

Electrical apparatus for explosive gas atmospheres —

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

The European Standard EN 60079-14:2003 has the status of a
British Standard

ICS 29.260.20

National foreword

This British Standard is the official English language version of EN 60079-14:2003. It is identical with IEC 60079-14:2002. It supersedes BS EN 60079-14:1997 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee GEL/31, Electrical apparatus for use in explosive atmospheres, to Subcommittee GEL/31/11, Code of practice for electrical apparatus for explosive atmospheres, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 63 and a back cover.

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Amendments issued since publication

Amd. No.	Date	Comments

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 10 September 2003

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ISBN 0 580 42598 3

English version

Electrical apparatus for explosive gas atmospheres
Part 14: Electrical installations in hazardous areas
(other than mines)
(IEC 60079-14:2002)

Matériel électrique pour atmosphères
explosives gazeuses
Partie 14: Installations électriques
dans les emplacements dangereux
(autres que les mines)
(CEI 60079-14:2002)

Elektrische Betriebsmittel für
gasexplosionsgefährdete Bereiche
Teil 14: Errichtung elektrischer Anlagen
in explosionsgefährdeten Bereichen
(ausgenommen Grubenbaue)
(IEC 60079-14:2002)

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of the International Standard IEC 60079-14:2002, prepared by SC 31J, Classification of hazardous areas and installation requirements, of IEC TC 31, Electrical apparatus for explosive atmospheres, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 60079-14 on 2003-07-01.

This European Standard supersedes EN 60079-14:1997.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement dop) 2004-07-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2006-07-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A and ZA are normative and annexes B and C are informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60079-14:2002 was approved by CENELEC as a European Standard without any modification.

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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.

3.4.5

simple apparatus

electrical component or combination of components of simple construction with well-defined electrical parameters which is compatible with the intrinsic safety of the circuit in which it is used

NOTE The following apparatus is considered to be simple apparatus:

- a) passive components, e.g. switches, junction boxes, resistors and simple semi-conductor devices;
- b) sources of stored energy with well-defined parameters, e.g. capacitors or inductors, whose values are considered when determining the overall safety of the system;
- c) sources of generated energy, e.g. thermocouples and photocells, which do not generate more than 1,5 V, 100 mA and 25 mW. Any inductance or capacitance present in these sources of energy are considered as in b) above.

3.4.6

intrinsically safe circuit

circuit in which all the apparatus is either intrinsically safe apparatus or simple apparatus

NOTE The circuit may also contain associated apparatus.

3.4.7

intrinsically safe electrical system

assembly of interconnected items of electrical apparatus, described in a descriptive system document, in which the circuits or parts of circuits intended to be used in an explosive atmosphere are intrinsically safe

3.4.8

intrinsically safe sub-circuit

part of an intrinsically safe circuit which is galvanically isolated from another part or other parts of the same intrinsically safe circuit

3.5 Intrinsic safety parameters

3.5.1

maximum external capacitance (C_o)

maximum capacitance in an intrinsically safe circuit that can be connected to the connection facilities of the apparatus without invalidating intrinsic safety

3.5.2

maximum external inductance (L_o)

maximum value of inductance in an intrinsically safe circuit that can be connected to the connection facilities of the apparatus without invalidating intrinsic safety

3.5.3

maximum external inductance to resistance ratio (L_o/R_o)

ratio of inductance (L_o) to resistance (R_o) of any external circuit connected to the connection facilities of the electrical apparatus without invalidating intrinsic safety

3.5.4

maximum input current (I_i)

maximum current (peak a.c. or d.c.) that can be applied to the connection facilities for intrinsically safe circuits without invalidating intrinsic safety

3.5.5

maximum input power (P_i)

maximum input power in an intrinsically safe circuit that can be dissipated within an apparatus when it is connected to an external source without invalidating intrinsic safety

3.5.6

maximum input voltage (U_i)

maximum voltage (peak a.c. or d.c.) that can be applied to the connection facilities for intrinsically safe circuits without invalidating intrinsic safety

3.5.7

maximum internal capacitance (C_i)

total equivalent internal capacitance of the apparatus which is considered as appearing across the connection facilities of the apparatus

3.5.8

maximum internal inductance (L_i)

total equivalent internal inductance of the apparatus which is considered as appearing at the connection facilities of the apparatus

3.5.9

maximum internal inductance to resistance ratio (L_i/R_i)

ratio of inductance (L_i) to resistance (R_i) which is considered as appearing at the external connection facilities of the electrical apparatus

3.5.10

maximum output current (I_o)

maximum current (peak a.c. or d.c.) in an intrinsically safe circuit that can be taken from the connection facilities of the apparatus

3.5.11

maximum output power (P_o)

maximum electrical power in an intrinsically safe circuit that can be taken from the apparatus

3.5.12

maximum output voltage (U_o)

maximum output voltage (peak a.c. or d.c.) in an intrinsically safe circuit that can appear under open-circuit conditions at the connection facilities of the apparatus at any applied voltage up to the maximum voltage, including U_m and U_i

NOTE 1 Where there is more than one applied voltage, the maximum output voltage is that occurring under the most onerous combination of applied voltages.

NOTE 2 U_z is sometimes used to denote the output working voltage of a shunt diode safety barrier.

3.5.13

maximum r.m.s. a.c. or d.c. voltage (U_m)

maximum voltage that can be applied to the non-intrinsically safe connection facilities of associated apparatus without invalidating intrinsic safety

3.6 Pressurization

3.6.1

pressurization “p”

technique of guarding against the ingress of the external atmosphere into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere

3.6.2

continuous dilution (flow)

continuous supply of a protective gas, after purging, at such a rate that the concentration of a flammable substance inside the pressurized enclosure is maintained at a value outside the explosive limits at any potential ignition source (that is, outside the dilution area)

NOTE The dilution area is an area in the vicinity of an internal source of release where the concentration of a flammable substance is not diluted to a safe concentration.

3.6.3

leakage compensation

flow of protective gas sufficient to compensate for any leakage from the pressurized enclosure and its ducts

3.6.4

static pressurization

maintenance of an overpressure within a pressurized enclosure without the addition of protective gas in the hazardous area

3.7 Zone 2 protection

3.7.1

type of protection “n”

type of protection applied to electrical apparatus such that, in normal operation and in certain specified abnormal conditions, it is not capable of igniting a surrounding explosive atmosphere

NOTE 1 Additionally, the requirements of the apparatus standard are intended to ensure that a fault capable of causing ignition is not likely to occur.

NOTE 2 An example of a specified abnormal condition is a luminaire with a failed lamp.

3.8 Electrical supply systems

3.8.1

protective extra-low voltage (PELV)

extra-low voltage system which is not electrically separated from earth but which otherwise satisfies the requirements for SELV

NOTE A 50 V centre-tapped earth system is a PELV system.

3.8.2

safety extra-low voltage (SELV)

extra-low voltage system (i.e. normally not exceeding 50 V a.c. or 120 V ripple-free d.c.) which is electrically separated from earth and from other systems in such a way that a single fault cannot give rise to an electric shock

NOTE A 50 V earth free system is a SELV system.

4 General

4.1 General requirements

Electrical installations in hazardous areas shall also comply with the appropriate requirements for installations in non-hazardous areas. However the requirements for non-hazardous areas may be insufficient for installations in hazardous areas.

NOTE 1 Electrical apparatus and materials should be installed and used within their electrical ratings for power, voltage, current, frequency, duty and such other characteristics where non-conformity might jeopardize the safety of the installation. In particular, care should be taken to ensure that the voltage and frequency are appropriate to the supply system with which the apparatus is used and that the temperature classification has been established for the correct voltage, frequency, etc.

In order to facilitate the selection of appropriate electrical apparatus and the design of suitable electrical installations, hazardous areas are divided into zones 0, 1 and 2 according to IEC 60079-10.

Electrical apparatus should, as far as is reasonably practicable, be located in non-hazardous areas. Where it is not possible to do this, it should be located in the least hazardous area practicable.

All electrical apparatus and wiring in hazardous areas shall be selected and installed in accordance with clauses 5 to 9 inclusive and the additional requirements for the particular type of protection (clauses 10 to 14).

Apparatus shall be installed in accordance with its documentation. Care should be taken to ensure that replaceable items, such as lamps, are of the correct type and rating. On completion of the erection, initial inspection of the apparatus and installation shall be carried out in accordance with IEC 60079-17.

NOTE 2 If luminaires with fluorescent tubes are used, then the area should be confirmed to be free from group IIC gas/vapour before tubes are transported through the area or changed, unless suitable precautions are taken to prevent tubes being broken. Low-pressure sodium lamps should not be used in any hazardous area owing to the risk of ignition from the free sodium from a broken lamp.

Installations should be designed and apparatus and materials installed with a view to providing ease of access for inspection and maintenance (IEC 60079-17).

Apparatus and systems used in exceptional circumstances, for example research, development, pilot plant and other new project work, need not meet the requirements of clauses 5 to 9, provided that the installation is in use for limited periods only, is under the supervision of specially trained personnel and one or more of the following conditions, as appropriate, are met:

- measures are taken to ensure that an explosive gas atmosphere does not occur; or
- measures are taken to ensure that this apparatus is disconnected on the occurrence of an explosive gas atmosphere, in which case ignition after disconnection, e.g. due to heated parts, shall be prevented also; or
- measures are taken to ensure that persons and the environment are not endangered by fires or explosions in the experimental plant.

In addition, the measures to be taken are laid down in writing by persons who

- shall be familiar with the requirements for this, and any other relevant standards and code of practice concerning the use of electrical apparatus and systems for use in hazardous areas,
- have access to all information necessary to carry out the assessment.

4.2 Documentation

In order to correctly install or extend an existing installation, the following information, additional to that required for non-hazardous areas, is required, where applicable:

- area classification documents (see IEC 60079-10);
- instructions for erection and connection;
- documents for electrical apparatus with special conditions, e.g. for apparatus with certificate numbers which have the suffix "X" or other suffix;
- descriptive system document for the intrinsically safe system (see 12.2.5);
- manufacturer's/qualified person's declaration;
NOTE The manufacturer's/qualified person's declaration is applicable to situations where uncertified apparatus (other than simple apparatus in intrinsically safe circuits) is used.
- necessary information to ensure correct installation of the apparatus provided in a form which is suitable to the personnel responsible for this activity;
- information necessary for inspection, e.g. list and location of apparatus, spares, technical information (see IEC 60079-17);
- details of any relevant calculation, e.g. for purging rates for instruments or analyser houses;
- if repairs are to be carried out by the user or a repairer, information necessary for the repair of the electrical apparatus (see IEC 60079-19).

4.3 Assurance of conformity of apparatus

4.3.1 Use of certified apparatus

The use of certified apparatus provides the necessary assurance that apparatus meets the requirements of the appropriate standard.

4.3.2 Use of uncertified apparatus

Apart from

- simple apparatus used within an intrinsically safe circuit, or
- apparatus covered by 5.2.3.b), c) or d),

the use of uncertified apparatus should be restricted to exceptional circumstances, e.g. research, development, pilot plant and other new project work where suitable certified apparatus is not obtainable. In such circumstances the users of this apparatus should obtain a document of conformity.

NOTE A document of conformity shows that the apparatus has been examined and, where necessary, tested by a competent body (who may be the user) and has been found to conform to the requirements of the appropriate standard for the particular type of protection.

5 Selection of electrical apparatus (excluding cables and conduits)

5.1 Specific information

In order to select the appropriate electrical apparatus for hazardous areas, the following information is required:

- classification of the hazardous area;
- temperature class or ignition temperature of the gas or vapour involved according to 5.3;
- where applicable, gas or vapour classification in relation to the group or subgroup of the electrical apparatus according to 5.4;

NOTE Of the types of protection listed in IEC 60079-0, the apparatus subgroup is only required for protection types “d” (flameproof enclosures) and “i” (intrinsic safety). The apparatus subgroup is also required for certain apparatus with protection types “n” or “o” (oil immersion) (see 5.4).

- external influences and ambient temperature.

5.2 Selection according to zones

5.2.1 Apparatus for use in zone 0

Electrical apparatus and circuits can be used in zone 0 if they are in accordance with IEC 60079-11 (category “ia” – intrinsic safety) and with the requirements of 12.3 (see also 5.2.4).

Apparatus that conforms to IEC 60079-26¹ may also be used in zone 0.

5.2.2 Apparatus for use in zone 1

Electrical apparatus can be used in zone 1 if it is constructed in accordance with the requirements for zone 0 or one or more of the following types of protection (see also 5.2.4):

Flameproof enclosures	“d”	according to IEC 60079-1
Pressurized enclosures	“p”	according to IEC 60079-2
Powder filling	“q”	according to IEC 60079-5
Oil immersion	“o”	according to IEC 60079-6
Increased safety	“e”	according to IEC 60079-7
Intrinsic safety	“i”	according to IEC 60079-11
Encapsulation	“m”	according to IEC 60079-18

¹ Under consideration.

5.2.3 Apparatus for use in zone 2

The following electrical apparatus may be installed in zone 2:

- a) electrical apparatus for zone 0 or zone 1; or
- b) electrical apparatus designed specifically for zone 2 (for example type of protection “n” according to IEC 60079-15), or
- c) electrical apparatus complying with the requirements of a recognized standard for industrial electrical apparatus which does not, in normal operation, have ignition-capable hot surfaces; and
 - 1) does not, in normal operation, produce arcs or sparks, or
 - 2) in normal operation produces arcs or sparks but the values, of the electrical parameters (U , I , L and C) in the circuit (including the cables) do not exceed the values specified in IEC 60079-11 with a safety factor of unity. The assessment shall be in accordance with the specification for energy limited apparatus and circuits given in IEC 60079-15.

Unless safety is demonstrated by test, a surface is presumed to be ignition-capable if its temperature exceeds the ignition temperature of the explosive gas atmosphere concerned.

This electrical apparatus shall be in an enclosure with a degree of protection and mechanical strength at least suitable for non-hazardous areas with a similar environment. It requires no special marking, but it shall be clearly identified, either on the apparatus or in the documentation, that it has been assessed by a person who shall

- be familiar with the requirements of any relevant standards and codes of practice and their current interpretations,
- have access to all information necessary to carry out the assessment,
- where necessary, utilize similar test apparatus and test procedures to those used by national authorities.

- d) apparatus in accordance with 5.2.4.

In the case of rotating electrical machines in accordance with items b), c) or d) above, incentive sparking shall not occur during start-up unless precautions are taken to ensure that an explosive gas atmosphere is not present.

5.2.4 Selection of apparatus not available in accordance with IEC standards

In order to ensure the correct selection and installation of such apparatus (for example equipment marked “s” and identified with the zone of use in accordance with IEC 60079-0), reference should be made to the relevant national standard or code of practice that deals with these aspects.

5.3 Selection according to the ignition temperature of the gas or vapour

The electrical apparatus shall be so selected that its maximum surface temperature will not reach the ignition temperature of any gas or vapour which may be present.

Symbols for the temperature classes which may be marked on the electrical apparatus have the meaning indicated in table 1.