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Explosive atmospheres -
Part 38: Equipment and components in explosive atmospheres in underground mines

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

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Explosive atmospheres - Part 38: Equipment and components in explosive atmospheres in underground mines

FOREWORD

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ISO/IEC 80079-38 has been prepared by IEC technical committee 31: Equipment for explosive atmospheres. It is an International Standard.

It is published as a double logo International Standard.

This second edition cancels and replaces the first edition, published in 2016. This edition constitutes a technical revision.

Users of this document are advised that interpretation sheets clarifying the interpretation of this document can be published. Interpretation sheets are available from the IEC webstore and can be found in the "history" tab of the page for each document.

The significance of changes between ISO/IEC 80079-38:2016 (Edition 1) and ISO/IEC 80079-38: (Edition 2) is as listed below:

		Type		
Changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
Throughout document where appropriate changed "equipment" and "components" to "Ex Equipment" and "Ex Components"	General	X		
Throughout the document "machine" changed to "mining machine"	General	X		
Throughout the body of the document removed the use of "should" by, in most cases, moving the clause to Annex B as guidance	General			C1
References to "standard" changed to "document" where appropriate in accordance with ISO/IEC Directives	General	X		
Throughout the document changed "e.g." to "for example" in accordance with TC 31 Good Working Practice	General	X		
Scope changed to cover "construction, testing and marking for use in Group I" from "design, construction, assessment and information for use (maintenance, repair, marking)". Hand tools are no longer covered by the standard	1			C2
Note added to scope to clarify that Group I takes account that coal dust can be present with or without methane	1	X		
Note added to scope to clarify that Group I also covers mines other than coal mines	1	X		
Note added to scope to clarify that "assembly" is not identical to the meaning in IEC 60079-46	1	X		
Scope expanded to cover EPL Ma as well as EPL Mb	1			C3
Scope changed to allow this document to be used for guidance on underground applications where firedamp or coal dust can be present but which are not Group I mines, for example tunnels	1		X	
Deletion of definitions in IEC 60079-0	Former 3.1, 3.7, 3.10, 3.14, 3.15 and 3.16	X		
Deletion of definition "protection against firedamp explosions"	Former 3.2	X		
Change of definition of "flammable substance" to align with definition in IEC 60079-10-1.	3.1	X		
Deletion of definition "component" and introduction of use of term "Ex Component" from IEC 60079-0	Former 3.4	X		
Deletion of definition of "equipment" and introduction of use of term "Ex Equipment from IEC 60079-0	Former 3.5	X		
Deletion of definition "explosion"	Former 3.6	X		
Deletion of definition "intended use"	Former 3.8	X		
Change of definition of "machinery" to "mining machinery" with added admitted term of "mining machine"	3.2	X		
Deletion of definition "minimum ignition energy"	Former 3.11	X		

		Type		
Changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
Deletion of definition "potentially explosive atmospheres"	Former 3.12	X		
Deletion of definition "self-ignition of dust in bulk"	Former 3.13	X		
Deletion of definition of mechanical sparks	Former 3.19	X		
Deletion of definition of incendive sparks	Former 3.20	X		
Introduction of definition of "safety device" from IEC TS 60079-42	3.5	X		
Introduction of requirements regarding Specific Conditions of Use	4.1		X	
Rewording of requirements for ignition hazard assessment including reference to ISO 80079-36	4.2	X		
Revision of requirements regarding insulation faults to provide two options.	4.4.3		X	
Introduction of requirements for temperature rating of cables	4.4.6.1		X	
Rewording of requirements for ventilating fans	5.3.1	X		
Reference to standard for internal combustion engines – ISO/IEC 80079-41	5.4		X	
Reference to requirements in IEC 60079-0 for traction batteries, starter batteries and vehicle lighting batteries	5.8	X		
Additional requirement for batteries not complying with IEC 60079-11 Ex ia Ma to comply with IEC 60079-33 Ex sa Ma	5.8		X	
Optical radiation requirements in standard replaced with requirement to comply with IEC 60079-28	5.9	X		
Electromagnetic and ultrasonic energy radiating equipment requirements in standard replaced with requirement to comply with IEC 60079-0	5.10	X		
Gas monitoring now refers to IEC 60079-29-0 and does not include any other requirements.	5.11			C4
Note added to state that gas detector can be required on mobile mining machines	5.11	X		
New clause "EPL Ma equipment having the requisite Level of Protection using a second independent means" has been added	6			C5
Subclause headings added for General and Fire resistant fluids and clause reorganised to separate requirements for hydraulic and pneumatic equipment. Compliance with ISO 4413 and ISO 4413 introduced	7.3	X		C6
Requirements for conveyor belting deleted	Former 6.7			C7
Marking requirements revised including for EPL Ma and EPL Mb situations	9			C8
Example of an ignition hazard assessment for a conveyor belt intended for use in a coal mine deleted as conveyor belts are no longer part of the standard	Former Annex A			C9
Deletion of Annex on ignition sources as information is in ISO 80079-36	Former Annex C			C10

		Type		
Changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
Deletion of Annex on Guidance on potential risks for converter-fed motors	Former Annex D			C11
Tests for surface protective coating for Group I hand tools of EPL Mb deleted as hand tools are not part of this edition	Former Annex E			C12
Inclusion of informative guidance material, most of which was formerly in body of standard	Annex B			C13

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. More guidance can be found by referring to the Redline Version of the standard.

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.

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

C1 The body of the document has been changed to only mandatory text to make it more suitable to use for conformity assessment.

C2 The scope was made clearer for the application and to remove hand tools from the scope.

C3 The scope was expanded to include EPL Ma equipment as well as EPL Mb equipment.

C4 The relevant standard for gas monitoring has changed from IEC 60079-29 to IEC 60079-29-0 and hence the latest standard is referenced.

C5 The new section now provides requirements relevant to EPL Ma.

C6 Reference to compliance with ISO 4413 and ISO 4414 introduces additional requirements for hydraulic and pneumatic equipment.

C7 Conveyor belts are no longer part of the scope and so requirements were deleted.

C8 Marking updated to address both EPL Ma and EPL Mb with the introduction of EPL Ma in the scope.

C9 See C6 regarding conveyor belts and hence example no longer relevant.

C10 The information on ignition sources is available in ISO 80079-36 and so there is no need to duplicate the information here.

C11 There is no calling clause to this annex and the information is of a general nature not specific to mines

C12 With hand tools now longer in the scope, this test is no longer needed.

C13 Most of the guidance material from the body of the previous edition of the standard is now in this annex.

The text of this International Standard is based on the following documents:

Draft	Report on voting
31M/302/FDIS	31M/315/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts of the IEC 60079 series, under the general title *Explosive atmospheres*, as well as the ISO/IEC 80079 series, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,

– withdrawn, or

– revised.

INTRODUCTION

This part of ISO/IEC 80079 specifies requirements for the constructional features of Ex Equipment and Ex Components that can be an individual item or form an assembly, to enable them to be used in mines, or parts of mines, susceptible to explosive atmospheres of firedamp, combustible dust or a combination of the two.

Most of the Ex Equipment used on mining machinery complies with the Type of Protection standards as an individual item of equipment, for example motors and switchgear, and they have their own marking requirements. The Type of Protection standards, however, do not deal with the interconnection of Ex Equipment and Ex Components.

Both non-electrical Ex Equipment and the interconnection of electrical/non-electrical Ex Equipment can require an ignition hazard assessment.

The need for this document arises because of major operational differences between underground mining operations and those in other industries working with, or in, explosive atmospheres. Examples of these differences are:

– firedamp can be released during the extraction of coal or other mining where firedamp is trapped;
– the ignitability of the atmosphere around Ex Equipment and Ex Components usually depends upon the amount of dilution offered by an active ventilating system;
– the atmosphere in the general body of mine air in which machinery is working can change from one that is not explosive to one that is explosive (for example, during an outburst of firedamp) and, depending on the likelihood, this can impact on the EPL required (Ma versus Mb);
– persons working in the mine can be situated in an explosive atmosphere if there is an increase in the concentration of firedamp; there is a need to monitor constantly the mine atmosphere at strategic places to ensure that power can be disconnected from all Ex Equipment except EPL Ma Ex Equipment which is suitable for use in a constantly present explosive atmosphere;
– in gassy coal mines, an initial explosion of firedamp can raise combustible dust clouds that when ignited commonly provide a significantly more serious explosion;
– some mining machinery contains cutting devices and drilling devices that can produce an ignition risk from sparks generated from contact with strata containing high concentrations of quartz or iron pyrites; and
– long roadways in coal mines are equipped with mineral conveying systems carrying a product that has a potential for raising a combustible dust cloud and the release of firedamp.

1 Scope

This part of ISO/IEC 80079 is applicable for the explosion protection requirements for the construction, testing and marking for Group I Ex Equipment that can be an individual item, or be an assembly of multiple items of Ex Equipment and Ex Components forming mining machinery.

NOTE 1 The Group I designation takes account of the fact coal dust (which is a combustible dust) is expected to be present, with or without the presence of firedamp, which is predominately methane.

NOTE 2 The definition of Group I also covers mines other than coal mines that are susceptible to firedamp.

NOTE 3 The term "assembly" as used in this document is not identical in meaning to the term "Equipment Assembly" as defined in IEC 60079-46.

The standard atmospheric conditions (relating to the explosion characteristics of the atmosphere) under which it can be assumed that Ex Equipment can be operated are:

– temperature −20 °C to +60 °C;
– pressure 80 kPa (0,8 bar) to 110 kPa (1,1 bar); and
– air with normal oxygen content, typically a volume fraction of 21 %.

This part of ISO/IEC 80079 applies for Ex Equipment and Ex Components with Explosion Protection Levels (EPLs) Ma and Mb.

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

This document can be used for guidance on underground applications where firedamp or coal dust can be present, but which are not Group I mines, for example tunnels.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60079-5, *Explosive atmospheres - Part 5: Equipment protection by powder filling "q"*

IEC 60079-7, *Explosive atmospheres - Part 7: Equipment protection by increased safety "e"*

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

IEC 60079-18, *Explosive atmospheres - Part 18: Equipment protection by encapsulation "m"*

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

IEC 60079-28, *Explosive atmospheres - Part 28: Protection of equipment and transmission systems using optical radiation*

IEC 60079-29-0, *Explosive atmospheres - Part 29-0: Gas detection equipment - General requirements and test methods*

IEC 60079-33, *Explosive atmospheres - Part 33: Equipment protection by special protection 's'*

IEC 60204-1, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements*

IEC 60204-11, *Safety of machinery - Electrical equipment of machines - Part 11: Requirements for equipment for voltages above 1 000 V AC or 1 500 V DC and not exceeding 36 kV*

IEC 60332-1 (all parts), *Tests on electric and optical fibre cables under fire conditions*

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

ISO 340, *Conveyor belts - Laboratory scale flammability characteristics - Requirements and test method*

ISO 630-5, *Structural steels - Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance*

ISO 4413*, Hydraulic Fluid Power - General rules and safety requirements for systems and their components*

ISO 4414*, Pneumatic Fluid Power - General rules and safety requirements for systems and their components*

ISO 6805*, Rubber hoses and hose assemblies for underground mining - Wire-reinforced hydraulic types for coal mining - Specification*

ISO 7010, *Graphical symbols - Safety colours and safety signs - Registered safety signs*

ISO 14935, *Petroleum and related products - Determination of wick flame persistence of fire-resistant fluids*

ISO 15029-1, *Petroleum and related products - Determination of spray ignition characteristics of fire-resistant fluids - Part 1: Spray flame persistence - Hollow-cone nozzle method*

ISO 15029-2, *Petroleum and related products - Determination of spray ignition characteristics of fire-resistant fluids - Part 2: Spray test - Stabilized flame heat release method*

ISO 21840-11, *Mechanical vibration - Rotor balancing - Part 11: Procedures and tolerances for rotors with rigid behaviour*

ISO 80079-36, *Explosive atmospheres - Part 36: Non-electrical equipment for explosive atmospheres - Basic method and requirements*

ISO 80079-37, *Explosive atmospheres - Part 37: Non-electrical equipment for explosive atmospheres - Non-electrical type of protection constructional safety "c", control of ignition sources "b", liquid immersion "k*"

ISO/IEC 80079-41, *Explosive atmospheres - Part 41: Reciprocating internal combustion engines*

3 Terms, definitions and abbreviated terms

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

– IEC Electropedia: available at https://www.electropedia.org/

– ISO Online browsing platform: available at https://www.iso.org/obp/ui

NOTE Additional definitions applicable to explosive atmospheres can be found in the International Electrotechnical Vocabulary (IEV) IEC 60050-426.

3.1
flammable substance
substance which is itself flammable, or is capable of producing a flammable gas, vapour or mist

[SOURCE: IEC 60079-10-1:2020, 3.6.1]

3.2
mining machinery
mining machine
assembly, fitted with or intended to be fitted with a drive system consisting of linked parts or components, at least one of which moves, and which are joined together for use in mines

Note 1 to entry: The term "machinery" also covers an assembly of machines which, in order to achieve the same end, are arranged and controlled so that they function as an integral whole.

3.3
non-electrical equipment
equipment which can achieve its intended function mechanically

Note 1 to entry: Equipment addressed in ISO 80079-36 can be powered by any kind of energy including electrical equipment.

[SOURCE: ISO 80079-36:2016, 3.7]

3.4
hydraulic fluid
any fluid and its concentrate for hydraulic transmission and monitoring with exception of water

3.5
safety device
device intended for use inside or outside explosive atmospheres but required for or contributing to the safe functioning of Ex Equipment and protective systems with respect to the risks of explosion

Note 1 to entry: Safety devices differ from the term devices used in the IEC 61508 and IEC 61511 series. Safety devices can be compared to the terms like "safety-related system (IEC 61508)" or "safety instrumented system (IEC 61511)".

[SOURCE: IEC TS 60079-42:2019, 3.1]