



# INTERNATIONAL STANDARD

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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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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 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.

## 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 .....	36
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 .....	39
5.2.6 Minimum air gap .....	39
5.2.7 Rotating electrical machines with cage rotors .....	40
5.2.8 Limiting temperature .....	42
5.2.9 Machines with permanent magnet rotors .....	45
5.2.10 Stator winding insulation system.....	45
5.2.11 Supplemental winding requirements Level of Protection “eb” .....	46

5.2.12	Bearing seals and shaft seals .....	46
5.2.13	Neutral point connections .....	47
5.3	Luminaires, hand lights, or caplights .....	47
5.3.1	General .....	47
5.3.2	Light source.....	48
5.3.3	Minimum distance between lamp and protective cover .....	49
5.3.4	Electrical spacings.....	49
5.3.5	Lampholders and lamp caps .....	50
5.3.6	Auxiliaries for Luminaires in Level of Protection “ec”.....	53
5.3.7	Surface temperatures .....	54
5.3.8	Limiting temperatures .....	55
5.3.9	Luminaires for tubular fluorescent bi-pin lamps .....	55
5.3.10	Tests for resistance to impact.....	56
5.4	Analog measuring instruments and instrument transformers .....	56
5.4.1	General .....	56
5.4.2	Limiting temperature .....	56
5.4.3	Short-circuit currents .....	56
5.4.4	Short time thermal current .....	57
5.4.5	Measuring instruments supplied by current transformers .....	57
5.4.6	Moving coils .....	57
5.4.7	External secondary circuits.....	57
5.5	Transformers other than instrument transformers.....	57
5.6	Supplementary requirements for equipment incorporating cells and batteries.....	58
5.6.1	Type of cells and batteries.....	58
5.6.2	Requirements for cells and batteries ≤25 Ah.....	59
5.6.3	Requirements for valve-regulated or vented cells or batteries >25 Ah .....	62
5.6.4	Charging of cells and batteries .....	65
5.7	General purpose connection and junction boxes .....	66
5.8	Resistance heating equipment (other than trace heating systems) .....	66
5.8.1	General .....	66
5.8.2	Heating resistors .....	66
5.8.3	Temperature coefficient .....	67
5.8.4	Insulating material .....	67
5.8.5	Cold-start current.....	67
5.8.6	Electrical safety device .....	67
5.8.7	Electrically conductive covering .....	67
5.8.8	Exclusion of explosive atmosphere .....	68
5.8.9	Conductor cross-section .....	68
5.8.10	Limiting temperature .....	68
5.8.11	Safety device.....	68
5.9	Supplementary requirements for fuses .....	69
5.9.1	General .....	69
5.9.2	Temperature class of equipment.....	70
5.9.3	Fuse mounting.....	70
5.9.4	Fuse enclosures .....	70
5.9.5	Replacement fuse identification .....	70
5.10	Other electrical equipment .....	70
6	Type verifications and type tests.....	70
6.1	Dielectric strength.....	70

6.2	Rotating electrical machines .....	71
6.2.1	Determination of starting current ratio $I_A/ I_N$ and the time $t_E$ .....	71
6.2.2	Mounting of machine for test.....	71
6.2.3	Additional tests for machines .....	71
6.2.4	Overspeed test of cemented magnets .....	73
6.3	Luminaires .....	73
6.3.1	Battery operated luminaires .....	73
6.3.2	Impact and drop tests .....	73
6.3.3	Mechanical tests for screw lampholders other than E10.....	74
6.3.4	Abnormal operation of luminaires .....	75
6.3.5	Sulphur dioxide test for Level of Protection “eb” for the connection of bi-pin lamp caps to lampholders .....	76
6.3.6	Vibration test for Level of Protection “eb” for luminaires with bi-pin lamps .....	77
6.3.7	Test for wiring of luminaires subject to high-voltage impulses from ignitors .....	78
6.3.8	Tests for electronic starters for tubular fluorescent lamps and for ignitors in Level of Protection “ec” for discharge lamps .....	78
6.3.9	Test for starter holders for luminaires in Level of Protection “ec” .....	79
6.4	Measuring instruments and instrument transformers .....	79
6.5	Transformers other than instrument transformers.....	80
6.6	Verification and tests for cells and batteries of Level of Protection “eb” .....	80
6.6.1	General .....	80
6.6.2	Insulation resistance .....	80
6.6.3	Mechanical shock test .....	80
6.6.4	Test for ventilation of Level of Protection “eb” battery container.....	81
6.7	Verification and tests for cells and batteries of Level of Protection “ec” .....	82
6.7.1	General .....	82
6.7.2	Insulation resistance .....	82
6.7.3	Mechanical shock test .....	82
6.7.4	Test for ventilation of Level of Protection “ec” battery container.....	82
6.8	General purpose connection and junction boxes .....	83
6.8.1	General .....	83
6.8.2	Maximum dissipated power method .....	83
6.8.3	Defined arrangement method.....	83
6.9	Resistance heating equipment .....	83
6.10	Terminal insulating material tests.....	84
7	Routine verifications and routine tests .....	85
7.1	Dielectric tests .....	85
7.2	Dielectric tests for batteries .....	86
7.3	Inter-turn overvoltage tests .....	86
8	Ex Component certificates .....	86
8.1	General.....	86
8.2	Terminals.....	86
9	Marking and instructions.....	87
9.1	General marking .....	87
9.2	Ex Component enclosures .....	88
9.3	Instructions for use .....	88
9.3.1	Battery operated equipment.....	88

9.3.2	Terminals .....	88
9.3.3	Luminaires.....	88
9.3.4	Machines.....	89
9.4	Warning markings .....	89
10	Documentation .....	90
Annex A (normative) Temperature determination of electrical machines – Methods of test and of calculation.....		91
A.1	General.....	91
A.2	Determination of maximum service temperatures .....	91
A.2.1	Rotor temperature – normal operation .....	91
A.2.2	Winding temperature – normal operation .....	91
A.3	Determination of maximum surface temperatures.....	92
A.3.1	General .....	92
A.3.2	Locked rotor tests .....	92
A.4	Optional calculation of maximum surface temperature .....	93
A.4.1	General .....	93
A.4.2	Rotor temperature .....	93
A.4.3	Stator temperature.....	93
A.5	Determination of $t_E$ time .....	93
A.6	Arduous starting conditions.....	94
A.7	Motors operated with a converter .....	94
Annex B (normative) Type tests for specific forms of resistance heating devices or resistance heating units (other than trace heater) .....		95
B.1	Resistance heating devices subjected to mechanical stresses .....	95
B.2	Resistance heating devices or units intended for immersion.....	95
B.3	Resistance heating devices or units having hygroscopic insulating material.....	95
B.4	Verification of limiting temperature of resistance heating devices (other than trace heaters) .....	95
B.4.1	General .....	95
B.4.2	Safety devices .....	95
B.4.3	Resistance heating unit of stabilized design.....	96
B.4.4	Heating device with temperature self-limiting characteristic .....	96
Annex C (informative) Cage motors – Thermal protection in service.....		97
Annex D (informative) Resistance heating devices and units – Additional electrical protection .....		98
D.1	Objective .....	98
D.2	Method of protection .....	98
Annex E (informative) Combinations of terminals and conductors for general purpose connection and junction boxes.....		99
E.1	General.....	99
E.2	Maximum dissipated power method.....	99
E.3	Defined arrangement method .....	99
Annex F (normative) Dimensions of copper conductors.....		102
Annex G (normative) Test procedure for T5 (only 8 W), T8, T10 and T12 lamps.....		103
G.1	Asymmetric pulse test.....	103
G.1.1	General .....	103
G.1.2	Test procedure .....	103
G.2	Asymmetric power test.....	104
G.2.1	General .....	104

G.2.2	Test procedure .....	105
Annex H (normative)	Alternative separation distances for Level of Protection “ec” equipment under controlled environments.....	108
H.1	General.....	108
H.2	Specific Conditions of Use .....	108
H.3	Control of pollution access .....	109
H.4	Voltage limitation .....	109
H.5	Control of overvoltages and transient protection .....	109
H.6	Alternative separation distances .....	109
Annex I (informative)	Application, installation, and testing considerations for Level of Protection “ec” asynchronous machines.....	111
I.1	Surface temperature .....	111
I.2	Starting.....	111
I.3	Rated voltage and surface discharges .....	112
Annex J (informative)	Luminaires incorporating LEDs .....	113
J.1	LEDs for EPL Gb .....	113
J.2	LEDs for EPL Gc.....	113
Bibliography.....		114
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 $I_A/I_N$ .....		43
Figure 3 – Arrangement for the luminaire vibration test.....		77
Figure A.1 – Diagram illustrating the determination of time $t_E$ .....		94
Figure E.1 – Example of defined terminal/conductor arrangement table .....		101
Figure G.1 – Asymmetric pulse test circuit .....		104
Figure G.2 – Asymmetric power detection circuit.....		106
Figure G.3 – Flow Chart – Asymmetric power Test for T8, T10, T12 and T5 (8 W lamps) .....		107
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.....		42
Table 6 – Stator insulation system tests of Level of Protection “ec” machines .....		46
Table 7 – Assumed voltage of neutral points.....		47
Table 8 – Minimum distance between lamp and protective cover .....		49
Table 9 – Creepage distances and clearances at peak values of pulse voltages greater than 1,5 kV .....		50
Table 10 – Creepage distances and clearances for screw lampholder and lamp cap.....		51
Table 11 – Resistance to the effect of short-circuit currents .....		57
Table 12 – Types and use of cells and batteries .....		59
Table 13 – Explosion test mixtures .....		72
Table 14 – Tests for resistance to impact.....		74
Table 15 – Insertion torque and minimum removal torque .....		74



Table 16 – Power dissipation of cathodes of lamps supplied by electronic ballasts .....	76
Table 17 – Value for pull-out tests .....	85
Table 18 – Creepage distances and clearances for screw lamp caps .....	89
Table 19 – Text of warning markings.....	89
Table F.1 – Standard cross-sections of copper conductors .....	102
Table H.1 – Alternative separation distances for equipment under controlled environments .....	110

## 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.
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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 5.3.4.3		X	
Clarified internal spacings for LED packages	5.3.4.3	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 relevant 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.

The contents of the interpretation sheet of September 2016 have been included in this copy.

## 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.



This standard supplements and modifies the general requirements of IEC 60079-0. Where a requirement of this standard conflicts with a requirement of IEC 60079-0, the requirement of this standard takes precedence.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60034-1, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60044-6, *Instrument transformers – Part 6: Requirements for protective current transformers for transient performance*

IEC 60061-1, *Lamp caps and holders together with gauges for the control of interchangeability and safety. Part 1: Lamp caps*

IEC 60061-2, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 2: Lampholders*

IEC 60064, *Tungsten filament lamps for domestic and similar general lighting purposes – Performance requirements*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-42, *Environmental testing – Part 2-42: Tests – Test Kc: Sulphur dioxide test for contacts and connections*

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-1, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d"*

IEC 60079-11, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"*

IEC 60079-30-1, *Explosive atmospheres – Part 30-1: Electrical resistance trace heating – General and testing requirements*

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

IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

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

IEC 60216-2, *Electrical insulating materials – Thermal endurance properties – Part 2: Determination of thermal endurance properties of electrical insulating materials – Choice of test criteria*

IEC 60228, *Conductors of insulated cables*

IEC 60238, *Edison screw lampholders*

IEC 60317-3:2004, *Specifications for particular types of winding wires – Part 3: Polyester enamelled round copper wire, class 155*

IEC 60317-3:2004/AMD1:2010

IEC 60317-8, *Specifications for particular types of winding wires – Part 8: Polyesterimide enamelled round copper wire, class 180*

IEC 60317-13, *Specifications for particular types of winding wires – Part 13: Polyester or polyesterimide overcoated with polyamide-imide enamelled round copper wire, class 200*

IEC 60317-46, *Specifications for particular types of winding wires – Part 46: Aromatic polyimide enamelled round copper wire, class 240*

IEC 60400, *Lampholders for tubular fluorescent lamps and starterholders*

IEC 60432-1, *Incandescent lamps – Safety specifications – Part 1: Tungsten filament lamps for domestic and similar general lighting purposes*

IEC 60432-2, *Incandescent lamps – Safety specifications – Part 2: Tungsten halogen lamps for domestic and similar general lighting purposes*

IEC 60432-3, *Incandescent lamps – Safety specifications – Part 3: Tungsten halogen lamps (non-vehicle)*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60598-1, *Luminaires – Part 1: General requirements and tests*

IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60947-1, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-7-1, *Low-voltage switchgear and controlgear – Part 7-1: Ancillary equipment – Terminal blocks for copper conductors*

IEC 60947-7-2, *Low-voltage switchgear and controlgear – Part 7-2: Ancillary equipment – Protective conductor terminal blocks for copper conductors*

IEC 60947-7-4, *Low-voltage switchgear and controlgear – Part 7-4: Ancillary equipment – PCB terminal blocks for copper conductors*

IEC 60998-2-4, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-4: Particular requirements for twist-on connecting devices*

IEC 60999-1, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm<sup>2</sup> up to 35 mm<sup>2</sup> (included)*

IEC 60999-2, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 2: Particular requirements for clamping units for conductors above 35 mm<sup>2</sup> up to 300 mm<sup>2</sup> (included)*

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– 17 –

IEC 61184, *Bayonet lampholders*

IEC 61195, *Double-capped fluorescent lamps – Safety specifications*

IEC 61347-1, *Lamp controlgear – Part 1: General and safety requirements*

IEC 61347-2-3, *Lamp control gear – Part 2-3: Particular requirements for a.c. and/or d.c. supplied electronic control gear for fluorescent lamps*

IEC 62035, *Discharge lamps (excluding fluorescent lamps) – Safety specifications*

ISO 2859-1, *Sampling procedures for inspection by attributes – Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 527-2, *Plastics – Determination of tensile properties – Part 2: Test conditions for moulding and extrusion plastics*

ISO 178, *Plastics – Determination of flexural properties*