machines, i.e. totally enclosed frame-surface cooled machines intended for exterior cooling by a ventilating means external to the machine, are covered by this standard. Efficiency testing of such motors may be performed with the fan removed and the cooling provided by an external blower with a similar airflow rate as the original fan.

- Motors with integrated frequency-converters (compact drives) when the motor cannot be tested separately from the converter. Energy efficiency classification of compact drives shall be based on the complete product (PDS : Power Drive System) and will be defined in a separate standard.

NOTE 7 A motor is not excluded when the motor and frequency-converter can be separated and the motor can be tested independently of the converter.

- Brake motors when the brake is an integral part of the inner motor construction and can neither be removed nor supplied by a separate power source during the testing of motor efficiency.

NOTE 8 Brake motors with a brake coil that is integrated into the flange of the motor are covered as long as it is possible to test motor efficiency without the losses of the brake (for example by dismantling the brake or by energizing the brake coil from a separate power source).

When the manufacturer offers a motor of the same design with and without a brake the test of motor efficiency may be done on a motor without the brake. The determined efficiency may then be used as the rating of both motor and brake motor.

- Submersible motors specifically designed to operate wholly immersed in a liquid.
- Smoke extraction motors with a temperature class above 400 °C.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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/TS 60034-2-3, *Rotating electrical machines – Part 2-3: Specific test methods for determining losses and efficiency of converter-fed AC induction motors*

IEC 60034-6, *Rotating electrical machines – Part 6: Methods of cooling (IC Code)*

IEC/TS 60034-25, *Rotating electrical machines – Part 25: Guidance for the design and performance of a.c. motors specifically designed for converter supply*

IEC 60038, *IEC standard voltages*



This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

- 
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
  - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-