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PN-EN IEC 60079-31

Wprowadza

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IEC 60079-31:2022, IDT

IEC 60079-31:2022/COR1:2023, IDT

Zastępuje

PN-EN 60079-31:2014-10

Atmosfery wybuchowe

Część 31: Zabezpieczenie urządzeń przed zapłonem pyłu za pomocą obudowy "t"

Norma Europejska EN IEC 60079-31:2024 Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t" (IEC 60079-31:2022 + COR1:2023) ma status Polskiej Normy

PN-EN IEC 60079-31:2024-08

Przedmowa krajowa

Niniejsza norma została zatwierdzona przez Prezesa PKN 20 czerwca 2024 r.

Komitetem krajowym odpowiedzialnym za normę jest PKN/KT 64 ds. Urządzeń Elektrycznych w Przestrzeniach Zagrożonych Wybuchem.

Istnieje możliwość przetłumaczenia normy na język polski na wniosek zainteresowanych środowisk. Decyzję podejmuje właściwy Komitet Techniczny.

Niniejsza norma zastępuje: PN-EN 60079-31:2014-10.

Odpowiedniki krajowe norm i innych dokumentów powołanych w niniejszym dokumencie można znaleźć w katalogu Polskich Norm. Oryginały norm i innych dokumentów powołanych są dostępne w PKN.

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Nota uznaniowa

Norma Europejska EN IEC 60079-31:2024 została uznana przez PKN za Polską Normę PN-EN IEC 60079-31:2024-08.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN IEC 60079-31

March 2024

ICS 29.260.20

Supersedes EN 60079-31:2014

English Version

Explosive atmospheres - Part 31: Equipment dust ignition
protection by enclosure "t"
(IEC 60079-31:2022 + COR1:2023)

Atmosphères explosives - Partie 31: Protection contre
l'inflammation de poussières par enveloppe "t" relative à
l'appareil
(IEC 60079-31:2022 + COR1:2023)

Explosionsgefährdete Bereiche - Teil 31: Geräte-
Staubexplosionsschutz durch Gehäuse "t"
(IEC 60079-31:2022 + COR1:2023)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN IEC 60079-31:2024 (E)

European foreword

The text of document 31/1595/FDIS, future edition 3 of IEC 60079-31+COR1, prepared by IEC/TC 31 "Equipment for explosive atmospheres" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60079-31:2024.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2024-09-13 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2026-12-13 document have to be withdrawn

This document supersedes EN 60079-31:2014 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 60079-31:2022+COR1:2023 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60079-14 NOTE Approved as EN 60079-14

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cencenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60079-0	-	Explosive atmospheres - Part 0: Equipment - General requirements	EN IEC 60079-0	-
IEC 60127	series	Miniature fuses	-	series
IEC 60269	series	Low-voltage fuses	EN 60269	series
IEC 60691	-	Thermal-links - Requirements and application guide	EN IEC 60691	-
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	EN IEC 60034-5	-
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	series	Standard for low-voltage fuses	-	series



IEC 60079-31

Edition 3.0 2022-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Explosive atmospheres –
Part 31: Equipment dust ignition protection by enclosure "t"**

**Atmosphères explosives –
Partie 31: Protection contre l'inflammation de poussières par enveloppe "t"
relative à l'appareil**





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IEC 60079-31

Edition 3.0 2022-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Explosive atmospheres –
Part 31: Equipment dust ignition protection by enclosure "t"**

**Atmosphères explosives –
Partie 31: Protection contre l'inflammation de poussières par enveloppe "t"
relative à l'appareil**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES –

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

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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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.

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

INTRODUCTION

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent. IEC takes no position concerning the evidence, validity, and scope of this patent right.

The holder of this patent right has assured IEC that s/he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from the patent database available at <http://patents.iec.ch>.

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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 equipment protected by enclosure and surface temperature limitation for use in explosive dust atmospheres. It specifies requirements for design, construction and testing of 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 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 hazard due to an emission of flammable or toxic gas from the dust.

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 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.

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 following terms and definitions apply.

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 equipment is provided with an enclosure providing dust ingress protection and a means to limit surface temperatures

4 General

4.1 Levels of protection

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

- Level of Protection "ta" for EPL "Da";
- Level of Protection "tb" for EPL "Db";
- Level of Protection "tc" for EPL "Dc".

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 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

4.3 Requirements for Ex Equipment with Level of Protection "ta"

4.3.1 Fault current

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 modify and supplement the requirements of IEC 60079-0.

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 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 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 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 Ex Equipment or be external to the Ex Equipment.

Where the external protective device is not provided by the manufacturer as part of the Ex Equipment, the certificate number shall include the "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.

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 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 60691, in which case only one device is necessary.

4.3.4.3 Overcurrent protective devices

As an alternative to 4.3.4.2, if it is demonstrated that an overcurrent protective device or devices provide thermal protection, such a device, or devices may be used. The overcurrent protective device may be located outside the enclosure of the Ex Equipment. In this case, the certificate number shall include the "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 performance characteristics required by the overcurrent protective devices.

At least one of the protective devices shall be capable of interrupting the maximum available short circuit current of the circuit in which it is installed.

Overcurrent protective devices shall be duplicated unless conforming to the IEC 60127 series, IEC 60269 series or ANSI/UL 248 series, in which case only one device is necessary.

4.3.5 Supplementary internal enclosure

Where normally arcing and sparking parts are incorporated, these parts shall have a supplementary enclosure inside the main enclosure and the maximum surface temperature of that enclosure is used to determine the marked surface temperature of the equipment in accordance with 4.3.2.

When hot internal components are enclosed in a supplementary enclosure, the maximum surface temperature of that enclosure shall be used to determine the marked surface temperature of the equipment in accordance with 4.3.2.

The supplementary enclosure shall:

- have a continuous operating temperature at least equal to the lower specified ambient temperature and at least 20 K greater than the maximum service temperature for non-metallic materials,
- undergo the resistance to impact test in accordance with 6.1.1.2 with no hot and cold impact testing required,
- be IP6X in accordance with IEC 60529 following the resistance to impact without thermal endurance to heat and cold.

These requirements replace the requirements of IEC 60079-0 for such an enclosure.

4.3.6 Cells and batteries

Only sealed primary cells or batteries shall be used. A control device shall be provided to prevent overheating of the cell or battery. The control device may also be considered as a thermal protective device or overcurrent protective device as given in 4.3.4, provided it also protects the complete Ex Equipment from exceeding the maximum surface temperature.

4.4 Requirements for Ex Equipment with Level of Protection "tb" and "tc"

4.4.1 Fault current

Ex Equipment having Level of Protection "tb" or "tc" which is intended for mains connection to a circuit with a maximum available short circuit current above 10 kA, shall be tested in accordance with 6.1.1.1, and be marked according to Clause 7.

NOTE Limiting the maximum available short circuit current could be achieved by several means including the use of current limiting fuses or current limiting circuit breakers.

4.4.2 Maximum surface temperature

The marked maximum surface temperature shall be measured on the external surfaces of the enclosure for Ex Equipment with Level of Protection "tb" or "tc" in accordance with 6.1.2.

4.4.3 Dust exclusion

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

4.4.4 Thermal protection

4.4.4.1 General

For Level of Protection "tb", if the Ex Equipment is capable of exceeding the marked maximum surface temperature as a result of the temperature test of 6.1.2, a protective device shall be used. The protective device may be a thermal protective device according to 4.4.4.2 or an overcurrent protective device according to 4.4.4.3 which may be directly integrated into the Ex Equipment or be external to the Ex Equipment.

Where the external protective device is not provided by the manufacturer as part of the Ex Equipment, the certificate number shall include the "X" suffix in accordance with the marking requirements of IEC 60079-0 and the Specific Conditions of Use shall detail the required ratings and characteristics of the protective device. The protective device shall be capable of interrupting the maximum current of the circuit in which it is installed.

4.4.4.2 Thermal protective devices

When required by 4.4.4.1 the 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 the IEC 60691 series, in which case only one device is necessary.

The response time of the thermal protective devices shall be adequate for the necessary over temperature protection.

4.4.4.3 Overcurrent protective devices

As an alternative to 4.4.4.2, if it is demonstrated that an overcurrent protective device can be used to provide thermal protection, such a device may be used. It is permissible for the overcurrent protective device to be located outside the enclosure of the Ex Equipment. In this case, the certificate number shall include the "X" suffix in accordance with the marking requirements of IEC 60079-0 and the Specific Conditions of Use shall detail the required overcurrent protective device. The protective device shall be capable of interrupting the maximum current of the circuit in which it is installed.

Overcurrent protective devices shall be duplicated unless conforming to the IEC 60127 series, IEC 60269 series, or ANSI/UL 248 series, in which case only one device is necessary.

4.4.5 Cells and batteries

Only sealed cells or batteries shall be used. A control device shall be provided to prevent overheating of the cell or battery. The control device may also be considered as a thermal protective device or overcurrent protective device as given in 4.4.4.2 or 4.4.4.3, provided it also protects the complete Ex Equipment from exceeding the maximum surface temperature.

4.4.6 External plug and socket connections for field wiring connection

External plug and socket connections for field wiring connection shall meet one of the following requirements:

- a) they shall be interlocked mechanically or electrically, or otherwise designed so that they cannot be separated when the contacts are energized and the contacts cannot be energized when plug and socket are separated; or
- b) plug and socket connectors for Level of Protection "tc", shall be fixed together by a mechanical means other than the friction between the plug and socket; and for Level of Protection "tb", shall be fixed together by means of special fasteners.

5 Construction

5.1 Joints

5.1.1 General

All joints in the structure of the enclosure, whether permanently closed or designed to be opened from time to time, shall be effectively sealed against the ingress of dust and shall comply with the particular requirements in 5.1.2 to 5.1.6 and be subjected to the test of 6.1.1.

The use of grease alone to maintain the integrity of the seal is not considered to satisfy this requirement.

5.1.2 Threaded joints

The number of engaged threads for all threaded joints, employing parallel threads without an additional seal or gasket shall be at least five threads and with a tolerance quality of medium or fine according to ISO 965-1.

Joints employing parallel threads with an additional seal or gasket are permitted to have less than five threads. In this case, a specific tolerance class is not required.

Tapered threaded joints without an additional seal or gasket shall engage no less than 3½ threads.

Where necessary, a means shall be provided to facilitate correct alignment of mating parts.

5.1.3 Gaskets and seals

Gaskets under compression in joints may be used to ensure the effectiveness of the enclosure sealing.

All gaskets and seals shall be of one-piece continuous construction, that is with an uninterrupted periphery.

One-piece construction also includes gaskets and seals that have been permanently joined to form an uninterrupted periphery while maintaining the mechanical properties of the gasket or seal material. Alternately, 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.

Unless all gaskets are secured to one face of the mating surface, either by adhesive or being mechanically secured, the design of the enclosure shall be such that gaskets are correctly positioned. Except for a slight amount of lubricant necessary for assembly or an adhesive material on one side of the mating surfaces, joints using gaskets shall not be supplemented by the application of a sealant material.

A flexible seal, for example a bellows, shall be such that it is not over-stressed at any point and shall be protected from external mechanical damage and secured at each end by mechanical means.

Hinges shall not be used as a means of maintaining a seal unless the correct compression of the gasket is achieved without causing undue movement, stress or distortion to the gasket. The hinges shall be manufactured from materials that would not affect the correct function of the sealing means.

These requirements do not apply to internal seals of cable glands.

5.1.4 Cemented joints

Cemented joints shall not be used on mating parts which need to be removed to gain access to field wiring connections or in-service adjusting facilities.

5.1.5 Operating rods, spindles and shafts

Openings in enclosures for rods, spindles or shafts shall have means to inhibit the ingress of dust, other than only grease or compound, both when the spindles, rods or shafts are in motion and when they are at rest.

5.1.6 Windows

5.1.6.1 Windows employing a cemented joint

A window design employing a cemented joint shall be such that it is cemented either directly into the wall of the enclosure so as to form with the latter an inseparable assembly, or into a frame such that the assembly can be replaced as a unit.

5.1.6.2 Windows employing a gasket joint

A window design employing a gasket for dust exclusion shall be such that it is mounted directly in the wall or cover of the enclosure. Alternatively, a window employing a gasket may be mounted in a separate frame such that the assembly can be replaced as a unit.

5.2 Cable glands, cable transit devices and conduit sealing devices

Cable glands, cable transit devices, and conduit sealing devices, whether integral or separate, shall meet the requirements of IEC 60079-0 and Annex A.

5.3 Entries

5.3.1 Plain entries

The clearance holes for plain entries shall be specified in the instructions to allow the proper selection of a gland or fitting. The inside of the enclosure shall be provided with sufficient room to attach a locknut to the gland or fitting.

5.3.2 Threaded entries

Threaded entries are considered to meet the requirements for Levels of Protection "ta", "tb" and "tc" Ex Equipment if they are one of the following:

- tapered threads with no fewer than 3½ threads according to ANSI/ASME B1.20.1;
- parallel threads with no fewer than five threads, with a tolerance class of 6H or better according to ISO 965-1;
- parallel threads with fewer than five threads with a tolerance class of 6H or better according to ISO 965-1 and are provided with an additional seal or gasket. If the additional seal is not

an integral part of the Ex Equipment, the certificate number shall include the "X" suffix in accordance with the marking requirements of IEC 60079-0 and the Specific Conditions of Use shall detail the required use of a seal or gasket. An advisory marking of the requirement for a seal or gasket may appear on the Ex Equipment as an alternative to the requirement for the "X" marking.

6 Verification and tests

6.1 Type tests

6.1.1 Type tests for dust exclusion by enclosures

6.1.1.1 General

Samples of the Ex Equipment shall be subjected to the thermal endurance to heat, thermal endurance to cold and impact tests specified in IEC 60079-0, and the drop test if applicable. If there is a supplementary internal enclosure, there shall be no visible damage to the supplementary internal enclosure caused by the impact testing of the equipment enclosure.

The supplementary internal enclosure may be removed during the thermal endurance to heat and thermal endurance to cold tests.

After conducting the tests of enclosures in accordance with IEC 60079-0, all of the samples shall then be subjected to the pressure test of 6.1.1.3 followed by the IP test of 6.1.1.4.

Ex Equipment having Level of Protection "tb" or "tc" which is intended for mains connection and intended to interrupt fault current above 10 kA, shall be subjected to short circuit interrupting tests in accordance with the relevant industrial standard after the pressure test of 6.1.1.3 and prior to the IP tests of 6.1.1.4.

NOTE 1 Limiting the maximum available short circuit current could be achieved by several means including the use of current limiting fuses or current limiting circuit breakers.

NOTE 2 When the volume of the switching device displaces a large portion of the free internal volume of the enclosure, damage from a short circuit event can occur due to the venting of arc products from the switching device into the enclosure volume. The increase in enclosure pressure resulting from this venting could impact the ability of the enclosure seal to meet the IP requirement of this document.

6.1.1.2 Impact test on supplementary internal enclosures

An impact test on supplementary internal enclosures shall be performed in accordance with the resistance to impact test of IEC 60079-0 using the nominal 1 kg mass dropped from a nominal height of 0,2 m. There shall be no damage which invalidates the required ingress protection.

6.1.1.3 Pressure test

A positive internal pressure of at least:

- $(4 \pm 0,4)$ kPa for Level of Protection "ta", or
- $(2 \pm 0,2)$ kPa for Level of Protection "tb" and "tc",

shall be applied to the Ex Equipment for at least 60 seconds but not more than 70 seconds.

Any breathing or draining device may be sealed for this test if the pressure cannot be maintained. Any seals of the breathing or draining device shall be removed and the sample shall be subjected to the IP test in the condition it is in after the completion of this test. This test is not required for cable glands evaluated as Ex Equipment cable gland.

If the design of the Ex Equipment is such that any gaskets or seals are physically constrained from moving, for example an "O" ring in a groove, this test is not required to be conducted for Levels of Protection "tb" and "tc" Ex Equipment.

The pressure test is not performed on a supplementary internal enclosure.

6.1.1.4 IP test

The ingress protection specified in Table 1 shall be determined in accordance with degree of protection (IP) of enclosures as specified in IEC 60079-0, with the following modifications:

For Level of Protection "ta":

- The level of depression shall be increased to at least 4 kPa for a period of at least 8 h.

For Level of Protection "tb" and "tc":

- When IP5X or IP6X is required for rotating machines, the test requirements of IEC 60034-5 and acceptance requirements of IEC 60529 shall apply.
- Grease in joints shall be removed before the IP test is performed; except in the case of shafts in rotating machines where the supplied lubricant is retained.

6.1.2 Tests to determine maximum surface temperature

For Levels of Protection "ta", "tb" and "tc", the tests shall be carried out as described in IEC 60079-0.

For Level of Protection "ta" overload and malfunction shall be simulated by dissipating 1,5 times the input power as measured under normal operation and measuring the maximum surface temperature on the external surface of the main enclosure. Temperatures on internal components or the external surface of the supplementary enclosure are determined at rated input power.

NOTE The simulation is often achieved by substitution of the internal components with a resistor capable of dissipating the intended power.

For Level of Protection "tb", overload and malfunction conditions are as specified in Table 2.

Table 2 – Overload or malfunction conditions for Level of Protection "tb"

Type of Ex Equipment	Overload or malfunction conditions
Luminaires (without ballast)	None
Luminaires with electro-magnetic ballasts	$U_n + 10\%$ Rectifier effect simulated by diode
Luminaires with electronic ballasts	As specified for the applicable standard for industrial equipment
Electric Machines – mains supply connected	None
Electric machines – converter connected	<p>None if electric machine is evaluated with a specific converter and a specified duty as described by IEC 60079-0, or;</p> <p>If the electric machine is not evaluated with a specific converter and a specified duty as described by IEC 60079-0, overload as necessary to confirm that the required direct thermal protection, normally in the stator winding, has sufficient margin to be able to detect excessive temperatures at the bearings, bearing caps and shaft extensions. The margin may be determined by test or calculation. In this case, the use of the thermal protection is made mandatory by identification of this Specific Condition of Use in the certificate.</p> <p>NOTE Direct thermal protection of the bearings is often appropriate to represent the maximum surface temperatures of the parts of concern. It has been found that for some motors, direct thermal protection of the winding set at 160 °C can be appropriate for</p>

Type of Ex Equipment	Overload or malfunction conditions
	maximum surface temperature T200°C, but this would still need to be confirmed by test or calculation.
Resistors	None
Electromagnets	U_n and worst-case air-gap
Other equipment	As specified by the applicable standard for industrial equipment

NOTE For test voltage and current parameters, see the maximum surface temperature requirements in IEC 60079-0.

6.2 Routine tests

There are no additional routine tests required for Levels of Protection "ta", "tb", or "tc".

7 Marking

These requirements supplement the requirements of IEC 60079-0, which are applicable to Levels of Protection "ta", "tb" and "tc". The symbol for the Type of Protection used shall be "ta", "tb", or "tc", as applicable.

Ex Equipment having Level of Protection "ta" shall be marked to indicate suitability for connection to a supply with a maximum available short circuit current of 1,5 kA.

Ex Equipment having Level of Protection "tb" or "tc" which is intended for mains connection and which contains one or more circuit breakers shall be marked to indicate the maximum available short circuit rating of the mains supply with which the Ex Equipment was determined to comply in 6.1.1.1.

Annex A (normative)

Supplementary requirements for entry devices

A.1 General

This annex contains the requirements which apply to the construction and testing of entry devices having Type of Protection "t" in addition to the requirements found in IEC 60079-0.

Group III entry devices include cable glands, cable transit devices, conduit sealing devices, blanking elements and thread adaptors as Ex Equipment or Ex Components.

A.2 Construction requirements

A.2.1 Cable glands, cable transit devices and conduit sealing devices

Cable glands, cable transit devices and conduit sealing devices, whether integral or separate, shall meet the joint requirements of 5.1 and the marking requirements of Clause A.4.

A.2.2 Blanking elements and thread adapters

Blanking elements shall meet the joint requirements of 5.1, and the threading requirements of 5.2, 5.3.

Thread adapters may use thread forms other than those in 5.3.2, whether as an Ex Equipment thread adapter or as a thread adapter fitted and assessed as a factory-assembled part of the enclosure.

A.3 Type tests

A.3.1 Cable glands, cable transit devices and conduit sealing devices

Cable glands, cable transit devices and conduit sealing devices, shall comply with the "Test for degree of protection (IP) of cable glands" in IEC 60079-0 as modified by 6.1.1.

A.3.2 Blanking elements and thread adapters

Blanking elements and thread adapters shall comply the "Test for degree of protection (IP) of cable glands" in IEC 60079-0 as modified by 6.1.1.

A.4 Marking

Group III entry devices shall be marked in accordance with Clause 7. The specific thread type and size thread shall be marked in accordance with IEC 60079-0.

Bibliography

IEC 60050-426, *International Electrotechnical Vocabulary (IEV) – Part 426: Explosive atmospheres*

IEC 60079-14, *Explosive atmospheres - Part 14: Electrical installations design, selection and erection*

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EXPLOSIVE ATMOSPHERES –

ATMOSPHÈRES EXPLOSIVES –

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

Partie 31: Protection contre l'inflammation de
poussières par enveloppe "t" relative à
l'appareil

C O R R I G E N D U M 1

Corrections to the French version appear after the English text.

Les corrections à la version française sont données après le texte anglais.

FOREWORD

B) Information about the background of 'Major Technical Changes'

Replace the existing text of C2 with the following new text:

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.

Table 2 – Overload or malfunction conditions for Level of Protection "tb"

Replace existing Table 2 with the following new table:

Type of Ex Equipment	Overload or malfunction conditions
Luminaires (without ballast)	None
Luminaires with electro-magnetic ballasts	$U_n + 10\%$ Rectifier effect simulated by diode
Luminaires with electronic ballasts	As specified for the applicable standard for industrial equipment
Electric Machines – mains supply connected	None
Electric machines – converter connected	<p>None if electric machine is evaluated with a specific converter and a specified duty as described by IEC 60079-0, or;</p> <p>If the electric machine is not evaluated with a specific converter and a specified duty as described by IEC 60079-0, overload as necessary to confirm that the required direct thermal protection, normally in the stator winding, has sufficient margin to be able to detect excessive temperatures at the bearings, bearing caps and shaft extensions. The margin may be determined by test or calculation. In this case, the use of the thermal protection is made mandatory by identification of this Specific Condition of Use in the certificate.</p> <p>NOTE Direct thermal protection of the bearings is often appropriate to represent the maximum surface temperatures of the parts of concern. It has been found that for some motors, direct thermal protection of the winding set at 160 °C can be appropriate for maximum surface temperature T200°C, but this would still need to be confirmed by test or calculation.</p>
Resistors	None
Electromagnets	U_n and worst-case air-gap
Other equipment	As specified by the applicable standard for industrial equipment
NOTE For test voltage and current parameters, see the maximum surface temperature requirements in IEC 60079-0.	

Corrections à la version française:

AVANT-PROPOS**B) Informations relatives aux origines des "modifications techniques majeures"***Remplacer le texte existant de C2 par le nouveau texte suivant:*

C2 – Pour l'Appareil Ex avec le niveau de protection "ta" seules des piles ou batteries primaires scellées doivent être utilisées. Un dispositif de contrôle doit être fourni pour empêcher la surchauffe de la pile ou de la batterie pendant le fonctionnement normal, les dysfonctionnements attendus ou les dysfonctionnements rares. Le dispositif de commande peut également être considéré comme un dispositif de protection thermique ou un dispositif de protection contre les surintensités. Pour l'Appareil Ex avec le niveau de protection "tb" ou "tc" seules des piles ou des batteries scellées doivent être utilisées. Un dispositif de contrôle doit être prévu pour empêcher la surchauffe de la pile ou de la batterie pendant le fonctionnement normal ou les dysfonctionnements attendus ("tb") ou pendant le fonctionnement normal ("tc"). Le dispositif de commande peut également être considéré comme un dispositif de protection thermique ou un dispositif de protection contre les surintensités.

Tableau 2 – Conditions de surcharge ou de dysfonctionnement pour le niveau de protection "tb"*Remplacer le Tableau 2 existant par le nouveau tableau suivant:*

Type d'Appareil Ex	Conditions de surcharge ou de dysfonctionnement
Luminaires (sans ballast)	Aucune
Luminaires avec ballasts électromagnétiques	$U_n + 10 \%$ Effet redresseur simulé par une diode
Luminaires avec ballasts électroniques	Comme cela est spécifié par la norme applicable à l'appareil industriel
Machines électriques – raccordées au secteur	Aucune
Machines électriques – raccordées par un convertisseur	Aucune, si la machine électrique est évaluée avec un convertisseur spécifique et un service spécifié comme cela est décrit dans l'IEC 60079-0, ou ; Si la machine électrique n'est pas évaluée avec un convertisseur spécifique et un service spécifié comme cela est décrit dans l'IEC 60079-0, la surcharge nécessaire pour confirmer que la protection thermique directe exigée, généralement au niveau de l'enroulement du stator, présente une marge suffisante qui lui permet de détecter les températures excessives à des paliers, des couvercles de paliers et des bouts d'arbres. La marge peut être déterminée par essai ou par calcul. Dans ce cas, l'utilisation de la protection thermique est rendue obligatoire par l'identification de cette condition particulière d'utilisation dans le certificat. NOTE La protection thermique directe des paliers est souvent appropriée pour représenter les températures maximales de surface des parties concernées. Il a été constaté, pour certains moteurs, que la protection thermique directe de l'enroulement fixée à 160 °C peut être appropriée pour une température maximale de surface T200°C, ce qu'il est toutefois toujours nécessaire de confirmer par essai ou par calcul.
Résistances	Aucune
Électroaimants	U_n et entrefer du cas le plus défavorable
Autres appareils	Comme cela est spécifié par la norme applicable à l'appareil industriel
NOTE Pour les paramètres de tension et de courant d'essai, voir les exigences relatives à la température maximale de surface spécifiées dans l'IEC 60079-0.	