

Electric traction — Rotating electrical machines for rail and road vehicles —

Part 2: Electronic convertor-fed alternating current motors

UDC 621.313.3:629.4:629.113/.118

Cooperating organizations

The Joint European Standards Institution (CEN/CENELEC), under whose supervision this European Prestandard was prepared, comprises the national standards organizations of the following countries:

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Belgium	Luxembourg
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This Draft for Development, having been prepared under the direction of the Power Electrical Engineering Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 January 1994

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National foreword

This Draft for Development has been prepared under the direction of the Power Electrical Engineering Standards Policy Committee. It is identical with European Prestandard ENV 60349-2 *Electric traction — Rotating electrical machines for rail and road vehicles — Part 2: Electronic convertor-fed alternating current motors*. ENV 60349-2 was published by the European Committee for Electrotechnical Standardization (CENELEC).

The UK actively participated through BSI Technical Committee PEL/44 in the development of the International Electrotechnical Commission standard IEC 349-2:1993 which was adopted by CENELEC as ENV 60349-2:1993.

IEC 349-2 is being revised by a Working Group of IEC TC9 and it is anticipated that when the revised text is available from IEC it will be adopted as a European Standard, subsequently published as a British Standard and that this Draft for Development will be withdrawn.

This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature because the subject matter is still under technical development requiring wider exposure. It should be applied on this provisional basis, so that information and experience of its practical application may be obtained.

A review of this Draft for Development will be carried out not later than 2 years after its publication. Notification of the start of the review period, with a request for the submission of comments from users of this Draft for Development, will be made in an announcement in the appropriate issue of *BSI News*. According to the replies received, the responsible BSI Committee will judge whether the Draft for Development can be converted into a British Standard or what other action should be taken.

Observations which it is felt should receive attention before the official call for comments will be welcomed. These should be sent to the Secretary of BSI Technical Committee PEL/44 at the BSI Head Office address shown on the back cover.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 22, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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Descriptors: Railway rolling stock, road vehicles, electric traction, rotating electric machines, electric motors, alternating current, electric power supply, electric converters, definitions, characteristics, heat limit, tests, acoustic measurements, verification, marking, name plates

English version

Electric traction — Rotating electrical machines for rail and road vehicles Part 2: Electronic convertor-fed alternating current motors

(IEC 349-2:1993)

Traction électrique — Machines électriques tournantes des véhicules ferroviaires et routiers
Partie 2: Moteurs à courant alternatif alimentés par convertisseur électronique
(CEI 349-2:1993)

Elektrische Zugförderung drehende elektrische Maschinen auf Schienen- und Straßenfahrzeugen
Teil 2: Umrichtergespeiste Drehstrommotoren
(IEC 349-2:1993)

This European Prestandard (ENV) was approved by CENELEC on 1993-07-06 as a prospective standard for provisional application. The period of validity of this ENV is limited initially to three years. After two years the members of CENELEC will be requested to submit their comments, particularly on the question whether the ENV can be converted into a European Standard (EN).

CENELEC members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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 09(CO)297, as prepared by IEC Technical Committee No. 9: Electric traction equipment, and adopted by the International Mixed Committee on Electric Traction Equipment (CMT), was submitted to the IEC-CENELEC parallel vote in May 1992.

The reference document was approved by CENELEC as ENV 60349-2 on 6 July 1993.

The following date was fixed:

- latest date of
announcement of the
ENV at national level (doa) 1993-10-01

Annexes designated “normative” are part of the body of the standard. In this standard, Annex A, Annex B, Annex C, Annex D, Annex E and Annex ZA are normative.

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Section 1. General

1.1 Scope and object

1.1.1 This part of IEC 349 applies to convertor-fed alternating current motors forming part of the equipment of electrically propelled rail and road vehicles.

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

Particular attention is drawn to the need for collaboration between the designers of the motor and its associated convertor as detailed in clause **3.1**.

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

NOTE 2 The basic requirements of this part may be applied to motors 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 motors 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 motors complying with IEC 34 may be suitable for some auxiliary drives, providing that it is demonstrated that operation on a convertor supply will meet the requirements of the particular application.

1.1.2 The rating of traction motors fed in parallel by a common convertor shall take account of the effect on load-sharing of differences of wheel diameter and of motor characteristics and also of weight transfer when operating at high coefficients of adhesion. The user shall be informed of the maximum permissible difference in wheel diameter for the particular application.

1.1.3 The electrical input to motors covered by this part shall be from an electronic convertor.

NOTE At the time of drafting this part only the following combinations of motors and convertors had been used for traction applications, but it may also apply to other combinations which may be used in the future:

- asynchronous motors fed by voltage source convertors;
- asynchronous motors fed by current source convertors;
- synchronous motors fed by current source convertors.

1.1.4 The motors covered by this part are classified as follows:

1.1.4.1 Traction motors

Motors for propelling rail or road vehicles.

1.1.4.2 Auxiliary motors not covered by IEC 34

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

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 349. All normative documents are subject to revision, and parties to agreements based on this part of IEC 349 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 34-2:1972, *Rotating electrical machines — Part 2: Methods for determining losses and efficiency of rotating electrical machinery from tests (excluding machines for traction vehicles)*.

IEC 34-5:1991, *Rotating electrical machines — Part 5: Classification of degrees of protection provided by enclosures of rotating machines (IP code)*.

IEC 34-8:1972, *Rotating electrical machines — Part 8: Terminal markings and direction of rotation of rotating machines*.

IEC 34-14:1988, *Rotating electrical machines — Part 14: Mechanical vibration of certain machines with shaft heights 56 mm and higher — Measurement, evaluation and limits of the vibration severity*.

IEC 50 (131):1978, *International Electrotechnical Vocabulary — Chapter 131: Electric and magnetic circuits*.

IEC 50 (151):1978, *International Electrotechnical Vocabulary — Chapter 151: Electrical and magnetic devices*.

IEC 50 (411):1973, *International Electrotechnical Vocabulary — Chapter 411: Rotating machines*.

IEC 50 (811):1991, *International Electrotechnical Vocabulary — Chapter 811: Electric traction*.

IEC 85:1984, *Thermal evaluation and classification of electrical insulation*.

IEC 411-5:1991, *Electronic power convertors with multiphase output installed onboard railway rolling stock*.

IEC 850:1988, *Supply voltages of traction systems*.

ISO/R70, 1680:1970, *Acoustics — Test code for the measurement of the airborne noise emitted by rotating electrical machinery*.

1.3 Environmental conditions

Unless otherwise specified by the user, the following environmental conditions are assumed:

a) Altitude

Height above sea level not exceeding 1 200 m.

b) Temperature

Temperature in the shade not exceeding 40 °C.

Whenever motors are intended to operate where one or both of these limits will be exceeded, special requirements may be agreed between user and manufacturer.

Furthermore, the user shall inform the manufacturer of any particularly severe environmental condition such as dust, humidity, temperature, snow, dynamic effects, etc. to which the motors will be subjected.

Section 2. Definitions

2.1 General

For definition of general terms used in this part reference should be made to IEC 50(131), IEC 50(151), IEC 50(411) and IEC 50(811).

For the purpose of this part of IEC 349, the following definitions apply:

2.2 rating of a motor

Combination of simultaneous values of electrical and mechanical quantities, with their duration and sequence, assigned to the motor by the manufacturer.

2.2.1

rated value

numerical value of any quantity included in a rating

2.2.2

continuous rating

mechanical output that the motor can deliver on the test bed for an unlimited time under the conditions specified in clause 6.1 without exceeding the limits of temperature rise given in Table 2, all other appropriate requirements in this part also being satisfied

several continuous ratings may be specified

2.2.3

short-time rating (for example, one hour)

mechanical output that the motor can deliver on the test bed for the stated time without exceeding the limits of temperature rise given in Table 2, the test being carried out as specified in 6.1 starting with the motor cold, all other appropriate requirements in this part being also satisfied

2.2.4

short-time overload rating

mechanical output that the motor can deliver on the test bed for the stated time without exceeding the limits of temperature rise given in Table 3, the test being started and carried out as specified in 6.1.9

NOTE Short-time overload ratings are of value in determining the suitability of motors for duties which involve relatively long periods of operation below the continuous rating followed by a period above it. These are most likely to occur in locomotive applications. They are not relevant to the repeated short load cycles of rapid transit and similar duties, and should not be specified for such applications.

2.2.5

intermittent duty rating

duty cycle on which the motor may be operated without the temperature rises at any point exceeding the limits given in Table 2

2.2.6

equivalent rating

continuous rating with constant values of voltage, current and speed that, as far as temperature rise is concerned, is equivalent to the intermittent duty cycle which the motor has to withstand in service. This rating shall be agreed between user and manufacturer

2.2.7 guaranteed rating

Rating guaranteed by the manufacturer.

2.2.7.1

guaranteed rating of a traction motor

normally the continuous rating but in special cases the user and manufacturer may agree that it be a short-time or intermittent rating

2.2.7.2

guaranteed rating of an auxiliary motor

continuous rating unless otherwise specified