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TECHNICAL SPECIFICATION

SPECIFICATION TECHNIQUE

AMENDMENT 1
AMENDEMENT 1

Explosive atmospheres –
Part 32-1: Electrostatic hazards, guidance

Atmosphères explosives –
Partie 32-1: Dangers électrostatiques – Recommandations

IEC TS 60079-32-1:2013-08/AMD1:2017-03(en-fr)

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FOREWORD

This amendment has been prepared by IEC technical committee 31: Equipment for explosive atmospheres.

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

DTS	Report on voting
31/1237/DTS	31/1253/RVC

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

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

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

2 Normative references

Replace the following two references:

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-32-2, *Explosive atmospheres – Part 32-2: Electrostatics hazards – Tests*

with the following two new references:

IEC 60079-0:2011, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-32-2:2015, *Explosive atmospheres – Part 32-2: Electrostatics hazards – Tests*

Insert, after Clause 13, a new Clause 14 as follows:

14 Special requirements for equipment according to IEC 60079-0

14.1 General

In this document, threshold limits are given for electrostatic testing of products which differ from the threshold limits in IEC 60079-0:2011. The threshold limits specified in this document are in some cases more conservative, as they apply to a broad range of industrial applications where the physical situation may be quite different to that in which electrical equipment complying with IEC 60079-0 is used. The more conservative limits are based on theoretical modeling supported by empirical data.

In order to have all relevant electrostatic requirements accessible in one place, the requirements from IEC 60079-0:2011 are included for information in this clause of this document, with the addition of helpful explanatory material and cross-references to other text in this document.

The test methods in IEC 60079-32-2:2015 are equivalent to those cited in IEC 60079-0:2011, but in some cases climatic conditions are different. Equipment within the scope of IEC 60079-0 may be tested in the climatic conditions specified in IEC 60079-0.

NOTE The use in apparatus of products and materials conforming to the threshold limits specified in IEC 60079-0:2011 is not known to have resulted in any accidental ignition.

14.2 Electrostatic charges on external non-metallic materials

14.2.1 Applicability

The requirements of this subclause only apply to external non-metallic materials of electrical equipment, including non-metallic parts which are applied to the external surface of an enclosure.

NOTE 1 Non-metallic paints, films, foils, and plates are typically attached to external surfaces of enclosures to provide additional environmental protection. Their ability to store an electrostatic charge is addressed by this subclause.

NOTE 2 It is generally acknowledged that glass is not susceptible to storing an electrostatic charge.

14.2.2 Avoidance of a build-up of electrostatic charge on Group I or Group II electrical equipment

Electrical equipment should be so designed that under normal conditions of use, maintenance and cleaning, danger of ignition due to electrostatic charges are avoided. This requirement should be satisfied by one or more of the following:

a) By suitable selection of the material so that surface resistance shall meet at least one of the criteria given below (see 6.2.1) when measured in accordance with IEC 60079-32-2:
   - ≤ 100 GΩ measured at (30 ± 5) % relative humidity
   - ≤ 1 GΩ measured at (50 ± 5) % relative humidity

   NOTE 1 For more information see 6.1.

b) By limitation of the surface area of non-metallic parts of enclosures, determined according to 6.3.2, to the values of Table 23.

   The values for surface area can be increased by a factor of four if the exposed area of non-metallic material is surrounded by and in contact with conductive earthed frames (see 6.3.3).

   Alternatively, for long parts with non-metallic surfaces, such as tubes, bars, or ropes, the surface area need not be considered, but the diameters or widths should not exceed the values shown in Table 23.

NOTE 2 Electric cables for connection of external circuits are not in the scope of Clause 14. Information on external cables can be found in IEC 60079-14.

NOTE 3 Requirements for pipes and hoses for liquids are not in the scope of Clause 14. Requirements for pipes and hoses for liquids are given in 7.7, and for solids in 9.3.3.

c) By provision of an insulating layer bonded to a conductive surface. This layer should meet at least one of the following criteria:

   1) the layer is not expected to be subject to high charging processes stronger than manual rubbing (see 3.13) and has a thickness ≤ 2 mm for Groups I, IIA, IIB or ≤ 0,2 mm for Group IIC (see Table 23 and 6.3.4.2).

   2) the breakdown voltage measured through the thickness of the insulating material is ≤ 4 kV (see 6.3.4.3) when measured as described in IEC 60079-32-2.

NOTE 4 According to IEC 60243-2, insulating materials stressed by DC have their breakdown voltage tested with DC and the method described in IEC 60243-1 with the additional requirements in IEC 60243-2. This method and the additional requirements are also given in IEC 60079-32-2.

d) By provision of a conductive coating (see 6.3.5). Non-metallic surfaces may be covered with a bonded durable conductive coating. The resistance between the coating and either the bonding point (in the case of fixed equipment) or the farthest point of possible contact with the enclosure (in the case of portable equipment) should not exceed 1 GΩ. The resistance should be measured in accordance with IEC 60079-32-2 but using the 100 mm^2 electrode at the worst case position of the surface and either the bonding point or the farthest point of possible contact.

NOTE 5 The environmental conditions that have an effect on the coating material can include influences from small particles in an air stream, solvent vapours, and the like.

e) By using any other safety measure in this Technical Specification to avoid the danger of ignition due to electrostatic charges.

f) By testing that the maximum transferred charge measured according to IEC 60079-32-2 under worst case conditions is within the threshold limits of Table 23.

g) In specific cases, IEC 60079-0 allows the use of fixed equipment which does not fulfill the requirements a) to f) and may have a risk from electrostatic discharges by marking them with “X”. In this case, the instruction manual should provide guidance for the user to minimize the risk from electrostatic discharges by operational measures. Where practicable, the equipment should also be marked with the electrostatic charge warning given in IEC 60079-0. However, this alternative should not be used if hazardous electrostatic charging is expected during use (e.g. for hand-held equipment or for constantly charging fixed installations).

NOTE 6 X-marking is used e.g. for insulating housings of electrical equipment that are touched by the operator only during cleaning, maintenance and repair.

Table 23 – Alternative restrictions on insulating solid materials and isolated conductive or dissipative parts in hazardous areas for equipment within the scope of IEC 60079-0

	Group I	Group II				Group III		
	EPL Ma, Mb	Sub group	EPL Ga	EPL Gb	EPL Gc	EPL Da	EPL Db	EPL Dc
A) Surface area	≤10 000 mm^2	A	≤5 000 mm^2	≤10 000 mm^2	≤10 000 mm^2	No limits		
		B	≤2 500 mm^2	≤10 000 mm^2	≤10 000 mm^2			
		C	≤ 400 mm^2	≤ 2 000 mm^2	≤ 2 000 mm^2			
B) Width of bars, rods	≤30 mm	A	≤3 mm	≤30 mm	≤30 mm	No limits		
		B	≤3 mm	≤30 mm	≤30 mm			
		C	≤1 mm	≤20 mm	≤20 mm			
C) Thickness of insulating coatings to avoid brush discharges	≤2 mm	A	≤2 mm			No limits		
		B	≤2 mm					
		C	≤0,2 mm					
Thickness of insulating coatings to avoid any incendive discharge	Not permitted	Not permitted	Not permitted			≥ 8 mm if area > 500 mm^2		
D) Transferred charge	≤60 nC	A	≤60 nC			No limits for insulating solids ≤200 nC[a]		
		B	≤25 nC					
		C	≤10 nC					
E) Capacitance of unearthed metal parts	≤10 pF	A	≤3 pF	≤10 pF	≤10 pF	≤10 pF[b]		
		B	≤3 pF	≤10 pF	≤10 pF			
		C	≤3 pF					

[a] Value only valid for spark discharges from unearthed conductive or dissipative parts

[b] For equipment intended for use in ducts or pipes subject to the presence of fast moving dust a lower limiting value of capacitance is under consideration

NOTE 1 The width criterion in B) applies to thin pipes, cable sheaths, and other insulating materials having small widths or diameters.

NOTE 2 The limits in A) and B) are not absolute values that prevent incendive discharges, they merely reduce it to a generally accepted low level.

NOTE 3 The limits in C) apply to insulating coatings and layers on conductive or dissipative materials.

NOTE 4 The limits in D) ensure that incendive discharges do not occur.

NOTE 5 All of the values in D) contain a certain safety margin. Recent work indicates that the value hitherto used for IIB contains a lower safety margin than all other values. To equalize all safety margins the values for IIB have been reduced from 30 nC to 25 nC. This does not mean that the former value was unsafe or retesting is necessary.

NOTE 6 The subgroups are based on the maximum experimental safe gap (MESG) or the minimum ignition current ratio (MIC ratio) of the explosive gas atmosphere in which the equipment may be installed (see IEC 60079-20-1). More details can be found in C.6 and D.3.

NOTE 7 The values in EPL Gc do not exclude the possibility of high charging processes. Manual rubbing is usually not considered to be a high charging process (see 3.13).

NOTE 8 It is generally accepted that an unearthed metal fastener such as a cover screw will present a capacitance of not more than 3 pF.

14.2.3 Avoidance of a build-up of electrostatic charge on equipment for Group III

It is not possible to create electrostatic discharges from insulating surfaces that are incendive for dust clouds or dust layers just by manual rubbing. However, if high charging processes (see 3.13) are not excluded, painted/coated metal equipment and equipment of plastic material should be so designed that under normal conditions of use, ignition caused by propagating brush discharges is avoided.

Enclosures of plastic material cannot be charged to such a critical charge density that propagating brush discharges can be generated. However, no extended flat conductive surfaces should be installed inside the enclosure within a distance of 8 mm to the outer surface.

NOTE 1 An internal printed circuit board can be considered to be an extended flat conductive surface, though this need not be applied in small hand-held equipment unless the equipment is likely to be subjected to a prolific charge generating mechanism (such as might occur in pneumatic transfer of powders or charge spraying in a powder coating process). Charging through normal handling of hand-held equipment is not considered to lead to a prolific charge generating mechanism and therefore would not lead to a situation where a propagating brush discharge might occur.

NOTE 2 A single flat conductive surface not exceeding 500 mm^2 is not considered to be an extended flat surface. This allows for the standoffs or brackets used for the mounting of conductive flat plates inside of an enclosure.

Using external insulation of at least 8 mm in thickness on metal parts such as measurement probes or similar components can prevent propagating brush discharges. When evaluating the minimum thickness of the insulation to be used or specified it is necessary to allow for any expected wear under normal usage.

If plastic with a surface area exceeding 500 mm^2 is employed as a covering on a conductive material, and high charging processes (see 3.13) stronger than manual rubbing are not excluded, the plastic should have one or more of the following characteristics (see 6.3.4.3):

a) material suitably selected so that surface resistance complies with the limits given in 14.2.2;

b) a breakdown voltage ≤4 kV, measured through the thickness of the insulating material according to the method described in IEC 60079-32-2;

c) a thickness ≥8 mm of the external insulation on metal parts.

14.3 Electrostatic charges on external conductive parts

All external conductive parts of the equipment (metal, conductive plastic etc.) should be earthed with a maximum earth resistance of 1 MΩ. For items having a capacitance of less than 100 pF, a maximum earth resistance of 100 MΩ is acceptable (see Table 22).

Accessible metal parts (e.g. aluminum labels on plastic enclosures) with a resistance to earth of more than 100 MΩ could be susceptible to electrostatic charges that could become a source of ignition, and should be tested in accordance with the capacitance test method in IEC 60079-32-2. The maximum allowed values are given in Table 23.

The requirements of 14.3 are not applicable if the capacitance requirements of unearthed metal parts in Table 23, section E), are fulfilled.

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