
**Električne naprave za potencialno eksplozivne atmosfere - Neprodirni okrov
“d“**

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

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EUROPEAN STANDARD

EN 50018

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November 2000

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Supersedes EN 50018:1994

English version

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

Matériel électrique pour atmosphères
explosibles -
Enveloppe antidéflagrante 'd'

Elektrische Betriebsmittel für
explosionsgefährdete Bereiche -
Druckfeste Kapselung 'd'

This European Standard was approved by CENELEC on 2000-04-01. 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.

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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

Foreword

This European Standard was prepared by SC 31-2, Flameproof enclosures 'd', of Technical Committee CENELEC TC 31, Electrical apparatus for explosive atmospheres.

It consists of the text of EN 50018:1994 and three amendments (prAA, prAB and prAC) which were submitted to the Unique Acceptance Procedure and approved by CENELEC on 2000-04-01 for publication as a new edition of the standard.

This European Standard supersedes EN 50018:1994.

This European standard was prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of the EC Directive 94/9/EC.

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) 2001-04-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2003-06-30

This European Standard is to be read in conjunction with EN 50014:1997 - Electrical apparatus for potentially explosive atmospheres - General requirements, and with the European Standards for the specific types of protection listed in the scope of EN 50014:1997. This European Standard should not be considered with any other editions of these standards and their amendments.

Annexes designated "normative" are part of the body of the standard. Annexes designated "informative" are given only for information. In this standard, annexes A, B, C and D are normative.

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Contents

GENERAL	4
1 Scope.....	4
2 Normative references	4
3 Definitions	5
4 Apparatus grouping and temperature classification	7
SPECIFIC CONSTRUCTIONAL REQUIREMENTS	7
5 Flameproof joints	7
6 Cemented joints	16
7 Operating rods	16
8 Supplementary requirements for shafts and bearings	16
9 Light-transmitting parts	19
10 Breathing and draining devices which form part of a flameproof enclosure	19
11 Fasteners, associated holes and closing devices	20
12 Materials and mechanical strength of enclosures; materials inside the enclosures.....	23
13 Entries for flameproof enclosures	23
VERIFICATIONS AND TESTS.....	25
14 General	25
15 Type tests	26
16 Routine tests	34
OTHER REQUIREMENTS	35
17 Switchgear.....	35
18 Lampholders and lampcaps	36
19 Non-metallic enclosures and non-metallic parts of enclosures	37
20 Pressure transducers using capillaries	40
ANNEX A (normative) Additional requirements for crimped ribbon elements of breathing and draining devices	41
ANNEX B (normative) Additional requirements for elements, with non-measurable paths, of breathing and draining devices	42
ANNEX C (normative) Additional requirements for flameproof cable entries	44
ANNEX D (normative) Additional requirements for group I, IIA and IIB for empty flameproof enclosures to be certified as Ex components and the utilisation of such Ex Component certificates to obtain certificates	49

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

1.3 This European Standard covers only Category M2 and 2.

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

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 50014	1997	Electrical apparatus for potentially explosive atmospheres General requirements
EN 50019	2000	Electrical apparatus for potentially explosive atmospheres Increased safety 'e'
EN 50020	1994	Electrical apparatus for potentially explosive atmospheres Intrinsic safety 'i'
EN 50039	1980	Electrical apparatus for potentially explosive atmospheres Intrinsically safe electrical systems 'i'
EN 60061	Series	Lamp caps and holders together with gauges for the control of interchangeability and safety SIST EN 50018:2001
EN 60061-1	1993	Part 1: Lamp caps (IEC 60061-1:1969 + supplements A:1970 to N:1992, modified)
EN 60061-2	1993	Part 2: Lampholders (IEC 60061-1:1969 + supplements A:1970 to K:1992, modified)
EN 60529	1991	Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)
EN 60695-11-10	1999	Fire hazard testing -- Part 11-10: Test flames - 50 W horizontal and vertical flame test methods (IEC 60695-11-10:1999)
HD 214 S2	1980	Recommended method for determining the comparative tracking index of solid insulating materials under moist conditions (IEC 60112:1979)

IEC 60079-1A	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
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	1998	ISO general purpose metric screw threads; Tolerances; Part 1: Principles and basic data
ISO 965-3	1998	ISO general purpose metric screw threads; Tolerances; Part 3: Deviations for constructional threads
ISO 1210	1982	Plastics -- Determination of flammability characteristics of plastics in the form of small specimens in contact with a small flame
ISO 2738	1999	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 at ambient temperature

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 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

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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

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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 ten tests made under the conditions specified in IEC 60079-1A

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.

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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)

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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

3.16

Ex stopping plug

a threaded stopping device tested separately from the apparatus enclosure but certified as apparatus and which can be fitted to the apparatus enclosure during installation without further certification

3.17

Ex thread adapter

a thread adapter tested separately from the enclosure but certified as apparatus and which can be fitted to the apparatus enclosure during installation without further certification. This does not preclude the component certification of thread adapters in accordance with EN 50014. Examples of thread adapters are shown in Figure C.2

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 1 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 2 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

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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 cm³ 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 $6,3 \mu\text{m}$.

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 construction for indirect checking of a flameproof joint.

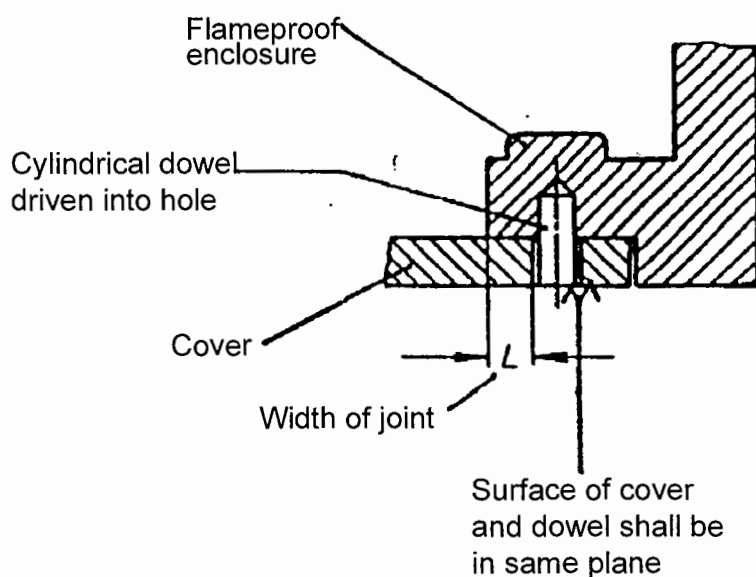


Figure 1 — Example of construction for indirect checking of a flanged Group I flameproof joint

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

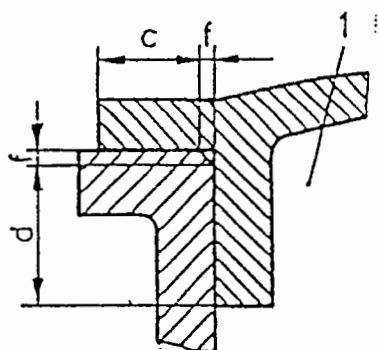


Figure 2

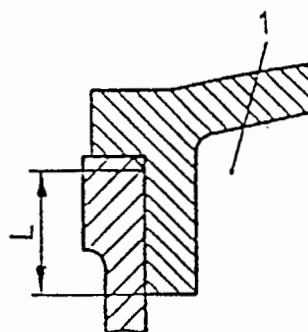


Figure 3

- $L = c + d$ (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: <https://standards.iteh.ai/catalog/standards/sist/58eee592-8608-4c57-9084-1ad9b612c3ee/sist-en-50018-2001>

- 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.

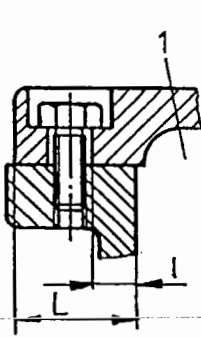


Figure 4

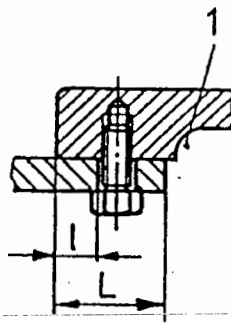


Figure 5

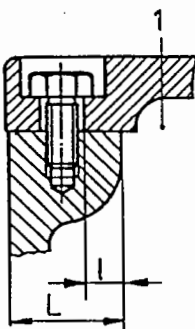


Figure 6

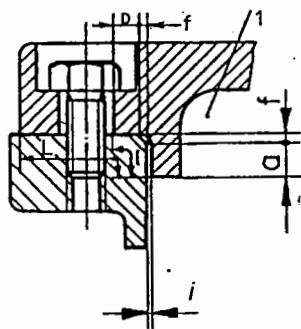


Figure 7

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

1 Interior of enclosure

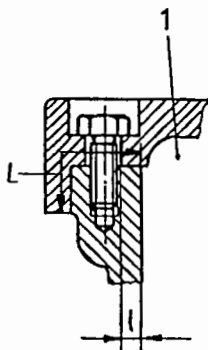


Figure 8

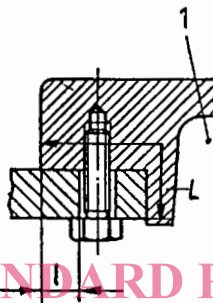


Figure 9

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Figures 4, 5, 6 — Holes in surfaces of flanged joints
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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 be 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.

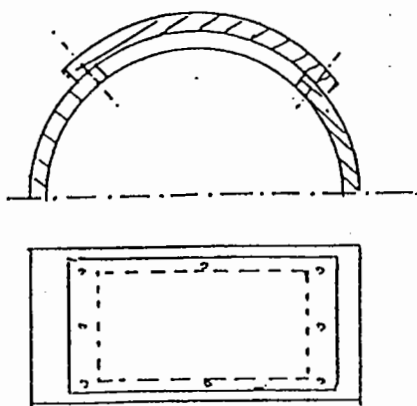


Figure 10 — Example for a joint with partial cylindrical surfaces

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 cm³.

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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 ≤ 100		100 < V ≤ 500		500 < V ≤ 2 000		V > 2 000					
		I	IIA	IIB	I	IIA	IIB	I	IIA	IIB			
Flanged, cylindrical or spigot joints For spigot joints, see figures 2 and 3	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	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
Rolling-element bearings	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
	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.

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Table 2 — Minimum width of joint and maximum gap for Group IIC enclosures

Type of joint	Minimum width of joint L Mm	Maximum gap in mm for Volume V (cm ³)			
		V ≤ 100	100 < V ≤ 500	500 < V ≤ 2 000	V > 2 000
Flanged joints ¹⁾	6 9,5	0,10 0,10	- 0,10	- -	- -
Spigot joints c ≥ 6 mm (figure 2) d _{min} = 0,5 L L = c + d f ≤ 1 mm	12,5 25 40	0,15 0,18 2) 0,20 3)	0,15 0,18 2) 0,20 3)	0,15 0,18 2) 0,20 3)	0,18 2) 0,20 3)
Cylindrical joints	6	0,10	-	-	-
Spigot joints (figure 3)	9,5 12,5 25 40	0,10 0,15 0,15 0,20	0,10 0,15 0,15 0,20	0,15 0,15 0,15 0,20	- - 0,15 0,20
Cylindrical joints for shaft glands of rotating electrical machines with rolling-element bearings	6 9,5 12,5 25 40	0,15 0,15 0,25 0,25 0,30	- 0,15 0,25 0,25 0,30	- - 0,25 0,25 0,30	- - - 0,25 0,30

1) Flanged joints are not permitted for explosive mixtures of acetylene/air.

2) f_T of cylindrical part increased to 0,20 if f ≤ 0,5.

3) f_T of cylindrical part increased to 0,25 if f ≤ 0,5.

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

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