IEC 60079-11

Edition 6.0 2011-07
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Explosive atmospheres –
Part 11: Equipment protection by intrinsic safety "i"

Atmosphères explosives –
Partie 11: Protection de l'équipement par sécurité intrinsèque «i»

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IEC 60079-11:2011

SC 31G/IEC 60079-11 (2011), sixth edition/I-SH 01

EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

INTERPRETATION SHEET 1

This interpretation sheet has been prepared by subcommittee 31G: Equipment for explosive atmospheres – Equipment protection by intrinsic safety "i", of IEC technical committee 31.

The text of this interpretation sheet is based on the following documents:

ISH	Report on voting
31G/235/ISH	31G/238/RVISH

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

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Following decision No 16 of the TC 31 meeting in Melbourne in 2011, the issuing of an Interpretation Sheet for IEC 60079-11:2011 (6th edition) was requested, in order to clarify the significance of the changes with respect to the 5th edition.

Question

What are the minor editorial, extensions, and major technical changes of the 6th edition with respect to the 5th edition?

Answer

The following table shows the significance of the changes.

The significance of the changes between IEC Standard, IEC 60079-11, Edition 5, 2006-07 and IEC 60079-11, Edition 6, 2011-06 are as listed below

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Significance of changes with respect to IEC 60079-11:2006

		Type		
Significant Changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
General: Changes to remove specific clause references to other IEC 60079 standards	General	x		
Scope: Expansion to include Group III	1		x	
Scope: Table 1 updated to include references to both IEC 60079-0 Edition 5 and Edition 6	1		x	
Normative references: Deletion of IEC 60079-27, and addition of IEC 61158-2 and IEC 62013-1	2	x		
Terms and definitions: Commonly used definitions moved to IEC 60079-0. Energy limitation definitions moved from IEC 60079-0.New definitions added	3	x		
Spark ignition compliance: Group III ignition requirements added	5.5		x	
Temperature for small components for Group I and Group II: Relocated to IEC 60079-0	5.6.2	x		
Intrinsically safe apparatus and component temperature for Group III	5.6.5		x	
Enclosures for Group I or Group II apparatus	6.1.2	x		
Apparatus complying with Annex F	6.1.2.3 c)	x		
Enclosures for Group III apparatus	6.1.3		x	
Requirements for connections and accessories for IS apparatus when located in the non-hazardous area	6.2.5			C1
Separation of conductive parts	6.3.2	x		
Encapsulation	6.6.1	x		
Encapsulation used for the exclusion of explosive atmospheres	6.6.2			C2
Primary and secondary cells and batteries	7.4.1		x	
Battery construction	7.4.2		x	
Level of Protection “ic”	8.1	x		
Filter capacitors	8.6.2		x	
Wiring, printed circuit board tracks, and connections	8.8 c)	x		
FISCO apparatus	9.2		x	
Handlights and caplights	9.3		x	
Circuits with both inductance and capacitance	10.1.5.2	x		
Electrolyte leakage test for cells and batteries	10.5.2	x		
Spark ignition and surface temperature of cells and batteries	10.5.3	x		
Determination of the acceptability of fuses requiring encapsulation	10.6.2		x	
Optical isolators tests	10.11		x	
Marking	12.1	x		
Encapsulation	Annex D			C2
Fieldbus intrinsically safe concept (FISCO) – Apparatus requirements	Annex G		x	
Ignition testing of semiconductor limiting power supply circuits	Annex H		x	

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Explanation of the Types of Significant 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.

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 – Requirements for external connections, other than battery charging connections, that are designed for use only when an explosive gas or dust atmosphere is not present, for example when in a non-hazardous area or when a gas-free permit is in force, have been added.

C2 – The requirements for encapsulation referenced in 6.6.2 and detailed in Annex D have been changed in terms of the thickness to the free surface and are extended related to moulding. Annex D is changed from informative to normative.

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EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

INTERPRETATION SHEET 2

This interpretation sheet has been prepared by subcommittee 31G: Intrinsically-safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

The text of this interpretation sheet is based on the following documents:

ISH	Report on voting
31G/252/ISH	31G/254/RVD

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

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Interpretation of 6.2.5 – Requirements for connections and accessories for IS apparatus when located in the non-hazardous area

Question:

Does the first NOTE of 6.2.5 imply that equipment which may be connected to non-intrinsically safe connection facilities of intrinsically safe apparatus restricted to use in non-hazardous area need to be assessed applying IEC 60079-11, if the value of U_m is less than 250 V a.c.? Does this furthermore apply to equipment to be connected to non-intrinsically safe connection facilities of associated apparatus, if the value of U_m is less than 250 V a.c.?

Background:

The first NOTE of 6.2.5 requires in cases were U_m is specified less than 250 V a.c. that this should not be derived from unassessed equipment. This is sometimes read as if the requirements of IEC 60079-11 should be applied for voltage limitation to guarantee U_m.

Terminological entry 3.13.13 defines that U_m is the maximum voltage that can be applied to the non intrinsically safe connection facilities of associated apparatus without invalidating the

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type of protection. NOTE 1 of 3.13.13, as an example, explains that this may apply to connection facilities used for charging batteries.

In IEC 60079-11 there are no measures required for limiting the voltage of non I.S. circuits to the specified U_m value, except for the use of a single Zener diode protected by a fuse as an integral measure of an associated apparatus limiting the voltage which can appear at a transformer (8.3) or a coupler (8.9.2).

IEC 60079-14: 2013, 16.2.1 states:

Where U_m marked on the associated apparatus is less than 250 V it shall be installed in accordance with one of the following:

a) where U_m does not exceed 50 V a.c. or 120 V d.c., in an SELV or PELV system, or
b) via a safety isolating transformer complying with the requirements of IEC 61558-2-6, or technically equivalent standard, or
c) directly connected to apparatus complying with the IEC 60950 series, IEC 61010-1, or a technically equivalent standard, or
d) fed directly from cells or batteries.

Answer

No

IEC 60079-11 does not require measures to limit U_m where it is specified as 250 V a.c. which is guaranteed by the public power supply using standards other than IEC 60079-11. Similarly, IEC 60079-14 allows measures not compliant with IEC 60079-11 for limiting U_m to below 250 V a.c.

Therefore no assessment of the voltage supply according to IEC 60079-11 is necessary where U_m is specified less than 250 V a.c. provided that one of the measures allowed by IEC 60079-14:2013, 16.2.1 are applied.

NOTE This does not alter the requirement of the 3rd paragraph of 6.2.5 to assess, in accordance with IEC 60079-11, any protective circuitry located in the non-hazardous area accessory.

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EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

INTERPRETATION SHEET 3

This interpretation sheet has been prepared by subcommittee 31G: Intrinsically-safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

The text of this interpretation sheet is based on the following documents:

ISH	Report on voting
31G/253/ISH	31G/255/RVD

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

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Question

Regarding IEC 60079-11:2011 Edition 6.0 (2011-06), some clauses specifically indicate whether or not the requirement is applicable or not applicable to level of protection “ic”. However, many other clauses include no indication one way or the other, resulting in potential inconsistencies when applied. In the interest of improving consistency, what are the requirements in IEC 60079-11:2011 Edition 6.0 (2011-06) that are applicable to level of protection “ic”?

Answer

In answering this question, the following considerations were taken:

1) Requirements in IEC 60079-11 Edition 6.0 (2011-06) indicating that the requirements are applicable to level of protection “ic” are considered “Applicable”;
2) Requirements in IEC 60079-11 Edition 6.0 (2011-06) indicating that the requirements are not applicable to level of protection “ic” are considered “Not applicable”;
3) Regarding requirements in IEC 60079-11 Edition 6.0 (2011-06) other than those referenced in 1) and 2) above:
   - determine if the intent of these requirements for levels of protection "ia" and "ib" is to address fault (abnormal) conditions; and

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- if the intent is to address fault (abnormal) conditions, then the requirements are considered not applicable for level of protection "ic".

Based on the above considerations, the following informative table (similar in concept to Annex B of IEC 60079-0:2011 on Ex Components) provides guidance regarding which requirements in IEC 60079-11 Edition 6.0 (2011-06) are applicable to level of protection “ic”.

Additional background

As additional background details, the following seven key issues of principle were taken into account when developing the above answer:

1) Objective of the original transfer of type of protection “nL” to “ic”: The objective of the original transfer of type of protection “nL” to “ic” (as first included in IEC 60079-11 Fifth Edition) was not to substantially revise the applicable requirements, except where the maintenance team MT 60079-11 made specific reference to level of protection “ic” in a given clause. Examples of this include 7.1, which simplifies the rating requirements for level of protection “ic” protective components from “nL” requirements; and 6.2.1, which increases the separation distances for level of protection “ic” terminals (to align with IEC 60079-14) from “nL” requirements. This objective approach is consistent with how the transfer of other IEC 60079-15 types of protection have been handled, and are still being handled in other IEC 60079 series standards.
2) Common applications of a level of protection “ic” circuit that protects an arcing part: The following are common applications of a level of protection “ic” circuit that protects an arcing part:
   - The circuit does not exit the device.
   - The circuit exits one device and is interconnected via a wiring method to another device, with both devices and the interconnecting wiring method being part of a system.
   - The circuit exits a device via a receptacle, with entity parameters provided for field connection to the receptacle.
   - The circuit exits a device via a terminal block, with entity parameters provided for field connection to the terminal block.

   For all the above applications, the level of protection "ic" circuit does not begin until after the last protective component that establishes the necessary voltage and current limitation. For other circuitry in the device, another type of protection, such as “nA” or “ec”, is applied. It is also possible for an entire apparatus to be only ”Ex ic”.
3) Remarks in the draft I-SH: In the draft I-SH, the intent is for all Remarks to only be for issues specific to level of protection “ic”. The few exceptions to this are for Remarks highlighting requirements that, while applicable to all types of protection “i”, represent a significant change in requirements from type of protection “nL” to “ic”.
4) Transient effects on level of protection “ic” circuits: For level of protection “ic” circuits, the effects of transients are only addressed for diode safety barriers. This is because connection of such barriers is to unspecified equipment. For other level of protection “ic” circuit applications, no additional evaluation is required regarding the effects of transients based on the following considerations:
   - the presence of an explosive atmosphere is only under abnormal conditions; and
   - the circuit complies with the applicable safety requirements of the relevant industrial standards.
5) Separation distances for level of protection “ic” circuits: Separation distances are only applicable to the level of protection “ic” circuit and to the protective components that establish the level of protection “ic” circuit. Where separation distances are required, separations that do not comply with the values of Table 5 or Annex F are to be shorted as part of the evaluation, if the shorting may impair intrinsic safety.

6) Protective components for level of protection “ic” circuits: Voltage and current limiting protective components comply with the applicable requirements for components on which intrinsic safety depends (e.g. 7.1).

7) IEC/TC 31 MT 60079-15 support: The MT 60079-15 convener has been involved in the development of the content of this I-SH, and supports it based on the current IEC 60079-11 Edition 6.0 (2011-06) text.

The following informative table provides guidance regarding which requirements in IEC 60079-11 Edition 6.0 (2011-06) are applicable to level of protection “ic”.

Informative guide for level of protection “ic” evaluations

NOTE 1 In some cases, where a clause is indicated as “Applicable” to level of protection “ic”, it is applicable in its entirety. In other cases, the clause is only applicable in part. Remarks are provided to indicate which parts of a given clause are applicable to level of protection “ic”, along with indicating general explanatory content regarding the application of the clause to level of protection “ic”.

NOTE 2 Where a clause is indicated as being not applicable, in its entirety or in part, consideration is still given regarding the applicability of other IEC 60079-11 and IEC 60079-0 clauses, including the applicable safety requirements of the relevant industrial standards in accordance with IEC 60079-0.

Clause	Requirement	Applicability	Remark
1	Scope	Applicable	
2	Normative references	Applicable	
3	Terms and definitions	Applicable	For “ic” circuits, Ui, Ii, Pi are maximum values possible in normal operation. Uo, Io, Po are determined in normal operation, but with the most onerous rated load for each case attached. Reduction of maximum voltage from Um can be achieved with a transformer that complies with the applicable requirements of this standard. The same equipment designed for “ic”, and also designed for “ia” or “ib”, can have different parameters for connection to “ic” circuits versus connection to “ia” or “ib” circuits. Even though these are all the same “type of protection”, just with varying EPLs, the requirements under “Multiple types of protection” in IEC 60079-0 applies.
4	Grouping and classification of intrinsically safe apparatus and associated apparatus	Applicable	While “nL” was only a Gc type of protection, “ic” is for both Gc and Dc.
5	Levels of protection and ignition compliance requirements of electrical apparatus		
5.1	General	Applicable	Opening, shorting and earthing of an “ic” circuit at output terminals intended for field wiring are considered normal operating conditions.
5.2	Level of protection "ia"	Not applicable	Addresses safety factors and fault conditions for "ia".
5.3	Level of protection "ib"	Not applicable	Addresses safety factors and fault conditions for "ib".
5.4	Level of protection "ic"	Applicable	A safety factor of 1.0 with no fault condition is applicable for "ic".
5.5	Spark ignition compliance	Applicable	
5.6	Thermal ignition compliance		
5.6.1	General	Applicable	Temperature testing is to be under worst case normal operating conditions.
5.6.2	Temperature for small components for Group I and Group II	Applicable	
5.6.3	Wiring within intrinsically safe apparatus for Group I and Group II	Applicable	Requirement is addressed by testing according to 5.6.1, or addressed according to the applicable safety requirements of the relevant industrial standards.

Clause	Requirement	Applicability	Remark
5.6.4	Tracks on printed circuit boards for Group I and Group II	Applicable	Requirement is addressed by testing according to 5.6.1, or addressed according to the applicable safety requirements of the relevant industrial standards.
5.6.5	Intrinsically safe apparatus and component temperature for Group III	Applicable	Temperature classification to be based on the temperature of the surface exposed to dust.
5.7	Simple apparatus	Applicable	
6	Apparatus construction		
6.1	Enclosures	Applicable	
6.2	Facilities for connection of external circuits		
6.2.1	Terminals	Applicable	NOTE As with “ia” and “ib”, due to IEC 60079-14 installation requirements, circuits that exit a piece of equipment via a terminal block, with entity parameters provided for field connection to the terminal block, maintain the following: – at least 50 mm separation distance between terminals for “ic” circuits and terminals for non-intrinsically safe circuits. – at least 6 mm separation distance between terminals for separate intrinsically safe circuits. – at least 3 mm separation distance between terminals for intrinsically safe circuits and earthed parts, if connection to earth has not been considered in the safety analysis. This separation distance requirement is different from previous Ex “nL” requirements.
6.2.2	Plugs and sockets	Applicable	
6.2.3	Determination of maximum external inductance to resistance ratio (L_o/R_o) for resistance limited power source	Applicable	
6.2.4	Permanently connected cable	Applicable	
6.2.5	Requirements for connections and accessories for IS apparatus when located in the non-hazardous area	Applicable	Applicable except regarding protective circuitry for functions such as charging in the non-hazardous area. As there is no application of faults, the ratings of components may be ensured without additional protection.
6.3	Separation distances		
6.3.1	General	Applicable	Applicable to “ic” circuit and protective components only. Where separation distances are less than required, they are to be shorted if the shorting may impair intrinsic safety. NOTE For example, an "ic" circuit is the circuit after the last protective component that establishes the necessary voltage and current limitation.

Clause	Requirement	Applicability	Remark
6.3.2	Separation of conductive parts	Applicable	Applicable to "ic" circuit and protective components only. Any use of an interposing insulating partition or earthed metallic partition is only required to comply with the safety requirements of the relevant industrial standard.
6.3.2.1	Distances according to Table 5	Applicable	Regarding transformers, only applicable between external connections. Remaining construction features of transformers are only required to comply with the applicable safety requirements of the relevant industrial standards.
6.3.2.2	Distances according to Annex F	Applicable	Regarding transformers, only applicable between external connections. NOTE Remaining construction features of transformers are only required to comply with the applicable safety requirements of the relevant industrial standard. Through solid insulation of conductors are required to comply with Table 5.
6.3.3	Voltage between conductive parts	Applicable	For “ic”, the effects of transients are only addressed for diode safety barriers because connection is to unspecified equipment. For other “ic” applications, no additional evaluation is required regarding the effects of transients based on the following considerations: • The presence of an explosive atmosphere is not likely to occur in normal operation. • The circuit complies with the applicable safety requirements of the relevant industrial standards. Where separation of conductive parts is required, separations that do not comply with the values of Table 5 or Annex F may be shorted as part of the evaluation if it may impair intrinsic safety.
6.3.4	Clearance	Not Applicable	Any use of an interposing insulating partition or earthed metallic partition is only required to comply with the safety requirements of the relevant industrial standard. See 6.3.2.
6.3.5	Separation distances through casting compound	Applicable	
6.3.6	Separation distances through solid insulation	Applicable	
6.3.7	Composite separations	Applicable	Applicable, except regarding the 1/3 restriction for composite separations, as this restriction is based on fault considerations.
6.3.8	Creepage distance	Applicable	Applicable, except regarding the 1/3 restriction for composite separations, and the partition restrictions above 1,575 V. Any use of an interposing insulating partition or earthed metallic partition shall comply with the safety requirements of the relevant industrial standard. See 6.3.2.
6.3.9	Distance under coating	Applicable	

Clause	Requirement	Applicability	Remark
6.3.10	Requirements for assembled printed circuit boards	Applicable	Applicable, except for consideration of the body of a component as being an uninsulated live part. For example, a component mounted over or adjacent to tracks as defined in c) is not considered as connected to the track.
6.3.11	Separation by earthed screens	Applicable	Where separation distances to the earthed screen do not comply with the required separation distances to earth, the screen is to be capable of carrying the maximum possible current to which it could be continuously subjected (such as a short to earth).
6.3.12	Internal wiring	Applicable	
6.3.13	Dielectric strength requirement	Applicable	Applicable, except for the additional dielectric strength testing in the 3rd paragraph. Regarding the 2nd paragraph, only applicable to insulation or insulating components. Additional dielectric testing is not required between level of protection "ic" and other circuits, or between separate level of protection "ic" circuits. This aligns with previous level of protection "nL" requirements. NOTE Dielectric test requirements of other applicable standards may still apply (such as the relevant industrial standards).
6.3.14	Relays	Applicable	Applicable only regarding requirement for relay to be used within its rating. NOTE Requirements for dielectric and separation distances are still addressed, along with applicable safety requirements of the relevant industrial standards.
6.4	Protection against polarity reversal	Applicable	
6.5	Earth conductors, connections and terminals	Applicable	Earthing requirements in the 1st paragraph are only applicable if earth is necessary for "ic" circuit. Requirements for earthing are suitably addressed by the applicable safety requirements of the relevant industrial standards. Requirements in 2nd paragraph only applicable to level of protection "ia" and level of protection "ib". A single connection is sufficient for level of protection ‘ic’.
6.6	Encapsulation	Applicable	Applicable only if relying on encapsulation to exclude the atmosphere so as to reduce separation distances, or reduce the ignition capability of hot components. No short conditions are applied unless separation distances are less than required values so as to impair intrinsic safety (see Annex D).
7	Components on which intrinsic safety depends		
7.1	Rating of components	Applicable	For voltage and current, this clause simplifies the rating requirements for “ic” protective components from “nL” requirements. NOTE The concept of a component having a defined "failure mode such that protection is maintained" as an alternative to de-rating (as existed for "nL") does not exist for "ic".

Clause	Requirement	Applicability	Remark
7.2	Connectors for internal connections, plug-in cards and components	Applicable	Applicable except for requirement regarding incorrect connection of internal plug-in connections in the 1st paragraph, and the open circuit failure of a connection requirement in the 2nd paragraph. While interchangeability is a concern for external connections due to field error, it is not considered an “ic” concern for internal connections. Production control and proper service expectations can address internal applications. Open circuit failure of a connection requirement is not applicable because faults are not considered for ‘ic’. Both are not considered a normal operations condition (see 6.5).
7.3	Fuses	Applicable	Where an “ic” circuit depends upon a fuse **and** where the fuse is directly connected to the mains **and** where the fuse is also directly connected to a circuit that is considered normally subject to overloading or shorting (such as output field wiring receptacles or terminals), the breaking capacity of such a fuse is based upon the prospective short circuit current of the mains supply. A diode safety barrier would be a common example of such an application involving output field wring terminals. The prospective short-circuit current of a 250 V mains supply is considered to not be greater than 1 500 A.”
7.4	Primary and secondary cells and batteries	Applicable	For both apparatus and associated apparatus, when such involves more than type of protection “ic” (such as ‘ic nA’ apparatus or ‘nA [ic]’ associated apparatus), connection of cells and batteries in parallel for ‘ic’ is only permitted in the ‘ic’ circuit provided that intrinsic safety is not impaired.
7.5	Semiconductors		
7.5.1	Transient effects	Applicable	For “ic”, the effects of transients are only addressed for diode safety barriers because connection is to unspecified equipment. For other “ic” applications, no additional evaluation is required regarding the effects of transients based on the following considerations: • The presence of an explosive atmosphere not likely to occur in normal operation. • The circuit complies with the applicable safety requirements of the relevant industrial standards. NOTE Semiconductors serving as protective components in "ic" circuits are required to comply with the applicable requirements elsewhere in this standard.

Clause	Requirement	Applicability	Remark
7.5.2	Shunt voltage limiters	Applicable	For “ic”, the effects of transients are only addressed for diode safety barriers because connection is to unspecified equipment. For other “ic” applications, no additional evaluation is required regarding the effects of transients based on the following considerations: • The presence of an explosive atmosphere is not likely to occur in normal operation. • The circuit complies with the applicable safety requirements of the relevant industrial standards. For level of protection ‘ic’, a single semiconductor is sufficient.
7.5.3	Series current limiters	Applicable	For level of protection “ic” a single semiconductor is sufficient.
7.6	Failure of components, connections and separations	Applicable	Applicable except for "ia" and "ib" requirements in 2nd paragraph, and infallible connections requirements in 5th and 6th paragraphs.
7.7	Piezo-electric devices	Applicable	Applicable only if the piezo-circuit can be directly shorted (for example due to non-compliant spacings or sparking components) (see 10.7). NOTE The potential for the enclosure to be impacted is a normal operating condition, and therefore is applicable to "ic".
7.8	Electrochemical cells for the detection of gases	Applicable	
8	Infallible components, infallible assemblies of components and infallible connections on which intrinsic safety depends	Not applicable	According to 8.1, Clause 8, in its entirety, does not apply for "ic" circuits.
9	Supplementary requirements for specific apparatus		
9.1	Diode safety barriers	Applicable	For “ic”, the effects of transients are addressed for diode safety barriers because connection is to unspecified equipment. NOTE Earthing requirements are applicable to “ic” due to the earthing requirements of intrinsically safe circuits in IEC 60079-14.
9.2	FISCO apparatus	Applicable	
9.3	Handlights and caplights	Applicable	
10	Type verifications and type tests		
10.1	Spark ignition test	Applicable	A safety factor of 1.0 with no countable or non-countable fault conditions is applicable for "ic".
10.2	Temperature tests	Applicable	Applicable except for non-linear concerns in the last line of the 1st paragraph, which would require mandatory testing of components with non-linear aspects in the actual rated ambient. Such an approach to testing is not applicable for "ic" circuits, and is only to be an option.
10.3	Dielectric strength tests	Applicable	See 6.3.13.

Clause	Requirement	Applicability	Remark
10.4	Determination of parameters of loosely specified components	Applicable	
10.5	Tests for cells and batteries	Applicable	Applicable except short circuit testing is only to be considered at points external to the cell or battery where the required separation distances are not met. Where temperature rise testing of the cells and batteries is required, only one sample need be subjected to the testing.
10.6	Mechanical tests		
10.6.1	Casting compound	Applicable	Force and impact testing is applicable to casting compounds that complete enclosures. As such, this is a normal operating conditions concern, and the testing is therefore applicable to "ic".
10.6.2	Determination of the acceptability of fuses requiring encapsulation	Applicable	While encapsulation of fuses for “ic” is not generally required, the concern regarding encapsulation flowing within the chamber of a fuse, and preventing the element to open, does reflect a normal operating conditions concern, and therefore is applicable to "ic" circuits (also see 7.3). NOTE One example of such a concern is for glass cartridge fuses.
10.6.3	Partitions	Not applicable	Any use of an interposing insulating partition or earthed metallic partition is only required to comply with the safety requirements of the relevant industrial standard.
10.7	Tests for intrinsically safe apparatus containing piezoelectric devices	Applicable	Applicable only if the piezo-circuit can be directly shorted (for example due to non-compliant spacings or sparking components)(see 7.7). NOTE The potential for the enclosure to be impacted is a normal operating condition, and therefore is applicable to "ic".
10.8	Type tests for diode safety barriers and safety shunts	Applicable	For level of protection “ic”, the effects of transients are to be addressed for diode safety barriers because connection is to unspecified equipment. (See 7.5.1)
10.9	Cable pull test	Applicable	
10.10	Transformer tests	Not applicable	This testing is required by 8.2.4, which is explicitly waived for "ic" circuits. NOTE Applicable safety requirements of the relevant industrial standards still apply.
10.11	Optical isolators tests	Not applicable	This testing is required by 8.9.2, which is explicitly waived for "ic" circuits. NOTE Applicable safety requirements of the relevant industrial standards still apply.
10.12	Current carrying capacity of infallible printed circuit board connections	Not applicable	This testing is required by 8.8, which is explicitly waived for "ic" circuits.
11	Routine verifications and tests		
11.1	Routine tests for diode safety barriers		
11.1.1	Completed barriers	Applicable	NOTE Removable links are not generally needed for level of protection “ic” safety barriers.

Clause	Requirement	Applicability	Remark
11.1.2	Diodes for 2-diode "ia" barriers	Not applicable	This testing is applicable only to "ia" circuits.
11.2	Routine tests for infallible transformers	Not applicable	This testing is required by 8.2.5, which is explicitly waived for "ic" circuits.
12	Marking	Applicable	Where it is necessary to include marking from one of the other methods of protection listed in IEC 60079-0, the symbol “ic” shall occur first.
13	Documentation	Applicable	Where “ic” live maintenance procedures are specified by the manufacturer in the instructions provided, the effects of this live maintenance do not invalidate intrinsic safety under both normal operating conditions and under conditions that may reasonably be considered to occur during live maintenance.
Annex A (normative)	Assessment of intrinsically safe circuits	Applicable	
Annex B (normative)	Spark test apparatus for intrinsically safe circuits	Applicable	
Annex C (informative)	Measurement of creepage distances, clearances and separation distances through casting compound and through solid insulation		
Annex D (normative)	Encapsulation	Applicable	Applicable only if relying on encapsulation to exclude the atmosphere so as to reduce separation distances, or reduce the ignition capability of hot components. No fault conditions are applied unless separation distances are less than required values (see 6.6.2).
Annex E (informative)	Transient energy test		
Annex F (normative)	Alternative separation distances for assembled printed circuit boards and separation of components	Applicable	Regarding transformers, only applicable between external connections. NOTE Remaining construction features of transformers are required to only comply with the applicable safety requirements of the relevant industrial standard. Through solid insulation of conductors are required to comply with Table 5.
Annex G (normative)	Fieldbus intrinsically safe concept (FISCO) - Apparatus requirements	Applicable	
Annex H (informative)	Ignition testing of semiconductor limiting power supply circuits		

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IEC 60079-11

Edition 6.0 2011-06

EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

INTERPRETATION SHEET 4

This interpretation sheet has been prepared by subcommittee 31G: Intrinsically-safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

The text of this interpretation sheet is based on the following documents:

DISH	Report on voting
31G/293/DISH	31G/296/RVD

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

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The wording in the intrinsic safety standard, IEC 60079-11 (2011), with respect to the enclosure requirements for intrinsically safe apparatus for Group III where the separation is accomplished by meeting the requirements for clearance or creepage distances of Table 5 or Annex F, according to Subclause 6.1.3a), is ambiguous. This observation may lead to different interpretation by different test laboratories.

This issue was discussed at the Busan, Republic of Korea meeting of the MT in October 2018. The MT agreed at that meeting that this interpretation should also be applied to IEC 60079-11:2011.

Because the title of Subclause 6.1.2.3 is “Apparatus complying with Annex F”, an interpretation has been made that the additional tests required by 6.1.2.3a) only apply when Annex F is used. The potential for compromising infallible creepage and clearance distances exists when Annex F is applied, but also exist when Table 5 is applied.

IEC 60079-11:2011-06/ISH4:2019-04(en-fr)

The wording of IEC 60079-11 is:

6.1.3 Enclosures for Group III apparatus

Where the intrinsic safety of intrinsically safe apparatus can be impaired by ingress of dust or by access to conducting parts, for example if the circuits contain infallible creepage distances, an enclosure is necessary by one of the following:

a) Where separation is accomplished by meeting the requirements for clearance or creepage distances of Table 5 or Annex F, the enclosure shall provide a degree of protection of at least IP5X, according to IEC 60529. For such enclosures the [*requirements of*] 6.1.2.3 a) shall additionally apply.

The text of the referenced clause is:

6.1.2.3 Apparatus complying with Annex F

Apparatus meeting the separation requirements of Tables F.1 or F.2 shall be provided with protection to achieve pollution degree 2. This can be achieved by one of the following:

a) an enclosure meeting the requirements of IP54 or greater according to the intended use and environmental conditions in accordance with IEC 60529. For such enclosures the clauses of IEC 60079-0 identified in Table 1 additionally apply.

Question

For Groups IIIA, IIIB, and IIIC, where Annex F is not applied and the creepage or clearance distances of Table 5, Column 2 or Column 5 are relied upon for intrinsic safety, do all the applicable enclosure requirements of IEC 60079-0 listed in Table 1, including thermal endurance and resistance to impact, apply?

Interpretation

Yes, for Groups IIIA, IIIB, IIIC, the “Tests of enclosures” requirements of IEC 60079-0 apply for intrinsically safe apparatus for which the creepage and clearance distances are assessed against either Table 5 or Annex F.

This does not apply where the separations are protected by means other than an enclosure, such as encapsulation or conformal coating as described in 6.1.3b) of IEC 60079-11.

NOTE These tests are specified in the following subclauses of IEC 60079-0:2011; 6.2, 6.5, 7.1.1, 7.1.2.1, 7.1.2.2, 7.1.2.3, 7.2, 7.3, 12, 16, 26.4.1, 26.4.1.1, 26.4.1.2, 26.4.1.2.1, 26.4.1.2.2, 26.4.2, 26.4.3, 26.4.4, 26.5.2, 26.7, 26.8, 26.9, 26.10, 26.16, as well as Annex C and Annex F.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IEC 60079-11

Edition 6.0 2011-06

EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

INTERPRETATION SHEET 5

This interpretation sheet has been prepared by subcommittee 31G: Intrinsically-safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

The text of this interpretation sheet is based on the following documents:

DISH	Report on voting
31G/306/DISH	31G/308/RVDISH

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

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BACKGROUND

As stated in the scope of Edition 6 of IEC 60079-11 (2011), the standard supplements and modifies the general requirements of IEC 60079-0. Subsequent to the publication of Edition 6 of IEC 60079-11, IEC 60079-0 was revised. The revised version of IEC 60079-0 (Edition 7:2017) now contains the 200 mm dust blanketing temperature test for Group III Da equipment (Subclause 5.3.2.3.1), relocated from IEC 60079-18 and IEC 60079-31.

QUESTIONS

1) Does the alternative approach of IEC 60079-11:2011 for equipment with components dissipating less power than given in Table 4 and with continuous short-circuit current less than 250 mA still apply when assessing according to IEC 60079-0:2017?
2) Is it necessary to conduct the 200 mm dust blanket temperature testing of Group III EPL Da intrinsically safe apparatus when applying IEC 60079-0:2017 in situations where the power limits of IEC 60079-11:2011 Table 4 are exceeded?

IEC 60079-11:2011-06/ISH5:2019-08(en)

ICS 29.260.20

ANSWER

1) Yes. The requirement of IEC 60079-0 is modified by the requirement of IEC 60079-11 and the requirements of IEC 60079-11 take precedence over IEC 60079-0.

2) Yes.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IEC 60079-11

Edition 6.0 2011-06

EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

INTERPRETATION SHEET 6

This interpretation sheet has been prepared by subcommittee 31G: Intrinsically-safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

The text of this interpretation sheet is based on the following documents:

DISH	Report on voting
31G/311/DISH	31G/314/RVDISH

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

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Background

The second and third paragraphs of IEC 60079-11:2011, Subclause 10.5.3 b) state the following:

The maximum surface temperature shall be determined as follows:

For "ia" and "ib" all current-limiting devices external to the cell or battery shall be short-circuited for the test. The test shall be carried out both with internal current-limiting devices in circuit and with the devices short-circuited using 10 cells in each case. The 10 samples having the internal current-limiting devices short-circuited shall be obtained from the cell/battery manufacturer together with any special instructions or precautions necessary for safe use and testing of the samples. If the internal current limiting devices protect against internal shorts then these devices need not be removed. However, such devices shall only be considered for Level of Protection "ib".

The intent of the cited paragraphs is to simulate an internal short inside a cell, by shorting the cell's external terminals for the purpose of thermal assessment.

IEC 60079-11:2011-06/ISH6:2019-12(en-fr)

It was found that two details have been misinterpreted in these paragraphs:

a) The subjects of the paragraphs are cells or batteries, while the intent is clearly to simulate internal shorts inside cells and not inside batteries in which case the shorts could be interpreted as being external to the cell(s) within a battery.

b) It is unclear what constitutes a current limiting device that protects against internal shorts.

A separator with shutdown function may be interpreted as a current limiting device that protects against internal shorts by its function, but since it is a constructional part of the cell that is not removable without invalidating the functionality of the basic cell, it is not a current limiting device for the purposes of implementing the standard. Conversely, a CID (Current interruption device), for example, is a switch that is triggered by increased pressure inside the cell, and the cell's functionality is not invalidated by the absence of the CID.

The reference to internal current limiting devices that protect against internal shorts in edition 6 was included to address unknown future cell technologies which could include such current limiting devices, however at this time no such current limiting devices are known.

Question

For either Level of Protection "ia" or "ib", what are the current limiting devices that are required to be disabled (or equivalent e.g. not fitted, short-circuited or removed) by IEC 60079-11:2011, Subclause 10.5.3 b), and what are the current limiting devices that need not be disabled?

Answer

All discrete protective devices that can be schematically represented as individual devices apart from the cell are to be disabled for the purposes of testing according to IEC 60079-11:2011, Subclause 10.5.3 b), regardless if they are located inside the cell or if they are external to the cell. This includes, but is not limited to resistors, fuses, resettable fuses (NTC, PTC, PPTC), CID (current interruption device), semiconductors, etc.

Features that provide essential cell functions, such as a separator with shutdown function or the ohmic resistance of the electrolyte, are not considered current limiting devices in the sense of this clause and need not be shorted or removed, and such cells can be considered for Level of Protection "ia".

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FOREWORD

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International Standard IEC 60079-11 has been prepared by subcommittee 31G: Intrinsically safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

This sixth edition cancels and replaces the fifth edition of IEC 60079-11 published in 2006, the first edition of IEC 61241-11 published in 2005, and the new Annex G replaces the apparatus requirements of the second edition of IEC 60079-27 published in 2008. This sixth edition constitutes a technical revision of these publications.

NOTE IEC 60079-25 cancels and replaces the remaining subject matter of IEC 60079-27.

The significant changes with respect to the previous edition are listed below:

- Inclusion of non-edition specific references to IEC 60079-0.
- The merging of the apparatus requirements for FISCO from IEC 60079-27.
- The merging of the requirements for combustible dust atmospheres from IEC 61241-11.

- Clarification of the requirements for accessories connected to intrinsically safe apparatus; such as chargers and data loggers.
- Addition of new test requirements for opto-isolators.
- Introduction of Annex H about ignition testing of semiconductor limiting power supply circuits.

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

FDIS	Report on voting
31G/207/FDIS	31G/213/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 standard supplements and modifies the general requirements of IEC 60079-0, except as indicated in Table 1 (see Scope).

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 60079 series, 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.

The contents of the corrigendum of January 2012, the interpretation sheet 1 of October 2014, the interpretation sheet 2 and 3 of July 2016, the interpretation sheet 4 of April, the interpretation sheet 5 of August 2019 and interpretation sheet 6 of December 2019 have been included in this copy.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

1 Scope

This part of IEC 60079 specifies the construction and testing of intrinsically safe apparatus intended for use in an explosive atmosphere and for associated apparatus, which is intended for connection to intrinsically safe circuits which enter such atmospheres.

This type of protection is applicable to electrical equipment in which the electrical circuits themselves are incapable of causing an explosion in the surrounding explosive atmospheres.

This standard is also applicable to electrical equipment or parts of electrical equipment located outside the explosive atmosphere or protected by another Type of Protection listed in IEC 60079-0, where the intrinsic safety of the electrical circuits in the explosive atmosphere may depend upon the design and construction of such electrical equipment or parts of such electrical equipment. The electrical circuits exposed to the explosive atmosphere are evaluated for use in such an atmosphere by applying this standard.

The requirements for intrinsically safe systems are provided in IEC 60079-25.

This standard supplements and modifies the general requirements of IEC 60079-0, except as indicated in Table 1. Where a requirement of this standard conflicts with a requirement of IEC 60079-0, the requirements of this standard shall take precedence.

If requirements in this standard are applicable to both intrinsically safe apparatus and associated apparatus the term “apparatus” is used throughout the standard.

This standard is for electrical equipment only; therefore the term “equipment” used in the standard always means “electrical equipment”.

If associated apparatus is placed in the explosive atmosphere, it shall be protected by an appropriate Type of Protection listed in IEC 60079-0, and then the requirements of that method of protection together with the relevant parts of IEC 60079-0 also apply to the associated apparatus.

Table 1 – Applicability of specific clauses of IEC 60079-0

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (2007) (informative)	Ed. 6.0 (2011) (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
1	1	Scope	Applies	Applies	Applies
2	2	Normative references	Applies	Applies	Applies
3	3	Terms and definitions	Applies	Applies	Applies
4	4	Equipment grouping	Applies	Applies	Applies
4.1	4.1	Group I	Applies	Excluded	Applies
4.2	4.2	Group II	Applies	Excluded	Applies

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (2007) (informative)	Ed. 6.0 (2011) (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
4.3	4.3	Group III	Excluded	Applies	Applies
4.4	4.4	Equipment for a particular explosive atmosphere	Applies	Applies	Applies
5.1	5.1	Environmental influences	Applies	Applies	Applies
5.1.1	5.1.1	Ambient temperature	Applies	Applies	Applies
5.1.2	5.1.2	External source of heating or cooling	Applies	Applies	Applies
5.2	5.2	Service temperature	Applies	Applies	Applies
5.3.1	5.3.1	Determination of maximum surface temperature	Applies	Applies	Excluded
5.3.2.1	5.3.2.1	Group I electrical equipment	Applies	Excluded	Excluded
5.3.2.2	5.3.2.2	Group II electrical equipment	Applies	Excluded	Excluded
5.3.2.3	5.3.2.3	Group III electrical equipment	Excluded	Applies	Excluded
5.3.3	5.3.3	Small component temperature for Group I or Group II electrical equipment	Applies	Excluded	Excluded
6.1	6.1	General	Applies	Applies	Applies
6.2	6.2	Mechanical strength of equipment	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
6.3	6.3	Opening times	Excluded	Excluded	Excluded
6.4	6.4	Circulating currents in enclosures (e.g. of large electrical machines)	Excluded	Excluded	Excluded
6.5	6.5	Gasket retention	Excluded except when 6.1.2.3a)is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
6.6	6.6	Electromagnetic and ultrasonic radiating equipment	Applies	Applies	Excluded
7.1.1	7.1.1	Applicability	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
7.1.2	7.1.2.1	Specification of materials	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
7.1.3	7.1.2.2	Plastic materials	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
7.1.4	7.1.2.3	Elastomers	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
7.2	7.2	Thermal endurance	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (2007) (informative)	Ed. 6.0 (2011) (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
7.3	7.3	Resistance to light	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
7.4	7.4	Electrostatic charges on external non-metallic materials	Applies	Applies	Excluded
NR	7.5	Accessible metal parts	Applies	Applies	Excluded
7.5	NR	Threaded holes	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
8.1	8.1	Material composition	Applies	Applies	Excluded
8.1.1	8.2	Group I	Applies	Excluded	Excluded
8.1.2	8.3	Group II	Applies	Excluded	Excluded
8.1.3	8.4	Group III	Excluded	Applies	Excluded
8.2	NR	Threaded holes	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
9	9	Fasteners	Excluded	Excluded	Excluded
10	10	Interlocking devices	Excluded	Excluded	Excluded
11	11	Bushings	Excluded	Excluded	Excluded
12	12	Materials used for cementing	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
13	13	Ex Components	Applies	Applies	Applies
14	14	Connection facilities and termination compartments	Excluded	Excluded	Excluded
15	15	Connection facilities for earthing or bonding conductors	Excluded	Excluded	Excluded
16	16	Entries into enclosures	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
17	17	Supplementary requirements for rotating machines	Excluded	Excluded	Excluded
18	18	Supplementary requirements for switchgear	Excluded	Excluded	Excluded
19	19	Supplementary requirements for fuses	Excluded	Excluded	Excluded
20	20	Supplementary requirements for plugs, socket outlets and connectors	Excluded	Excluded	Excluded
21	21	Supplementary requirements for luminaires	Excluded	Excluded	Excluded
22	22	Supplementary requirements for caplights and handlights	Modified	Modified	Excluded
23.1	23.1	General	Applies	Applies	Applies

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (2007) (informative)	Ed. 6.0 (2011) (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
23.2	23.2	Batteries	Excluded	Excluded	Excluded
23.3	23.3	Cell types	Applies	Applies	Applies
23.4	23.4	Cells in a battery	Applies	Applies	Applies
23.5	23.5	Ratings of batteries	Applies	Applies	Applies
23.6	23.6	Interchangeability	Applies	Applies	Applies
23.7	23.7	Charging of primary batteries	Applies	Applies	Applies
23.8	23.8	Leakage	Applies	Applies	Applies
23.9	23.9	Connections	Applies	Applies	Applies
23.10	23.10	Orientation	Applies	Applies	Applies
23.11	23.11	Replacement of cells or batteries	Applies	Applies	Applies
23.12	23.12	Replaceable battery pack	Applies	Applies	Applies
24	24	Documentation	Applies	Applies	Applies
25	25	Compliance of prototype or sample with documents	Applies	Applies	Applies
26.1	26.1	General	Applies	Applies	Applies
26.2	26.2	Test configuration	Applies	Applies	Applies
26.3	26.3	Tests in explosive test mixtures	Applies	Applies	Applies
26.4.1	26.4.1	Order of tests	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.4.1.1	26.4.1.1	Metallic enclosures, metallic parts of enclosures and glass parts of enclosures	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.4.1.2	26.4.1.2	Non-metallic enclosures or non-metallic parts of enclosures	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.4.1.2.1	26.4.1.2.1	Group I electrical equipment	Excluded except when 6.1.2.3a) is applied	Excluded	Excluded except when 6.1.2.3a) is applied
26.4.1.2.2	26.4.1.2.2	Group II and Group III electrical equipment	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.4.2	26.4.2	Resistance to impact	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.4.3	26.4.3	Drop test	Applies	Applies	Excluded except when 6.1.2.3a) is applied
26.4.4	26.4.4	Acceptance criteria	Applies	Applies	Excluded except when 6.1.2.3a) is applied
26.4.5	26.4.5	Degree of protection (IP) by enclosures	Applies	Applies	Applies
26.5.1.1	26.5.1.1	General	Applies	Applies	Excluded
26.5.1.2	26.5.1.2	Service temperature	Modified	Modified	Modified

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (2007) (informative)	**Ed. 6.0 (2011) (informative)**	**Clause / Subclause title (normative)**	**Group I and Group II**	**Group III**	
26.5.1.3	26.5.1.3	Maximum surface temperature	Modified	Modified	Modified
26.5.2	26.5.2	Thermal shock test	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.5.3	26.5.3	Small component ignition test (Group I and Group II)	Applies	Excluded	Excluded
26.6	26.6	Torque test for bushings	Excluded	Excluded	Excluded
26.7	26.7	Non-metallic enclosures or non-metallic parts of enclosures	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.8	26.8	Thermal endurance to heat	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.9	26.9	Thermal endurance to cold	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.10	26.10	Resistance to light	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.11	26.11	Resistance to chemical agents for Group I electrical equipment	Excluded except when 6.1.2.3a) is applied	Excluded	Excluded
26.12	26.12	Earth continuity	Excluded	Excluded	Excluded
26.13	26.13	Surface resistance test of parts of enclosures of non-metallic materials	Applies	Applies	Excluded
26.15	26.14	Measurement of capacitance	Applies	Applies	Excluded
NR	26.15	Verification of ratings of ventilating fans	Excluded	Excluded	Excluded
NR	26.16	Alternative qualification of elastomeric sealing O-rings	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
27	27	Routine tests	Applies	Applies	Applies
28	28	Manufacturer's responsibility	Applies	Applies	Applies
29	29	Marking	Applies	Applies	Applies
30	30	Instructions	Applies	Applies	Applies
Annex A (Normative)	Annex A (Normative)	Supplementary requirements for cable glands	Excluded	Excluded	Excluded
Annex B (Normative)	Annex B (Normative)	Requirements for Ex Components	Applies	Applies	Applies
Annex C (Informative)	Annex C (Informative)	Example of rig for resistance to impact test	Applies	Applies	Excluded except when 6.1.2.3a) is applied

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (2007) (informative)	**Ed. 6.0 (2011) (informative)**	**Clause / Subclause title (normative)**	**Group I and Group II**	**Group III**	
Annex D (Informative)	NR	Alternative risk assessment method encompassing "equipment protection levels" for Ex equipment	Applies	Applies	Applies
Annex E (Informative)	Annex D (Informative)	Motors supplied by converters	Excluded	Excluded	Excluded
NR	Annex E (Informative)	Temperature rise testing of electric machines	Excluded	Excluded	Excluded
NR	Annex F (Informative)	Guideline flowchart for tests of non-metallic enclosures or non-metallic parts of enclosures (26.4)	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
Applies – This requirement of IEC 60079-0 is applied without change. Excluded – This requirement of IEC 60079-0 does not apply. Excluded except – This requirement of IEC 60079-0 does not apply except when the conditions stated are met. Modified – This requirement of IEC 60079-0 is modified as detailed in this standard. NR – No requirements.					
NOTE The clause numbers in the above table are shown for information only. The applicable requirements of IEC 60079-0 are identified by the clause title which is normative. This table was written against the specific requirements of IEC 60079-0, ed. 6.0. The clause numbers for the previous edition are shown for information only. This is to enable the General requirements IEC 60079-0, ed. 5.0, to be used where necessary with this part of IEC 60079. Where there were no requirements, indicated by NR, or there is a conflict between requirements, the later edition requirements take precedence.					

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.

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

IEC 60079-7, *Explosive atmospheres – Part 7: Equipment protection by increased safety "e"*

IEC 60079-25, *Explosive atmospheres – Part 25: Intrinsically safe electrical systems*

IEC 60085, *Electrical insulation – Thermal evaluation and designation*

IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60127 (all parts), *Miniature fuses*

IEC 60317-3, *Specifications for particular types of winding wires – Part 3: Polyester enamelled round copper wire, class 155*

IEC 60317-7, *Specifications for particular types of winding wires – Part 7: Polyimide enamelled round copper wire, class 220*

IEC 60317-8, *Specifications for particular types of winding wires – Part 8: Polyesterimide enamelled round copper winding wire, class 180*

IEC 60317-13, *Specifications for particular types of winding wires – Part 13: Polyester or polyesterimide overcoated with polyamide-imide enamelled round copper wire, class 200*

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

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3:2003, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 61158-2, *Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition*

IEC 62013-1, *Caplights for use in mines susceptible to firedamp – Part 1: General requirements – Construction and testing in relation to the risk of explosion*

ANSI/UL 248-1, *Low-Voltage Fuses – Part 1: General Requirements*

SC 31G/IEC 60079-11 (2011), sixième édition/I-SH 01

ATMOSPHÈRES EXPLOSIVES –

Partie 11: Protection de l'équipement par sécurité intrinsèque "i"

FEUILLE D'INTERPRÉTATION 1

Cette feuille d'interprétation a été établie par le sous-comité 31G: Matériels pour atmosphères explosives – Matériels à sécurité intrinsèque «i», du comité d'études 31 de l'IEC.

Le texte de cette feuille d'interprétation est issue des documents suivants:

ISH	Rapport de vote
31G/235/ISH	31G/238/RVISH

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette feuille d'interprétation.

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Suivant la décision No 16 de la réunion de Melbourne du TC 31 en 2011, la publication d'une feuille d'interprétation pour l'IEC 60079-11:2011 (6ème édition) a été demandée afin de clarifier la signification les changements par rapport à la 5ème édition

Question

Quelles sont les changements éditoriaux mineurs, extensions et changements techniques majeurs de la 6éme édition par rapport à la 5éme édition ?

Réponse

Le tableau suivant met en évidence l'importance des modifications.

L'importance des modifications de la CEI 60079-11, Édition 6, 2011-06, par rapport à la CEI 60079-11, Édition 5, 2006-07 est indiquée ci-dessous:

Octobre 2014 ICS 29.260.20

Importance des modifications de la CEI 60079-11:2006

		Type		
Modifications importantes	**Article**	**Modifications mineures et éditoriales**	**Extension**	**Modifications techniques majeures**
Généralités: Modifications consistant à retirer des références d'articles spécifiques au profit d'autres normes de la série CEI 60079	Généralités	x		
Domaine d'application: Extension en vue d'inclure le Groupe III	1		x	
Domaine d'application: Tableau 1 mis à jour en vue d'inclure les références à l'Édition 5 et l'Édition 6 de la CEI 60079-0	1		x	
Références normatives: Suppression de la CEI 60079-27, et ajout de la CEI 61158-2 et de la CEI 62013-1	2	x		
Termes et définitions: Les définitions couramment utilisées sont intégrées dans la CEI 60079-0. Définitions de la limitation de l'énergie provenant de la CEI 60079-0. Ajout de nouvelles définitions	3	x		
Conformité à l'inflammation à l'éclateur: Ajout des exigences relatives à l'inflammation du Groupe III	5.5		x	
Température pour les petits composants pour le Groupe I et le Groupe II: Transférée dans la CEI 60079-0	5.6.2	x		
Température des matériels et des composants de sécurité intrinsèque pour le Groupe III	5.6.5		x	
Enveloppes pour les matériels de Groupe I ou de Groupe II	6.1.2	x		
Matériel conforme à l'Annexe F	6.1.2.3 c)	x		
Enveloppes pour les matériels de Groupe III	6.1.3		x	
Exigences pour les connexions et les accessoires des matériels à sécurité intrinsèque lorsqu'ils sont placés dans la zone non dangereuse	6.2.5			C1
Séparation des parties conductrices	6.3.2	x		
Encapsulage	6.6.1	x		
Encapsulage utilisé pour l'exclusion des atmosphères explosives	6.6.2			C2
Piles et accumulateurs	7.4.1		x	
Construction des batteries	7.4.2		x	
Niveau de Protection "ic"	8.1	x		
Condensateurs de filtrage	8.6.2		x	
Câblage, pistes de circuits imprimés et connexions	8.8 c)	x		
Matériel FISCO	9.2		x	
Lampes à main et lampes-chapeaux	9.3		x	
Circuits comportant à la fois inductance et condensateur	10.1.5.2	x		
Essai de fuite d'électrolyte des piles et accumulateurs	10.5.2	x		
Inflammation par étincelle et température de surface des piles et accumulateurs	10.5.3	x		
Détermination de l'acceptabilité de fusibles exigeant encapsulation	10.6.2		x	
Essais des isolateurs optiques	10.11		x	
Marquage	12.1	x		
Encapsulage	Annexe D			C2

		Type		
Modifications importantes	**Article**	**Modifica-tions mineures et éditoriales**	**Exten-sion**	**Modifications techniques majeures**
Exigences concernant les matériels du Concept de réseau de terrain de sécurité intrinsèque (FISCO)	Annexe G		x	
Essai d'inflammation des circuits d'alimentation de limitation de semiconducteur	Annexe H		x	

Explication des Types de Modifications Significatives:

A) Définitions

1. Modifications mineures et éditoriales:

- Clarification
- Diminution des exigences techniques
- Modification technique mineure
- Corrections éditoriales

Il s'agit de modifications éditoriales ou de modifications techniques mineures apportées aux exigences. Elles comprennent les modifications de formulations pour clarifier les exigences techniques sans aucune modification technique, ou une réduction du niveau des exigences existantes.

2. Extension: Ajout d'options techniques

Il s'agit de modifications qui ajoutent de nouvelles exigences techniques ou modifient les exigences techniques existantes, de telle manière que de nouvelles options sont données, mais sans augmenter les exigences pour les matériels qui étaient totalement conformes à la norme précédente. Par conséquent, celles-ci ne devront pas être prises en compte pour les produits conformes à l'édition précédente.

3. Modifications techniques majeures:

- ajout d'exigences techniques
- augmentation d'exigences techniques

Il s'agit de modifications apportées aux exigences techniques (ajout, augmentation du niveau ou suppression), de telle manière qu'un produit conforme à l'édition précédente ne pourra pas toujours satisfaire aux exigences données dans la dernière édition. Ces modifications doivent être prises en compte pour les produits conformes à l'édition précédente. Concernant ces modifications, des informations supplémentaires sont données dans l'article B) ci-dessous.

NOTE Ces modifications représentent les connaissances technologiques actuelles. Il convient néanmoins que ces modifications n'aient en principe pas d'influence sur les matériels déjà commercialisés.

B) Informations de base concernant les 'modifications techniques majeures'

C1 – Il a été ajouté des exigences relatives aux connexions externes, autres que connexions pour charge d'accumulateur, uniquement conçues pour être utilisées en cas d'absence d'atmosphère explosive gazeuse ou d'atmosphère de poussières, par exemple dans une zone non dangereuse ou lorsqu'un permis pour dégazage est en vigueur.

C2 – Les exigences relatives à l'encapsulage figurant dans le 6.6.2 et détaillées dans l'Annexe D ont été modifiées pour ce qui concerne l'épaisseur jusqu'à la surface libre et elles ont été étendues pour ce qui a trait au moulage. L'Annexe D antérieurement informative est devenue normative.

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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IEC 60079-11
Edition 6.0 2011-06

ATMOSPHÈRES EXPLOSIVES –

Partie 11: Protection de l'équipement par sécurité intrinsèque "i"

FEUILLE D'INTERPRÉTATION 2

Cette feuille d'interprétation a été établie par le sous-comité 31G: Matériels à sécurité intrinsèque, du comité d'études 31 de l'IEC: Equipements pour atmosphères explosives.

Le texte de cette feuille d'interprétation est issu des documents suivants:

ISH	Rapport de vote
31G/252/ISH	31G/254/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette feuille d'interprétation.

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Interprétation de 6.2.5 – Exigences pour les connexions et les accessoires des matériels à sécurité intrinsèque lorsqu'ils sont placés dans la zone non dangereuse

Question:

La première NOTE de 6.2.5 signifie-t-elle que les équipements qui peuvent être connectés aux dispositifs de raccordement de sécurité non intrinsèque des matériels à sécurité intrinsèque (dont l'utilisation est restreinte dans une zone non dangereuse) nécessitent d'être évalués conformément à l'IEC 60079-11, si la valeur de U_m est inférieure à 250 V en courant alternatif? De plus, cette disposition s'applique-t-elle aux équipements à connecter aux dispositifs de raccordement de sécurité non intrinsèque des matériels associés, si la valeur de U_m est inférieure à 250 V en courant alternatif?

Contexte:

La première NOTE de 6.2.5 exige que si la valeur U_m est inférieure à 250 V en courant alternatif, il convient de ne pas la dériver d'un matériel non évalué. Cette disposition est parfois considérée comme une situation dans laquelle il convient d'appliquer les exigences de l'IEC 60079-11 afin de limiter la tension pour garantir la valeur U_m.

Selon la définition de 3.13.13, la valeur de U_m est la tension maximale qui peut être appliquée aux dispositifs de raccordement du matériel associé qui ne sont pas de sécurité intrinsèque, sans invalider le mode de protection.

La NOTE 1 de 3.13.13 explique, à titre d'exemple, que cette valeur peut s'appliquer aux dispositifs de raccordement utilisés pour la charge des accumulateurs.

L'IEC 60079-11 n'exige aucune mesure de limitation de la tension des circuits de sécurité non intrinsèque à la valeur U_m spécifiée, sauf pour l'utilisation d'une diode Zener unique protégée par un coupe-circuit à fusible. Ceci constitue la mesure intégrale d'un matériel associé qui limite la tension qui peut apparaître au niveau d'un transformateur (8.3) ou d'un coupleur (8.9.2).

Selon 16.2.1 de l'IEC 60079-14:2013:

Lorsque U_m indiqué sur le matériel associé est inférieur à 250 V, le matériel doit être installé conformément à l'un des points suivants:

a) lorsque U_m ne dépasse pas 50 V c.a. ou 120 V c.c., dans un schéma TBTS ou TBTP ou,

b) via un transformateur d'isolement de sécurité satisfaisant aux exigences de l'IEC 61558-2-6 ou à une norme techniquement équivalente, ou

c) directement raccordé au matériel conforme à la série IEC 60950, l'IEC 61010-1, ou une norme techniquement équivalente, ou

d) alimenté directement par des éléments ou des batteries.

Réponse:

Non

L'IEC 60079-11 n'exige aucune mesure de limitation de U_m lorsque cette valeur est définie comme égale à 250 V en courant alternatif garantie par le réseau d'alimentation public en appliquant d'autres normes que l'IEC 60079-11. De même, l'IEC 60079-14 autorise l'application de mesures non conformes à l'IEC 60079-11 destinées à limiter U_m à une valeur inférieure à 250 V en courant alternatif.

Par conséquent, une évaluation de l'alimentation de tension conformément à l'IEC 60079-11 n'est pas nécessaire lorsque U_m est défini comme une valeur inférieure à 250 V en courant alternatif sous réserve d'appliquer l'une des mesures admises en 16.2.1 de l'IEC 60079-14:2013.

NOTE Cette disposition ne modifie pas l'exigence du 3^e alinéa de 6.2.5 selon laquelle les circuits de protection quels qu'ils soient situés dans la partie située en zone non dangereuse sont à évaluer conformément à l'IEC 60079-11.

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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IEC 60079-11
Edition 6.0 2011-06

ATMOSPHÈRES EXPLOSIVES –

Partie 11: Protection de l'équipement par sécurité intrinsèque "i"

FEUILLE D'INTERPRÉTATION 3

Cette feuille d'interprétation a été établie par le sous-comité 31G: Matériels à sécurité intrinsèque, du comité d'études 31 de l'IEC: Equipements pour atmosphères explosives.

Le texte de cette feuille d'interprétation est issu des documents suivants:

ISH	Rapport de vote
31G/253/ISH	31G/255/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette feuille d'interprétation.

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Question

Certains articles de l'IEC 60079-11:2011 Edition 6.0 (2011-06) indiquent précisément si l'exigence est applicable ou non applicable au niveau de protection “ic”. De nombreux autres articles, cependant, ne comportent aucune indication de quelque nature que ce soit, contribuant ainsi à des incohérences possibles lorsque cette exigence s'applique. Quelles sont les exigences de l'IEC 60079-11:2011 Edition 6.0 (2011-06) applicables au niveau de protection "ic" dans la perspective d'une plus grande cohérence?

Réponse

Les éléments suivants ont été pris en compte dans la réponse à cette question:

1) Les exigences définies dans l'IEC 60079-11 Edition 6.0 (2011-06) qui indiquent que les exigences sont applicables au niveau de protection “ic” sont considérées comme “Applicables”;
2) Les exigences définies dans l'IEC 60079-11 Edition 6.0 (2011-06) qui indiquent que les exigences ne sont pas applicables au niveau de protection “ic” sont considérées comme “Non applicables”;
3) Dans le cas des exigences définies dans l'IEC 60079-11 Edition 6.0 (2011-06) autres que celles citées en référence en 1) et 2) ci-dessus:

- déterminer si ces exigences relatives aux niveaux de protection "ia" et "ib" ont pour objectif de s'appliquer aux conditions de défaut (anormales); et
- si tel est le cas, les exigences sont alors considérées comme non applicables au niveau de protection "ic".

Compte tenu des éléments susmentionnés, le tableau informatif suivant (dont le concept est analogue à l'Annexe B de l'IEC 60079-0:2011 pour les composants Ex) fournit un guide permettant de déterminer les exigences définies dans l'IEC 60079-11 Edition 6.0 (2011-06) qui s'appliquent au niveau de protection "ic".

Contexte complémentaire

Les sept questions de principe fondamentales suivantes (en qualité d'informations détaillées relatives au contexte complémentaire) ont contribué à l'élaboration de la réponse ci-dessus:

1) Objectif du transfert d'origine du mode de protection "nL" vers le mode de protection "ic": Le transfert d'origine du mode de protection "nL" vers le mode de protection "ic" (inclus pour la première fois dans la cinquième édition de l'IEC 60079-11) n'avait pas pour objectif la révision approfondie des exigences applicables, sauf dans le cas d'une référence spécifique, par l'équipe de maintenance MT 60079-11, au niveau de protection "ic" dans un article donné. À titre d'exemple, se reporter au 7.1, qui simplifie les exigences concernant les caractéristiques assignées applicables aux composants de protection de niveau de protection "ic" par rapport aux exigences "nL" et au 6.2.1, qui accroît les distances de séparation applicables aux bornes de niveau de protection "ic" (pour alignement sur l'IEC 60079-14) par rapport aux exigences "nL". Cette approche est cohérente avec le mode de traitement du transfert des autres modes de protection qui a été appliqué dans l'IEC 60079-15 et qui est toujours appliqué dans d'autres normes de la série IEC 60079.
2) Applications communes d'un circuit de niveau de protection "ic" protégeant une partie produisant un arc: Exemples d'applications communes d'un circuit de niveau de protection "ic" protégeant une partie produisant un arc:
   - Le circuit ne sort pas du dispositif.
   - Le circuit sort d'un dispositif et son interconnexion à un autre dispositif s'effectue par une méthode de câblage. Les deux dispositifs et la méthode de câblage par interconnexion font partie intégrante d'un système.
   - Le circuit sort d'un dispositif par l'intermédiaire d'une embase, les paramètres du circuit permettant une connexion avec l'embase.
   - Le circuit sort d'un dispositif par l'intermédiaire d'un bornier, les paramètres du circuit permettant une connexion avec le bornier.

   Pour l'ensemble des applications susmentionnées, le circuit de niveau de protection "ic" ne commence qu'après le dernier composant de protection qui détermine la limitation nécessaire de courant et de tension. Un autre mode de protection, tel que "nA" ou "ec", est appliqué pour les autres circuits du dispositif. Il est également possible que le niveau de protection d'un matériel complet soit "Ex ic" uniquement.
3) Commentaires internes au projet I-SH: L'ensemble des commentaires du projet I-SH concerne uniquement les questions spécifiques au niveau de protection "ic". Les quelques exceptions à cette disposition concernent les commentaires soulignant les exigences qui, bien qu'applicables à tous les modes de protection "i", représentent une modification importante des exigences par rapport au mode de protection "nL" à "ic".
4) Effets des transitoires sur les circuits de niveau de protection "ic": Pour les circuits de niveau de protection "ic", les effets des transitoires ne sont pris en compte que pour les barrières de sécurité à diodes. Cette prise en compte exclusive s'explique par la connexion de ce type de barrières à des équipements non spécifiés. Pour les autres applications de circuits de niveau de protection "ic", aucune évaluation supplémentaire des effets des transitoires n'est nécessaire compte tenu des éléments suivants:
   - Une atmosphère n'est explosive que dans des conditions anormales; et

- le circuit est conforme aux exigences de sécurité applicables des normes industrielles pertinentes.

5) Distances de séparation pour les circuits de niveau de protection “ic”: Les distances de séparation ne s'appliquent qu'au circuit de niveau de protection “ic” et aux composants de protection qui définissent le circuit de niveau de protection “ic”. Lorsque des distances de séparation sont exigées, les distances non conformes aux valeurs données dans le Tableau 5 ou à l'Annexe F doivent être mises en court-circuit dans le cadre de l'évaluation si ce court-circuit peut compromettre la sécurité intrinsèque.

6) Composants de protection pour les circuits de niveau de protection “ic”: Les composants de protection à limitation de tension et de courant satisfont aux exigences applicables concernant les composants dont dépend la sécurité intrinsèque (par exemple, 7.1).

7) Soutien de l’équipe de maintenance MT 60079-15 du CE 31 de l'IEC: L’animateur de l’équipe de maintenance MT 60079-15 a participé à l'élaboration du contenu de ce projet I-SH, et le soutient sur la base du texte actuel de l'IEC 60079-11 Edition 6.0 (2011-06).

Le tableau informatif suivant propose un guide concernant les exigences de l'IEC 60079-11:2011 Edition 6.0 (2011-06) applicables au niveau de protection "ic".

Guide informatif applicable aux évaluations du niveau de protection “ic”

NOTE 1 Dans certains cas pour lesquels un article est désigné comme “Applicable” au niveau de protection “ic”, cet article est applicable dans son intégralité. Dans d'autres cas, l'article est applicable uniquement de manière partielle. Les commentaires permettent d'indiquer quelles parties d'un article donné sont applicables au niveau de protection “ic”. Ils décrivent également de manière générale l'application de l'article au niveau de protection “ic”.

NOTE 2 Lorsqu'un article est désigné comme non applicable, dans son intégralité ou partiellement, il est toujours tenu compte de l'applicabilité des autres articles de l'IEC 60079-11 et de l'IEC 60079-0, y compris les exigences de sécurité applicables des normes industrielles pertinentes conformément à l'IEC 60079-0.

Article/Paragraphe	Exigence	Applicabilité	Remarque
1	Domaine d’application	Applicable	
2	Références normatives	Applicable	
3	Termes et définitions	Applicable	Pour les circuits “ic”, les valeurs Ui, Ii, Pi sont les valeurs maximales possibles en fonctionnement normal. Les valeurs Uo, Io, Po sont déterminées en fonctionnement normal, mais avec la charge assignée la plus élevée pour chaque cas associé. Un transformateur conforme aux exigences applicables de cette norme permet de réduire la tension maximale à partir de Um. Le même équipement conçu pour “ic”, ainsi que pour “ia” ou “ib”, peut comporter différents paramètres de connexion aux circuits “ic” par rapport à une connexion aux circuits “ia” ou “ib”. Même si ces circuits relèvent tous du même “mode de protection”, simplement avec des niveaux différents de protection du matériel, les exigences définies dans “Modes de protection multiples” de l'IEC 60079-0 s'appliquent.
4	Groupement et classification des matériels à sécurité intrinsèque et des matériels associés	Applicable	Alors que “nL” ne désignait qu'un mode de protection Gc, “ic” désigne à la fois les modes de protection Gc et Dc.
5	Exigences de conformité des modes de protection et d’inflammation des matériels électriques		
5.1	Généralités	Applicable	L'ouverture, la mise en court-circuit et la mise à la terre d'un circuit “ic” aux bornes de sortie destinées au câblage sur site sont considérées comme des conditions normales de fonctionnement.
5.2	Niveau de protection "ia"	Non applicable	Concerne les coefficients de sécurité et les conditions de défaut pour "ia".
5.3	Niveau de protection "ib"	Non applicable	Concerne les coefficients de sécurité et les conditions de défaut pour "ib".
5.4	Niveau de protection "ic"	Applicable	Un coefficient de sécurité de 1,0 sans condition de défaut est applicable pour "ic".
5.5	Conformité à l’inflammation à l’éclateur	Applicable	
5.6	Conformité à l’inflammation par échauffement		
5.6.1	Généralités	Applicable	Les essais de température doivent être réalisés dans les conditions normales de fonctionnement les plus défavorables.

Article/Paragraphe	Exigence	Applicabilité	Remarque
5.6.2	Température pour les petits composants pour le Groupe I et le Groupe II	Applicable	
5.6.3	Câblage dans un matériel intrinsèquement sûr pour le Groupe I et le Groupe II.	Applicable	L'exigence est prise en compte par les essais réalisés selon 5.6.1, ou selon les exigences de sécurité applicables des normes industrielles pertinentes.
5.6.4	Pistes de cartes à circuits imprimés pour le Groupe I et Groupe II	Applicable	L'exigence est prise en compte par les essais réalisés selon 5.6.1, ou selon les exigences de sécurité applicables des normes industrielles pertinentes.
5.6.5	Température des matériels et des composants de sécurité intrinsèque pour le Groupe III	Applicable	Classement en température à fonder sur la température de la surface en contact avec la poussière.
5.7	Matériel simple	Applicable	
6	Construction des matériels		
6.1	Enveloppes	Applicable	
6.2	Dispositifs de raccordement des circuits externes		
6.2.1	Bornes	Applicable	NOTE Comme cela est le cas avec “ia” et “ib”, en raison des exigences d'installation définies dans l'IEC 60079-14, les circuits qui sortent d'un équipement par l'intermédiaire d'un bornier, les paramètres de ces circuits permettant une connexion au bornier, maintiennent les distances de séparation suivantes: – au moins 50 mm entre les bornes pour les circuits “ic” et les bornes pour les circuits de sécurité non intrinsèque. – au moins 6 mm entre les bornes pour les circuits de sécurité intrinsèque séparés. – au moins 3 mm entre les bornes pour les circuits de sécurité intrinsèque et les parties mises à la terre, si l'analyse de sécurité n'a pas pris en compte la connexion à la terre. Cette exigence relative aux distances de séparation est différente des exigences Ex “nL” précédentes.
6.2.2	Prises de courant	Applicable	
6.2.3	Détermination du rapport externe maximal de l'inductance à la résistance (L_o/R_o) pour des sources de puissance limitées par résistance	Applicable	
6.2.4	Câble solidaire en permanence	Applicable	

Article/Paragraphe	Exigence	Applicabilité	Remarque
6.2.5	Exigences pour les connexions et les accessoires des matériels à sécurité intrinsèque lorsqu'ils sont placés dans la zone non dangereuse	Applicable	Applicable sauf pour les circuits de protection dans le cas de fonctions telles que la charge dans la zone non dangereuse. Les caractéristiques assignées des composants peuvent être garanties sans protection complémentaire du fait de l'absence de défauts.
6.3	Distances de séparation		
6.3.1	Généralités	Applicable	Applicable uniquement au circuit “ic” et aux composants de protection. Lorsque les distances de séparation sont inférieures aux valeurs exigées, elles doivent être mises en court-circuit si le court-circuit peut compromettre la sécurité intrinsèque. NOTE Par exemple, un circuit "ic" est le circuit qui suit le dernier composant de protection qui détermine la limitation nécessaire de tension et de courant.
6.3.2	Séparation des parties conductrices	Applicable	Applicable uniquement au circuit “ic” et aux composants de protection. Toute utilisation d'une cloison isolante de séparation ou d'une cloison métallique raccordée à la terre est nécessaire uniquement pour satisfaire aux exigences de sécurité de la norme industrielle pertinente.
6.3.2.1	Distances conformes au Tableau 5	Applicable	Dans le cas des transformateurs, applicable uniquement entre les connexions externes. Les caractéristiques de construction restantes des transformateurs sont nécessaires uniquement pour satisfaire aux exigences de sécurité applicables des normes industrielles pertinentes.
6.3.2.2	Distances conformes à l'Annexe F	Applicable	Dans le cas des transformateurs, applicable uniquement entre les connexions externes. NOTE Les caractéristiques de construction restantes des transformateurs sont nécessaires uniquement pour satisfaire aux exigences de sécurité applicables des normes industrielles pertinentes. Des distances au travers d'une isolation solide des conducteurs sont nécessaires pour satisfaire au Tableau 5.

Article/Paragraphe	Exigence	Applicabilité	Remarque
6.3.3	Tension entre parties conductrices	Applicable	Pour “ic”, les effets des transitoires ne sont pris en compte que pour les barrières de sécurité à diodes parce que la connexion s'effectue avec un équipement non spécifié. Pour les autres applications “ic”, aucune évaluation supplémentaire des effets des transitoires n'est nécessaire compte tenu des éléments suivants: • La présence d'une atmosphère explosive est improbable en fonctionnement normal. • Le circuit est conforme aux exigences de sécurité applicables des normes industrielles pertinentes. Lorsque la séparation des parties conductrices est nécessaire, les séparations non conformes aux valeurs données dans le Tableau 5 ou à l'Annexe F peuvent être mises en court-circuit dans le cadre de l'évaluation si ce court-circuit peut compromettre la sécurité intrinsèque.
6.3.4	Distance dans l'air	Non applicable	Toute utilisation d'une cloison isolante de séparation ou d'une cloison métallique raccordée à la terre est nécessaire uniquement pour satisfaire aux exigences de sécurité de la norme industrielle pertinente. Voir 6.3.2.
6.3.5	Distances de séparation au travers d'un compound de moulage	Applicable	
6.3.6	Distances de séparation au travers d'une isolation solide	Applicable	
6.3.7	Séparations composites	Applicable	Applicable, à l'exception de la restriction de 1/3 pour les séparations composites, étant donné que cette restriction repose sur les éléments tenant compte des défauts.
6.3.8	Lignes de fuite	Applicable	Applicable, à l'exception de la restriction de 1/3 pour les séparations composites et des restrictions concernant les cloisons pour une tension supérieure à 1,575 V. Toute utilisation d'une cloison isolante de séparation ou d'une cloison métallique raccordée à la terre doit satisfaire aux exigences de sécurité de la norme industrielle pertinente. Voir 6.3.2.
6.3.9	Distance sous revêtement	Applicable	
6.3.10	Exigences pour les cartes à circuits imprimés montées	Applicable	Applicable, à l'exception de la prise en compte du corps d'un composant comme une partie active non isolée. Par exemple, un composant monté au-dessus ou tout à côté d’une piste comme défini en c), n'est pas considéré comme étant connecté à la piste.
6.3.11	Séparation par écrans raccordés à la terre	Applicable	Lorsque les distances de séparation par rapport à l'écran raccordé à la terre ne satisfont pas aux distances nécessaires de séparation par rapport à la terre, l'écran doit pouvoir acheminer le courant maximal possible auquel il peut être soumis en continu (tel qu'un court-circuit à la terre).
6.3.12	Câblage interne	Applicable	

Article/Paragraphe	Exigence	Applicabilité	Remarque
6.3.13	Exigence de rigidité diélectrique	Applicable	Applicable, à l'exception de l'essai de rigidité diélectrique supplémentaire du 3e alinéa. Dans le cas du 2e alinéa, applicable uniquement à l'isolation ou aux composants isolants. Un essai de rigidité diélectrique supplémentaire n'est pas nécessaire entre le niveau de protection "ic" et les autres circuits, ou entre les circuits séparés de niveau de protection "ic". Cette disposition est conforme aux exigences du niveau de protection "nL" précédentes. NOTE Les exigences relatives à l'essai diélectrique définies dans d'autres normes applicables peuvent toujours s'appliquer (normes telles que les normes industrielles pertinentes).
6.3.14	Relais	Applicable	Applicable uniquement à l'exigence relative au relais à utiliser dans les limites de ses caractéristiques assignées. NOTE Les exigences relatives à l'essai diélectrique et aux distances de séparation sont toujours couvertes, ainsi que les exigences de sécurité applicables des normes industrielles pertinentes.
6.4	Protection contre une inversion de polarité	Applicable	
6.5	Conducteurs de raccordement à la terre, connexions et bornes de raccordement	Applicable	Les exigences de mise à la terre définies dans le 1er alinéa s'appliquent uniquement si le circuit "ic" nécessite une mise à la terre. Les exigences relatives à la mise à la terre sont couvertes de manière appropriée par les exigences de sécurité applicables des normes industrielles pertinentes. Les exigences définies dans le 2e alinéa s'appliquent uniquement au niveau de protection "ia" et au niveau de protection "ib". Une seule connexion s'avère suffisante pour le niveau de protection ‘ic’.
6.6	Encapsulage	Applicable	Applicable uniquement si l'exclusion de l'atmosphère repose sur l'encapsulage de manière à réduire les distances de séparation, ou réduire la capacité d'inflammation des composants chauds. Aucune condition de court-circuit ne s'applique à moins que les distances de séparation ne soient inférieures aux valeurs exigées susceptibles de compromettre la sécurité intrinsèque (voir Annexe D).
7	Composants dont dépend la sécurité intrinsèque		
7.1	Caractéristiques des composants	Applicable	Cet article simplifie, dans le cas du courant et de la tension, les exigences relatives aux caractéristiques assignées concernant les composants de protection “ic” par rapport aux exigences “nL”. NOTE Le concept d'un composant dont le "mode de défaillance est tel qu'il maintient la protection" comme variante au déclassement (tel qu'il existe pour "nL") n'existe pas pour "ic".

Article/Paragraphe	Exigence	Applicabilité	Remarque
7.2	Connecteurs pour connexions internes, cartes et composants enfichables	Applicable	Applicable à l'exception de l'exigence relative à la connexion incorrecte des raccordements enfichables internes définie dans le 1er alinéa, et de l'exigence relative à la défaillance de connexion en circuit ouvert définie dans le 2e alinéa. Bien que l'interchangeabilité constitue un problème pour les connexions externes en raison d'une erreur sur site, elle n'est pas considérée comme un problème de protection “ic” pour les connexions internes. Les attentes en matière de contrôle de production et d'entretien approprié peuvent concerner des applications internes. L'exigence relative à la défaillance de connexion en circuit ouvert n'est pas applicable étant donné que les défauts ne sont pas pris en compte pour ‘ic’. Les deux coefficients ne sont pas considérés comme une condition normale de fonctionnement (voir 6.5).
7.3	Coupe-circuits à fusibles	Applicable	Lorsqu'un circuit “ic” dépend d'un coupe-circuit à fusibles **et** lorsque ce dernier est connecté directement au réseau **et** lorsque le coupe-circuit est également connecté directement à un circuit considéré comme normalement soumis à une surcharge ou à un court-circuit (tels que des embases ou des bornes pour câblage externe de sortie), le pouvoir de coupure d'un tel coupe-circuit à fusibles repose sur le courant de court-circuit présumé du réseau d'alimentation. Une barrière de sécurité à diodes constitue un exemple courant d'une telle application qui implique des bornes pour câblage externe de sortie. Il est considéré que le courant de court-circuit présumé d'un réseau d'alimentation de 250 V n’est pas supérieur à 1 500 A.”
7.4	Piles et accumulateurs	Applicable	Pour les matériels et les matériels associés, lorsque ce mode de protection concerne un mode de protection supérieur au mode de protection “ic” (tels que les matériels ‘ic nA’ ou les matériels associés ‘nA [ic]’), la connexion en parallèle des piles et accumulateurs pour le mode de protection ‘ic’ est admise uniquement dans le circuit ‘ic’ à condition de ne pas compromettre la sécurité intrinsèque.
7.5	Semi-conducteurs		

Article/Paragraphe	Exigence	Applicabilité	Remarque
7.5.1	Effets transitoires	Applicable	Pour “ic”, les effets des transitoires ne sont pris en compte que pour les barrières de sécurité à diodes parce que la connexion s'effectue avec un équipement non spécifié. Pour les autres applications “ic”, aucune évaluation supplémentaire des effets des transitoires n'est nécessaire compte tenu des éléments suivants: • La présence d'une atmosphère explosive est improbable en fonctionnement normal. • Le circuit est conforme aux exigences de sécurité applicables des normes industrielles pertinentes. NOTE Il est exigé que les semi-conducteurs utilisés comme composants de protection dans les circuits "ic" satisfassent aux exigences applicables définies dans un autre article de la présente norme.
7.5.2	Limiteur shunt de tension	Applicable	Pour “ic”, les effets des transitoires ne sont pris en compte que pour les barrières de sécurité à diodes parce que la connexion s'effectue avec un équipement non spécifié. Pour les autres applications “ic”, aucune évaluation supplémentaire des effets des transitoires n'est nécessaire compte tenu des éléments suivants: • La présence d'une atmosphère explosive est improbable en fonctionnement normal. • Le circuit est conforme aux exigences de sécurité applicables des normes industrielles pertinentes. Un seul semi-conducteur s'avère suffisant pour le niveau de protection ‘ic’.
7.5.3	Limiteurs série de courant	Applicable	Un seul semi-conducteur s'avère suffisant pour le niveau de protection ‘ic’.
7.6	Défaillance de composants, de connexions et de séparations	Applicable	Applicable à l'exception des exigences relatives aux niveaux de protection "ia et "ib" définies dans le 2^{e} alinéa, et des exigences relatives aux connexions infaillibles définies dans les 5e et 6e alinéas.
7.7	Dispositifs piézoélectriques	Applicable	Applicable uniquement si le circuit piézoélectrique peut être mis en court-circuit directement (par exemple, en raison d'espacements ou de composants produisant des étincelles non conformes) (voir 10.7). NOTE Une condition normale de fonctionnement constitue la condition potentielle d'effet sur l'enveloppe, et est par conséquent applicable au niveau de protection "ic".
7.8	Cellules électrochimiques pour la détection des gaz	Applicable	
8	Composants infaillibles, assemblages infaillibles de composants et connexions infaillibles dont dépend la sécurité intrinsèque	Non applicable	Selon 8.1, l'Article 8 ne s'applique pas, dans son intégralité, aux circuits "ic".
9	Exigences supplémentaires pour matériels spécifiques		

Article/Paragraphe	Exigence	Applicabilité	Remarque
9.1	Barrières de sécurité à diodes	Applicable	Pour “ic”, les effets des transitoires sont pris en compte pour les barrières de sécurité à diodes parce que la connexion s'effectue avec un équipement non spécifié. NOTE Les exigences de mise à la terre sont applicables au niveau de protection “ic” en raison des exigences correspondantes des circuits de sécurité intrinsèque définies dans l'IEC 60079-14.
9.2	Matériel FISCO	Applicable	
9.3	Lampes à main et lampes-chapeaux	Applicable	
10	Vérifications de type et essais de type		
10.1	Essai d'inflammation à l’éclateur	Applicable	Un coefficient de sécurité de 1,0 sans condition de défaut prise en compte ou non prise en compte est applicable pour "ic".
10.2	Essais de température	Applicable	Applicable à l'exception des problèmes de caractéristiques non linéaires mentionnés à la dernière ligne du 1er alinéa, qui nécessitent de soumettre à l'essai (essai obligatoire) à la température assignée réelle, les composants à caractéristiques non linéaires. Une méthode d'essai de cette nature n'est pas applicable pour les circuits "ic" et doit être considérée uniquement comme une possibilité.
10.3	Essais de tenue diélectrique	Applicable	Voir 6.3.13.
10.4	Détermination des paramètres de composants mal définis	Applicable	
10.5	Essais des piles et accumulateurs	Applicable	Applicable, sauf si l'essai de court-circuit doit être envisagé uniquement aux points externes à la pile ou à l'accumulateur lorsque les distances de séparation nécessaires ne sont pas satisfaites. Lorsque l'essai d'échauffement des piles et accumulateurs est exigé, il est nécessaire de soumettre à l'essai un seul échantillon.
10.6	Essais mécaniques		
10.6.1	Compound de moulage	Applicable	Les essais de choc s'appliquent aux compounds de moulage des enveloppes. Ils représentent ainsi un problème de condition normale de fonctionnement, et sont par conséquent applicables à "ic".
10.6.2	Détermination de l'acceptabilité de fusibles exigeant encapsulation	Applicable	Alors que l'encapsulage des coupe-circuits à fusibles pour “ic” n'est généralement pas nécessaire, le problème relatif à la pénétration de l'encapsulage à l'intérieur de la chambre d'un coupe-circuit à fusibles, et qui empêche l'ouverture de l'élément, constitue véritablement un problème de condition normale de fonctionnement, et s'applique par conséquent aux circuits "ic" (voir également 7.3). NOTE Un exemple de ce type de problème s'applique aux coupe-circuits à fusibles pour cartouche en verre.

Article/Paragraphe	Exigence	Applicabilité	Remarque
10.6.3	Cloisons	Non applicable	Toute utilisation d'une cloison isolante de séparation ou d'une cloison métallique raccordée à la terre est nécessaire uniquement pour satisfaire aux exigences de sécurité de la norme industrielle pertinente.
10.7	Essais des matériels de sécurité intrinsèque comportant des dispositifs piézoélectriques	Applicable	Applicable uniquement si le circuit piézoélectrique peut être mis en court-circuit directement (par exemple, en raison d'espacements ou de composants produisant des étincelles non conformes) (voir 7.7). NOTE Une condition normale de fonctionnement constitue la condition potentielle d'effet sur l'enveloppe, et est par conséquent applicable au niveau de protection "ic".
10.8	Essais de type des barrières de sécurité à diodes et des shunts de sécurité	Applicable	Pour le niveau de protection “ic”, les effets des transitoires doivent être pris en compte pour les barrières de sécurité à diodes parce que la connexion s'effectue avec un équipement non spécifié. (Voir 7.5.1)
10.9	Essai de traction du câble	Applicable	
10.10	Essais des transformateurs	Non applicable	Les spécifications de 8.2.4 exigent de réaliser ces essais. Il est dérogé de manière explicite à ces essais pour les circuits "ic". NOTE Les exigences de sécurité applicables des normes industrielles pertinentes s'appliquent toujours.
10.11	Essais des isolateurs optiques	Non applicable	Les spécifications de 8.9.2 exigent de réaliser ces essais. Il est dérogé de manière explicite à ces essais pour les circuits "ic". NOTE Les exigences de sécurité applicables des normes industrielles pertinentes s'appliquent toujours.
10.12	Courant admissible des connecteurs des circuits imprimés infaillibles	Non applicable	Les spécifications de 8.8 exigent de réaliser ces essais. Il est dérogé de manière explicite à ces essais pour les circuits "ic".
11	Essais individuels		
11.1	Essais individuels pour les barrières de sécurité à diode		
11.1.1	Barrières terminées	Applicable	NOTE Des liaisons amovibles ne sont généralement pas nécessaires pour les barrières de sécurité de niveau de protection “ic”.
11.1.2	Diodes des barrières «ia» à deux diodes	Non applicable	Cet essai s'applique uniquement aux circuits "ia".
11.2	Essais diélectriques individuels de série des transformateurs infaillibles	Non applicable	Les spécifications de 8.2.5 exigent de réaliser ces essais. Il est dérogé de manière explicite à ces essais pour les circuits "ic".
12	Marquage	Applicable	Lorsqu'il est nécessaire d'inclure le marquage de l'une des autres méthodes de protection énumérées dans l'IEC 60079-0, le symbole “ic” doit être placé en premier.

Article/Paragraphe	Exigence	Applicabilité	Remarque
13	Documentation	Applicable	Lorsque les instructions du fabricant définissent des procédures de maintenance sous tension “ic”, les effets de cette maintenance sous tension n’invalident pas la sécurité intrinsèque dans des conditions normales de fonctionnement et dans des conditions qui peuvent être raisonnablement considérées comme se produisant lors d'une maintenance sous tension.
Annexe A (normative)	Évaluation des circuits de sécurité intrinsèque	Applicable	
Annexe B (normative)	Éclateur pour l'essai des circuits de sécurité intrinsèque	Applicable	
Annexe C (informative)	Mesure des lignes de fuite, distances dans l'air et distances de séparation au travers d'un compound de moulage ou d'un isolant solide		
Annexe D (normative)	Encapsulage	Applicable	Applicable uniquement si l'exclusion de l'atmosphère repose sur l'encapsulage de manière à réduire les distances de séparation, ou réduire la capacité d'inflammation des composants chauds. Aucune condition de défaut ne s'applique à moins que les distances de séparation ne soient inférieures aux valeurs exigées (voir 6.6.2).
Annexe E (informative)	Essai d'énergie transitoire		
Annexe F (normative)	Distances de séparation alternative pour les circuits imprimés assemblés et séparation de composants	Applicable	Dans le cas des transformateurs, applicable uniquement entre les connexions externes. NOTE Les caractéristiques de construction restantes des transformateurs sont nécessaires uniquement pour satisfaire aux exigences de sécurité applicables des normes industrielles pertinentes. Des distances au travers d'une isolation solide des conducteurs sont nécessaires pour satisfaire au Tableau 5.
Annexe G (normative)	Exigences concernant les matériels du Concept de réseau de terrain de sécurité intrinsèque (FISCO)	Applicable	
Annexe H (informative)	Essai d'inflammation des circuits d'alimentation de limitation de semi-conducteur		

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IEC 60079-11

Edition 6.0 2011-06

ATMOSPHERES EXPLOSIVES –

Partie 11: Protection de l'équipement par sécurité intrinsèque "i"

FEUILLE D'INTERPRÉTATION 4

Cette feuille d'interprétation a été établie par le sous-comité 31G: Matériels à sécurité intrinsèque, du comité d'études 31 de l'IEC: Equipements pour atmosphères explosives.

Le texte de cette feuille d'interprétation est issu des documents suivants:

DISH	Rapport de vote
31G/293/DISH	31G/296/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette feuille d'interprétation.

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Dans la norme qui traite de la sécurité intrinsèque, IEC 60079-11 (2011), la formulation utilisée concernant les exigences applicables aux enveloppes des matériels de sécurité intrinsèque de Groupe III stipulant que la séparation est réalisée en satisfaisant aux exigences de distances dans l'air ou de lignes de fuite du Tableau 5 ou de l'Annexe F, selon le Paragraphe 6.1.3a), est ambiguë. Cette observation peut donner lieu à des interprétations différentes de la part des laboratoires d'essai.

Cette question a été examinée lors de la réunion de la MT à Busan, Corée du Sud en octobre 2018. La MT a décidé lors de cette réunion qu'il convenait d'appliquer la présente interprétation à l'IEC 60079-11:2011.

L'interprétation qui découle du titre du Paragraphe 6.1.2.3, "Matériel conforme à l'Annexe F", est que l'exigence d'essais supplémentaires stipulée par le 6.1.2.3a) ne s'applique que dans le cas où l'Annexe F est utilisée. La possibilité que les lignes de fuite et distances dans l'air infaillibles soient compromises existe lorsque l'Annexe F est appliquée mais aussi lorsque le Tableau 5 est appliqué.

L'IEC 60079-11 est libellée comme suit:

6.1.3 Enveloppes pour les matériels de Groupe III

Lorsque la sécurité intrinsèque des matériels de sécurité intrinsèque peut être dégradée par la pénétration de poussière ou par l'accès à des parties conductrices, par exemple si les circuits possèdent des lignes de fuite infaillibles, une enveloppe est nécessaire et ce avec l'une des conditions suivantes:

a) Lorsque la séparation est réalisée en conformité avec les exigences de distances dans l'air ou de lignes de fuite du Tableau 5 ou de l'Annexe F, l'enveloppe doit fournir un degré de protection d'au moins IP5X, selon l'IEC 60529. Pour ces enveloppes, *[les exigences du]* 6.1.2.3a) doit s'appliquer en plus.

Le texte du paragraphe cité en référence est le suivant:

6.1.2.3 Matériel conforme à l'Annexe F

Le matériel conforme aux exigences de séparation des Tableaux F.1 ou F.2 doit être fourni avec une protection atteignant le degré de pollution 2. Cela peut être atteint par l'un de moyens suivants:

a) une enveloppe conforme aux exigences IP54 ou plus conformément à l'utilisation prévue et aux conditions d'environnement selon l'IEC 60529. Pour ces enveloppes, les articles de l'IEC 60079-0 identifiés dans le Tableau 1 s'appliquent en plus.

Question

Pour les groupes IIIA, IIIB et IIIC, lorsque l'Annexe F n'est pas appliquée et que les lignes de fuite et les distances dans l'air du Tableau 5, colonne 2 ou 5, assurent la sécurité intrinsèque, est-ce que toutes les exigences applicables de l'IEC 60079-0 indiquées dans le Tableau 1 qui sont relatives aux enveloppes, y compris celles concernant l'endurance thermique et la résistance aux chocs mécaniques s'appliquent ?

Interprétation

Oui, pour les groupes IIIA, IIIB, IIIC, les exigences portant sur les "Essais des enveloppes" de l'IEC 60079-0 s'appliquent aux matériels à sécurité intrinsèque dont les lignes de fuite et distances dans l'air sont évaluées soit par rapport au Tableau 5 soit par rapport à l'Annexe F.

Ce qui précède ne s'applique pas lorsque les séparations sont protégées par un moyen autre qu'une enveloppe, par exemple par encapsulation ou par un revêtement conforme comme cela est décrit en 6.1.3b) de l'IEC 60079-11.

NOTE Ces essais sont spécifiés dans les paragraphes suivants de l'IEC 60079-0 Éd 6.0; 6.2, 6.5, 7.1.1, 7.1.2.1, 7.1.2.2, 7.1.2.3, 7.2, 7.3, 12, 16, 26.4.1, 26.4.1.1, 26.4.1.2, 26.4.1.2.1, 26.4.1.2.2, 26.4.2, 26.4.3, 26.4.4, 26.5.2, 26.7, 26.8, 26.9, 26.10, 26.16, ainsi que l'Annexe C et l'Annexe F.

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ATMOSPHÈRES EXPLOSIVES –

Partie 11: Protection de l'équipement par sécurité intrinsèque "i"

FEUILLE D'INTERPRÉTATION 6

Cette feuille d'interprétation a été établie par le sous-comité 31G: Matériels à sécurité intrinsèque, du comité d'études 31 de l'IEC: Equipements pour atmosphères explosives.

Le texte de cette feuille d'interprétation est issu des documents suivants:

DISH	Rapport de vote
31G/311/DISH	31G/314/RVDISH

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette feuille d'interprétation.

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Contexte

Les deuxième et troisième alinéas de l'IEC 60079-11:2011, 10.5.3 b) spécifient ce qui suit:

La température maximale de surface doit être déterminée comme suit:

Pour "ia" et "ib", tous les dispositifs de limitation de courant extérieurs à l'élément ou à la batterie doivent être court-circuités pour l'essai. L'essai doit être effectué avec les dispositifs internes de limitation de courant en circuit puis en court-circuit, en utilisant 10 éléments dans chaque cas. Les 10 échantillons ayant les dispositifs internes de limitation de courant court-circuités doivent être fournis par le fabricant de l'élément ou de la batterie avec toutes les instructions ou précautions particulières nécessaires pour une utilisation et une mise en essai sûres des échantillons. Si les dispositifs internes de limitation de courant assurent une protection contre les courts-circuits internes, il n'est pas nécessaire de retirer ces dispositifs. Néanmoins, ces dispositifs doivent seulement être considérés pour le niveau de protection "ib".

L'objectif des alinéas cités est de simuler un court-circuit interne à l'intérieur d'un élément, en court-circuitant les bornes externes de l'élément dans le cadre de l'évaluation thermique.

Il a été établi que deux détails ont été mal interprétés dans les présents alinéas:

a) Les alinéas traitent des éléments et des batteries, tandis que l'objectif est clairement de simuler des courts-circuits internes à l'intérieur des éléments et non à l'intérieur des batteries, auquel cas les courts-circuits pourraient être interprétés comme étant externes à l'élément ou aux éléments à l'intérieur d'une batterie.

b) Il est difficile de définir clairement ce qui constitue un dispositif de limitation de courant qui assure une protection contre les courts-circuits internes.

Un séparateur avec fonction de coupure peut être interprété comme un dispositif de limitation de courant qui protège contre les courts-circuits internes de par sa fonction, mais étant donné qu'il constitue une partie de construction de l'élément qui ne peut pas être retirée sans altérer la fonctionnalité de l'élément de base, il ne s'agit pas d'un dispositif de limitation de courant pour mettre en application la norme. Inversement, un CID (dispositif d'interruption de courant, *Current interruption device*), par exemple, est un interrupteur qui est déclenché par une augmentation de la pression à l'intérieur de l'élément, et la fonctionnalité de l'élément n'est pas altérée par l'absence du CID.

La référence aux dispositifs internes de limitation de courant qui assurent une protection contre les courts-circuits internes dans l'édition 6 a été incluse pour traiter des technologies de piles futures non connues, qui pourraient inclure des dispositifs de limitation de courant de ce type; toutefois, à l'heure actuelle, aucun dispositif de limitation de courant de ce type n'est connu.

Question

Pour l'un ou l'autre des niveaux de protection "ia" ou "ib", quels sont les dispositifs de limitation de courant qui doivent être désactivés (ou encore non installés, mis en court-circuit ou retirés) selon l'IEC 60079-11:2011, 10.5.3 b), et quels sont les dispositifs de limitation de courant qui ne doivent pas être désactivés?

Réponse

Tous les dispositifs de protection discrets qui peuvent être représentés schématiquement comme des dispositifs individuels ne faisant pas partie de l'élément, doivent être désactivés pour les essais conformément à l'IEC 60079-11:2011, 10.5.3 b), qu'ils soient situés à l'intérieur ou à l'extérieur de l'élément. Ces dispositifs comprennent, sans toutefois s'y limiter, les résistances, les fusibles, les fusibles réarmables (NTC, PTC, PPTC), les CID (dispositifs d'interruption de courant), les semiconducteurs, etc.

Les caractéristiques qui constituent des fonctions essentielles d'un élément, comme par exemple un séparateur avec fonction de coupure ou la résistance ohmique de l'électrolyte, ne sont pas considérées comme des dispositifs de limitation de courant au sens du présent article, et ces dispositifs ne doivent pas être mis en court-circuit ni retirés; des éléments de ce type peuvent être considérés pour le niveau de protection "ia".

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

ATMOSPHÈRES EXPLOSIVES –

Partie 11: Protection de l'équipement par sécurité intrinsèque «i»

AVANT-PROPOS

1) La Commission Electrotechnique Internationale (CEI) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de la CEI). La CEI a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. A cet effet, la CEI – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de la CEI"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec la CEI, participent également aux travaux. La CEI collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de la CEI peuvent faire l'objet de droits de brevet. La CEI ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets et de ne pas avoir signalé leur existence.

La Norme internationale CEI 60079-11 a été établie par le sous-comité 31G: Matériels à sécurité intrinsèque, du comité d'études 31 de la CEI: Équipements pour atmosphères explosives.

Cette sixième édition annule et remplace la cinquième édition de la CEI 60079-11 publiée en 2006, la première édition de la CEI 61241-11 publiée en 2005 et la nouvelle Annexe G remplace les exigences concernant les matériels de la deuxième édition de la CEI 60079-27 publiée en 2008. Cette sixième édition constitue une révision technique de ces publications.

NOTE La CEI 60079-25 annule et remplace les points en suspend de la CEI 60079-27.

Les modifications importantes par rapport à l'édition antérieure sont indiquées ci-dessous:

- Introduction d'une référence à la CEI 60079-0 non spécifique à l'édition;
- L'incorporation des exigences de matériel issues de la CEI 60079-27 relatives au FISCO;
- L'incorporation des exigences issues de la CEI 61241-11 relatives aux atmosphères de poussières combustibles;
- La clarification des exigences relatives aux accessoires reliés à un matériel à sécurité intrinsèque; tels que les chargeurs et les collecteurs de données;
- Ajout de nouvelles exigences d'essai relatives aux isolateurs optiques;
- l'introduction d'une Annexe H–au sujet des essais d'inflammation des dispositifs de limitation d'alimentation électrique à semi-conducteur.

Le texte de la présente Norme est issu des documents suivants:

FDIS	Rapport de vote
31G/207/FDIS	31G/213/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de la présente Norme.

La présente norme complète et modifie les exigences générales de la CEI 60079-0, à l'exception de ce qui est indiqué au Tableau 1 (voir Domaine d'application).

Cette publication a été rédigée selon les Directives ISO/CEI, Partie 2.

Une liste de toutes les parties de la CEI 60079, sous le titre général: *Atmosphères explosives*, est disponible sur le site web de la CEI.

Le comité a décidé que le contenu de cette publication ne sera pas modifié avant la date de stabilité indiquée sur le site web de la CEI sous "http://webstore.iec.ch" dans les données relatives à la publication recherchée. A cette date, la publication sera

- reconduite,
- supprimée,
- remplacée par une édition révisée, ou
- amendée.

Le contenu du corrigendum de janvier 2012, de la feuille d'interprétation 1 d'octobre 2014, des feuilles d'interprétation 2 et 3 de juillet 2016, 4 d'avril 2019, 5 (english only) d'août 2019 et 6 de décembre 2019 a été pris en considération dans cet exemplaire.

IMPORTANT – Le logo "colour inside" qui se trouve sur la page de couverture de cette publication indique qu'elle contient des couleurs qui sont considérées comme utiles à une bonne compréhension de son contenu. Les utilisateurs devraient, par conséquent, imprimer cette publication en utilisant une imprimante couleur.

ATMOSPHÈRES EXPLOSIVES –

Partie 11: Protection de l'équipement par sécurité intrinsèque «i»

1 Domaine d'application

La présente partie de la CEI 60079 spécifie la construction et les essais pour le matériel électrique de sécurité intrinsèque destiné à être utilisé dans les atmosphères explosives et pour le matériel électrique associé destiné à être relié à des circuits de sécurité intrinsèque qui entrent dans de telles atmosphères.

Ce mode de protection s'applique aux équipements électriques dont les circuits sont eux-mêmes incapables de provoquer l'explosion de l'atmosphère environnante.

La présente norme s'applique également aux équipements électriques ou aux parties de matériels électriques situés hors de l'atmosphère explosive ou protégés par un autre Mode de Protection cité dans la CEI 60079-0, lorsque la sécurité intrinsèque des circuits électriques situés dans l'atmosphère explosive peut dépendre de la conception et de la construction de ces matériels électriques ou de ces parties de matériels électriques. Les circuits électriques exposés à une atmosphère explosive sont évalués en vue de leur emploi dans une telle atmosphère en appliquant la présente Norme.

Les exigences pour les systèmes de sécurité intrinsèque sont données dans la CEI 60079-25.

La présente norme complète et modifie les exigences générales de la CEI 60079-0, à l'exception de ce qui est indiqué au Tableau 1. Lorsqu'une exigence de la présente norme entre en conflit avec une exigence de la CEI 60079-0, l'exigence de la présente Norme prévaut.

Si les exigences de cette norme sont applicables tant à la sécurité intrinséque d'un matériel qu'aux matériels associés, le terme 'matériel' est utilisé dans toute cette norme.

Cette norme est uniquement pour l'équipement électrique; cependant le terme 'équipement' utilisé dans la norme signifie toujours 'équipement électrique'.

Si un matériel associé est placé dans une atmosphère explosive, il doit être protégé par un Mode de Protection approprié cité dans la CEI 60079-0, et les exigences de ce mode de protection ainsi que les parties applicables de la CEI 60079-0 s'appliquent aussi au matériel associé.

Tableau 1 – Applicabilité des articles spécifiques de la CEI 60079-0

Articles et paragraphes de la CEI 60079-0			Application d'articles de la CEI 60079-0 à la CEI 60079-11		
			Matériel à sécurité intrinsèque		matériel électrique associé
Ed 5.0 (2007) (informative)	Ed 6.0 (2011) (informative)	Titre d'Article / Paragraphe (normative)	Groupe I et Groupe II	Groupe III	
1	1	Domaine d'application	S'applique	S'applique	S'applique
2	2	Références normatives	S'applique	S'applique	S'applique
3	3	Termes et définitions	S'applique	S'applique	S'applique
4	4	Groupes d'appareils	S'applique	S'applique	S'applique
4.1	4.1	Groupe I	S'applique	Exclu	S'applique
4.2	4.2	Groupe II	S'applique	Exclu	S'applique
4.3	4.3	Groupe III	Exclu	S'applique	S'applique
4.4	4.4	Appareil pour une atmosphère explosive particulière	S'applique	S'applique	S'applique
5.1	5.1	Influences environnementales	S'applique	S'applique	S'applique
5.1.1	5.1.1	Température ambiante	S'applique	S'applique	S'applique
5.1.2	5.1.2	Source externe d'échauffement ou de refroidissement	S'applique	S'applique	S'applique
5.2	5.2	Température de service	S'applique	S'applique	S'applique
5.3.1	5.3.1	Détermination de la température maximale de la surface	S'applique	S'applique	Exclu
5.3.2.1	5.3.2.1	Matériel électrique du Groupe I	S'applique	Exclu	Exclu
5.3.2.2	5.3.2.2	Matériel électrique du Groupe II	S'applique	Exclu	Exclu
5.3.2.3	5.3.2.3	Matériel électrique du Groupe III	Exclu	S'applique	Exclu
5.3.3	5.3.3	Température des petits composants pour le matériel électrique de Groupe I et de Groupe II	S'applique	Exclu	Exclu
6.1	6.1	Généralités	S'applique	S'applique	S'applique
6.2	6.2	Résistance mécanique de l'appareil	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
6.3	6.3	Temps d'ouverture	Exclu	Exclu	Exclu
6.4	6.4	Courants de circulation	Exclu	Exclu	Exclu
6.5	6.5	Maintien des garnitures d'étanchéité	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué

Articles et paragraphes de la CEI 60079-0			Application d'articles de la CEI 60079-0 à la CEI 60079-11		
			Matériel à sécurité intrinsèque		matériel électrique associé
Ed 5.0 (2007) (informative)	Ed 6.0 (2011) (informative)	Titre d'Article / Paragraphe (normative)	Groupe I et Groupe II	Groupe III	
6.6	6.6	Matériel émettant une énergie rayonnée électromagnétique ou ultrasonique	S'applique	S'applique	Exclu
7.1.1	7.1.1	Applicabilité	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
NR	7.1.2.1	Généralités	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
7.1.3	7.1.2.2	Matériaux plastiques	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
7.1.4	7.1.2.3	Elastomères	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
7.2	7.2	Endurance thermique	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
7.3	7.3	Résistance à la lumière	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
7.4	7.4	6.0 - Charges électrostatiques sur des matériaux externes non métalliques	S'applique	S'applique	Exclu
NR	7.5	Parties métalliques accessibles	S'applique	S'applique	Exclu
7.5	NR	Trous taraudés	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
8.1	8.1	Composition des matériaux	S'applique	S'applique	Exclu
8.1.1	8.2	Groupe I	S'applique	Exclu	Exclu
8.1.2	8.3	Groupe II	S'applique	Exclu	Exclu
8.1.3	8.4	Groupe III	Exclu	S'applique	Exclu
8.2	NR	Trous taraudés	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
9	9	Fermetures	Exclu	Exclu	Exclu
10	10	Dispositifs de verrouillage	Exclu	Exclu	Exclu
11	11	Traversées	Exclu	Exclu	Exclu

Articles et paragraphes de la CEI 60079-0			Application d'articles de la CEI 60079-0 à la CEI 60079-11		
			Matériel à sécurité intrinsèque		matériel électrique associé
Ed 5.0 (2007) (informative)	Ed 6.0 (2011) (informative)	Titre d'Article / Paragraphe (normative)	Groupe I et Groupe II	Groupe III	
12	12	Matériaux utilisés pour les scellements	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
13	13	Composants Ex	S'applique	S'applique	S'applique
14	14	Eléments de raccordement et logements de raccordement	Exclu	Exclu	Exclu
15	15	Eléments de raccordement des conducteurs de mise à la terre et de liaison équipotentielle	Exclu	Exclu	Exclu
16	16	Entrées dans les enveloppes	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
17	17	Exigences complémentaires pour machines électriques tournantes	Exclu	Exclu	Exclu
18	18	Exigences complémentaires pour appareillage de connexion	Exclu	Exclu	Exclu
19	19	Exigences complémentaires pour coupe-circuit à fusibles	Exclu	Exclu	Exclu
20	20	Exigences complémentaires pour les prises de courant et les connecteurs	Exclu	Exclu	Exclu
21	21	Exigences complémentaires pour les luminaires	Exclu	Exclu	Exclu
22	22	Exigences complémentaires pour lampes-chapeaux et lampes à main	Modifié	Modifié	Exclu
23.1	23.1	Généralités	S'applique	S'applique	S'applique
23.2	23.2	Batteries	Exclu	Exclu	Exclu
23.3	23.3	Types d'éléments	S'applique	S'applique	S'applique
23.4	23.4	Éléments dans une batterie	S'applique	S'applique	S'applique
23.5	23.5	Caractéristiques assignées des batteries	S'applique	S'applique	S'applique
23.6	23.6	Interchangeabilité/interversion ?	S'applique	S'applique	S'applique
23.7	23.7	Charge des piles	S'applique	S'applique	S'applique
23.8	23.8	Fuite	S'applique	S'applique	S'applique
23.9	23.9	Connexions	S'applique	S'applique	S'applique

Articles et paragraphes de la CEI 60079-0			Application d'articles de la CEI 60079-0 à la CEI 60079-11		
			Matériel à sécurité intrinsèque		matériel électrique associé
Ed 5.0 (2007) (informative)	Ed 6.0 (2011) (informative)	Titre d'Article / Paragraphe (normative)	Groupe I et Groupe II	Groupe III	
23.10	23.10	Orientation	S'applique	S'applique	S'applique
23.11	23.11	Remplacement d'éléments ou de batteries	S'applique	S'applique	S'applique
23.12	23.12	Ensemble de batteries remplaçables	S'applique	S'applique	S'applique
24	24	Documentations	S'applique	S'applique	S'applique
25	25	Conformité du prototype ou de l'échantillon avec les documents	S'applique	S'applique	S'applique
26.1	26.1	Généralités	S'applique	S'applique	S'applique
26.2	26.2	Configuration d'essai	S'applique	S'applique	S'applique
26.3	26.3	Essais en présence de mélanges d'essai explosifs	S'applique	S'applique	S'applique
26.4.1	26.4.1	Ordre des essais	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
26.4.1.1	26.4.1.1	Enveloppes métalliques, parties métalliques des enveloppes et parties en verre des enveloppes	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
26.4.1.2	26.4.1.2	Enveloppes non métalliques ou parties non métalliques d'enveloppes	Exclu sauf lorsque 6.1.2.3 a) est appliqué = 1	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
26.4.1.2.1	26.4.1.2.1	Appareil électrique du Groupe I	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu	Exclu sauf lorsque 6.1.2.3 a) est appliqué
26.4.1.2.2	26.4.1.2.2	Appareil électrique du Groupe II et du Groupe III	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
26.4.2	26.4.2	Résistance au choc mécanique	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
26.4.3	26.4.3	Essai de chute	S'applique	S'applique	Exclu sauf lorsque 6.1.2.3 a) est appliqué
26.4.4	26.4.4	Critères d'acceptation	S'applique	S'applique	Exclu sauf lorsque 6.1.2.3 a) est appliqué
26.4.5	26.4.5	6.0 - Degré de protection (IP) par les enveloppes	S'applique	S'applique	S'applique
26.5.1.1	26.5.1.1	Généralités	S'applique	S'applique	Exclu
26.5.1.2	26.5.1.2	Température de service	Modifié	Modifié	Modifié

Articles et paragraphes de la CEI 60079-0			Application d'articles de la CEI 60079-0 à la CEI 60079-11		
			Matériel à sécurité intrinsèque		matériel électrique associé
Ed 5.0 (2007) (informative)	Ed 6.0 (2011) (informative)	Titre d'Article / Paragraphe (normative)	Groupe I et Groupe II	Groupe III	
26.5.1.3	26.5.1.3	Température maximale de surface	Modifié	Modifié	Modifié
26.5.2	26.5.2	Essai de choc thermique	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
26.5.3	26.5.3	Essai d'inflammation des petits composants (Groupe I et Groupe II)	S'applique	Exclu	Exclu
26.6	26.6	Essai de rotation pour les traversées	Exclu	Exclu	Exclu
26.7	26.7	Enveloppes non métalliques et parties non métalliques d'enveloppes	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
26.8	26.8	Endurance thermique à la chaleur	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
26.9	26.9	Endurance thermique au froid	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
26.10	26.10	Résistance à la lumière	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
26.11	26.11	Résistance aux agents chimiques de l'appareil électrique du Groupe I	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu	Exclu
26.12	26.12	Continuité de terre	Exclu	Exclu	Exclu
26.13	26.13	Vérification de la résistance de surface de parties d'enveloppes en matériaux non métalliques	S'applique	S'applique	Exclu
26.15	26.14	Mesure de capacité	S'applique	S'applique	Exclu
NR	26.15	Vérification des caractéristiques assignées des ventilateurs d'aération	Exclu	Exclu	Exclu
NR	26.16	Qualification alternative des joints toriques d'étanchéité en élastomère	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué
27	27	Essais individuels	S'applique	S'applique	S'applique
28	28	Responsabilité du constructeur	S'applique	S'applique	S'applique
29	29	Marquage	S'applique	S'applique	S'applique
30	30	Instructions	S'applique	S'applique	S'applique
Annexe A (Norm.)	Annexe A (Norm.)	Exigences complémentaires pour les entrées de câbles	Exclu	Exclu	Exclu

Articles et paragraphes de la CEI 60079-0			Application d'articles de la CEI 60079-0 à la CEI 60079-11		
			Matériel à sécurité intrinsèque		matériel électrique associé
Ed 5.0 (2007) **(informative)**	**Ed 6.0 (2011)** **(informative)**	**Titre d'Article / Paragraphe** **(normative)**	**Groupe I et Groupe II**	**Groupe III**	
Annexe B (Norm.)	Annexe B (Norm.)	Exigences pour composants Ex	S'applique	S'applique	S'applique
Annexe C (Inf.)	Annexe C (Inf.)	Exemple de dispositif pour l'essai de résistance au choc mécanique	S'applique	S'applique	Exclu sauf lorsque 6.1.2.3a) est appliqué
Annexe D (Inf.)	NR	Introduction à une méthode alternative d'évaluation des risques incluant les "niveaux de protection du matériel" pour les matériels Ex	S'applique	S'applique	S'applique
Annexe E (Inf.)	Annexe F (Inf.)	Moteurs alimentés par des convertisseurs	Exclu	Exclu	Exclu
NR	Annexe E (Inf.)	Essais d'échauffement des machines électriques	Exclu	Exclu	Exclu
NR	Annexe F (Inf.)	Organigramme suggéré pour les essais des enveloppes non métalliques ou les parties non métalliques des enveloppes (26.4)	Exclu sauf lorsque 6.1.2.3 a) est appliqué	Exclu sauf lorsque 6.1.3 a) est appliqué	Exclu sauf lorsque 6.1.2.3 a) est appliqué

S'applique – Cette exigence de la CEI 60079-0 est appliquée sans modification.

Exclu – Cette exigence de la CEI 60079-0 ne s'applique pas.

S'applique sauf – Cette exigence de la CEI 60079-0 ne s'applique pas sauf lorsque les conditions exposées sont rencontrées.

Modifié – Cette exigence de la CEI 60079-0 est modifiée comme indiqué dans le détail dans la présente Norme.

NR – Pas d'exigences.

NOTE Les numéros d'articles dans le tableau ci-dessus sont donnés uniquement pour information. Les exigences applicables de la CEI 60079-0 sont identifiées par le titre d'article qui est normatif. Le présent tableau a été rédigé selon les exigences spécifiques de la CEI 60079-0 Ed 6.0. Les numéros d'article de l'édition précédente sont montrés uniquement pour information. Cela sert à permettre d'utiliser la CEI 60079-0 Ed 5.0 "Exigences générales" avec la présente partie de la CEI 60079 lorsque cela est nécessaire. En l'absence de toute exigence, signalée par NR, ou en cas de conflit entre exigences, les exigences de la dernière édition prévalent.

2 Références normatives

Les documents de référence suivants sont indispensables pour l'application du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

CEI 60079-0, *Atmosphères explosives – Partie 0*: *Matériel – Exigences générales*

CEI 60079-7, *Atmosphères explosives – Partie 7*: *Protection de l'équipement par sécurité augmentée «e»*

CEI 60079-25, *Atmosphères explosives – Partie 25: Systèmes de sécurité intrinsèque électrique*

CEI 60085, *Isolation électrique – Evaluation et désignation thermique*

CEI 60112, *Méthode de détermination des indices de résistance et de tenue au cheminement des matériaux isolants solides*

CEI 60127 (toutes les parties), *Coupe-circuit miniatures*

CEI 60317-3, *Spécifications pour types particuliers de fils de bobinage – Partie 3: Fil de section circulaire en cuivre émaillé avec polyester, classe 155*

CEI 60317-7, *Spécifications pour types particuliers de fils de bobinage – Partie 7: Fil de section circulaire en cuivre émaillé avec polyimide, classe 220*

CEI 60317-8, *Spécifications pour types particuliers de fils de bobinage – Partie 8: Fil de section circulaire en cuivre émaillé avec polyesterimide, classe 180*

CEI 60317-13, *Spécifications pour types particuliers de fils de bobinage – Partie 13: Fil de section circulaire en cuivre émaillé avec polyester ou polyesterimide et avec surcouche polyamide-imide, classe 200*

CEI 60529, *Degrés de protection procurés par les enveloppes (Code IP)*

CEI 60664-1:2007, *Coordination de l'isolement des matériels dans les systèmes (réseaux) à basse tension – Partie 1: Principes, exigences et essais*

CEI 60664-3:2003, *Coordination de l'isolement des matériels dans les systèmes (réseaux) à basse tension – Partie 3: Utilisation de revêtement, d'empotage ou de moulage pour la protection contre la pollution*

IEC 61158-2, *Réseaux de communication industriel – Spécifications des bus de terrain- Partie 2: Spécification des couches physiques et définition des services* (document non disponible en français)

CEI 62013-1, *Lampes-chapeaux utilisables dans les mines grisouteuses – Partie 1:Exigences générales – Construction et essais liés au risque d'explosion*

ANSI/UL 248-1, *Fusibles basse-tension – Partie 1: Exigences générales*

IEC 60079-11

Edition 6.0 2011-07

REDLINE VERSION

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Explosive atmospheres –
Part 11: Equipment protection by intrinsic safety "i"

Atmosphères explosives –
Partie 11: Protection de l'équipement par sécurité intrinsèque «i»

IEC 60079-11:2011

SC 31G/IEC 60079-11 (2011), sixth edition/I-SH 01

EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

INTERPRETATION SHEET 1

This interpretation sheet has been prepared by subcommittee 31G: Equipment for explosive atmospheres – Equipment protection by intrinsic safety "i", of IEC technical committee 31.

The text of this interpretation sheet is based on the following documents:

ISH	Report on voting
31G/235/ISH	31G/238/RVISH

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

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Following decision No 16 of the TC 31 meeting in Melbourne in 2011, the issuing of an Interpretation Sheet for IEC 60079-11:2011 (6th edition) was requested, in order to clarify the significance of the changes with respect to the 5th edition.

Question

What are the minor editorial, extensions, and major technical changes of the 6th edition with respect to the 5th edition?

Answer

The following table shows the significance of the changes.

The significance of the changes between IEC Standard, IEC 60079-11, Edition 5, 2006-07 and IEC 60079-11, Edition 6, 2011-06 are as listed below

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Significance of changes with respect to IEC 60079-11:2006

		Type		
Significant Changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
General: Changes to remove specific clause references to other IEC 60079 standards	General	x		
Scope: Expansion to include Group III	1		x	
Scope: Table 1 updated to include references to both IEC 60079-0 Edition 5 and Edition 6	1		x	
Normative references: Deletion of IEC 60079-27, and addition of IEC 61158-2 and IEC 62013-1	2	x		
Terms and definitions: Commonly used definitions moved to IEC 60079-0. Energy limitation definitions moved from IEC 60079-0.New definitions added	3	x		
Spark ignition compliance: Group III ignition requirements added	5.5		x	
Temperature for small components for Group I and Group II: Relocated to IEC 60079-0	5.6.2	x		
Intrinsically safe apparatus and component temperature for Group III	5.6.5		x	
Enclosures for Group I or Group II apparatus	6.1.2	x		
Apparatus complying with Annex F	6.1.2.3 c)	x		
Enclosures for Group III apparatus	6.1.3		x	
Requirements for connections and accessories for IS apparatus when located in the non-hazardous area	6.2.5			C1
Separation of conductive parts	6.3.2	x		
Encapsulation	6.6.1	x		
Encapsulation used for the exclusion of explosive atmospheres	6.6.2			C2
Primary and secondary cells and batteries	7.4.1		x	
Battery construction	7.4.2		x	
Level of Protection “ic”	8.1	x		
Filter capacitors	8.6.2		x	
Wiring, printed circuit board tracks, and connections	8.8 c)	x		
FISCO apparatus	9.2		x	
Handlights and caplights	9.3		x	
Circuits with both inductance and capacitance	10.1.5.2	x		
Electrolyte leakage test for cells and batteries	10.5.2	x		
Spark ignition and surface temperature of cells and batteries	10.5.3	x		
Determination of the acceptability of fuses requiring encapsulation	10.6.2		x	
Optical isolators tests	10.11		x	
Marking	12.1	x		
Encapsulation	Annex D			C2
Fieldbus intrinsically safe concept (FISCO) – Apparatus requirements	Annex G		x	
Ignition testing of semiconductor limiting power supply circuits	Annex H		x	

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Explanation of the Types of Significant 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.

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 – Requirements for external connections, other than battery charging connections, that are designed for use only when an explosive gas or dust atmosphere is not present, for example when in a non-hazardous area or when a gas-free permit is in force, have been added.

C2 – The requirements for encapsulation referenced in 6.6.2 and detailed in Annex D have been changed in terms of the thickness to the free surface and are extended related to moulding. Annex D is changed from informative to normative.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IEC 60079-11
Edition 6.0 2011-06

EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

INTERPRETATION SHEET 2

This interpretation sheet has been prepared by subcommittee 31G: Intrinsically-safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

The text of this interpretation sheet is based on the following documents:

ISH	Report on voting
31G/252/ISH	31G/254/RVD

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

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Interpretation of 6.2.5 – Requirements for connections and accessories for IS apparatus when located in the non-hazardous area

Question:

Does the first NOTE of 6.2.5 imply that equipment which may be connected to non-intrinsically safe connection facilities of intrinsically safe apparatus restricted to use in non-hazardous area need to be assessed applying IEC 60079-11, if the value of U_m is less than 250 V a.c.? Does this furthermore apply to equipment to be connected to non-intrinsically safe connection facilities of associated apparatus, if the value of U_m is less than 250 V a.c.?

Background:

The first NOTE of 6.2.5 requires in cases were U_m is specified less than 250 V a.c. that this should not be derived from unassessed equipment. This is sometimes read as if the requirements of IEC 60079-11 should be applied for voltage limitation to guarantee U_m.

Terminological entry 3.13.13 defines that U_m is the maximum voltage that can be applied to the non intrinsically safe connection facilities of associated apparatus without invalidating the

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type of protection. NOTE 1 of 3.13.13, as an example, explains that this may apply to connection facilities used for charging batteries.

In IEC 60079-11 there are no measures required for limiting the voltage of non I.S. circuits to the specified U_m value, except for the use of a single Zener diode protected by a fuse as an integral measure of an associated apparatus limiting the voltage which can appear at a transformer (8.3) or a coupler (8.9.2).

IEC 60079-14: 2013, 16.2.1 states:

Where U_m marked on the associated apparatus is less than 250 V it shall be installed in accordance with one of the following:

a) where U_m does not exceed 50 V a.c. or 120 V d.c., in an SELV or PELV system, or
b) via a safety isolating transformer complying with the requirements of IEC 61558-2-6, or technically equivalent standard, or
c) directly connected to apparatus complying with the IEC 60950 series, IEC 61010-1, or a technically equivalent standard, or
d) fed directly from cells or batteries.

Answer

No

IEC 60079-11 does not require measures to limit U_m where it is specified as 250 V a.c. which is guaranteed by the public power supply using standards other than IEC 60079-11. Similarly, IEC 60079-14 allows measures not compliant with IEC 60079-11 for limiting U_m to below 250 V a.c.

Therefore no assessment of the voltage supply according to IEC 60079-11 is necessary where U_m is specified less than 250 V a.c. provided that one of the measures allowed by IEC 60079-14:2013, 16.2.1 are applied.

NOTE This does not alter the requirement of the 3rd paragraph of 6.2.5 to assess, in accordance with IEC 60079-11, any protective circuitry located in the non-hazardous area accessory.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IEC 60079-11
Edition 6.0 2011-06

EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

INTERPRETATION SHEET 3

This interpretation sheet has been prepared by subcommittee 31G: Intrinsically-safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

The text of this interpretation sheet is based on the following documents:

ISH	Report on voting
31G/253/ISH	31G/255/RVD

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

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Question

Regarding IEC 60079-11:2011 Edition 6.0 (2011-06), some clauses specifically indicate whether or not the requirement is applicable or not applicable to level of protection “ic”. However, many other clauses include no indication one way or the other, resulting in potential inconsistencies when applied. In the interest of improving consistency, what are the requirements in IEC 60079-11:2011 Edition 6.0 (2011-06) that are applicable to level of protection “ic”?

Answer

In answering this question, the following considerations were taken:

1) Requirements in IEC 60079-11 Edition 6.0 (2011-06) indicating that the requirements are applicable to level of protection “ic” are considered “Applicable”;
2) Requirements in IEC 60079-11 Edition 6.0 (2011-06) indicating that the requirements are not applicable to level of protection “ic” are considered “Not applicable”;
3) Regarding requirements in IEC 60079-11 Edition 6.0 (2011-06) other than those referenced in 1) and 2) above:
   - determine if the intent of these requirements for levels of protection "ia" and "ib" is to address fault (abnormal) conditions; and

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- if the intent is to address fault (abnormal) conditions, then the requirements are considered not applicable for level of protection "ic".

Based on the above considerations, the following informative table (similar in concept to Annex B of IEC 60079-0:2011 on Ex Components) provides guidance regarding which requirements in IEC 60079-11 Edition 6.0 (2011-06) are applicable to level of protection “ic”.

Additional background

As additional background details, the following seven key issues of principle were taken into account when developing the above answer:

1) Objective of the original transfer of type of protection “nL” to “ic”: The objective of the original transfer of type of protection “nL” to “ic” (as first included in IEC 60079-11 Fifth Edition) was not to substantially revise the applicable requirements, except where the maintenance team MT 60079-11 made specific reference to level of protection “ic” in a given clause. Examples of this include 7.1, which simplifies the rating requirements for level of protection “ic” protective components from “nL” requirements; and 6.2.1, which increases the separation distances for level of protection “ic” terminals (to align with IEC 60079-14) from “nL” requirements. This objective approach is consistent with how the transfer of other IEC 60079-15 types of protection have been handled, and are still being handled in other IEC 60079 series standards.
2) Common applications of a level of protection “ic” circuit that protects an arcing part: The following are common applications of a level of protection “ic” circuit that protects an arcing part:
   - The circuit does not exit the device.
   - The circuit exits one device and is interconnected via a wiring method to another device, with both devices and the interconnecting wiring method being part of a system.
   - The circuit exits a device via a receptacle, with entity parameters provided for field connection to the receptacle.
   - The circuit exits a device via a terminal block, with entity parameters provided for field connection to the terminal block.

   For all the above applications, the level of protection "ic" circuit does not begin until after the last protective component that establishes the necessary voltage and current limitation. For other circuitry in the device, another type of protection, such as “nA” or “ec”, is applied. It is also possible for an entire apparatus to be only ”Ex ic”.
3) Remarks in the draft I-SH: In the draft I-SH, the intent is for all Remarks to only be for issues specific to level of protection “ic”. The few exceptions to this are for Remarks highlighting requirements that, while applicable to all types of protection “i”, represent a significant change in requirements from type of protection “nL” to “ic”.
4) Transient effects on level of protection “ic” circuits: For level of protection “ic” circuits, the effects of transients are only addressed for diode safety barriers. This is because connection of such barriers is to unspecified equipment. For other level of protection “ic” circuit applications, no additional evaluation is required regarding the effects of transients based on the following considerations:
   - the presence of an explosive atmosphere is only under abnormal conditions; and
   - the circuit complies with the applicable safety requirements of the relevant industrial standards.
5) Separation distances for level of protection “ic” circuits: Separation distances are only applicable to the level of protection “ic” circuit and to the protective components that establish the level of protection “ic” circuit. Where separation distances are required, separations that do not comply with the values of Table 5 or Annex F are to be shorted as part of the evaluation, if the shorting may impair intrinsic safety.

6) Protective components for level of protection “ic” circuits: Voltage and current limiting protective components comply with the applicable requirements for components on which intrinsic safety depends (e.g. 7.1).

7) IEC/TC 31 MT 60079-15 support: The MT 60079-15 convener has been involved in the development of the content of this I-SH, and supports it based on the current IEC 60079-11 Edition 6.0 (2011-06) text.

The following informative table provides guidance regarding which requirements in IEC 60079-11 Edition 6.0 (2011-06) are applicable to level of protection “ic”.

Informative guide for level of protection “ic” evaluations

NOTE 1 In some cases, where a clause is indicated as “Applicable” to level of protection “ic”, it is applicable in its entirety. In other cases, the clause is only applicable in part. Remarks are provided to indicate which parts of a given clause are applicable to level of protection “ic”, along with indicating general explanatory content regarding the application of the clause to level of protection “ic”.

NOTE 2 Where a clause is indicated as being not applicable, in its entirety or in part, consideration is still given regarding the applicability of other IEC 60079-11 and IEC 60079-0 clauses, including the applicable safety requirements of the relevant industrial standards in accordance with IEC 60079-0.

Clause	Requirement	Applicability	Remark
1	Scope	Applicable	
2	Normative references	Applicable	
3	Terms and definitions	Applicable	For “ic” circuits, Ui, Ii, Pi are maximum values possible in normal operation. Uo, Io, Po are determined in normal operation, but with the most onerous rated load for each case attached. Reduction of maximum voltage from Um can be achieved with a transformer that complies with the applicable requirements of this standard. The same equipment designed for “ic”, and also designed for “ia” or “ib”, can have different parameters for connection to “ic” circuits versus connection to “ia” or “ib” circuits. Even though these are all the same “type of protection”, just with varying EPLs, the requirements under “Multiple types of protection” in IEC 60079-0 applies.
4	Grouping and classification of intrinsically safe apparatus and associated apparatus	Applicable	While “nL” was only a Gc type of protection, “ic” is for both Gc and Dc.
5	Levels of protection and ignition compliance requirements of electrical apparatus		
5.1	General	Applicable	Opening, shorting and earthing of an “ic” circuit at output terminals intended for field wiring are considered normal operating conditions.
5.2	Level of protection "ia"	Not applicable	Addresses safety factors and fault conditions for "ia".
5.3	Level of protection "ib"	Not applicable	Addresses safety factors and fault conditions for "ib".
5.4	Level of protection "ic"	Applicable	A safety factor of 1.0 with no fault condition is applicable for "ic".
5.5	Spark ignition compliance	Applicable	
5.6	Thermal ignition compliance		
5.6.1	General	Applicable	Temperature testing is to be under worst case normal operating conditions.
5.6.2	Temperature for small components for Group I and Group II	Applicable	
5.6.3	Wiring within intrinsically safe apparatus for Group I and Group II	Applicable	Requirement is addressed by testing according to 5.6.1, or addressed according to the applicable safety requirements of the relevant industrial standards.

Clause	Requirement	Applicability	Remark
5.6.4	Tracks on printed circuit boards for Group I and Group II	Applicable	Requirement is addressed by testing according to 5.6.1, or addressed according to the applicable safety requirements of the relevant industrial standards.
5.6.5	Intrinsically safe apparatus and component temperature for Group III	Applicable	Temperature classification to be based on the temperature of the surface exposed to dust.
5.7	Simple apparatus	Applicable	
6	Apparatus construction		
6.1	Enclosures	Applicable	
6.2	Facilities for connection of external circuits		
6.2.1	Terminals	Applicable	NOTE As with “ia” and “ib”, due to IEC 60079-14 installation requirements, circuits that exit a piece of equipment via a terminal block, with entity parameters provided for field connection to the terminal block, maintain the following: – at least 50 mm separation distance between terminals for “ic” circuits and terminals for non-intrinsically safe circuits. – at least 6 mm separation distance between terminals for separate intrinsically safe circuits. – at least 3 mm separation distance between terminals for intrinsically safe circuits and earthed parts, if connection to earth has not been considered in the safety analysis. This separation distance requirement is different from previous Ex “nL” requirements.
6.2.2	Plugs and sockets	Applicable	
6.2.3	Determination of maximum external inductance to resistance ratio (L_o/R_o) for resistance limited power source	Applicable	
6.2.4	Permanently connected cable	Applicable	
6.2.5	Requirements for connections and accessories for IS apparatus when located in the non-hazardous area	Applicable	Applicable except regarding protective circuitry for functions such as charging in the non-hazardous area. As there is no application of faults, the ratings of components may be ensured without additional protection.
6.3	Separation distances		
6.3.1	General	Applicable	Applicable to “ic” circuit and protective components only. Where separation distances are less than required, they are to be shorted if the shorting may impair intrinsic safety. NOTE For example, an "ic" circuit is the circuit after the last protective component that establishes the necessary voltage and current limitation.

Clause	Requirement	Applicability	Remark
6.3.2	Separation of conductive parts	Applicable	Applicable to "ic" circuit and protective components only. Any use of an interposing insulating partition or earthed metallic partition is only required to comply with the safety requirements of the relevant industrial standard.
6.3.2.1	Distances according to Table 5	Applicable	Regarding transformers, only applicable between external connections. Remaining construction features of transformers are only required to comply with the applicable safety requirements of the relevant industrial standards.
6.3.2.2	Distances according to Annex F	Applicable	Regarding transformers, only applicable between external connections. NOTE Remaining construction features of transformers are only required to comply with the applicable safety requirements of the relevant industrial standard. Through solid insulation of conductors are required to comply with Table 5.
6.3.3	Voltage between conductive parts	Applicable	For “ic”, the effects of transients are only addressed for diode safety barriers because connection is to unspecified equipment. For other “ic” applications, no additional evaluation is required regarding the effects of transients based on the following considerations: • The presence of an explosive atmosphere is not likely to occur in normal operation. • The circuit complies with the applicable safety requirements of the relevant industrial standards. Where separation of conductive parts is required, separations that do not comply with the values of Table 5 or Annex F may be shorted as part of the evaluation if it may impair intrinsic safety.
6.3.4	Clearance	Not Applicable	Any use of an interposing insulating partition or earthed metallic partition is only required to comply with the safety requirements of the relevant industrial standard. See 6.3.2.
6.3.5	Separation distances through casting compound	Applicable	
6.3.6	Separation distances through solid insulation	Applicable	
6.3.7	Composite separations	Applicable	Applicable, except regarding the 1/3 restriction for composite separations, as this restriction is based on fault considerations.
6.3.8	Creepage distance	Applicable	Applicable, except regarding the 1/3 restriction for composite separations, and the partition restrictions above 1,575 V. Any use of an interposing insulating partition or earthed metallic partition shall comply with the safety requirements of the relevant industrial standard. See 6.3.2.
6.3.9	Distance under coating	Applicable	

Clause	Requirement	Applicability	Remark
6.3.10	Requirements for assembled printed circuit boards	Applicable	Applicable, except for consideration of the body of a component as being an uninsulated live part. For example, a component mounted over or adjacent to tracks as defined in c) is not considered as connected to the track.
6.3.11	Separation by earthed screens	Applicable	Where separation distances to the earthed screen do not comply with the required separation distances to earth, the screen is to be capable of carrying the maximum possible current to which it could be continuously subjected (such as a short to earth).
6.3.12	Internal wiring	Applicable	
6.3.13	Dielectric strength requirement	Applicable	Applicable, except for the additional dielectric strength testing in the 3rd paragraph. Regarding the 2nd paragraph, only applicable to insulation or insulating components. Additional dielectric testing is not required between level of protection "ic" and other circuits, or between separate level of protection "ic" circuits. This aligns with previous level of protection "nL" requirements. NOTE Dielectric test requirements of other applicable standards may still apply (such as the relevant industrial standards).
6.3.14	Relays	Applicable	Applicable only regarding requirement for relay to be used within its rating. NOTE Requirements for dielectric and separation distances are still addressed, along with applicable safety requirements of the relevant industrial standards.
6.4	Protection against polarity reversal	Applicable	
6.5	Earth conductors, connections and terminals	Applicable	Earthing requirements in the 1st paragraph are only applicable if earth is necessary for "ic" circuit. Requirements for earthing are suitably addressed by the applicable safety requirements of the relevant industrial standards. Requirements in 2nd paragraph only applicable to level of protection "ia" and level of protection "ib". A single connection is sufficient for level of protection ‘ic’.
6.6	Encapsulation	Applicable	Applicable only if relying on encapsulation to exclude the atmosphere so as to reduce separation distances, or reduce the ignition capability of hot components. No short conditions are applied unless separation distances are less than required values so as to impair intrinsic safety (see Annex D).
7	Components on which intrinsic safety depends		
7.1	Rating of components	Applicable	For voltage and current, this clause simplifies the rating requirements for “ic” protective components from “nL” requirements. NOTE The concept of a component having a defined "failure mode such that protection is maintained" as an alternative to de-rating (as existed for "nL") does not exist for "ic".

Clause	Requirement	Applicability	Remark
7.2	Connectors for internal connections, plug-in cards and components	Applicable	Applicable except for requirement regarding incorrect connection of internal plug-in connections in the 1st paragraph, and the open circuit failure of a connection requirement in the 2nd paragraph. While interchangeability is a concern for external connections due to field error, it is not considered an “ic” concern for internal connections. Production control and proper service expectations can address internal applications. Open circuit failure of a connection requirement is not applicable because faults are not considered for ‘ic’. Both are not considered a normal operations condition (see 6.5).
7.3	Fuses	Applicable	Where an “ic” circuit depends upon a fuse **and** where the fuse is directly connected to the mains **and** where the fuse is also directly connected to a circuit that is considered normally subject to overloading or shorting (such as output field wiring receptacles or terminals), the breaking capacity of such a fuse is based upon the prospective short circuit current of the mains supply. A diode safety barrier would be a common example of such an application involving output field wring terminals. The prospective short-circuit current of a 250 V mains supply is considered to not be greater than 1 500 A.”
7.4	Primary and secondary cells and batteries	Applicable	For both apparatus and associated apparatus, when such involves more than type of protection “ic” (such as ‘ic nA’ apparatus or ‘nA [ic]’ associated apparatus), connection of cells and batteries in parallel for ‘ic’ is only permitted in the ‘ic’ circuit provided that intrinsic safety is not impaired.
7.5	Semiconductors		
7.5.1	Transient effects	Applicable	For “ic”, the effects of transients are only addressed for diode safety barriers because connection is to unspecified equipment. For other “ic” applications, no additional evaluation is required regarding the effects of transients based on the following considerations: • The presence of an explosive atmosphere not likely to occur in normal operation. • The circuit complies with the applicable safety requirements of the relevant industrial standards. NOTE Semiconductors serving as protective components in "ic" circuits are required to comply with the applicable requirements elsewhere in this standard.

Clause	Requirement	Applicability	Remark
7.5.2	Shunt voltage limiters	Applicable	For “ic”, the effects of transients are only addressed for diode safety barriers because connection is to unspecified equipment. For other “ic” applications, no additional evaluation is required regarding the effects of transients based on the following considerations: • The presence of an explosive atmosphere is not likely to occur in normal operation. • The circuit complies with the applicable safety requirements of the relevant industrial standards. For level of protection ‘ic’, a single semiconductor is sufficient.
7.5.3	Series current limiters	Applicable	For level of protection “ic” a single semiconductor is sufficient.
7.6	Failure of components, connections and separations	Applicable	Applicable except for "ia" and "ib" requirements in 2nd paragraph, and infallible connections requirements in 5th and 6th paragraphs.
7.7	Piezo-electric devices	Applicable	Applicable only if the piezo-circuit can be directly shorted (for example due to non-compliant spacings or sparking components) (see 10.7). NOTE The potential for the enclosure to be impacted is a normal operating condition, and therefore is applicable to "ic".
7.8	Electrochemical cells for the detection of gases	Applicable	
8	Infallible components, infallible assemblies of components and infallible connections on which intrinsic safety depends	Not applicable	According to 8.1, Clause 8, in its entirety, does not apply for "ic" circuits.
9	Supplementary requirements for specific apparatus		
9.1	Diode safety barriers	Applicable	For “ic”, the effects of transients are addressed for diode safety barriers because connection is to unspecified equipment. NOTE Earthing requirements are applicable to “ic” due to the earthing requirements of intrinsically safe circuits in IEC 60079-14.
9.2	FISCO apparatus	Applicable	
9.3	Handlights and caplights	Applicable	
10	Type verifications and type tests		
10.1	Spark ignition test	Applicable	A safety factor of 1.0 with no countable or non-countable fault conditions is applicable for "ic".
10.2	Temperature tests	Applicable	Applicable except for non-linear concerns in the last line of the 1st paragraph, which would require mandatory testing of components with non-linear aspects in the actual rated ambient. Such an approach to testing is not applicable for "ic" circuits, and is only to be an option.
10.3	Dielectric strength tests	Applicable	See 6.3.13.

Clause	Requirement	Applicability	Remark
10.4	Determination of parameters of loosely specified components	Applicable	
10.5	Tests for cells and batteries	Applicable	Applicable except short circuit testing is only to be considered at points external to the cell or battery where the required separation distances are not met. Where temperature rise testing of the cells and batteries is required, only one sample need be subjected to the testing.
10.6	Mechanical tests		
10.6.1	Casting compound	Applicable	Force and impact testing is applicable to casting compounds that complete enclosures. As such, this is a normal operating conditions concern, and the testing is therefore applicable to "ic".
10.6.2	Determination of the acceptability of fuses requiring encapsulation	Applicable	While encapsulation of fuses for “ic” is not generally required, the concern regarding encapsulation flowing within the chamber of a fuse, and preventing the element to open, does reflect a normal operating conditions concern, and therefore is applicable to "ic" circuits (also see 7.3). NOTE One example of such a concern is for glass cartridge fuses.
10.6.3	Partitions	Not applicable	Any use of an interposing insulating partition or earthed metallic partition is only required to comply with the safety requirements of the relevant industrial standard.
10.7	Tests for intrinsically safe apparatus containing piezoelectric devices	Applicable	Applicable only if the piezo-circuit can be directly shorted (for example due to non-compliant spacings or sparking components)(see 7.7). NOTE The potential for the enclosure to be impacted is a normal operating condition, and therefore is applicable to "ic".
10.8	Type tests for diode safety barriers and safety shunts	Applicable	For level of protection “ic”, the effects of transients are to be addressed for diode safety barriers because connection is to unspecified equipment. (See 7.5.1)
10.9	Cable pull test	Applicable	
10.10	Transformer tests	Not applicable	This testing is required by 8.2.4, which is explicitly waived for "ic" circuits. NOTE Applicable safety requirements of the relevant industrial standards still apply.
10.11	Optical isolators tests	Not applicable	This testing is required by 8.9.2, which is explicitly waived for "ic" circuits. NOTE Applicable safety requirements of the relevant industrial standards still apply.
10.12	Current carrying capacity of infallible printed circuit board connections	Not applicable	This testing is required by 8.8, which is explicitly waived for "ic" circuits.
11	Routine verifications and tests		
11.1	Routine tests for diode safety barriers		
11.1.1	Completed barriers	Applicable	NOTE Removable links are not generally needed for level of protection “ic” safety barriers.

Clause	Requirement	Applicability	Remark
11.1.2	Diodes for 2-diode "ia" barriers	Not applicable	This testing is applicable only to "ia" circuits.
11.2	Routine tests for infallible transformers	Not applicable	This testing is required by 8.2.5, which is explicitly waived for "ic" circuits.
12	Marking	Applicable	Where it is necessary to include marking from one of the other methods of protection listed in IEC 60079-0, the symbol “ic” shall occur first.
13	Documentation	Applicable	Where “ic” live maintenance procedures are specified by the manufacturer in the instructions provided, the effects of this live maintenance do not invalidate intrinsic safety under both normal operating conditions and under conditions that may reasonably be considered to occur during live maintenance.
Annex A (normative)	Assessment of intrinsically safe circuits	Applicable	
Annex B (normative)	Spark test apparatus for intrinsically safe circuits	Applicable	
Annex C (informative)	Measurement of creepage distances, clearances and separation distances through casting compound and through solid insulation		
Annex D (normative)	Encapsulation	Applicable	Applicable only if relying on encapsulation to exclude the atmosphere so as to reduce separation distances, or reduce the ignition capability of hot components. No fault conditions are applied unless separation distances are less than required values (see 6.6.2).
Annex E (informative)	Transient energy test		
Annex F (normative)	Alternative separation distances for assembled printed circuit boards and separation of components	Applicable	Regarding transformers, only applicable between external connections. NOTE Remaining construction features of transformers are required to only comply with the applicable safety requirements of the relevant industrial standard. Through solid insulation of conductors are required to comply with Table 5.
Annex G (normative)	Fieldbus intrinsically safe concept (FISCO) - Apparatus requirements	Applicable	
Annex H (informative)	Ignition testing of semiconductor limiting power supply circuits		

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IEC 60079-11

Edition 6.0 2011-06

EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

INTERPRETATION SHEET 4

This interpretation sheet has been prepared by subcommittee 31G: Intrinsically-safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

The text of this interpretation sheet is based on the following documents:

DISH	Report on voting
31G/293/DISH	31G/296/RVD

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

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The wording in the intrinsic safety standard, IEC 60079-11 (2011), with respect to the enclosure requirements for intrinsically safe apparatus for Group III where the separation is accomplished by meeting the requirements for clearance or creepage distances of Table 5 or Annex F, according to Subclause 6.1.3a), is ambiguous. This observation may lead to different interpretation by different test laboratories.

This issue was discussed at the Busan, Republic of Korea meeting of the MT in October 2018. The MT agreed at that meeting that this interpretation should also be applied to IEC 60079-11:2011.

Because the title of Subclause 6.1.2.3 is “Apparatus complying with Annex F”, an interpretation has been made that the additional tests required by 6.1.2.3a) only apply when Annex F is used. The potential for compromising infallible creepage and clearance distances exists when Annex F is applied, but also exist when Table 5 is applied.

IEC 60079-11:2011-06/ISH4:2019-04(en-fr)

The wording of IEC 60079-11 is:

6.1.3 Enclosures for Group III apparatus

Where the intrinsic safety of intrinsically safe apparatus can be impaired by ingress of dust or by access to conducting parts, for example if the circuits contain infallible creepage distances, an enclosure is necessary by one of the following:

a) Where separation is accomplished by meeting the requirements for clearance or creepage distances of Table 5 or Annex F, the enclosure shall provide a degree of protection of at least IP5X, according to IEC 60529. For such enclosures the [*requirements of*] 6.1.2.3 a) shall additionally apply.

The text of the referenced clause is:

6.1.2.3 Apparatus complying with Annex F

Apparatus meeting the separation requirements of Tables F.1 or F.2 shall be provided with protection to achieve pollution degree 2. This can be achieved by one of the following:

a) an enclosure meeting the requirements of IP54 or greater according to the intended use and environmental conditions in accordance with IEC 60529. For such enclosures the clauses of IEC 60079-0 identified in Table 1 additionally apply.

Question

For Groups IIIA, IIIB, and IIIC, where Annex F is not applied and the creepage or clearance distances of Table 5, Column 2 or Column 5 are relied upon for intrinsic safety, do all the applicable enclosure requirements of IEC 60079-0 listed in Table 1, including thermal endurance and resistance to impact, apply?

Interpretation

Yes, for Groups IIIA, IIIB, IIIC, the “Tests of enclosures” requirements of IEC 60079-0 apply for intrinsically safe apparatus for which the creepage and clearance distances are assessed against either Table 5 or Annex F.

This does not apply where the separations are protected by means other than an enclosure, such as encapsulation or conformal coating as described in 6.1.3b) of IEC 60079-11.

NOTE These tests are specified in the following subclauses of IEC 60079-0:2011; 6.2, 6.5, 7.1.1, 7.1.2.1, 7.1.2.2, 7.1.2.3, 7.2, 7.3, 12, 16, 26.4.1, 26.4.1.1, 26.4.1.2, 26.4.1.2.1, 26.4.1.2.2, 26.4.2, 26.4.3, 26.4.4, 26.5.2, 26.7, 26.8, 26.9, 26.10, 26.16, as well as Annex C and Annex F.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IEC 60079-11

Edition 6.0 2011-06

EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

INTERPRETATION SHEET 5

This interpretation sheet has been prepared by subcommittee 31G: Intrinsically-safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

The text of this interpretation sheet is based on the following documents:

DISH	Report on voting
31G/306/DISH	31G/308/RVDISH

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

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BACKGROUND

As stated in the scope of Edition 6 of IEC 60079-11 (2011), the standard supplements and modifies the general requirements of IEC 60079-0. Subsequent to the publication of Edition 6 of IEC 60079-11, IEC 60079-0 was revised. The revised version of IEC 60079-0 (Edition 7:2017) now contains the 200 mm dust blanketing temperature test for Group III Da equipment (Subclause 5.3.2.3.1), relocated from IEC 60079-18 and IEC 60079-31.

QUESTIONS

1) Does the alternative approach of IEC 60079-11:2011 for equipment with components dissipating less power than given in Table 4 and with continuous short-circuit current less than 250 mA still apply when assessing according to IEC 60079-0:2017?
2) Is it necessary to conduct the 200 mm dust blanket temperature testing of Group III EPL Da intrinsically safe apparatus when applying IEC 60079-0:2017 in situations where the power limits of IEC 60079-11:2011 Table 4 are exceeded?

IEC 60079-11:2011-06/ISH5:2019-08(en)

ICS 29.260.20

ANSWER

1) Yes. The requirement of IEC 60079-0 is modified by the requirement of IEC 60079-11 and the requirements of IEC 60079-11 take precedence over IEC 60079-0.

2) Yes.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IEC 60079-11

Edition 6.0 2011-06

EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

INTERPRETATION SHEET 6

This interpretation sheet has been prepared by subcommittee 31G: Intrinsically-safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

The text of this interpretation sheet is based on the following documents:

DISH	Report on voting
31G/311/DISH	31G/314/RVDISH

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

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Background

The second and third paragraphs of IEC 60079-11:2011, Subclause 10.5.3 b) state the following:

The maximum surface temperature shall be determined as follows:

For "ia" and "ib" all current-limiting devices external to the cell or battery shall be short-circuited for the test. The test shall be carried out both with internal current-limiting devices in circuit and with the devices short-circuited using 10 cells in each case. The 10 samples having the internal current-limiting devices short-circuited shall be obtained from the cell/battery manufacturer together with any special instructions or precautions necessary for safe use and testing of the samples. If the internal current limiting devices protect against internal shorts then these devices need not be removed. However, such devices shall only be considered for Level of Protection "ib".

The intent of the cited paragraphs is to simulate an internal short inside a cell, by shorting the cell's external terminals for the purpose of thermal assessment.

IEC 60079-11:2011-06/ISH6:2019-12(en-fr)

It was found that two details have been misinterpreted in these paragraphs:

a) The subjects of the paragraphs are cells or batteries, while the intent is clearly to simulate internal shorts inside cells and not inside batteries in which case the shorts could be interpreted as being external to the cell(s) within a battery.

b) It is unclear what constitutes a current limiting device that protects against internal shorts.

A separator with shutdown function may be interpreted as a current limiting device that protects against internal shorts by its function, but since it is a constructional part of the cell that is not removable without invalidating the functionality of the basic cell, it is not a current limiting device for the purposes of implementing the standard. Conversely, a CID (Current interruption device), for example, is a switch that is triggered by increased pressure inside the cell, and the cell's functionality is not invalidated by the absence of the CID.

The reference to internal current limiting devices that protect against internal shorts in edition 6 was included to address unknown future cell technologies which could include such current limiting devices, however at this time no such current limiting devices are known.

Question

For either Level of Protection "ia" or "ib", what are the current limiting devices that are required to be disabled (or equivalent e.g. not fitted, short-circuited or removed) by IEC 60079-11:2011, Subclause 10.5.3 b), and what are the current limiting devices that need not be disabled?

Answer

All discrete protective devices that can be schematically represented as individual devices apart from the cell are to be disabled for the purposes of testing according to IEC 60079-11:2011, Subclause 10.5.3 b), regardless if they are located inside the cell or if they are external to the cell. This includes, but is not limited to resistors, fuses, resettable fuses (NTC, PTC, PPTC), CID (current interruption device), semiconductors, etc.

Features that provide essential cell functions, such as a separator with shutdown function or the ohmic resistance of the electrolyte, are not considered current limiting devices in the sense of this clause and need not be shorted or removed, and such cells can be considered for Level of Protection "ia".

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EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

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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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60079-11 has been prepared by subcommittee 31G: Intrinsically safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

This sixth edition cancels and replaces the fifth edition of IEC 60079-11 published in 2006, the first edition of IEC 61241-11 published in 2005, and the new Annex G replaces the apparatus requirements of the second edition of IEC 60079-27 published in 2008. This sixth edition constitutes a technical revision of these publications.

NOTE IEC 60079-25 cancels and replaces the remaining subject matter of IEC 60079-27.

The significant changes with respect to the previous edition are listed below:

- Inclusion of non-edition specific references to IEC 60079-0.
- The merging of the apparatus requirements for FISCO from IEC 60079-27.
- The merging of the requirements for combustible dust atmospheres from IEC 61241-11.
- Clarification of the requirements for accessories connected to intrinsically safe apparatus; such as chargers and data loggers.
- Addition of new test requirements for opto-isolators.
- Introduction of Annex H about ignition testing of semiconductor limiting power supply circuits.

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

FDIS	Report on voting
31G/207/FDIS	31G/213/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 standard supplements and modifies the general requirements of IEC 60079-0, except as indicated in Table 1 (see Scope).

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 60079 series, 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.

The contents of the corrigendum of January 2012, the interpretation sheet 1 of October 2014, the interpretation sheet 2 and 3 of July 2016, 4 of April 2019 5 of August 2019 and 6 of December 2019 have been included in this copy.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

NEW EXPLOSIVE ATMOSPHERES –

Part 11: Equipment protection by intrinsic safety "i"

1 Scope

This part of IEC 60079 specifies the construction and testing of intrinsically safe apparatus intended for use in an explosive ~~gas~~ atmosphere and for associated apparatus, which is intended for connection to intrinsically safe circuits which enter such atmospheres.

This type of protection is applicable to electrical ~~apparatus~~ equipment in which the electrical circuits themselves are incapable of causing an explosion in the surrounding explosive atmospheres.

This standard is also applicable to electrical ~~apparatus~~ equipment or parts of electrical ~~apparatus~~ equipment located outside the explosive ~~gas~~ atmosphere or protected by another Type of Protection listed in IEC 60079-0, where the intrinsic safety of the electrical circuits in the explosive ~~gas~~ atmosphere may depend upon the design and construction of such electrical ~~apparatus~~ equipment or parts of such electrical ~~apparatus~~ equipment. The electrical circuits exposed to the explosive ~~gas~~ atmosphere are evaluated for use in such an atmosphere by applying this standard.

The requirements for intrinsically safe systems are provided in IEC 60079-25. ~~The requirements for intrinsically safe concepts for fieldbus are provided in IEC 60079-27.~~

This standard supplements and modifies the general requirements of IEC 60079-0, except as indicated in Table 1. Where a requirement of this standard conflicts with a requirement of IEC 60079-0, the requirements of this standard shall take precedence.

If requirements in this standard are applicable to both intrinsically safe apparatus and associated apparatus the term “apparatus” is used throughout the standard.

This standard is for electrical equipment only; therefore the term “equipment” used in the standard always means “electrical equipment”.

If associated apparatus is placed in the explosive ~~gas~~ atmosphere, it ~~must~~ shall be protected by an appropriate Type of Protection listed in IEC 60079-0, and then the requirements of that method of protection together with the relevant parts of IEC 60079-0 also apply to the associated apparatus.

Table 1 – ~~Exclusion~~ Applicability of specific clauses of IEC 60079-0

~~Clause or subclause of IEC 60079-0~~		~~Intrinsically safe apparatus~~	~~Associated apparatus~~
~~4.2.2~~	~~Group II – Surface temperature marking~~	~~Applies~~	~~Excluded~~
~~5.3~~	~~Maximum surface temperature~~	~~Applies~~	~~Excluded~~
~~5.4~~	~~Surface temperature and ignition temperature~~	~~Applies~~	~~Excluded~~
~~5.5~~	~~Small components~~	~~Applies~~	~~Excluded~~
~~6.3~~	~~Opening times~~	~~Excluded~~	~~Excluded~~
~~7.1.1~~	~~Applicability~~	~~Applies~~	~~Excluded~~
~~7.1.2~~	~~Specification of materials~~	~~Applies~~	~~Excluded~~

Clause or subclause of IEC 60079-0		Intrinsically safe apparatus	Associated apparatus
7.1.3*	Plastic materials	Excluded	Excluded
7.2*	Thermal endurance	Excluded	Excluded
7.3	Electrostatic charges on external non-metallic materials of enclosures	Applies	Excluded
7.3.2	Avoidance of a build-up electrostatic charge	Applies	Excluded
7.4	Threaded holes	Excluded	Excluded
8.1	Material composition	Applies	Excluded
8.2	Threaded holes	Excluded	Excluded
9	Fasteners	Excluded	Excluded
10	Interlocking devices	Excluded	Excluded
11	Bushings	Excluded	Excluded
12	Materials used for cementing	Excluded	Excluded
14	Connection facilities and terminal compartments	Excluded	Excluded
15	Connection facilities for earthing or bonding conductors	Excluded	Excluded
16.5	Conductor temperature	Excluded	Excluded
17	Supplementary requirements for rotating electrical machines	Excluded	Excluded
18	Supplementary requirements for switchgear	Excluded	Excluded
19	Supplementary requirements for fuses	Excluded	Excluded
20	Supplementary requirements for plugs and sockets	Excluded	Excluded
21	Supplementary requirements for luminaires	Excluded	Excluded
22	Supplementary requirements for caplights and handlights	Excluded	Excluded
23.1	Batteries	Applies	Excluded
26.4	Tests of enclosures	Applies	Excluded
26.5.1	Temperature measurement	Applies	Excluded
26.5.2	Thermal shock test	Excluded	Excluded
26.5.3	Small component ignition test	Applies	Excluded
26.6	Torque test for bushings	Excluded	Excluded
26.7*	Non-metallic enclosures or non-metallic parts of enclosures	Excluded	Excluded
26.8*	Thermal endurance to heat	Excluded	Excluded
26.9*	Thermal endurance to cold	Excluded	Excluded
26.10*	Resistance to light	Excluded	Excluded
26.11*	Resistance to chemical agents for Group I electrical apparatus	Excluded	Excluded
26.12	Earth continuity	Excluded	Excluded
26.13	Surface resistance test of parts of enclosures or non-metallic materials	Applies	Excluded
26.14	Charging tests	Applies	Excluded
26.15	Measurement of capacitance	Applies	Excluded
Annex A	Ex cable glands	Excluded	Excluded
* indicates that these requirements apply for 6.1.2a) only.			

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (2007) (informative)	Ed. 6.0 (2011) (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
1	1	Scope	Applies	Applies	Applies
2	2	Normative references	Applies	Applies	Applies
3	3	Terms and definitions	Applies	Applies	Applies
4	4	Equipment grouping	Applies	Applies	Applies
4.1	4.1	Group I	Applies	Excluded	Applies
4.2	4.2	Group II	Applies	Excluded	Applies
4.3	4.3	Group III	Excluded	Applies	Applies
4.4	4.4	Equipment for a particular explosive atmosphere	Applies	Applies	Applies
5.1	5.1	Environmental influences	Applies	Applies	Applies
5.1.1	5.1.1	Ambient temperature	Applies	Applies	Applies
5.1.2	5.1.2	External source of heating or cooling	Applies	Applies	Applies
5.2	5.2	Service temperature	Applies	Applies	Applies
5.3.1	5.3.1	Determination of maximum surface temperature	Applies	Applies	Excluded
5.3.2.1	5.3.2.1	Group I electrical equipment	Applies	Excluded	Excluded
5.3.2.2	5.3.2.2	Group II electrical equipment	Applies	Excluded	Excluded
5.3.2.3	5.3.2.3	Group III electrical equipment	Excluded	Applies	Excluded
5.3.3	5.3.3	Small component temperature for Group I or Group II electrical equipment	Applies	Excluded	Excluded
6.1	6.1	General	Applies	Applies	Applies
6.2	6.2	Mechanical strength of equipment	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
6.3	6.3	Opening times	Excluded	Excluded	Excluded
6.4	6.4	Circulating currents in enclosures (e.g. of large electrical machines)	Excluded	Excluded	Excluded
6.5	6.5	Gasket retention	Excluded except when 6.1.2.3a)is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
6.6	6.6	Electromagnetic and ultrasonic radiating equipment	Applies	Applies	Excluded
7.1.1	7.1.1	Applicability	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
7.1.2	7.1.2.1	Specification of materials	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied

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Ed. 5.0 (2007) (informative)	Ed. 6.0 (2011) (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
7.1.3	7.1.2.2	Plastic materials	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
7.1.4	7.1.2.3	Elastomers	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
7.2	7.2	Thermal endurance	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
7.3	7.3	Resistance to light	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
7.4	7.4	Electrostatic charges on external non-metallic materials	Applies	Applies	Excluded
NR	7.5	Accessible metal parts	Applies	Applies	Excluded
7.5	NR	Threaded holes	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
8.1	8.1	Material composition	Applies	Applies	Excluded
8.1.1	8.2	Group I	Applies	Excluded	Excluded
8.1.2	8.3	Group II	Applies	Excluded	Excluded
8.1.3	8.4	Group III	Excluded	Applies	Excluded
8.2	NR	Threaded holes	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
9	9	Fasteners	Excluded	Excluded	Excluded
10	10	Interlocking devices	Excluded	Excluded	Excluded
11	11	Bushings	Excluded	Excluded	Excluded
12	12	Materials used for cementing	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
13	13	Ex Components	Applies	Applies	Applies
14	14	Connection facilities and termination compartments	Excluded	Excluded	Excluded
15	15	Connection facilities for earthing or bonding conductors	Excluded	Excluded	Excluded
16	16	Entries into enclosures	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
17	17	Supplementary requirements for rotating machines	Excluded	Excluded	Excluded
18	18	Supplementary requirements for switchgear	Excluded	Excluded	Excluded
19	19	Supplementary requirements for fuses	Excluded	Excluded	Excluded

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
			Intrinsically safe apparatus		Associated apparatus
Ed. 5.0 (2007) (informative)	Ed. 6.0 (2011) (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
20	20	Supplementary requirements for plugs, socket outlets and connectors	Excluded	Excluded	Excluded
21	21	Supplementary requirements for luminaires	Excluded	Excluded	Excluded
22	22	Supplementary requirements for caplights and handlights	Modified	Modified	Excluded
23.1	23.1	General	Applies	Applies	Applies
23.2	23.2	Batteries	Excluded	Excluded	Excluded
23.3	23.3	Cell types	Applies	Applies	Applies
23.4	23.4	Cells in a battery	Applies	Applies	Applies
23.5	23.5	Ratings of batteries	Applies	Applies	Applies
23.6	23.6	Interchangeability	Applies	Applies	Applies
23.7	23.7	Charging of primary batteries	Applies	Applies	Applies
23.8	23.8	Leakage	Applies	Applies	Applies
23.9	23.9	Connections	Applies	Applies	Applies
23.10	23.10	Orientation	Applies	Applies	Applies
23.11	23.11	Replacement of cells or batteries	Applies	Applies	Applies
23.12	23.12	Replaceable battery pack	Applies	Applies	Applies
24	24	Documentation	Applies	Applies	Applies
25	25	Compliance of prototype or sample with documents	Applies	Applies	Applies
26.1	26.1	General	Applies	Applies	Applies
26.2	26.2	Test configuration	Applies	Applies	Applies
26.3	26.3	Tests in explosive test mixtures	Applies	Applies	Applies
26.4.1	26.4.1	Order of tests	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.4.1.1	26.4.1.1	Metallic enclosures, metallic parts of enclosures and glass parts of enclosures	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.4.1.2	26.4.1.2	Non-metallic enclosures or non-metallic parts of enclosures	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.4.1.2.1	26.4.1.2.1	Group I electrical equipment	Excluded except when 6.1.2.3a) is applied	Excluded	Excluded except when 6.1.2.3a) is applied
26.4.1.2.2	26.4.1.2.2	Group II and Group III electrical equipment	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied

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Ed. 5.0 (2007) (informative)	Ed. 6.0 (2011) (informative)	Clause / Subclause title (normative)	Group I and Group II	Group III	
26.4.2	26.4.2	Resistance to impact	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.4.3	26.4.3	Drop test	Applies	Applies	Excluded except when 6.1.2.3a) is applied
26.4.4	26.4.4	Acceptance criteria	Applies	Applies	Excluded except when 6.1.2.3a) is applied
26.4.5	26.4.5	Degree of protection (IP) by enclosures	Applies	Applies	Applies
26.5.1.1	26.5.1.1	General	Applies	Applies	Excluded
26.5.1.2	26.5.1.2	Service temperature	Modified	Modified	Modified
26.5.1.3	26.5.1.3	Maximum surface temperature	Modified	Modified	Modified
26.5.2	26.5.2	Thermal shock test	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.5.3	26.5.3	Small component ignition test (Group I and Group II)	Applies	Excluded	Excluded
26.6	26.6	Torque test for bushings	Excluded	Excluded	Excluded
26.7	26.7	Non-metallic enclosures or non-metallic parts of enclosures	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.8	26.8	Thermal endurance to heat	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.9	26.9	Thermal endurance to cold	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.10	26.10	Resistance to light	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
26.11	26.11	Resistance to chemical agents for Group I electrical equipment	Excluded except when 6.1.2.3a) is applied	Excluded	Excluded
26.12	26.12	Earth continuity	Excluded	Excluded	Excluded
26.13	26.13	Surface resistance test of parts of enclosures of non-metallic materials	Applies	Applies	Excluded
26.15	26.14	Measurement of capacitance	Applies	Applies	Excluded
NR	26.15	Verification of ratings of ventilating fans	Excluded	Excluded	Excluded
NR	26.16	Alternative qualification of elastomeric sealing O-rings	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
27	27	Routine tests	Applies	Applies	Applies
28	28	Manufacturer's responsibility	Applies	Applies	Applies
29	29	Marking	Applies	Applies	Applies

Clause or subclause of IEC 60079-0			IEC 60079-0 clause application to IEC 60079-11		
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30	30	Instructions	Applies	Applies	Applies
Annex A (Normative)	Annex A (Normative)	Supplementary requirements for cable glands	Excluded	Excluded	Excluded
Annex B (Normative)	Annex B (Normative)	Requirements for Ex Components	Applies	Applies	Applies
Annex C (Informative)	Annex C (Informative)	Example of rig for resistance to impact test	Applies	Applies	Excluded except when 6.1.2.3a) is applied
Annex D (Informative)	NR	Alternative risk assessment method encompassing "equipment protection levels" for Ex equipment	Applies	Applies	Applies
Annex E (Informative)	Annex D (Informative)	Motors supplied by converters	Excluded	Excluded	Excluded
NR	Annex E (Informative)	Temperature rise testing of electric machines	Excluded	Excluded	Excluded
NR	Annex F (Informative)	Guideline flowchart for tests of non-metallic enclosures or non-metallic parts of enclosures (26.4)	Excluded except when 6.1.2.3a) is applied	Excluded except when 6.1.3 a) is applied.	Excluded except when 6.1.2.3a) is applied
Applies – This requirement of IEC 60079-0 is applied without change. Excluded – This requirement of IEC 60079-0 does not apply. Excluded except – This requirement of IEC 60079-0 does not apply except when the conditions stated are met. Modified – This requirement of IEC 60079-0 is modified as detailed in this standard. NR – No requirements.					
NOTE The clause numbers in the above table are shown for information only. The applicable requirements of IEC 60079-0 are identified by the clause title which is normative. This table was written against the specific requirements of IEC 60079-0, ed. 6.0. The clause numbers for the previous edition are shown for information only. This is to enable the General requirements IEC 60079-0, ed. 5.0, to be used where necessary with this part of IEC 60079. Where there were no requirements, indicated by NR, or there is a conflict between requirements, the later edition requirements take precedence.					

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.

IEC 60079-0~~:2004, *Electrical apparatus for explosive gas*~~, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-7, *Explosive atmospheres – Part 7: Equipment protection by increased safety "e"*

IEC 60079-25, ~~*Electrical apparatus for explosive gas*~~ *Explosive atmospheres – Part 25: Intrinsically safe electrical systems*

~~IEC 60079-27, *Electrical apparatus for explosive gas atmospheres – Part 27: Fieldbus intrinsically safe concept (*~~FISCO~~*) and Fieldbus non-incendive concept (FNICO)*~~

IEC 60085, *Electrical insulation – Thermal ~~classification~~ evaluation and designation*

IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60127 (all parts), *Miniature fuses*

IEC 60317-3, *Specifications for particular types of winding wires – Part 3: Polyester enamelled round copper wire, class 155*

IEC 60317-7, *Specifications for particular types of winding wires – Part 7: Polyimide enamelled round copper wire, class 220*

IEC 60317-8, *Specifications for particular types of winding wires – Part 8: Polyesterimide enamelled round copper winding wire, class 180*

IEC 60317-13, *Specifications for particular types of winding wires – Part 13: Polyester or polyesterimide overcoated with polyamide-imide enamelled round copper wire, class 200*

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

IEC 60664-1:~~2002~~ 2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests* ~~1)~~
~~Amendment 1 (2000)~~
~~Amendment 2 (2002)~~

IEC 60664-3:2003, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 61158-2, *Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition*

IEC 62013-1, *Caplights for use in mines susceptible to firedamp – Part 1: General requirements – Construction and testing in relation to the risk of explosion*

ANSI/UL 248-1, *Low-Voltage Fuses – Part 1: General Requirements*

~~1) A consolidated edition 1.2 exists, that comprises IEC 60664-1 and its amendments 1 and 2.~~