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English version

Non-electrical equipment for use in potentially explosive atmospheres - Part 3: Protection by flameproof enclosure 'd'

Appareils non électriques destinés à être utilisés en atmosphères explosibles - Partie 3 : protection par enveloppe antidéflagrante 'd'

Nicht-elektrische Geräte für den Einsatz in explosionsgefährdeten Bereichen - Teil 3: Schutz durch druckfeste Kapselung 'd'

This European Standard was approved by CEN on 15 March 2005.

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Foreword

This document (EN 13463-3:2005) has been prepared by Technical Committee CEN/TC 305 “Potentially explosive atmospheres - Explosion prevention and protection”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2005, and conflicting national standards shall be withdrawn at the latest by October 2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 94/4EC of 23 March 1994.

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

This document is to specify the requirements for the type of protection “Protection by flameproof enclosure” for equipment intended for use in potentially explosive atmospheres and should be used in conjunction with EN 13463-1 “Non-electrical equipment for potentially explosive atmospheres – Basic method and requirements”.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Introduction

Some types of non-electrical equipment intended for use in potentially explosive atmospheres of gas, vapour, mist and/or combustible dust, contain effective ignition sources in normal operation and these have to be prevented from becoming an ignition source for the surrounding atmosphere in which they are used. One way of achieving this is to enclose the ignition sources so that an ignition of the atmosphere inside the enclosure is not transmitted to the outside atmosphere. This document describes one such way, known as protection by "Flameproof enclosure 'd'".

The basic principle of ignition protection by the use of a flameproof enclosure, is that gases, or vapour, may enter the enclosure through the cover joints / flanges and if an explosive atmosphere inside the enclosure ignites, neither the enclosure will be deformed significantly, nor flame transmitted through the joints / flanges to the explosive atmosphere outside. For this reason the enclosure has to be both robust and have dimensionally controlled cover joints / flanges with maximum allowable safe gaps appropriate for the types of explosive gas / vapour likely to occur inside the equipment.

Since its conception, protection by flameproof enclosure has been developed to allow many kinds of continuously sparking equipment to be used safely in places where a potentially explosive atmosphere exists. For electrical equipment, this type of protection is well known for protecting power arcing components and is defined and described in EN 60079-1. As the electrical equipment standard contains the generic testing, verification and marking requirements, unnecessary duplication of the requirements in this non-electrical equipment document is avoided by cross reference to the electrical standard. In this document, only those differences necessary for the purpose of providing protection for non-electrical equipment are written in full.

In contrast to this document EN 60079-1 does not consider explosive atmospheres formed by dusts, except for Group I, category M2 electrical equipment, where its associated general requirements document, EN 60079-0, states that flameproof equipment designed, constructed and tested for use in explosive atmospheres of firedamp (explosive mine gas consisting mainly of methane) needs no alteration, or further testing to allow it to be used where a coal dust cloud is present.

The concept of protecting equipment against dust cloud ignition by testing it in a gas / air mixture is also accepted in this document for both Group I, Category M2 mining equipment, and Group II, Category 2G and 2D non-mining equipment. This is because it introduces an acceptable safety factor against ignition and it allows a much more simple method of testing and verifying its explosion protection properties.

Examples of non-electrical types of equipment that can be protected by flameproof enclosure are:

- a) Equipment with potentially hot rubbing surfaces exceeding the ignition temperature of the atmosphere surrounding them, e.g. friction clutches and brake linings
- b) equipment that has to operate at high temperature to function correctly, such as catalytic converters in the exhaust systems of flameproof internal combustion engines, or hot catalytic pellistors used in the sensors of flammable gas measuring instruments,
- c) equipment producing incandive frictional sparks in normal operation.

Little equipment is currently made to flameproof designs for dust applications, because alternative designs using dust tight enclosures are usually cheaper. There are however non-mining applications where both dust and gas are present, where this document may be applicable.

Where dust alone is present, there is usually no mechanism to create inside an enclosure an explosive dust cloud, although deposits of dust may form. The risk from a fire involving dust deposits inside the enclosure is not considered by this document, as it falls outside the concept of protection by flameproof enclosure.

1 Scope

This document specifies the requirements for the design, assessment, construction and testing of equipment intended for use in potentially explosive gas or dust atmospheres, protected by the type of protection: Flameproof enclosure "d".

This document supplements the requirements in EN 13463-1, the contents of which also apply in full to equipment constructed to this document. Equipment complying with the relevant clauses of this document meets the requirements for the following categories:

- Equipment Group I Category M2 – that does not contain an ignition source arising from severe operating conditions, in particular arising from rough handling and changing environmental conditions;
- Equipment Group II Category 2G or 2D – that does not contain an ignition source arising as a result of foreseeable malfunctions.

The type of ignition protection described in the document can be used either on its own or in combination with other types of ignition protection to meet the requirements for equipment of Group I categories M2, or Group II categories 1 and 2 depending on the ignition hazard assessment in EN 13463-1.

NOTE The requirements for Group I Category M1 equipment are given in EN 50303, which specifies the requirements for both electrical and non-electrical equipment.

This document shall not be used for equipment intended for use in sulphur dust and organic peroxides because of the difficulty of testing and specifying the requirements

This document does not apply to the ignition protection of electrical equipment, or reciprocating internal combustion engines. For these requirements reference shall be made to EN 60079-0 and EN 60079-1 for electrical equipment and EN 1834-1, -2 and -3 for reciprocating internal combustion engines.

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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.

EN 1127-1:1997, *Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology*.

EN 1127-2:2002, *Explosive atmospheres — Explosion prevention and protection — Part 2: Basic concepts and methodology for mining*.

EN 13463-1:2001, *Non-electrical equipment for potentially explosive atmospheres — Part 1: Basic method and requirements*.

EN 60079-0:2004, *Electrical apparatus for explosive gas atmospheres — Part 0: General requirements*.

EN 60079-1:2004, *Electrical apparatus for potentially explosive atmospheres — Part 1: Flameproof enclosure 'd'*.

3 Terms and Definitions

For the purposes of this document, the terms and definitions given in EN 1127-1:1997, EN 1127-2:2002, EN 13463-1:2001, EN 60079-0:2004 and EN 60079-1:2004 and the following apply.

3.1

flameproof enclosure

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.

[EN 13237:2003]

4 Determination of suitability and general requirements

4.1 Determination of suitability

Before a decision is made to protect equipment, or pieces of equipment for use as an assembly, including interconnecting parts, by measures described in this document, it shall be subjected to the ignition hazard assessment in accordance with EN 13463-1. Furthermore, this assessment shall determine that protection by flameproof enclosure 'd' is appropriate for the type of potential ignition source in the equipment and capable of achieving the level of protection required by the Group and Category to which the equipment is to be constructed.

The equipment grouping and temperature classification defined in EN 13463-1 apply.

The subdivisions of the gas Group IIA, IIB and IIC described in EN 60079-0 (which refer to equipment atmospheres of different gases or vapours) also apply to the requirements for Group II equipment in this document.

4.2 General requirements

All references to EN 60079-0 in EN 60079-1 shall additionally be taken as a reference to EN 13463-1 and where conflict occurs, EN 13463-1 shall take precedence.

5 Flameproof joints

Flameproof joints shall conform to EN 60079-1:2004, Clause 5 which includes tables of the required maximum gap for different gas groups.

The following modifications shall apply hereby:

- a) In EN 60079-1:2004, Clause 5 reference to the word "electrical" shall be replaced by "non-electrical" and the word "apparatus" shall be replaced by "equipment".
- b) EN 60079-1:2004, 5.1 shall be replaced by the following:

"When tested in accordance with 15.1 (Ability of the enclosure to withstand the pressure of an internal explosion), the enclosure shall not suffer permanent deformation or damage, which reduces the level of ignition protection provided by the enclosure to an unsatisfactory level. That is, by either weakening the mechanical strength / robustness of the enclosure, or by enlarging the width of any flameproof joint."

"When tested in accordance with 15.2 (Ability of the enclosure joints to prevent flame transmission), the enclosure shall not transmit an incensive flame through its flameproof joints."

All flameproof joints, whether permanently closed or designed to be opened from time to time, shall comply, in the absence of pressure, with the requirements of Clause 5.

NOTE The values given in Clause 5 constitute the necessary conditions. Additional measures can be necessary in order to pass the non-transmission test of 15.2.

The surface of joints may be protected against corrosion

Coating with paint is not permitted. Other coating material may be used if the material and application procedure have been shown not to adversely affect the flameproof properties of the joint."

6 Cemented joints

Cemented joints shall conform to EN 60079-1.

7 Operating rods

Operating rods shall conform to EN 60079-1.

8 Supplementary requirements for shafts and bearings

Shafts and bearings shall conform to EN 60079-1:2004, Clause 8.

The following modification shall apply hereby:

The word “electrical” in EN 60079-1:2004, 8.1 and 8.2 and in EN 60079-1:2004, Figures 17, 18, 19 and 20 shall be replaced by “non-electrical”.

9 Light transmitting parts

Light transmitting parts shall conform to EN 60079-1 for inspection windows and for sight glasses forming part of a non-electrical equipment enclosure.

The following modification shall apply hereby:

The reference to EN 60079-0 in EN 60079-1 shall be treated as being a reference to EN 13463-1.

10 Breathing and draining devices which form part of a flameproof enclosure

Breathing and draining devices which form part of a flameproof enclosure shall conform to EN 60079-1.

The following modification shall apply hereby: [SIST EN 13463-3:2005](https://standards.iteh.ai/catalog/standards/sist/1314e221-3f7a-4562-9bf0-24eeb7968cf3/sist-en-13463-3-2005)

The reference to EN 60079-0 in EN 60079-1 shall be treated as being a reference to EN 13463-1.

11 Fasteners, associated holes and closing devices

Fasteners, associated holes and closing devices shall conform to EN 60079-1.

The following modification shall apply hereby:

The words “cable gland or conduit entry” in EN 60079-1:2004, 11.9 shall be treated as including pipe entries and similar openings in non-electrical equipment that need to be closed for the protection to be effective.

12 Materials and mechanical strength of enclosures; materials inside the enclosure

Materials and mechanical strength of enclosures; materials inside the enclosure shall conform to EN 60079-1.

The following modification shall apply hereby:

EN 60079-1:2004, 12.6 (CTI of electrical insulating material), which is not relevant to non-electrical equipment shall be disregarded.

13 Entries for flameproof enclosures

Although it is unlikely that an equivalent to the electrical barrier type cable entry exists for non-electrical equipment, the requirements of EN 60079-1:2004, Clause 13 and the tests described in EN 60079-1:2004, Annex C, shall be applied if similar types of non-electrical enclosure entry devices are used.

Non-electrical plug and socket entries to flameproof enclosures shall comply with EN 60079-1:2004, 13.3.1 and shall bear a label warning: "DO NOT SEPARATE WHEN EQUIPMENT IS OPERATING".

The following modification shall apply hereby:

EN 60079-1:2004, 13.3.2 and 13.3.3 shall be disregarded, because they are not relevant to non-electrical equipment.

Entries for flameproof enclosures shall conform to EN 60079-1:2004, 13.4, for bushings between flameproof equipment enclosure walls.

The following modifications shall apply hereby:

- a) 1) "Conductors" shall be treated as any solid material / strand passing through the enclosure wall by means of a bushing. For example, a fibre optic core passing through an internal wall (via a bushing) to transmit light from one compartment to another;
- b) 2) reference to EN 60079-0 in EN 60079-1:2004, 13.4.2 shall be treated as a reference to EN 13463-1;
- c) 3) "electrical apparatus" in EN 60079-1:2004, 13.4.4 shall be treated as "non-electrical apparatus".

14 Verification and tests

The requirements in EN 60079-1:2004, Clause 14 do not apply to non-electrical equipment because it deals with the determination of maximum surface temperature of certain kinds of electrical equipment and is not therefore applicable.

15 Type tests

NOTE As this document has a wider scope than EN 60079-1, by dealing with equipment intended for use in potentially explosive atmospheres of combustible dust, additional clauses have been added to the existing clauses of EN 60079-1 (which only deal with the testing of equipment intended for use in potentially explosive gas atmospheres. See 15.2 below.

15.1 Type testing of flameproof non-electrical equipment for explosive gas or vapour/air mixtures

Flameproof non-electrical equipment for explosive gas or vapour/air mixtures fulfil the requirements of EN 60079-1:2004, Clause 15 in so far as they relate to the type testing of equipment intended for use in gases and vapours. All reference to EN 60079-0 in EN 60079-1 shall be treated as reference to EN 13463-1.

NOTE Based on the findings of several EU member state laboratories, Dr. G. A. Lunn concluded in his literature survey report of 24 June 1997, HSE Health & Safety Laboratory Report reference SM/97/01 – "The use of flameproof enclosures in coal dust and methane atmospheres", that mining flameproof equipment with joints of less than 1mm width and 3 mm length were unlikely to permit propagation of coal dust deposit combustion from inside the enclosure to outside. Thus, by referring to the maximum gap width and minimum flamepath length for methane, as specified in Table 2 of EN 60079-1:2004, it can be seen that flameproof equipment tested in methane is also adequately safe for use in combustible coal dust atmospheres. This report was subsequently expanded to include work by Dr. P. Tolson on the acceptability of gas tested intrinsically safe equipment in combustible coal dust atmospheres and was published as transaction paper – "Trans. Inst. Min. Metall (Sect A: Min. industry) No. 108 by the UK Institution of Mining Engineers in April 1999, entitled "Electrical ignitions and use of flameproof enclosures in coal-dust and methane atmospheres".

15.2 Type testing of non-electrical electrical equipment for explosive gas or vapour/air mixtures

Enclosures intended for use in a potentially explosive atmosphere of combustible dust (other than those mentioned in Clause 1 of this document), shall:

- a) be tested according to 15.1 above using an explosive gas/air mixture for Group IIA, equipment, and
- b) withstand the pressure and meet the flame transmission prevention requirements for Group IIA equipment.

NOTE Ignition protecting non-electrical equipment intended for use in potentially explosive atmospheres of combustible dust alone by the use of a flameproof enclosure 'd', as described in this document, is not normally practiced. This is because an equivalent level of ignition protection can usually be achieved by a simpler and more economically constructed dust proof enclosure. (e.g. a robust enclosure with simple joints having a solid matter ingress protection rating of IP6X as described in the IP Code EN 60529). This prevents combustible dust entering the enclosures and therefore prevents an explosive dust cloud forming inside it.

16 Routine tests

Routine tests shall conform to EN 60079-1:2004, Clause 16 (performance of a routine pressure test on each enclosure).

17 Switchgear

The requirements of EN 60079-1:2004, Clause 17 deal with electrical switchgear and are not applicable to non-electrical equipment.

18 Lampholders and lampholders

The requirements of EN 60079-1:2004, Clause 18 deal with lampholders and lampholders and are not applicable to non-electrical equipment.

19 Non-metallic enclosures and non-metallic parts of enclosures

Non-metallic enclosures and non-metallic parts of enclosures shall conform to EN 60079-1.

20 Apparatus using capillaries

Apparatus using capillaries shall conform to EN 60079-1:2004, 5.5.

21 Instructions and documentation

21.1 User instructions

Equipment conforming to the requirements of this document shall be accompanied by user instructions as required by EN 13463-1 and additionally:

- a) If necessary, any specific mounting instructions for the equipment;
- b) instructions relating to maintenance of the enclosure and its recommended duty life;
- c) if necessary to prevent corrosion of flameproof joint surfaces, a description of the type(s) of compounds that may be applied to the joint surfaces without affecting the level of ignition protection offered by them (see EN 60079-1:2004, 5.1, as cross-referred to in this document);
- d) a warning about the avoidance of pressure piling, that can occur if unrestricted pipe connections are made between separate flameproof enclosures;
- e) a warning that the equipment is not suitable for use in sulphur dust, or organic peroxide dust, atmospheres.

21.2 Technical documentation

Technical documentation to demonstrate compliance with the document shall contain the user instructions and the following technical documentation:

- a) Object and use purpose;
- b) desired type of protection, temperature class and relevant standards;
- c) type label with explanation;