



**SLOVENSKI STANDARD**  
**SIST EN 50016:1995**

**01-avgust-1995**

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**Electrical apparatus for potentially explosive atmospheres - Pressured apparatus "p"**

Electrical apparatus for potentially explosive atmospheres - Pressurized apparatus p

Elektrische Betriebsmittel für explosionsgefährdete Bereiche - Überdruckkapselung p

Matériel électrique pour atmosphères explosibles - Surpression interne p

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English version

## Electrical apparatus for potentially explosive atmospheres Pressurized apparatus 'p'

Matériel électrique pour atmosphères  
explosibles – Surpression interne 'p'

Elektrische Betriebsmittel für explosionsgefährdete  
Bereiche – Überdruckkapselung 'p'

This European Standard was accepted by CENELEC on 1 March 1977. The CENELEC members are bound to adhere to the CENELEC Internal Regulations which specify under which conditions this European Standard has to be given, without any alteration, the status of a national standard.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CENELEC General Secretariat or to any CENELEC member.

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## CENELEC

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Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

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**IEC Publications referred to in European Standard EN 50 016**

- IEC 34-5 (1968) Rotating electrical machines  
(1st edition) Part 5 Degrees of protection by enclosures for rotating machinery
- IEC 79-10 (1972) Electrical apparatus for explosive gas atmospheres  
(1st edition) Part 10 Classification of hazardous areas
- IEC 144 (1963) Degrees of protection of enclosures for low-voltage switchgear and controlgear  
(1st edition)

**European Standard referred to in European Standard EN 50 016**

- EN 50 014 (1977) Electrical apparatus for potentially explosive atmospheres — General requirements  
(1st edition)

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This European Standard has been prepared by the CENELEC Technical Committee 31.

## Section I. General

### 1. Scope

1.1 This European Standard contains the specific requirements for the construction and testing of pressurized apparatus, type of protection 'p', intended for use in potentially explosive atmospheres.

1.2 This European Standard supplements European Standard EN 50 014 'General requirements', the requirements of which apply to pressurized electrical apparatus except for that which concerns 8.1 of that standard (access to uninsulated live parts).

1.3 This European Standard includes the requirements for the construction of the enclosure and its associated components, including the inlet and exhaust ducts for the protective gas, and for the auxiliary control apparatus necessary to ensure that the overpressure is established and maintained safely.

NOTE. This European Standard specifies the requirements for electrical apparatus into which no flammable gas or vapour is introduced. It does not contain requirements for pressurized rooms or for enclosures containing an internal source of flammable gas or vapour.

### 2. Definitions

The following definitions specific to type of protection pressurized apparatus 'p' are applicable in this European Standard; they supplement the definitions which are given in European Standard EN 50 014.

2.1 **pressurized apparatus 'p'**. A type of protection by which the entry of a surrounding atmosphere into the enclosure of the electrical apparatus is prevented by maintaining, inside the said enclosure, a protective gas at a higher pressure than that of the surrounding atmosphere. The overpressure is maintained either with or without a continuous flow of the protective gas.

2.2 **protective gas**. A gas used to maintain an overpressure within the enclosure (air, inert gas or another suitable gas).

2.3 **purging**. The passing of a quantity of protective gas through the enclosure and ducts, before the application of voltage to the electrical apparatus, so that any explosive atmosphere possibly present in the enclosure is expelled and any such explosive atmosphere in the pressurized enclosure is reduced to a concentration significantly below the lower explosive limit.

2.4 **pressurization with continuous circulation of the protective gas**. The maintenance of an overpressure within a pressurized enclosure with continuous circulation of the protective gas through the enclosure after purging.

2.5 **pressurization with leakage compensation**. The maintenance of an overpressure within a pressurized enclosure so that, when the exit apertures are closed, the supply of protective gas is sufficient to compensate for any inevitable leakages from the pressurized enclosure and its ducts.

## Section II. Specific constructional requirements

### 3. Enclosures and associated ducting

3.1 The enclosure, including any apertures for moving parts, but excluding apertures for the inlet and outlet of the protective gas, shall have a degree of protection in accordance with at least IP 40 of IEC 144 or, in the case of a rotating electrical machine, IEC 34-5.

The protection devices and the ducting for the protective gas shall prevent sparks or incandescent particles from being ejected from the enclosure.

3.2 The enclosure, ducts and their connecting parts shall be able to withstand an overpressure equal to 1.5 times the maximum overpressure specified in normal service with a minimum of 2 mbar (200 Pa). Suitable safety devices shall be fitted if an overpressure can occur in service that is likely to cause any dangerous deformation of the enclosure, ducts or connecting parts.

3.3 In the case of pressurization with continuous circulation of the protective gas, the enclosure shall have one or more inlet apertures and one or more outlet apertures for the connection of the inlet and outlet ducts for the protective gas.

3.4 In the case of pressurization with leakage compensation, the enclosure shall have one or more inlet apertures. It shall also have one or more outlet apertures constructed so that they can be closed after purging.

3.5 The materials used for the enclosure, the ducts and the connecting parts shall be affected neither by the specified protective gas or gases nor by the flammable gases or vapours in which they are to be used.

3.6 Notwithstanding 8.1 of European Standard EN 50 014 'General requirements', doors and covers may be openable without the use of tools or keys. Doors and covers which can be opened without the use of a tool shall, however, be interlocked so that the electrical supply is disconnected automatically when they are opened and so that the supply cannot be restored until they are closed. The requirements of 5.1 shall also apply.

3.7 Doors and covers for Group I electrical apparatus which have to be opened with a tool shall use special fasteners in accordance with European Standard EN 50 014 'General requirements'.

When the doors or covers are provided to permit inspection in service, they shall carry the following warning:

'DO NOT OPEN WHILE ENERGIZED'

The requirements of 5.1 shall also apply.

3.8 When it is necessary to delay the opening of an enclosure because of an explosion risk (for example, due to the internal surface temperature of the equipment or residual charge on components), the doors or covers shall carry a warning plate giving the required delay to be observed between the switching off of the supply and the opening of the enclosure.

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#### 4. Temperature limits

4.1 The electrical apparatus shall be classified in accordance with the temperature classification requirements of European Standard EN 50 014 'General requirements'.

The classification shall be determined by the higher of the following temperatures:

- (a) the maximum external surface temperature of the enclosure, or
- (b) the maximum surface temperature of any internal parts which are protected by another type of protection listed in European Standard EN 50 014 'General requirements', and which remain energized even when the supply of protective gas is removed (e.g. electrical heaters).

4.2 If during normal service the temperatures of any internal surfaces exceed the maximum values permitted in European Standard EN 50 014 'General requirements' for the temperature class of the equipment, appropriate measures shall be taken to ensure that, if pressurization ceases, any explosive atmosphere which may exist cannot reach the heated surfaces before they have cooled below the permitted maximum value, either by the design and construction of the joints of the enclosure and ducts or by other means, e.g. by bringing auxiliary ventilation systems into operation or by arranging that the hot surfaces within the enclosure are in gas-tight or encapsulated housings (see also 3.8).

#### 5. Safety provisions and devices

All safety devices which ensure that pressurized equipment cannot cause an explosion shall themselves be incapable of causing an explosion or be mounted outside the potentially explosive area.

5.1 Safety devices, such as time-delay relays and devices for monitoring the flow of protective gas, shall be provided to ensure that pressurized electrical apparatus cannot be energized until it has been purged by a quantity of protective gas sufficient to reduce the concentration of any flammable gas or vapour inside the pressurized enclosure to a level below the lower explosive limit.

The quantity of protective gas required for purging shall be at least five times the volume of the free space in the enclosure and its associated ducts.

5.2 An automatic device shall be provided to operate when the overpressure falls below the minimum prescribed value.

NOTE. The purpose for which the automatic device is used (i.e. to disconnect power or to sound an alarm or otherwise to ensure the safety of the installation) is the responsibility of the user.

5.3 When a source of protective gas is common to a number of separate enclosures, the safety arrangements may be common to several of these, provided that the resulting control takes account of the most unfavourable conditions in the group of enclosures. If the safety device is common, the opening of a door or cover need not switch off all the electrical apparatus in the enclosures or initiate the alarm, provided that the following three conditions are met.

- (a) The said opening is preceded by switching off the equipment in the particular enclosure, except such parts as remain protected by another type of protection listed in European Standard EN 50 014 'General requirements'.
- (b) The common safety device continues to monitor the overpressure in all the other enclosures of the group.
- (c) The subsequent switching on of the equipment in the particular enclosure is preceded by the purging procedure specified in 5.1.

5.4 All parts of the installation and electrical apparatus within the enclosure which remain energized when the source of protective gas is interrupted (e.g. electric heaters) shall be protected by another type of protection listed in European Standard EN 50 014 'General requirements'.

## 6. Level of overpressure

A minimum overpressure of 0.5 mbar (50 Pa) shall be maintained relative to the external pressure at every point within the enclosure and its associated ducts at which leakage can occur.

The distribution of pressure in different systems of enclosure and ducts is illustrated in figures A1 to A4.

NOTE. It is essential for the safety of an installation of pressurized enclosures that the installation of the associated ducts and of the compressor or fan does not introduce a hazard. The basic requirements for the installation of ducting systems are given in annex A.

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## 7. Supply of protective gas <https://standards.itech.ai/catalog/standards/sist/643a770e-ffe-40a0-a667-001784203e2/sist-en-50016-1995>

The protective gas used for purging and for maintaining pressurization in the enclosure shall be non-flammable. The gas shall not, by reason of its chemical characteristics or the impurities that it may contain, reduce the level of safety below that sought, or affect the satisfactory operation and integrity of the enclosed apparatus.

NOTE 1. The protective gas may also serve other purposes, for example, for cooling the electrical apparatus.

NOTE 2. When an inert gas is used and a risk of asphyxiation exists, a suitable warning label should be fixed to the enclosure.

## Section III. Verifications and tests

### 8. Verifications and type tests

The following tests shall be carried out to show that the electrical apparatus complies with this standard.

8.1 Verification of effective purging by test or by examination of the manufacturer's documents.

8.2 A test to prove that the minimum overpressure required in clause 6 is maintained with the minimum protective gas supply as indicated by the manufacturer. For rotating electrical machines the test is carried out with the machine stopped and running at its rated speed.



## Section IV. Marking

### 9. Additional marking

9.1 The electrical apparatus shall bear marking in accordance with European Standard EN 50 014 'General requirements'. The marking shall also give the following supplementary information:

(a) internal free volume (excluding ducts), type of protective gas (where air is not used) and minimum quantity of protective gas required to purge the enclosure;

NOTE. It is the responsibility of the user to increase this volume to ensure purging of the ducts.

(b) the minimum permissible overpressure in service and, if necessary, the minimum flow of protective gas.

9.2 The point at which the pressure is to be monitored, as specified by the testing station, shall be precisely indicated either on the electrical apparatus or in the certificate.

9.3 The electrical apparatus shall bear any warning labels required by clauses 3 and 7.

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