



NSAI
Standards

Irish Standard
I.S. EN 60034-29:2008

Rotating electrical machines -- Part 29:
Equivalent loading and superposition
techniques - Indirect testing to
determine temperature rise (IEC 60034
-29:2008 (EQV))

© NSAI 2008 No copying without NSAI permission except as permitted by copyright law.

I.S. EN 60034-29:2008

Incorporating amendments/corrigenda issued since publication:

This is a free 11 page sample. Access the full version online.

<i>This document replaces:</i> EN 61986:2002	<i>This document is based on:</i> EN 60034-29:2008 EN 61986:2002	<i>Published:</i> 11 July, 2008 12 April, 2002
-------------------------------------------------	------------------------------------------------------------------------	------------------------------------------------------

This document was published under the authority of the NSAI and comes into effect on: 12 January, 2010	ICS number: 29.160
---------------------------------------------------------------------------------------------------------------	-----------------------

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

English version

**Rotating electrical machines -
Part 29: Equivalent loading and superposition techniques -
Indirect testing to determine temperature rise
(IEC 60034-29:2008)**

Machines électriques tournantes -
Partie 29: Techniques par charge
équivalente et par superposition -
Essais indirects pour déterminer
l'échauffement
(CEI 60034-29:2008)

Drehende elektrische Maschinen -
Teil 29: Verfahren der äquivalenten
Belastung und Überlagerung -
Indirekte Prüfung zur Ermittlung
der Übertemperatur
(IEC 60034-29:2008)

This European Standard was approved by CENELEC on 2008-06-01. 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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 2/1476/FDIS, future edition 1 of IEC 60034-29, prepared by IEC TC 2, Rotating machinery, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60034-29 on 2008-06-01.

This European Standard supersedes EN 61986:2002.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2009-03-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2011-06-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60034-29:2008 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60034-1	2004	Rotating electrical machines - Part 1: Rating and performance	EN 60034-1	2004
IEC 60034-2-1	- 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	2007 ²⁾

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

This page is intentionally left BLANK.

CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Symbols and units	6
4 General test requirements	7
5 Superposition method.....	8
5.1 Basic principles	8
5.1.1 General	8
5.1.2 Temperature rise	9
5.1.3 Estimation of temperature rise from reduced load tests	9
5.2 Induction motors.....	10
5.2.1 Applicable tests	10
5.2.2 Method of reduced voltage and rated current.....	10
5.2.3 Method of rated voltage and reduced current.....	13
5.2.4 Method combining tests at reduced voltage and reduced current	14
5.3 Synchronous machines	14
5.3.1 Method of open circuit, short circuit, zero excitation	14
5.3.2 Method of zero power factor and open circuit loading	16
5.4 DC machines.....	17
6 Equivalent load method	17
6.1 Principles	17
6.1.1 General	17
6.1.2 Temperature rise	18
6.2 Induction motors.....	18
6.2.1 Forward short-circuit test.....	18
6.2.2 Modulated frequency method.....	19
6.2.3 DC injection.....	20
6.2.4 Mixed-frequency or bi-frequency method	21
6.3 Synchronous machines – Zero power factor	24
7 Preferred methods.....	26
Annex A (informative) Example calculation	28
Figure 1 – Graphical superposition method for induction motors	12
Figure 2 – Derivation of field winding temperature rise at rated load (synchronous machines).....	16
Figure 3 – Test circuit for d.c.-injection equivalent load test.....	20
Figure 4 – Mixed-frequency test – Generators in series	21
Figure 5 – Mixed-frequency test – Series transformer	22
Figure 6 – Combination of torque and current in a mixed-frequency test	23
Figure 7 – Rotor-feeding mixed-frequency method	24
Table 1 – Preferred methods.....	27

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ROTATING ELECTRICAL MACHINES –

**Part 29: Equivalent loading and superposition techniques –
Indirect testing to determine temperature rise**

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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 60034-29 has been prepared by IEC technical committee 2: Rotating machinery. It cancels and replaces IEC 61986:2002 which is withdrawn.

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

FDIS	Report on voting
2/1476/FDIS	2/1491A/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.

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

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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

The object of this standard is to provide various indirect load tests, the purpose of which is to determine the temperature rise of rotating electrical machines, including a.c. induction machines, a.c. synchronous machines and d.c. machines. The test methods in some cases provide, in addition, means of measuring or estimating other parameters such as losses and vibration, but the methods are not designed specifically to provide such data.

The proposed test methods are considered equivalent, the choice relying only on the location, the testing equipment and the machine type, and the test result accuracy.

This standard should not be interpreted as requiring any or all of the tests on any given machine. Particular tests are subject to a special agreement between the manufacturer and the purchaser.

NOTE As the methods reproduce only approximately the thermal conditions of the machines under rated condition, temperature-rise measurement results achieved from tests with these methods may be taken as the basis for the evaluation of machine heating in accordance with 8.10 of IEC 60034-1 by agreement between the manufacturer and the purchaser.

ROTATING ELECTRICAL MACHINES –

Part 29: Equivalent loading and superposition techniques – Indirect testing to determine temperature rise

1 Scope

This International Standard applies to machines covered by IEC 60034-1 when they cannot be loaded to a specific condition (rated or otherwise). It is applicable to both motors and generators.

2 Normative references

The following referenced documents are indispensable for the application 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 60034-1:2004, *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)*

3 Symbols and units

For the purposes of this document, the following symbols and units apply.

K slope factor of temperature rise, K/W

NOTE 1 The full name of K is "slope factor of the straight line characterizing variation of temperature rise with losses", see IEC 60027-4, item 901.

$\Delta\theta$	temperature rise, K
θ	temperature, °C
P	power, loss, W
I	current, A
R	resistance, Ω
X	reactance, Ω
U	voltage, V
E	e.m.f., V
f	frequency, Hz
$f_{1,2}$	main/auxiliary frequency, Hz
Δt	time interval, s
T	torque, N·m
J	moment of inertia, kg·m ²
$\cos\varphi$	power factor
γ	method uncertainty, %

NOTE 2 The definition implies that $\gamma > 0$ means test temperature rise is higher than at actual load condition.

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

I.S. EN 60034-29 : 2008 : EN : COMBINED PDF

- ⤵ Looking for additional Standards? Visit SAI Global Infostore
- ⤵ Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation

Need to speak with a Customer Service Representative - Contact Us