IEC 60079-14

Edition 5.0 2013-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Explosive atmospheres –
Part 14: Electrical installations design, selection and erection

Atmosphères explosives –
Partie 14: Conception, sélection et construction des installations électriques

IEC 60079-14:2013

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Part 14: Electrical installations design, selection and erection

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 60079-14 has been prepared by subcommittee 31J: Classification of hazardous areas and installation requirements, of IEC technical committee 31: Equipment for explosive atmospheres.

This fifth edition cancels and replaces the fourth edition published in 2007. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

		Type		
Explanation of the significance of the changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
Introduction of initial inspection	Scope		X	
Introduction of definition “electrical equipment”	3.1.3	X		
Introduction of definition “hybrid mixture”	3.2.4		X	
Note added to the definition “associated apparatus”	3.5.2	X		
Introduction of definition “radio frequency identification”	3.15	X		
List for documents improved and extended: site, equipment, installation and personnel	4.2	X		
New subclause for initial inspection	4.3		X	
Specific requirements given in this standard based on the current edition of the IEC standards in the IEC 60079 series.	4.4.1.2	X		
New selection criteria for radiating equipment according to IEC 60079-0	5.7		X	
New selection criteria for ultrasonic equipment according to IEC 60079-0	5.8		X	
Specific requirements for cells and batteries used in transportable, portable and personal equipment aligned with IEC 60079-11	5.10			C1
New structure for the selection of rotating electrical machines	5.11	X		
New selection criteria for cells and batteries	5.14		X	
New selection criteria for radio frequency identification tags	5.15		X	
New selection criteria for gas detection equipment	5.16		X	
The requirements for material composition of metallic installation material aligned with the requirements for light metal according to IEC 60079-0	6.1		X	
Above hazardous area, the restriction of 3,5 m deleted	6.3.7	X		
New structure of the requirements for static electricity according to IEC 60079-0 added	6.5		X	
New requirements for electromagnetic radiation in accordance with IEC 60079-0	6.7		X	
Improvement of the text for cables, cables for fixed and flexible cables for fixed installation for easier reading	9.3.1 9.3.2 9.3.3	X		
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		Type		
Explanation of the significance of the changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
New structure for the requirements for electric heating systems including temperature monitoring, limiting temperature, safety device and additional requirements for electrical heat tracing system	13		X	
New subclause to limit the dissipation power of terminal boxes as a function of the numbers of wire in relation to the cross-section and the permissible continuous current with an example	15.4		X	
Improvement of the text for simple apparatus with its definition, limits and the variation in maximum power dissipation based on the ambient temperature and an alternative equation to calculate the max. surface temperature.	16.4		X	
New requirements for terminal boxes if containing more than one intrinsically safe circuit to avoid short-circuits between independent intrinsically safe circuits	16.5			C2
Improvement of the text for terminal boxes with non-intrinsically and intrinsically safe circuits	16.5.4	X		
New subclause for pressurized rooms and analyser houses	17.4		X	
New clause for optical radiation	22		X	
New annex for initial inspection with the equipment specific inspection schedule for all types of protections	Annex C		X	
New annex for electrical installations in extremely low ambient temperature	Annex D		X	
New annex for the restricted migration of gas through cables	Annex E		X	
New annex for installation of electrical trace heating systems	Annex F		X	
New annex for the requirements for type of protection “op” – Optical radiation	Annex K		X	
New annex for hybrid mixtures	Annex M		X	

<table>
<tr><th colspan="2">Explanation of the types of significant changes:</th></tr>
<tr><th colspan="2">A) Definitions</th></tr>
<tr><td>1. Minor and editorial changes:</td><td>– Clarification
– Decrease of technical requirements
– Minor technical change
– Editorial corrections</td></tr>
<tr><td colspan="2">These are changes which modify requirements in an editorial or a minor technical way. They include changes of the wording to clarify technical requirements without any technical change, or a reduction in the level of existing requirement.</td></tr>
<tr><td>2. Extension:</td><td>– Addition of technical options</td></tr>
<tr><td colspan="2">These are changes which add new or modify existing technical requirements, in a way that new options are given, but without increasing the requirements for the design, selection and erection of existing installations that are fully compliant with the previous standard. Therefore, these will not have to be considered for existing installations in conformity with the preceding edition.</td></tr>
<tr><td>3. Major technical changes:</td><td>– Addition of technical requirements
– Increase of technical requirements</td></tr>
<tr><td colspan="2">These are changes to technical requirements (addition, increase of the level or removal) made in a way that an existing installation in conformity with the preceding edition will not always be able to fulfil the requirements given in the later edition. These changes have to be considered for existing installations in conformity with the preceding edition, for which additional information is provided in B) below.

These changes represent the latest state-of-the-art technology. However, these changes should not normally have an influence on existing installations.</td></tr>
<tr><th colspan="2">B) Information about the background of “major technical changes”</th></tr>
<tr><td colspan="2">C1 Due to the risk of gassing producing hydrogen from all cell types, adequate provision for venting is required as the gassing can create an explosive condition in small enclosures. This condition would apply to torches, multi meters, pocket gas sensors and similar items. Alternatively, where the equipment meets the requirements for Equipment Group IIC, the requirement of degassing apertures or limitation of hydrogen concentration does not apply.

C2 An individual intrinsically safe circuit is also safe under short-circuit conditions. The short-circuit between two independent intrinsically safe circuits is not considered. Therefore the terminal boxes have to meet additional requirements for IP rating as well for the mechanical impact to make sure that the integrity of the enclosure is given also under worst case conditions.</td></tr>
</table>

The text of this standard is based on the following documents:

FDIS	Report on voting
31J/225/FDIS	31J/230/RVD

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

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

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

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Preventive measures to reduce the explosion risk from flammable materials are based on three principles, which are normally applied in the following order:

1) substitution
2) control
3) mitigation

Substitution involves, for example, replacing a flammable material by one which is either not flammable or less flammable.

Control involves, for example:

a) reducing the quantity of flammables;
b) avoiding or minimising releases;
c) controlling the release;
d) preventing the formation of an explosive atmosphere;
e) collecting and containing releases; and
f) avoiding ignition sources.

NOTE 1 With the exception of item f), all of the above are part of the process of hazardous area classification.

Mitigation involves, for example:

1) reducing the number of people exposed;
2) providing measures to avoid the propagation of an explosion;
3) providing explosion pressure relief;
4) providing explosion pressure suppression; and
5) providing suitable personal protective equipment.

NOTE 2 The above items are part of consequence management when considering risk.

Once the principles of substitution and control (items a) to e)) have been applied, the remaining hazardous areas should be classified into zones according to the likelihood of an explosive atmosphere being present (see IEC 60079-10-1 or IEC 60079-10-2). Such classification, which may be used in conjunction with an assessment of the consequences of an ignition, allows equipment protection levels to be determined and hence appropriate types of protection to be specified for each location.

For an explosion to occur, an explosive atmosphere and a source of ignition need to co-exist. Protective measures aim to reduce, to an acceptable level, the likelihood that the electrical installation could become a source of ignition.

By careful design of the electrical installation, it is frequently possible to locate much of the electrical equipment in less hazardous or non-hazardous areas.

When electrical equipment is installed in areas where explosive concentrations and quantities of flammable gases vapours or dusts may be present in the atmosphere, protective measures are applied to reduce the likelihood of explosion due to ignition by arcs, sparks or hot surfaces, produced either in normal operation or under specified fault conditions.

Many types of dust that are generated, processed, handled and stored, are combustible. When ignited they can burn rapidly and with considerable explosive force if mixed with air in the appropriate proportions. It is often necessary to use electrical equipment in locations where such materials are present, and suitable precautions should therefore be taken to

ensure that all such equipment is adequately protected so as to reduce the likelihood of ignition of the external explosive atmosphere. In electrical equipment, potential ignition sources include electrical arcs and sparks, hot surfaces and frictional sparks.

Dust can be ignited by equipment in several ways:

- by surfaces of the equipment that are above the minimum ignition temperature of the dust concerned. The temperature at which a type of dust ignites is a function of the properties of the dust, whether the dust is in a cloud or layer, the thickness of the layer and the geometry of the heat source;
- by arcing or sparking of electrical parts such as switches, contacts, commutators, brushes, or the like;
- by discharge of an accumulated electrostatic charge;
- by radiated energy (e.g. electromagnetic radiation);
- by mechanical sparking or frictional sparking associated with the equipment.

In order to avoid dust ignition hazards it is important that:

- the temperature of surfaces on which dust can be deposited, or which would be in contact with a dust cloud, is kept below the temperature limitation specified in this standard;
- any electrical sparking parts, or parts having a temperature above the temperature limit specified in this standard:
  - are contained in an enclosure which adequately prevents the ingress of dust, or
  - the energy of electrical circuits is limited so as to avoid arcs, sparks or temperatures capable of igniting dust;
- any other ignition sources are avoided.

Several types of protection are available for electrical equipment in hazardous areas (see IEC 60079-0), and this standard gives the specific requirements for design, selection and erection of electrical installations in explosive atmospheres.

This part of the IEC 60079 series is supplementary to other relevant IEC standards, for example IEC 60364 series as regards electrical installation requirements. This part also refers to IEC 60079-0 and its associated standards for the construction, testing and marking requirements of suitable electrical equipment.

This standard provides the specific requirements for the design, selection, erection and the required initial inspection of electrical equipment in hazardous areas. This standard is also based on manufacturer’s instructions being followed. On-going inspection, maintenance and repair aspects also play an important role in control of hazardous area installations and the user’s attention is drawn to IEC 60079-17, IEC 60079-19 and manufacturer’s instructions for further information concerning these aspects.

In any industrial installation, irrespective of size, there may be numerous sources of ignition apart from those associated with electrical equipment. Precautions may be necessary to ensure safety from other possible ignition sources, but guidance on this aspect is outside the scope of this standard.

EXPLOSIVE ATMOSPHERES –

Part 14: Electrical installations design, selection and erection

1 Scope

This part of the IEC 60079 series contains the specific requirements for the design, selection, erection and initial inspection of electrical installations in, or associated with, explosive atmospheres.

Where the equipment is required to meet other environmental conditions, for example, protection against ingress of water and resistance to corrosion, additional protection requirements may be necessary.

The requirements of this standard apply only to the use of equipment under standard atmospheric conditions as defined in IEC 60079-0. For other conditions, additional precautions may be necessary, and the equipment should be certified for these other conditions. For example, most flammable materials and many materials which are normally regarded as non-flammable might burn vigorously under conditions of oxygen enrichment.

NOTE 1 The standard atmospheric conditions defined in IEC 60079-0 relate to the explosion characteristics of the atmosphere and not the operating range of the equipment i.e.

- Temperature: –20 °C to 60 °C;
- Pressure: 80 kPa (0,8 bar) to 110 kPa (1,1 bar); and
- air with normal oxygen content, typically 21 % v/v.

These requirements are in addition to the requirements for installations in non-hazardous areas.

NOTE 2 For voltages up to 1 000 V a.c. or 1 500 V d.c. requirements of this standard are based on installation requirements in the IEC 60364 series, but other relevant national requirements can apply.

This standard applies to all electrical equipment including fixed, portable, transportable and personal, and installations, permanent or temporary.

This standard does not apply to

– electrical installations in mines susceptible to firedamp;

NOTE 3 This standard can apply to electrical installations in mines where explosive gas atmospheres other than firedamp can be formed and to electrical installations in the surface installation of mines.

– inherently explosive situations and dust from explosives or pyrophoric substances (for example explosives manufacturing and processing);
– rooms used for medical purposes;
– electrical installations in areas where the hazard is due to flammable mist.

NOTE 4 Additional guidance on the requirements for hazards due to hybrid mixtures of dust or flyings and flammable gas or vapour is provided in Annex M.

No account is taken in this Standard of the toxic risks that are associated with flammable gases, liquids and dusts in concentrations that are usually very much less than the lower explosive limit. In locations where personnel may be exposed to potentially toxic concentrations of flammable material, appropriate precautions should be taken. Such precautions are outside the scope of this Standard.