

# INTERNATIONAL STANDARD



**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

<https://standards.iteh.ai/standards/iec/459588be-9f59-40c2-8063-25f6fa209a8e/iec-60079-11-2011>



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## NORME INTERNATIONALE



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## 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.

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

#### Question

What are the minor editorial, extensions, and major technical changes of the 6<sup>th</sup> edition with respect to the 5<sup>th</sup> 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

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

Significant Changes	Clause	Type		
		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	

## 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

**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.

<https://standards.iteh.ai/en/standards/iec/459688be-9f59-40c2-8063-25f6fa209a8e/iec-60079-11-2011>

**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 where  $U_m$  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

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 3<sup>rd</sup> 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

**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.

<https://standards.iteh.ai/en/standards/iec/4295888be-9f59-40c2-8063-25f6fa209a8e/iec-60079-11-2011>

**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

- 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.

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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, $U_i$ , $I_i$ , $P_i$ are maximum values possible in normal operation. $U_o$ , $I_o$ , $P_o$ are determined in normal operation, but with the most onerous rated load for each case attached. Reduction of maximum voltage from $U_m$ 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.