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Interested committees:

Title: Draft BS EN 60079-0 Ed.8.0 Explosive atmospheres. Part 0: Equipment - General requirements.

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- i) has any issues related to 3rd party IPR, patent or copyright
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- iii) requires additional national guidance or information

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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.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

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- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

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	Commend (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.	



31/1597/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER: IEC 60079-0 ED8	
DATE OF CIRCULATION: 2021-10-22	CLOSING DATE FOR COMMENTS: 2022-01-14
SUPERSEDES DOCUMENTS: 31/1591/RR	

IEC TC 31 : EQUIPMENT FOR EXPLOSIVE ATMOSPHERES	
SECRETARIAT: United Kingdom	SECRETARY: Mr Mick Maghar
OF INTEREST TO THE FOLLOWING COMMITTEES:	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	

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Explosive atmospheres - Part 0: Equipment - General requirements

NOTE FROM TC/SC OFFICERS:

Please refer to 31/1596/INF which is circulated in parallel to the CD to have the information background to the revision of IEC 600079-0:2017.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES –

Part 0: Equipment – General requirements

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60079-0 has been prepared by IEC technical committee 31: Equipment for explosive atmospheres.

This eighth edition cancels and replaces the seventh edition, published in 2017. This edition constitutes a technical revision.

335 Table will be developed and circulated as part of the CDV.

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 may be found by referring to the Redline Version of the standard.

341 A) Definitions


Documents
 Document Sharing Hub

344 minor technical change
345 editorial corrections

346 These are changes which modify requirements in an editorial or a minor technical way. They
347 include changes of the wording to clarify technical requirements without any technical change,
348 or a reduction in level of existing requirement.

349 **Extension** addition of technical options

350 These are changes which add new or modify existing technical requirements, in a way that new
351 options are given, but without increasing requirements for equipment that was fully compliant
352 with the previous standard. Therefore, these will not have to be considered for products in
353 conformity with the preceding edition.

354 **Major technical changes** addition of technical requirements
355 increase of technical requirements

356 These are changes to technical requirements (addition, increase of the level or removal) made
357 in a way that a product in conformity with the preceding edition will not always be able to fulfil
358 the requirements given in the later edition. These changes have to be considered for products
359 in conformity with the preceding edition. For these changes additional information is provided
360 in clause B) below.

361 NOTE These changes represent current technological knowledge. However, these changes should not normally
362 have an influence on equipment already placed on the market.

363 B) Information about the background of changes

364 A1

365 A2

366 A3

367 A4

368 B1

369 C1

370 C2

371 C3

372 C4

373 C5

374 C6

375 C7

376 C8

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

FDIS	Report on voting
31/????/FDIS	31/????/RVD

378
379 Full information on the voting for the approval of this International Standard can be found in the
380 report on voting indicated in the above table.

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

382 A list of all parts of the IEC 60079 series, under the general title *Explosive atmospheres*, can
383 be found on the IEC website.

384 The committee has decided that the contents of this document will remain unchanged until the
385 stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to
386 the specific document. At this date, the document will be

- 387 • reconfirmed,
- 388 • withdrawn,
- 389 • replaced by a revised edition, or
- 390 • amended.

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393

EXPLOSIVE ATMOSPHERES –

Part 0: Equipment – General requirements

1 Scope

This part of IEC 60079 specifies the general requirements for construction, testing and marking of Ex Equipment and Ex Components intended for use in explosive atmospheres.

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 $+60\text{ °C}$;
- pressure 80 kPa ($0,8\text{ bar}$) to 110 kPa ($1,1\text{ bar}$); and
- air with normal oxygen content, typically 21 % v/v .

This part of IEC 60079 and other standards supplementing this standard specify additional test requirements for Ex Equipment operating outside the standard temperature range, but further additional consideration and additional testing may be required for Ex Equipment operating outside the standard atmospheric pressure range and standard oxygen content. Such additional testing may be particularly relevant with respect to Types of Protection that depend on quenching of a flame such as 'flameproof enclosures "d"' (IEC 60079-1) or limitation of energy, 'intrinsic safety "i"' (IEC 60079-11).

NOTE 1 Although the standard atmospheric conditions above give a temperature range for the atmosphere of -20 °C to $+60\text{ °C}$, the normal ambient temperature range for the Ex Equipment is -20 °C to $+40\text{ °C}$, unless otherwise specified and marked. See 5.1.1. It is considered that -20 °C to $+40\text{ °C}$ is appropriate for many items of Ex Equipment and that to manufacture all Ex Equipment to be suitable for a standard atmosphere upper ambient temperature of $+60\text{ °C}$ would place unnecessary design constraints.

NOTE 2 Requirements given in this standard result from an ignition hazard assessment made on equipment. The ignition sources taken into account are those found associated with this type of equipment, such as hot surfaces, electromagnetic radiation, mechanically generated sparks, mechanical impacts resulting in thermite reactions, electrical arcing and static electric discharge in normal industrial environments.

NOTE 3 Where an explosive gas atmosphere and a combustible dust atmosphere are, or can be, present at the same time, the simultaneous presence of both often warrants additional protective measures. Additional guidance on the use of Ex Equipment in hybrid mixtures (mixture of a flammable gas or vapour with a combustible dust or combustible flyings) is given in IEC 60079-14.

IEC 60079 does not specify requirements for safety, other than those directly related to the explosion risk.

Ignition sources like adiabatic compression, shock waves, exothermic chemical reaction, self-ignition of dust, naked flames and hot gases/liquids, are not addressed by this standard.

NOTE 4 Although outside the scope of this standard, such equipment would typically be subjected to a hazard analysis that identifies and lists all of the potential sources of ignition by the equipment and the measures to be applied to prevent them becoming effective. See ISO/IEC 80079-36.

This document is supplemented or modified by the following parts and technical specifications:

- IEC 60079-1: Gas – Flameproof enclosures "d";
- IEC 60079-2: Gas and dust – Pressurized enclosure "p";
- IEC 60079-5: Gas – Powder filling "q";
- IEC 60079-6: Gas – Liquid immersion "o";

- 440 – IEC 60079-7: Gas – Increased safety "e";
- 441 – IEC 60079-11: Gas and dust – Intrinsic safety "i";
- 442 – IEC 60079-13: Gas and dust – Equipment protection by pressurized room "p" & artificially
- 443 ventilated room "v";
- 444 – IEC 60079-15: Gas – Type of protection "n";
- 445 – IEC 60079-18: Gas and dust – Encapsulation "m";
- 446 – IEC 60079-25: Gas and dust – Intrinsically safe electrical systems
- 447 – IEC 60079-26: Gas and dust – Equipment with Separation Elements or combined Levels of
- 448 Protection
- 449 – IEC 60079-28: Gas and dust – Protection of equipment and transmission systems using
- 450 optical radiation
- 451 – IEC 60079-29-1: Gas detectors – Performance requirements of detectors for flammable
- 452 gases
- 453 – IEC 60079-29-4: Gas detectors – Performance requirements of open path detectors for
- 454 flammable gases
- 455 – IEC/IEEE 60079-30-1: Gas and dust – Electrical resistance trace heating – General and
- 456 testing requirements.
- 457 – IEC 60079-31: Dust – Protection by enclosure "t"
- 458 – IEC 60079-33: Gas and dust – Special protection "s"
- 459 – IEC 60079-35-1: Caplights for use in mines susceptible to firedamp – General requirements
- 460 – Construction and testing in relation to the risk of explosion
- 461 – IEC TS 60079-39: Gas – Intrinsically safe systems with electronically controlled spark
- 462 duration limitation
- 463 – IEC TS 60079-40: Gas – Requirements for process sealing between flammable process
- 464 fluids and electrical systems
- 465 – IEC TS 60079-46: Gas and dust – Equipment assemblies
- 466 – ISO 80079-36: Gas and dust – Non-electrical equipment for explosive atmospheres – Basic
- 467 method and requirements
- 468 – ISO 80079-37: Gas and dust - Non-electrical equipment for explosive atmospheres – Non
- 469 electrical type of protection constructional safety "c", control of ignition source "b", liquid
- 470 immersion "k"

471 This document, along with the additional parts of IEC 60079 and ISO 80079 mentioned above,
 472 is not applicable to the construction of

- 473 • electromedical apparatus,
- 474 • shot-firing exploders,
- 475 • test devices for exploders, and
- 476 • shot-firing circuits.

477 **2 Normative references**

478 The following documents are referred to in the text in such a way that some or all of their content
 479 constitutes requirements of this document. For dated references, only the edition cited applies.
 480 For undated references, the latest edition of the referenced document (including any
 481 amendments) applies.

482 IEC 60034-1, *Rotating electrical machines – Part 1: Rating and performance*

- 483 IEC 60034-5, *Rotating electrical machines – Part 5: Degrees of protection provided by the*
484 *integral design of rotating electrical machines (IP code) – Classification*
- 485 IEC 60079-1, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures*
486 *"d"*
- 487 IEC 60079-26, *Explosive atmospheres – Part 26: Equipment with Separation Elements or*
488 *combined Levels of Protection*
- 489 IEC 60079-35-1, *Explosive atmospheres – Part 35-1: Caplights for use in mines susceptible to*
490 *firedamp – General requirements – Construction and testing in relation to the risk of explosion*
- 491 IEC 60086-1, *Primary batteries – Part 1: General*
- 492 IEC 60192, *Low-pressure sodium vapour lamps – Performance specifications*
- 493 IEC 60216-1, *Electrical insulating materials – Thermal endurance properties – Part 1: Ageing*
494 *procedures and evaluation of test results*
- 495 IEC 60216-2, *Electrical insulating materials – Thermal endurance properties – Part 2:*
496 *Determination of thermal endurance properties of electrical insulating materials – Choice of test*
497 *criteria*
- 498 IEC 60243-1, *Electric strength of insulating materials – Test methods – Part 1: Tests at power*
499 *frequencies*
- 500 IEC 60423, *Conduit systems for cable management – Outside diameters of conduits for*
501 *electrical installations and threads for conduits and fittings*
- 502 IEC 60529, *Degrees of protection provided by enclosures (IP Code)*
- 503 IEC 60662, *High-pressure sodium vapour lamps – Performance specifications*
- 504 IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1:*
505 *Principles, requirements and tests*
- 506 IEC 60947-1, *Low-voltage switchgear and controlgear – Part 1: General rules*
- 507 IEC 62626-1, *Low-voltage switchgear and controlgear enclosed equipment – Part 1: Enclosed*
508 *switch-disconnectors outside the scope of IEC 60947-3 to provide isolation during repair and*
509 *maintenance work*
- 510 ISO 48, *Rubber, vulcanized or thermoplastic – Determination of hardness (hardness between*
511 *10 IRHD and 100 IRHD)*
- 512 ISO 178, *Plastics – Determination of flexural properties*
- 513 ISO 179 (all parts), *Plastics – Determination of Charpy impact properties*
- 514 ISO 262, *ISO general-purpose metric screw threads – Selected sizes for screws, bolts and nuts*
- 515 ISO 273, *Fasteners – Clearance holes for bolts and screws*

- 516 ISO 527-2, *Plastics – Determination of tensile properties – Part 2: Test conditions for moulding*
517 *and extrusion plastics*
- 518 ISO 965-1, *ISO general-purpose metric screw threads – Tolerances – Part 1: Principles and*
519 *basic data*
- 520 ISO 965-3, *ISO general-purpose metric screw threads – Tolerances – Part 3: Deviations for*
521 *constructional screw threads*
- 522 ISO 3601-1, *Fluid power systems – O-rings – Part 1: Inside diameters, cross-sections,*
523 *tolerances and designation codes*
- 524 ISO 3601-2, *Fluid power systems – O-rings – Part 2: Housing dimensions for general*
525 *applications*
- 526 ISO 4014, *Hexagon head bolts – Product grades A and B*
- 527 ISO 4017, *Hexagon head screws – Product grades A and B*
- 528 ISO 4026, *Hexagon socket set screws with flat point*
- 529 ISO 4027, *Hexagon socket set screws with cone point*
- 530 ISO 4028, *Hexagon socket set screws with dog point*
- 531 ISO 4029, *Hexagon socket set screws with cup point*
- 532 ISO 4032, *Hexagon nuts, style 1 – Product grades A and B*
- 533 ISO 4762, *Hexagon socket head cap screws*
- 534 ISO 4892-2, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc*
535 *lamps*
- 536 ISO 7380, *Hexagon socket button head screws*
- 537 ISO 14583, *Hexalobular socket pan head screws*
- 538 ISO/IEC 80079-20-1, *Explosive atmospheres – Part 20-1: Material characteristics for gas and*
539 *vapour classification – Test methods and data*ANSI/UL 746B, *Polymeric Materials – Long-Term*
540 *Property Evaluations*
- 541 ANSI/UL 746C, *Polymeric Materials – Used in Electrical Equipment Evaluations*
- 542 ASTM D5964, *Standard practice for rubber IRM 901, IRM 902, and IRM 903 replacement oils*
543 *for ASTM No. 1, ASTM No. 2, and ASTM No. 3*

544 **3 Terms and definitions**

545 For the purposes of this document, the following terms and definitions apply.

546 ISO and IEC maintain terminological databases for use in standardization at the following
547 addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

NOTE Additional definitions applicable to explosive atmospheres can be found in IEC 60050-426.

3.1

ambient temperature

T_{amb}

T_a

temperature of the air or other media, in the immediate vicinity of the equipment or component

Note 1 to entry: This does not refer to the temperature of any process media, unless the equipment or component is totally immersed in the process media. See Clause 5.

Note 2 to entry: If Ex Equipment or an Ex Component is located inside or adjacent to another piece of equipment, the “ambient temperature” is the temperature of the air or other media surrounding the Ex Equipment or Ex Component and can be higher than the ambient air surrounding the complete equipment due to the additional heat dissipated within the complete equipment.

Note 3 to entry: The ambient temperature referred to in the IEC 60079 series is only related to the explosion safety of the Ex Equipment or Ex Component.

3.2

area, hazardous

area in which an explosive atmosphere is present, or can be expected to be present, in quantities such that special precautions for the construction, installation and use of equipment are required

3.3

area, non-hazardous

area in which an explosive atmosphere is not expected to be present in quantities such that special precautions for the construction, installation and use of equipment are required

3.4

associated apparatus

electrical apparatus that contains both intrinsically safe and non-intrinsically safe circuits and is constructed so that the non-intrinsically safe circuits cannot adversely affect the intrinsically safe circuits

Note 1 to entry: Associated apparatus is either:

- additionally protected by a Type of Protection suitable for use in the appropriate explosive atmosphere, or
- not protected by a Type of Protection suitable for use in the appropriate explosive atmosphere and therefore is not to be used within an explosive atmosphere

3.5

Ex associated equipment

auxiliary equipment used in conjunction with explosion-protected equipment to maintain specific aspects of the Type of Protection of the explosion-protected equipment

Note 1 to entry: Examples include special time/current relays for increased safety motors, pressurization control systems, power limits for encapsulated Ex Equipment, and the like.

Note 2 to entry: Ex associated equipment is either:

- additionally protected by a Type of Protection suitable for use in the appropriate explosive atmosphere; or
- not protected by a Type of Protection suitable for use in the appropriate explosive atmosphere and therefore is not to be used within an explosive atmosphere,

Note 3 to entry: A similar concept is applied to intrinsic safety where it is referred to as “associated apparatus”. See 3.4. A single piece of equipment can include both Ex associated equipment and associated apparatus.

3.6

auto-ignition temperature

AIT

minimum ignition temperature of an explosive gas atmosphere

lowest temperature (of a surface) at which, under specified conditions (according to ISO/IEC 80079-20-1), an ignition of a flammable gas or vapour in mixture with air or air/inert gas occurs

3.7

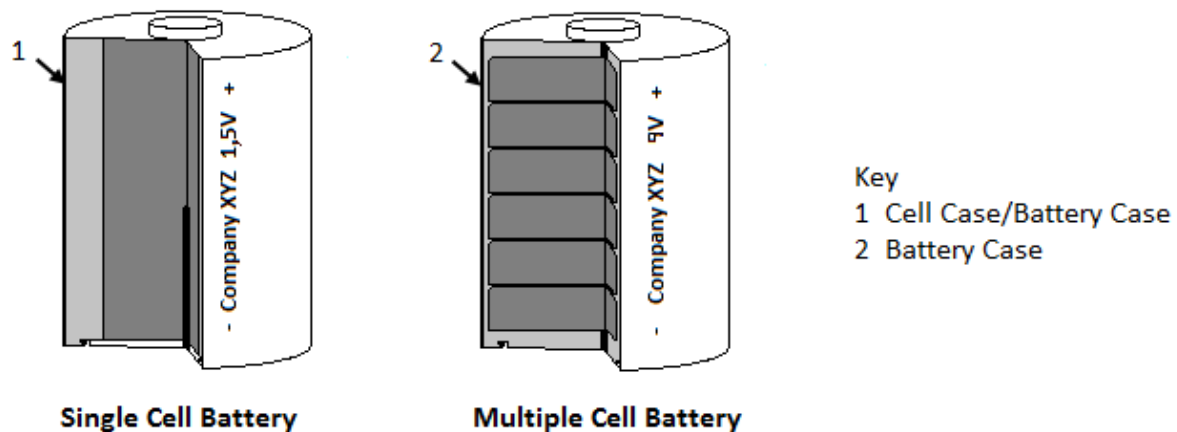
cells and batteries

3.7.1

battery

one or more cells fitted with devices necessary for use, for example, terminals, marking and protective devices

Note 1 to entry: See Figure 1 for examples of typical battery constructions.



IEC

Figure 1 – Typical battery examples

3.7.2

capacity

electric charge which a battery or cell can deliver under specified discharge conditions

Note 1 to entry: The SI unit for electric charge, or quantity of electricity, is the coulomb ($1\text{ C} = 1\text{ A} \times \text{s}$) but in practice, capacity is usually expressed in ampere hours (Ah).

3.7.3

cell

basic functional unit, consisting of an assembly of electrodes, electrolyte, case, terminals and usually separators, that is a source of electric energy obtained by direct conversion of chemical energy

Note 1 to entry: See primary cell and secondary cell.

3.7.4

charging

operation during which a secondary cell or battery is supplied with electric energy from an external circuit which results in chemical changes within the cell and thus the storage of energy as chemical energy

3.7.5**deep discharge**

event which reduces a cell voltage below that recommended by the cell or battery manufacturer

3.7.6**maximum open-circuit voltage****<cell or battery>**

voltage of a new primary battery or of a fully charged secondary battery when the discharge current is zero

Note 1 to entry: See Table 13 and Table 14 which show the maximum open-circuit voltage for acceptable cells.

3.7.7**nominal voltage****<cell or battery>**

suitable approximate value of the voltage used to designate or identify a cell or battery or an electrochemical system

3.7.8**vented cell or battery**

secondary cell, or battery, having a cover provided with an opening through which gaseous products can escape

3.7.9**primary cell or battery**

cell or battery which is not designed to be electrically recharged

3.7.10**reverse charging**

act of forcing current through either a primary cell or secondary cell in the same direction as the normal flow, generally due to the reverse polarity in an expired cell of a series connected battery

3.7.11**sealed cell**

secondary cell which remains closed and does not release either gas or liquid when operated within the limits specified by the cell manufacturer

Note 1 to entry: A sealed cell is often equipped with a safety device to protect against a dangerously high internal pressure and is designed to operate during its life in its original sealed state.

3.7.12**valve-regulated cell or battery**

cell or battery which is closed under normal conditions but which has an arrangement which allows the escape of gas if the internal pressure exceeds a pre-determined value

Note 1 to entry: The cell cannot normally receive an addition to the electrolyte.

3.7.13**secondary cell or battery**

cell which is designed to be electrically recharged

Note 1 to entry: The recharge is accomplished by way of a reversible chemical reaction.

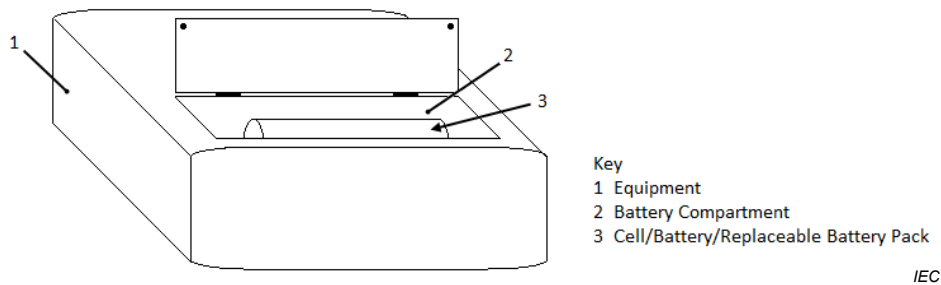
3.7.14**battery compartment**

compartment of the equipment that accommodates one or more cells and batteries

671 Note 1 to entry: The battery compartment is an integral part of the equipment.
672 Note 2 to entry: A battery compartment can be a battery container
673 Note 3 to entry: See Figure 2 for an example of typical battery compartment construction.
674

675 **3.7.15**
676 **battery container**
677 enclosure to contain one or more cells or batteries

678 Note 1 to entry: See Figure 1 for examples of typical battery constructions.



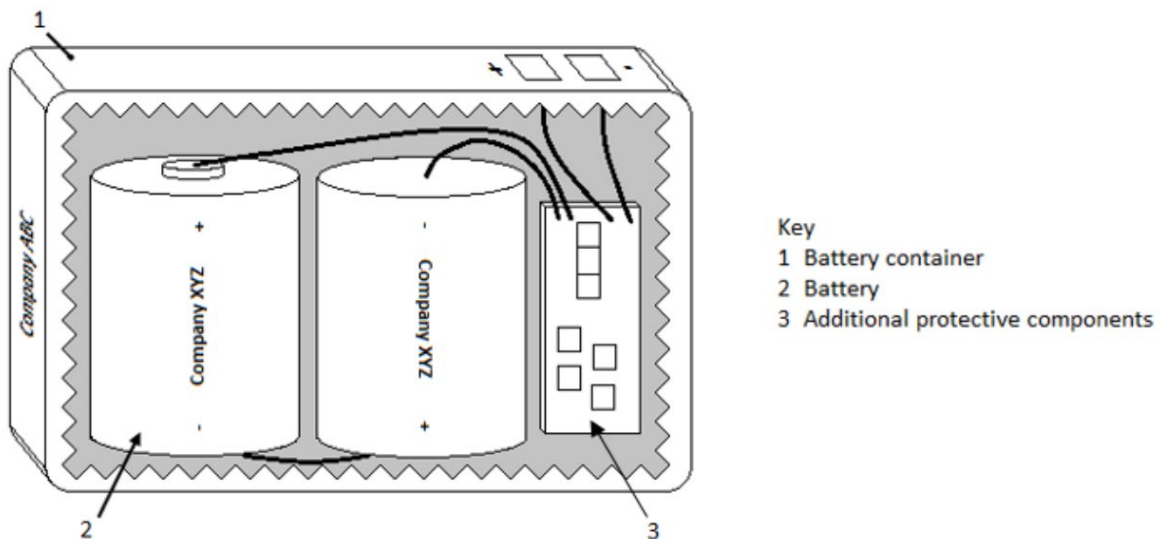
679
680 **Figure 2 – Typical battery compartment**

681 **3.7.16**
682 **battery case**
683 **cell case**
684 cell or battery enclosure that is an integral part of the construction of the cell or battery

685 Note 1 to entry: The case can be sealed, valve-regulated, or vented.

686 **3.7.17**
687 **replaceable battery pack**
688 assembly consisting of one or more interconnected batteries, along with any additional
689 protective components, which form a complete replaceable battery pack

690 Note 1 to entry: See Figure 3 for an example of typical replaceable battery pack construction.



691
692 **Figure 3 – Typical replaceable battery pack**

3.8**breathing device**

device that permits an exchange between the atmosphere within an enclosure and the surrounding atmosphere and which maintains the integrity of the Type of Protection

3.9**bushing**

insulating device carrying one or more conductors, insulated or bare, through an internal or external wall of an enclosure

3.10**cable gland**

device permitting the introduction of one or more electric or fibre optic cables into an electrical Ex Equipment enclosure so as to maintain the relevant Type of Protection and provide a degree of strain relief

Note 1 to entry: See Figure A.1 for illustration of the terms used for cable glands.

3.10.1**clamping device****<cable gland>**

element of a cable gland for preventing tension or torsion in the cable from being transmitted to the connections

3.10.2**compression element****<cable gland>**

element of a cable gland compressing or displacing the sealing ring

3.10.3**sealing ring****<cable gland>**

element used in a cable gland to ensure the sealing between the cable gland and the cable

3.10.4**Ex Equipment cable gland****<cable gland>**

cable gland tested separately from the equipment enclosure but having an Ex Equipment certificate and which is intended to be fitted to an Ex Equipment enclosure

Note 1 to entry: This does not preclude an Ex Component certificate for cable glands.

3.10.5**cable transit device****<cable gland>**

an entry device, intended for one or more electric or fibre optic cables, with a seal made up of one or more separate elastomeric modules or parts of modules (modular internal seal), which are compressed together when the device is assembled and mounted as intended

Note 1 to entry: Cable transit devices serve as Ex Equipment Blanking Elements when the elastomeric modules provided allow for this function.

3.11**casting****<non-metallic compound>**

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

738 **3.12**
739 **certificate**
740 document that conveys the assurance of the conformity of a product, process, system, person,
741 or organization with specified requirements

742 Note 1 to entry: The certificate is either the supplier's declaration of conformity or the purchaser's recognition of
743 conformity or certification (as a result of action by a third party) as defined in ISO/IEC 17000.

744 **3.12.1**
745 **Ex Component Certificate**
746 certificate prepared for an Ex Component (see 3.37)

747 **3.12.2**
748 **Ex Equipment Certificate**
749 certificate prepared for Ex Equipment

750 **3.13**
751 **coating**
752 material applied to a surface

753 **3.14**
754 **conformal coating**
755 electrical insulating material applied as a coating to loaded printed circuit boards to produce a
756 thin layer conforming to the surface in order to provide a protective barrier against deleterious
757 effects from environmental conditions

758 **3.15**
759 **comparable converter**
760 converter where the losses in the motor supplied by the converter are not higher than the losses
761 that would have occurred if the motor were used with the specific converter that was used during
762 the type test

763 Note 1 to Entry: This converter is similar with respect to the output voltage, output current, and
764 switching frequency specifications so the machine limiting temperatures, for maximum surface
765 temperature and material thermal stability, are not exceeded.

766 **3.16**
767 **compound**
768 **<for encapsulation>**
769 thermosetting, thermoplastic, epoxy resin or elastomeric materials with or without fillers and/or
770 additives, in their solid state

771 **3.17**
772 **conduit entry**
773 means of introducing a conduit into Ex Equipment so as to maintain the relevant Type of
774 Protection

775 **3.18**
776 **connection facilities**
777 terminals, screws or other parts, used for the electrical connection of conductors

778 **3.19**
779 **connections, factory**
780 terminations intended for connection during a manufacturing process under controlled
781 conditions

3.20

connections, field-wiring

terminations intended for connection by the installer in the field

3.21

continuous operating temperature**COT**

temperature range which ensures the stability and integrity of the material for the expected life of the equipment, or part, in its intended application

3.22

converter**<for use with electric machines>**

unit for electronic power conversion, changing one or more electrical characteristics and comprising one or more electronic switching devices and associated components, such as transformers, filters, commutation aids, controls, protections, and auxiliaries, if any

Note 1 to entry: A converter is also known by other terms. For example, a frequency converter, a converter drive, an inverter drive, a variable speed drive, an adjustable speed drive (ASD), or a variable frequency drive (VFD).

3.22.1

converter, soft-start**<for use with electric machines>**

converter which limits the input current to the electric machine during the starting process

Note 1 to entry: It is intended that the soft-start converter is used only during the starting process and is then isolated from the power system or bypassed when the electric machine is running.

3.23

degree of protection (IP) of enclosure

numerical classification according to IEC 60529 or IEC 60034-5 (as applicable) preceded by the symbol IP applied to the enclosure of equipment to provide:

- protection of persons against contact with, or approach to, live parts and against contact with moving parts (other than smooth rotating shafts and the like) inside the enclosure,
- protection of the equipment against ingress of solid foreign objects, and
- where indicated by the classification, protection of the equipment against harmful ingress of water

Note 1 to entry: The detailed test requirements for rotating electric machines are in IEC 60034-5.

Note 2 to entry: The enclosure which provides the degree of protection (IP) is not necessarily the same as the equipment enclosure providing the Type of Protection listed in Clause 1.

Note 3 to entry: An enclosure which provides the degree of protection (IP) required by one of the types of protection listed in Clause 1 will have been subjected to other tests prior to the tests for degree of protection (IP). See 26.4.

3.24

draining device

device that permits liquids to flow out from an enclosure and which maintains the integrity of the Type of Protection

3.25

dust

combustible dust or combustible flyings

Note 1 to entry: An explosive dust atmosphere (3.40) can be created when either combustible dust or combustible flyings are present in hazardous quantities.

827 **3.25.1**
828 **combustible dust**
829 finely divided solid particles, 500 µm or less in nominal size, which can form explosive mixtures
830 with air at standard atmospheric pressure and temperatures

831 Note 1 to entry: This includes dust and grit as defined in ISO 4225.

832 Note 2 to entry: The term solid particles is intended to address particles in the solid phase and not the gaseous or
833 liquid phase, but does not preclude a hollow particle.

834 **3.25.1.1**
835 **conductive dust**
836 combustible dust with electrical resistivity equal to or less than 1 kΩ·m

837 Note 1 to entry: ISO/IEC 80079-20-2 contains the test method for determining the electrical resistivity of dusts.

838 Note 2 to entry: Metal dust is treated as conductive dust because it is assumed that surface oxidation cannot be
839 depended upon to always ensure electrical resistivity greater than 1k Ω·m.

840 **3.25.1.2**
841 **non-conductive dust**
842 combustible dust with electrical resistivity greater than 1 kΩ·m

843 Note 1 to entry: ISO/IEC 80079-20-2 contains the test method for determining the electrical resistivity of dusts.

844 **3.25.2**
845 **combustible flyings**
846 solid particles, including fibres, where one dimension is greater than 500 µm in nominal size,
847 which can form an explosive mixture with air at standard atmospheric pressure and temperature

848 Note 1 to entry: One dimension has a high ratio when compared to the other two dimensions

849 Note 2 to entry: Examples of combustible flyings include carbon fibre, rayon, cotton (including cotton linters and
850 cotton waste) sisal, jute, hemp, cocoa fibre, oakum and baled waste kapok.

851 **3.26**
852 **dust-tight enclosure**
853 enclosure capable of excluding the ingress of observable dust particle deposits

854 **3.27**
855 **dust-protected enclosure**
856 enclosure in which the ingress of dust is not totally excluded, but is unlikely to enter in sufficient
857 quantity to interfere with the safe operation of the equipment and does not accumulate in a
858 position within the enclosure where it is liable to cause an ignition hazard

859 **3.28**
860 **duty cycle**
861 repetitive variation of load in which the cycle time is too short for thermal equilibrium to be
862 attained in the first cycle

863 [SOURCE: IEC 60050-411:1996, 411-51-7]

864 **3.29**
865 **elastomer**
866 a macromolecular material which returns rapidly to approximately its initial dimensions and
867 shape after substantial deformation by a weak stress and release of the stress

868 Note 1 to entry: The definition applies to room temperature test conditions.

869 [SOURCE: IEC 60050-212:2010, 212-14-05]

3.30**encapsulation**

process of applying a compound to enclose an electrical device(s) by suitable means

3.31**enclosure**

all the walls, doors, covers, cable glands, rods, spindles, shafts, etc. which contribute to the Type of Protection or the degree of protection (IP) of the equipment

3.32**equipment**

general term including apparatus, fittings, devices, components, and the like used as a part of, or in connection with, an installation

3.32.1**equipment, electrical**

items applied as a whole or in part for the utilization of electrical energy

Note 1 to entry: These include, amongst others, items for the generation, transmission, distribution, storage, measurement, regulation, conversion and consumption of electrical energy and items for telecommunications.

3.32.2**equipment, fixed**

equipment fastened to a support, or otherwise secured in a specific location, when energized

3.32.3**equipment, personal**

equipment intended to be worn by and to be in contact with a person's body during operation

Note 1 to Entry: Examples of personal equipment include wristwatches, in-ear or on-ear hearing aids.

3.32.4**equipment, portable**

equipment intended to be carried by a person during its operation

Note 1 to entry: Portable equipment carried by a person during its operation is sometimes referred to as hand-held equipment.

Note 2 to Entry: Examples of portable equipment include mobile phones, remote controls for hearing aids, flammable / toxic gas detectors, insulin pumps.

3.32.5**equipment, transportable**

equipment not intended to be carried by a person during its operation nor intended for fixed installation

3.33**equipment grouping**

classification system of equipment related to the explosive atmosphere for which they are intended to be used

Note 1 to entry: IEC 60079-0 identifies three equipment groups:

Group I, equipment for mines susceptible to fire damp;

Group II, which is divided into sub-groups, equipment for all places with an explosive gas atmosphere other than mines susceptible to fire damp

Group III, which is divided into sub-groups, equipment for all places with an explosive dust atmosphere other than mines susceptible to fire damp

3.34

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

3.34.1

EPL Ma

equipment for 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

3.34.2

EPL Mb

equipment for 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

3.34.3

EPL Ga

equipment for explosive gas atmospheres, having a "very high" Level of Protection, which is not a source of ignition in normal operation, during expected malfunctions or during rare malfunctions

3.34.4

EPL Gb

equipment for explosive gas atmospheres, having a "high" Level of Protection, which is not a source of ignition in normal operation or during expected malfunctions

3.34.5

EPL Gc

equipment for explosive gas atmospheres, having an "enhanced" Level of Protection, which is not a source of ignition in normal operation and which can have some additional protection to ensure that it remains inactive as an ignition source in the case of regular expected occurrences (for example failure of a lamp)

3.34.6

EPL Da

equipment for explosive dust atmospheres, having a "very high" Level of Protection, which is not a source of ignition in normal operation, during expected malfunctions, or during rare malfunctions

3.34.7

EPL Db

equipment for explosive dust atmospheres, having a "high" Level of Protection, which is not a source of ignition in normal operation or during expected malfunctions

3.34.8

EPL Dc

equipment for explosive dust atmospheres, having an "enhanced" level of protection, which is not a source of ignition in normal operation and which can have some additional protection to ensure that it remains inactive as an ignition source in the case of regular expected occurrences (for example failure of a lamp)

3.35**Explosion-protected**

application of one or more Types of Protection to minimize the risk of equipment causing ignition of a surrounding explosive atmosphere

1.1**Ex Equipment blanking element**

blanking element tested separately from the Ex Equipment enclosure but having an Ex Equipment certificate and which is intended to be fitted to an Ex Equipment enclosure

Note 1 to entry: This does not preclude an Ex Component certificate for blanking elements.

3.36**Ex Equipment thread adapter**

thread adapter tested separately from the Ex Equipment enclosure but having an Ex Equipment certificate and which is intended to be fitted to an Ex Equipment enclosure

Note 1 to entry: This does not preclude an Ex Component certificate for thread adapters.

3.37**Ex Component**

equipment intended to be part of Ex Equipment, marked with the symbol “U”, which is not intended to be used alone, and requires additional consideration when incorporated into Ex Equipment

3.38**Ex Equipment**

explosion-protected equipment

Note 1 to entry: Such equipment often includes Ex Components, but additional evaluation is always required as part of their incorporation into equipment.

3.39**explosive atmosphere**

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

3.40**explosive dust atmosphere**

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

3.41**explosive gas atmosphere**

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

3.42**explosive test mixture**

specified explosive mixture used for the testing of equipment for explosive gas atmospheres

3.43**fault, countable**

fault which occurs in parts of electrical equipment conforming to the constructional requirements of the standard for the Type of Protection being considered

1006 **3.44**
1007 **fault, non-countable**
1008 fault which occurs in parts of electrical apparatus not conforming to the constructional
1009 requirements of the standard for the Type of Protection being considered

1010 **3.45**
1011 **firedamp**
1012 flammable mixture of gases naturally occurring in a mine

1013 Note 1 to entry: Firedamp consists mainly of methane, but always contains small quantities of other gases, such as
1014 nitrogen, carbon dioxide, and hydrogen, and sometimes ethane and carbon monoxide. The terms firedamp and
1015 methane are used frequently in mining practice as synonyms.

1016 **3.46**
1017 **free space**
1018 intentionally created space surrounding components or space inside components

1019 **3.47**
1020 **fuse**
1021 a device that by the fusing of one or more of its specially designed and proportioned
1022 components intended to melt under the action of current exceeding some definite value for a
1023 definite period of time, opens the circuit in which it is inserted by breaking the current when this
1024 exceeds a given value for a sufficient time

1025 **3.48**
1026 **galvanic isolation**
1027 arrangement within equipment that permits the transfer of signals or power between two circuits
1028 without any direct electrical connection between the two

1029 Note 1 to entry: Galvanic isolation frequently utilizes either magnetic (transformer or relay) or opto-coupled
1030 elements.

1031 **3.49**
1032 **gasket**
1033 compressible element provided in a joint of an enclosure to provide a degree of protection (IP)
1034 against the ingress of solid foreign objects or against the ingress of water

1035 **3.50**
1036 **gas**
1037 gaseous state of a substance that cannot reach equilibrium with its liquid or solid state in the
1038 temperature and pressure range of interest

1039 Note 1 to entry: This definition is a simplification of the scientific definition, and merely requires that the substance
1040 is at a temperature above its boiling point or sublimation point at the ambient temperature and pressure.

1041 **3.51**
1042 **hybrid mixture**
1043 mixture of a flammable gas or vapour with a dust

1044 Note 1 to entry: According to ISO/IEC 80079-20-2, the term "dust" is defined as including both combustible dust
1045 and combustible flyings

1046 **3.52**
1047 **infallible separation**
1048 separation between electrically conductive parts, not considered as subject to short circuits,
1049 when in conformity with the "infallible" constructional requirements of the standard for the Type
1050 of Protection being considered

1051 **3.53**
 1052 **Insulation coordination**
 1053 mutual correlation of insulation characteristics of electric equipment taking into account the
 1054 expected micro-environment and other influencing stresses

1055 [IEC 60050-442, 442-09-01]

1056 **3.53.1**
 1057 **isolated circuit**
 1058 circuit which is galvanically isolated from another circuit (such as a mains circuit) by means of
 1059 an isolating element

1060 Note 1 to Entry: Examples include a transformer, optical isolator, relay

1061 **3.53.2**
 1062 **macro-environment <of an electrical system>**
 1063 environment of the room or other location in which the equipment is installed or used

1064 Note 1 to Entry: See IEC 60664-1 for additional information

1065 **3.53.3**
 1066 **mains circuit**
 1067 circuit, where the transients on the electrical supply system have not yet been protected against,
 1068 which is intended to be directly connected to the mains supply, for the purpose of powering the
 1069 equipment

1070 Note 1 to Entry: The Mains Circuit extends up to the components or devices of the transient protection, voltage
 1071 limitation or isolation as applicable.

1072 **mains supply**
 1073 AC or DC power distribution system (external to the equipment) that supplies operating power
 1074 to the equipment

1075 Note 1 to entry: Mains supply includes public or private utilities and, unless otherwise specified in this document,
 1076 equivalent sources such as motor-driven generators and uninterruptible power supplies

1077 **3.53.4**
 1078 **micro-environment <of an electrical system>**
 1079 the ambient conditions which immediately influences the dimensioning of the clearance and 1
 1080 creepage distances see.

1081 Note 1 to Entry: See IEC 60664-1 for additional information

1082 **3.53.5**
 1083 **overvoltage category**
 1084 numeral defining a transient overvoltage condition

1085 Note 1 to entry: Overvoltage categories I, II, III and IV are used, see IEC 60664-1.

1086 **3.53.6**
 1087 **pollution <of an electrical system>**
 1088 any condition of foreign matter, solid, liquid, or gaseous (ionized gases) that may affect dielectric
 1089 strength or surface resistivity

1090 Note 1 to Entry: See IEC 60664-1 for additional information

1091 **pollution degree**
 1092 numeral characterizing the expected pollution of the micro-environment

1093 **3.54 Note 1 to entry: Pollution degrees 1, 2, 3 and 4 are used, see IEC 60664-1**
1094 **joint**
1095 place where the corresponding surfaces of two parts of an enclosure, or the conjunction of two
1096 enclosures, come together

1097 **3.55**
1098 **Level of Protection**
1099 subdivision of a Type of Protection, correlating with the Equipment Protection Level, that
1100 differentiates the likelihood of the equipment becoming a source of ignition

1101 Note 1 to entry: For example, Type of Protection intrinsic safety "i" is subdivided into Levels of Protection "ia", "ib",
1102 and "ic"; which correlate with Equipment Protection Levels Ga, Gb, and Gc (for explosive gas atmospheres).

1103 **3.56**
1104 **limiting temperature**
1105 maximum permissible temperature for equipment or parts of equipment equal to the lower of
1106 the two temperatures determined by:

- 1107 a) the maximum surface temperature;
1108 b) the thermal stability of the materials used

1109 **3.57**
1110 **lower flammable limit**
1111 **LFL**
1112 concentration of flammable gas or vapour in air below which an explosive gas atmosphere does
1113 not form (see ISO/IEC 80079-20-1)

1114 Note 1 to entry: For the purposes of Ex Equipment, this was previously referred to as the lower explosive limit
1115 (LEL).

1116 Note 2 to entry: The concentration can be expressed as either a volume fraction or a mass per unit volume.

1117 **3.58**
1118 **malfunction**
1119 situation where equipment or components do not perform their intended function with respect
1120 to explosion protection

- 1121 Note 1 to entry: A malfunction can happen due to a variety of reasons, including:
- 1122 – failure of one (or more) of the component parts of the equipment or components;
 - 1123 – external disturbances (e.g. shocks, vibration, electromagnetic fields);
 - 1124 – design error or deficiency (e.g. software errors);
 - 1125 – disturbance of the power supply or other services;
 - 1126 – loss of control by the operator (especially for portable equipment).

1127 Note 2 to entry: Some earlier editions of the Type of Protection standards referred to a "malfunction" as a "fault".

1128 **3.58.1**
1129 **malfunction, expected**
1130 disturbances or equipment malfunctions that normally occur in practice

1131 **3.58.2**
1132 **malfunction, rare**
1133 type of malfunction, that happens, but only in rare instances

1134 Note 1 to entry: Two independent expected malfunctions which, separately, would not create a source of ignition,
1135 but which, in combination, do create a source of ignition, are regarded as a single rare malfunction

3.59**maximum surface temperature**

highest temperature which is attained in service under the most adverse conditions (but within the specified tolerances) by any part or surface of Ex Equipment

3.60**minimum ignition temperature of a dust layer**

lowest temperature of a hot surface at which ignition occurs in a dust layer under specified test conditions

Note 1 to entry: The ignition temperature of a dust layer can be determined by the test method given in ISO/IEC 80079-20-2.

3.61**minimum ignition temperature of a dust cloud**

lowest temperature of a hot surface on which the most ignitable mixture of the dust with air is ignited under specified test conditions

Note 1 to entry: The ignition temperature of a dust cloud can be determined by the test method given in ISO/IEC 80079-20-2.

3.62**mist**

liquid released through a small opening, at temperatures below its flash point, resulting in extremely small droplets forming a cloud

3.63**normal operation**

operation of equipment conforming electrically and mechanically with its design specification and used within the limits specified by the manufacturer

Note 1 to entry: The limits specified by the manufacturer can include persistent operational conditions, e.g. operation on a duty cycle.

Note 2 to entry: Variation of the supply voltage within stated limits and any other operational tolerance is part of normal operation.

Note 3 to entry: For electric machines, normal operation is specified based on the duty type (S1...S10 per IEC 60034-1).

3.64**plastic**

a material which contains as an essential ingredient a high polymer and which at some stage in its processing into finished products can be shaped by flow

Note 1 to entry: Elastomers, which are also shaped by flow, are not considered as plastics.

[SOURCE: IEC 60050-212:2010, 212-04-02]

3.65**propagating brush discharge**

highly energetic electrostatic discharge from an insulating sheet, layer, or coating on a grounded conductive surface or from a material of high resistivity and high breakdown voltage with the two surfaces highly charged to opposite polarity

3.66**protective device**

device provided to interrupt an electric circuit in case a parameter exceeds a predetermined value

1181 Note 1 to entry: Parameters often include current, temperature, pressure, flow etc.

1182 **3.67**

1183 **pyrophoric substance**

1184 substance that ignites spontaneously on exposure to air (for example, phosphorus) or water
1185 (for example, potassium or sodium)

1186 Note 1 to entry: Pyrophoric substances are outside the scope of the IEC 60079 series

1187 **3.68**

1188 **radio frequency**

1189 electromagnetic waves from 9 kHz to 60 GHz

1190 **3.68.1**

1191 **continuous transmission**

1192 transmission where the duration of the pulse is greater than half the thermal initiation time

1193 **3.68.2**

1194 **pulsed transmission**

1195 transmission where the duration of the pulse is shorter than half the thermal initiation time, but
1196 the time between two consecutive pulses is longer than three times the thermal initiation time

1197 **3.68.3**

1198 **thermal initiation time**

1199 duration (over which the threshold power is averaged) during which energy deposited by the
1200 spark accumulates in a small volume of gas around it without significant thermal dissipation

1201 Note 1 to entry: For times shorter than the thermal initiation time the total energy deposited by the spark will
1202 determine whether or not ignition occurs. For increasingly longer times, the power or rate at which energy is deposited
1203 becomes the determining factor for ignition.

1204 **3.68.4**

1205 **threshold energy**

1206 Z_{th}

1207 for a pulsed radio-frequency discharge, the maximum energy of the single pulse that can be
1208 extracted from the receiving body

1209 **3.68.5**

1210 **threshold power**

1211 P_{th}

1212 effective output power of the transmitter multiplied by the antenna gain

1213 Note 1 to entry: The gain is produced by an antenna concentrating radiation in a particular direction and is always
1214 related to a specified reference antenna

1215 Note 2 to entry: The threshold power is considered to be equal to the effective isotropic radiated power (EIRP) per
1216 ITU-R BS.561-2.

1217 **3.68.6**

1218 **antenna gain**

1219 gain produced by an antenna concentrating radiation in a particular direction

1220 Note 1 to entry: The gain of antennas is frequently less than unity.

1221 **3.69**

1222 **rated value**

1223 value of a quantity, assigned generally by the manufacturer, for a specified operating condition
1224 of a component, device or apparatus

3.70**rated insulation voltage**

RMS 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

Note 1 to entry: The rated insulation voltage is not necessarily equal to the rated voltage of equipment which is primarily related to functional performance.

3.71**rating**

set of rated values and operating conditions

[SOURCE: IEC 60050-151, 151-16-11]

3.72**recurring peak voltage**

maximum peak value of periodic excursions of the voltage waveform resulting from distortions of an AC voltage or from AC components superimposed on a DC voltage

Note 1 to entry: Random overvoltages, for example due to occasional switching, are not considered as recurring peak voltages.

3.73**related drawing**

drawing or document not listed in the certificate but linked to the schedule drawing, and used for example, for detailed manufacture of component parts

3.74**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

3.75**schedule drawing**

technical documentation

drawing or document listed in the certificate or test report

3.76**Schedule of Limitations**

information that is necessary to correctly apply an Ex Component and is provided on an Ex Component Certificate

3.77**separation element**

mechanical element, inside the equipment, which separates different parts of the equipment with different EPLs

Note 1 to entry: A separation element consists of a mechanical partition wall, which can be combined with a flameproof joint or natural ventilation.

3.78**serviceable condition**

condition which permits a replacement or reclaimed component part to be used without prejudice to the performance or explosion protection aspects of the equipment, with due regard to the schedule drawings, as applicable, in which such a component part is used

1269 **3.79**
1270 **service temperature**
1271 T_s
1272 maximum or minimum temperature reached at specific points of the equipment when the
1273 equipment is operating at rated conditions, including ambient temperature and any external
1274 sources of heating or cooling(see 5.2)

1275 Note 1 to entry: Equipment can reach different service temperatures in different parts.

1276 **3.80**
1277 **solid insulation**
1278 electrical insulation material which is extruded or moulded, but not poured

1279 Note 1 to entry: Insulators fabricated from two or more pieces of electrical insulating material, that are solidly
1280 bonded together may be considered as solid. The term solid insulation describes the final form and not necessarily
1281 the form in which they are initially applied. For windings of electrical machines, the process of using varnish as a
1282 means of consolidating and insulating the winding is considered to result in solid insulation, irrespective of how the
1283 varnish is applied.

1284 **3.81**
1285 **spacings, electrical**
1286 separation distances between conductive parts at different electrical potentials

1287 **3.81.1**
1288 **clearance**
1289 shortest distance in air between two conductive parts

1290 **3.81.2**
1291 **creepage distance**
1292 shortest distance along the surface of a solid insulating material, in contact with air, between
1293 two conductive parts

1294 **3.81.3**
1295 **distance through casting compound**
1296 shortest distance through a casting compound between two conductive parts

1297 **3.81.4**
1298 **distance through solid insulation**
1299 shortest distance through solid insulation between two conductive parts

1300 **3.81.5**
1301 **distance under coating**
1302 shortest distance between conductive parts along the surface of an insulating medium covered
1303 with insulating coating

1304 **3.82**
1305 **special fastener**
1306 specific form of fastening device in accordance with IEC 60079-0

1307 **3.83**
1308 **Specific Conditions of Use**
1309 essential information for the installation, use, and maintenance of the Ex Equipment and is
1310 provided on an Ex Equipment certificate.

1311 Note 1 to Entry: These Specific Conditions of Use are in addition to the installation design, selection, erection,
1312 inspection, maintenance, repair, and overhaul requirements of the IEC 60079 Series and the ISO/IEC 80079 Series;
1313 and they do not repeat those requirements.

1314 **3.84**1315 **U**

1316 suffix to the certificate number used to denote an Ex Component

1317 Note 1 to entry: The symbol U suffix to the certificate number is used to identify that the Ex Component is incomplete
 1318 and is not suitable for installation without further evaluation.

1319 **3.85**1320 **X**

1321 suffix to the certificate number used to denote Specific Conditions of Use for Ex Equipment

1322 Note 1 to entry: The symbol X suffix to the certificate number is used to provide a means of identifying that essential
 1323 information for the installation, use, and maintenance of the Ex Equipment is contained within the Ex Equipment
 1324 certificate.

1325 Note 2 to Entry: These Specific Conditions of Use are in addition to the installation design, selection, erection,
 1326 inspection, maintenance, repair, and overhaul requirements of the IEC 60079 Series and the ISO/IEC 80079 Series;
 1327 and they do not repeat those requirements.

1328 **3.86**1329 **temperature class**

1330 classification system of Ex Equipment, based on its maximum surface temperature, related to
 1331 the specific explosive gas atmosphere for which it is intended to be used

1332 **3.87**1333 **termination compartment**

1334 compartment containing connection facilities

1335 **3.88**1336 **test, routine**

1337 test to which each individual device is subjected during or after manufacture to ascertain
 1338 whether it complies with certain criteria

1339 **3.89**1340 **test, type**

1341 test of one or more devices made to a certain design to show that the design meets certain
 1342 specifications

1343 **3.90**1344 **Type of Protection**

1345 specific measures applied to equipment to avoid ignition of a surrounding explosive atmosphere

1346 **3.91**1347 **upper flammable limit**1348 **UFL**

1349 concentration of flammable gas or vapour in air above which an explosive gas atmosphere does
 1350 not form (see ISO/IEC 80079-20-1)

1351 Note 1 to entry: For the purposes of Ex Equipment, this was previously referred to as the upper explosive limit
 1352 (UEL).

1353 Note 2 to entry: The concentration may be expressed as either a volume fraction or a mass per unit volume.

1354 **3.92**1355 **vapour**

1356 gaseous state of a substance that can reach equilibrium with its liquid or solid state in the
 1357 temperature and pressure range of interest

1358 Note 1 to entry: This definition is a simplification of the scientific definition, and merely requires that the substance
 1359 is at a temperature below its boiling point or sublimation point at the ambient temperature and pressure.

1360 **3.93**
1361 **void**
1362 unintentional space created as a consequence of the encapsulation or filling process

1363 **3.94**
1364 **wiring**
1365 cables and wiring systems

1366 **3.94.1**
1367 **wiring, field**
1368 wiring completed by the installer in the field (see IEC 60079-14)

1369 **3.94.2**
1370 **wiring, factory**
1371 wiring completed by the manufacturer of the Ex Equipment or Ex Component

1372 **3.94.2.1**
1373 **factory wiring within enclosures**
1374 wiring routed completely within an Ex Equipment or Ex Component and used to interconnect
1375 internally mounted pieces of equipment

1376 **3.94.2.2**
1377 **factory wiring between enclosures**
1378 wiring routed externally between, and terminated within, two or more enclosures that overall
1379 are covered by a single Ex Equipment certificate

1380 **3.94.3**
1381 **wiring, assembly**

1382 **3.95 wiring completed by the manufacturer of the Ex Equipment assembly (see**
1383 **IEC 60079-46)**
1384 **working voltage**
1385 highest _{RMS} value of the AC or DC voltage across any particular insulation which can occur
1386 when the equipment is supplied at rated voltage

1387 Note 1 to entry: Transients are disregarded.

1388 Note 2 to entry: Both open-circuit conditions and normal operating conditions are taken into account.

1389 **4 Equipment grouping**

1390 **4.1 General**

1391 Equipment for explosive atmospheres is divided into groups as shown in 4.2, 4.3, and 4.4:

1392 **4.2 Group I**

1393 Equipment of Group I is intended for use in mines susceptible to firedamp.

1394 NOTE The types of protection for Group I take into account the ignition of both firedamp and coal dust along with
1395 enhanced physical protection for equipment used underground.

1396 Equipment intended for mines where the atmosphere, in addition to firedamp, may contain
1397 significant proportions of other flammable gases (i.e. other than methane), shall be constructed
1398 and tested in accordance with the requirements relating to Group I and also to the subdivision
1399 of Group II corresponding to the other significant flammable gases.

4.3 Group II

Equipment of Group II is intended for use in areas with an explosive gas atmosphere other than mines susceptible to firedamp.

Equipment of Group II is subdivided according to the nature of the explosive gas atmosphere for which it is intended.

Group II subdivisions:

- IIA, a typical gas is propane;
- IIB, a typical gas is ethylene;
- IIC, typical gases are hydrogen and acetylene.

NOTE 1 This subdivision is based on the maximum experimental safe gap (MESG) or the minimum igniting current ratio (MIC ratio) of the explosive gas atmosphere in which the equipment may be installed. (See ISO/IEC 80079-20-1).

NOTE 2 For external non-metallic materials of equipment, the subdivision is based on the electrostatic charging risk for external surface areas (see 7.4.2).

NOTE 3 Equipment marked IIB is suitable for applications requiring Group IIA equipment. Similarly, equipment marked IIC is suitable for applications requiring Group IIA or Group IIB equipment.

4.4 Group III

Equipment of Group III is intended for use in areas with an explosive dust atmosphere other than mines susceptible to firedamp.

Equipment of Group III is subdivided according to the nature of the explosive dust atmosphere for which it is intended.

Group III subdivisions:

- IIIA: combustible flyings;
- IIIB: non-conductive dust;
- IIIC: conductive dust.

NOTE Equipment marked IIIB is suitable for applications requiring Group IIIA equipment. Similarly, equipment marked IIIC is suitable for applications requiring Group IIIA or Group IIIB equipment.

4.5 Equipment for a particular explosive gas atmosphere

The equipment may be tested for a particular explosive gas atmosphere. In this case, the information shall be recorded on the certificate and the equipment marked accordingly.

5 Temperatures

5.1 Environmental influences

5.1.1 Ambient temperature

The marking shall include either the symbol T_a or T_{amb} together with both the upper and lower ambient temperatures or, if this is impracticable, the symbol “X” suffix on the certificate number shall be used to indicate Specific Conditions of Use that include the upper and lower ambient temperatures. See item e) of 29.3.

NOTE 1 Prior to Edition 8, if an ambient temperature range was not marked, the ambient temperature range was considered to be -20°C to +40°C.

1439 NOTE 2 With the global increase in maximum expected ambient temperature, equipment intended to be used
1440 outdoors is often rated for +50°C or higher.

1441

1442

1443 5.1.2 External source of heating or cooling

1444 Where the equipment is intended to be physically connected to or influenced by a separate
1445 external source of heating or cooling, such as a heated or cooled process vessel or pipeline,
1446 the ratings of the external source shall be specified in the certificate and in the manufacturer's
1447 instructions.

1448 NOTE 1 The external source of heating or cooling is frequently referred to as the "process temperature".

1449 NOTE 2 The way in which these ratings are expressed will vary according to the nature of the source and the
1450 installation. For sources generally larger than the equipment, the maximum or minimum temperature will usually be
1451 sufficient. For sources generally smaller than the equipment, or for heat conduction through thermal insulation, the
1452 rate of heat flow may be appropriate. Alternatively, the rating is often expressed by specification of a temperature at
1453 a defined accessible point on the equipment.

1454 NOTE 3 The influence of radiated heat may need to be considered on the final installation. See IEC 60079-14.

1455 5.2 Service temperature, T_s

1456 Where this standard, or the standard for the specific Type of Protection, requires the service
1457 temperature, T_s , to be determined at any place in the equipment, the temperature shall be
1458 determined for the rating of the equipment when the equipment is subjected to maximum or
1459 minimum ambient temperature and, where relevant, the maximum rated external source of
1460 heating or cooling. Service temperature, T_s , testing, when required, shall be in accordance with
1461 26.5.1.

1462 For EPL Da equipment, the same dust layer thickness as applied in 5.3.2.3.1 shall be applied
1463 when determining the service temperature, T_s .

1464 For EPL Db equipment with a layer of dust, the same dust layer thicknesses as applied in b) or
1465 c) of 5.3.2.3.2, as applicable, shall be applied when determining the service temperature, T_s .

1466 The service temperature range of an Ex Component depends on the service temperature range
1467 of the materials of construction on which the Type of Protection depends. The permitted service
1468 temperature range for the Ex Component shall be indicated in the Schedule of Limitations. See
1469 13.5.

1470 5.3 Maximum surface temperature

1471 5.3.1 Determination of maximum surface temperature

1472 Maximum surface temperature shall be determined according to 26.5.1 considering the
1473 maximum ambient temperature and, where relevant, the maximum rated external source of
1474 heating.

5.3.2 Limitation of maximum surface temperature

5.3.2.1 Group I equipment

For equipment of Group I, the maximum surface temperature shall be specified in relevant Schedule Drawings according to 24.1.

This maximum surface temperature shall not exceed:

- 150 °C on any surface where coal dust can form a layer,
- 450 °C where coal dust is not likely to form a layer (i.e., inside of a dust-protected enclosure).

5.3.2.2 Group II equipment

The maximum surface temperature determined (see 26.5.1) shall not exceed:

- the temperature class assigned (see Table 2), or
- the maximum surface temperature assigned, or
- if appropriate, the ignition temperature of the specific gas for which it is intended.

Table 1 – Classification of maximum surface temperatures for Group II equipment

Temperature class	Maximum surface temperature °C
T1	≤ 450
T2	≤ 300
T3	≤ 200
T4	≤ 135
T5	≤ 100
T6	≤ 85

More than one temperature class may be established for different ambient temperatures and different external sources of heating and cooling.

5.3.2.3 Group III equipment

5.3.2.3.1 Maximum surface temperature for EPL Da

The maximum surface temperature shall be determined **with** a dust layer thickness of at least 200 mm of dust surrounding all sides of the equipment according to 26.5.1 (maximum surface temperature marking prefix T₂₀₀).

NOTE Dust layer thicknesses of more than 200 mm does not give rise to a further temperature increase that would need to be taken into account.

5.3.2.3.2 Maximum surface temperature for EPL Db

The maximum surface temperature for EPL Db can be determined according to any one of the following three configurations.

a) Maximum surface temperature determined **without a layer** of dust for EPL Db.

The maximum surface temperature determined without a layer of dust according to 26.5.1 (maximum surface temperature marking prefix T) shall not exceed the maximum surface temperature assigned.

1507 b) Maximum surface temperature with respect to a **specified thickness** of dust layer for EPL
1508 Db.

1509 In addition to the maximum surface temperature required in a) above, the maximum surface
1510 temperature may also be determined according to 26.5.1 for a specified layer thickness,
1511 (maximum surface temperature marking prefix $T_{\text{specified layer thickness}}$), of dust surrounding
1512 all sides of the equipment. The maximum specified layer thickness shall not exceed 200
1513 mm.

1514 NOTE 1 A dust layer thickness of more than 200 mm does not give rise to a further temperature increase.

1515 c) Maximum surface temperature with respect to a layer of dust with a **specified orientation**
1516 of the equipment for EPL Db.

1517 If one or more specific orientations are given in the instructions, tests shall be carried out
1518 according to 26.5.1 with a layer of dust on the surfaces on which the dust can accumulate
1519 for each orientation, (maximum surface temperature marking prefix T_L), and the certificate
1520 number shall include the suffix "X" to indicate this Specific Condition of Use in accordance
1521 with item d) of 29.5.

1522 NOTE 2 Additional information on the application of equipment where dust layer thicknesses up to 50 mm may
1523 accumulate on the equipment is given in IEC 60079-14.

1524 **5.3.2.3.3 Maximum surface temperature determined without a layer of dust for EPL** 1525 **Dc**

1526 The maximum surface temperature determined **without** a layer of dust according to 26.5.1 shall
1527 not exceed the maximum surface temperature assigned.

1528 **5.3.3 Small component temperature for Group I or Group II electrical equipment**

1529 NOTE There is both theoretical and practical evidence to show that the smaller the heated surface, the higher the
1530 surface temperature required to ignite a given explosive atmosphere.

1531 Small components, for example transistors or resistors, whose temperature exceeds that
1532 permitted for the temperature classification, shall be acceptable providing that they conform to
1533 one of the following:

1534 a) when tested in accordance with 26.5.3, small components shall not cause ignition of the
1535 flammable mixture and any deformation or deterioration caused by the higher temperature
1536 shall not impair the Type of Protection; or

1537 d) for T4 and Group I classification, small components shall conform to Table 3 and Table 4;
1538 or

1539 e) for T5 classification, the surface temperature of a component with a surface area smaller
1540 than 1 000 mm² (excluding lead wires) shall not exceed 150 °C.

1541 Items a), b), and c) do not apply to small components that produce a surface temperature rise
1542 as a result of a catalytic or other chemical reaction. The tests of 26.5.3 may be applied, but the
1543 flammable mixtures used shall be those that produce the highest component temperature due
1544 to the chemical reaction considering both the equipment group and the temperature class of
1545 the intended application.