INTERNATIONAL STANDARD

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Third edition
2002-10

Electrical apparatus for explosive gas atmospheres –

Part 14:
Electrical installations in hazardous areas (other than mines)

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Part 14: Electrical installations in hazardous areas (other than mines)

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CONTENTS

FOREWORD 9
INTRODUCTION 13

1 Scope and object 8
2 Normative references 15
3 Definitions and terms 19
4 General 31
4.1 General requirements 31
4.2 Documentation 33
4.3 Assurance of conformity of apparatus 33
5 Selection of electrical apparatus (excluding cables and conduits) 35
5.1 Specific information 35
5.2 Selection according to zones 35
5.3 Selection according to the ignition temperature of the gas or vapour 37
5.4 Selection according to apparatus grouping 39
5.5 External influences 41
5.6 Light metals as construction materials 41
5.7 Portable apparatus and test equipment 41
6 Protection from dangerous (incentive) sparking 43
6.1 Danger from live parts 43
6.2 Danger from exposed and extraneous conductive parts 43
6.3 Potential equalization 45
6.4 Static electricity 45
6.5 Lightning protection 47
6.6 Electromagnetic radiation 47
6.7 Cathodically protected metallic parts 47
7 Electrical protection 47
8 Emergency switch-off and electrical isolation 49
8.1 Emergency switch-off 49
8.2 Electrical isolation 49
9 Wiring systems 49
9.1 General 49
9.2 Cable systems for zone 0 55
9.3 Cable systems for zones 1 and 2 55
9.4 Conduit systems 57

10 Additional requirements for type of protection “d” – Flameproof enclosures 59
10.1 General 59
10.2 Solid obstacles 59
10.3 Protection of flameproof joints 59
10.4 Cable entry systems 61
10.5 Motors supplied at varying frequency and voltage 63
10.6 Conduit systems 65
11 Additional requirements for type of protection “e” – Increased safety 67
11.1 Degree of protection of enclosures (IEC 60034-5 and IEC 60529) 67
11.2 Cage induction motors – Thermal protection in operation 67
11.3 Wiring systems 71
11.4 Resistance heating devices 73
11.5 Cage rotor and high voltage machines 73
12 Additional requirements for type of protection “i” – Intrinsic safety 73
12.1 Introductory remark 73
12.2 Installations for zones 1 and 2 75
12.3 Installations for zone 0 91
12.4 Special applications 93
13 Additional requirements for type of protection “p” – Pressurized apparatus 95
13.1 Ducting 95
13.2 Action to be taken on failure of pressurization 97
13.3 Multiple pressurized enclosures with a common safety device 101
13.4 Purging 101
13.5 Pressurized rooms and analyser houses 103
14 Additional requirements for apparatus suitable only for use in zone 2 103
14.1 Degree of protection of enclosures (IEC 60034-5 and IEC 60529) 103
14.2 Energy-limited apparatus and circuits 103
14.3 Wiring systems 105
14.4 Motors supplied at varying frequency and voltage 105
15 Personal electrical apparatus 107

Annex A (normative) Verification of intrinsically safe circuits with more than one associated apparatus with linear current/voltage characteristics 109

Annex B (informative) Methods of determining the maximum system voltages and currents in intrinsically safe circuits with more than one associated apparatus with linear current/voltage characteristics (as required by annex A) 111

Annex C (informative) Determination of cable parameters 117

Bibliography 121

Figure 1 – Selection chart for cable entry devices into flameproof enclosures for cables complying with item b) of 10.4.2 63
Figure 2 – Earthing of conducting screens 79
Figure B.1 – Series connection – Summation of voltage 113
Figure B.2 – Parallel connection – Summation of currents 113
Figure B.3 – Series and parallel connections – Summations of voltages and summations of currents 115

Table 1 – Relationship between the temperature classes, surface temperatures and ignition temperature 39
Table 2 – Relationship between gas/vapour subdivision and apparatus subgroup 39
Table 3 – Minimum distance of obstruction from the flameproof flange joints related to the gas/vapour Subgroup of the hazardous area 59
Table 4 – Assessment for T4 classification according to component size and ambient temperature 91
Table 5 – Use of spark and particle barriers 97
Table 6 – Action to be taken when the pressurization with the protective gas fails for electrical apparatus without an internal source of release 99

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL APPARATUS FOR EXPLOSIVE GAS ATMOSPHERES –

Part 14: Electrical installations in hazardous areas (other than mines)

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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: Electrical apparatus for explosive atmospheres.

This third edition cancels and replaces the second edition published in 1996, and constitutes a technical revision.

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

FDIS	Report on voting
31J/86/FDIS	31J/87/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 3.

This standard is to be read in conjunction with IEC 60079-0 and with the standards for the specific types of protection listed in the scope.

Annex A forms an integral part of this standard.

Annexes B and C are for information only.

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

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

INTRODUCTION

When electrical apparatus is to be installed in areas where dangerous concentrations and quantities of flammable gases, vapours, mists, ignitable fibres 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.

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

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

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.

It has been found practical to classify hazardous areas into zones according to the likelihood of an explosive gas atmosphere being present (see IEC 60079-10). Such classification allows appropriate types of protection to be specified for each zone.

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

This standard is based on the assumption that electrical apparatus is correctly installed, tested, maintained and used in accordance with its specified characteristics.

Inspection, maintenance and repair aspects also form an important part of hazardous area installations and the user's attention is drawn to IEC 60079-17 and IEC 60079-19 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 apparatus. Precautions may be necessary to ensure safety, but guidance on this aspect is outside the scope of this standard.

ELECTRICAL APPARATUS FOR EXPLOSIVE GAS ATMOSPHERES –

Part 14: Electrical installations in hazardous areas (other than mines)

1 Scope

This part of IEC 60079 contains the specific requirements for the design, selection and erection of electrical installations in explosive gas atmospheres.

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

This standard applies to all electrical equipment and installations in hazardous areas whether permanent, temporary, portable, transportable or hand-held.

It applies to installations at all voltages.

This standard does not apply to

– electrical installations in mines susceptible to firedamp;

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

– electrical installations in areas where the hazard is due to combustible dusts or fibres;

– inherently explosive situations, for example explosives manufacturing and processing;

– rooms used for medical purposes.

2 Normative references

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

IEC 60034-5:2000, *Rotating electrical machines – Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) – Classification*

IEC 60034-17:2002, *Rotating electrical machines – Part 17: Cage induction motors when fed from converters – Application guide*

IEC 60050(426):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 426: Electrical apparatus for explosive atmospheres*

IEC 60060-1:1989, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60079-0:1998, *Electrical apparatus for explosive gas atmospheres – Part 0: General requirements*

IEC 60079-1:2001, *Electrical apparatus for explosive gas atmospheres – Part 1: Flameproof enclosures "d"*

IEC 60079-2:2001, *Electrical apparatus for explosive gas atmospheres – Part 2: Pressurized enclosures "p"*

IEC 60079-5:1997, *Electrical apparatus for explosive gas atmospheres – Part 5: Powder-filling "q"*

IEC 60079-6:1995, *Electrical apparatus for explosive gas atmospheres – Part 6: Oil-immersion "o"*

IEC 60079-7:2001, *Electrical apparatus for explosive gas atmospheres – Part 7: Increased safety "e"*

IEC 60079-10:1995, *Electrical apparatus for explosive gas atmospheres – Part 10: Classification of hazardous areas*

IEC 60079-11:1999, *Electrical apparatus for explosive gas atmospheres – Part 11: Intrinsic safety "i"*

IEC 60079-13:1982, *Electrical apparatus for explosive gas atmospheres – Part 13: Construction and use of rooms or buildings protected by pressurization*

IEC 60079-15:2001, *Electrical apparatus for explosive gas atmospheres – Part 15: Type of protection "n"*

IEC 60079-16:1990, *Electrical apparatus for explosive gas atmospheres – Part 16: Artificial ventilation for the protection of analyser(s) houses*

IEC 60079-17:1996, *Electrical apparatus for explosive gas atmospheres – Part 17: Inspection and maintenance of electrical installations in hazardous areas (other than mines)*

IEC 60079-18:1992, *Electrical apparatus for explosive gas atmospheres – Part 18: Encapsulation "m"*

IEC 60079-19:1993, *Electrical apparatus for explosive gas atmospheres – Part 19: Repair and overhaul for apparatus used in explosive atmospheres (other than mines or explosives)*

IEC 60332-1:1993, *Tests on electric cables under fire conditions – Part 1: Test on a single vertical insulated wire or cable*

IEC 60364-4-41:2001, *Electrical installations of buildings – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60529: 1989, *Degrees of protection provided by enclosure (IP code)*

IEC 60614-2-1:1982, *Specification for conduits for electrical installations – Part 2: Particular specifications for conduits – Section One: Metal conduits*

IEC 60614-2-5: 1992, *Specification for conduits for electrical installations – Part 2: Particular specifications for conduits – Section 5: Flexible conduits*

IEC 60742:1983, *Isolating transformers and safety isolating transformers – Requirements*

IEC 61024-1:1990, *Protection of structures against lightning – Part 1: General principles*

IEC 61024-1-1:1993, *Protection of structures against lightning – Part 1: General principles – Section 1: Guide A: Selection of protection levels for lightning protection systems*

IEC 61285:1994, *Industrial process control – Safety of analyser houses*

ISO 10807:1994, *Pipework – Corrugated flexible metallic hose assemblies for the protection of electric cables in explosive atmospheres*

3 Definitions and terms

For the purposes of this part of IEC 60079, the following definitions, in addition to those given in IEC 60050(426), apply.

3.1 Hazardous areas

3.1.1
explosive atmosphere
mixture with air, under atmospheric conditions, of flammable substances in the form of gas, vapour, mist or dust, in which after ignition, combustion spreads throughout the unconsumed mixture

3.1.2
explosive gas atmosphere
mixture with air, under atmospheric conditions, of flammable substances in the form of gas or vapour, in which after ignition, combustion spreads throughout the unconsumed mixture

3.1.3
hazardous area
area in which an explosive gas atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of apparatus

NOTE For the purposes of this standard, an area is a three-dimensional region or space.

3.1.4
non-hazardous area
area in which an explosive gas atmosphere is not expected to be present in quantities such as to require special precautions for the construction, installation and use of apparatus

3.1.5
normal operation
operation of apparatus conforming electrically and mechanically with its design specification and used within the limits specified by the manufacturer

NOTE The limits specified by the manufacturer may include persistent operational conditions such as stalled rotors, failed lamps and overloads.

3.1.6
competent body
individual or organization which can demonstrate appropriate technical knowledge and relevant skills to make the necessary assessments of the safety aspect under consideration

3.1.7
group (of an electrical apparatus for explosive atmospheres)
classification of electrical apparatus related to the explosive atmosphere for which it is to be used

NOTE Electrical apparatus for use in explosive gas atmospheres is divided into two groups:

– group I: electrical apparatus for mines susceptible to firedamp;

– group II: (which can be divided into subgroups): electrical apparatus for places with an explosive gas atmosphere, other than mines susceptible to firedamp (see 5.4).

3.1.8
maximum surface temperature
highest temperature which is attained in service under the most adverse operating conditions (but within recognized tolerances) by any part or surface of the electrical apparatus, which would be able to produce an ignition of the surrounding explosive atmosphere

NOTE 1 The most adverse conditions include recognized overloads and fault conditions recognized in the specific standard for the type of protection concerned.

NOTE 2 The relevant surface temperature may be internal and/or external depending upon the type of protection concerned.

3.1.9
sealing ring
ring used in a cable or conduit entry to ensure sealing between the entry and the cable or conduit

3.1.10
type of protection
specific measures applied to electrical apparatus to avoid ignition of a surrounding explosive atmosphere

3.2 Flameproof enclosure

3.2.1
flameproof enclosure "d"
type of protection in which the parts which can ignite an explosive atmosphere are placed in an enclosure which can withstand the pressure developed during an internal explosion of an explosive mixture and which prevents the transmission of the explosion to the explosive atmosphere surrounding the enclosure

3.2.2
pressure-piling
condition resulting from the ignition of pre-compressed gases in compartments or subdivisions other than those in which ignition was initiated

NOTE This may lead to a higher maximum pressure than would otherwise be expected.

3.3 Increased safety

3.3.1
increased safety "e"
type of protection applied to electrical apparatus in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks in normal service or under specified abnormal conditions

3.3.2
initial starting current I_A
highest r.m.s. value of current absorbed by an a.c. motor at rest when supplied at the rated voltage and frequency

3.3.3
starting current ratio I_A/I_N
ratio between initial starting current I_A and rated current I_N

3.3.4
time t_E
time taken for an a.c. rotor or stator winding, when carrying the initial starting current I_A, to be heated up to the limiting temperature from the temperature reached in rated service at the maximum ambient temperature

3.4 Intrinsic safety – general

3.4.1
intrinsic safety "i"
type of protection based upon the restriction of electrical energy within apparatus and of interconnecting wiring exposed to an explosive atmosphere to a level below that which can cause ignition by either sparking or heating effects

NOTE Because of the method by which intrinsic safety is achieved, it is necessary to ensure that not only the electrical apparatus exposed to the explosive atmosphere but also other electrical apparatus with which it is interconnected is suitably constructed.

3.4.2
intrinsically safe apparatus
electrical apparatus in which all the circuits are intrinsically safe

NOTE Intrinsically safe apparatus should conform to IEC 60079-11, category "ia" or "ib".

3.4.3
galvanic isolation
arrangement within an item of intrinsically safe apparatus such that a signal is transferred from the apparatus input to the apparatus output without any direct electrical connection between the two

NOTE Galvanic isolation frequently utilizes either magnetic (transformer or relay) or opto-coupled elements.

3.4.4
associated apparatus
electrical apparatus in which the circuits or parts of circuits are not all necessarily intrinsically safe but which contains circuits that can affect the safety of the intrinsically safe circuits associated with it

NOTE The associated apparatus is normally the interface between an intrinsically safe circuit and a non-intrinsically safe circuit and is frequently located in the non-hazardous area. The associated apparatus may be, for example, shunt diode safety barriers or galvanic isolators.