

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Explosive atmospheres –
Part 7: Equipment protection by increased safety "e"**

**Atmosphères explosives –
Partie 7: Protection du matériel par sécurité augmentée «e»**

IEC 60079-7:2015

<https://standards.iteh.ai/catalog/standards/iec/cf863b1c-949b-4ce1-9477-8cf86103dc5b/iec-60079-7-2015>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2017 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and definitions clause of IEC publications issued between 2002 and 2015. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et définitions des publications IEC parues entre 2002 et 2015. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.



IEC 60079-7

Edition 5.1 2017-08
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Explosive atmospheres –
Part 7: Equipment protection by increased safety "e"**

**Atmosphères explosives –
Partie 7: Protection du matériel par sécurité augmentée «e»**

[IEC 60079-7:2015](https://standards.iteh.ai/catalog/standards/iec/cf863b1c-949b-4ce1-9477-8cf86103dc5b/iec-60079-7-2015)

<https://standards.iteh.ai/catalog/standards/iec/cf863b1c-949b-4ce1-9477-8cf86103dc5b/iec-60079-7-2015>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.260.20

ISBN 978-2-8322-4708-2

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

REDLINE VERSION

VERSION REDLINE



Explosive atmospheres –
Part 7: Equipment protection by increased safety "e"

Atmosphères explosives –
Partie 7: Protection du matériel par sécurité augmentée «e»

IEC 60079-7:2015

<https://standards.iteh.ai/catalog/standards/iec/cf863b1c-949b-4ce1-9477-8cf86103dc5b/iec-60079-7-2015>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

IEC 60079-7
Edition 5.0 2015-06

EXPLOSIVE ATMOSPHERES –

Part 7: Equipment protection by increased safety 'e'

INTERPRETATION SHEET 1

This interpretation sheet has been prepared by IEC technical committee 31: Equipment for explosive atmospheres.

The text of this interpretation sheet is based on the following documents:

ISH	Report on voting
31/1258/ISH	31/1272/RVD

Full information on the voting for the approval of this interpretation sheet can be found in the report on voting indicated in the above table.

[IEC 60079-7:2015](https://standards.iteh.ai/catalog/standards/iec/cf863b1c-9496-4ce1-9477-8cf86103dc5b/iec-60079-7-2015)

<https://standards.iteh.ai/catalog/standards/iec/cf863b1c-9496-4ce1-9477-8cf86103dc5b/iec-60079-7-2015>

IEC 60079-7:2015 Edition 5.0, Explosive atmospheres – Part 7: Equipment protection by increased safety “e”

Question:

Do the requirements given in 5.2.3 prohibit the use of a terminal box opened to the interior of a motor rated 1 kV or greater, provided the interior of the machine has an ingress protection of IP54 or greater?

IEC 60079-7:2015 Edition 5.0

5.2.3 Degrees of protection provided by electrical machines, Level of Protection “ec”

The requirements of 4.10 apply, except that terminal boxes attached to electrical machines operating at voltages up to 1 kV, may be opened to the interior of the machine, only when the degree of protection of the electrical machine is at least IP44. Covers and entries of the terminal box shall provide at least degree of protection IP54.

Answer:

No. As long as the interior of the machine has an ingress protection of IP54 or greater, determined in accordance with IEC 60079-0, there is no limitation to less than 1 kV. If the interior of the machine has an ingress rating of IP44 or lower, the use of a terminal box open to the interior of a motor rated 1 kV or greater is not permitted.

NOTE Many manufacturers opt to declare IP44 for the machine for certification purposes, whilst claiming a rating of IP54 or higher, by assessment, for contractual purposes in order to avoid the difficult testing required for certification of the IP of larger machines. As such, this additional IP rating need only comply with IEC 60529 or IEC 60034-5 as applicable, and not with any of the testing detailed in IEC 60079-0.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC 60079-7:2015](#)

<https://standards.iteh.ai/catalog/standards/iec/ef863b1c-949b-4ce1-9477-8cf86103dc5b/iec-60079-7-2015>

CONTENTS

FOREWORD.....	8
1 Scope.....	14
2 Normative references	15
3 Terms and definitions	17
4 Constructional requirements	21
4.1 Level of Protection	21
4.2 Electrical connections	21
4.2.1 General	21
4.2.2 Field wiring connections	22
4.2.3 Factory connections.....	23
4.2.4 External plug and socket connections for field wiring connection	25
4.3 Clearances	26
4.4 Creepage distances	26
4.5 Printed wiring boards with conformal coating, Level of Protection “ec”	32
4.6 Solid electrical insulating materials	33
4.6.1 Specification.....	33
4.6.2 Long-term thermal stability	33
4.7 Windings.....	34
4.7.1 General	34
4.7.2 Insulated conductors	34
4.7.3 Winding impregnation	34
4.7.4 Conductor dimensions	34
4.7.5 Sensing elements	35
4.8 Temperature limitations	35
4.8.1 General	35
4.8.2 Conductors	35
4.8.3 Insulated windings	36
4.9 Wiring internal to equipment	37
4.10 Degrees of protection provided by enclosures.....	37
4.11 Fasteners	38
5 Supplementary requirements for specific electrical equipment	38
5.1 General.....	38
5.2 Electrical machines	38
5.2.1 General	38
5.2.2 Degrees of protection provided by electrical machines, Level of Protection “eb”	39
5.2.3 Degrees of protection provided by electrical machines, Level of Protection “ec”	39
5.2.4 Connection facilities for external conductors	39
5.2.5 Internal fans	40
5.2.6 Minimum air gap	40
5.2.7 Rotating electrical machines with cage rotors	41
5.2.8 Limiting temperature	43
5.2.9 Machines with permanent magnet rotors	46
5.2.10 Stator winding insulation system.....	46
5.2.11 Supplemental winding requirements Level of Protection “eb”	47

5.2.12	Bearing seals and shaft seals	47
5.2.13	Neutral point connections	48
5.3	Luminaires, hand lights, or caplights	48
5.3.1	General	48
5.3.2	Light source.....	49
5.3.3	Minimum distance between lamp and protective cover	50
5.3.4	Electrical spacings.....	50
5.3.5	Lampholders and lamp caps	51
5.3.6	Auxiliaries for Luminaires in Level of Protection “ec”.....	54
5.3.7	Surface temperatures	55
5.3.8	Limiting temperatures	56
5.3.9	Luminaires for tubular fluorescent bi-pin lamps	56
5.3.10	Tests for resistance to impact.....	57
5.4	Analog measuring instruments and instrument transformers	57
5.4.1	General	57
5.4.2	Limiting temperature	57
5.4.3	Short-circuit currents	57
5.4.4	Short time thermal current	58
5.4.5	Measuring instruments supplied by current transformers	58
5.4.6	Moving coils	58
5.4.7	External secondary circuits	58
5.5	Transformers other than instrument transformers.....	58
5.6	Supplementary requirements for equipment incorporating cells and batteries.....	59
5.6.1	Type of cells and batteries.....	59
5.6.2	Requirements for cells and batteries ≤ 25 Ah.....	60
5.6.3	Requirements for valve-regulated or vented cells or batteries >25 Ah	63
5.6.4	Charging of cells and batteries	66
5.7	General purpose connection and junction boxes	67
5.8	Resistance heating equipment (other than trace heating systems)	67
5.8.1	General	67
5.8.2	Heating resistors	67
5.8.3	Temperature coefficient	68
5.8.4	Insulating material	68
5.8.5	Cold-start current.....	68
5.8.6	Electrical safety device	68
5.8.7	Electrically conductive covering	68
5.8.8	Exclusion of explosive atmosphere	69
5.8.9	Conductor cross-section	69
5.8.10	Limiting temperature	69
5.8.11	Safety device.....	69
5.9	Supplementary requirements for fuses	70
5.9.1	General	70
5.9.2	Temperature class of equipment.....	71
5.9.3	Fuse mounting.....	71
5.9.4	Fuse enclosures	71
5.9.5	Replacement fuse identification	71
5.10	Other electrical equipment	71
6	Type verifications and type tests.....	71
6.1	Dielectric strength.....	71

6.2	Rotating electrical machines	72
6.2.1	Determination of starting current ratio I_A/I_N and the time t_E	72
6.2.2	Mounting of machine for test.....	72
6.2.3	Additional tests for machines	72
6.2.4	Overspeed test of cemented magnets	74
6.3	Luminaires	74
6.3.1	Battery operated luminaires	74
6.3.2	Impact and drop tests	74
6.3.3	Mechanical tests for screw lampholders other than E10.....	75
6.3.4	Abnormal operation of luminaires	76
6.3.5	Sulphur dioxide test for Level of Protection “eb” for the connection of bi-pin lamp caps to lampholders	77
6.3.6	Vibration test for Level of Protection “eb” for luminaires with bi-pin lamps	78
6.3.7	Test for wiring of luminaires subject to high-voltage impulses from ignitors	79
6.3.8	Tests for electronic starters for tubular fluorescent lamps and for ignitors in Level of Protection “ec” for discharge lamps	79
6.3.9	Test for starter holders for luminaires in Level of Protection “ec”	80
6.4	Measuring instruments and instrument transformers	80
6.5	Transformers other than instrument transformers.....	81
6.6	Verification and tests for cells and batteries of Level of Protection “eb”	81
6.6.1	General	81
6.6.2	Insulation resistance.....	81
6.6.3	Mechanical shock test	81
6.6.4	Test for ventilation of Level of Protection “eb” battery container.....	82
6.7	Verification and tests for cells and batteries of Level of Protection “ec”	83
6.7.1	General	83
6.7.2	Insulation resistance.....	83
6.7.3	Mechanical shock test	83
6.7.4	Test for ventilation of Level of Protection “ec” battery container.....	83
6.8	General purpose connection and junction boxes	84
6.8.1	General	84
6.8.2	Maximum dissipated power method	84
6.8.3	Defined arrangement method.....	84
6.9	Resistance heating equipment	84
6.10	Terminal insulating material tests.....	85
7	Routine verifications and routine tests	86
7.1	Dielectric tests	86
7.2	Dielectric tests for batteries	87
7.3	Inter-turn overvoltage tests	87
8	Ex Component certificates	87
8.1	General.....	87
8.2	Terminals.....	87
9	Marking and instructions.....	88
9.1	General marking	88
9.2	Ex Component enclosures	89
9.3	Instructions for use	89
9.3.1	Battery operated equipment.....	89

9.3.2	Terminals	89
9.3.3	Luminaires.....	89
9.3.4	Machines.....	90
9.4	Warning markings	90
10	Documentation	91
Annex A (normative) Temperature determination of electrical machines – Methods of test and of calculation		92
A.1	General.....	92
A.2	Determination of maximum service temperatures	92
A.2.1	Rotor temperature – normal operation	92
A.2.2	Winding temperature – normal operation	92
A.3	Determination of maximum surface temperatures.....	93
A.3.1	General	93
A.3.2	Locked rotor tests	93
A.4	Optional calculation of maximum surface temperature	94
A.4.1	General	94
A.4.2	Rotor temperature	94
A.4.3	Stator temperature.....	94
A.5	Determination of t_E time	94
A.6	Arduous starting conditions.....	95
A.7	Motors operated with a converter	95
Annex B (normative) Type tests for specific forms of resistance heating devices or resistance heating units (other than trace heater)		96
B.1	Resistance heating devices subjected to mechanical stresses	96
B.2	Resistance heating devices or units intended for immersion.....	96
B.3	Resistance heating devices or units having hygroscopic insulating material.....	96
B.4	Verification of limiting temperature of resistance heating devices (other than trace heaters)	96
B.4.1	General	96
B.4.2	Safety devices	96
B.4.3	Resistance heating unit of stabilized design.....	97
B.4.4	Heating device with temperature self-limiting characteristic	97
Annex C (informative) Cage motors – Thermal protection in service.....		98
Annex D (informative) Resistance heating devices and units – Additional electrical protection		99
D.1	Objective	99
D.2	Method of protection	99
Annex E (informative) Combinations of terminals and conductors for general purpose connection and junction boxes		100
E.1	General.....	100
E.2	Maximum dissipated power method.....	100
E.3	Defined arrangement method	100
Annex F (normative) Dimensions of copper conductors.....		103
Annex G (normative) Test procedure for T5 (only 8 W), T8, T10 and T12 lamps.....		104
G.1	Asymmetric pulse test.....	104
G.1.1	General	104
G.1.2	Test procedure	104
G.2	Asymmetric power test.....	105
G.2.1	General	105

G.2.2	Test procedure	106
Annex H (normative)	Alternative separation distances for Level of Protection “ec” equipment under controlled environments	109
H.1	General.....	109
H.2	Specific Conditions of Use	109
H.3	Control of pollution access	110
H.4	Voltage limitation	110
H.5	Control of overvoltages and transient protection	110
H.6	Alternative separation distances	110
Annex I (informative)	Application, installation, and testing considerations for Level of Protection “ec” asynchronous machines	112
I.1	Surface temperature	112
I.2	Starting.....	112
I.3	Rated voltage and surface discharges	113
Annex J (informative)	Luminaires incorporating LEDs	114
J.1	LEDs for EPL Gb	114
J.2	LEDs for EPL Gc.....	114
Bibliography	115
Figure 1	– Determination of creepage distances and clearances	32
Figure 2	– Minimum values of the time t_E (in seconds) of motors in relation to the starting current ratio I_A/I_N	44
Figure 3	– Arrangement for the luminaire vibration test	78
Figure A.1	– Diagram illustrating the determination of time t_E	95
Figure E.1	– Example of defined terminal/conductor arrangement table	102
Figure G.1	– Asymmetric pulse test circuit	105
Figure G.2	– Asymmetric power detection circuit.....	107
Figure G.3	– Flow Chart – Asymmetric power Test for T8, T10, T12 and T5 (8 W lamps)	108
Table 1	– Tracking resistance of insulating materials	27
Table 2	– Minimum Creepage distances, clearances and separations	28
Table 3	– Conditions for the determination of maximum surface temperature	35
Table 4	– Maximum temperatures for insulated windings	36
Table 5	– Potential air gap sparking risk assessment for cage rotor ignition risk factors.....	43
Table 6	– Stator insulation system tests of Level of Protection “ec” machines	47
Table 7	– Assumed voltage of neutral points.....	48
Table 8	– Minimum distance between lamp and protective cover	50
Table 9	– Creepage distances and clearances at peak values of pulse voltages greater than 1,5 kV	51
Table 10	– Creepage distances and clearances for screw lampholder and lamp cap	52
Table 11	– Resistance to the effect of short-circuit currents	58
Table 12	– Types and use of cells and batteries	60
Table 13	– Explosion test mixtures	73
Table 14	– Tests for resistance to impact.....	75
Table 15	– Insertion torque and minimum removal torque	75

Table 16 – Power dissipation of cathodes of lamps supplied by electronic ballasts	77
Table 17 – Value for pull-out tests	86
Table 18 – Creepage distances and clearances for screw lamp caps	90
Table 19 – Text of warning markings.....	90
Table 20 – Separation in compound-filled cable sealing boxes.....	40
Table F.1 – Standard cross-sections of copper conductors	103
Table H.1 – Alternative separation distances for equipment under controlled environments	111

iTeh Standards
(<https://standards.itih.ai>)
Document Preview

[IEC 60079-7:2015](#)

<https://standards.itih.ai/catalog/standards/iec/cf863b1c-949b-4ce1-9477-8cf86103dc5b/iec-60079-7-2015>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES –**Part 7: Equipment protection
by increased safety "e"**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This consolidated version of the official IEC Standard and its amendment(s) has been prepared for user convenience.

IEC 60079-7 edition 5.1 contains the fifth edition (2015-06) [documents 31/1182/FDIS and 31/1194/RVD], its interpretation sheet (2016-09), and its amendment 1 (2017-08) [documents 31/1301/CDV and 31/1324/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.