INTERNATIONAL STANDARD

IEC 61241-4

First edition
2001-03

Electrical apparatus for use in presence of combustible dust –

Part 4: Type of protection "pD"

Matériels électriques destinés à être utilisés en présence de poussières combustibles –

Partie 4: Type de protection «p»

Reference number
IEC 61241-4:2001(E)

Publication numbering

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International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE S

For price, see current catalogue

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL APPARATUS FOR USE IN THE PRESENCE OF COMBUSTIBLE DUST –

Part 4: Type of protection "pD"

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. 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 61241-4 has been prepared by subcommittee 31H: Apparatus for use in the presence of combustible dust, of IEC technical committee 31: Electrical apparatus for explosive atmospheres.

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

FDIS	Report on voting
31H/117/FDIS	31H/127/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.

Annexes A and B form an integral part of this standard.

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

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- withdrawn;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

ELECTRICAL APPARATUS FOR COMBUSTIBLE DUST ATMOSPHERES –

Part 4: Type of protection “pD”

1 Scope

This part of IEC 61241, gives requirements on the design, construction, testing and marking of electrical apparatus for use in combustible dust atmospheres in which a protective gas (air or inert gas), maintained at a pressure above that of the external atmosphere, is used to prevent the entry of dust which might otherwise lead to the formation of a combustible mixture within enclosures which do not contain a source of combustible dust.

This standard contains the specific requirements for construction and testing, including protective requirements that apply to electrical apparatus with type of protection pressurization “pD” intended for use in potentially combustible dust atmospheres.

This standard includes the requirements for the construction of the enclosure and its associated components, including, if any, the inlet and outlet ducts for the protective gas, and for the safety provisions and devices necessary to ensure that pressurization is established and maintained for type of protection pressurization “pD”.

Requirements for pressurized enclosures with an internal source of dust release are not included in this standard.

This standard does not cover the requirements for pressurized rooms with or without internal sources of dust release.

This standard does not apply to dusts of explosives which do not require atmospheric oxygen for combustion or to pyrophoric substances.

This standard does not cover combined gas and dust hazard. Those requirements are under consideration.

The requirements contained in this standard are supplementary to those in IEC 61241-1-1.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61241. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61241 are encouraged to investigate the possibility of applying the most recent editions of the normative documents listed below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60034-1:1996, *Rotating electrical machines – Part 1: Rating and performance* [1]

IEC 61241 (all parts), *Electrical apparatus for use in the presence of combustible dust*

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[1] "A consolidated edition 10.2 exists (1999) that includes IEC 60034-1 (1996), its amendment 1 (1997) and its amendment 2 (1999).

IEC 61241-1-1:1999, *Electrical apparatus for use in the presence of combustible dust – Part 1-1: Electrical apparatus protected by enclosures and surface temperature limitation – Specification for apparatus*

IEC 61241-1-2:1999, *Electrical apparatus for use in the presence of combustible dust – Part 1-2: Electrical apparatus protected by enclosures and surface temperature limitation – Selection, installation and maintenance*

IEC 61241-3:1997, *Electrical apparatus for use in the presence of combustible dust – Part 3: Classification of areas where combustible dusts are or may be present*

3 Definitions

For the purpose of this part of IEC 61241, the definitions from IEC 61241-1-1 and the following apply.

3.1
type of protection 'pD'
technique of applying a protective gas to an enclosure in order to prevent the formation of an explosive dust atmosphere inside the enclosure by maintaining an overpressure against the surrounding atmosphere

3.2
overpressure
pressure above ambient pressure within a pressurized enclosure

3.3
pressurization
technique of guarding against the ingress of the external dust atmosphere, which may be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere

3.4
protective gas
air or inert gas used for maintaining an overpressure

NOTE For the purpose of this document inert gas means nitrogen, carbon dioxide, argon or any gas which, when mixed with oxygen in the ratio of 4:1 as found in air, does not make the ignition and combustible properties, such as combustible limits, more onerous.

3.5
enclosure
all the walls which surround the live parts of electrical apparatus including doors, covers, cable entries, rods, spindles and shafts and which ensure the protection of the electrical apparatus

3.6
pressurized enclosure
enclosure in which protective gas is maintained at a pressure greater than that of the external atmosphere

NOTE The pressurized enclosure may or may not also be the enclosure surrounding the live parts and ensuring the protection in other respects of the electrical apparatus.

3.7
static pressurization
maintenance of an overpressure within a pressurized enclosure without the addition of protective gas in a hazardous area

3.8
pressurization with leakage compensation
maintenance of an overpressure within a pressurized enclosure so that, when the outlet apertures – if any – are closed, the supply of protective gas is sufficient to compensate for any leakage from the pressurized enclosure and its ducts

3.9
pressurization with continuous flow of the protective gas
maintenance of an overpressure within a pressurized enclosure with continuous flow of the protective gas through the enclosure

3.10
electrical apparatus
items applied as a whole or in part for the utilization of electrical energy. These include, among others, items for the generation, transmission, distribution, storage, measurement, regulation, conversion, and consumption of electrical energy and items for telecommunications

3.11
ignition-capable apparatus
apparatus which, in normal operation, constitutes a source of ignition for a specified combustible dust atmosphere. This includes electrical apparatus not protected by a type of protection listed in IEC 61241-1-2

3.12
self-revealing fault
fault which would cause a malfunction of the apparatus necessitating correction before proceeding with further operation of the apparatus and which may be indicated, for example, by an audible or visible signal

3.13
opening
aperture, door, window or non-airtight fixed panel

3.14
protective device
device provided to protect a system against conditions which could result in a fire or explosion

3.15
alarm
piece of apparatus that generates a visual or audible signal that is intended to attract attention

3.16
indicator
piece of apparatus that shows flow or pressure and is monitored periodically, consistent with the requirement of the application

3.17
protected apparatus
electrical apparatus internal to the pressurized enclosure

3.18
pressurization system
grouping of components used to pressurize and monitor a pressurized enclosure

3.19
alternate (or auxiliary) source of supply of protective gas
second source of protective gas that may take over in the event of failure of the primary source

3.20
zones
classified areas are divided into zones based upon the frequence and duration of the occurrence of explosive dust/air mixtures. Dust layers should also be taken into consideration

[IEC 61241-3, definition 2.10]

3.21
zone 20
area in which combustible dust, as a cloud, is present continuously or frequently, during normal operation, in sufficient quantity to be capable of producing an explosive concentration of combustible dust mixed with air, and/or where layers of dust of uncontrollable and excessive thickness can be formed.

This can be the case inside dust containment areas where dust can form explosive mixtures frequently or for long periods of time. This occurs typically inside equipment

[IEC 61241-3, definition 2.11]

3.22
zone 21
area not classified as zone 20 in which combustible dust, as a cloud, is likely to occur during normal operation, in sufficient quantities to be capable of producing an explosive concentration of combustible dust mixed with air.

This zone can include, among others, areas in the immediate vicinity of powder filling or emptying points and areas where dust layers occur and are likely, in normal operation, to give rise to an explosive concentration of combustible dust mixed with air

[IEC 61241-3, definition 2.12]

3.23
zone 22
areas not classified as zone 21 in which combustible dust clouds may occur infrequently, and persist for only a short period, or in which accumulations or layers of combustible dust may be present under abnormal conditions and give rise to combustible mixtures of dust in air. Where, following an abnormal condition, the removal of dust accumulations or layers cannot be assured, then the area is to be classified zone 21.

This zone can include, among others, areas in the vicinity of equipment containing dust, where dust can escape from leaks and form deposits (such as milling rooms in which dust can escape from the mills and then settle)

IEC 61241-3, definition 2.13]

4 Pressurization principle

Protection by pressurization is a type of protection that relies upon the interior of the enclosure being subjected to a continuous overpressure from a supply of protective gas while electrical equipment within the enclosure is energized.

In designing a pressurization system, the following basic principles apply.

4.1 Protective gas

There is a suitable supply of protective gas capable of maintaining the pressure above a predetermined level except for static pressurization as given in clause 7.