



SLOVENSKI STANDARD

SIST EN 50016:2001

01-februar-2001

Nadomešča:
SIST EN 50016:1995

Electrical apparatus for potentially explosive atmospheres - Pressurized 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

Ta slovenski standard je istoveten z: EN 50016:1995

[SIST EN 50016:2001](#)

[http://www.sist.si/log/standards/sist-en-50016-2001-3b-49aa-958c-f6947cd63491/sist-en-50016-2001](#)

ICS:

29.260.20	Električni aparati za eksplozivna ozračja	Electrical apparatus for explosive atmospheres
-----------	---	--

SIST EN 50016:2001

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 50016:2001

<https://standards.iteh.ai/catalog/standards/sist/575cfd77-3e3b-49aa-958c-f6947cd63491/sist-en-50016-2001>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 50016

October 1995

ICS 29.260.20

Supersedes EN 50016:1977 and its amendment

Descriptors: Electrical apparatus, potentially explosive atmosphere, explosive atmosphere, explosion proofing, specific requirement, pressurized apparatus "p"

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"

**ITeH STANDARD PREVIEW
(standards.iteh.ai)**

[SIST EN 50016:2001](https://standards.iteh.ai/catalog/standards/sist/575cfd77-3e3b-49aa-958c-f6947cd63491/sist-en-50016-2001)

<https://standards.iteh.ai/catalog/standards/sist/575cfd77-3e3b-49aa-958c-f6947cd63491/sist-en-50016-2001>

This European Standard was approved by CENELEC on 1995-09-20. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Page 2
EN 50016:1995

Foreword

This European Standard was prepared by SC 31-7, Pressurization and other techniques, of Technical Committee CENELEC TC 31, Electrical apparatus for explosive atmospheres.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50016 on 1995-09-20.

This second edition of EN 50016 is based on the first edition but extended to also include pressurized enclosures with an internal source of release of flammable substances and static pressurization.

This European Standard is to be read in conjunction with EN 50014:1992, Electrical apparatus for potentially explosive atmospheres - General requirements, and with the second edition of the European Standards for the specific types of protection listed in the scope of EN 50014:1992. This European Standard should not be considered in conjunction with any of the first edition standards and their amendments, published in 1977 or thereafter, listed in EN 50014.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1996-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-09-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annex D is normative and annexes A, B and C are informative.

CONTENTS

	Page
GENERAL	
1. Scope	4
2. Definitions	6
REQUIREMENTS FOR PRESSURIZED ENCLOSURES	
3. Enclosures and ducting	9
4. Temperature limits	11
5. Safety provisions and safety devices (except for static pressurization)	11
6. Safety provisions and safety devices for static pressurization	14
7. Supply of protective gas	15
ADDITIONAL REQUIREMENTS FOR PRESSURIZED ENCLOSURES WITH CONTAINMENT SYSTEMS	
8. Introduction	16
9. Release conditions	16
10. Design requirements for the containment system	17
11. Protective gas and pressurizing technique	20
12. Ignition capable apparatus	22
13. Internal hot surfaces	22
VERIFICATION AND TESTS	
14. Type verification and tests	23
15. Routine tests	29
MARKING	
16. Marking	30
ANNEX A	DUCTING OF PROTECTIVE GAS (INFORMATIVE) 32
ANNEX B	INFALLIBILITY TEST FOR A CONTAINMENT SYSTEM (INFORMATIVE) 38
ANNEX C	FUNCTION TEST OF SURVEILLANCE CIRCUITS (INFORMATIVE) 39
ANNEX D	PURGING AND DILUTION TESTS (NORMATIVE) 40

GENERAL**1. SCOPE**

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

This European Standard supplements European Standard EN 50014, the requirements of which apply to electrical apparatus with type of protection 'p'.

- 1.2 This European Standard includes the requirements for the construction of the enclosure and its associated components, including, if any, the inlet and outlet ducts for the protective gas, and for the safety provisions and devices necessary for the type of protection pressurization 'p'.

- 1.3 This European Standard specifies the requirements for pressurized enclosures with or without an internal source of release, with the exceptions given in 1.5 and 1.6.

- 1.4 This European Standard specifies requirement for pressurized enclosures containing an unlimited source of release of flammable gas or vapour only where the unlimited source of release is from the surface of a liquid.

- 1.5 This European Standard does not contain requirements for pressurized rooms or analyser houses.

- 1.6 This European Standard does not contain the requirements for pressurized enclosures where, in a containment system with limited or unlimited release there is:

- a) air with an oxygen content greater than normal
- b) or oxygen in combination with inert gas in a proportion greater than 21%.

- 1.7 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 apparatus with the requirements of this standard.

1.8

Publications

European Standards:

EN 50014: 1992	Electrical apparatus for potentially explosive atmospheres General requirements
EN 50015: 1994	Electrical Apparatus for potentially explosive atmospheres Oil immersion 'o'
EN 50017: 1994	Electrical apparatus for potentially explosive atmospheres Powder filling 'q'
EN 50018: 1994	Electrical apparatus for potentially explosive atmospheres Flameproof enclosures 'd'
EN 50019: 1994	Electrical apparatus for potentially explosive atmospheres Increased safety 'e'
EN 50020: 1994	Electrical apparatus for potentially explosive atmospheres Intrinsic safety 'i'
EN 50028: 1987	Electrical apparatus for potentially explosive atmospheres Encapsulation 'm'
EN 50033: 1991	Electrical apparatus for potentially explosive atmospheres Caplights for mines susceptible to firedamp
EN 50039: 1980	Electrical apparatus for potentially explosive atmospheres Intrinsically safe systems 'i'
EN 954: *)	Safety of machinery - Safety related parts of control systems
EN 60034-5: 1986	Rotating electrical machines. Part 5: Classification of degrees of protection provided by enclosures for rotating machines (IEC 34-5: 1981)
EN 60529: 1991	Degrees of protection provided by enclosures (IP Code) (IEC 529: 1989)
HD 53.1 S2: 1985	Rotating electrical machines Rating and performance. (IEC 34-1: 1983)
HD 214 S2: 1980	Method for determining the comparative and the proof tracking indice of solid insulating materials under moist conditions. (IEC 112: 1979)

*) : *In preparation*

2. DEFINITIONS

The following definitions specific to type of protection pressurization 'p', are applicable in this European Standard; they supplement the definitions which are given in EN 50014.

2.1 Type of protection pressurization 'p'

The technique of applying a protective gas to an enclosure in order to prevent the formation of an explosive atmosphere inside the enclosure by maintaining an overpressure against the surrounding atmosphere, and where necessary by using dilution.

2.2 Pressurized enclosure

An enclosure in which a protective gas is maintained at a pressure greater than that of the external atmosphere.

2.3 Protective gas

Air or inert gas used for purging and maintaining an overpressure and, if required, dilution.

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

2.4 Purging

The operation of passing a quantity of protective gas through the pressurized enclosure and ducts, so that

- a) when the protective gas is air, any explosive atmosphere in the pressurized enclosure is reduced to a safe concentration
- b) or when the protective gas is inert the concentration of oxygen in the pressurized enclosure is reduced to a safe level.

2.5 Static pressurization

The maintenance of an overpressure within a pressurized enclosure without the addition of protective gas in a hazardous area.

2.6 Pressurization with leakage compensation

The maintenance of an overpressure within a pressurized enclosure so that, when the outlet apertures are closed, the supply of protective gas is sufficient to compensate for any leakage from the pressurized enclosure and its ducts.

2.7 Pressurization with continuous flow of the protective gas

The maintenance of an overpressure within a pressurized enclosure with continuous flow of the protective gas through the enclosure.

2.8 Internal source of release

A 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.

2.9 Containment system

The part of the apparatus containing the flammable gas, vapour or liquid that may constitute an internal source of release.

2.10 Infallible containment system

The construction of an infallible containment system is of such integrity that the possibility of a leak is so remote that it can be ignored.

2.11 Dilution

The continuous supply of a protective gas, after purging, at such a rate that the concentration of a flammable mixture inside the pressurized enclosure is maintained at a value outside the explosive limits except in a dilution area.

Note: Dilution of oxygen by inert gas may result in a concentration of flammable gas above the UEL.

2.12 Ignition capable apparatus

Apparatus which in normal operation constitutes a source of ignition for a specified explosive atmosphere. This includes electrical apparatus not protected by a type of protection listed in 1.8.1 of this standard.

2.13 Dilution area

An area in the vicinity of a source of release where the concentration of flammable gas or vapour is not diluted to a safe concentration.

2.14 Limited release

A release of flammable gas or vapour the maximum flow rate of which can be predicted.

2.15 **Unlimited release**

A release of flammable gas or vapour the maximum flow rate of which cannot be predicted.

Note: This refers to liquids which can evolve flammable gas or vapour where the rate of release cannot be predicted

2.16 **Lower explosive limit (LEL)**

Volume ratio of flammable gas or vapour in air below which an explosive gas atmosphere will not be formed.

2.17 **Upper explosive limit (UEL)**

Volume ratio of flammable gas or vapour in air above which an explosive gas atmosphere will not be formed.

2.18 **Volume ratio (v/v)**

Ratio of the volume of a component to the volume of the gas mixture under specified conditions of temperature and pressure.

ITeh STANDARD PREVIEW
(standards.iteh.ai)
<https://standards.iteh.ai/catalog/standards/sist/575cfd77-3e3b-49aa-958c-f6947cd63491/sist-en-50016-2001>

REQUIREMENTS FOR PRESSURIZED ENCLOSURES**3. ENCLOSURES AND DUCTING****3.1 General**

The pressurized 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 EN 60529, or in the case of a rotating electrical machine, EN 60034-5.

Note: The degree of protection of IP 44 may be required on a coal face under humid and dusty conditions.

3.2 Spark and particle barriers

The pressurized enclosure and the ducting, if any, for the protective gas shall guard against the ejection of ignition capable sparks or particles into the hazardous area (see Annex A2).

3.3 Mechanical strength

[SIST EN 50016:2001](https://standards.itech.ai/catalog/standards/sist/575cfd77-3e3b-49aa-958c-8942c054715e/en-50016-2001)

<https://standards.itech.ai/catalog/standards/sist/575cfd77-3e3b-49aa-958c-8942c054715e/en-50016-2001>
The pressurized enclosure, ducts if any, and their connecting parts shall withstand a pressure equal to 1,5 times the maximum overpressure specified by the manufacturer for normal service with all outlets closed with a minimum of 200 Pa.

If a pressure can occur in service that can cause a deformation of the enclosure, ducts if any, or connecting parts, a safety device shall be fitted by the manufacturer to limit the maximum internal overpressure to a level below that which could adversely affect the type of protection.

3.4 Apertures

3.4.1 In the case of static pressurization the enclosure shall have one or more apertures.
After filling and pressurization all apertures shall be closed.

3.4.2 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.

3.4.3 In the case of pressurization with continuous flow of 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.

Note: The location, size and number of apertures should be suitable for effective purging. The number of apertures should be chosen with regard to the design and disposition of the apparatus, particular consideration being given to the needs of subcompartments into which the apparatus might be divided.

3.5 **Materials**

The materials used for the enclosure, ducts and connecting parts shall not be adversely affected by the specified protective gas

3.6 **Doors and covers**

3.6.1 **Group I apparatus**

For Group I pressurized enclosures, doors and covers shall either:

- have special fasteners complying with 9.2 of EN 50014.
- or, except for the case of static pressurization be interlocked so that the electrical supply to apparatus not protected by a type of protection listed in 1.8.1 of this standard is disconnected automatically when they are opened and so that the supply cannot be restored until they are closed. The requirements of 5.6 of this standard shall also apply.

In the case of static pressurization, doors and covers shall carry the following warning:

<https://standards.iteh.ai/catalog/standards/sist/575cfd77-3e3b-49aa-958c-f6947cd63491/sist-en-50016-2001>

"Do not open in hazardous area."

3.6.2 **Group II apparatus**

The requirements for fasteners for doors and covers in 9.1, paragraph 1, of EN 50014 need not apply to Group II pressurized enclosures. Doors and covers, except for those which can be opened only by the use of a tool or key, shall be interlocked so that the electrical supply to electrical apparatus not protected by a type of protection listed in 1.8.1 of this standard is disconnected automatically when they are opened and so that the supply cannot be restored until they are closed. The requirements of 5.6 of this standard shall also apply.

In the case of static pressurization, doors and covers shall only be opened by the use of a tool, and shall carry the following warning:

"Do not open in hazardous area."

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

"Do not open when energised"

except where provision is made for adjustment during operation, in which case the warning shall be

"See instructions before opening".

3.7 **Insulating materials**

For Group I apparatus, insulating materials subjected to electrical stresses capable of causing arcs in air and which result from rated currents of more than 16A shall have a comparative tracking index equal to or greater than CTI 400M according to IEC Publication 112.

4. **TEMPERATURE LIMITS**

4.1 The pressurized enclosure shall be classified in accordance with the temperature classification requirements of EN 50014.

The maximum surface temperature shall be determined:

- a) either by the temperature of the hottest point of the external surface of the enclosure.
- b) or by the temperature of the hottest point of the surface of the internal parts which are protected by any of the types of protection listed in EN 50014, and which remain energised even when the supply of protective gas is removed (e.g. electrical heaters).

4.2 If during normal service the temperature of any surface within the pressurized enclosure exceeds the maximum value permitted in EN 50014 for the temperature class, appropriate measures shall be taken to prevent, if pressurization ceases, any explosive atmosphere which may exist making contact with that surface before it has cooled below the permitted maximum value. This may be achieved either by the design and construction of the joints of the pressurized enclosure and ducts or by other means, e.g. by bringing auxiliary ventilation systems into operation or by arranging that the hot surface within the enclosure is in a gas tight or encapsulated housing.

When determining the temperature for rotating electrical machines the duty type according to publication IEC 34-1 as specified by the manufacturer shall be considered.

5. **SAFETY PROVISIONS AND SAFETY DEVICES (EXCEPT FOR STATIC PRESSURIZATION)**

5.1 All safety devices used to prevent electrical apparatus protected by pressurization from causing an explosion shall themselves not be capable of causing an explosion or shall be mounted outside the hazardous area.

5.2 The safety devices required by this standard form safety related parts of a control system. It is the responsibility of the manufacturer to assess that the safety and integrity of the control system is consistent with the level of safety required by this standard.

Note: EN 954 Safety of machinery-Safety related parts of a control system, is in preparation.