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Standards

Irish Standard  
I.S. EN 62520:2011

# Railway applications - Electric traction - Short-primary type linear induction motors (LIM) fed by power converters (IEC 62520:2011 (EQV))

## I.S. EN 62520:2011

*Incorporating amendments/corrigenda issued since publication:*

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<b>NSAI</b> 1 Swift Square, Northwood, Santry Dublin 9	T +353 1 807 3800 F +353 1 807 3838 E standards@nsai.ie  W NSAI.ie	<b>Sales:</b> T +353 1 857 6730 F +353 1 857 6729 W standards.ie
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EUROPEAN STANDARD

**EN 62520**

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 2011

ICS 45.060

English version

**Railway applications -  
Electric traction -  
Short-primary type linear induction motors (LIM) fed by power converters  
(IEC 62520:2011)**

Applications ferroviaires -  
Traction électrique -  
Moteurs à induction linéaires (LIM) du  
type à primaire court alimentés par des  
convertisseurs de puissance  
(CEI 62520:2011)

Elektrische Zugförderung -  
Elektrische Maschinen für Schienen- und  
Straßenfahrzeuge -  
Umrichtergespeiste Asynchron-  
Linearmotoren des Kurzstatortyps  
(IEC 62520:2011)

This European Standard was approved by CENELEC on 2011-06-29. 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.

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

**Management Centre: Avenue Marnix 17, B - 1000 Brussels**

## **Foreword**

The text of document (9/1531/FDIS), future edition 1 of IEC 62520, 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 62520 on 2011-06-29.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

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) | 2012-03-29 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn   | (dow) | 2014-06-29 |

Annex ZA has been added by CENELEC.

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## **Endorsement notice**

The text of the International Standard IEC 62520:2011 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 60034-5	NOTE	Harmonized as EN 60034-5.
IEC 61672-1	NOTE	Harmonized as EN 61672-1.
IEC 61260	NOTE	Harmonized as EN 61260.
IEC 61287-1	NOTE	Harmonized as EN 61287-1.
IEC 61377-1	NOTE	Harmonized as EN 61377-1.

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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 When 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 60034-8	-	Rotating electrical machines - Part 8: Terminal markings and direction of rotation	EN 60034-8	-
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 60050-411	-	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 60349-2	2010	Electric traction - Rotating electrical machines for rail and road vehicles - Part 2: Electronic converter-fed alternating current motors	EN 60349-2	2010
IEC 60850	-	Railway applications - Supply voltages of traction systems	-	-
IEC 61133	2006	Railway applications - Rolling stock - Testing of rolling stock on completion of construction and before entry into service	-	-
IEC 61373	-	Railway applications - Rolling stock equipment - Shock and vibration tests	EN 61373	-

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## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references .....	7
3 Terms and definitions .....	8
4 Environmental conditions.....	12
5 Characteristics .....	13
5.1 Exchange of information .....	13
5.2 Reference temperature.....	14
5.3 Specified characteristics.....	14
5.4 Declared characteristics .....	14
5.5 Efficiency characteristics .....	15
5.6 Traction motor characteristics .....	15
6 Marking .....	15
6.1 Primary nameplate .....	15
6.2 Secondary marking.....	15
7 Test categories.....	16
7.1 Test categories .....	16
7.1.1 General .....	16
7.1.2 Type tests .....	16
7.1.3 Routine tests .....	17
7.1.4 Investigation tests .....	17
7.2 Summary of tests .....	17
8 Type tests .....	18
8.1 Temperature-rise tests .....	18
8.1.1 General .....	18
8.1.2 Ventilation during temperature-rise tests .....	18
8.1.3 Measurement of temperature .....	18
8.1.4 Judgement of results .....	18
8.1.5 Limits of temperature rise .....	18
8.2 Characteristic tests and tolerances.....	19
8.2.1 General .....	19
8.2.2 Tolerances .....	20
8.3 Shock and vibration tests .....	20
9 Routine tests .....	20
9.1 Routine tests of primary .....	20
9.1.1 General .....	20
9.1.2 Characteristic tests and tolerance.....	21
9.1.3 Dielectric tests.....	21
9.1.4 Structural tests .....	22
9.2 Routine tests of secondary .....	23
9.2.1 Dimension test.....	23
9.2.2 Chemical composition test.....	23
9.2.3 Tension test.....	23
9.2.4 Bending test .....	23

**I.S. EN 62520:2011**

62520 © IEC:2011

– 3 –

9.2.5	Shear test.....	23
9.2.6	Ultrasonic flaw detection.....	23
9.2.7	Friction test .....	23
9.2.8	Electrical conductivity test .....	23
10	Investigation tests .....	24
10.1	General .....	24
10.2	Noise test.....	24
Annex A (normative)	Measurement of temperature .....	25
Annex B (informative)	Test method using a rotary test facility of a LIM.....	27
Annex C (normative)	Supply voltages of traction systems .....	29
Annex D (normative)	Agreement between user and manufacturer .....	30
Bibliography.....		31
Figure B.1 – Rotary test facility for LIM .....		28
Table 1 – Technical items transferred and requested between the manufacturer of the primary and his counterparts.....		14
Table 2 – Summary of tests for the primary.....		17
Table 3 – Summary of tests for secondary .....		18
Table 4 – Limits of temperature rise for continuous and other ratings.....		19
Table 5 – Dielectric test voltages .....		22



## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RAILWAY APPLICATIONS –  
ELECTRIC TRACTION –  
SHORT-PRIMARY TYPE LINEAR INDUCTION  
MOTORS (LIM) FED BY POWER CONVERTERS**

## FOREWORD

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International Standard IEC 62520 has been prepared by IEC technical committee 9: Electric equipment and systems for railways.

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

FDIS	Report on voting
9/1531/FDIS	9/1544/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.

**I.S. EN 62520:2011**

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– 5 –

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.

## INTRODUCTION

This International Standard is introduced because there are significant differences between the rotary induction motor and the linear induction motor (LIM). These differences necessitate a different testing standard to ensure consistency, repeatability and dependability of the test results. For clarification, the significant differences are listed below:

- a) The LIM has a power factor and an electric efficiency substantially lower than those of rotary motors, because its magnetic gap length is several times that of the rotary motors. As such, the assumption made for the rotary induction motor that the primary leakage reactance is significantly less than the mutual reactance is no longer valid.
- b) The traction efficiency of a LIM does not include the mechanical transmission, typical of rotary motor propulsion.
- c) LIMs produce direct thrust between the primary and secondary without the need for mechanical contact. Therefore, there are no adhesion limits due to the rail and wheels contact of the typical rotary drive. No spin/slide controls are needed with LIMs and thus there is no need for testing of this function.
- d) LIMs produce not only thrust (which is in the longitudinal direction) but also normal and lateral forces which are effectively eliminated in the rotary induction motor, due to the symmetrical geometry of rotary motor. The normal force is either an attraction or a repulsion between the primary and secondary. The effect of these forces should be considered on deflection of primary and secondary and for their mechanical strength and rigidity, particularly as the deflection will affect the gap between primary and secondary and thereby change the LIM performance.
- e) The normal force mentioned in d) has a direct effect on the design of magnetically levitated vehicles. Depending on whether the normal force is attractive or repulsive, this force will either assist the suspension of the vehicle or oppose it. Thus testing of the LIM must ensure that the force occurs in the appropriate part of the LIM operating range.
- f) Information in Table 1 should be shared with subsystem component designers. Particular attention is drawn to the need for collaboration between the designers of the LIM and its associated converter as detailed in 5.1.

# **RAILWAY APPLICATIONS – ELECTRIC TRACTION – SHORT-PRIMARY TYPE LINEAR INDUCTION MOTORS (LIM) FED BY POWER CONVERTERS**

## **1 Scope**

This International standard applies to short-primary type linear induction motors (LIM) for propelling rail and road vehicles.

This standard applies to a specific configuration of LIM that has the primary mounted on either the vehicle body or trucks and a secondary that is fixed to the track and that is connected only by a magnetic field with the primary.

The object of this standard is to allow the performance of a LIM to be confirmed by tests and to provide a basis for assessment of its suitability for a specified duty.

The rating of LIMs fed in parallel by a common converter should take into account the effect on load-sharing due to differences of gap length and of LIM characteristics. The user should be informed of the maximum permissible difference in gap length for the particular application.

The electrical input to LIMs covered by this standard should come from an electronic converter.

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

- LIMs fed by voltage source converters.

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

IEC 60050-131, *International Electrotechnical Vocabulary – Part 131: Circuit theory*

IEC 60050-151, *International Electrotechnical Vocabulary – Part 151: Electrical and magnetic devices*

IEC 60050-411, *International Electrotechnical Vocabulary – Part 411: Rotating machinery*

IEC 60050-811, *International Electrotechnical Vocabulary – Part 811: Electric traction*

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

IEC 60349-2:2010, *Electric traction – Rotating electrical machines for rail and road vehicles – Part 2: Electronic convertor-fed alternating current motors*

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

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