IEC 60034-2-2

Edition 2.0 2024-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Rotating electrical machines – Part 2-2: Specific methods for determining separate losses of large machines from tests – Supplement to IEC 60034-2-1

Machines électriques tournantes – Partie 2-2: Méthodes spécifiques pour déterminer les pertes séparées des machines de grande taille à partir d'essais – Complément à l'IEC 60034-2-1



IEC 60034-2-2:2024-03(en-fr)



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.160.01

ISBN 978-2-8322-8171-0

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ROTATING ELECTRICAL MACHINES –

Part 2-2: Specific methods for determining separate losses of large machines from tests – Supplement to IEC 60034-2-1

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IEC 60034-2-2 has been prepared by IEC technical committee 2: Rotating machinery. It is an International Standard.

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) Layout and procedures aligned with IEC 60034-2-1 and IEC 60034-2-3.
b) Annex A added: an informative procedure for the summation of losses for large permanent-magnet excited synchronous machines.

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

Draft	Report on voting
2/2157/FDIS	2/2178/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 is English.

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.

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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

ROTATING ELECTRICAL MACHINES –

Part 2-2: Specific methods for determining separate losses of large machines from tests – Supplement to IEC 60034-2-1

1 Scope

This part of IEC 60034 applies to large rotating electrical machines and establishes additional methods of determining separate losses and to define an efficiency supplementing IEC 60034-2-1. These methods apply when full-load testing is not practical and results in a greater uncertainty.

NOTE In situ testing according to the calorimetric method for full-load conditions is recognized.

The specific methods described are:

– Calibrated-machine method.
– Retardation method.
– Calorimetric method.
– Summation of losses for permanent magnet excited synchronous machines.

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)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60034-1 and IEC 60034-2-1 apply, as well as the following.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
calibrated machine
machine whose mechanical power input/output is determined, with low uncertainty, using measured electrical output/input values according to a defined test procedure

3.2
calibrated-machine method
method in which the mechanical input/output to/from an electrical machine under test is determined from the measurement of the electrical input/output of a calibrated machine mechanically coupled to the test machine

3.3
retardation method
method in which the separate losses in a machine under test are deduced from the measurements of the deceleration rate of its rotating components when only these losses are present

3.4
calorimetric method
method in which the losses in a machine are deduced from the measurements of the heat generated by them

3.5
thermal equilibrium
state reached when the temperature rises of the several parts of the machine do not vary by more than rate of change 1 K per half hour

[SOURCE: IEC 60050-411:1996, 411-51-08]

4 Symbols and abbreviated terms

4.1 Symbols

A is an area, m^2,

C is the retardation constant, kg m^2 s^2,

c_p is the specific heat capacity of the cooling medium, J/(kg K),

h is the coefficient of heat transfer, W/(m^2 K),

J is the moment of inertia, kg m^2,

n is the operating speed, s^{-1},

P_1 is the input power, W,

P_{1E} is the excitation power supplied by a separate source, W,

P_2 is the output power, W,

P_a is the I^2R armature-winding losses (interpole, compensation and series field winding loss in case of DC machines), W,

P_b is the brush losses, W,

P_c is the constant losses, W,

P_e is the excitation circuit losses, W,

P_{Ed} is the exciter losses, W,

P_{el} is the electrical power, excluding excitation, W,

P_f is the excitation (field winding) losses, W,

P_{fe} is the iron losses, W,

P_{fw} is the friction and windage losses, W,

P_{sc} is the short-circuit losses, W,