SLOVENSKI STANDARD
SIST EN 50018:1995

01-avgust-1995

Electrical apparatus for explosive atmospheres - Flameproof enclosures "d"

Electrical apparatus for potentially explosive atmospheres - Flameproof enclosure 'd'

Elektrische Betriebsmittel für explosionsgefährdete Bereiche - Druckfeste Kapselung 'd'

Matériel électrique pour atmosphères explosibles - Enveloppe antidéflagrante 'd'

Ta slovenski standard je istoveten z: **EN 50018:1994**

ICS:

29.260.20	Električni aparati za eksplozivna ozračja	Electrical apparatus for explosive atmospheres

SIST EN 50018:1995 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50018

August 1994

UDC 621.31-213.34-213.6-78.614.833.4/.5:001.4:620.1:62-777

Supersedes EN 50018:1977 and its amendments
To be read in conjunction with EN 50014:1992

Descriptors: Electrical apparatus, potentially explosive atmosphere, explosive atmosphere, explosion proofing, specific requirement, flameproof enclosure "d"

English version

Electrical apparatus for potentially explosive atmospheres Flameproof enclosures "d"

Matériel électrique pour atmosphères explosibles Enveloppe antidéflagrante "d"

Elektrische Betriebsmittel für explosionsgefährdete Bereiche Druckfeste Kapselung "d"

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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.

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CENELEC

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

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FOREWORD

This European Standard was prepared by CENELEC Subcommittee SC 31-2 Flameproof enclosures "d".

It was submitted to the CENELEC members for formal vote in July 1993 and was approved by CENELEC as EN 50018 on 1994-03-08. This EN supersedes EN 50018:1977 and its amendments A1:1979, A2:1982 and A3:1985.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1994-12-01
- latest date of withdrawel of conflicting national standards (dow) -

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 editions of the European Standards for the specific types of protection used in the scope of EN 50014:1992. This European Standard should not be considered in conjunction with any of the first edition standards listed in EN 50014:1977.

CONTENTS

GENERAL

1 Scope

1.1 This European Standard contains the specific requirements for the construction and testing of electrical apparatus with type of protection flameproof enclosure "d", intended for use in potentially explosive atmospheres.

1.2 This European Standard supplements European Standard EN 50014, the requirements of which apply to electrical apparatus with flameproof enclosure.

2 Publications

2.1 IEC PUBLICATIONS REFERRED TO IN EUROPEAN STANDARD EN 50018

IEC 61	Lamp caps and holders together with gauges for the control of interchangeability and safety.
IEC 61-1 - supplement K (1983)	Part 1: Lamp caps (HD 65.1 S1(1978))
IEC 61-2 - supplement G (1983)	Part 2: Lampholders (HD 65.2 S1 (1978))
IEC 79-1A (1975)	Electrical apparatus for explosive gas atmospheres. Part 1: Construction and test of flameproof enclosures of electrical apparatus. First supplement: Appendix D: Method of test for ascertainment of maximum experimental safe gap.
IEC 82 (1984)	Ballasts for tubular fluorescent lamps.
IEC 112 (1979)	Recommended method for determining the comparative tracking index of solid insulating materials under moist conditions (HD 214 S2 (1980)).
IEC 529 (1989)	Degrees of protection provided by enclosures (IP Code). (EN 60529(1991))
IEC 707 (1981)	Methods of test for the determination of the flammability of solid electrical insulating materials when exposed to an igniting source. (HD 441 S1(1983))

2.2 ISO STANDARDS REFERRED TO IN EUROPEAN STANDARD EN 50018

ISO 31-0 (1992)	Quantities and units; part 0: General principles
ISO 185 (1988)	Grey cast iron ; classification
ISO 468 (1982)	Surface roughness; Parameters, their values and general rules for specifying requirements.
ISO 965-1 (1980)	ISO general purpose metric screw threads; Tolerances; Part 1: Principles and basic data.

ISO 965-3 (1980)	ISO general purpose metric screw threads; Tolerances; Part 3: Deviations for constructional threads.
ISO 1210 (1992)	Plastics; Determination of burning behaviour of horizontal and vertical specimens in contact with a small-flame ignition source
ISO 2738 (1987)	Permeable sintered metal materials; Determination of density, oil content, and open porosity.
ISO 4003 (1977)	Permeable sintered metal materials; Determination of bubble test pore size.
ISO 4022 (1987)	Permeable sintered metal materials; Determination of fluid permeability.
ISO 6892 (1984)	Metallic materials; Tensile testing. (EN 10002-1 (1990) and EN 10002-1 AC1 (1990))

2.3 EUROPEAN STANDARDS REFERRED TO IN EUROPEAN STANDARD EN 50018

EN 50014 (1992)	Electrical apparatus for potentially explosive atmospheres General requirements
EN 50019 (1994)	Electrical apparatus for potentially explosive atmospheres. Increased safety "e"
EN 50020 (1994)	Electrical apparatus for potentially explosive atmospheres. Intrinsic safety "i"

3 Definitions

The following definitions specific to type of protection flameproof enclosure "d" are applicable in this European Standard; they supplement the definitions which are given in European Standard EN 50014.

3.1 Flameproof enclosure "d"

A type of protection in which the parts which can ignite an explosive atmosphere are placed in an enclosure which can withstand the pressure developed during an internal explosion of an explosive mixture and which prevents the transmission of the explosion to the explosive atmosphere surrounding the enclosure.

3.2 Volume

The total internal volume of the enclosure. However, for enclosures in which the contents are essential in service, the volume to be considered is the remaining free volume.

Note: For luminaires, the volume is determined without lamps fitted.

3.3 Flameproof joint

The place where corresponding surfaces of two parts of an enclosure come together, or the conjunction of enclosures, and prevent the transmission of an internal explosion to the explosive atmosphere surrounding the enclosure.

3.4 Width of flameproof joint (*L*)

The shortest path through a flameproof joint from the inside to the outside of an enclosure.

3.5 Distance (*l*)

The shortest path through a flameproof joint, when the width of the joint *L* is interrupted by holes intended for the passage of fasteners for assembling the parts of the flameproof enclosure.

3.6 Gap of flameproof joint (*i*)

The distance between the corresponding surfaces of a flameproof joint when the electrical apparatus enclosure has been assembled. For cylindrical surfaces, forming cylindrical joints, the gap is the difference between the diameters of the bore and the cylindrical component.

3.7 Maximum experimental safe gap (MESG) (for an explosive mixture)

The maximum gap of a joint of 25 mm width which prevents any transmission of an explosion in 10 tests made under the conditions specified in IEC 79-1A.

3.8 Shaft

A part of circular cross section used for the transmission of rotary movement.

3.9 Operating rod

A part used for the transmission of control movements which may be rotary or linear or a combination of the two.

3.10 Pressure-piling

The results of an ignition, in a compartment or subdivision of an enclosure, of a gas mixture pre-compressed for example due to a primary ignition in another compartment or subdivision.

3.11 Quick-acting door or cover

A door or cover provided with a device which permits opening or closing by a simple operation, such as the movement of a lever or the rotation of a wheel. The device is arranged so that the operation has two stages:

- one for locking or unlocking
- another for opening or closing

3.12 Door or cover fixed by threaded fasteners

A door or cover the opening or closing of which requires the manipulation of one or more threaded fasteners (screws, studs, bolts or nuts).

3.13 Threaded door or cover

A door or cover which is assembled to a flameproof enclosure by a threaded flameproof joint.

3.14 Breathing device

An integral or separable part of a flameproof enclosure designed to permit exchange between the atmosphere inside the enclosure and the surrounding atmosphere.

3.15 Draining device

An integral or separable part of a flameproof enclosure designed to permit water formed by condensation to escape from the enclosure.

4 Apparatus grouping and temperature classification

The apparatus grouping and temperature classification defined in EN 50014 for the use of electrical apparatus in potentially explosive atmospheres apply to flameproof enclosures. The subdivisions A, B, C for electrical apparatus of Group II also apply.

SPECIFIC CONSTRUCTIONAL REQUIREMENTS

5 Flameproof joints

5.1 General requirements

All flameproof joints, whether permanently closed or designed to be opened from time to time, shall comply, in the absence of pressure, with the appropriate requirements of clause 5.

The design of joints shall be appropriate to the mechanical constraints applied to them.

Note: The values given in clause 5 constitute the necessary conditions. Additional measures may be necessary in order to pass the non transmission test of 15.2.

The surface of joints may be protected against corrosion.

Note: Coating with paint is not permitted. Other coating material may be used if the material and application procedure have been shown not to adversely affect the flameproof properties of the joint.

5.2 Non-threaded joints

5.2.1 Width of joints (*L*)

The width of joints shall not be less than the minimum values given in tables 1 and 2. The width of joint for cylindrical metallic parts press-fitted into the walls of a metallic flameproof enclosure of volume not greater than 2 000 cm^3 may be reduced to 5 mm, if:

- the design does not rely only on an interference fit to prevent the part being displaced during the type tests of clause 15, and

- the assembly meets the impact test requirements of EN 50014, taking the worst case interference fit tolerances into account and,

- the external diameter of the press-fitted part, where the width of joint is measured, does not exceed 60 mm.

5.2.2 Gap (*i*)

The gap, if one exists, between the surfaces of a joint shall nowhere exceed the maximum values given in tables 1 and 2.

The surfaces of joints shall be such that their average roughness R_a (ISO 468) does not exceed 6,3 µm.

For flanged joints there shall be no intentional gap between the surfaces, except for quick acting doors or covers.

For electrical apparatus of Group I, it shall be possible to check, directly or indirectly, the gaps of flanged joints of covers and doors designed to be opened from time to time. Figure 1 shows an example of constuction for indirect checking of a flameproof joint.

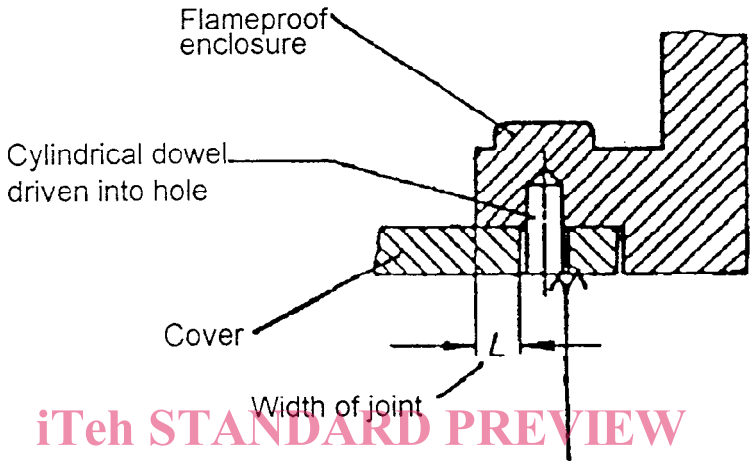


Figure 1: Example of construction for indirect checking of a flanged Group I flameproof joint

5.2.3 Spigot joints

For the determination of the width L of spigot joints the following shall be taken into account:

- either the cylindrical part and the plane part (see figure 2).

  The gap if one exists, between the surfaces of the joint shall nowhere exceed the maximum values given in tables 1 and 2.

- or the cylindrical part only (see figure 3).

  In this case the plane part need not comply with the requirements of tables 1 and 2.

  Note: For gaskets see also 5.4

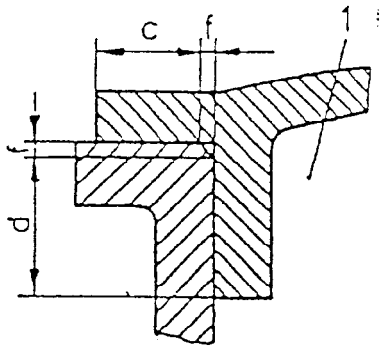


Figure 2

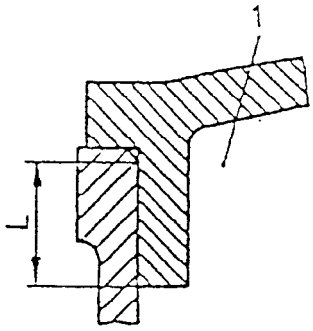


Figure 3

L = c + d (I, IIA, IIB, IIC)
$c \geq$ 6,0 mm (IIC)
$\geq$ 3,0 mm (I, IIA, IIB)
$d \geq$ 0,50 L (IIC)
$f \leq$ 1,0 mm (I, IIA, IIB, IIC)

1 Interior of enclosure

Figures 2 and 3: Spigot joints

5.2.4 Holes in joint surfaces

Where a plane joint or the plane part or partial cylindrical surface (see 5.2.6) of a joint is interrupted by holes intended for the passage of threaded fasteners for assembling the parts of a flameproof enclosure, the distance l to the edge of the hole shall be equal to or greater than:

- 6 mm when the width of joint L is less than 12,5 mm
- 8 mm when the width of joint L is equal to or greater than 12,5 mm but less than 25 mm;
- 9 mm when the width of joint L is equal to or greater than 25 mm.

The distance l is determined as follows:

5.2.4.1 Flanged joints with holes outside the enclosure (see figures 4 and 6)

The distance l is measured between each hole and the inside of the enclosure.

5.2.4.2 Flanged joints with holes inside the enclosure (see figure 5)

The distance l is measured between each hole and the outside of the enclosure.

5.2.4.3 Spigot joints where, to the edges of the holes, the joint consists of a cylindrical part and a plane part (see figure 7)

The distance *l* is:

- the sum of the width *a* of the cylindrical part and the width *b* of the plane part, if f is less than or equal to 1 mm and if the gap of the cylindrical part is less than or equal to 0,2 mm for electrical apparatus of Groups I and IIA, 0,15 mm for electrical apparatus of Group IIB, or 0,1 mm for electrical apparatus of Group IIC (reduced gap);

- the width *b* of the plane part alone, if either of the above-mentioned conditions is not met.

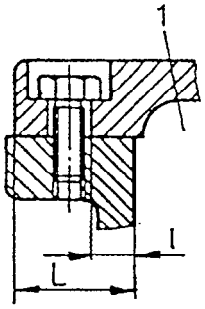


Figure 4

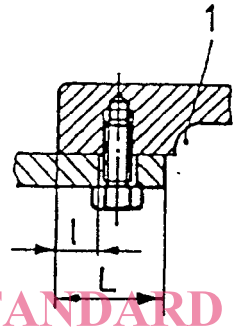


Figure 5

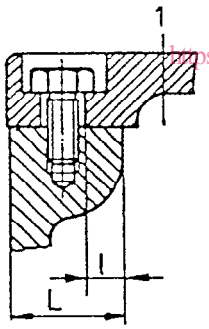
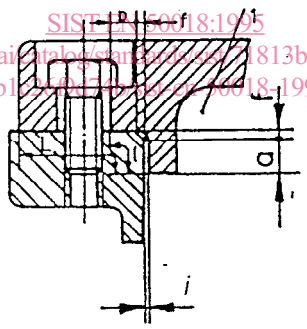


Figure 6



$i \leq 0{,}20$ mm (I, IIA)
$i \leq 0{,}15$ mm (IIB)
$i \leq 0{,}10$ mm (IIC)

Figure 7

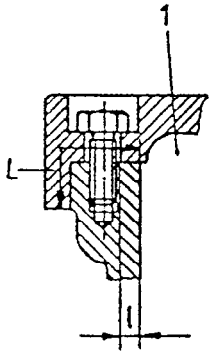


Figure 8

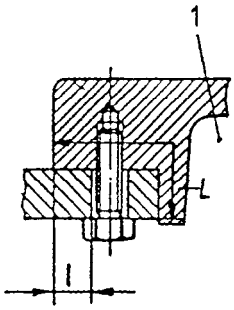


Figure 9

1 interior of enclosure

Figures 4, 5, 6: Holes in surfaces of flanged joints

Figures 7, 8, 9: Holes in surfaces of spigot joints

5.2.4.4 Spigot joints where, to the edges of the holes, the joint consists only of the plane part (see figures 8 and 9), in so far as plane joints are permitted (see 5.2.7)

The distance *l* is the width of the plane part between the inside of the enclosure and a hole, where the hole is outside the enclosure (see figure 8), or between a hole and the outside of the enclosure where the hole is inside the enclosure (see figure 9).

5.2.5 Conical joints

Where joints include conical surfaces, the width of joint, and the gap normal to the joint surfaces shall comply with the relevant values in tables 1 and 2. The gap shall be uniform through the conical part. For electrical apparatus of group IIC, the cone angle shall not exceed 5°.

5.2.6 Joints with partial cylindrical surfaces (not permitted for Group IIC)

There shall by no intentional gap between the two parts (see figure 10).

The width of the joint shall comply with the requirements of table 1.

The diameters of the cylindrical surfaces of the two parts forming the flameproof joint, and their tolerances, shall ensure compliance with the relevant requirements for the gap of a cylindrical joint as given in table 1.

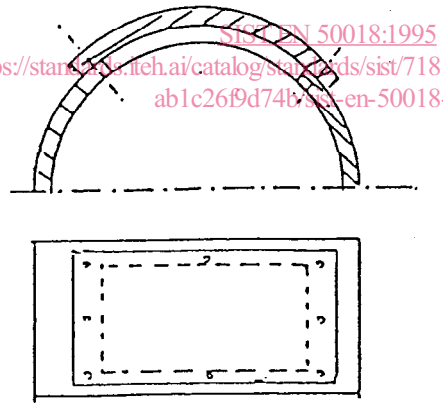


Figure 10: Example for a joint with partial cylindrical surfaces

5.2.7 Additional requirements for joints of electrical apparatus of Group IIC

Flanged joints are not permitted for electrical apparatus of Group IIC intended for use in potentially explosive atmospheres containing acetylene; they are permitted for potentially explosive atmospheres containing no acetylene if the volume of the enclosure does not exceed 500 cm^3.

Table 1: Minimum width of joint and maximum gap for enclosures of Groups I, IIA and IIB

Type of joint		Minimum width of joint l mm	Maximum gap in mm for Volume V (cm^3)											
			$V \leq 100$			$100 < V \leq 500$			$500 < V \leq 2\,000$			$V > 2\,000$		
			I	IIA	IIB	I	IIA	IIB	I	IIA	IIB	I	IIA	IIB
Flanged, cylindrical or spigot joints		6	0,30	0,30	0,20	-	-	-	-	-	-	-	-	-
		9,5	0,35	0,30	0,20	0,35	0,30	0,20	-	-	-	-	-	-
		12,5	0,40	0,30	0,20	0,40	0,30	0,20	0,40	0,30	0,20	0,40	0,20	0,15
		25	0,50	0,40	0,20	0,50	0,40	0,20	0,50	0,40	0,20	0,50	0,40	0,20
Cylindrical joints for shaft glands of rotating electrical machines with	Sleeve bearings	6	0,30	0,30	0,20	-	-	-	-	-	-	-	-	-
		9,5	0,35	0,30	0,20	0,35	0,30	0,20	-	-	-	-	-	-
		12,5	0,40	0,35	0,25	0,40	0,30	0,20	0,40	0,30	0,20	0,40	0,20	-
		25	0,50	0,40	0,30	0,50	0,40	0,25	0,50	0,40	0,25	0,50	0,40	0,20
		40	0,60	0,50	0,40	0,60	0,50	0,30	0,60	0,50	0,30	0,60	0,50	0,25
	Rolling-element bearings	6	0,45	0,45	0,30	-	-	-	-	-	-	-	-	-
		9,5	0,50	0,45	0,35	0,50	0,40	0,25	-	-	-	-	-	-
		12,5	0,60	0,50	0,40	0,60	0,45	0,30	0,60	0,45	0,30	0,60	0,30	0,20
		25	0,75	0,60	0,45	0,75	0,60	0,40	0,75	0,60	0,40	0,75	0,60	0,30
		40	0,80	0,75	0,60	0,80	0,75	0,45	0,80	0,75	0,45	0,80	0,75	0,40

Note: The constructional values rounded according to ISO 31/0 should be taken when determining the maximum gap.