

**SLOVENSKI  
PREDSTANDARD**

**OSIST prEN 61241-11:2004**

april 2004

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Electrical apparatus for use in the presence of combustible dust – Part 11:  
Intrinsically safe apparatus 'ID'

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31H/171/CDV

COMMITTEE DRAFT FOR VOTE (CDV)
PROJET DE COMITÉ POUR VOTE (CDV)

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Titre : CEI 61241-11, Ed.1 : Matériels électriques destinés à être utilisés en présence de poussières combustibles - Partie 11 : Protection par sécurité intrinsèque "iD"

Title : IEC 61241-11, Electrical apparatus for use in the presence of combustible dust - Part 11: Protection by intrinsic safety "iD"

Note d'introduction: Cette 1ère Ed. de la CEI 61241-11 introduit la méthode de protection par sécurité intrinsèque pour les matériels électriques destinés à être utilisés en présence de poussières combustibles.

Introductory note: This first edition of IEC 61241-11 introduces the protection method of "Intrinsically safe" for electrical apparatus for use in the presence of combustible dust.

Table with 2 columns: 'ATTENTION CDV soumis en parallèle au vote (CEI) et à l'enquête (CENELEC)' and 'ATTENTION Parallel IEC CDV/CENELEC Enquiry'.

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL APPARATUS FOR USE IN THE  
PRESENCE OF COMBUSTIBLE DUST -****Part 11: Protection by intrinsic safety 'iD'**

## 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 61241-11 (DRAFT) has been prepared by subcommittee 31H - WG3: Intrinsically-safe apparatus, of IEC technical committee 31: Electrical apparatus for use in the presence of combustible dusts.

This edition is an initial draft for comment. The text is based on the 4<sup>th</sup> edition of IEC 60079-11 1999.

This International Standard is to be read in conjunction with IEC61241-0:200X Electrical apparatus for use in combustible dust - Part 0: General Requirements

Annexes A & C are normative

Annex B is informative

IEC 61241 consists of the following parts under the general title:  
Electrical apparatus for use in the presence of combustible dust:

- Part 0: Electrical Apparatus - General Requirements
- Part 1: Protection by enclosures 'tD';
- Part 2: Protection by pressurization 'pD'
- Part 10: Classification of areas where combustible dusts are or may be present
- Part 11: Protection by intrinsic safety 'iD'
- Part 14: Selection and installation
- Part 17: Inspection and maintenance <sup>1)</sup>
- Part 18: Protection by encapsulation 'mD' <sup>1)</sup>
- Part 20: Test Methods
- Part 20-1: Methods for determining the minimum ignition temperatures of dust
- Part 20-2: Method for determining the electrical resistivity of dust in layers
- Part 20-3: Method for determining minimum ignition energy of dust/air mixtures

1) Under consideration.

### IMPORTANT NOTE:

All references in this document, to the IEC 61241 series, follows the proposed renumbering of the dust standards agreed by SC31H and TC31. It may be necessary to alter these numbers if the standards are not yet published.

#### REFERENCE TABLE

Number of Current Standard	Proposed New Number	Subject	Anticipated Date of Change
IEC 61241-1-1	IEC 61241-0	General Requirements	2003
	IEC 61241-1	Protection by enclosure	2003
IEC 61241-1-2	IEC 61241-14	Selection & installation	2003
IEC 61241-2-1	IEC 61241-20-1	Test Methods	2005
IEC 61241-2-2	IEC 61241-20-2	Test Methods	2005
IEC 61241-2-3	IEC 61241-20-3	Test Methods	2005
IEC 61241-3	IEC 61241-10	Classification	2003
IEC 61241-4	IEC 61241-2	Protection by pressurization	2005
	IEC 61241-11	Protection by intrinsic safety	2002
	IEC 61241-18	Protection by encapsulation	2004
	IEC 61241-17	Inspection & Maintenance	?
	IEC 61241-19	Repair & Overhaul	?

## INTRODUCTION

Many dusts which 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 apparatus in locations where such combustible materials are present, and suitable precautions must therefore be taken to ensure that all such apparatus is adequately protected so as to reduce the likelihood of ignition of the external explosive atmosphere. In electrical apparatus, potential ignition sources include electrical arcs and sparks, hot surfaces, and frictional sparks.

Areas where dusts, flyings and fibres in air occur in dangerous quantities are classified as hazardous and are divided into 3 Zones according to the level of risk.

Generally, electrical safety is ensured by the implementation of one of two considerations, i.e. that electrical apparatus be located where reasonably practicable outside hazardous areas and that electrical apparatus be designed, installed and maintained in accordance with measures recommended for the area in which the apparatus is located.

Combustible dust can be ignited by electrical apparatus in several main ways:

- by surfaces of the apparatus 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 or heating associated with the apparatus.

In order to avoid ignition hazards it is necessary 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 IEC 61241 Part 14
  - 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 to ignite combustible dust;
- any other ignition sources are avoided.

Several techniques are available for the explosion-protection of electrical apparatus in hazardous areas. This Standard describes the safety features of type of explosion-protection technique and specifies the requirements to be adopted. It is most important that the correct selection and installation procedures be followed to ensure the safe use of electrical apparatus in hazardous areas.

Compliance with this standard will only provide the required level of safety if the electrical apparatus is operated within its rating and is installed and maintained according to the relevant codes of practice or requirements, for example in respect of protection against over-currents, internal short-circuits, and other electrical faults. In particular, it is essential that the severity and duration of an internal or external fault be limited to values that can be sustained by the electrical apparatus without damage, for example, installed in a system designed in accordance with the principles of IEC 60079-25 and installed in accordance with IEC 61241-14.



The following principles should be followed:

- The electronic circuits must fulfil Group IIB requirements according to 60079-11 to avoid spark ignition
- IP 6x or encapsulation is normally required to ensure that creepage and clearance distances are not compromised by dusts. Therefore the importance and the durability of the integrity of the enclosure or encapsulation are much higher than required by IEC 60079-11.
- Power limitation for apparatus or parts of apparatus not protected by an enclosure or encapsulation (e. g. uninsulated sensor) to avoid ignition of a dust layer by power dissipation directly into the dust (power matching by conductive dusts) and to avoid thermal ignition at the surface of components.
- Limitation of the temperature of all exposed surfaces of all apparatus or parts of apparatus exceeding the power limitation limits in accordance to 61241-0. The surface can be the surface of the enclosure or of the encapsulation.

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## ELECTRICAL APPARATUS FOR USE IN THE PRESENCE OF COMBUSTIBLE DUST -

### Part 11: Protection by intrinsic safety 'iD'

#### 1 Scope

This part of IEC 61241 specifies the construction and testing of intrinsically safe apparatus intended for use in potentially explosive dust cloud or dust layer environments and for associated apparatus which is intended for connection to intrinsically safe circuits which enter such environments.

This Standard supplements IEC 61241-0:200X - Electrical apparatus for use in the presence of combustible dust - Part 0: General Requirements, the requirements of which apply to intrinsically safe apparatus and to associated apparatus except as indicated in the following list.

Apparatus utilized in systems shall be constructed according to IEC 60079-25

If associated apparatus is protected by a type of protection listed in IEC 61241-0 or IEC 60079-0 then the requirements of that method of protection together with the relevant Parts of IEC61241 or IEC 60079 also apply to the associated apparatus. The list of exclusions which follows is directly applicable to associated apparatus intended for use in situations where there is no potentially hazardous atmosphere and in other circumstances should be used in combination with the requirements of the other methods of protection.

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Clause of IEC 61241-0:200X (DRAFT)		Clause excluded for Intrinsically safe apparatus
4.1	General	No
4.2	Opening enclosures	Yes
4.3	Environmental conditions	No
5.1	Maximum surface temperature	No
5.2	Maximum surface temperature with respect to dust layers above 50mm	No
6.1.1	Material specification	No
6.1.2	Plastic materials	No
6.1.3	Verification of compliance	No
6.1.4	Thermal endurance	No
6.1.5	Electrostatic charges	No
6.2.1	Alloys	No
6.2.2	Threaded holes	Yes
7	Fasteners	Yes
8	Interlocking devices	Yes
9	Bushings	Yes
10	Materials used for cementing	No
12	Connection facilities and terminal compartments	Yes
13	Connection facilities for earthing or bonding conductors	Yes
14	Cable and conduit entries	No

<b>15 to 20</b>	Supplementary requirements for certain electrical apparatus	No
<b>21.4.2.1</b>	Test for resistance to impact for zone 20 or 21 enclosures	No
<b>21.4.2.2</b>	Drop test for zone 20 or 21 apparatus	No
<b>21.4.2.3</b>	Required results <u>(note: IEC 60079-0:1997 pass criteria apply)</u>	Yes
<b>21.4.3</b>	Test for dust exclusion (Degree of protection)	No
<b>21.4.4</b>	Torque test for bushings in enclosures for use in zone 20 or 21	Yes
<b>21.4.5</b>	Thermal tests	No
<b>21.4.6</b>	Thermal shock test	No
<b>21.4.7.1 to 21.4.7.5</b>	Tests of non-metallic enclosures or of non-metallic parts of enclosures for use in zone 20 or 21	Yes
<b>21.4.7.6</b>	Insulation resistance test	No
<b>25 &amp; 26</b>	Clamping tests of cables	Yes

This Standard is applicable to electrical apparatus in which the electrical circuits themselves are incapable of causing an explosion in the surrounding combustible dust environment.

This standard is also applicable to electrical apparatus or parts of electrical apparatus located outside the combustible dust atmosphere or protected by another type of protection listed in IEC 61241-0:200X or IEC 60079-0:1997, where the intrinsic safety of the electrical circuits in the potentially explosive atmosphere may depend upon the design and construction of such electrical apparatus or parts of such electrical apparatus. The electrical circuits exposed to the combustible dust environment are evaluated for use in such an atmosphere by applying this standard.

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