UL 60079-11

STANDARD FOR SAFETY

Explosive Atmospheres – Part 11: Equipment Protection by Intrinsic Safety "i"

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UL Standard for Safety for Explosive Atmospheres – Part 11: Equipment Protection by Intrinsic Safety “i”, UL 60079-11

Sixth Edition, Dated February 15, 2013

Summary of Topics

This revision to ANSI/UL 60079-11 is an adoption of IEC 60079-11, the Standard for Safety for Explosive Atmospheres – Part 11: Equipment Protection by Intrinsic Safety ″i″, is being issued to incorporate the following:

Harmonization of Annex DVI of UL 60079-11 with IEC ISH3:2016 of IEC 60079-11:2011

As noted in the Commitment for Amendments statement located on the back side of the title page, UL and ISA are committed to updating this bi-national standard jointly. However, the revision pages dated September 14, 2018 will not be issued by ISA as revision pages but as an update to their standard.

Text that has been changed in any manner or impacted by UL’s electronic publishing system is marked with a vertical line in the margin.

The new requirements are substantially in accordance with Proposal(s) on this subject dated April 20, 2018.

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ANSI/UL 60079-11
Sixth Edition

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ANSI/UL 60079-11-2018

Commitment for Amendments

This standard is issued jointly by ISA and Underwriters Laboratories Incorporated (UL). Comments or proposals for revisions on any part of this standard may be submitted to ISA or UL at any time. Revisions to this standard will be made only after processing according to the standards development procedures of ISA and UL. ***ISA and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.***

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The most recent designation of ANSI/ISA 60079-11 as an American National Standard (ANSI) occurred on September 14, 2018.

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This ANSI/UL Standard for Safety consists of the Sixth edition including revisions through September 14, 2018.

The most recent designation of ANSI/UL 60079-11 as an American National Standard (ANSI) occurred on September 14, 2018. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface. The National Difference Page and IEC Foreword are also excluded from the ANSI approval of IEC-based standards.

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General Notes

This is the common ISA and UL Standard for Explosive Atmospheres – Part 11: Equipment Protection by Intrinsic Safety "i". It is edition 6.2 of ANSI/ISA-60079-11 and edition 6 of ANSI/UL 60079-11. This document is a modification of the IEC document and includes US deviations encompassing both additions and deletions of information.

ANSI/ISA 60079-11 and ANSI/UL 60079-11 contain identical requirements, and the identical publication dates. The presentation and format of the standards material may differ between the two published standards.

This common standard was prepared by ISA and Underwriters Laboratories Inc. (UL).

Note: Although the intended primary application of this standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

Level of harmonization

This standard adopts the IEC text with deviations.

The requirements are presented in different formats. The ISA version of the standard illustrates the national differences from the IEC text through the use of legislative text (strike-out and underline). The UL version of the standard illustrates national differences immediately following the IEC text. National differences between the UL version and the ISA version shall be word for word except for editorial changes.

Interpretations

The interpretation by the SDO of an identical or equivalent standard shall be based on the literal text to determine compliance with the standard in accordance with the procedural rules of the SDO. If more than one interpretation of the literal text has been identified, a revision shall be proposed as soon as possible to each of the SDOs to more accurately reflect the intent.

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Preface (ISA)

This ISA standard is based on the Sixth edition of IEC Publication 60079-11 including Corrigendum 1. It is the intention of the ISA12 Committee to develop an ANSI Standard that is harmonized with IEC 60079-11 to the fullest extent possible. This preface is included for informational purposes and is not part of ISA 60079-11. The document is a modification of the IEC document and includes U.S. deviations encompassing both additions and deletions of information.

The entire text of IEC 60079-11:2011 is included in this document including Corrigendum 1. U.S. National Deviations are shown by strikeout through deleted text and underlining of added text. Tables, or portions of tables, that are to be deleted are shown as shaded; figures to be deleted are marked with the overlay ″X.″ Some tables have been reformatted to allow for US standard paper sizes. There are ten annexes in this standard. Annexes A, B, D, F and G are normative and form part of the requirements of this standard. Annexes C, E, H, I and J are informative and are not considered part of this standard.

The significant changes with respect to the previous edition are listed below:

- Inclusion of non-edition specific references to ANSI/ISA 60079-0.
- The merging of the apparatus requirements for FISCO from ANSI/ISA 60079-27.
- The merging of the requirements for combustible dust atmospheres from ANSI/ISA 61241-11.
- Clarification of the requirements for accessories connected to intrinsically safe apparatus; such as chargers and data loggers.
- Addition of new test requirements for opto-isolators.
- Introduction of Annex H about ignition testing of semiconductor limiting power supply circuits.
- Clarification of the spacing requirements applicable to protective fuses.

The standards referenced within this document may contain provisions which, through reference in this text, constitute requirements of this document. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this document are encouraged to investigate the possibility of applying the most recent editions of the standards indicated within this document. Members of IEC and ISO maintain registers of currently valid International Standards. ANSI maintain registers of currently valid U.S. National Standards.

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National Differences from the text of International Electrotechnical Commission (IEC) Publication 60079-11, Explosive Atmospheres – Part 11: Equipment Protection by Intrinsic Safety ″i″ copyright 2011, are indicated by notations (differences) and are presented in bold text. The national difference type is included in the body.

In the ISA publication of this standard, National Differences are presented using legislative text (strike-out and underline). The national difference type is identified in an informative annex.

The UL printed standard includes the national difference types within the body of the text using legislative text (strike-out and underline).

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

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D2 – These are National Differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

DC – These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

DE – These are National Differences based on **editorial comments or corrections**.

DR – These are National Differences based on the **national regulatory requirements**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

Addition / Add - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.

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Modification / Modify - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES – Part 11: Equipment Protection by intrinsic safety ″i″

FOREWORD

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International Standard IEC 60079-11 has been prepared by subcommittee 31G: Intrinsically safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

This sixth edition cancels and replaces the fifth edition of IEC 60079-11 published in 2006, the first edition of IEC 61241-11 published in 2005, and the new Annex G replaces the apparatus requirements of the second edition of IEC 60079-27 published in 2008. This sixth edition constitutes a technical revision of these publications.

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NOTE IEC 60079-25 cancels and replaces the remaining subject matter of IEC 60079-27.

The significant changes with respect to the previous edition are listed below:

• Inclusion of non-edition specific references to IEC 60079-0.

• The merging of the apparatus requirements for FISCO from IEC 60079-27.

• The merging of the requirements for combustible dust atmospheres from IEC 61241-11.

• Clarification of the requirements for accessories connected to intrinsically safe apparatus; such as chargers and data loggers.

• Addition of new test requirements for opto-isolators.

• Introduction of Annex H about ignition testing of semiconductor limiting power supply circuits.

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

FDIS	Report on voting
31G/207/FDIS	31G/213/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 standard supplements and modifies the general requirements of IEC 60079-0, except as indicated in Table 1 (see Scope).

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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EXPLOSIVE ATMOSPHERES – Part 11 : Equipment Protection By Intrinsic Safety ″i″

1 Scope

This part of IEC 60079 specifies the construction and testing of intrinsically safe apparatus intended for use in an explosive atmosphere and for associated apparatus, which is intended for connection to intrinsically safe circuits which enter such atmospheres.

1DV.1 DR *Modification of Clause 1, first paragraph as follows:*

1DV.1.1 Replace ″part of IEC 60079″ with ″standard″.

This type of protection is applicable to electrical equipment in which the electrical circuits themselves are incapable of causing an explosion in the surrounding explosive atmospheres.

This standard is also applicable to electrical equipment or parts of electrical equipment located outside the explosive atmosphere or protected by another Type of Protection listed in IEC 60079-0, where the intrinsic safety of the electrical circuits in the explosive atmosphere may depend upon the design and construction of such electrical equipment or parts of such electrical equipment. The electrical circuits exposed to the explosive atmosphere are evaluated for use in such an atmosphere by applying this standard.

The requirements for intrinsically safe systems are provided in IEC 60079-25.

This standard supplements and modifies the general requirements of IEC 60079-0, except as indicated in Table 1. Where a requirement of this standard conflicts with a requirement of IEC 60079-0, the requirements of this standard shall take precedence.

If requirements in this standard are applicable to both intrinsically safe apparatus and associated apparatus the term “apparatus” is used throughout the standard.

This standard is for electrical equipment only; therefore the term “equipment” used in the standard always means “electrical equipment”.

If associated apparatus is placed in the explosive atmosphere, it shall be protected by an appropriate Type of Protection listed in IEC 60079-0, and then the requirements of that method of protection together with the relevant parts of IEC 60079-0 also apply to the associated apparatus.

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Table 1 – Applicability of specific clauses of IEC 60079-0

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (2007) (informative)	Ed. 6.0 (2011) (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
1	1	Scope	Applies	Applies	Applies
2	2	Normative references	Applies	Applies	Applies
3	3	Terms and definitions	Applies	Applies	Applies
4	4	Equipment grouping	Applies	Applies	Applies
4.1	4.1	Group I	Applies	Excluded	Applies
4.2	4.2	Group II	Applies	Excluded	Applies
4.3	4.3	Group III	Excluded	Applies	Applies
4.4	4.4	Equipment for a particular explosive atmosphere	Applies	Applies	Applies
5.1	5.1	Environmental influences	Applies	Applies	Applies
5.1.1	5.1.1	Ambient temperature	Applies	Applies	Applies
5.1.2	5.1.2	External source of heating or cooling	Applies	Applies	Applies
5.2	5.2	Service temperature	Applies	Applies	Applies
5.3.1	5.3.1	Determination of maximum surface temperature	Applies	Applies	Excluded
5.3.2.1	5.3.2.1	Group I electrical equipment	Applies	Excluded	Excluded
5.3.2.2	5.3.2.2	Group II electrical equipment	Applies	Excluded	Excluded
5.3.2.3	5.3.2.3	Group III electrical equipment	Excluded	Applies	Excluded
5.3.3	5.3.3	Small component temperature for Group I or Group II electrical equipment	Applies	Excluded	Excluded
6.1	6.1	General	Applies	Applies	Applies
6.2	6.2	Mechanical strength of equipment	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
6.3	6.3	Opening times	Excluded	Excluded	Excluded
6.4	6.4	Circulating currents in enclosures (e.g. of large electrical machines)	Excluded	Excluded	Excluded
6.5	6.5	Gasket retention	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
6.6	6.6	Electromagnetic and ultrasonic radiating equipment	Applies	Applies	Excluded
7.1.1	7.1.1	Applicability	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
7.1.2	7.1.2.1	Specification of materials	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
7.1.3	7.1.2.2	Plastic materials	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
7.1.4	7.1.2.3	Elastomers	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
7.2	7.2	Thermal endurance	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied

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Table 1 – Applicability of specific clauses of IEC 60079-0 Continued on Next Page

Table 1 – Applicability of specific clauses of IEC 60079-0 Continued

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (2007) (informative)	Ed. 6.0 (2011) (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
7.3	7.3	Resistance to light	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
7.4	7.4	Electrostatic charges on external non-metallic materials	Applies	Applies	Excluded
NR	7.5	Accessible metal parts	Applies	Applies	Excluded
7.5	NR	Threaded holes	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
8.1	8.1	Material composition	Applies	Applies	Excluded
8.1.1	8.2	Group I	Applies	Excluded	Excluded
8.1.2	8.3	Group II	Applies	Excluded	Excluded
8.1.3	8.4	Group III	Excluded	Applies	Excluded
8.2	NR	Threaded holes	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
9	9	Fasteners	Excluded	Excluded	Excluded
10	10	Interlocking devices	Excluded	Excluded	Excluded
11	11	Bushings	Excluded	Excluded	Excluded
12	12	Materials used for cementing	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
13	13	Ex Components	Applies	Applies	Applies
14	14	Connection facilities and termination compartments	Excluded	Excluded	Excluded
15	15	Connection facilities for earthing or bonding conductors	Excluded	Excluded	Excluded
16	16	Entries into enclosures	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
17	17	Supplementary requirements for rotating machines	Excluded	Excluded	Excluded
18	18	Supplementary requirements for switchgear	Excluded	Excluded	Excluded
19	19	Supplementary requirements for fuses	Excluded	Excluded	Excluded
20	20	Supplementary requirements for plugs, socket outlets and connectors	Excluded	Excluded	Excluded
21	21	Supplementary requirements for luminaires	Excluded	Excluded	Excluded
22	22	Supplementary requirements for caplights and handlights	Modified	Modified	Excluded
23.1	23.1	General	Applies	Applies	Applies
23.2	23.2	Batteries	Excluded	Excluded	Excluded
23.3	23.3	Cell types	Applies	Applies	Applies
23.4	23.4	Cells in a battery	Applies	Applies	Applies
23.5	23.5	Ratings of batteries	Applies	Applies	Applies

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Table 1 – Applicability of specific clauses of IEC 60079-0 Continued on Next Page

Table 1 – Applicability of specific clauses of IEC 60079-0 Continued

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (2007) (informative)	Ed. 6.0 (2011) (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
23.6	23.6	Interchangeability	Applies	Applies	Applies
23.7	23.7	Charging of primary batteries	Applies	Applies	Applies
23.8	23.8	Leakage	Applies	Applies	Applies
23.9	23.9	Connections	Applies	Applies	Applies
23.10	23.10	Orientation	Applies	Applies	Applies
23.11	23.11	Replacement of cells or batteries	Applies	Applies	Applies
23.12	23.12	Replaceable battery pack	Applies	Applies	Applies
24	24	Documentation	Applies	Applies	Applies
25	25	Compliance of prototype or sample with documents	Applies	Applies	Applies
26.1	26.1	General	Applies	Applies	Applies
26.2	26.2	Test configuration	Applies	Applies	Applies
26.3	26.3	Tests in explosive test mixtures	Applies	Applies	Applies
26.4.1	26.4.1	Order of tests	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.4.1.1	26.4.1.1	Metallic enclosures, metallic parts of enclosures and glass parts of enclosures	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.4.1.2	26.4.1.2	Non-metallic enclosures or non-metallic parts of enclosures	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.4.1.2.1	26.4.1.2.1	Group I electrical equipment	Excluded except when 6.1.2.3 a) is applied	Excluded	Excluded except when 6.1.2.3 a) is applied
26.4.1.2.2	26.4.1.2.2	Group II and Group III electrical equipment	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.4.2	26.4.2	Resistance to impact	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.4.3	26.4.3	Drop test	Applies	Applies	Excluded except when 6.1.2.3 a) is applied
26.4.4	26.4.4	Acceptance criteria	Applies	Applies	Excluded except when 6.1.2.3 a) is applied
26.4.5	26.4.5	Degree of protection (IP) by enclosures	Applies	Applies	Applies
26.5.1.1	26.5.1.1	General	Applies	Applies	Excluded
26.5.1.2	26.5.1.2	Service temperature	Modified	Modified	Modified
26.5.1.3	26.5.1.3	Maximum surface temperature	Modified	Modified	Modified
26.5.2	26.5.2	Thermal shock test	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.5.3	26.5.3	Small component ignition test (Group I and Group II)	Applies	Excluded	Excluded
26.6	26.6	Torque test for bushings	Excluded	Excluded	Excluded

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Table 1 – Applicability of specific clauses of IEC 60079-0 Continued on Next Page

Table 1 – Applicability of specific clauses of IEC 60079-0 Continued

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (2007) (informative)	Ed. 6.0 (2011) (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
26.7	26.7	Non-metallic enclosures or non-metallic parts of enclosures	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.8	26.8	Thermal endurance to heat	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.9	26.9	Thermal endurance to cold	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.10	26.10	Resistance to light	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.11	26.11	Resistance to chemical agents for Group I electrical equipment	Excluded except when 6.1.2.3 a) is applied	Excluded	Excluded
26.12	26.12	Earth continuity	Excluded	Excluded	Excluded
26.13	26.13	Surface resistance test of parts of enclosures of non-metallic materials	Applies	Applies	Excluded
26.15	26.14	Measurement of capacitance	Applies	Applies	Excluded
NR	26.15	Verification of ratings of ventilating fans	Excluded	Excluded	Excluded
NR	26.16	Alternative qualification of elastomeric sealing O-rings	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
27	27	Routine tests	Applies	Applies	Applies
28	28	Manufacturer's responsibility	Applies	Applies	Applies
29	29	Marking	Applies	Applies	Applies
30	30	Instructions	Applies	Applies	Applies
Annex A (Normative)	Annex A (Normative)	Supplementary requirements for cable glands	Excluded	Excluded	Excluded
Annex B (Normative)	Annex B (Normative)	Requirements for Ex Components	Applies	Applies	Applies
Annex C (Normative)	Annex C (Normative)	Example of rig for resistance to impact test	Applies	Applies	Excluded except when 6.1.2.3 a) is applied
Annex D (Informative)	NR	Alternative risk assessment method encompassing "equipment protection levels" for Ex equipment	Applies	Applies	Applies
Annex E (Informative)	Annex D (Informative)	Motors supplied by converters	Excluded	Excluded	Excluded
NR	Annex E (Informative)	Temperature rise testing of electric machines	Excluded	Excluded	Excluded
NR	Annex F (Informative)	Guideline flowchart for tests of non-metallic enclosures or nonmetallic parts of enclosures (26.4)	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
Applies – This requirement of IEC 60079-0 is applied without change. Excluded – This requirement of IEC 60079-0 does not apply.					

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Table 1 – Applicability of specific clauses of IEC 60079-0 Continued on Next Page

Table 1 – Applicability of specific clauses of IEC 60079-0 Continued

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (2007) (informative)	Ed. 6.0 (2011) (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
Excluded except – This requirement of IEC 60079-0 does not apply except when the conditions stated are met. Modified – This requirement of IEC 60079-0 is modified as detailed in this standard. NR – No requirements.					
NOTE The clause numbers in the above table are shown for information only. The applicable requirements of IEC 60079-0 are identified by the clause title which is normative. This table was written against the specific requirements of IEC 60079-0, ed. 6.0. The clause numbers for the previous edition are shown for information only. This is to enable the General requirements IEC 60079-0, ed. 5.0, to be used where necessary with this part of IEC 60079. Where there were no requirements, indicated by NR, or there is a conflict between requirements, the later edition requirements take precedence.					

Table 1DV DR *Modification of Table 1DV NOTE to replace with the following:*

Table 1DV – Applicability of specific clauses of IEC 60079-0

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (informative)	Ed. 6.0 (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
1	1	Scope	Applies	Applies	Applies
2	2	Normative references	Applies	Applies	Applies
3	3	Terms and definitions	Applies	Applies	Applies
4	4	Equipment grouping	Applies	Applies	Applies
4.1	4.1	Group I	Applies	Excluded	Applies
4.2	4.2	Group II	Applies	Excluded	Applies
4.3	4.3	Group III	Excluded	Applies	Applies
4.4	4.4	Equipment for a particular explosive atmosphere	Applies	Applies	Applies
5.1	5.1	Environmental influences	Applies	Applies	Applies
5.1.1	5.1.1	Ambient temperature	Applies	Applies	Applies
5.1.2	5.1.2	External source of heating or cooling	Applies	Applies	Applies
5.2	5.2	Service temperature	Applies	Applies	Applies
5.3.1	5.3.1	Determination of maximum surface temperature	Applies	Applies	Excluded
5.3.2.1	5.3.2.1	Group I electrical equipment	Applies	Excluded	Excluded
5.3.2.2	5.3.2.2	Group II electrical equipment	Applies	Excluded	Excluded
5.3.2.3	5.3.2.3	Group III electrical equipment	Excluded	Applies	Excluded
5.3.3	5.3.3	Small component temperature for Group I or Group II electrical equipment	Applies	Excluded	Excluded
6.1	6.1	General	Applies	Applies	Applies
6.2	6.2	Mechanical strength of equipment	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
6.3	6.3	Opening times	Excluded	Excluded	Excluded

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Table 1DV – Applicability of specific clauses of IEC 60079-0 Continued on Next Page

Table 1DV – Applicability of specific clauses of IEC 60079-0 Continued

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (informative)	Ed. 6.0 (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
6.4	6.4	Circulating currents in enclosures (e.g. of large electrical machines)	Excluded	Excluded	Excluded
6.5	6.5	Gasket retention	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
6.6	6.6	Electromagnetic and ultrasonic radiating equipment	Applies	Applies	Excluded
7.1.1	7.1.1	Applicability	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
7.1.2	7.1.2.1	Specification of materials	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
7.1.3	7.1.2.2	Plastic materials	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
7.1.4	7.1.2.3	Elastomers	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
7.2	7.2	Thermal endurance	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
7.3	7.3	Resistance to light	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
7.4	7.4	Electrostatic charges on external non-metallic materials	Applies	Applies	Excluded
NR	7.5	Accessible metal parts	Applies	Applies	Excluded
7.5	NR	Threaded holes	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
8.1	8.1	Material composition	Applies	Applies	Excluded
8.1.1	8.2	Group I	Applies	Excluded	Excluded
8.1.2	8.3	Group II	Applies	Excluded	Excluded
8.1.3	8.4	Group III	Excluded	Applies	Excluded
8.2	NR	Threaded holes	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
9	9	Fasteners	Excluded	Excluded	Excluded
10	10	Interlocking devices	Excluded	Excluded	Excluded

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Table 1DV – Applicability of specific clauses of IEC 60079-0 Continued on Next Page

Table 1DV – Applicability of specific clauses of IEC 60079-0 Continued

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (informative)	Ed. 6.0 (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
11	11	Bushings	Excluded	Excluded	Excluded
12	12	Materials used for cementing	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
13	13	Ex Components	Applies	Applies	Applies
14	14	Connection facilities and termination compartments	Excluded	Excluded	Excluded
15	15	Connection facilities for earthing or bonding conductors	Excluded	Excluded	Excluded
16	16	Entries into enclosures	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
17	17	Supplementary requirements for rotating machines	Excluded	Excluded	Excluded
18	18	Supplementary requirements for switchgear	Excluded	Excluded	Excluded
19	19	Supplementary requirements for fuses	Excluded	Excluded	Excluded
20	20	Supplementary requirements for plugs, socket outlets and connectors	Excluded	Excluded	Excluded
21	21	Supplementary requirements for luminaires	Excluded	Excluded	Excluded
22	22	Supplementary requirements for caplights and handlights	Modified	Modified	Excluded
23.1	23.1	General	Applies	Applies	Applies
23.2	23.2	Batteries	Excluded	Excluded	Excluded
23.3	23.3	Cell types	Applies	Applies	Applies
23.4	23.4	Cells in a battery	Applies	Applies	Applies
23.5	23.5	Ratings of batteries	Applies	Applies	Applies
23.6	23.6	Interchangeability	Applies	Applies	Applies
23.7	23.7	Charging of primary batteries	Applies	Applies	Applies
23.8	23.8	Leakage	Applies	Applies	Applies
23.9	23.9	Connections	Applies	Applies	Applies
23.10	23.10	Orientation	Applies	Applies	Applies
23.11	23.11	Replacement of cells or batteries	Applies	Applies	Applies
23.12	23.12	Replaceable battery pack	Applies	Applies	Applies
24	24	Documentation	Applies	Applies	Applies
25	25	Compliance of prototype or sample with documents	Applies	Applies	Applies
26.1	26.1	General	Applies	Applies	Applies
26.2	26.2	Test configuration	Applies	Applies	Applies
26.3	26.3	Tests in explosive test mixtures	Applies	Applies	Applies

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Table 1DV – Applicability of specific clauses of IEC 60079-0 Continued

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (informative)	Ed. 6.0 (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
26.4.1	26.4.1	Order of tests	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.4.1.1	26.4.1.1	Metallic enclosures, metallic parts of enclosures and glass parts of enclosures	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.4.1.2	26.4.1.2	Non-metallic enclosures or non-metallic parts of enclosures	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.4.1.2.1	26.4.1.2.1	Group I electrical equipment	Excluded except when 6.1.2.3 a) is applied	Excluded	Excluded except when 6.1.2.3 a) is applied
26.4.1.2.2	26.4.1.2.2	Group II and Group III electrical equipment	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.4.2	26.4.2	Resistance to impact	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.4.3	26.4.3	Drop test	Applies	Applies	Excluded except when 6.1.2.3 a) is applied
26.4.4	26.4.4	Acceptance criteria	Applies	Applies	Excluded except when 6.1.2.3 a) is applied
26.4.5	26.4.5	Degree of protection (IP) by enclosures	Applies	Applies	Applies
26.5.1.1	26.5.1.1	General	Applies	Applies	Excluded
26.5.1.2	26.5.1.2	Service temperature	Modified	Modified	Modified
26.5.1.3	26.5.1.3	Maximum surface temperature	Modified	Modified	Modified
26.5.2	26.5.2	Thermal shock test	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.5.3	26.5.3	Small component ignition test (Group I and Group II)	Applies	Excluded	Excluded
26.6	26.6	Torque test for bushings	Excluded	Excluded	Excluded
26.7	26.7	Non-metallic enclosures or non-metallic parts of enclosures	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied

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Table 1DV – Applicability of specific clauses of IEC 60079-0 Continued

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (informative)	Ed. 6.0 (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
26.8	26.8	Thermal endurance to heat	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.9	26.9	Thermal endurance to cold	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.10	26.10	Resistance to light	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
26.11	26.11	Resistance to chemical agents for Group I electrical equipment	Excluded except when 6.1.2.3 a) is applied	Excluded	Excluded
26.12	26.12	Earth continuity	Excluded	Excluded	Excluded
26.13	26.13	Surface resistance test of parts of enclosures of non-metallic materials	Applies	Applies	Excluded
26.15	26.14	Measurement of capacitance	Applies	Applies	Excluded
NR	26.15	Verification of ratings of ventilating fans	Excluded	Excluded	Excluded
NR	26.16	Alternative qualification of elastomeric sealing O-rings	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
27	27	Routine tests	Applies	Applies	Applies
28	28	Manufacturer's responsibility	Applies	Applies	Applies
29	29	Marking	Applies	Applies	Applies
30	30	Instructions	Applies	Applies	Applies
Annex A (Normative)	Annex A (Normative)	Supplementary requirements for cable glands	Excluded	Excluded	Excluded
Annex B (Normative)	Annex B (Normative)	Requirements for Ex Components	Applies	Applies	Applies
Annex C (Normative)	Annex C (Normative)	Example of rig for resistance to impact test	Applies	Applies	Excluded except when 6.1.2.3 a) is applied
Annex D (Informative)	NR	Alternative risk assessment method encompassing "equipment protection levels" for Ex equipment	Applies	Applies	Applies
Annex E (Informative)	Annex D (Informative)	Motors supplied by converters	Excluded	Excluded	Excluded
NR	Annex E (Informative)	Temperature rise testing of electric machines	Excluded	Excluded	Excluded

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Table 1DV – Applicability of specific clauses of IEC 60079-0 Continued on Next Page

Table 1DV – Applicability of specific clauses of IEC 60079-0 Continued

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (informative)	Ed. 6.0 (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
NR	Annex F (Informative)	Guideline flowchart for tests of non-metallic enclosures or nonmetallic parts of enclosures (26.4)	Excluded except when 6.1.2.3 a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3 a) is applied
Applies – This requirement of IEC 60079-0 is applied without change. Excluded – This requirement of IEC 60079-0 does not apply. Excluded except – This requirement of IEC 60079-0 does not apply except when the conditions stated are met. Modified – This requirement of IEC 60079-0 is modified as detailed in this standard. NR – No requirements.					
NOTE 1 The clause numbers in the above table are shown for information only. The applicable requirements of IEC 60079-0 are identified by the clause title which is normative. This table was written against the specific requirements of IEC 60079-0, ed. 6.0. The clause numbers for the previous edition are shown for information only. This is to enable the General requirements IEC 60079-0, ed. 5.0, to be used where necessary with this part of IEC 60079. Where there were no requirements, indicated by NR, or there is a conflict between requirements, the later edition requirements take precedence. NOTE 2 In the US, the authority having jurisdiction for underground mines is the Mine Safety and Health Administration (MSHA) of the federal government. Additional regulations beyond those detailed here will also apply.					

1DV.2 DR *Addition of 1DV.2.1*

1DV.2.1 Where references are made to other IEC 60079 standards, the referenced requirements found in these standards shall apply as modified by any applicable U.S. National Differences.

2 Normative references

2DV.1 DR *Modification of the title in Clause 2 as follows:*

Replace "Normative references" with "References".

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

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

IEC 60079-7, Explosive atmospheres – Part 7: Equipment protection by increased safety ″e″

IEC 60079-25, Explosive atmospheres – Part 25: Intrinsically safe electrical systems

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 60127 (all parts), Miniature fuses

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

IEC 60317-7, Specifications for particular types of winding wires – Part 7: Polyimide enamelled round copper wire, class 220

IEC 60317-8, Specifications for particular types of winding wires – Part 8: Polyesterimide enamelled round copper winding 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 60529, Degrees of protection provided by enclosures (IP Code)

IEC 60664-1:2007, Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests

IEC 60664-3:2003, Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution

IEC 61158-2, Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition

IEC 62013-1, Caplights for use in mines susceptible to firedamp – Part 1: General requirements – Construction and testing in relation to the risk of explosion

ANSI/UL 248-1 Low-Voltage Fuses – Part 1: General Requirements

2DV.2 DR *Modification of Clause 2 references to replace with the following:*

IEC 60079-35-1, Explosive atmospheres Part 35-1: Caplights for use in mines susceptible to firedamp – General requirements – Construction and testing in relation to the risk of explosion

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 60127 (all parts), Miniature fuses

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

IEC 60317-7, Specifications for particular types of winding wires – Part 7: Polyimide enamelled round copper wire, class 220

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

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

IEC 60664-1:2007, Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests

IEC 60664-3:2003, Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution

IEC 61158-2, Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition

ISA 60079-25, Explosive atmospheres – Part 25: Intrinsically safe electrical systems

UL 248 (all parts) Low-Voltage Fuses

UL 746A Polymeric Materials B Short Term Property Evaluations

UL 840 Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment

UL 60079-0 Explosive Atmospheres Part 0: Equipment – General Requirements

UL 60079-7 Explosive Atmospheres – Part 7: Equipment Protection by Increased Safety "e"

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60079-0, and the following apply.

3.1 General

3.1.1 **intrinsic safety "i"** type of protection based on the restriction of electrical energy within equipment and of interconnecting wiring exposed to the explosive atmosphere to a level below that which can cause ignition by either sparking or heating effects

3.1.2 **associated apparatus** electrical equipment which contains both intrinsically safe circuits and non-intrinsically safe circuits and is constructed so that the non-intrinsically safe circuits cannot adversely affect the intrinsically safe circuits

NOTE Associated apparatus may be either:

a) electrical equipment which has another type of protection listed in IEC 60079-0 for use in the appropriate explosive atmosphere, or

b) electrical equipment not so protected and which, therefore, is not normally used within an explosive atmosphere, for example a recorder which is not itself in an explosive atmosphere, but is connected to a thermocouple situated within an explosive atmosphere where only the recorder input circuit is intrinsically safe.

3.1.3 **intrinsically safe apparatus** electrical equipment in which all the circuits are intrinsically safe circuits

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3.1.4 **intrinsically safe circuit** circuit in which any spark or any thermal effect produced in the conditions specified in this standard, which include normal operation and specified fault conditions, is not capable of causing ignition of a given explosive atmosphere

3.1.5 **simple apparatus** electrical component or combination of components of simple construction with well-defined electrical parameters and which is compatible with the intrinsic safety of the circuit in which it is used

3.2 **coating** insulating material such as varnish or dry film laid on the surface of the assembly

NOTE Coating and base material of a printed board form an insulating system that may have properties similar to solid insulation.

[Definition 3.5 of IEC 60664-3]

3.3 **conformal coating** electrical insulating material applied as a coating to loaded printed circuit boards to produce a thin layer conforming to the surface in order to provide a protective barrier against deleterious effects from environmental conditions

[Definition 2.1 of IEC 61086-1]

3.4 **control drawing** drawing or other document that is prepared by the manufacturer for the intrinsically safe or associated apparatus, detailing the electrical parameters to allow for interconnections to other circuits or apparatus

3.5 **diode safety barrier** assemblies incorporating shunt diodes or diode chains (including Zener diodes) protected by fuses or resistors or a combination of these, manufactured as an individual apparatus rather than as part of a larger apparatus

3.6 **entity concept** method used to determine acceptable combinations of intrinsically safe apparatus and associated apparatus through the use of intrinsically safe parameters assigned to connection facilities

3.7 **faults**

3.7.1 **countable fault** fault which occurs in parts of electrical apparatus conforming to the constructional requirements of IEC 60079-11

3.7.2 **fault** any defect of any component, separation, insulation or connection between components, not defined as infallible by IEC 60079-11, upon which the intrinsic safety of a circuit depends

3.7.3 **non-countable fault** fault which occurs in parts of electrical apparatus not conforming to the constructional requirements of IEC 60079-11

3.8 **fuse rating** – I_n current rating of a fuse as specified in IEC 60127 series, ANSI/UL 248-1 or in the manufacturer's specification

3.8DV D2 ***Modification of Clause 3.8 to replace with the following:***

fuse rating – I_n current rating of a fuse as specified in IEC 60127 series, the ANSI/UL 248 series or in the manufacturer's specification

3.9 **FISCO** abbreviation of Fieldbus Intrinsically Safe Concept

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3.10 **infallibility**

3.10.1 **infallible component – infallible assembly of components** component or assembly of components that is considered as not subject to certain fault modes as specified in IEC 60079-11

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NOTE The probability of such fault modes occurring in service or storage is considered to be so low that they are not to be taken into account.

3.10.2 **infallible connection** connections, including joints and interconnecting wiring and printed circuit board tracks, that are not considered according to IEC 60079-11 as becoming open-circuited in service or storage

NOTE The probability of such fault modes occurring in service or storage is considered to be so low that they are not to be taken into account.

3.10.3 **infallible separation – infallible insulation** separation or insulation between electrically conductive parts that is considered as not subject to short circuits as specified in IEC 60079-11

NOTE The probability of such fault modes occurring in service or storage is considered to be so low that they are not to be taken into account.

3.11 **internal wiring** wiring and electrical connections that are made within the apparatus by its manufacturer

3.11DV DR *Modification of Clause 3.11 to add the following NOTE after the first paragraph:*

NOTE Within a rack or panel, interconnections between separate pieces of apparatus made in accordance with detailed instructions from the manufacturer are considered to be internal wiring.

3.12 **live maintenance** maintenance activities carried out while the associated apparatus, intrinsically safe apparatus and circuits are energized

3.13 **electrical parameters**

3.13.1 **maximum input voltage U_i** maximum voltage (peak a.c. or d.c.) that can be applied to the connection facilities of apparatus without invalidating the type of protection

3.13.2 **maximum input current I_i** maximum current (peak a.c. or d.c.) that can be applied to the connection facilities of apparatus without invalidating the type of protection

3.13.3 **maximum input power P_i** maximum power that can be applied to the connection facilities of apparatus without invalidating the type of protection

3.13.4 **maximum internal capacitance C_i** maximum equivalent internal capacitance of the apparatus which is considered as appearing across the connection facilities

3.13.5 **maximum internal inductance L_i** maximum equivalent internal inductance of the apparatus which is considered as appearing at the connection facilities

3.13.6 **maximum internal inductance to resistance ratio L_i/R_i** maximum value of ratio of inductance to resistance which is considered as appearing at the external connection facilities of the electrical apparatus

3.13.7 **maximum output voltage U_o** maximum voltage (peak a.c. or d.c.) that can appear at the connection facilities of the apparatus at any applied voltage up to the maximum voltage

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3.13.8 **maximum output current I_o** maximum current (peak a.c. or d.c.) in apparatus that can be taken from the connection facilities of the apparatus

3.13.9 **maximum output power P_o** maximum electrical power that can be taken from the apparatus

3.13.10 **maximum external capacitance C_o** maximum capacitance that can be connected to the connection facilities of the apparatus without invalidating the type of protection

3.13.11 **maximum external inductance L_o** maximum value of inductance that can be connected to the connection facilities of the apparatus without invalidating the type of protection

3.13.12 **maximum external inductance to resistance ratio L_o/R_o** maximum value of ratio of inductance to resistance that can be connected to the external connection facilities of the electrical apparatus without invalidating intrinsic safety

3.13.13 **maximum r.m.s. a.c. or d.c. voltage U_m** maximum voltage that can be applied to the non intrinsically safe connection facilities of associated apparatus without invalidating the type of protection

NOTE 1 This additionally applies to the maximum voltage that can be applied to non-intrinsically safe connection facilities of intrinsically safe apparatus (for example, charging connections on battery operated apparatus, where charging is only done in the non-hazardous area).

NOTE 2 The value of Um may be different at different sets of connection facilities, and may be different for a.c. and d.c. voltages.

3.14 **overvoltage category** numeral defining a transient overvoltage condition

[Definition 1.3.10 of IEC 60664-1]

NOTE Overvoltage categories I, II, III and IV are used, see 2.2.2.1 of IEC 60664-1.

3.15 **pollution degree** numeral characterizing the expected pollution of the micro-environment

[Definition 1.3.13 of IEC 60664-1]

NOTE Pollution degrees 1, 2, 3 and 4 are used.

3.16 **protective extra-low voltage – PELV** extra-low voltage system which is not electrically separated from earth but which otherwise satisfies the requirements for SELV

NOTE A 50 V centre-tapped earth system is a PELV system.

3.17 **rated insulation voltage** r.m.s. withstand voltage value assigned by the manufacturer to the equipment or to a part of it, characterizing the specified (long-term) withstand capability of its insulation

[Definition 1.3.9.1 of IEC 60664-1]

NOTE The rated insulation voltage is not necessarily equal to the rated voltage of equipment which is primarily related to functional performance.

3.18 **recurring peak voltage** maximum peak value of periodic excursions of the voltage waveform resulting from distortions of an a.c. voltage or from a.c. components superimposed on a d.c. voltage

NOTE Random overvoltages, for example due to occasional switching, are not considered as recurring peak voltages

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3.19 **safety extra-low voltage – SELV** extra-low voltage system (i.e. normally not exceeding 50 V a.c. or 120 V ripple-free d.c.) electrically separated from earth and from other systems in such a way that a single fault cannot give rise to an electric shock

NOTE A 50 V earth free system is a SELV system.

3.20 **encapsulation – encapsulate** process of applying a compound to enclose or placing in or as if in a capsule

3.21 **casting** process of pouring a liquid compound at normal ambient pressure into a cast

3.22 **moulding** process of placing an object in a tool with a shaping cavity and with plastic material being introduced around the inserted component with pressure applied to either partially or totally encapsulate the inserted component

NOTE This process may also be referred to as injection moulding, over-moulding or insert moulding.

3.23 **galvanic isolation** arrangement within an apparatus which permits the transfer of signal or power between two circuits without any direct electrical connection between the two

NOTE Galvanic isolation frequently utilizes either magnetic (transformer or relay) or optocoupled elements.

4 Grouping and classification of intrinsically safe apparatus and associated apparatus

Intrinsically safe and associated apparatus which has a type of protection listed in IEC 60079-0 for use in the appropriate explosive atmosphere, shall be grouped in accordance with equipment grouping requirements of IEC 60079-0 and shall have a maximum surface temperature or temperature class assigned in accordance with the temperature requirements of IEC 60079-0.

Associated apparatus which has no such type of protection shall only be grouped in accordance with the equipment grouping requirements of IEC 60079-0.

4DV.1 DR *Modification of Clause 4, second paragraph to replace with the following:*

4DV.1.1 Associated apparatus which has a type of protection listed in UL 60079-0 but not suitable to be located in the explosive atmosphere shall only be grouped in accordance with the equipment grouping requirements of UL 60079-0.

5 Levels of protection and ignition compliance requirements of electrical apparatus

5.1 General

Intrinsically safe apparatus and intrinsically safe parts of associated apparatus shall be placed in Levels of Protection ″ia″, ″ib″ or “ic”.

The requirements of this standard shall apply to all levels of protection unless otherwise stated. In the determination of level of protection “ia″, ″ib″ or “ic”, failure of components and connections shall be considered in accordance with 7.6. Failure of separations between conductive parts shall be considered in accordance with 6.3. The determination shall include opening, shorting and earthing of the external intrinsically safe connection facilities in accordance with 6.2.

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The intrinsically safe parameters for the intrinsically safe apparatus and associated apparatus shall be determined taking into account the requirements for spark ignition compliance of 5.5 and thermal ignition compliance of 5.6.

For circuits of associated apparatus which are connected to safety extra low-voltage circuits (SELV) or protective extra low-voltage circuits (PELV) circuits, U_m shall only be applied as a 'common mode' voltage, with the nominal operating voltage applied for the differential mode signal between the circuit conductors. (Typical examples are RS-232, RS-485 or 4-20 mA circuits). The certificate number for associated apparatus relying on SELV or PELV circuits shall include the ″X″ suffix in accordance with the marking requirements of IEC 60079-0 and the specific conditions of use listed on the certificate shall detail the precautions necessary.

5.1DV.1 DR *Modification of Clause 5.1, fourth paragraph to replace with the following:*

5.1DV.1.1 For circuits of associated apparatus which are connected to safety extra low-voltage circuits (SELV) or protective extra low-voltage circuits (PELV) circuits, U_m shall only be applied as a 'common mode' voltage, with the nominal operating voltage applied for the differential mode signal between the circuit conductors. (Typical examples are RS-232, RS-485 or 4-20 mA circuits). Associated apparatus relying on SELV or PELV circuits shall detail any special precautions necessary for installation.

Where live maintenance procedures are specified by the manufacturer in the documentation provided, the effects of this live maintenance shall not invalidate intrinsic safety and this shall be considered during the testing and assessment.

NOTE 1 Apparatus may be specified with more than one level of protection, and may have different parameters for each level of protection.

NOTE 2 For the application of U_m, U_i in the following clauses, any voltage up to the maximum voltage may be applied for the assessment.

5.2 Level of protection ″ia″

With U_m and U_i applied, the intrinsically safe circuits in electrical apparatus of level of protection ″ia″ shall not be capable of causing ignition in each of the following circumstances:

a) in normal operation and with the application of those non-countable faults which give the most onerous condition;

b) in normal operation and with the application of one countable fault plus those non-countable faults which give the most onerous condition;

c) in normal operation and with the application of two countable faults plus those noncountable faults which give the most onerous condition.

The non-countable faults applied may differ in each of the above circumstances.

In testing or assessing the circuits for spark ignition, the following safety factors shall be applied in accordance with 10.1.4.2:

– for both a) and b) 1,5

– for c) 1,0

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