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Title: BS ISO/IEC 80079-38 Explosive atmospheres

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

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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UK Vote

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Submission of Comments

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



31M/211/CD

COMMITTEE DRAFT (CD)

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IEC SC 31M : NON-ELECTRICAL EQUIPMENT AND PROTECTIVE SYSTEMS FOR EXPLOSIVE ATMOSPHERES

SECRETARIAT:
Germany

SECRETARY:
Mrs Anke Sachtleben

OF INTEREST TO THE FOLLOWING COMMITTEES:
TC 31, SC 31G, SC 31J

PROPOSED HORIZONTAL STANDARD:



Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC

☐ ENVIRONMENT

☐ QUALITY ASSURANCE

☒ SAFETY

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TITLE:

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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 subcommittee 31M: Non-electrical equipment and protective systems for explosive atmospheres, of IEC technical committee 31: Equipment for explosive atmospheres.

It is published as a double logo standard.

The text of this document is based on the following documents of the IEC:

FDIS	Report on voting
31M/XX/FDIS	31M/XX/RVD

Full information on the voting for the approval of this document can be found in the report on voting indicated in the above table. In ISO, the document has been approved by XX P members out of XX having cast a vote.

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

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

172 The committee has decided that the contents of this publication will remain unchanged until the
173 stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to
174 the specific publication. At this date, the publication will be

- 175 • reconfirmed,
- 176 • withdrawn,
- 177 • replaced by a revised edition, or
- 178 • amended.

179

180 The National Committees are requested to note that for this publication the stability date
181 is xxxx

182 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED
183 AT THE PUBLICATION STAGE.

184

185

INTRODUCTION

This part of ISO/IEC 80079 specifies requirements for the constructional features of Ex Equipment and Ex Components that may 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 and/or combustible dust.

Most of the Ex equipment used on mining machinery is certified as an individual item of equipment, for example the motor, switchgear etc., and meets its own marking requirements. This certification, however, might 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 might 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 may 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 may change from one that is not explosive to one that is explosive (for example, during an outburst of firedamp);
- persons working in the mine are usually situated within the explosive atmosphere;
- 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 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 might may produce an ignition risk from sparks generated from contact with strata containing high concentrations of quartz or iron pyrites;
- 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.

EXPLOSIVE ATMOSPHERES –

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

1 Scope

This part of ISO/IEC 80079 specifies the explosion protection requirements for the construction, testing and marking for use in Group I of Ex Equipment that may 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 may 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 21 % v/v.

This part of ISO/IEC 80079 applies for Ex Equipment and Ex Components with EPLs Ma and Mb.

2 Normative references

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

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

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

IEC 60079-5, *Explosive atmospheres – Part 5: Equipment protection by powder filling “q”*

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 detectors – General requirements and test methods (under development)*

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 HV equipment for voltages above 1 000 V a.c. or 1 500 V d.c. 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 1940-1, *Mechanical vibration – Balance quality requirements for rotors in a constant (rigid) state – Part 1: Specification and verification of balance tolerances*

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/TS 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 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 (under development)*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms and definitions given in IEC 60079-0, ISO 80079-36, ISO 80079-37 and the following apply.

3.1

firedamp

flammable mixture of gases naturally occurring in a mine

Note 1 to entry: Firedamp consists mainly of methane, but always contains small quantities of other gases, such as nitrogen, carbon dioxide, and hydrogen, and sometimes ethane and carbon monoxide. The terms firedamp and methane are used frequently in mining practice as synonyms.

[SOURCE: IEC 60079-0]

3.2**flammable substance**

substance in the form of gas, vapour, liquid, solid, or mixtures of these, able to undergo an exothermic reaction with air when ignited

3.3**component**

any item essential to the safe functioning of equipment and protective systems but with no autonomous function

3.4**equipment**

machines, apparatus, fixed or mobile devices, control components and instrumentation thereof and detection and prevention systems which, separately or jointly, are intended for the generation, transfer, storage, measurement, control and conversion of energy, for the processing of material, and which may be capable of causing an explosion through their own source(s) of ignition

[SOURCE: ISO 80079-36]

3.5**explosion**

sudden increase of pressure and temperature, due to oxidation or other exothermic reaction

[SOURCE: IEC 60050-426, 426-02-13, modified by removal of "(of an explosive atmosphere" in the title)]

3.6**explosive atmosphere**

mixture with air, under atmospheric conditions, of flammable substances in the form of gas, vapour, dust, fibres, or flyings which, after ignition, permits self-sustaining propagation

[SOURCE: IEC 60079-0]

3.7**mining machinery**

mining machine <admitted term>

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.

[SOURCE: based on ISO 12100 for machinery/machine]

3.8**malfunction**

equipment or components which do not perform their intended function with respect to explosion protection

Note 1 to entry: For the purposes of this document this can happen due to a variety of reasons, including

- failure of one (or more) of the component parts of the equipment or components;
- external disturbances (for example shocks, vibration, electromagnetic fields);
- design error or deficiency (e.g. software errors);
- disturbance of the power supply or other services;
- loss of control by the operator (especially for hand-held machines).

[SOURCE: IEC 60079-0]

3.9**minimum ignition energy****MIE**

lowest stored energy which upon discharge is sufficient to effect ignition of the most ignitable atmosphere under specified test conditions

3.10**self-ignition of dust in bulk**

ignition of dusts caused by the rate of heat generation from oxidation and/or decomposition reactions of the dust being greater than the rate of heat loss to the surroundings

3.11**equipment protection level****EPL**

level of protection assigned to equipment based on its likelihood of becoming a source of ignition and distinguishing the differences between explosive gas atmospheres, explosive dust atmospheres, and the explosive atmospheres in mines susceptible to firedamp .

[SOURCE: IEC 60079-0]

3.12**EPL Ma**

equipment for installation in a mine susceptible to firedamp, having a "very high" Level of Protection, which has sufficient security that it is unlikely to become an ignition source in normal operation, during expected malfunctions or during rare malfunctions, even when left energized in the presence of an outbreak of gas

[SOURCE: IEC 60079-0]

3.13**EPL Mb**

equipment for installation in a mine susceptible to firedamp, having a "high" Level of Protection, which has sufficient security that it is unlikely to become a source of ignition in normal operation or during expected malfunctions in the time span between there being an outbreak of gas and the equipment being de-energized

[SOURCE: IEC 60079-0]

3.14**maximum surface temperature**

highest temperature that can be attained in service, under the most adverse operating conditions (but within the recognised tolerance) by any part or surface of equipment, protective system or component which can produce an ignition of the surrounding explosive atmosphere

Note 1 to entry: The surface temperature which is relevant can be internal or external depending upon the type of ignition protection concerned.

Note 2 to entry: For Ex equipment in an explosive dust atmosphere, this temperature occurs on the external surface of the enclosure and may include a defined dust layer condition

[SOURCE: ISO 80079-36]

3.15**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]

3.16**mechanical sparks**

sparks, as well as showers of sparks, produced by impact or friction between two similar or dissimilar solid materials

3.17**incendive sparks**

mechanical sparks with sufficient thermal energy to ignite a flammable atmosphere

3.18**hydraulic fluids**

all fluids and their concentrates for hydraulic transmission and monitoring with exception of water

3.19**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]

4 Requirements for Ex Equipment and Ex Components**4.1 General**

Ex Equipment and Ex Components shall conform with the requirements for EPL Ma or Mb according to IEC 60079 series for electrical equipment and according to ISO 80079 series for non-electrical equipment, for Group I. The requirement for conformity with Ma or Mb will depend on the intended application.

When Ex Equipment or Ex Components are installed on a mining machine, the Specific Conditions of Use or the Schedule of Limitations specified in the certificates shall be complied with as part of the assembly or become Specific Conditions of Use for the resultant certification of the mining machine.

NOTE Typical conditions for Specific Conditions of Use might, for example, include the minimum flow of cooling water, temperature protection settings, duty cycle (short time rating).

Guidance relevant to achieving the above requirements is provided in Annex D.

4.2 Ignition hazard assessment

An assessment of the ignition hazards associated with mining machinery shall be performed using the methodology in ISO 80079-36.

The documentation shall address the ignition hazards as follows:

- a) ignition hazards directly related to the mining machinery, and how they were mitigated in the equipment assembly; and
- b) ignition hazards directly related to the mining machinery, not mitigated in the equipment assembly, but able to be mitigated in the end-user site installation.

For ignition hazards that are not mitigated in the mining machinery, but that are able to be mitigated in the end-user site installation, the mining machinery certificate number shall include the "X" suffix in accordance with the marking requirements of IEC 60079-0 and the Specific

Conditions of Use shall be listed on the certificate and the documentation shall provide guidance on satisfying those Specific Conditions of Use.

Ignition hazards for each item of Ex Equipment are addressed by the Ex Equipment certificates, and therefore need not be reassessed.

Compliance with this document will require verification that the Ignition Hazard Assessment has been carried out and documented, along with any control measures and residual hazards as detailed above.

NOTE Typically the above verification would be done as part of a certification process.

Guidance on different ignition sources is provided in Annex B.

4.3 Non-electrical Ex Equipment and Ex Components

All non-electrical Ex Equipment and Ex Components (including parts used within the mining machine in order to connect them), shall comply with the requirements of ISO 80079-36 and, where necessary, one of the other Types of Protection listed in that document, except where specific requirements exist in this document, for example the fitting of water spray ignition protection to cutting picks.

NOTE 1 ISO 80079-36 addresses ignition protection of non-electrical Ex Equipment and Ex Components intended for use in both explosive gas atmospheres and explosive dust atmospheres, existing either separately, or combined (hybrid mixtures as defined in IEC 60079-14).

NOTE 2 Types of ignition protection for non-electrical Ex Equipment are given in ISO 80079-37.

4.4 Electrical Ex Equipment and Ex Components

4.4.1 General

All electrical Ex Equipment and Ex Components shall comply with the requirements of IEC 60079-0 and at least one of the types of protection listed in that document related to Group I.

NOTE 1 IEC 60079-0 deals with the ignition protection of electrical equipment and components intended for use in explosive gas atmospheres and explosive dust atmospheres. For gassy mines, equipment tested in an explosive gas atmosphere and protected against igniting firedamp is also adequately protected against ignition of an explosive coal dust cloud.

NOTE 2 Examples of Type of Protection documents particularly relevant to mining are:

- IEC 60079-1 (Flameproof enclosure "d");
- IEC 60079-7 (Increased safety "e");
- IEC 60079-11 (Intrinsic safety "i").

NOTE 3 The requirements of this document are in addition to the applicable electrical safety requirements of the relevant industrial standards. The relevant electrical safety standards typically include IEC 60204-1 and IEC 60204-11. It is not a requirement of this document that compliance with the relevant industrial standards be verified.

Where protective measures depend on devices external to the mining machine, the manufacturer shall specify these in the instructions. For the purposes of this document, the requirements below commence at the point where the electrical supply is connected to the mining machine (terminals, plug and socket).

NOTE 4 All terms used to describe electrical devices are as defined in IEC 60050-441.