

INTERNATIONAL STANDARD



Explosive atmospheres – iTeh Standards
Part 31: Equipment dust ignition protection by enclosure "t"
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES –

Part 31: Equipment dust ignition protection by enclosure "t"

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60603-7:2013. 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 60079-31 has been prepared by IEC technical committee 31: Equipment for explosive atmospheres.

This third edition cancels and replaces the second edition published in 2013. This edition constitutes a technical revision.

The significance of changes between IEC Standard, IEC 60079-31, Edition 3.0 and IEC 60079-31, Edition 2.0, are as listed below:

Changes	Clause	Type		
		Minor and editorial changes	Extension	Major technical changes
Document has been restructured from edition 2	Numerous	X		
Withstand of prospective short-circuit current	4.3.1		X	
Fault current rating of interrupting contacts rated greater than 10 kA for mains connected circuits	4.4.1 and 6.1.1.1			C1
Thermal protective device can include a thermal protective circuit with an appropriate sensor.	4.4.4.1		X	
Cells and batteries	4.3.6 and 4.4.5			C2
Joints employing parallel threads with an additional seal or gasket are permitted to have less than five threads.	5.1.2		X	
Gasket joints that interlock (not a butt joint) and are designed such that under the intended compression no gap between the pieces exist so that an uninterrupted periphery is formed, these joints do not need to be permanently joined.	5.1.3		X	
Overload or malfunction condition for the determination of temperature class for "tb" converter fed rotating electric machines	Table 2			C3
Additional requirements for entry devices with dust ignition protection by enclosure "t"	Annex A			C4
Thermal tests are relocated to IEC 60079-0.	Formerly 6.1.2	A1		

NOTE The technical changes referred to include the significance of technical changes in the revised IEC Standard, but they do not form an exhaustive list of all modifications from the previous version. More guidance may be found by referring to the Redline Version of the standard.

Explanations:

A) Definitions

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.

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.

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 – For Ex Equipment having Level of Protection "tb" or "tc" which is intended for mains connection and intended to interrupt fault current above 10kA is tested according to 6.1.1.1, and is marked according to Clause 7.

C2 – For Ex Equipment having Level of Protection "ta" only sealed primary cells or batteries shall be used. A control device shall be provided to prevent overheating of the cell or battery during normal operation, expected malfunctions, or rare malfunctions. The control device may also be considered as a thermal protective device or overcurrent protective device. For Ex Equipment having Level of Protection "tb" and "tc" only sealed cells or batteries shall be used. A control device shall be provided to prevent overheating of the cell or battery during normal operation or expected malfunctions ("tb") or during normal operation ("tc"). The control device may also be considered as a thermal protective device or overcurrent protective device.

C3 – Table 2 now includes malfunction conditions for temperature class determination of Level of Protection "tb" converter-fed electric machines.

C4 – Annex A added for entry devices with Type of Protection "t" including cable transit devices.

A1 – Thermal tests formerly located in 6.1.2 are relocated to IEC 60079-0 for the 2017 and later editions.

The text of this International Standard is based on the following documents:

Draft	Report on voting
31/1595/FDIS	31/1606/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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

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

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The contents of the corrigendum 1 (2023-10) have been included in this copy.

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INTRODUCTION

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EXPLOSIVE ATMOSPHERES –

Part 31: Equipment dust ignition protection by enclosure "t"

1 Scope

This part of IEC 60079 is applicable to ~~electrical~~ equipment protected by enclosure and surface temperature limitation for use in explosive dust atmospheres. It specifies requirements for design, construction and testing of ~~electrical equipment~~ Ex Equipment and Ex Components.

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

This document does not apply to dusts of explosives, which do not require atmospheric oxygen for combustion, or to pyrophoric substances.

This document does not apply to ~~electrical equipment~~ Ex Equipment or Ex Components intended for use in underground parts of mines as well as those parts of surface installations of such mines endangered by firedamp and/or combustible dust.

This document does not take account of any ~~risk~~ hazard due to an emission of flammable or toxic gas from the dust.

~~Consideration of additional protective measures is required where the application of electrical equipment is in atmospheres, which can contain combustible dust and explosive gas, whether simultaneously or separately.~~

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~~This document does not contain requirements for Ex Equipment used in areas where both combustible dust and explosive gas atmospheres can occur, whether simultaneously or separately. Requirements for explosive gas atmospheres can be found in other parts of the IEC 60079 series. Guidance on Ex Equipment to be used where combustible dust and explosive gas atmospheres occur simultaneously ("hybrid mixtures") can be found in IEC 60079-14.~~

Where the ~~electrical equipment~~ Ex Equipment has to meet other environmental conditions, for example, protection against ingress of water and resistance to corrosion, additional measures which do not adversely affect the integrity of the enclosure can be necessary. ~~The measures used should not adversely affect the integrity of the enclosure.~~

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60127 (all parts), *Miniature fuses*

IEC 60269 (all parts), *Low-voltage fuses*

IEC 60691, *Thermal-links – Requirements and application guide*

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

IEC 60034-5, *Rotating electrical machines – Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) – Classification*

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

ANSI/ASME B1.20.1, *Pipe threads, general purpose (inch)*

ANSI/UL 248 (all parts), *Standard for Low-Voltage Fuses*

3 Terms and definitions

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

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

dust ignition protection by enclosure "t"

Type of Protection for explosive dust atmospheres where ~~electrical~~ equipment is provided with an enclosure providing dust ingress protection and a means to limit surface temperatures

3.2

joint

~~place where the corresponding surfaces of two parts of an enclosure, or the conjunction of enclosures, come together~~

3.3

gasket

~~compressible element provided in a joint to provide a degree of protection against the ingress of solid foreign objects and /or against ingress water/dust~~

4 General

4.1 Levels of protection

Type of Protection "t" is divided into three Levels of Protection based on the risk of the ~~electrical equipment~~ Ex Equipment and Ex Components becoming an ignition source in an explosive dust atmosphere. ~~Electrical equipment~~ Ex Equipment and Ex Components with ~~dust ignition protection by enclosure~~ Type of Protection "t" shall be ~~either~~ one of the following:

- Level of Protection "ta" ~~(for EPL "Da"), or~~
- Level of Protection "tb" ~~(for EPL "Db"), or~~
- Level of Protection "tc" ~~(for EPL "Dc").~~

~~The construction and marking requirements apply to all electrical equipment, and in addition, the requirements for "ta" as given in 4.3 and the requirements for "tb" and "tc" as given in 4.4.~~

The general requirements of Clause 4, the construction requirements of Clause 5, and the marking requirements of Clause 7, apply to all Ex "t" Equipment and Ex "t" Components.

Failure modes as defined in the industrial standard for particular internal components affecting the temperatures of the equipment shall be taken into account when considering applicable ~~fault conditions~~ malfunctions.

When a resistor is used for current limiting, it shall not be considered to fail as a short circuit if it is of metal film or of wire wound construction. The resistor shall be rated for the maximum rated voltage of the equipment.

4.2 Equipment groups and ingress protection

The relationship between the Level of Protection, the group, and ingress protection required is shown in Table 1.

Table 1 – Level of Protection, equipment group and ingress protection (IP) relationship

Level of Protection	Group IIIC	Group IIIB	Group IIIA
"ta"	IP6X	IP6X	IP6X
"tb"	IP6X	IP6X	IP5X
"tc"	IP6X	IP5X	IP5X

~~Ingress protection shall be determined in accordance with degree of protection (IP) of enclosures as specified in IEC 60079-0 for level of protection "tb" and "tc". For Level of Protection "ta" the level of depression shall be increased to at least 4 KPa for a period of least 8 h. Any grease in the joints shall be removed before the IP test is performed.~~

~~When IP5X is required, all enclosures including rotating machines, shall satisfy the test and acceptance requirements of IP5X, as specified in IEC 60529.~~

4.3 Requirements for ~~electrical equipment~~ Ex Equipment with Level of Protection "ta"

4.3.1 Fault current

~~For Level of Protection "ta", the electrical equipment shall be rated for connection to a circuit having a prospective short circuit current of not greater than 10 kA. Where the prospective short circuit current withstand is less than 10 kA, it shall be marked according to Clause 7.~~

Ex Equipment shall be rated for connection to a circuit with a prospective short circuit current of not greater than 1,5 kA and marked according to Clause 7.

4.3.2 Maximum surface temperature

These requirements ~~for maximum surface temperature for "ta" electrical equipment~~ modify and supplement the requirements of IEC 60079-0.

~~The marked maximum surface temperature shall be measured on the external surfaces of the enclosure and the surfaces of the internal components for electrical equipment with types of protection "ta" in accordance with 6.1.2. The highest of the measured temperatures shall be the basis for the maximum surface temperature marking.~~

The marked maximum surface temperature, as determined according to 6.1.2, shall be the higher of the measured temperatures a) or b):

- a) the surfaces of the internal components where there is no supplementary enclosure, or,
- b) the temperature on the external surfaces of the supplementary enclosure.

NOTE 1 Partial rupture of the external enclosure is considered to be a potential rare malfunction and is considered in the temperature determination for "ta" equipment.

NOTE 2 Level of Protection "ta" is typically applied for instrumentation where the maximum available short circuit current is in the mA range. Due to the limited thermal dissipation available to Level of Protection "ta" equipment, the maximum normal power dissipation is generally limited to a few watts.

~~4.3.3 Overpressure~~

~~A positive internal pressure of 4 kPa shall be applied to the enclosure in accordance with 6.1.1.3 prior to the dust exclusion test.~~

4.3.3 Dust exclusion

Dust exclusion by enclosure shall be carried out in accordance with 6.1.1.

4.3.4 Protective Devices

4.3.4.1 General

If the ~~electrical equipment~~ Ex Equipment is capable of exceeding the marked maximum surface temperature as a result of the temperature test of 6.1.2 under expected malfunction or for rare malfunction conditions, a protective device ~~is required~~ shall be used. The protective device may be a thermal protective device according to 4.3.4.2 or an overcurrent protective device according to 4.3.4.3 which may be directly integrated into the ~~electrical equipment~~ Ex Equipment or be external to the ~~electrical equipment~~ Ex Equipment.

Where the external protective device is not provided by the manufacturer as part of the ~~electrical equipment~~ Ex Equipment, the ~~marking~~ certificate number shall include the ~~symbol~~ "X" suffix in accordance with the marking requirements of IEC 60079-0 and the Specific Conditions of Use listed on the certificate shall detail the required ratings and performance characteristics of the protective device. The protective device shall be capable of interrupting the maximum current of the circuit in which it is installed. ~~If the electrical equipment contains a cell or battery and a control device is provided to prevent overheating of the cell or battery, the control device can also be considered as a protective device, provided it also protects the complete electrical equipment from exceeding the maximum surface temperature.~~

The response time of the thermal protective device or overcurrent protective device shall be taken into account and be adequate for the necessary over temperature protection.

4.3.4.2 Thermal protective devices

When required by 4.3.4.1, the ~~electrical equipment~~ Ex Equipment shall be protected by one or more integral thermal protective devices. Thermal protective devices shall not be of a self-resettable type and shall be duplicated unless conforming to ~~IEC 60127 series or~~ IEC 60691, in which case only one device is necessary.

~~Alternatively, if it can be demonstrated that an overcurrent protective device can be used to provide thermal protection, such a device may be used. The overcurrent protective device used in this way shall conform to IEC 60127 series and shall be rated at not more than 170 % of the maximum rated current of the electrical equipment. When an overcurrent protective device is not also used as a thermal protective device, it is permissible for the overcurrent protective device to be located outside the enclosure of the electrical equipment. In this case, the marking shall include the symbol "X" in accordance with IEC 60079-0 and the Specific Conditions of Use shall detail the required overcurrent protective device.~~

~~The response time of the thermal protective devices should be taken into account and be adequate for the necessary overtemperature protection.~~