

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Explosive atmospheres –
Part 0: Equipment – General requirements**

**Atmosphères explosives –
Partie 0: Matériel – Exigences générales**

This is a preview. [Click here to purchase the full publication.](#)



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

A bout 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 corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

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 also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions 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

65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

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: csc@iec.ch.

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.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

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 aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions 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

65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

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

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Explosive atmospheres –
Part 0: Equipment – General requirements**

**Atmosphères explosives –
Partie 0: Matériel – Exigences générales**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.260.20

ISBN 978-2-8322-5065-5

**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.**

CONTENTS

FOREWORD	8
1 Scope	15
2 Normative references	16
3 Terms and definitions	18
4 Equipment grouping	36
4.1 General	36
4.2 Group I	36
4.3 Group II	36
4.4 Group III	36
4.5 Equipment for a particular explosive gas atmosphere	37
5 Temperatures	37
5.1 Environmental influences	37
5.1.1 Ambient temperature	37
5.1.2 External source of heating or cooling	37
5.2 Service temperature	37
5.3 Maximum surface temperature	38
5.3.1 Determination of maximum surface temperature	38
5.3.2 Limitation of maximum surface temperature	38
5.3.3 Small component temperature for Group I or Group II electrical equipment	39
5.3.4 Component temperature of smooth surfaces for Group I or Group II electrical equipment	40
6 Requirements for all equipment	41
6.1 General	41
6.2 Mechanical strength of equipment	41
6.3 Opening times	41
6.4 Circulating currents in enclosures (e.g. of large electric machines)	42
6.5 Gasket retention	42
6.6 Electromagnetic and ultrasonic energy radiating equipment	42
6.6.1 General	42
6.6.2 Radio frequency sources	42
6.6.3 Ultrasonic sources	43
6.6.4 Lasers, luminaires, and other non-divergent continuous wave optical sources	44
7 Non-metallic enclosures and non-metallic parts of enclosures	44
7.1 General	44
7.1.1 Applicability	44
7.1.2 Specification of materials	44
7.2 Thermal endurance	45
7.2.1 Tests for thermal endurance	45
7.2.2 Material selection	46
7.2.3 Alternative qualification of elastomeric sealing O-rings	46
7.3 Resistance to ultraviolet light	46
7.4 Electrostatic charges on external non-metallic materials	47
7.4.1 Applicability	47
7.4.2 Avoidance of a build-up of electrostatic charge for Group I or Group II	47

7.4.3	Avoidance of a build-up of electrostatic charge for Group III	49
7.5	Attached external conductive parts	50
8	Metallic enclosures and metallic parts of enclosures	51
8.1	Material composition	51
8.2	Group I	51
8.3	Group II	51
8.4	Group III	52
8.5	Copper Alloys	52
9	Fasteners	52
9.1	General.....	52
9.2	Special fasteners	53
9.3	Holes for special fasteners.....	53
9.3.1	Thread engagement.....	53
9.3.2	Tolerance and clearance	53
9.4	Hexagon socket set screws.....	54
10	Interlocking devices	54
11	Bushings	54
12	(Reserved for future use).....	54
13	Ex Components	54
13.1	General.....	54
13.2	Mounting.....	55
13.3	Internal mounting	55
13.4	External mounting	55
13.5	Ex Component certificate	55
14	Connection facilities	55
14.1	General.....	55
14.2	Type of protection	56
14.3	Creepage and clearance	56
15	Connection facilities for earthing or bonding conductors	56
15.1	Equipment requiring earthing or bonding	56
15.1.1	Internal earthing	56
15.1.2	External bonding.....	56
15.2	Equipment not requiring earthing	56
15.3	Size of protective earthing conductor connection	56
15.4	Size of equipotential bonding conductor connection	57
15.5	Protection against corrosion.....	57
15.6	Secureness of electrical connections	57
15.7	Internal earth continuity plate	57
16	Entries into enclosures	57
16.1	General.....	57
16.2	Identification of entries.....	57
16.3	Cable glands.....	58
16.4	Blanking elements.....	58
16.5	Thread adapters	58
16.6	Temperature at branching point and entry point	59
16.7	Electrostatic charges of cable sheaths	59
17	Supplementary requirements for electric machines	60
17.1	General.....	60

17.2	Ventilation.....	60
17.2.1	Ventilation openings	60
17.2.2	Materials for external fans	60
17.2.3	Cooling fans of rotating electric machines.....	60
17.2.4	Auxiliary motor cooling fans.....	61
17.2.5	Room ventilating fans	61
17.3	Bearings	62
18	Supplementary requirements for switchgear	62
18.1	Flammable dielectric	62
18.2	Disconnectors	62
18.3	Group I – Provisions for locking	63
18.4	Doors and covers.....	63
19	Reserved for future use	63
20	Supplementary requirements for external plugs, socket outlets and connectors for field wiring connection	63
20.1	General.....	63
20.2	Explosive gas atmospheres	64
20.3	Explosive dust atmospheres	64
20.4	Energized plugs	64
21	Supplementary requirements for luminaires	64
21.1	General.....	64
21.2	Covers for luminaires of EPL Mb, EPL Gb, or EPL Db	64
21.3	Covers for luminaires of EPL Gc or EPL Dc	65
21.4	Sodium lamps	65
22	Supplementary requirements for caplights and handlights	65
22.1	Group I caplights	65
22.2	Group II and Group III caplights and handlights	65
23	Equipment incorporating cells and batteries.....	66
23.1	General.....	66
23.2	Interconnection of cells to form batteries	66
23.3	Cell types.....	66
23.4	Cells in a battery.....	69
23.5	Ratings of batteries.....	69
23.6	Interchangeability	69
23.7	Charging of primary batteries	69
23.8	Leakage.....	69
23.9	Connections.....	69
23.10	Orientation.....	69
23.11	Replacement of cells or batteries	69
23.12	Replaceable battery pack.....	70
24	Documentation	70
25	Compliance of prototype or sample with documents.....	70
26	Type tests	70
26.1	General.....	70
26.2	Test configuration	70
26.3	Tests in explosive test mixtures	70
26.4	Tests of enclosures.....	71
26.4.1	Order of tests	71

26.4.2	Resistance to impact	73
26.4.3	Drop test	74
26.4.4	Acceptance criteria	75
26.4.5	Degree of protection (IP) by enclosures	75
26.5	Thermal tests	76
26.5.1	Temperature measurement	76
26.5.2	Thermal shock test	78
26.5.3	Small component ignition test (Group I and Group II)	78
26.6	Torque test for bushings	79
26.6.1	Test procedure	79
26.6.2	Acceptance criteria	80
26.7	Non-metallic enclosures or non-metallic parts of enclosures	80
26.7.1	General	80
26.7.2	Test temperatures	80
26.8	Thermal endurance to heat	80
26.9	Thermal endurance to cold	81
26.10	Resistance to UV light	81
26.10.1	General	81
26.10.2	Light exposure	82
26.10.3	Acceptance criteria	82
26.11	Resistance to chemical agents for Group I equipment	82
26.12	Earth continuity	83
26.13	Surface resistance test of parts of enclosures of non-metallic materials	84
26.14	Measurement of capacitance	85
26.14.1	General	85
26.14.2	Test procedure	85
26.15	Verification of ratings of ventilating fans	86
26.16	Alternative qualification of elastomeric sealing O-rings	86
26.17	Transferred charge test	86
26.17.1	Test equipment	86
26.17.2	Test sample	87
26.17.3	Test procedure	87
27	Routine tests	88
28	Manufacturer's responsibility	88
28.1	Conformity with the documentation	88
28.2	Certificate	89
28.3	Responsibility for marking	89
29	Marking	89
29.1	Applicability	89
29.2	Location	89
29.3	General	89
29.4	Ex marking for explosive gas atmospheres	90
29.5	Ex marking for explosive dust atmospheres	92
29.6	Combined types (or levels) of protection	95
29.7	Multiple types of protection	95
29.8	Ga equipment using two independent Gb types (or levels) of protection	95
29.9	Boundary wall	95
29.10	Ex Components	95
29.11	Small Ex Equipment and small Ex Components	96

29.12	Extremely small Ex Equipment and extremely small Ex Components	96
29.13	Warning markings	96
29.14	Cells and batteries	97
29.15	Electric machines operated with a converter	97
29.16	Examples of marking.....	98
30	Instructions.....	101
30.1	General.....	101
30.2	Cells and batteries	102
30.3	Electric machines.....	103
30.4	Ventilating fans	103
30.5	Cable glands.....	104
Annex A	(normative) Supplementary requirements for cable glands	105
A.1	General.....	105
A.2	Constructional requirements	105
A.2.1	Cable sealing.....	105
A.2.2	Filling compounds.....	106
A.2.3	Clamping	106
A.2.4	Lead-in of cable	106
A.2.5	Release by a tool.....	107
A.2.6	Fixing	107
A.2.7	Degree of protection	107
A.3	Type tests.....	107
A.3.1	Tests of clamping of non-armoured and braided cables	107
A.3.2	Tests of clamping of armoured cables.....	110
A.3.3	Type test for resistance to impact	111
A.3.4	Test for degree of protection (IP) of cable glands	112
A.4	Marking.....	113
A.4.1	Marking of cable glands.....	113
A.4.2	Identification of cable-sealing rings.....	113
A.5	Instructions	113
Annex B	(normative) Requirements for Ex Components	115
Annex C	(informative) Example of rig for resistance to impact test	118
Annex D	(informative) Electric machines connected to converters.....	119
Annex E	(informative) Temperature evaluation of electric machines.....	120
Annex F	(informative) Guidance flowchart for tests of non-metallic enclosures or non-metallic parts of enclosures (26.4)	123
Annex G	(informative) Guidance flowchart for tests of cable glands	124
Annex H	(informative) Shaft voltages resulting in motor bearing or shaft brush sparking Discharge energy calculation	125
H.1	General.....	125
H.2	Assessment of the risk of ignition using ignition energy calculation	125
H.3	Shaft voltage determination for a rotating machine.....	126
H.4	Capacitance “C” calculation for a rotating machine	126
H.5	Energy “E” calculation for a rotating machine	129
H.6	Assessment using reference curves	129
Bibliography		131

Figure 1	– Typical battery examples.....	20
----------	---------------------------------	----

Figure 2 – Typical battery compartment	21
Figure 3 – Typical replaceable battery pack	22
Figure 4 – Tolerances and clearance for threaded fasteners	53
Figure 5 – Contact surface under head of fastener with a reduced shank	54
Figure 6 – Cable gland	59
Figure 7 – Conduit entry	59
Figure 8 – Assembly of test sample for earth-continuity test	84
Figure 9 – Test piece with painted electrodes	85
Figure 10 – Compression set of an O-ring	86
Figure A.1 – Illustration of the terms used for cable glands	106
Figure A.2 – Rounded edge of the point of entry of the flexible cable	107
Figure A.3 – Example of rig for resistance to impact test	112
Figure C.1 – Example of rig for resistance to impact test	118
Figure F.1 – Non-metallic enclosures or non-metallic parts of enclosures	123
Figure H.1 – Capacitance stored in bearing clearance of sleeve bearing Between journal and outer bearing housing	128
Figure H.2 – Air-gap between stator and rotor	128
Figure H.3 – Typical surfaces that form capacitors from the motor shaft to ground	129
Figure H.4 – Capacitive ignition curves	130
Table 1 – Ambient temperatures in service and additional marking	37
Table 2 – Classification of maximum surface temperatures for Group II electrical equipment	38
Table 3 – Assessment of temperature classification according to component size	40
Table 4 – Assessment of temperature classification Component surface area $\geq 20 \text{ mm}^2$	40
Table 5 – Threshold power	43
Table 6 – Threshold energy	43
Table 7 – Limitation of surface areas	48
Table 8 – Maximum diameter or width	49
Table 9 – Limitation of thickness of non-metallic layer	49
Table 10 – Maximum acceptable transferred charge	49
Table 11 – Maximum capacitance of unearthed conductive parts	51
Table 12 – Minimum cross-sectional area of PE conductors	57
Table 13 – Primary cells	66
Table 14 – Secondary cells	68
Table 15 – Tests for resistance to impact	74
Table 16 – Torque to be applied to the stem of bushing used for connection facilities	79
Table 17 – Thermal endurance test	80
Table 18 – Text of warning markings	97
Table 19 – Example of type-test converter parameters	103
Table B.1 – Applicability of clauses to Ex Components	115
Table H.1 – Maximum permitted energy	126

INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES –

Part 0: Equipment – General requirements

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.

International Standard IEC 60079-0 has been prepared by IEC technical committee 31: Equipment for explosive atmospheres.

This seventh edition cancels and replaces the sixth edition, published in 2011. This edition constitutes a technical revision.

The significance of the changes between IEC Standard, IEC 60079-0, Edition 6 (2011) and IEC 60079-0, Edition 7 (2017) are as listed below:

Explanation of the significance of the changes	Clause	Type		
		Minor and editorial changes	Extension	Major technical changes
Throughout document, “electrical equipment” replaced by “equipment” where appropriate.	Multiple	X		
Scope List of “Type of “Protection” and “Product” standards combined into one list.	1	X		
Definitions used in multiple sub-parts added. Definitions harmonized across sub-parts and added to 60079-0 where appropriate. Battery definitions updated	3	X		
Clarification of the way that information on process temperature influences can be expressed.	5.1.2	X		
Clarification regarding the determination of service temperatures when dust layers are present	5.2	X		
Clarification on the need to provide service temperature information for Ex Components in the Schedule of Limitations	5.2	X		
Relocation of EPL Da dust layer requirements from IEC 60079-18 & IEC 60079-31	5.3.2.3.1	A1		
Clarified that for EPL Db, a maximum specified dust layer of greater than 200 mm is not permitted as thicker layers have no additional effect on maximum surface temperature.	b)	X		
Added for EPL Db, a dust layer in a specified orientation, marked as T_L	c)		X	
Clarified that for EPL Dc, no dust layer tests are required.	5.3.2.3.3	X		
Clarified that the “temperature” is the temperature of the air surrounding the component	5.3.3	X		
Subdivided section dealing with higher permitted surface temperatures for “smooth” surfaces. Corrected area from 1 000 mm ² to 10 000 mm ² .	5.3.4	X		
Clarified that the “Ex” requirements of IEC 60079 supplement those of the relevant industrial standards.	6.1	X		
Added requirement that where an adhesive is used to secure a gasket, it shall be used within its COT and shall comply with the requirements for cements.	6.5			C1
Requirements relocated to IEC 60079-28	former 6.6.2	A2		
Ultrasonic requirements updated based on latest research work	6.6.3		X	
Added reference to IEC 60079-28	6.6.4	A2		
Material identification parameters have been revised to reflect reasonably obtainable information	7.1.2.2	X		
“RTI-mechanical” has been clarified to include “RTI-mechanical strength” and “RTI-mechanical impact”	7.1.2.2	X		
Material identification parameters have been revised to reflect reasonably obtainable information	7.1.2.3	X		
Relocated information on “cements” from Clause 12.	7.1.2.4	X		
“RTI-mechanical” has been clarified to include “RTI-mechanical strength” and “RTI-mechanical impact”. Requirements for cements aligned with the requirements for elastomers.	7.2.2	X		