SLOVENSKI STANDARD
oSIST prEN ISO 80079-37:2014

01-oktober-2014

Esplozivna atmosfera - 37. del: Neelektrična oprema za uporabo v potencialno eksplozivnih atmosferah - Neelektrična vrsta zaščite s konstrukcijsko varnostjo 'c', kontrolo virov vžiga 'b', s potopitvijo v tekočino 'k' (ISO/DIS 80079-37:2014)

Explosive atmospheres - Part 37: Non-electrical equipment for use in explosive atmospheres - Non-electrical type of protection constructional safety 'c', control of ignition sources 'b', liquid immersion 'k' (ISO/DIS 80079-37:2014)

Explosionsfähige Atmosphären - Nicht-elektrische Geräte für den Einsatz in explosionsfähigen Atmosphären - Teil 37: Sicherheit 'c', Zündquellenüberwachung 'b', Flüssigkeitskapselung 'k' (ISO/DIS 80079-37:2014)

Atmosphères explosives - Partie 37: Matériels non électriques pour atmosphères explosives - Mode de protection non électrique par sécurité de construction "ch", par contrôle de source d'inflammation "bh", par immersion dans un liquide "kh" (ISO/DIS 80079-37:2014)

Ta slovenski standard je istoveten z: **prEN ISO 80079-37 rev**

ICS:

13.230	Varstvo pred eksplozijo	Explosion protection
29.260.20	Električni aparati za eksplozivna ozračja	Electrical apparatus for explosive atmospheres

oSIST prEN ISO 80079-37:2014 **en,fr,de**

DRAFT INTERNATIONAL STANDARD IEC/DIS 80079-37.2

Secretariat: **TMB**

Voting begins on
2014-07-18

Voting terminates on
2014-10-24

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION
INTERNATIONAL ELECTROTECHNICAL COMMISSION • МЕЖДУНАРОДНАЯ ЭЛЕКТРОТЕХНИЧЕСКАЯ КОММИСИЯ • COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

Explosive atmospheres —

Part 37:
Non-electrical equipment for use in explosive atmospheres — Non-electrical type of protection constructional safety 'c', control of ignition sources 'b', liquid immersion 'k'

Atmosphères explosives —

Partie 37: Matériels non électriques pour atmosphères explosives — Mode de protection non électrique par sécurité de construction "ch", par contrôle de source d'inflammation "bh", par immersion dans un liquide "kh"

ICS 29.260.20

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

This draft is submitted to a parallel enquiry in ISO and a CDV vote in the IEC.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES

Part 37: Non-electrical equipment for explosive atmospheres – Non electrical type of protection constructional safety ”c”, control of ignition source ”b”, liquid immersion ”k”

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International Standard ISO 80079-37 has been prepared by ISO/IEC technical committee 31M: Non-electrical equipment and protective systems for explosive atmospheres

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

FDIS	Report on voting
31/XX/FDIS	31/XX/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.

198 A list of all parts of the IEC 60079 series, under the general title *Explosive atmospheres*, as
199 well as the ISO/IEC 80079 series, can be found on the IEC website.

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

203 • reconfirmed,
204 • withdrawn,
205 • replaced by a revised edition, or
206 • amended.

207

208 The National Committees are requested to note that for this publication the stability date
209 is 2018.

210 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELET-
211 ED AT THE PUBLICATION STAGE.

212

213 .

EXPLOSIVE ATMOSPHERES

Part 37: Non-electrical equipment for explosive atmospheres – Non electrical type of protection constructional safety ”c”, control of ignition source ”b”, liquid immersion ”k”

1 Scope

This International standard specifies the requirements for the design and construction of non-electrical equipment, intended for use in explosive atmospheres, protected by the types of protection constructional safety ”c”, control of ignition source ”b” and liquid immersion ”k”.

This standard supplements and modifies the requirements in ISO 80079-36. Where a requirement of this standard conflicts with the requirement of ISO 80079-36 the requirement of this standard takes precedence.

Types of protection ”c”, ”k” and ”b” are not applicable for Group I, EPL Ma without additional protective precautions.

The types of ignition protection described in the standard can be used either on their own or in combination with each other to meet the requirements for equipment of Group I, Group II, and Group III depending on the ignition hazard assessment in ISO 80079-36.

2 Normative references

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

IEC 60079-0, *Explosive Atmospheres – Part 0: Equipment – General requirements*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

ISO 281, *Rolling bearings – Dynamic load ratings and rating life*

ISO 1813, *Belt drives – V-ribbed belts, joined V-belts and V-belts including wide section belts and hexagonal belts – Electrical conductivity of antistatic belts: Characteristics and methods of test*

ISO 9563 *Belt drives — Electrical conductivity of antistatic endless synchronous belts — Characteristics and test method*

ISO 4413, *Hydraulic fluid power – General rules and safety requirements for systems and their components*

ISO 4414, *Pneumatic fluid power – General rules and safety requirements for systems and their components*

ISO 80079-36, *Explosive atmospheres – Non-electrical equipment for explosive atmospheres – Part 1: Basic method and requirements*[1]

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[1] To be published.

(EN 13237EN 13501-1, *Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire tests*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 80079-36, IEC 60079-0 and the following apply.

3.1
constructional safety "c"
ignition protection in which constructional measures are applied so as to protect against the possibility of ignition from hot surfaces, sparks and adiabatic compression generated by moving parts

3.2
mechanically generated sparks
sparks produced by mechanical impact or friction burning particles, as well as showers of particles, produced by impact or friction between two solid materials (EN 13237)

3.3
control of ignition source "b"
ignition protection where mechanical or electrical devices are used in conjunction with non-electrical equipment to manually or automatically reduce the likelihood of a potential ignition source from becoming an effective ignition source

Note 1 to entry: This might for example be a level sensor used to indicate loss of oil, a temperature sensor to indicate a hot bearing or a speed sensor to indicate over-speed.

3.3.1
automatic control measure
action taken without manual intervention, to reduce the likelihood of a potential ignition source from becoming an effective ignition source

3.3.2
manual control measure
action taken by a person as a result of a warning, indication, or alarm, to reduce the likelihood of a potential ignition source from becoming an effective ignition source

3.3.3
ignition protection devices/systems
arrangement that converts signals from one or more sensors into an action, or indication, to reduce the likelihood of a potential ignition source from becoming an effective ignition source

3.3.4
safety devices
devices intended for use inside or outside explosive atmospheres but required for or contributing to the safe functioning of equipment and protective systems with respect to the risks of explosion

3.4
liquid immersion "k"
type of protection in which potential ignition sources are made ineffective or separated from the explosive atmosphere by either totally immersing them in a protective liquid, or by partially immersing and continuously coating their active surfaces with a protective liquid in such a way that an explosive atmosphere which may be above the liquid, or outside the equipment enclosure, cannot be ignited

3.4.1
protective liquid
a liquid which prevents the explosive atmosphere from making direct contact with potential ignition sources and thereby ensures the explosive atmosphere cannot be ignited

3.4.2
equipment with a sealed enclosure
totally enclosed equipment that limits the ingress of an external atmosphere during the expansion and contraction of the internally contained protective liquid during use in service

Note 1 to entry: Such equipment includes any pipework associated with it and often contains an overpressure relief device.

3.4.3
equipment with a vented enclosure
enclosed equipment that allows the ingress and egress of an external atmosphere through a breathing device or constricted opening during the expansion and contraction of the internally contained protective fluid during normal operation

Note 1 to entry: Such equipment includes any pipework associated with it.

3.4.4
open equipment
equipment that is immersed, or has its components immersed, in a protective liquid that is open to the external atmosphere

Note 1 to entry: For example, an open top vessel with immersed moving components. Such equipment includes any pipework associated with it.

4 Determination of suitability

Before a decision is made to protect equipment or parts of equipment for use as an assembly, including interconnecting parts, by the measures described in this standard, it shall have been subjected to the ignition hazard assessment in accordance with ISO 80079-36.

5 Requirements for equipment with type of protection constructional safety ”c”

5.1 General requirements

All parts shall be capable of functioning in conformity with the operational parameters established by the manufacturer. They shall be sufficiently firm and durable to withstand the mechanical and thermal stresses to which they are intended to be subjected.

This also applies to interconnecting parts of equipment including joints (e.g. cemented, soldered or welded joints).

5.2 Ingress protection

5.2.1 General

The degree of ingress protection (IP) as specified in IEC 60529 provided by the outer enclosures of equipment depends upon its intended duty and the type of environment it is designed to be used in. An appropriate rating shall be determined as part of the ignition hazard assessment (see Clause 4) and if relevant for ignition protection shall be able to provide the required degree of protection against the entry of foreign objects andwater.

NOTE IP degrees of protection according to IEC 60529 are not intended to provide protection against the ingress of explosive gas atmosphere.

5.2.2 Ingress protection in special cases

The following points specify the minimum degree of protection (IP) for enclosures used in the circumstances described.

a) In the case of equipment intended for use in explosive gas atmospheres, where entry of foreign objects can cause ignition, but entry of dust is harmless, the required degree of protection against the entry of foreign objects shall be determined in the ignition hazard assessment and shall be at least IP20.

b) In the case of equipment intended for use in explosive gas atmospheres, where the entry of dusts or liquids could cause malfunction leading to an ignition source, the enclosure shall be at least IP5X for dust and IPX4 for liquids.

c) In the case of equipment intended for use in explosive dust atmospheres, where ingress of dust can result in an ignition source or fire, the enclosure shall be IP6X.

d) In the case of equipment intended for use in explosive dust atmospheres, where ingress of dust, foreign objects and liquids are not likely to cause an ignition, no enclosure is necessary for the purpose of ignition protection.

NOTE An enclosure can be required for other safety reasons, e.g. IP2X to prevent parts of the body coming into contact with rotating parts.

5.3 Seals for moving parts

5.3.1 Unlubricated gaskets, seals, sleeves, bellows and diaphragms

Unlubricated gaskets, seals, sleeves, bellows and diaphragms shall not become an effective ignition source, e. g. if there is a risk of mechanically generated sparks and hot surfaces which can become an effective ignition source. Light metals shall not be used for these parts in this case (see ISO 80079-36).

Non-metallic materials shall be resistant to distortion and degradation which would reduce the effectiveness of explosion protection within the specified lifetime of operation.

5.3.2 Stuffing box seals (packed glands)

Stuffing box seals (packed glands) shall only be used when instructions are provided by the manufacturer to limit the maximum surface temperature during operation of the gland; alternately an automatic means shall be provided.

5.3.3 Lubricated seals

Seals which normally require the presence of a lubricant which can be replenished to reduce the likelihood of hot surfaces occurring at their interface with equipment parts shall be designed to ensure the sufficient presence of lubricant or shall be protected by one of the following means:

– provision of an effective means to monitor the continued presence of the lubricant; or

– provision of a temperature detection device to warn of increasing temperatures; or

– design of the equipment to be capable of completing the ‘dry run’ type test, as described in Annex B, without exceeding the maximum surface temperature of the equipment and not suffering damage which would reduce the effectiveness of its ignition protection.

Monitoring shall be either continuous or by required appropriate inspection and examination. Where the level of lubricant cannot be easily monitored (e. g. seal containing grease) the relevant information shall be given in the instructions.

The instructions shall include details relating to the correct lubrication, monitoring and maintenance of such seals.

5.4 Equipment lubricants, coolants and fluids

Lubricants andcoolants, which are required for the prevention of incendive hot surfaces or mechanical generated sparks (see Clause 7) shall have an autoignition temperature (see IEC 60079-20-1) at least 50 K above the maximum surface temperature of the equipment where the liquid is being used.

NOTE IEC 60079-20-1 is under revision and is expected to be published as ISO/IEC 80079-20-1.

Any fluid which can be released shall not result in an effective ignition source, e. g. due to high temperature or electrostatic charging.

5.5 Vibration

Effective ignition sources, hot surfaces or mechanically generated sparks or loss of protection, caused by vibration shall be avoided. Vibration can arise from the equipment itself or from the place where it is mounted.

The manufacturer shall prepare any necessary installation, operation and maintenance instructions. In particular, the instructions shall specify the correct operating speed range of the equipment in order to avoid excessive vibration.

5.6 Requirements for moving parts

5.6.1 General

The ignition hazard assessment (see Clause 4) shall identify those moving parts which could lead to the occurrence of unsafe vibration or impact or friction. Such parts shall be constructed in such a way so that they are unlikely to become an effective ignition source during the specified lifetime of operation of the equipment, taking the EPL into consideration in combination with the instructions.

Where the melting point of the material used in the construction of moving parts is below the maximum surface temperature of the equipment, or is not capable of causing incendive hot surfaces or mechanical sparks, additional protective measures are not normally necessary (e.g. the provision of a low melting point sacrificial wear plate; the use of a plastic fan inside a metal housing, or a metallic fan with sacrificial non-sparking low melting point fan blade-tips).

5.6.2 Clearance

Clearances between unlubricated moving parts and fixed parts shall be designed such that likelihood of frictional contact, able to produce an effective ignition source in the form of hot surfaces or mechanically generated sparks, is appropriate to the intended EPL.

5.6.3 Lubrication

For moving parts needing lubrication to avoid excessive temperatures or mechanically generated sparks, effective lubrication shall be ensured, e.g. by:

- an oil splash lubricator, or
- a constant oil feed by means of a reservoir, pump and perhaps an oil cooler, or
- an automatic greasing system, or
- an adequate maintenance procedure to provide for routine greasing or oil level verification by manual or visual means.

If the above measures do not achieve the required EPL of the equipment additional measures to monitor adequate lubrication shall be applied, e.g. level, flow, pressure or temperature sensor which operates an alarm or switch function before a critical lubricant condition is reached, see Clause 6.

Where equipment is designed to process liquids and the presence of the process liquid is essential for the purpose of lubrication, cooling, quenching, or ignition protection, or when the safe operation of the equipment (e.g. of a pump) requires special priming considerations, this shall be stated in the instructions.

5.7 Requirements for bearings

5.7.1 General

Bearings are basically divided into three types, sliding plane motion, sliding rotary motion and rolling element. When assessing bearings, as part of the ignition hazard assessment required by ISO 80079-36, at least the following list shall be taken into account:

a) bearing's suitability for the equipment's intended duty e.g. speed, temperature, loading and variations of speed and loading;

b) the bearing's basic rated life as described in ISO 281 for rolling element bearings (see also Note 1);

c) the proper fit of the bearings in their housing and on the shaft (tolerances, roundness and surface quality), taking into consideration the vertical and axial loads on the bearing with respect to shaft and housing;

d) the correct alignment of the bearings;

e) the axial and radial loading of the bearings caused by thermal expansion of the shaft and the housing under the most severe operating conditions;

f) protection of the bearing from ingress of water and solids, if necessary to avoid premature failure;

g) protection of the bearing from electrical currents, including stray circulating currents (which can cause, for example, incendive sparking, or spark erosion leading to premature failure, at the point of contact between the ball and ball race of a ball bearing);

h) the provision of adequate lubrication, according to the lubricating regime necessary for the type of bearing (e.g. for sliding bearings, boundary lubrication, mixed film, or full film hydrodynamic lubrication are the most commonly used regimes);

i) maintenance at the recommended intervals;

j) replacement after unacceptable wear or at the end of its recommended life, whichever comes first;

k) protection of the bearing from vibration, especially at standstill;

l) the use of well documented low reliability of non-metallic bearing cages in industrial applications.

Where a special initial running in period is necessary that could lead to an effective ignition source, information shall be given in the instructions.

NOTE 1 At the present time, no suitable experimental test exists to demonstrate that a given type of bearing has a low risk of becoming an ignition source in service. Ball and roller bearing manufacturers do, however, quote a basic rated life corresponding to a probability of mechanical failure occurring during operation (e.g. failure by deformation of an element, or fatigue flaking or spalling occurring on one of its elements). This basic rating can be used in the ignition hazard assessment in an attempt to determine the risk of bearing malfunction that might lead to the production of an incendive hot surface or sparks. The basic rated life of a ball/roller bearing is based on the amount of radial and axial loading that a ball/roller bearing can theoretically endure for one million revolutions. It is usually expressed as an "L" value in terms of foreseeable lifetime operating revolutions, or foreseeable lifetime hours of service. In an attempt to reduce the risk of malfunction in service to a minimum, it is paramount that the equipment manufacturer pays attention to good design, the ratio of the axial and radial loadings, construction, lubrication, cooling, and maintenance procedures. Regular examination is also recommended during operation, in an attempt to detect impending malfunction. If bearings act as an insulator, constructive measures should be taken, so that the isolation of parts of the equipment is avoided (see ISO 80079-36).