BSI Standards Publication

Explosive atmospheres

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

bsi.

National foreword

This British Standard is the UK implementation of EN ISO/IEC 80079-38:2016+A1:2018. It is derived from ISO/IEC 80079-38:2016. It supersedes BS EN ISO/IEC 80079-38:2016, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EXL/23, Explosion and fire precautions in industrial and chemical plant.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2018

ISBN 978 0 539 02070 0

ICS 29.260.20; 73.100.30

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2017.

Amendments/corrigenda issued since publication

Date	Text affected
30 June 2018	Implementation of CEN amendment A1:2018: Annexes ZA and ZB replaced and Annex ZC deleted
31 August 2018	Implementation of CEN correction notice 13 June 2018: Annex ZA, Table ZA.1, row '1.3.1' expanded

EUROPEAN STANDARD **EN ISO/IEC 80079-**

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2018

ICS 29.260.20

English Version

Explosive atmospheres - Part 38: Equipment and components in explosive atmospheres in underground mines (ISO/IEC 80079-38:2016)

Atmosphères explosives - Partie 38: Appareils et composants destinés à être utilisés dans les mines souterraines grisouteuses (ISO/IEC 80079-38:2016)

Explosionsfähige Atmosphären - Teil 38: Geräte und Komponenten in explosionsfähigen Atmosphären in untertägigen Bergwerken (ISO/IEC 80079-38:2016)

This amendment A1 modifies the European Standard EN ISO/IEC 80079-38:2016; it was approved by CEN on 24 January 2018.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for inclusion of this amendment into the relevant national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN ISO/IEC 80079-38:2016/A1:2018 E

European foreword

This document (EN ISO/IEC 80079-38:2016/A1:2018) has been prepared by Technical Committee ISO/TMBG "Technical Management Board - groups" in collaboration with Technical Committee CEN/TC 305 “Potentially explosive atmospheres - Explosion prevention and protection”, the secretariat of which is held by DIN.

This Amendment to the European Standard EN ISO/IEC 80079:2018 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2018, and conflicting national standards shall be withdrawn at the latest by November 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annexes ZA and B, which is an integral part of this document.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO/IEC 80079-38:2016 has been approved by CEN as EN ISO/IEC 80079-38:2016/A1:2018 without any modification.

Annex ZA
(informative)

Relationship between this European Standard and the essential requirements of Directive 2014/34/EU aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/BC/CEN/92/46 to provide one voluntary means of conforming to essential requirements of Directive 2014/34/EU "Directive 2014/34/EU Of The European Parliament And Of The Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres (recast)".

Once this standard is cited in the Official Journal of the European Union under that Directive compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 2014/34/EU

Requirement /EU	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
		General: To confer a presumption of conformity with the relevant essential requirements of Directive 2014/34/EU, this standard has to be applied together with at least with one of those standards as specified in this Column below
1.0.1	4; 5	EN ISO 80079-36
1.0.2	4; 5	
1.0.3	6.2; 6.3	
1.0.4	4.1; 5.1.2; 5.1.3	EN ISO 80079-36
1.0.5	8	EN ISO 80079-36
1.0.6	7.2	
1.1.1	4; 4.1; 5.3	EN ISO 80079-36, EN 60079-0
1.1.2	4.1; 4.3; 5.4; 5.5; 5.6; 5.7; 5.9	EN ISO 80079-36, EN 60079-0,
1.1.3	4.1	EN ISO 80079-36, EN 60079-0
1.2.1	4.1	
1.2.4	4	
1.2.5	4	
1.2.6	7.1	EN ISO 80079-36, EN 60079-0

Requirement /EU	**Clause(s)/sub-clause(s) of this EN**	**Remarks/Notes**
1.2.7 a)	4.4; 5.3.1.7; 5.8	
1.2.7 b)	4.1; 4.2.3; 4.4.3.1; 5.4.2; 5.5; 5.6; 5.7; 5.9; 6.1; C.8; C.9; C.10	
1.2.7 c)	4.2; 6.2	EN ISO 80079-36
1.2.7 d)	4.4.3; 5.8	
1.2.8	4.1; 4.2; 4.3; 5.3.1.7; 5.4.1; 5.4.2; 5.4.6	
1.2.9	4.3; 4.4	EN ISO 80079-36
1.3.1	4.1; 4.2.3; 4.4.3.1; 5.1; 5.4.2; 5.4.3; 5.5; 5.6; 5.7; 6.1; 7.2	
1.3.2	4.1; 4.4.6.2; 5.3.2; 5.4.1; 5.4.5; 6.6; C.6	EN ISO 80079-36, EN 60079-0
1.3.3	4.1; 4.4.6; C.4; C.5	
1.3.4	5.3.1.7; 5.4.2	
1.4.1	4.4.5; 6.3; 7.2	instructions notice for limits of use
1.4.2	4.1;7.2 C1, C.10;C.13	instructions notice for limits of use
1.5.1 to 1.5.8	5.4.1; 5.7.1; 5.8	EN ISO 80079-36
1.6.1 to 1.6.5	5.4.1	
2.0.2	4; 5	EN ISO 80079-36, EN 60079-0
2.0.2.1	4; 5	EN ISO 80079-36, EN 60079-0
2.0.2.2	7.1	

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

Annex ZB
(informative)

Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/396 to provide one voluntary means of conforming to essential requirements of Directive 2006/42/EC "DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast)".

Once this standard is cited in the Official Journal of the European Union under that Directive compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 2006/42/EC

Essential Requirements of Directive 2006/42/EC	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
1.5.7	Whole standard	

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

This page deliberately left blank

CONTENTS

FOREWORD....5
INTRODUCTION....7
1 Scope....9
2 Normative references....9
3 Terms, definitions and abbreviated terms....10
4 Requirements for equipment (machines) and components....14
4.1 General....14
4.2 Ignition hazard assessment....15
4.2.1 Formal analysis....15
4.2.2 Assessment for equipment-group I, EPL Mb....15
4.2.3 Establishing the maximum surface temperature....15
4.2.4 Dust deposits and other material in the gap of moving parts....15
4.2.5 Ignition hazard assessment report....16
4.2.6 Ignition sources....16
4.3 Non-electrical equipment and components....16
4.4 Electrical equipment and components....16
4.4.1 General....16
4.4.2 Electrical equipment protection....17
4.4.3 Over-current protection....17
4.4.4 Earth-fault protection....18
4.4.5 Mechanical protection of live parts....19
4.4.6 Electric cables that are part of the equipment....19
5 Additional requirements for specific equipment and components....20
5.1 Cutting and stripping equipment....20
5.1.1 General....20
5.1.2 Machines with cutting picks....20
5.1.3 Stripping machines....21
5.2 Rope haulages for level and inclined transport....21
5.3 Fans....21
5.3.1 Ventilating fans for use in underground parts of mine....21
5.3.2 Other fans....23
5.4 Internal combustion engines....23
5.5 Air compressors....24
5.6 Drilling equipment and components....24
5.7 Brakes....25
5.7.1 Brakes used only for stopping in emergency....25
5.7.2 Service brakes (including friction brakes and fluid based retarders)....25
5.7.3 Parking brakes....25
5.8 Traction batteries, starter batteries and vehicle lighting batteries....25
5.9 Optical fibres used on machines and electromagnetic radiation from components on machines....26
5.9.1 External pipes/optical fibres....26
5.9.2 Radio-frequency radiation from equipment....26
5.10 Gas monitoring systems....26
6 Fire protection....27
6.1 General....27

6.2 Non-metallic materials 27
6.3 Hydraulic and pneumatic equipment 27
6.4 Requirements for cable-reeled equipment 29
6.4.1 General 29
6.4.2 Special requirements 29
6.5 Fire prevention on electric cables that are part of the machine 29
6.6 Conveyor belting 29
7 Information for use 30
7.1 Signals and warning notices 30
7.2 Instructions 30
7.2.1 Information on use 30
7.2.2 Information on maintenance and repair 30
8 Marking 30
Annex A (informative) Example of an ignition hazard assessment for a conveyor belt intended for use in a coal mine 32
A.1 General 32
A.2 EPL and intended use of the equipment 32
A.3 Construction and description of the equipment 32
A.4 Assessment 33
Annex B (informative) Example of an ignition hazard assessment for a shearer loader intended for use in a potentially explosive atmosphere of a coal mine 36
B.1 General 36
B.2 EPL and intended use of equipment 36
B.3 Construction/description of the equipment with regard to ignition protection 36
B.4 Ignition control and monitoring system 37
B.5 Compliance with the basic methodology and requirements in ISO 80079-36 37
B.6 Ignition hazard assessment of the electrical parts of the equipment 38
B.7 Ignition hazard assessment of non-electrical ignition sources 38
B.8 Equipment marking 38
Annex C (normative) Ignition sources 42
C.1 Hot surfaces 42
C.2 Flames and hot gases (including hot particles) 42
C.3 Mechanically generated sparks 43
C.4 Electrical equipment 43
C.5 Stray electric currents 43
C.6 Static electricity 44
C.7 Lightning 44
C.8 Radio frequency (RF) electromagnetic waves from 10^4 Hz to 3×10^{12} Hz (high frequency) 44
C.9 Electromagnetic waves from 3×10^{11} Hz to 3×10^{15} Hz 45
C.10 Ionizing radiation 45
C.11 Ultrasonics 45
C.12 Adiabatic compression and shock waves 45
C.13 Exothermic reactions, including self-ignition of dusts 46
Annex D (informative) Guidance on potential risks for converter-fed motors 47
Annex E (normative) Tests for surface protective coating for group I hand tools of EPL Mb 48
E.1 Incendive impact tests in explosive mixture 48
E.1.1 Verification of ignition of the raw light alloy material 48

E.1.2 Estimation of protective coating efficiency 48
E.1.3 Evaluation of results 49
E.2 Adhesion test of the protective coating 49
Bibliography 51

Figure B.1 – Layout and construction of the coal face shearer loader 37
Figure E.1 – Rig for impact ignition test 50

Table 1 – Combination of materials 23
Table 2 – Limit values for hydraulic fluids 28
Table A.1 – Example of an ignition hazard assessment for a mining conveyor, EPL Mb *(1 of 2)* 33
Table B.1 – Example of an ignition hazard assessment for a shearer loader, EPL Mb *(1 of 3)* 39

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

EXPLOSIVE ATMOSPHERES –

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

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard 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 standard is based on the following documents of the IEC:

FDIS	Report on voting
31M/105/FDIS	31M/111/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. In ISO, the standard has been approved by 13 P members out of 21 having cast a vote.

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

"A list of all parts in the IEC 60079 series, under the general title *Explosive atmospheres*, as well as the International Standard 80079 series, 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.

INTRODUCTION

This part of ISO/IEC 80079 specifies requirements for the constructional features of equipment and 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 electrical equipment used on mining machinery is certified as an individual item of equipment, e.g. the motor, switchgear etc., and meets its own marking requirements. This certification, however, does not deal with the interconnection of these items of equipment by cables or the machine electrical power system as an entity. The equipment and components, including their interconnections, should be assessed, from an ignition point of view, by the manufacturer.

Both non-electrical equipment and the interconnection of electrical/non-electrical equipment require an ignition hazard assessment.

Therefore, it is necessary that not just the equipment, but all its parts, is examined by the manufacturer according to a formally documented ignition hazard assessment that establishes and lists all the possible ignition sources of the equipment including the cables and electrical supply system. The documentation shall list the measures that shall be introduced to keep possible ignition sources from becoming effective.

The need for this International Standard 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:

– the product being won from the underground strata may be combustible and may continually release firedamp during the winning process;
– the ignitability of the atmosphere around equipment and 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 potentially explosive to one that is explosive (for example, during an outburst of firedamp);
– persons working in the mine are usually situated within the potentially explosive atmosphere;
– there is a need to monitor constantly the mine atmosphere at strategic places to ensure that power can be disconnected from all equipment except Ma equipment which is suitable for use in a constantly explosive atmosphere;
– in gassy coal mines, an explosion of firedamp at a machine can raise a combustible dust cloud that exacerbates the explosion;
– some mining machinery, especially that associated with winning the product, contains cutting devices and drilling devices that are intended to cut into the combustible product as part of their normal operation. This introduces an ignition risk from frictional heating or frictional sparking 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 production of firedamp.

To decide which equipment or its component parts should merit inclusion in this International Standard, ignition data has been examined based on international experience.

When drafting this International standard, it has been assumed that equipment and components are:

- designed in accordance with good engineering practice, taking account of expected shocks, vibrations and failure modes;
- of sound mechanical and electrical construction;
- made of materials with adequate strength and of suitable quality;
- free from defects; and
- kept in good repair and working order, e.g. so that the required dimensions remain within permissible tolerance despite wear.

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 design, construction, assessment and information for use (maintenance, repair, marking) of equipment that may be an individual item or form an assembly.

This includes machinery and components for use in mines susceptible to explosive atmospheres of firedamp and/or combustible dust. The standard atmospheric conditions (relating to the explosion characteristics of the atmosphere) under which it may be assumed that 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 equipment and components according to EPL Mb to be used in explosive atmospheres containing firedamp and/or combustible dust.

NOTE 1 In some countries, there might be differences according to the classification, e.g. Mb is similar to category M2 in the European Union.

For equipment and components according to EPL Ma, the requirements of this standard and of ISO 80079-36 and IEC 60079-0 apply.

NOTE 2 A standard with additional requirements for EPL Ma is under preparation.

It is necessary to take account of external conditions to the equipment which may affect the hazard and the resultant protection measures. These measures may include ventilation, gas detection or gas drainage.

This part of ISO/IEC 80079 also deals with the prevention of ignitions of explosive atmospheres caused by burning (or smouldering) of combustible material such as fabric fibres, plastic ”O”-rings, rubber seals, lubricating oils or greases used in the construction of the equipment if such items could be an ignition source. For example, the mechanical failure of rotating shaft bearings can result in frictional heating that ignites its plastic cage, plastic seal or lubricating grease.

Detailed requirements and test procedures for the fire protection of conveyer belts are not part of this part of ISO/IEC 80079.

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*