# IEC 60079-2

Edition 6.0 2014-07
REDLINE VERSION

# INTERNATIONAL STANDARD

colour inside

## Explosive atmospheres –
## Part 2: Equipment protection by pressurized enclosure "p"



IEC 60079-2:2014-07 RLV(en)



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## Part 2: Equipment protection by pressurized enclosure "p"

INTERNATIONAL
ELECTROTECHNICAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

# EXPLOSIVE ATMOSPHERES –

# Part 2: Equipment protection by pressurized enclosure "p"

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International Standard IEC 60079-2 has been prepared by technical committee 31: Explosive atmospheres.

This sixth edition cancels and replaces the fifth edition published in 2007. This sixth edition cancels and replaces the first edition of IEC 61241-4 published in 2001. This sixth edition constitutes a technical revision.

The significance of changes between IEC 60079-2, Edition 6.0, 2014 and IEC 60079-2, Edition 5.0, 2007 are as listed below:

| | | Type | | |
|---|---|---|---|---|
| **Changes** | **Clause** | **Minor and Editorial Changes** | **Extension** | **Major Technical Changes** |
| Scope<br>Expanded to include combustible dust | 1 | | X | |
| Protective Gas<br>Replaced “apparatus” with “equipment” | 3 | | | |
| Protective Gas<br>Revised to show that purging is not required for explosive dust atmospheres | 3.16 | X | | |
| Level of Protection “pxb”<br>Term and definitions revised to reflect EPL and level of protection | 3.21 | X | | |
| Level of Protection “pyb”<br>Term and definitions revised to reflect EPL and level of protection | 3.22 | X | | |
| Level of Protection “pzc”<br>Term and definitions revised to reflect EPL and level of protection | 3.23 | X | | |
| Lower Flammable Limit<br>Term and definition revised to agree with 60079-0 | 3.26 | X | | |
| Upper Flammable Limit<br>Term and definition revised to agree with 60079-0 | 3.27 | X | | |
| Table 1 – Determination of protection level<br>Revised to use EPL terminology | Table 1 | X | | |
| Table 2 – Design Criteria based upon level of protection<br>Revised to use EPL terminology | Table 2 | X | | |
| Enclosure<br>Requirements relaxed for specific designs | 5.1 | | X | |
| Group II and Group III pressurized enclosures<br>Text revised to use EPL terminology | 5.3.3 | X | | |
| Group II and Group III Level of Protection “pxb”<br>Added that warning also applies for explosive dust atmospheres | 5.3.5 | | X | |
| Group II and Group III door and cover warning<br>Added that warning also applies for explosive dust atmospheres | 5.3.6 | | X | |
| Group II and Group III door and cover warning<br>Revised warning from atmosphere “may be present” to “is present” | 5.3.6 | X | | |

| | | Type | | |
|---|---|---|---|---|
| **Changes** | **Clause** | **Minor and Editorial Changes** | **Extension** | **Major Technical Changes** |
| Mechanical Strength<br>Removed reference to 60079-0 by clause number for “X” condition | 5.4 | X | | |
| Spark and particle barriers<br>Removed reference to 60079-0 by clause number for “X” condition | 5.9 | X | | |
| Cells and batteries<br>Added requirements for cells and batteries | 5.10 | | | C1 |
| For Level of Protection “pxb” or Level of Protection “pyb”<br>Revised Table to use terminology consistent with EPLs | 6.2 | X | | |
| Suitability of safety devices for hazardous area<br>Word “explosion” changed to “ignition” to reflect UFL/LFL terms | 7.1 | X | | |
| Integrity of safety devices<br>Added requirement for detecting fan failure | 7.2 | | | C2 |
| Table 3 – Safety devices based upon Level of Protection<br>Revised column labels to use Level of Protection terminology | Table 3 | X | | |
| Provider of safety devices<br>Remove reference to 60079-0 by clause number for “X” condition | 7.3 | X | | |
| Pressurization System evaluated as associated equipment<br>Added requirements for pressurization systems | 7.4 | | | C3 |
| Sequence diagram for Level of Protection “pxb”<br>Revised text to use Level of Protection terminology | 7.5 | X | | |
| Group I and Group II purging automated for Level of Protection “pxb”<br>Revised text to use Level of Protection terminology | 7.7 | X | | |
| Group I and Group II purging automated for Level of Protection “pxb”<br>Added text specifying that for “pxb”, control must be automated | 7.7 | | | C4 |
| Group I or Group II – purging criteria<br>Revised text to use Level of Protection terminology | 7.8 | X | | |
| Group III – cleaning<br>Added text for cleaning enclosures used in explosive dust atmospheres | 7.9 | | X | |
| Safety devices to detect minimum overpressure<br>Add word “minimum” to clause title to be consistent with text | 7.11 | X | | |
| Safety devices to detect minimum overpressure<br>Revised text to use Level of Protection terminology | 7.11 d) | X | | |
| Value of minimum overpressure<br>Added word “minimum” to clause title to be consistent with text | 7.12 | X | | |
| Value of minimum overpressure<br>Revised text to use Level of Protection terminology | 7.12 | X | | |
| Value of minimum overpressure<br>Added text to reflect a note in Annex C | 7.12 | | X | |
| Pressurizing multiple enclosures<br>Revised text to use Level of Protection terminology | 7.13 | X | | |

| | | Type | | |
|---|---|---|---|---|
| **Changes** | **Clause** | **Minor and Editorial Changes** | **Extension** | **Major Technical Changes** |
| Safety devices on doors and covers<br>Revised text to use Level of Protection terminology | 7.14 | X | | |
| Equipment that may remain energized<br>Revised text to use EPL and level of protection terminology | 7.15 | X | | |
| Equipment permitted within Level of Protection “pyb”<br>Revised text to use EPL and level of protection terminology | 7.16 | X | | |
| Group I and Group II Filling procedure<br>Allow filling in a hazardous location if tested as non-hazardous | 8.4 | | X | |
| Group III Filling Procedure<br>Added static pressurization filling procedure for combustible dust | 8.5 | | X | |
| Safety devices<br>Revised text to use Level of Protection terminology | 8.6 | X | | |
| Equipment that may remain energized<br>Revised text to use EPL terminology | 8.7 | X | | |
| Overpressure<br>Removed reference to 60079-0 by clause number | 8.8 | X | | |
| Backup supply<br>Added requirements for a backup supply of protective gas | 9.1 | | | C5 |
| Independent supplies<br>Provided requirements for independence of pressurization | 9.2 | | X | C6 |
| Release Conditions<br>Removed reference to 60079-0 by clause number for “X” condition | 11.1.2 | X | | |
| Containment system with a limited release<br>Removed reference to 60079-0 by clause number for “X” condition | 12.3 | X | | |
| 13.3.3 Limited release of a gas or vapour<br>Revised text to reflect UFL/LFL terms | 13.3.3 | X | | |
| Ignition-capable equipment<br>Revised text to use Level of Protection terminology | 14 | X | | |
| Type verification and tests<br>Edition 5 clauses 16.1 to 16.7 moved to Edition 6 clauses 16.2 to 16.8 | 16 | X | | |
| Determining the maximum overpressure rating<br>Added requirements to determine maximum overpressure | 16.1 | | | C7 |
| Maximum overpressure test<br>Moved Maximum overpressure test to 16.2 | 16.2 | | | C7 |
| Leakage test<br>Clarify the acceptance criteria for the test | 16.3.2 | | X | |
| Tests for an infallible containment system<br>Clarify the rating used for the test | 16.7.1 | | | C8 |
| Tests for an infallible containment system<br>Modified test for infallible containment | 16.7.2 | | | C9 |

| | | Type | | |
|---|---|---|---|---|
| **Changes** | **Clause** | **Minor and Editorial Changes** | **Extension** | **Major Technical Changes** |
| Edition 5 – Verifying ability of the pressurized enclosure to limit internal pressure<br>Eliminated test | 16.8 | | | C7 |
| Functional test<br>Clarified that applies only to safety devices provided with enclosures | 17.1 | X | | |
| Tests for an infallible containment system<br>Waived helium leak tests for liquid systems | 17.3 | | X | |
| Supplementary marking<br>Allowed continued use of type of protection marking | 18.3 | | | |
| Pressurization systems<br>Clarified use of Ex [p] and [Ex p] marking | 18.6 | X | | |
| Warnings required in other clauses<br>Added table number | 18.7 | X | | |
| Warnings required in other clauses<br>Added warning from 7.9 | 18.7 | | X | |
| Warnings required in other clauses<br>Added warnings from Annex G and Annex H | 18.7 | | | C1 |
| Instructions<br>Added requirements for Group III | 19 | | X | |
| Edition 5 Annex G – Infallibility test for containment system<br>Deleted and replaced | Annex G | X | | |
| Edition 5 Annex H – Introduction of an alternative risk assessment method encompassing “equipment protection levels”<br>Deleted and replaced | Annex H | X | | |
| Annex G – Internal Cells and Batteries for Level of Protection “pxb” and Level of Protection “pyb”<br>Added requirements for cells and Batteries | | | X | |
| Annex H – Internal Cells and Batteries for Level of Protection “pzc”<br>Added requirements for cells and Batteries | | | X | |

**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. 5.

**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 fulfill 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

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

C1 – Added annexes with requirements for using cells and batteries.

C2 – Added requirement that fan failure cannot be based upon loss of power to the fan.

C3 – Added requirements for equipment evaluated as a pressurization system to provide uniformity in the testing of such equipment.

C4 – Although, in Edition 5, the title of clause 7.6 stated automated purging, the word automated was not in the requirement. It is intended that all "pxb" equipment have an automated purging system to prevent energizing of ignition capable circuits until the purge cycle has been properly completed. This requires verifying that the flow is at least the minimum required for the purge time as well as verifying that the minimum overpressure exists within the enclosure.

C5 – If a backup supply of protective gas is provided, then both the primary and the backup supply needs to be capable of maintaining the required pressurization.

C6 – If a pressurized enclosure is used within a larger pressurized enclosure the protective gas supplies need to be independent.

C7 – The previous text in 16.1 of Edition 5, assumed that the enclosures had a maximum overpressure rating, but this is rarely the case. Some test houses relied upon the test in 16.8 to determine the maximum overpressure. Various methods were used to simulate regulator failure such as removing the regulator, but this also removed the orifices that would limit the flow. Based upon test house experience, the danger of flying fragments from the enclosure is acceptably small as either the enclosure or the gaskets will deform to relieve the internal pressure. A decision was taken to eliminate the overpressure test based upon the failed regulator. In addition, the definition of maximum overpressure is now based upon the value obtained when the pressurized enclosure is operated within its ratings. This maximum overpressure will generally occur when the equipment is in rapid purge mode with the maximum rated pressure applied to the inlet of the regulator. The Edition 5 text of 16.1 was modified and moved to 16.2.

C8 – The term overpressure in most cases implies operation outside of the normal ratings. Text was clarified to use the term "maximum operating pressure" rather than maximum internal overpressure. Test was 16.6.1 in Edition 5.

C9 – The test was modified to use helium leak detection rather than rely on maintaining a vacuum since this would depend upon the capability of the vacuum system. Test was 16.6.2 in Edition 5.

The significance of changes between IEC 60079-2, Edition 6.0, 2014 and IEC 61241-4, Edition 5.0, 2007 are as listed below:

| | | Type | | |
|---|---|---|---|---|
| **Changes** | **Clause in 61241-4** | **Minor and Editorial Changes** | **Extension** | **Major Technical Changes** |
| Removed type of protection "pD". Included in 3.20, 3.21 and 3.22 | 3.1 | | X | |
| Definition of pressurization now accommodates both gas and dust | 3.3 | | X | |
| Definition of protective gas now accommodates both gas and dust | 3.4 | | X | |
| Removed definition for an enclosure. Defined in IEC 60079-0 | 3.5 | X | | |
| Removed note in definition for pressurized enclosure. | 3.6 | X | | |

| | | Type | | |
|---|---|---|---|---|
| **Changes** | **Clause in 61241-4** | **Minor and Editorial Changes** | **Extension** | **Major Technical Changes** |
| Replaced definition of static pressurization with 60079-2 definition | 3.7 | X | | |
| Removed definition for “pressurization with continuous flow of the protective gas”. Term not used in 61241-4 | 3.9 | X | | |
| Removed definition for “electrical apparatus”. Definition is covered in IEV | 3.10 | X | | |
| Definition of ignition-capable apparatus now accommodates both gas and dust | 3.11 | X | | |
| Removed definition for “self-revealing fault”. Term not used in 61241-4 | 3.12 | X | | |
| Removed definition for “opening”. Term not used in 61241-4 | 3.13 | X | | |
| Removed definition for “protective device”. These are mostly referred to as a “safety device” throughout 61241-4. | 3.14 | X | | |
| Removed definition for “protected apparatus”. This was only used to address batteries which are now covered in Annex G and Annex H. | 3.17 | X | | |
| Replaced definition of “pressurization system” with 60079-2 definition | 3.18 | X | | |
| Removed definition for “alternate (or auxiliary) source of supply of protective gas”. Term used is “second source of Supply. This is now addressed in 60079-2, 9.1 | 3.19 | X | | |
| Removed definition for “zones in Area Classification” This definition is provided in 60079-10-2. | 3.20 | X | | |
| Removed definition for “zone 20 in Area Classification”. See above | 3.21 | X | | |
| Removed definition for “zone 21 in Area Classification”. See above | 3.22 | X | | |
| Removed definition for “zone 22 in Area Classification”. See above | 3.23 | X | | |
| Removed Clause on “Pressurization principle” including sub-clauses. This information is covered by the definition of “Pressurization”, see 3.13 and other clauses in the standard. | 4 | X | | |
| Removed Clause on “Electrical performance of apparatus”. Safe performance of equipment is addressed by 60079-0, 6.1 b) | 5.1 | X | | |
| Removed note about equipment with large surface areas subjected to pressures > 1kPa may be subject to pressure vessel legislation. | 5.2 | X | | |
| Text on apertures is equivalently covered by 5.5 and 5.6 | 5.3 | X | | |
| Text on electrical connections is equivalently covered in 60079-0, clause 14. | 5.4 | X | | |
| Text on delaying opening of an enclosure because of internal hot surface is equivalently covered in clause 15. | 5.5 | X | | |
| Removed text on providing suitable amount of doors or covers to provide for effective removal of dust from the enclosure. The text in 61241-4 would not lend itself to consistent assessments from different CBs. | 5.5 | X | | |
| Text on temperature limits is equivalently covered in clause 6 and 60079-0, 26.5.1.3. | 6 | X | | |
| Removed text on the responsibility of the manufacturer. Addressed in 60079-0. | 7.1 | X | | |
| Removed text on the responsibility of the user. Addressed in 60079-14. | 7.1 | X | | |
| Removed text that manufacturer shall provide instructions for cleaning the enclosure. Addressed in 60079-14. | 7.1 | X | | |
| Removed text requiring a safety device to operate when the pressure within the enclosure exceeds the permitted maximum pressure. It is the user responsibility to not exceed the rated maximum pressure. | 7.2 | X | | |
| Removed text requiring the isolation of the neutral conductor. Addressed in 60079-14. | 7.4 | X | | |
| Text on failure of pressurization is equivalently covered by clause 7 & 13.3. | 7.5 | X | | |

| | | Type | | |
|---|---|---|---|---|
| **Changes** | **Clause in 61241-4** | **Minor and Editorial Changes** | **Extension** | **Major Technical Changes** |
| Removed text on location of visible or audible alarms. Addressed in 60079-14. | 7.5.1 | X | | |
| Removed text requiring both disconnection and alarming for Zone 21 Db. Addressed in 60079-14. | 7.5.1.1 | X | | |
| Text on warning marking on doors and covers is equivalently covered in 5.3.6. | 7.5.1.2 | X | | |
| Removed text about providing means for removing oil or moisture. Addressed in 60079-14, 13.1.6. | 9.1 | X | | |
| Removed text requiring the minimum overpressure be verified over a 5 minute period. It is not considered that this measurement is time dependent. | 10.4.1 | X | | |
| Removed text requiring the minimum overpressure be verified with through-the-wall moving parts operating in normal use. It is not considered that operating such parts will affect the internal pressure. | 10.4.2 | X | | |
| Removed text requiring that the Leakage Test be done at a minimum of 200 Pa. The Leakage Test is only applicable to maximum overpressure specified by the manufacturer for normal service. | 10.5 | X | | |
| Text on conformity for Leakage Testing of Static Pressurization is equivalently covered in 16.3.2. | 10.5 | X | | |
| 60079-2, Ed 6 does not have an exception to the impact test for pressurized enclosures that are not subject to mechanical damage. | 10.6 | | | B1 |
| Removed text on routine Overpressure test | 10.7 | X | | |
| Added text for routine tests of containment systems. 61241-4 did not address enclosures which contained an internal release of a flammable substance. | 10.7 | | X | |
| Text on Marking is equivalently covered in clause 60079-0, clause 29 | 11.1 | X | | |
| Removed text requiring that “limitations affecting the safe use of the apparatus” be marked. This is covered in the Instructions, see 60079-0, clause 30. | 11.2 | X | | |
| Removed text requiring that “the position at which the pressure and flow are monitored” be marked. | 11.2 | X | | |
| Removed text requiring that “the maximum wattage of the lamp for a light fitting” be marked. | 11.2 | X | | |
| Removed text “As agreed upon between the certificate applicant and testing station if necessary.” | 11.4 | X | | |

**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. 5.

**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 fulfill 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

B) Information about the background of ‘Major Technical Changes’

B1 – Pressurized enclosure must be subjected to impact testing as shown in Table 2.

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

| FDIS | Report on voting |
|---|---|
| 31/1119/FDIS | 31/1131/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 is to be read in conjunction with IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*.

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

A list of all parts of IEC 60079 series, under the general title Explosive atmospheres can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the new edition.

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 July 2015 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.**

# INTRODUCTION

This part of IEC 60079 gives requirements for the design, construction, testing and marking of electrical ~~apparatus~~ equipment for use in ~~potentially~~ explosive atmospheres in which

a) a protective gas maintained at a pressure above that of the external atmosphere is used to guard against the formation of an explosive gas atmosphere within enclosures which do not contain an internal source of release of flammable gas or vapour ~~and, where necessary~~;

b) ~~a protective gas is provided in sufficient quantity to ensure that the resultant mixture concentration around the electrical parts is maintained at a value outside the explosive limit appropriate to the particular conditions of use~~ a protective gas maintained at a pressure above that of the external atmosphere is used to guard against the formation of an explosive gas atmosphere within enclosures and ~~. The protective gas~~ is supplied to an enclosure containing one or more internal sources of release in order to guard against the formation of an explosive gas atmosphere; or

c) a protective gas maintained at a pressure above that of the external atmosphere, is used to prevent the entry of combustible dust which might otherwise lead to the formation of an explosive dust atmosphere within enclosures, but only where there is no internal source of release of combustible dust.

This standard includes requirements for the ~~apparatus~~ equipment and its associated equipment including the inlet and exhaust ducts, and also for the auxiliary control ~~apparatus~~ equipment necessary to ensure that pressurization and/or dilution is established and maintained.

# EXPLOSIVE ATMOSPHERES –

# Part 2: Equipment protection by pressurized enclosure "p"

## 1 Scope

This part of IEC 60079 contains the specific requirements for the construction and testing of electrical ~~apparatus~~ equipment with pressurized enclosures, of type of protection “p”, intended for use in explosive gas atmospheres or explosive dust atmospheres. It ~~specifies~~ also includes the requirements for pressurized enclosures containing a limited release of a flammable substance.

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

This standard does not include the requirements for:

- pressurized enclosures where the containment system may release
  a) air with an oxygen content greater than normal, or
  b) oxygen in combination with inert gas where the oxygen is in a proportion greater than 21 %.
- pressurized rooms or analyser houses; see IEC 60079-13 ~~and IEC 60079-16.~~;
- pressurized enclosures used where “explosives” or pyrotechnics are present;
- pressurized enclosures used where hybrid mixtures of gas/vapour and combustible dust are present;

~~NOTE 1 Due to the safety factors incorporated in the type of protection, the uncertainty of measurement inherent in good quality, regularly calibrated measurement equipment is considered to have no significant detrimental effect and need not be taken into account when making the measurements necessary to verify compliance of the equipment with the requirements of this standard.~~

- pressurized enclosures used where pyrophoric substances such as explosives or propellants containing their own oxidizers are present;
- pressurized enclosures with an internal source of release of combustible dust.

NOTE ~~2~~ When the user acts in the role of the manufacturer, it is typically the user’s responsibility to ensure that all relevant parts of this standard are applied to the manufacturing and testing of the equipment.

~~NOTE 3 Types of protection “px” and “py”provide Equipment Protection Levels (EPL) Mb or Gb. Type of protection “pz” provides Equipment Protection Level (EPL) Gc. For further information, see Annex H.~~

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 60050 (all parts), *International Electrotechnical Vocabulary*

~~IEC 60050(151), *International Electrotechnical Vocabulary – Chapter 151: Electrical and magnetic devices*~~

~~IEC 60050(426), *International Electrotechnical Vocabulary – Chapter 426: Electrical apparatus for explosive atmospheres*~~

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

IEC 60079-11, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"*

IEC 60079-15, *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*

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

IEC 60664-1~~:1992~~, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-151, IEC 60050-426 and IEC 60079-0, as well as the following apply.

NOTE Unless otherwise specified, the terms "voltage" and "current" mean the r.m.s. values of an alternating, direct or composite voltage or current.

**3.1**
**alarm**
piece of ~~apparatus~~ equipment that generates a visual or audible signal that is intended to attract attention

**3.2**
**containment system**
part of the ~~apparatus~~ equipment containing the flammable substance that may constitute an internal source of release

**3.3**
**dilution**
continuous supply of a protective gas, after purging, at such a rate that the concentration of a flammable substance inside the pressurized enclosure is maintained at a value outside the explosive limits at any potential ignition source (that is to say, outside the dilution area)

Note 1 to entry: Dilution of oxygen by inert gas may result in a concentration of flammable gas or vapour above the upper ~~explosive~~ flammable limit (U~~E~~FL).

**3.4**
**dilution area**
area in the vicinity of an internal source of release where the concentration of a flammable substance is not diluted to a safe concentration

**3.5**
**enclosure volume**
volume of the empty enclosure without internal ~~apparatus~~ equipment. For rotating electrical machines, the free internal volume plus the volume displaced by the rotor

**3.6**
**flammable substance**
gases, vapours, liquids or mixtures thereof that are capable of being ignited

**3.7**
**hermetically sealed device**
device which is so constructed that the external atmosphere cannot gain access to the interior and in which any seal is made by fusion

Note 1 to entry: Examples of fusion include brazing, welding or the fusion of glass to metal.

**3.8**
**ignition-capable ~~apparatus (ICA)~~ equipment**
**ICE**
~~apparatus~~ equipment which in normal operation constitutes a source of ignition for a specified explosive ~~gas~~ atmosphere. ~~This includes electrical apparatus not protected by a type of protection listed in 7.13~~

**3.9**
**indicator**
piece of ~~apparatus~~ equipment that shows whether flow or pressure is adequate and which is intended to be monitored periodically, consistent with the requirement of the application

**3.10**
**internal source of release**
point or location from which a flammable substance in the form of a flammable gas or vapour or liquid may be released into the pressurized enclosure such that in the presence of air an explosive gas atmosphere could be formed

**3.11**
**leakage compensation**
provision of a flow of protective gas sufficient to compensate for any leakage from the pressurized enclosure and its ducts

**3.12**
**overpressure**
pressure above ambient pressure within a pressurized enclosure

**3.13**
**pressurization**
technique of guarding against the ingress of the external atmosphere into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere

**3.14**
**pressurization system**
grouping of safety devices and other components used to pressurize and monitor or control a pressurized enclosure

**3.15**
**pressurized enclosure**
enclosure in which a protective gas is maintained at a pressure greater than that of the external atmosphere

**3.16**
**protective gas**
air or inert gas used for ~~purging and~~ maintaining an overpressure and, if required, dilution and purging

Note 1 to entry: For the purposes of this standard, inert gas means nitrogen, carbon dioxide, argon or any gas which, when mixed with oxygen in the ratio 4 parts inert to 1 part oxygen as found in air, does not make the ignition and flammability properties, such as explosive limits, more onerous.

**3.17**
**protective gas supply**
compressor, blower or compressed gas container that provides the protective gas at a positive pressure

Note 1 to entry: The protective gas supply includes inlet (suction) pipes or ducts, pressure regulators, outlet pipes, ducts, and supply valves.

Note 2 to entry: Components of the pressurization system other than the pressure regulator, are not included.

**3.18**
**purging**
in a pressurized enclosure, the operation of passing a quantity of protective gas through the enclosure and ducts, so that the concentration of the explosive gas atmosphere is brought to a safe level

~~**3.19**~~
~~**routine test**~~
~~test to which each individual device (equipment) is subjected during or after manufacture to ascertain whether it complies with certain criteria~~

~~[IEV 151-04-16, modified]~~

**3.19**
**static pressurization**
maintenance of an overpressure within a pressurized enclosure without the addition of protective gas in a hazardous area

~~**3.21**~~
~~**type px**~~

~~pressurization that reduces theequipment protection level within the pressurized enclosure from Gb to non-hazardous or Mb to non-hazardous~~

~~**3.22**~~
~~**type py**~~

~~pressurization that reduces the equipment protection level within the pressurized enclosure from Gb to Gc~~

~~**3.23**~~
~~**type pz**~~
~~pressurization that reduces the equipment protection level within the pressurized enclosure from Gc to non-hazardous~~

**3.20**
**Level of Protection “pxb”**
pressurized enclosure providing Equipment Protection Level Mb, Gb or Db

Note 1 to entry: This permits unprotected equipment to be installed within the pressurized enclosure except for safety devices, see 3.23.

**3.21**
**Level of Protection "pyb"**
pressurized enclosure providing Equipment Protection Level Gb or Db with Equipment Protection Level Gc or Dc internal to the pressurized enclosure

Note 1 to entry: This permits Equipment Protection Level Gc or Dc equipment to be installed within the pressurized enclosure, except for safety devices, see 3.23

**3.22**
**Level of Protection "pzc"**
pressurized enclosure providing Equipment Protection Level Gc or Dc

Note 1 to entry: This permits unprotected equipment to be installed within the pressurized enclosure except for safety devices, see 3.23.

~~**3.24**~~
~~**type test**~~
~~test of one or more devices made to a certain design to show that the design meets certain specifications~~

~~[IEV 151-04-15]~~

**3.23**
**safety device**
device used to implement or maintain the integrity of the type of protection

**3.24**
**lower flammable limit**
**LFL**
volume fraction of flammable gas or vapour in air below which an explosive gas atmosphere will not form, expressed as a percentage (see IEC 60079-20-1)

Note 1 to entry: This is also known as Lower Explosive Limit (LEL).

**3.25**
**upper flammable limit**
**UFL**
volume fraction of flammable gas or vapour in air above which an explosive gas atmosphere will not form, expressed as a percentage (see IEC 60079-20-1)

Note 1 to entry: This is also known as Upper Explosive Limit (UEL).

## 4 Protection ~~types~~ levels

Protection by pressurization is subdivided into three ~~types of protection (px, py and pz)~~ Levels of Protection ("pxb", "pyb" and "pzc") which are selected based upon the Equipment Protection Level required ~~for the external explosive gas atmosphere~~ (Mb, Gb, Db, Gc or Dc), whether there is the potential for an internal release, and whether the equipment within the pressurized enclosure is ignition-capable; see Table 1. The ~~type~~ Level of Protection then defines design criteria for the pressurized enclosure and the pressurization system; see Table 2.