IEC 60310

Edition 5.0 2026-04

INTERNATIONAL STANDARD

Railway applications - Transformers and inductors on board rolling stock

ICS 45.060.01

ISBN 978-2-8327-1073-9

IEC 60310:2026-04(en)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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

This fifth edition cancels and replaces the fourth edition published in 2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) typical circuits for transformer and inductors are added;
b) letter symbols for cooling methods are added;
c) dielectric test table is modified;
d) subclauses for the tests of transformers and inductors are restructured;

e) temperature test for dry type transformer and dry type inductors are separated in different subclauses;

f) requirements for shock and vibration tests are updated according to IEC 61373:20—.

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

Draft	Report on voting
9/3296/FDIS	9/3322/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.

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– withdrawn, or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.

1 Scope

This document specifies the terms and definitions, classification, service conditions, characteristics and test methods for transformers and inductors on board rolling stock.

This document is applicable to traction and auxiliary power transformers installed on board rolling stock and to the various types of power inductors inserted in the traction and auxiliary circuits of rolling stock, of dry or liquid-immersed design.

This document is also applicable to the traction transformers of three-phase AC line-side powered vehicles and to the transformers inserted in the single-phase or polyphase auxiliary circuits of vehicles, after agreement between purchaser and manufacturer.

This document does not apply to instrument transformers, transformers of a rated output below 1 kVA single-phase or 5 kVA poly-phase, and inductors of a rated output below 1 kVAR single-phase or 5 kVAR poly-phase on board rolling stock.

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

NOTE Items requiring agreement between the delivery parties and items of supplementary information and specification particulars to be provided by the ordering party or manufacturer are given in Annex A.

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 60076-1:2011, *Power transformers - Part 1: General*

IEC 60076-2*, Power transformers - Part 2: Temperature rise for liquid-immersed transformers*

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

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

IEC 60076-6:2007, *Power transformers - Part 6: Reactors*

IEC 60076-10, *Power transformers - Part 10: Determination of sound levels*

IEC 60076-12:2008, *Power transformers - Part 12: Loading guide for dry-type transformers*

IEC 60076-18, *Power transformers - Part 18: Measurement of frequency response*

IEC 60296, *Fluids for electrotechnical applications - Mineral insulating oils for electrical equipment*

IEC 60836, *Specifications for unused silicone insulating liquids for electrotechnical purposes*

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

Bibliography

IEC 60050-151:2001, *International Electrotechnical Vocabulary (IEV) - Part 151: Electrical and magnetic devices*

IEC 60050-212:2010, *International Electrotechnical Vocabulary (IEV) - Part 212: Electrical insulating solids, liquids and gases*

IEC 60050-411:1996/AMD1:2007, *International Electrotechnical Vocabulary (IEV) - Part 411: Rotating machinery*

IEC 60050-421, *International Electrotechnical Vocabulary - Part 421: Power transformers and reactors*

IEC 60050-426:2020, *International Electrotechnical Vocabulary (IEV) - Part 426: Explosive atmospheres*

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

IEC 60060-1, *High-voltage test techniques - Part 1: General terminology and test requirements*

IEC 60060-2, *High-voltage test techniques - Part 2: Measuring systems*

IEC 60076-4, *Power transformers - Part 4: Guide to the lightning impulse and switching impulse testing - Power transformers and reactors*

IEC 60076-7, *Power transformers - Part 7: Loading guide for mineral-oil-immersed power transformers*

IEC 60076-11:2018, *Power transformers - Part 11: Dry-type transformers*

IEC 60076-14*, Power transformers - Part 14: Liquid-immersed power transformers using high-temperature insulation materials*

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

IEC 60085*, Electrical insulation - Thermal evaluation and designation*

IEC 60216-1*, Electrical insulating materials - Thermal endurance properties - Part 1: Ageing procedures and evaluation of test results*

IEC 60216-5, *Electrical insulating materials - Thermal endurance properties - Part 5: Determination of relative temperature index (RTI) of an insulating material*

IEC 60270, *High-voltage test techniques - Charge-based measurement of partial discharges*

IEC 60505, *Evaluation and qualification of electrical insulation systems*

IEC 61287-1*, Railway applications - Power converters installed on board rolling stock - Part 1: Characteristics and test methods*

EN 45545 (all parts), *Railway applications - Fire protection on railway vehicles*

IEEE C 57.12.91, *IEEE Standard Test Code for Dry-Type Distribution and Power Transformers*

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