

Electric traction — Rolling stock — Combined testing of inverter-fed alternating current motors and their control

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ICS 29.280

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Committees responsible for this British Standard

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- British Cable Makers Confederation
- Confederation of Passenger Transport
- London Underground Limited
- Railtrack
- Railway Industry Association

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National foreword

This British Standard has been prepared by Subcommittee PEL/9/2, and is the English language version of EN 61377:1996, including Corrigendum November 1996, *Electric traction — Rolling stock — Combined testing of inverter-fed alternating current motors and their control*, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 1377:1996, published by the International Electrotechnical Commission (IEC).

Cross-references

Publication referred to	Corresponding British Standard
	BS 4727 <i>Glossary of electrotechnical, power, telecommunication, electronics, lighting and colour terms</i>
	Part 2: <i>Terms particular to power engineering</i>
IEC 50(411):1973	Group 03:1971 <i>Rotating machinery terminology</i>
IEC 50(551):1982	Group 02:1983 <i>Power electronics terminology</i>
IEC 50(811):1991	Group 18:1992 <i>Electric traction</i>
IEC 349-2:1993	DD ENV 60349 <i>Electric traction. Rotating electrical machines for rail and road vehicles</i>
	DD ENV 60349-2:1994 <i>Electronic convertor-fed alternating current motors</i>
EN 50163:1995	BS EN 50163:1996 <i>Railway applications. Supply voltages of traction systems</i>

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Summary of pages

This document comprises a front cover, an Inside front cover, pages i and ii, the EN title page, pages 2 to 20, 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, electric traction, electric motors, alternating current, inverters, definitions, performance evaluation, tests, verification

English version

Electric traction — Rolling stock — Combined testing of inverter-fed alternating current motors and their control

(IEC 1377:1996)

Traction électrique — Matériel roulant
Essais combinés de moteurs à courant
alternatif alimentés par onduleur et de leur
régulation
(CEI 1377:1996)

Zugförderung — Schienenfahrzeuge
Kombinierte Prüfung von
wechselrichtergespeisten
Wechselstrommotoren und deren Steuerung
(IEC 1377:1996)

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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

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Foreword

The text of document 9/371/FDIS, future edition 1 of IEC 1377, prepared by IEC TC 9, Electric traction equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61377 on 1996-07-02.

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) 1997-04-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-04-01

Annexes designated “normative” are part of the body of the standard. In this standard, annexes A and ZA are normative. Annex ZA has been added by CENELEC.

NOTE 1 Instead of IEC 571-1, IEC 571-2 and IEC 517-3, the European Standard EN 50155:1995 “Railway applications — Electronic equipment used on rolling stock” applies.

NOTE 2 Instead of IEC 850:1988, the European Standard EN 50163:1995 “Railway applications — Supply voltages of traction systems” applies.

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1 General

1.1 Scope and object

This International Standard applies to the combinations of motor(s), inverter and their control, and its object is to specify:

- the performance characteristics of electric drives consisting of an inverter, alternating current motors, and the related control system;
- methods of verifying these performance characteristics by tests.

Two categories of combined systems can be considered:

- 1) Motors fed from an inverter without any control between the mechanical output (torque, speed) and the inverter (mostly auxiliary motors, for example cooling fan motors). The motor works exactly as if it were fed from a busbar (at variable frequency and voltage or not).
- 2) Motor(s) (paralleled or not) with a control between the mechanical output and the inverter.

The first category of systems is tested according to IEC 349-2 and IEC 1287-1.

This standard applies to the second category, mainly traction drives.

IEC 349-2 applies to convertor-fed alternating current motors, IEC 1287-1 to power electronic convertors; parts 1, 2 and 3 of IEC 571 apply to electronic equipments, this standard applies to the combination of motor(s), inverter, and their control. As a consequence, IEC 349-2 describes the tests to demonstrate the compliance of the motor to its specification, IEC 1287-1 does the same for the inverter. It is self-evident that some of the tests mentioned in this standard generally may replace the corresponding ones described in the above mentioned standards. An agreement should be reached between the parties to avoid the duplication of tests.

At the time of drafting this standard, only the following combinations of motors and inverters have 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 inverter;
- asynchronous motors fed by current source inverter;
- synchronous motors fed by current source inverter.

The d.c. source can be a supply line, a rectifier, a chopper, an input convertor, a diesel generator with integrated rectifiers, etc.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard 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 50(411):1973, *International Electrotechnical Vocabulary (IEV) — Chapter 411: Rotating machines*

IEC 50(551):1982, *International Electrotechnical Vocabulary (IEV) — Chapter 551: Power electronics*.

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

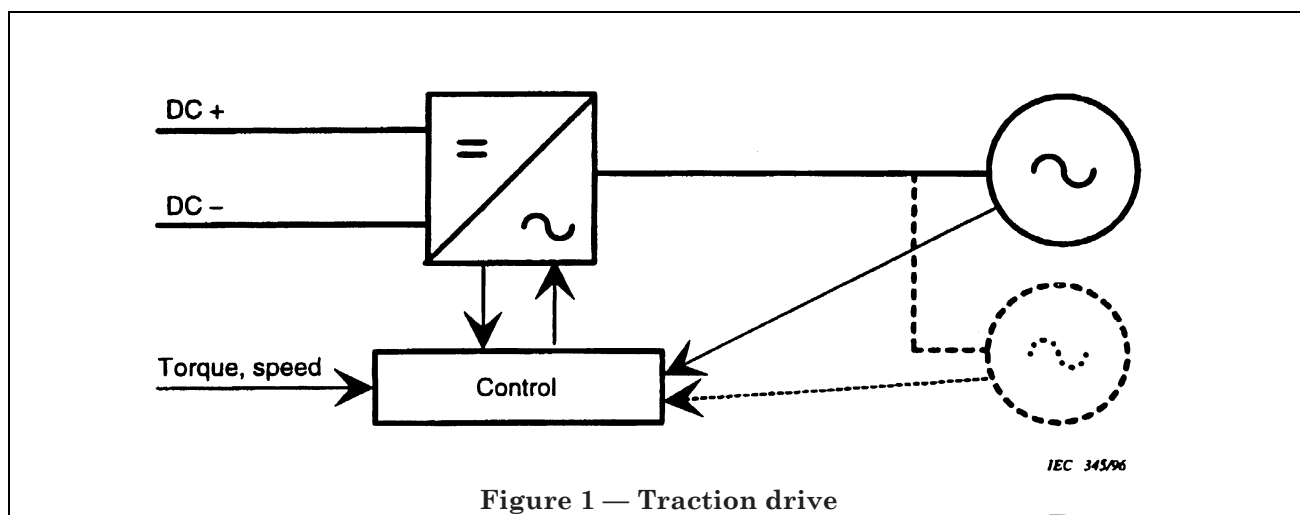


Figure 1 — Traction drive

IEC 349-2:1993, *Electric traction — Rotating electrical machines for rail and road vehicles — Part 2: Electronic convertor-fed alternating current motors.*

IEC 349-3:1995, *Rail and road vehicles — Determination of the total losses of convertor-fed alternating current motors by summation of the component losses.*

IEC 571-1:1990, *Electronic equipment used on rail vehicles — Part 1: General requirements and tests for electronic equipment.*

IEC 571-2:1988, *Electronic equipment used on rail vehicles — Part 2: Standardization of certain mechanical and electrical quantities — Principle of test devices.*

IEC 571-3:1990, *Electronic equipment used on rail vehicles — Part 3: Components, programmable electronic equipment and electronic system reliability.*

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

IEC 1287-1:1995, *Power convertors installed on board rolling stock — Part 1: Characteristics and test methods.*

1.3 Environmental conditions

Environmental conditions relative to motor, inverter, and control system are detailed in IEC 349-2, IEC 1287-1 and IEC 571-1.

2 Definitions

For the definition of general terms used in this standard, reference should be made to IEC 50(411), IEC 50(551), IEC 50(811), IEC 1287-1 and IEC 349-2.

For the purpose of this International Standard, the following definitions apply:

2.1 combined system

the unit consisting of the inverter, the motor(s), their related control system, equivalent power cables connecting them, and an equivalent cooling system

2.2

user

the organization which orders the combined system. The user is normally an organization which uses the vehicle or the equipment, unless the responsibility is delegated to a main contractor or consultant

2.3

manufacturer

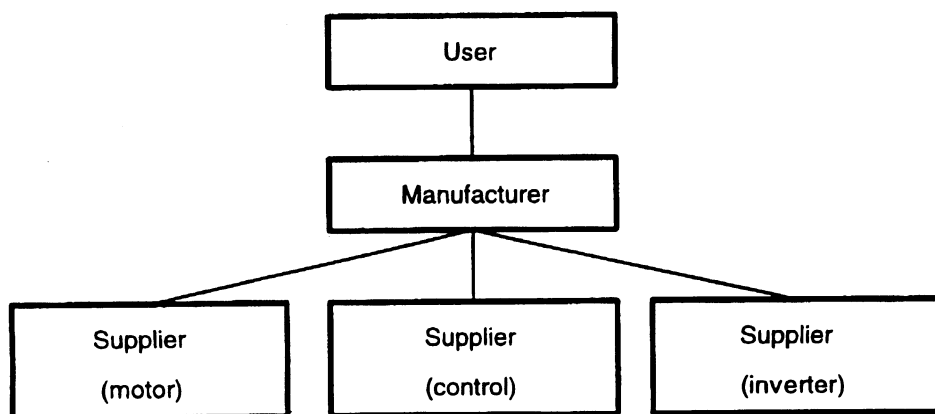
the organization which has the technical responsibility for the supply of the combined system

NOTE The manufacturer as defined above may also be the supplier of the motor, of the inverter, of the control, or of all of them, or of none of them.

2.4

supplier

the organization which has the responsibility of one or more of the constituents of the combined system



IEC 346/96