Irish Standard
I.S. EN 60349-4:2013

Electric traction - Rotating electrical machines for rail and road vehicles -- Part 4: Permanent magnet synchronous electrical machines connected to an electronic converter (IEC 60349-4:2012 (EQV))

I.S. EN 60349-4:2013

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Electric traction - Rotating electrical machines for rail and road vehicles - Part 4: Permanent magnet synchronous electrical machines connected to an electronic converter

(IEC 60349-4:2012)

Traction électrique - Machines électriques tournantes des véhicules ferroviaires et routiers - Partie 4: Machines électriques synchrones à aimants permanents connectées à un convertisseur électronique (CEI 60349-4:2012)

Elektrische Zugförderung – Drehende elektrische Maschinen für Bahn- und Straßenfahrzeuge - Teil 4: Umrichtergespeiste Synchronmaschinen mit Permanentmagneterregung (IEC 60349-4:2012)

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CENELEC

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

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Foreword

The text of document 9/1734/FDIS, future edition 1 of IEC 60349-4, prepared by IEC/TC 9 "Electrical equipment and systems for railways" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60349-4:2013.

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)	2013-10-15
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2016-01-15

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 60349-4:2012 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 60034-2-1	NOTE	Harmonized as EN 60034-2-1.
IEC/TS 60034-17	NOTE	Harmonized as CLC/TS 60034-17.
IEC 61260	NOTE	Harmonized as EN 61260.
IEC 61287 series	NOTE	Harmonized in EN 61287 series.
IEC 61672 series	NOTE	Harmonized in EN 61672 series.
ISO 3741:2010	NOTE	Harmonized as EN ISO 3741:2010 (not modified).
ISO 3743-1	NOTE	Harmonized as EN ISO 3743-1.
ISO 3743-2:1994	NOTE	Harmonized as EN ISO 3743-2:2009 (not modified).
ISO 3744:2010	NOTE	Harmonized as EN ISO 3744:2010 (not modified).
ISO 3745:2012	NOTE	Harmonized as EN ISO 3745:2012 (not modified).
ISO 3746:2010	NOTE	Harmonized as EN ISO 3746:2010 (not modified).
ISO 3747	NOTE	Harmonized as EN ISO 3747.
ISO 9614-1:1993	NOTE	Harmonized as EN ISO 9614-1:1995 (not modified).
ISO 9614-2:1996	NOTE	Harmonized as EN ISO 9614-2:1996 (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 When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60034-1	-	Rotating electrical machines - Part 1: Rating and performance	EN 60034-1	-
IEC 60034-8	-	Rotating electrical machines - Part 8: Terminal markings and direction of rotation	EN 60034-8	-
IEC 60034-9	-	Rotating electrical machines - Part 9: Noise limits	EN 60034-9	-
IEC 60034-14	-	Rotating electrical machines - Part 14: Mechanical vibration of certain machines with shaft heights 56 mm and higher - Measurement, evaluation and limits of vibration severity	EN 60034-14	-
IEC 60050-131	-	International Electrotechnical Vocabulary (IEV) - Part 131: Circuit theory	-	-
IEC 60050-151	-	International Electrotechnical Vocabulary (IEV) - Part 151: Electrical and magnetic devices	-	-
IEC 60050-221	-	International Electrotechnical Vocabulary (IEV) - Chapter 221: Magnetic materials and components	-	-
IEC 60050-411	-	International Electrotechnical Vocabulary (IEV) - Chapter 411: Rotating machinery	-	-
IEC 60050-811	-	International electrotechnical vocabulary (IEV) - Chapter 811: Electric traction	-	-
IEC 60085	-	Electrical insulation - Thermal evaluation and designation	EN 60085	-
IEC 60850	-	Railway applications - Supply voltages of traction systems	-	-
IEC 62498-1	-	Railway applications - Environmental conditions for equipment - Part 1: Equipment on board rolling stock	-	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRIC TRACTION – ROTATING ELECTRICAL MACHINES FOR RAIL AND ROAD VEHICLES –

Part 4: Permanent magnet synchronous electrical machines connected to an electronic converter

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.
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This International Standard IEC 60349-4 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This standard is derived from IEC 60349-2 changing the subject to permanent magnet synchronous machines.

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

FDIS	Report on voting
9/1734/FDIS	9/1759/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.

A list of all parts of IEC 60349 series, under the general title *Electric traction – Rotating electrical machines for rail and road vehicles*, can be found on the IEC website.

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

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.

ELECTRIC TRACTION – ROTATING ELECTRICAL MACHINES FOR RAIL AND ROAD VEHICLES –

Part 4: Permanent magnet synchronous electrical machines connected to an electronic converter

1 Scope and object

This part of IEC 60349 applies to converter-fed permanent magnet synchronous motors or generators (machines) forming part of the equipment of electrically propelled rail and road vehicles.

This standard is derived from IEC 60349-2 changing the subject to permanent magnet synchronous machines.

The object of this part is to enable the performance of a machine to be confirmed by tests and to provide a basis for assessment of its suitability for a specified duty and for comparison with other machines.

Where further testing is to be undertaken in accordance with a combined test, it may be preferable, that some type and investigation tests be carried out on the combined test bed, to avoid duplication.

Particular attention is drawn to the need for collaboration between the designers of the machine and its associated converter as detailed in 5.1.

NOTE 1 This part also applies to machines installed on trailers hauled by powered vehicles.

NOTE 2 The basic requirements of this part may be applied to machines for special purpose vehicles such as mine locomotives but this part does not cover flameproof or other special features that may be required.

NOTE 3 It is not intended that this part should apply to machines on small road vehicles, such as battery-fed delivery vehicles, factory trucks, etc. This part also does not apply to minor machines such as windscreen wiper motors, etc. that may be used on all types of vehicles.

NOTE 4 Industrial type machines complying with IEC 60034 may be suitable for some auxiliary drives, provided that it is demonstrated that operation on a converter supply will meet the requirements of the particular application.

The electrical input to motors covered by this part is be from an electronic converter. Generators may be connected to a rectifier or a converter.

The machines covered by this part are classified as follows:

a) Traction motors

   Motors for propelling rail or road vehicles.

b) Main generators

   Generators for supplying power to traction motors on the same vehicle or train.

c) Auxiliary motors not covered by IEC 60034

   Motors for driving compressors, fans, auxiliary generators or other auxiliary machines.

d) Auxiliary generators not covered by IEC 60034

   Generators for supplying power for auxiliary services such as air conditioning, heating, lighting and battery charging, etc.

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 60034-8, *Rotating electrical machines – Part 8: Terminal markings and direction of rotation*

IEC 60034-9, *Rotating electrical machines – Part 9: Noise limits*

IEC 60034-14, *Rotating electrical machines – Part 14: Mechanical vibration of certain machines with shaft heights 56 mm and higher – Measurement, evaluation and limits of vibration severity*

IEC 60050-131, *International Electrotechnical Vocabulary (IEV) – Chapter 131: Circuit theory*

IEC 60050-151, *International Electrotechnical Vocabulary (IEV) – Chapter 151: Electrical and magnetic devices*

IEC 60050-221, *International Electrotechnical Vocabulary (IEV) – Chapter 221: Magnetic materials and components*

IEC 60050-411, *International Electrotechnical Vocabulary (IEV) – Chapter 411: Rotating machines*

IEC 60050-811, *International Electrotechnical Vocabulary (IEV) – Chapter 811: Electric traction*

IEC 60085, *Thermal evaluation and classification of electrical insulation*

IEC 60850, *Railway applications – Supply voltages of traction systems*

IEC 62498-1, *Railway applications – Environmental conditions for equipment – Part 1: Equipment on board rolling stock*

3 Terms and definitions

For the purposes of this document the terms and definitions given in IEC 60050-131, IEC 60050-151, IEC 60050-221, IEC 60050-411, and IEC 60050-811 as well as the following, apply.

3.1
rating of a machine
combination of simultaneous values of electrical and mechanical quantities, with their duration and sequence, assigned to the machine by the manufacturer

3.1.1
rated value
numerical value of any quantity included in a rating

3.1.2
continuous rating
mechanical output that the motor (or electrical output that the generator) can deliver on the test bed for an unlimited time under the conditions specified in 8.1 without exceeding the limits of