
**Železniške naprave – Transformatorji in dušilke vlečnih tokokrogov na vozni
sredstvih (IEC 60310:2004)**

Railway applications - Traction transformers and inductors on board rolling stock
(IEC 60310:2004)

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English version

**Railway applications –
Traction transformers and inductors on board rolling stock
(IEC 60310:2004)**

Applications ferroviaires –
Transformateurs de traction et bobines
d'inductance à bord du matériel roulant
(CEI 60310:2004)

Bahnanwendungen –
Transformatoren und Drosselspulen
auf Bahnfahrzeugen
(IEC 60310:2004)

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This European Standard was approved by CENELEC on 2004-03-01. 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.

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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

Foreword

The text of document 9/780/FDIS, future edition 3 of IEC 60310, prepared by IEC TC 9, Electrical equipment and systems for railways, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60310 on 2004-03-01.

This European Standard supersedes EN 60310:1996.

This European Standard includes the following significant technical changes from EN 60310:1996: it takes into account the new generic railway standards, more specifically general service conditions and shock and vibration considerations, referring to EN 60077-1 and EN 61373.

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) 2004-12-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2007-03-01

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 60310:2004 was approved by CENELEC as a European Standard without any modification.
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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 Where 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 60076-1 (mod)	1993	Power transformers Part 1: General	EN 60076-1 + A11 + A12	1997 1997 2002
IEC 60076-2 (mod)	1993	Part 2: Temperature rise	EN 60076-2	1997
IEC 60076-3 + corr. December	2000 2000	Part 3: Insulation levels, dielectric tests and external clearances in air	EN 60076-3	2001
IEC 60076-5	2000	Part 5: Ability to withstand short circuit	EN 60076-5	2000
IEC 60077-1 (mod)	1999	Railway applications - Electric equipment for rolling stock Part 1: General service conditions and general rules	EN 60077-1	2002
IEC 60085	1984	Thermal evaluation and classification of electrical insulation	HD 566 S1	1990
IEC 60289 (mod)	1988	Reactors	EN 60289 + A11	1994 2002
IEC 60850	2000	Railway applications - Supply voltages of traction systems	-	-
IEC 61133	1992	Railway applications - Testing of rolling stock after completion of construction and before entry into service	-	-
IEC 61287-1	1995	Power convertors installed on board rolling stock Part 1: Characteristics and test methods	-	-
IEC 61373	1999	Railway applications - Rolling stock equipment - Shock and vibration tests	EN 61373	1999

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RAILWAY APPLICATIONS –
TRACTION TRANSFORMERS AND INDUCTORS
ON BOARD ROLLING STOCK**

FOREWORD

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International Standard IEC 60310 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This third edition cancels and replaces the second edition issued in 1991 and constitutes a technical revision. This edition includes the following significant technical changes from the previous edition: it takes into account the new generic railway standards, more specifically general service conditions and shock and vibration considerations, referring to IEC 60077-1 and IEC 61373.

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

FDIS	Report on voting
9/780/FDIS	9/784/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.

The committee has decided that the contents of this publication will remain unchanged until 2009. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RAILWAY APPLICATIONS –
TRACTION TRANSFORMERS AND INDUCTORS
ON BOARD ROLLING STOCK****1 Scope**

This International Standard applies to traction transformers installed on board rolling stock and to the various types of inductors inserted in the power and auxiliary circuits of electric vehicles.

NOTE 1 The term “inductor” is used in this standard with the same meaning as the term “reactor” mentioned in IEC 60050(421), IEC 60050(811) and IEC 60289.

The inductors mentioned in the first paragraph may be:

- filter inductors;
- smoothing inductors;
- commutation inductors;
- protection inductors in static power convertors;
- inductive shunts for traction motors;
- inductors used for transition between tap changer notches;
- braking circuit inductors;
- interference suppression inductors.

NOTE 2 The requirements of IEC 60076 are applicable to traction transformers where they do not conflict with this standard, or with the specialized IEC publications dealing with traction applications.

NOTE 3 For transformers and inductors for static power convertors, reference should also be made to IEC 61287.

This standard can also be applied, after agreement between user and manufacturer, to the traction transformers of three-phase a.c. line-side powered vehicles and to the transformers inserted in the single-phase or polyphase auxiliary circuits of vehicles, except for instrument transformers and transformers of a rated output below 1 kVA single-phase or 5 kVA polyphase.

This standard does not cover accessories such as tap changers, resistors, heat exchangers, fans, etc., intended for mounting on the transformers or inductors, which shall be tested separately according to relevant rules.

When tap changers are an integral part of the transformers, they cannot be separated while the latter are tested.

For service conditions, refer to IEC 60077-1, Clause 7.

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 60076-1:1993, *Power transformers – Part 1: General*

IEC 60076-2:1993, *Power transformers – Part 2: Temperature rise*

IEC 60076-3:2000, *Power transformers – Part 3: Insulation levels, dielectric tests and external clearances in air*

IEC 60076-5:2000, *Power transformers – Part 5: Ability to withstand short circuit*

IEC 60077-1:1999, *Railway applications – Electric equipment for rolling stock – Part 1: General service conditions and general rules*

IEC 60085:1984, *Thermal evaluation and classification of electrical insulation*

IEC 60289:1988, *Reactors*

IEC 60850:2000, *Railway applications – Supply voltage of traction systems*

IEC 61133:1992, *Electric traction – Rolling stock – Test methods for electric and thermal/electric rolling stock on completion of construction and before entry into service*

IEC 61287-1:1995, *Power convertors installed on board rolling stock – Part 1: Characteristics and test methods*

IEC 61373:1999, *Railway applications – Rolling stock equipment – Shock and vibration tests*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60076 and IEC 60289 together with the following definitions apply.

3.1 Definitions for transformers

3.1.1

classification of transformers

depending on arrangements made for on-load variation of the secondary voltage of the traction circuits, traction transformers can be classified as:

- fixed ratio transformers;
- transformers with low-voltage tapping;
- transformers with high-voltage tapping.

3.2 Definitions for inductors

3.2.1

classification of inductors

according to their utilisation, inductors can be classified as follows:

- *Inductors for alternating current*

Inductors that carry alternating current, such as transition inductors used for transition between tappings of tap changers, inductors for a.c. commutator motor braking circuits, interference suppression inductors, etc.