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INTERNATIONAL STANDARD

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

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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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.
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International Standard IEC 60079-7 has been prepared by IEC Technical Committee 31: Equipment for explosive atmospheres.

This fifth edition cancels and replaces the fourth edition published in 2006, and constitutes a technical revision.

The requirements for Type of Protection "nA" have been relocated from IEC 60079-15. To assist the user of this document, the significant changes with respect to the previous edition are shown below in two separate tables, one showing the changes from IEC 60079-7, Edition 4 (2006) for "e" to IEC 60079-7, Edition 5 (2014) for "eb"; and the other showing the changes from IEC 60079-15, Edition 4 (2010) for "nA" to IEC 60079-7, Edition 5 (2014) for "ec".

The significance of the changes between IEC Standard, IEC 60079-7, Edition 5 (2014) (for “eb”) and IEC 60079-7, Edition 4 (2006) (for “e”) are as listed below:

for “e” to “eb”		Type		
Explanation of the significance of the changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
Scope Clarification of applicability Notes added to address short circuits and short-term thermal excursions	1	X		
Clarification of resistance heating definitions	3.13	X		
Addition of terminal insulation material tests	4.2.2.4			C1
Soldered Connections	4.2.2.5 4.2.3.3			C2
Silver-Soldered connections	4.2.3.3	X		
Clarification of “duplicated” contacts	4.2.3.4a)	X		
External plug and socket connections for field wiring connection of batteries	4.2.4	X		
Clarification of conditions for the determination of maximum surface temperature	4.8.1 Table 3	X		
Maximum temperatures for insulated windings	Table 4	X		
Degrees of protection provided by enclosures	4.10.1		x	C3
Clarification of applicability	5.2.1	X		
Minimum air gap for motors	5.2.6	X		
Devices for limiting winding temperature protection	5.2.8.2 5.2.8.3		X	
Permanent magnet motors	5.2.9 6.2.4 9.3.4c)		X	
Added Tungsten-Halogen lamp	5.3.2.2 5.3.2.3 5.3.2.4		X	
Added spacings for < 10 W lamps	5.3.3		X	
Permission added for re-lamping outside of hazardous area	5.3.5.2.2		X	
Added bayonet lamps	5.3.5.4.2		X	
Added contact requirements for bayonet lamps	5.3.5.5		X	
Renaming of “Type” of cells and batteries	5.6.2	X		
Clarification of approaches for general purpose junctions boxes	5.7 6.9 Annex E	X		
Clarified temperature monitoring and control	5.8	X		
Clarification of testing of battery powered luminaires	6.3.1	X		
Clarification of impact tests	6.3.2.2	X		
Added abnormal tests for discharge lamps	6.3.4.1			C4
Added T5 8W	6.3.4.3 Table 16		X	

for “e” to “eb”		Type		
Explanation of the significance of the changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
To maintain T4 temperature class, cathode power or ambient temperature reduced	6.3.4.3 Table 16			C5
Clarification of routine tests for terminal boxes	7.1	X		
Marking of “e” replaced by “eb”	9.1	See “Information about the background of Changes”		
Ex Component enclosures	9.2			C6
Highlight essential documentation for rotating electrical machines	10	X		
Temperature tests	Annex A		X	

The significance of the changes between IEC Standard, IEC 60079-7, Edition 5 (2015) (for “ec”) and IEC 60079-15, Edition 4 (2010) (for “nA”) are as listed below:

for “nA” to “ec”		Type		
Explanation of the significance of the changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
Scope Clarification of applicability Notes added to address short circuits and short-term thermal excursions	1	X		
Clarification of resistance heating definitions	3.13	X		
Soldered Connections	4.2.2.5 4.2.3.3			C7
Silver-Soldered connections	4.2.3.3	X		
Evaluation of pluggable connections	4.2.3.5a)	X		
External plug and socket connections for field wiring connection	4.2.4	X		
Minimum separation distances for encapsulated or solid insulation replaced by requirements for solid insulating materials	4.3 4.4 4.5 Table 2	X		
Alternative separation distances for equipment under controlled environments	4.3 4.4 Annex H		X	
Thermal stability of solid insulating materials	4.6			C8
Clarification of conditions for the determination of maximum surface temperature	4.8.1 Table 3	X		
Maximum temperatures for insulated windings	Table 4	X		
Clarification of applicability	5.2.1	X		
Permanent magnet motors	5.2.9 6.2.4 9.3.4c)		X	
Clarified applicability to handlights and caplights	5.3	X		

for “nA” to “ec”		Type		
Explanation of the significance of the changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
Addition of permitted light sources	5.3.2 Annex J		X	
Added spacings for < 10 W & 100-200 W lamps	5.3.4		X	
Added LED as a light source	5.3.2.5 0		X	
Clarified internal sapcings for LED packages	0	X		
Added spacings for < 10 V lamps	5.3.5.3.2		X	
Clarification of temperature testing	5.3.7	X		
Renaming of “Type” of cells and batteries	5.6.1	X		
Clarification of approaches for general purpose junctions boxes	5.7 6.8 Annex E	X		
Clarified temperature monitoring and control	5.8	X		
Clarification of permitted fuses	5.9.1	X		
Clarification of testing of battery powered luminaires	6.3.1	X		
Addition of end-of-life tests	6.3.4.3.2 Table 16			C9
Dielectric tests based on industrial standards	7.1		X	
Clarification of routine tests for terminal boxes	7.1	X		
Marking of “nA” is replaced by “ec”	9.1	See “Information about the background of Changes”		
Ex Component enclosures	9.2			C10
Highlight essential documentation for rotating electrical machines	10	X		
Temperature tests	Annex A		X	
Alternative separation distances	Annex H	A1		

NOTE The technical changes referred to include the significance of technical changes in the revised IEC Standard, but they do not form an exhaustive list of all modifications from the previous version.

Explanations:

A) Definitions

Minor and editorial changes clarification
decrease of technical requirements
minor technical change
editorial corrections

These are changes which modify requirements in an editorial or a minor technical way. They include changes of the wording to clarify technical requirements without any technical change, or a reduction in level of existing requirement.

Extension addition of technical options

These are changes which add new or modify existing technical requirements, in a way that new options are given, but without increasing requirements for equipment that was fully

compliant with the previous standard. Therefore, these will not have to be considered for products in conformity with the preceding edition.

Major technical changes addition of technical requirements
increase of technical requirements

These are changes to technical requirements (addition, increase of the level or removal) made in a way that a product in conformity with the preceding edition will not always be able to fulfil the requirements given in the later edition. These changes have to be considered for products in conformity with the preceding edition. For these changes additional information is provided in clause B) below.

NOTE These changes represent current technological knowledge. However, these changes should not normally have an influence on equipment already placed on the market.

B) Information about the background of 'Changes

Marking:

Former marking of "nA" has been replaced by marking "ec". Even if the other technical aspects on the product are unchanged and comply with the revised requirements, a change in the marking will be required.

Former marking of "e" has been replaced by marking "eb" . Even if the other technical aspects on the product are unchanged and comply with the revised requirements, a change in the marking will be required.

A1 The text of Annex H for *Alternative separation distances for Level of Protection "ec" equipment under controlled environments* has been reorganized and clarified from Clause 13 of IEC 60079-15, Ed 4; to facilitate consistent application of the requirements. The title has been revised to remove "low power" as power is not relevent for insulation coordination in accordance with IEC 60664-1. Although a clarification, it is recognized that some existing equipment may not meet the clarified requirement.

C1 The terminal insulating materials are now subjected to the same tests as rail-mounted terminals as a failure of the material presents the same hazard.

C2 Although a clarification, it is recognized that some existing equipment will not meet the clarified requirement. The requirements for soldered connections were revised to specify that mechanical support of the connection was required in addition to the solder. It is not a requirement that the connection function electrically in the absence of the solder.

C3 Ingress protection requirements for Group I increased from IP20 to IP23 for consistency with the remainder of the document.

C4 Added abnormal tests for discharge lamps.

C5 Based on further research, maintaining temperature class T4, under conditions of end-of-life, requires either the cathode power or the ambient temperature be reduced.

C6 Requirements for Ex Component "e" enclosures introduced based on those for Ex Component "d" enclosures. Even if the other technical aspects on the product are unchanged and comply with the revised requirements, a change in the marking will be required.

C7 Although a clarification, it is recognized that some existing equipment may not meet the clarified requirement. The requirements for soldered connections were revised to specify that mechanical support of the connection was required in addition to the solder. It is not a requirement that the connection function electrically in the absence of the solder.

C8 Requirements added for the use of solid insulating materials within the limits of their thermal stability.

C9 Based on further research, requirements for T5 lamps added.

C10 Requirements for Ex Component “e” enclosures introduced based on those for Ex Component “d” enclosures. Even if the other technical aspects on the product are unchanged and comply with the revised requirements, a change in the marking will be required.

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

FDIS	Report on voting
31/1182/FDIS	31/1194/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.

A list of all parts of IEC 60079 series, under the general title *Explosive atmospheres*, can be found on the IEC website.

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.

A bilingual version of this publication may be issued at a later date.

EXPLOSIVE ATMOSPHERES –

Part 7: Equipment protection by increased safety "e"

1 Scope

This part of IEC 60079 specifies the requirements for the design, construction, testing and marking of electrical equipment and Ex Components with type of protection increased safety “e” intended for use in explosive gas atmospheres.

Electrical equipment and Ex Components of type of protection increased safety “e” are either:

a) Level of Protection “eb” (EPL “Mb” or “Gb”); or

b) Level of Protection “ec” (EPL “Gc”)

Level of Protection “eb” applies to equipment or Ex Components, including their connections, conductors, windings, lamps, and batteries; but not including semiconductors or electrolytic capacitors.

NOTE 1 The use of electronic components, such as semiconductors or electrolytic capacitors, is excluded from Level of Protection “eb” as expected malfunctions could result in excessive temperatures or arcs and sparks if the internal separation distances were not applied. It is not generally practical to maintain those separation distances and maintain the function of the electronic component.

Level of Protection “ec” applies to equipment or Ex Components, including their connections, conductors, windings, lamps, and batteries; and also including semiconductors and electrolytic capacitors.

NOTE 2 The use of electronic components, such as semiconductors or electrolytic capacitors, is permitted in Level of Protection “ec” as these are evaluated under both normal conditions and regular expected occurrences, and are not likely to result in excessive temperatures or arcs and sparks. As the requirements for separation distances are not applied to the internal construction, commercially available electronic components are generally suitable if the external separation distances comply.

The requirements of this standard apply to both Levels of Protection unless otherwise stated.

For Level of Protection “eb”, this standard applies to electrical equipment where the rated voltage does not exceed 11 kV r.m.s., a.c. or d.c.

For Level of Protection “ec”, this standard applies to electrical equipment where the rated voltage does not exceed 15 kV r.m.s., a.c. or d.c.

NOTE 3 Short circuit currents flowing through increased safety connections of mains circuits are not considered to create a significant risk of ignition of an explosive gas atmosphere due to movement of connections as a result of mechanical stresses created by the short circuit current. Normal industrial standards require that the effects of short time high currents on the security of connections be considered. The presence of the explosive gas atmosphere does not adversely affect the security of the connection.

NOTE 4 Any short term thermal excursions that occur as a result of electrical current excursions above normal rated currents, such as those that occur during the starting of motors, are not considered to create a significant risk of ignition of an explosive gas atmosphere due to the relatively short duration of the event and the convection that occurs during the event.

NOTE 5 High-voltage connections and associated wiring (above 1 kV) can be susceptible to increased partial discharge activity that could be a source of ignition. Increased spacings to earthed surfaces or other connections and provision of suitable high-voltage stress relief for the terminations are typically provided.