



Ex-News

Standardisation work on the topic of explosion of electrical apparatus

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IEC TC 31 Explosion protection of electrical apparatus and installations

IEC 60079-0: General Requirements

Comprehensive reorganisation of IEC 60079, Part 0, was continued at the Working Group 22 meetings in Chicago in April 2005 and in Buxton in October 2005. The aim of this reorganisation is to harmonise all the series of Standards handled in TC 31. In particular, to include dust explosion protection, combining regulations for apparatus from Zones 0 and 2 in a Basic Standard, and on a broad scale, standardising valid stipulations.

› Title and scope

Alone the title of the new edition of the Standard indicates the extended scope. The word ›gas‹ has disappeared from the old title: ›Electrical apparatus for explosive gas atmospheres‹, thus underlining the general scope of validity that also includes dust explosion protection.

› Terms and definitions

With this edition of the Standard, an attempt has been made to eliminate the inconsistency of the terms and definitions relating to explosion protection of electrical equipment, which have arisen over the years. Therefore the Part 0 ›General requirements‹ of IEC 60079 was revised by the Working Group at the same time as revision of the corresponding section of the IEV (International Electro technical Vocabulary) IEC 60050 (426). The terms and definitions from IEC 61241-0 for dust explosion protection were adopted.

Moreover, the descriptions of the Equipment Protection Levels (EPLs) were included in the definitions of terms.

› Introduction of the EPLs – Equipment Protection Levels

Introduction of the Equipment Protection Levels was sparked by the ATEX Directives coming into force, and by the introduction of equipment categories 1, 2 and 3 as counterparts to the three zones. An add-hoc Working group at IEC TC 31, set up in 2002, took over the task of reviewing the option of a systematic risk assessment in explosion protection that could be used to achieve compliance with the Equipment Protection Level to be implemented on equipment and components at risk of explosion. As a result of this work a solution was found based greatly on European practice under ATEX Directive.

› Definition of the term Equipment Protection Level

The term equipment protection level (EPL) means the level of protection assigned to equipment based on its risk of becoming a source of ignition, and to distinguish the differences between of explosive gas atmospheres, explosive dust atmospheres, and coal mines.

EPL Ma: Equipment for installation in a coal mine, having a ›very high‹ level of protection, which has sufficient security so that it is unlikely to become an ignition source, even when left energised in the presence of an outbreak of gas.

EPL Mb: Equipment for installation in a coal mine, having a ›high‹ level of protection, which has sufficient security so that it is unlikely to become a source of ignition in the time span between an outbreak of gas and the equipment being de-energised.

EPL Ga: Equipment for explosive gas atmospheres, having a ›very high‹ level

of protection, which is not a source of ignition in normal operation, expected malfunction, or when subject to rare malfunction. Such equipment has a form of protection, which remains effective even in the presence of two potential faults (for example, intrinsic safety category i_a) or has two independent means of protection.

EPL Gb: Equipment for explosive gas atmospheres, having a ›high‹ level of protection, which is not a source of ignition in normal operation, or when subject to faults that may be expected, though not necessarily on a regular basis.

EPL Gc: Equipment for explosive gas atmospheres, having a ›normal‹ level of protection, which is not a source of ignition in normal operation, and which may 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).

EPL Da: Equipment for explosive dust atmospheres, having a ›very high‹ level of protection, which is not a source of ignition in normal operation or when subject to rare faults.

The suffix Ga requiring security in the presence of two faults has obviously been removed by mistake during revision of the current Draft Standard. However, it must be assumed that it will be added again at the next Working Group meeting.

EPL Db: Equipment for explosive dust atmospheres, having a ›high‹ level of protection, which is not a source of ignition in normal operation or when subject to faults may be expected, though not necessarily on a regular basis.

EPL Dc: Equipment for explosive dust

atmospheres, having a ›normal‹ level of protection, which is not a source of ignition in normal operation, and which may have some additional protection to ensure that it remains inactive as an ignition source in the case of regular expected occurrences.

› Inclusion of dust explosion protection

All requirements of dust explosion protection from IEC 61241-0 that are generally valid, i.e. that are not specific to type of protection, have been included in the new edition of the Standard. The classification to date for Group I: Electrical apparatus for mines susceptible to firedamp, and Group II: Electrical apparatus for places with an explosive gas atmosphere other than mines, has been amended and supplemented:

- › Group I: Electrical apparatus for mines susceptible to firedamp
 - › Group II: Electrical apparatus for places with an explosive gas atmosphere other than mines susceptible to firedamp
 - › Group III: Electrical apparatus for use in the presence of combustible dust atmosphere.
- Analogously to the subdivision of Group II into IIA, IIB and IIC, the following subdivision has now also been made in order to reflect a grading of the explosive potential of the dust-air mixture from C to A:
- › III A: Combustible flyings
 - › III B: Non-conductive dust
 - › III C: Conductive dust

› Marking

As expected, discussion in the Working Group focussed mainly on the marking of electrical apparatus. Furthermore, the Equipment Protection Levels were introduced, dust explosion protection and gas

explosion protection were merged, and regulations for Zones 0 and 2 were included in the Standard 60079-0. The current chapter on ›Marking‹ may, at first glance, appear confusing owing to the diversity of options and combinations but, if considered in greater detail, we can clearly see the underlying logic, and the user should, after a certain amount of practice, be able to understand the information represented by the marking. Basically, it must be stated that the apparent confusion in relation to marking is not the result of the new Draft Standard but is attributable to the fact that the many different applications in which explosion protection is relevant necessitate different, technical-safety solutions, that must be identifiable by the various markings.

› Additional requirements relating to protection against electrostatic charges

The requirements relating to protection against electrostatic charges included to date in the Standard have been supplemented with the specifications stipulated in IEC 60079-26 (Apparatus for use in Zone 1) concerning the maximum diameters of long parts with non-conductive surfaces such as, conduits, cables, ropes or bars, and modified for equipment of EPLs Gb and Gc. The same applies to the requirements with regards to the thickness of chargeable, non-conductive layers, applied to earthed conductive layers.

› Limit values for ultrasonic and electromagnetic radiation

The present Draft Standard states limit values for power or energy of radio waves, pulsed radar waves, laser radiation and ultrasonic waves. Graded Equipment Protection Level values are →

stated in this case where practical and necessary from a technical safety point of view. Specifying limit values adapts the Draft Standard to technical progress as radio and optical signal transmission is becoming, for example, increasingly important in process automation.

IEC 60079-1: Flameproof enclosures

At its meeting in April 2005 in Chicago, Maintenance Team 25 at IEC TC 31 dealt with the comments received in relation to the CD of the 6th edition. One essential result was the introduction of Table 5.1 with correction factors for the reference pressure in the pressure test, these correction factors being dependent on ambient temperature if the pressure test itself is conducted at 'normal' ambient temperatures. Alternatively, the reference pressure can be determined by an explosion pressure test conducted at the specified, minimum ambient temperature.

IEC 60079-2: Pressurized enclosures

The CDV of the 5th edition of the Standard has been available since late last year. Only minor amendments were made. In the next edition of the Standard it will be necessary to link the types of protection already graded in line with the zones to the EPLs.

IEC 60079-5: Powder filling

The 3rd edition of the Standard has been available since November as a CDV. The most important change by comparison with the second edition is that it is now possible, under certain circumstances, to open the enclosure for repair purposes and then reseal it after refilling with powder.

This could mean that powder filling becomes established as an interesting alternative to encapsulation.

IEC 60079-6: Oil immersion

To date, oil immersion has been considered more or less a type of protection encountered only in engineering museums. The staff of WG 22 at TC 31 consequently asked themselves whether it made sense to elaborate with a 3rd edition of the Standard. In order to answer this question, the Secretariat of TC 31 submitted a questionnaire to the National Committees asking them whether the Standard should be withdrawn or updated. If in their replies they decided on an update, it would then adapt the requirements to current needs and, for instance, allow sparking apparatus beneath the immersing fluid, and fluids with better properties.

This could result in interesting applications, for example in power electronics, where the protective fluid both ensures explosion protection and serves as a cooling medium. At the time of publication, no definitive evaluation of the questionnaires was available.

IEC 60079-7: Increased safety

Edition 4 of IEC 60079-7 Increased safety 'ex', which has been available as an FDIS since late 2005 also underwent certain significant changes.

Firstly, the requirements in respect to electrical connections were updated to bring them in line with the current state of the art, allowing for the whirlwind pace of development in the sector of electrical connection systems. The requirements in respect to connections made during installation (field wiring) and requirements in respect to connections made by the product manufacturer (factory wiring) are now considered on a separate basis in the same way as the requirements applicable to permanent and detachable connections are. Modern

connection systems such as the cage clamp terminal or insulation-displacement systems are dealt with, and plug connectors, such as tab connectors, are now possible under certain circumstances.

The second point of major emphasis was expansion and detailing of the assessment and test methods for squirrel-cage motors and high-voltage machines. For this purpose, an expert group was formed to deal in the future with other topics and types of protection as well as, focussing on electrical machines for hazardous areas.

Finally, it was also possible to satisfactorily settle the topics relating to end of life when operating fluorescent lamps. With this in mind, the 'Asymmetric Pulse Test' and 'Asymmetric Power Test' for electronic ballast units, as already long applicable in the field of lighting technology, have now been made obligatory, and have been described in the normative Annex H.

IEC 60079-11: Intrinsic safety

In 2005, there were two meetings of Maintenance Team MT4 in Orlando and in Cape Town aimed at elaborating the 5th edition of the Standard. The process involved assessing around 60 pages of international comments and incorporating them into the CDV. Ultimately, voting on the CDV achieved a positive result so that publication of the FDIS can be anticipated in 2006 and publication of the finished Standard can be anticipated for the later half of the year.

Admittedly, the Equipment Protection Levels (EPLs) have not yet been included in the 5th edition, but adding 'ic' does, however, mean that there is already a grading for use in the three zones. This means that both types of protection 'ic' and 'nL' will exist for Zone 2 until publication of the new edition of IEC 60079-15, elaboration



work on which is to commence during the course of 2006.

Annex F was supplemented by specifying reduced clearances and creepage distances that are allowed for PC boards, relays and optocouplers under special, clean conditions. Consequently, the environment of a PC board must comply with pollution degree 2 in accordance with IEC 60664-1 or provide special protection through enclosures or covering layers so as to allow a reduction in clearances and creepage distances.

IEC 61 241-11, which deals with type of protection intrinsic safety ›i‹ for areas exposed to hazards by combustible dust was published in October 2005. It is intended to combine both Standards in the 6th edition of IEC 60079-11 and also introduce the EPLs in this edition.

IEC 60079-25: Intrinsically safe systems

Revision of the second edition was commenced in Cape Town. As it was necessary to wait for completion of IEC 60079-11, publication of the CD cannot be anticipated before late 2006.

IEC 60079-27: FISCO/FNICO

The first edition of the Standard was published in 2005 and included the Zone 2-Concept (FNICO). For the time being updating of the Standard is to be continued but for the long term, it is planned to incorporate the apparatus requirements in IEC 60079-11 and the system requirements in 60079-25.

IEC 60079-16: Encapsulation

The CD of the 3rd edition of the Standard was published in December 2005. In this Draft, the new integration process of the Standards under TC 31 were implemented for the first time in a Standard specific to

a type of protection, i.e. the Equipment Protection Levels (EPLs) were introduced, the type of protection was extended accordingly with Ex ma and Ex mc (Ex mb for Zone 1 having more or less already been in existence for a long time), dust explosion protection was added, and there was a close dovetailing process with Part 0 of IEC 60079 ›General requirements‹ so as to allow unclear aspects and redundancies in the Standard texts to be eliminated.

IEC 60079-26: Electrical apparatus for use in Group II, Zone 0

The CDV of the second edition was published in early 2005. The topics of cabling systems and electrostatics were shifted to the Standards applicable to constructors and to IEC 60079-0 (see above).

At the meeting in Cape Town, Working Group 09 decided to incorporate the EPLs in the FDIS. Since the Basic Standard IEC 60079-0 that defines the EPLs is not to be published before 2007, it was also decided to include all the new specific Standards on types of protection in an Annex containing the corresponding definitions.

The FDIS of IEC 60079-26 is to be published during the first half of 2006.

IEC 60079-28: Protection against ignition through optical radiation

There was a positive vote on the CDV published in March 2005 so that the FDIS can be anticipated shortly.

TC 31 SC 31 H: Dust explosion protection

As already mentioned several times above, restructuring of the entire range of aspects relating to Standards brought with it a very extensive merging process of

the Standards covering dust and gas explosion protection. For this reason, all dust explosion protection Maintenance Teams affected (Standards both for the types of protection and for installation, inspection, maintenance and repair) were disbanded at the meeting of IEC TC 31 in Cape Town and their members were requested to work in the future in the Working Groups of the previous gas explosion protection standards.

SC 31 H is to be retained until the ongoing standardisation work is complete, at which time it will also be disbanded.

IEC 61241-1: Protection by enclosures

Maintenance Team MT 61241-1 is the only SC 31 H Maintenance Team to be retained since protection by enclosures is an independent type of protection that can be used only for dust explosion protection.

Applicability of the type of protection to all dust explosion protection zones is, however, restricted to Zones 21 and 22 in the new edition as the principle of this type of protection is not compatible with the safety in the presence of two faults relating to equipment required for EPL Da without additional measures.

TC 31 SC 31J: Installation and services

IEC 60079-14: Electrical installations in hazardous areas

The CD of the 4th edition of the Standard was published in January 2006. The Equipment Protection Levels (EPLs) have now also been introduced in this Standard, firstly in the definition of terms (but only for gas explosion protection owing to the scope of the Standard) and, secondly, with the assignment of types of protection to the EPLs under section ›Selection of apparatus‹. →

For the first time, a statement is made in this Standard in relation to qualification of personnel responsible for the service in the installation. In accordance with this, selection and repair must, in future, be performed by competent persons whose training has familiarised them with the types of protection and installation technologies, and who are aware of the relevant rules and regulations, including the basic principles of zone classification.

IEC 60079-17: Inspection and maintenance

The CD of the 4th edition of the Standard was also published in late 2005. The text is now very closely linked to Part 14. For example, the EPLs have been included and the qualification requirements applicable to personnel have been matched. Moreover, the topic of inspection and maintenance of electrical apparatus in areas where combustible dust is present has been included.

IEC 60079-19: Repair and overhaul

The CDV of the second edition of this Standard has been available since mid-2005. In comparison with the first edition of this Standard, a number of organisational and technical requirements have now been included. Repair facilities for explosion protection apparatus will become increasingly important within the framework of globalisation. With this in mind, major efforts under the umbrella of IEC Ex-Scheme are currently

underway. Selection of the contents of this Standard must also be understood bearing this in mind.

ISO TC 305: Explosion protection of non-electrical apparatus

42 % of the Standards on explosion protection of mechanical apparatus have been published and 90 % of all standardisation projects have been completed, i.e. the completed Draft Standards were at the final editorial revision stage by late 2005. These Standards will be published during the course of 2006.

This has created a good basis for certification and operation of equipment with non-electrical ignition sources.

A decision will be made on future work in early 2006. There is currently a survey being conducted among the National Committees in relation to setting up a new TC 305 at ISO. Close cooperation with IEC TC 31 is also under consideration.

CENELEC TC 31

The annual CENELEC TC 31 meeting was held in September 2005 in Paris. Chairman Alain Czyz (Ineris) retired from his office during this meeting. Ron Sinclair of BASEEFA was elected as his successor. The previous

Chairman of SC 31-4: Increased Safety, Dr. Dieter Beerman of R. STAHL, also retired from his office. Dr. Thorsten Arnhold, also of R. STAHL, was elected as his successor. Another item on the agenda was the presentation of a new ATEX consultant. Dr. Wolfgang Dill took over this function in the summer.

Other topics were Annexes ZA and ZZ further to the European Standards, stating compliance of the Standard texts with the requirements of the ATEX Directives, distribution of the 'clarification sheets' by the notified bodies, and the validity of existing certificates after amendments to the Standards. The latter will, in future, still give rise to quite a few discussions in the National Committees.

Abbreviations

EPL	Equipment protection level
CD	Committee Draft
	1. Step: Publishing a draft of the Standard
CDV	Committee draft for Voting
	2. Step: First voting on the draft of Standard
FDIS	Final Draft International Standard
	3. Step: Final Voting on the draft of Standard