IEC 60079-26

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Withdrawn

Explosive atmospheres –
Part 26: Equipment with Equipment Protection Level (EPL) Ga

Atmosphères explosives –
Partie 26: Matériel d'un niveau de protection du matériel (EPL) Ga

IEC 60079-26:2014-10(en-fr)

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CONTENTS

FOREWORD 3
1 Scope 6
2 Normative references 6
3 Terms and definitions 7
4 Requirements for design and construction 7
4.1 Protection measures against ignition hazards of the electrical circuits 7
4.1.1 General 7
4.1.2 Application of two independent Types of Protection providing EPL Gb 7
4.1.3 Application of a Type of Protection providing EPL Gb and a separation element 8
4.2 Equipment with moving parts 12
4.2.1 Frictional heating 12
4.2.2 Damage arising from failure of moving parts 12
4.2.3 Light metals 12
4.3 Process connection 13
5 Type tests 13
5.1 Standardized types of protection 13
5.2 Separation elements 13
5.3 Temperature evaluation 13
6 Marking 14
6.1 General 14
6.2 Examples of marking 14
7 Instructions 14
7.1 Separation elements: 14
7.2 Process connection: 15
7.3 EPL allocation 15
Bibliography 16

Figure 1 – Example of a partition wall with a conductor bushing considered as gas diffusion tight 9
Figure 2 – Example of a separation element with a cylindrical shaft joint and naturalventilation 12

Table 1 – Separation elements 11

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES –

Part 26: Equipment with Equipment Protection Level (EPL) Ga

FOREWORD

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International Standard IEC 60079-26 has been prepared by IEC technical committee 31: Equipment for explosive atmospheres.

This third edition cancels and replaces the second edition published in 2006 and constitutes a technical revision.

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This edition includes the following significant changes with respect to the previous edition:

		Type		
Changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
Notes deleted	1	X		
Reference to associated apparatus deleted	1	X		
Additional normative references included	3	X		
Requirements against mechanical and electrostatic ignition hazards deleted (now covered in IEC 60079-0)	4.1	X		
Requirement for separation element detailed regarding external influences	4.1.3.2	X		
Intrinsic safety Ex ia as single type of protection including associated apparatus deleted (now covered by EPL)	4.2.2 (ed.2)	X		
Encapsulation Ex ma as single type of protection deleted (now covered by EPL)	4.2.3 (ed.2)	X		
Conditions a) and b) linked with an “and” , therefore requirement of “flameproof joint” deleted in following clause. Both requirements already covered by separation elements and standardised process connections.	4.3	X		
Process connection requires a sufficiently tight joint: IP66 added alternatively to IP67	4.3		X	
Requirement for isolated conductive components deleted (now covered in IEC 60079-0)	4.4 (ed.2)	X		
Requirements for non-conductive enclosures deleted (now covered in IEC 60079-0)	4.5 (ed.2)	X		
Test of partition walls according to 4.1.3.2 b) is specified in more detail	5.2			C1
Marking example for associated apparatus deleted	6.2 b)	X		
Note 3 with an additional example added	6.2	X		
Specification of material of partition wall required in instructions (also required in 4.1.3.2)	7	X		
Alternative risk assessment method deleted (is now generally introduced)	AnnexA (ed.2)	X		

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NOTE The technical changes referred to include the significance of technical changes in the revised IEC Standard, but they do not form an exhaustive list of all modifications from the previous version.

Explanation of the types of changes:

A) Definitions

1) Minor and editorial changes:

- Clarification
- Decrease of technical requirements
- Minor technical change
- Editorial corrections

These are changes which modify requirements in an editorial or a minor technical way. They include changes of the wording to clarify technical requirements without any technical change, or a reduction in level of existing requirement.

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2) Extension: Addition of technical options

These are changes which add new or modify existing technical requirements, in a way that new options are given, but without increasing requirements for equipment that was fully compliant with the previous standard.Therefore, these will not have to be considered for products in conformity with the preceding edition.

3) Major technical changes:

- addition of technical requirements
- increase of technical requirements

These are changes to technical requirements (addition, increase of the level or removal) made in a way that a product in conformity with the preceding edition will not always be able to fulfil the requirements given in the later edition. These changes have to be considered for products in conformity with the preceding edition. For these changes additional information is provided in Clause B below.

NOTE These changes represent current technological knowledge. However, these changes should not normally have an influence on equipment already placed on the market.

B) Information about the background of 'Major technical changes'

C1: Introduction of type tests for separation elements according to "4.1.3.2 b)"

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

FDIS	Report on voting
31/1146/FDIS	31/1155/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.

A list of all parts in the IEC 60079 series, published under the general title *Explosive atmospheres*, can be found on the IEC website.

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

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

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EXPLOSIVE ATMOSPHERES –

Part 26: Equipment with Equipment Protection Level (EPL) Ga

1 Scope

This part of IEC 60079 specifies alternative requirements for construction, test and marking for electrical equipment that provides Equipment Protection Level (EPL) Ga when single standardised Types of Protection (e.g. Ex “ia” , Ex “ma”, Ex “da”) cannot be applied. This standard also applies to equipment mounted across a boundary where different Equipment Protection Levels may be required.

EXAMPLE: Equipment installed in the wall of a storage vessel containing Zone 0 (requiring EPL Ga) inside an area defined as Zone 1 (requiring EPL Gb).

This electrical equipment, within the operational parameters specified by the manufacturer, ensures a very high Level of Protection that includes rare malfunctions related to the equipment or two malfunctions occurring independently of each other.

NOTE A malfunction may result from a failure of the component parts of the electrical equipment or from anticipated externally applied influences. Two independent malfunctions which may occur more frequently and which, separately, would not create an ignition hazard but which, in combination, could create a potential ignition hazard, are regarded as occurring together to form a rare malfunction.

This standard supplements and modifies the general requirements of IEC 60079-0. Where a requirement of this standard conflicts with a requirement of IEC 60079-0, the requirement of this standard takes precedence.

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 60079-1, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d"*

IEC 60079-11, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"*

IEC 60695-11-10, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

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

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3 Terms and definitions

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

NOTE Additional definitions applicable to explosive atmospheres can be found in IEC 60050-426.

3.1
separation element
mechanical element inside the equipment, which separates different parts of the equipment with different EPLs

Note 1 to entry: A separation element consists of a mechanical partition wall, which may be combined with a flameproof joint or a natural ventilation

4 Requirements for design and construction

4.1 Protection measures against ignition hazards of the electrical circuits

4.1.1 General

The equipment shall comply with the requirements of 4.1.2 or 4.1.3 in the event of a failure of one equipment means of protection, by the provision of a second independent means of protection.

NOTE 1 Types of Protection according to EPL Ga do not require a second independant means of protection, e.g. Ex “ia” (IEC 60079-11), Ex “ma” (IEC 60079-18), Ex “da” (IEC 60079-1).

Electrical connections and permanently connected cables of the equipment sited within an area requiring EPL Ga equipment shall comply with the same Level of Protection required by this standard, for example a cable suitable for EPL Gb containing non-Ex “ia” circuits additionally protected by a flameproof conduit or a cable suitable for EPL Gb provided with earth leakage protection.

NOTE 2 Detailed cable and installation requirements for Types of Protection accepted as achieving EPL Ga beyond intrinsically safe circuits are under consideration in IEC 60079-14.

NOTE 3 Because of ignition hazards which can arise from faults and/or transient circulating currents in the potential equalization system, galvanic isolation in the power and signal connections to the equipment according to 4.1.2 and 4.1.3 is commonly applied along with minimizing the effect of transient fault currents in the potential equalization network by the use of electrical protection equipment such as sensitive earth leakage monitors.

4.1.2 Application of two independent Types of Protection providing EPL Gb

Electrical equipment shall comply with the requirements of two independent Types of Protection that provide EPL Gb. If one Type of Protection fails, the other Type of Protection shall continue to function. The independent Types of Protection shall not have a common mode of failure, except as specified in this clause. Combined types of protection providing EPL Gb shall depend on different physical protection principles.

NOTE 1 An example of a common mode of failure is if an Ex “d” enclosure containing arcing components is installed inside an Ex “e” enclosure. Should the Ex “d” enclosure be compromised, it would also compromise the Ex “e” enclosure.

NOTE 2 The combination of Ex “d” and Ex “q” both depend on the avoidance of flame propagation (same physical protection principle) and may not be useful in combination. In practice, some combinations may not be useful, for example the combination of oil immersion “o” and powder filling “q”.

Where combined types of protection are used, it shall be possible for each Type of Protection to be tested individually (see 5.1).

Both Types of Protection shall be assessed using the most arduous fault condition of the other Type of Protection. When combining intrinsic safety, Type of Protection “ib” with other

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Types of Protection, the second Type of Protection shall be assessed, with the most arduous fault condition applied to the intrinsically safe circuit. Thermal dissipation shall be considered in case of a fault of one Type of protection.

When using two Types of Protection, which both rely on the same parameter (for example, the creepage distance combining Ex “ib” with Ex “e”), the most stringent requirement of both Types of Protection shall be applied.

If two Types of Protection are combined which both rely on the enclosure, one of the following shall be met:

a) if two enclosures are used (one totally enclosed within the other), each enclosure shall comply with the requirements of the respective Type of Protection; or

b) if only one enclosure is used, the enclosure and the cable glands shall meet the impact test requirements of IEC 60079-0, using the Group I values.

Examples of relevant combinations of two independent Types of Protection are as follows:

– inductive transmitters (for example proximity switches, electrical position sensors) with intrinsic safety “ib” enclosed by encapsulation “mb”. The connections to intrinsically safe “ib” circuits can be protected by the increased safety “e”;

– a luminaire designed as increased safety “e”may be included in a flameproof enclosure “d”:

– measuring transducers with intrinsic safety “ib” and a flameproof enclosure “d”;

– equipment with electrical circuits of intrinsic safety “ib”, additionally protected by powder filling “q”;

– electromagnetic valves with encapsulation “mb”, enclosed by a flameproof enclosure “d”;

– increased safety “e”, with pressurized equipment “pxb”.

4.1.3 Application of a Type of Protection providing EPL Gb and a separation element

4.1.3.1 General

Equipment which is mounted through or forms part of the boundary wall to an area requiring EPL Ga and contains electrical circuits which do not comply with EPL Ga shall comply with at least one of the Types of Protection providing EPL Gb. Additionally, it shall contain a mechanical separation element as part of the equipment to separate the electrical circuits of the equipment from the area requiring EPL Ga.

If the Type of Protection fails, the separation element shall:

a) prevent flame propagation through the equipment into the area requiring EPL Ga,

b) maintain its safety characteristics,

c) not exceed the maximum surface temperature of the specified temperature class of the equipment (see 5.3).

4.1.3.2 Partition walls

Partition walls shall be constructed of either:

a) corrosion-resistant metals, glass or ceramics,

b) other materials which can be verified to provide the same level of safety. In this case, the certificate number shall include the "X" suffix in accordance with the marking requirements of IEC 60079-0.

If the wall thickness is less than 1 mm, the certificate number shall include the "X" suffix in accordance with the marking requirements of IEC 60079-0 and the Specific Conditions of Use

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listed on the certificate shall indicate that the material shall not be subject to environmental conditions which might adversely affect the partition wall.

If the partition wall is under constant vibrational stress (for example vibrating membranes), the minimum endurance limit at maximum amplitude shall be defined in the documentation (see Clause 7). Due to specified process pressure, loads or temperature, the separation element shall not impair the Type of Protection.

A wall thickness less than 1 mm is only permitted in combination with intrinsic safety "ib", or a flameproof joint or natural ventilation (see 4.1.3.3). For glass or ceramics, a minimum thickness of 1/10 of the diameter/maximum dimension but not less than 1 mm is required.

In addition to the requirements of 4.1.3.1 to 4.1.3.3, metallic partition walls with a thickness ≥ 1 mm may be provided with suitable conductor bushings (see Figure 1).

To avoid a critical concentration of explosive gas atmosphere diffusing from the area requiring EPL Ga into the enclosure containing the electrical circuits, the leakage rate through the bushing shall be low compared to the leakage rate from the enclosure into the free atmosphere. For example this could be done using a standard enclosure with an IP67 rating according to IEC 60529, a bushing with a leakage rate equivalent to a helium-leakage rate less than 10^{-2} Pa×l/s (10^{-4} mbar × l/s) at a pressure difference of 10^5 Pa (1 bar). This can be achieved, for example, by using a glass or ceramic bushing as shown in Figure 1.

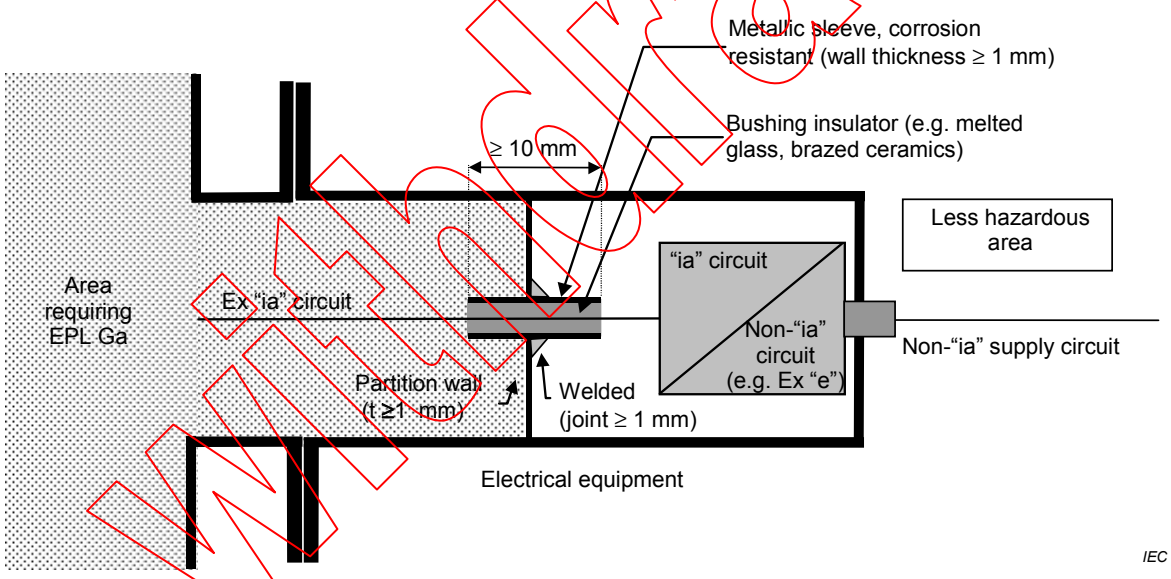

Figure 1 – Example of a partition wall with a conductor bushing considered as gas diffusion tight

4.1.3.3 Requirements depending on the thickness of the partition wall

The combinations of separation elements and additional protective measures depend on the wall thickness, t, of the partition wall as described below and shown in Table 1:

i) For homogeneous partition walls with a thickness ≥3 mm, no additional protection measures are required.

ii) For homogeneous partition walls with a thickness of 3 mm > t ≥ 1 mm, one EPL Gb type of protection is required (see example a) of Table 1). A homogeneous part of the enclosure of an equipment with a EPL Gb type of protection may form the partition wall, even for types of protection which rely on the enclosure, provided the equipment does not contain an ignition capable source, for example exposed contacts (see example a) of Table 1). If

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the equipment contains a source of ignition in normal operation, either a flameproof joint (example b) of Table 1) or a ventilated air gap (example c) of Table 1) is also required.

iii) Behind partition walls of 1 mm $> t \geq$ 0,2 mm, one of the following protective measures is required:

- Type of Protection intrinsic safety “ib” according to IEC 60079-11 (example a) of Table 1); or
- one EPL Gb Type of Protection in combination with a flameproof joint (example b) of Table 1); or
- one EPL Gb Type of Protection in combination with a ventilated air-gap and a flameproof joint (example c) of Table 1).

iv) For a partition wall with $t <$ 0.2 mm (for example membranes), a flameproof joint and one EPL Gb Type of Protection are required (example b) of Table 1). If the equipment contains a source of ignition in normal operation (for example by exposed contacts), a ventilated air gap is also required (type c) of Table 1).

NOTE In the context of this clause, ‘homogeneous’ means a membrane constructed of a single piece of material without any insertions such as feed-throughs, bushings.

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