

# INTERNATIONAL STANDARD

**IEC**  
**60079-1**

Fourth edition  
2001-02

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## **Electrical apparatus for explosive gas atmospheres –**

### **Part 1: Flameproof enclosures "d"**

*Matériel électrique pour atmosphères explosives gazeuses –*

*Partie 1:  
Enveloppe antidéflagrante «d»*



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL APPARATUS FOR EXPLOSIVE GAS ATMOSPHERES –**

**Part 1: Flameproof enclosures "d"**

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 60079-1 has been prepared by subcommittee 31A: Flameproof enclosures, of IEC technical committee 31: Electrical apparatus for explosive atmospheres.

This fourth edition cancels and replaces the third edition published in 1990 and its amendments 1 (1993) and 2 (1998). This fourth edition constitutes a technical revision.

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

FDIS	Report on voting
31A/89/FDIS	31A/91/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.

This standard is to be read in conjunction with IEC 60079-0, the requirements of which apply to electrical apparatus with flameproof enclosures.

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

The committee has decided that the contents of this publication will remain unchanged until 2002-12. At this date, the publication will be

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- withdrawn;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

A bilingual version of this publication may be issued at a later date.

# ELECTRICAL APPARATUS FOR EXPLOSIVE GAS ATMOSPHERES –

## Part 1: Flameproof enclosures "d"

### 1 Scope

This part of IEC 60079 contains the specific requirements for the construction and testing of electrical apparatus with the type of protection flameproof enclosure "d", intended for use in potentially explosive gas atmospheres.

### 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60079. 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 60079 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

IEC 60061 (all parts), *Lamp caps and holders together with gauges for the control of interchangeability and safety*

IEC 60079-0:1998, *Electrical apparatus for explosive gas atmospheres – Part 0: General requirements*

IEC 60079-1A:1975, *Electrical apparatus for explosive gas atmospheres – Part 1: Construction and verification test of flameproof enclosures of electrical apparatus – First supplement: Appendix D: Method of test for ascertainment of maximum experimental safe gap*

IEC 60079-7:1990, *Electrical apparatus for explosive gas atmospheres – Part 7: Increased safety "e"*

IEC 60079-11:1999, *Electrical apparatus for explosive gas atmospheres – Part 11: Intrinsic safety "i"*

IEC 60112:1979, *Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60707:1981, *Methods of test for the determination of the flammability of solid electrical insulating materials when exposed to an igniting source*

ISO 31-0:1992, *Quantities and units – Part 0: General principles*

ISO 185:1988, *Grey cast iron – Classification*

ISO 965-1:1980, *ISO general-purpose metric screw threads – Tolerances – Part 1: Principles and basic data*

ISO 965-3:1980, *ISO general-purpose metric screw threads – Tolerances – Part 3: Deviations for constructional threads*

ISO 1210:1982, *Plastics – Determination of the burning behaviour of horizontal and vertical specimens in contact with a small-flame ignition source*

ISO 2738:1987, *Permeable sintered metal materials – Determination of density, oil content, and open porosity*

ISO 4003:1977, *Permeable sintered metal materials – Determination of bubble test pore size*

ISO 4022:1987, *Permeable sintered metal materials – Determination of fluid permeability*

ISO 6892:1984, *Metallic materials – Tensile testing*

### 3 Definitions

For the purpose of this standard, the following definitions, in addition to those given in IEC 60079-0, apply.

#### 3.1

##### **flameproof enclosure "d"**

an enclosure in which the parts which can ignite an explosive atmosphere are placed and 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

#### 3.2

##### **volume**

total internal volume of the enclosure. However, for enclosures in which the contents are essential in service, the volume to be considered is the remaining free volume

NOTE For luminaires, the volume is determined without lamps fitted.

#### 3.3

##### **flameproof joint**

place where the corresponding surfaces of two parts of an enclosure come together, or the conjunction of enclosures, and which prevents the transmission of an internal explosion to the explosive atmosphere surrounding the enclosure

#### 3.4

##### **width of flameproof joint ( $L$ )**

shortest path through a flameproof joint from the inside to the outside of an enclosure

#### 3.5

##### **distance ( $l$ )**

shortest path through a flameproof joint, when the width of the joint  $L$  is interrupted by holes intended for the passage of fasteners for assembling the parts of the flameproof enclosure

#### 3.6

##### **gap of flameproof joint ( $l$ )**

distance between the corresponding surfaces of a flameproof joint when the electrical apparatus enclosure has been assembled. For cylindrical surfaces, forming cylindrical joints, the gap is the difference between the diameters of the bore and the cylindrical component

**3.7****maximum experimental safe gap (MESG) (for an explosive mixture)**

maximum gap of a joint of 25 mm in width which prevents any transmission of an explosion in 10 tests made under the conditions specified in IEC 60079-1A

**3.8****shaft**

part of circular cross-section used for the transmission of rotary movement

**3.9****operating rod**

part used for the transmission of control movements which may be rotary or linear or a combination of the two

**3.10****pressure-piling**

results of an ignition, in a compartment or subdivision of an enclosure, of a gas mixture pre-compressed, for example, due to a primary ignition in another compartment or subdivision

**3.11****quick-acting door or cover**

door or cover provided with a device which permits opening or closing by a simple operation, such as the movement of a lever or the rotation of a wheel. The device is arranged so that the operation has two stages:

- one for locking or unlocking;
- another for opening or closing

**3.12****door or cover fixed by threaded fasteners**

door or cover, the opening or closing of which, requires the manipulation of one or more threaded fasteners (screws, studs, bolts or nuts)

**3.13****threaded door or cover**

door or cover which is assembled to a flameproof enclosure by a threaded flameproof joint

**3.14****breathing device**

integral or separable part of a flameproof enclosure designed to permit exchange between the atmosphere inside the enclosure and the surrounding atmosphere

**3.15****draining device**

integral or separable part of a flameproof enclosure designed to permit water formed by condensation to escape from the enclosure

## 4 Apparatus grouping and temperature classification

The apparatus grouping and temperature classification defined in IEC 60079-0 for the use of electrical apparatus in potentially explosive atmospheres apply to flameproof enclosures. The subdivisions A, B, C for electrical apparatus of Group II also apply.

## 5 Flameproof joints

### 5.1 General requirements

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

The design of joints shall be appropriate to the mechanical constraints applied to them.

NOTE The values given in clause 5 constitute the necessary conditions. Additional measures may 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 or powder-coat finish 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.

### 5.2 Non-threaded joints

#### 5.2.1 Width of joints ( $L$ )

The width of joints shall not be less than the minimum values given in tables 1 and 2. The width of joints for cylindrical metallic parts press-fitted into the walls of a metallic flameproof enclosure of a volume not greater than 2 000 cm<sup>3</sup> may be reduced to 5 mm, if

- the design does not rely only on an interference fit to prevent the part being displaced during the type tests of clause 15, and
- the assembly meets the impact test requirements of IEC 60079-0, taking the worst-case interference fit tolerances into account, and
- the external diameter of the press-fitted part, where the width of the joint is measured, does not exceed 60 mm.

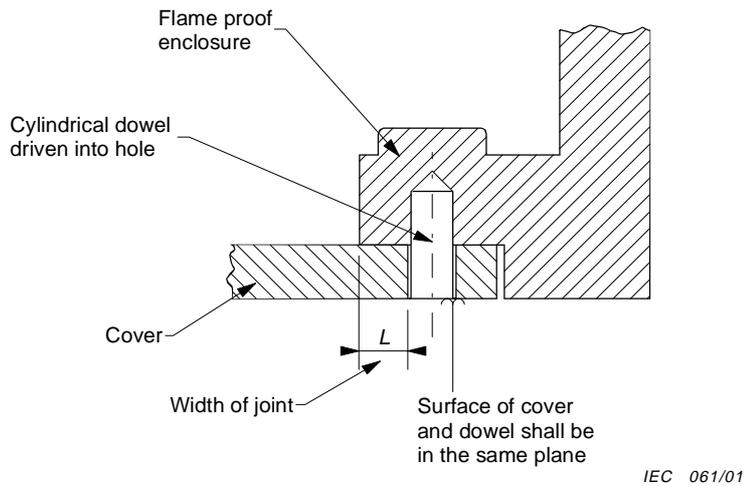
#### 5.2.2 Gap ( $j$ )

The gap, if one exists, between the surfaces of a joint shall nowhere exceed the maximum values given in tables 1 and 2.

The surfaces of joints shall be such that their average roughness  $R_a$  (derived from ISO 468:1982, *Surface roughness – Parameters, their values and general rules for specifying requirements – withdrawn 1998*) does not exceed 6,3  $\mu\text{m}$ .

For flanged joints there shall be no intentional gap between the surfaces, except for quick-acting doors or covers.

For electrical apparatus of Group I, it shall be possible to check, directly or indirectly, the gaps of flanged joints of covers and doors designed to be opened from time to time. Figure 1 shows an example of construction for indirect checking of a flameproof joint.



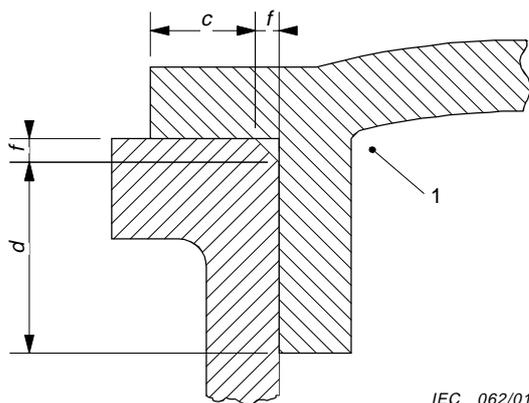
**Figure 1 – Example of construction for indirect checking of a flanged Group I flameproof joint**

### 5.2.3 Spigot joints

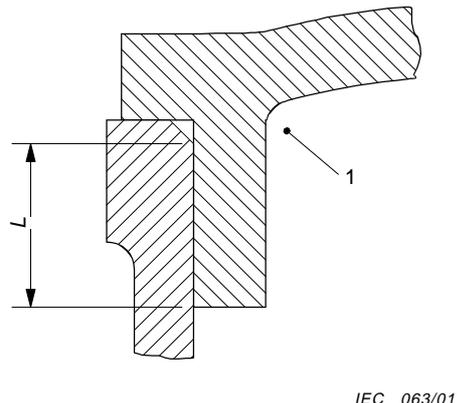
For the determination of the width  $L$  of spigot joints, the following shall be taken into account:

- either the cylindrical part and the plane part (see figure 2).  
(The gap, if one exists, between the surfaces of the joint shall nowhere exceed the maximum values given in tables 1 and 2.)
- or the cylindrical part only (see figure 3);  
(In this case the plane part need not comply with the requirements of tables 1 and 2.)

NOTE For gaskets see also 5.4.



**Figure 2**



**Figure 3**

**Key**

- $L = c + d$  (I, IIA, IIB, IIC)
- $c \geq 6,0$  mm (IIC)
- $\geq 3,0$  mm (I, IIA, IIB)
- $d \geq 0,50 L$  (IIC)
- $f \leq 1,0$  mm (I, IIA, IIB, IIC)
- 1 Interior of enclosure

**Figures 2 and 3 – Spigot joints**