SLOVENSKI STANDARD
SIST EN 50284:2000

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Posebne zahteve za konstruiranje, preskušanje in označevanje električnih naprav skupine opreme II, kategorije 1 G

Special requirements for construction, test and marking of electrical apparatus of equipment group II, Category 1 G

Spezielle Anforderungen an Konstruktion, Prüfung und Kennzeichnung elektrischer Betriebsmittel der Gerätegruppe II, Kategorie 1 G

Exigences spéciales pour la construction, l'essai et le marquage des matériels électriques des appareils du groupe II, catégorie 1 G

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29.260.20	Električni aparati za eksplozivna ozračja	Electrical apparatus for explosive atmospheres

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English version

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Foreword

This European Standard has been prepared by the Technical Committee CENELEC TC 31, Electrical apparatus for explosive atmospheres.

This standard has been prepared for electrical apparatus of equipment group II, Category 1 G under the mandate of the European Commission and EFTA. This apparatus is described in Annex 1, clause 2 a) of the European Directive 94/9/EC, concerning equipment and protective systems, which are intended for use in potentially explosive atmospheres.

The equipment of Category 1 G is intended for use in areas, in which explosive atmospheres caused by mixtures of air and gases, vapours or mists are present continuously, for long periods or frequently. The Directive contains requirements for this equipment, which can be used in accordance with the operational parameters stated by the manufacturer and which ensures a very high level of safety with respect to explosion protection. This equipment must be designed and constructed in such a way, that sources of ignition do not occur even in the event of rare or two independent faults related to the equipment.

Observing the requirements of this standard the applicable Essential Safety Requirements of Annex 2 clause 2.1.1 of the Directive are covered.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50284 on 1998-10-01.

The following dates have been 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) 1999-11-01

- latest date by which national standards conflicting with the EN have to be withdrawn (dow) 2003-06-30

This European Standard is to be read in conjunction with EN 50014:1997 and the related European Standards for specific types of protection listed in the scope of this standard. It does not apply in conjunction with the first or second editions of those standards and their amendments published before 1997.

Contents

1 Scope

This European Standard specifies the particular requirements for construction, testing and marking of electrical apparatus of equipment group II, conformity Category 1 G as defined in EN 50014:1997. Such apparatus comprises equipment designed to be capable of functioning in conformity with the operational parameters established by the manufacturer and ensuring a very high level of protection.

Category 1 G apparatus is intended for use in hazardous areas, in which potentially explosive atmospheres caused by mixtures of air and gases, vapours or mists under normal atmospheric conditions (temperature = -20 °C to +60 °C, pressure = 0,8 bar to 1,1 bar) are present continuously, for long periods or frequently. This standard also applies to apparatus mounted across the boundary between hazardous and less hazardous areas where Category 1 and Category 2 equipment may normally be installed, respectively, for example in the wall of a storage vessel. This standard also makes provision for apparatus installed outside the hazardous area, but electrically connected to apparatus of Category 1 within the hazardous area (associated apparatus).

This standard supplements the requirements of EN 50014 to EN 50020 and EN 50028 to adapt the level of safety provided by those standards to the very high level of risk.

NOTE: In designing apparatus for operation in a potentially explosive atmosphere under conditions other than the atmospheric conditions given above, this standard may be used as a guide. However, additional testing is recommended related specifically to the intended conditions of use. This is particularly important when the types of protection "Flameproof enclosure" (EN 50018) and "Intrinsic safety" (EN 50020) are applied.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1127-1		Explosive atmospheres - Explosion prevention and protection Part 1: Basic concepts and methodology
EN 50014	1997	Electrical apparatus for potentially explosive atmospheres General requirements
EN 50015		Electrical apparatus for potentially explosive atmospheres Oil immersion "o"
EN 50016		Electrical apparatus for potentially explosive atmosphere Pressurized apparatus "p"
EN 50017		Electrical apparatus for potentially explosive atmospheres Powder filling "q"
EN 50018		Electrical apparatus for potentially explosive atmospheres Flameproof enclosure "d"

EN 50019	Electrical apparatus for potentially explosive atmospheres Increased safety "e"
EN 50020	Electrical apparatus for potentially explosive atmospheres Intrinsic safety "i"
EN 50028	Electrical apparatus for potentially explosive atmospheres Encapsulation "m"
EN 50039	Electrical apparatus for potentially explosive atmospheres Intrinsically safe electric systems "i"
EN 60529	Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)
ISO 1210	Plastics -- Determination of the burning behaviour of horizontal and vertical specimens in contact with a small-flame ignition source
Directive 94/9/EC	Equipment and protective systems intended for use in potentially explosive atmospheres

3 Definitions

For the purpose of this European standard the following definitions apply:

3.1 equipment: Machines, apparatus, fixed or mobile devices, control components and instrumentation thereof and detection or prevention systems which, separately or jointly, are intended for the generation, transfer, storage, measurement, control and conversion of energy or the processing of material and which are capable of causing an explosion through their own potential sources of ignition.

3.2 The definitions of "**equipment group**" and "**Category**" are given in EN 50014:1997.

3.3 standardized types of protection: The standardized types of protection, as referred to in this standard, are the protection measures for electrical apparatus of Category 2 in accordance with the European Standards EN 50014 to EN 50020 and EN 50028.

4 Requirements for design and construction

4.1 General

Equipment in this category shall ensure the requisite level of protection, even in the event of rare incidents relating to the equipment. This requirement is satisfied if the measures against potential sources of ignition described in 4.2 to 4.5 of this standard based on the European Standards EN 50014 to EN 50020 or EN 50028 are observed.

NOTE: If the apparatus contains other potential sources of ignition (e.g. ultrasonic, optical or ionizing radiation), EN 1127-1 should be observed.

4.2 Protection measures against ignition hazards of the electrical circuits

4.2.1 General

To prevent ignition hazards caused by the electrical circuits of the equipment the requisite level of protection shall be ensured by:

- either, in the event of two faults occurring independently of each other in a single apparatus means of protection according to 4.2.2 or 4.2.3,

- or in the event of a failure of one apparatus means of protection, at least by an independent second means of protection according to 4.2.4 or 4.2.5 is provided.

Electrical connections and permanently connected cables of the equipment sited within the explosive atmosphere shall comply with the same level of protection as equipment to which they are connected.

NOTE: Because of possible ignition hazards which can arise from faults and/or transient circulating currents in the potential equalization system, galvanic isolation in the power and signal connections to the apparatus according to 4.2.2, 4.2.3 and 4.2.4 is preferred. Consideration should also be given to minimize the effect of transient fault currents in the potential equalization network by the use of electrical protection equipment such as sensitive earth leakage monitors.

4.2.2 Intrinsic safety

Electrical apparatus and electrical circuits of associated apparatus, which are in the hazardous area requiring Category 1 equipment, shall comply with the requirements of EN 50020, Category "ia".

4.2.3 Special encapsulation

Electrical apparatus, which is protected by "Encapsulation", shall comply with the requirements of EN 50028 and additionally with the following supplementary requirements:

- The apparatus shall withstand the high level mechanical strength test of EN 50014.

- Only components shall be used, which cannot damage the encapsulation mechanically or thermally in the case of a fault, or where a fault of an internal component may lead to failure of the encapsulation system due to increasing temperature, protection shall be ensured by the use of duplicated, non self-resetting thermal protecting devices, positioned as necessary throughout the circuit of the apparatus.

  NOTE: Certain components (e.g. batteries or electrolytic capacitors) whose application is allowed according to EN 50028 can possibly make the protective measure "encapsulation" ineffective by mechanical or thermal damage as a consequence of internal reactions (e.g. internal short circuit). This risk should be excluded for Category 1 equipment.

- The free volume of encapsulated components shall not exceed 10 cm^3. The enclosure of the free volume shall withstand a static pressure of at least 10 bar; an exception to this requirement is made for free volumes within small components such as transistors.

- The thickness of the encapsulation between the surface of the encapsulation and the components shall not be less than 3 mm even in combination with an enclosure.

- Switch contacts are not allowed in the apparatus.

- Where protection is dependent on application of correct voltage, current or power to the connections to the apparatus, all connections shall be to other apparatus or associated apparatus having control over voltage and current limitation equivalent of that of a Category "ib" circuit according to EN 50020, though not necessarily at the same levels of voltage, current or power.

- Encapsulated apparatus shall be marked with an "X" and the documentation shall draw attention to the necessity to provide mechanical protection and, where relevant, to the requirement for connection only to other specified apparatus or associated apparatus. The material of the encapsulation and its continuous operating temperature shall be clearly defined in the documentation, to enable the user to confirm the suitability in his particular application.

  EXAMPLE:
  Encapsulated ultrasonic level sensor for installation within a process vessel or storage tank, where the power requirements are in excess of those permitted by EN 50020.

  NOTE: Encapsulation according to EN 50028 may be considered as one of two independent means of protection according to 4.2.4.

4.2.4 Application of two independent standardized types of protection

Electrical apparatus shall meet the requirements independently of two of the standards within the series EN 50015 to EN 50020 (Ex ib), plus EN 50028. Independent means: in the event that one type of protection fails, the other type of protection shall ensure the requisite level of protection.

The combined standardized types of protection shall depend on different physical protection principles, e.g. the combination of Ex d and Ex q depends both on the avoidance of flame propagation and may not be useful. In practice some combinations may not be useful, e.g. the combination of oil and sand encapsulation.

Where combined types of protection are used, it shall be possible for each type of protection to be checked individually (see 5.1). If two protection measures are combined, which both rely on the enclosure, a double enclosure is required, which meets the requirements of the respective protection measure. Alternatively if only one enclosure is used, the enclosure and the cable entries have to withstand the impact test with an impact strength of 20 Joule. If this enclosure withstands only an impact test between 7 Joule and 20 Joule, X-marking is required in the certificate, to inform the user that the apparatus shall be installed in confined areas where mechanical protection is assured by the installation.

Both types of protection shall be assessed under the assumption of the most arduous fault of the other type of protection. In the case of apparatus combining intrinsic safety, Category "ib", with other forms of protection, the second form of protection shall be assessed, for example for temperature rise, with the most arduous fault applied to the intrinsically safe circuit.

In the case of combining two types of protection, which rely both on the same parameter (e.g. the creepage distance combining Ex ib with Ex e), the safest requirement of both types of protection shall be applied.