SLOVENSKI STANDARD
SIST EN 50019:2000

01-december-2000

Nadomeģ a:
SIST EN 50019:1999

Elektriļ ne naprave za potencialno eksplozivne atmosfere - Poveļ ana varnost "e"

Electrical apparatus for potentially explosive atmospheres - Increased safety 'e'

Elektrische Betriebsmittel für explosionsgefährdete Bereiche - Erhöhte Sicherheit 'e'

Matériel électrique pour atmosphères explosibles - Sécurité augmentée 'e'

Ta slovenski standard je istoveten z: EN 50019:2000

ICS:

29.260.20	Elektriļ ni aparati za eksplozivna ozraļ ja	Electrical apparatus for explosive atmospheres

SIST EN 50019:2000 **en**

EUROPEAN STANDARD **EN 50019**

NORME EUROPÉENNE

EUROPÄISCHE NORM July 2000

ICS 29.260.20

Supersedes EN 50019:1994
To be read in conjunction with EN 50014:1997

English version

Electrical apparatus for potentially explosive atmospheres Increased safety 'e'

Matériel électrique pour atmosphères explosibles
Sécurité augmentée 'e'

Elektrische Betriebsmittel für explosionsgefährdete Bereiche
Erhöhte Sicherheit 'e'

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

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, Czech Republic, 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

Ref. No. EN 50019:2000 E

Contents

Annexes

Tables

Figures

Foreword

This European Standard was prepared by the Technical Committee CENELEC SC 31-4, Electrical apparatus for explosive atmospheres: Increased safety 'e'

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50019 on 2000-01-01.

This European Standard supersedes EN 50019:1994 and its corrigendum April 1994.

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

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

The 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.

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.

1 Scope

This European Standard specifies the specific requirements for the construction, testing and marking of electrical apparatus with type of protection "increased safety "e"" intended for use in explosive gas atmospheres.

These specific requirements are additional to the general requirements in EN 50014 which are applicable to type of protection "e". This European Standard applies to electrical apparatus with a rated value of supply voltage not exceeding 11 kV (d.c. or a.c. r.m.s.) that does not produce in normal operation sparks, arcs, or dangerous temperatures.

Potentially explosive atmospheres include the presence of combustible dusts for Group I equipment.

Except where otherwise stated in the supplementary standards, this standard and the related standards provide protection in accordance with Category 2 or Category M2.

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 (including amendments).

Publication	Year	Title
EN 50014 + corrigendum April + A1 + A2	1997 1998 1999 1999	Electrical apparatus for potentially explosive atmospheres - General requirements
EN 50016		Electrical apparatus for potentially explosive atmospheres - Pressurized apparatus 'p'
EN 50018		Electrical apparatus for potentially explosive atmospheres - Flameproof enclosure "d"
EN 50020		Electrical apparatus for potentially explosive atmospheres - Intrinsic safety "i"
EN 50028		Electrical apparatus for potentially explosive atmospheres - Encapsulation 'm'
EN 50033		Electrical apparatus for potentially explosive atmospheres - Caplights for mines susceptible to firedamp
EN 50039		Electrical apparatus for potentially explosive atmospheres - Intrinsically safe electrical systems "i"
EN 60034-1		Rotating electrical machines - Part 1: Rating and performance (IEC 60034-1:1996, modified)
EN 60034-5		Rotating electrical machines - Part 5: Classification of degrees of protection provided by enclosures for rotating machines (IEC 60034-5:1981, modified)
EN 60061-1	1993	Lamp caps and holders together with gauges for the control of interchangeability and safety - Part 1: Lamp caps (IEC 60061-1:1969 + supplements A:1970 to N:1992, modified)
EN 60061-2	1993	Lamp caps and holders together with gauges for the control of interchangeability and safety - Part 2: Lampholders (IEC 60061-2:1969 + supplements A:1970 to K:1992, modified)
EN 60064		Tungsten filament lamps for domestic and similar general lighting purposes - Performance requirements (IEC 60064:1993, modified)
EN 60068-2-6		Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal) (IEC 60068-2-6:1995 + corrigendum March 1995)
EN 60068-2-27	1993	Basic environmental testing procedures - Part 2: Tests - Test Ea and guidance: Shock (IEC 60068-2-27:1987)
EN 60086-1		Primary batteries - Part 1: General (IEC 60086-1:1996)
EN 60095	series	Lead-acid starter batteries (IEC 60095 series, modified)

Publication	Year	Title
EN 60238		Edison screw lampholders (IEC 60238:1998)
EN 60285		Alkaline secondary cells and batteries - Sealed nickel-cadmium cylindrical rechargeable single cells (IEC 60285:1993 + corrigendum August 1993)
EN 60317-3 + A1	1994 1998	Specifications for particular types of winding wires - Part 3: Polyester enamelled round copper wire, class 155 (IEC 60317-3:1990 + A1:1997)
EN 60317-7 + A1 + A2	1994 1997 1998	Specifications for particular types of winding wires - Part 7: Polyimide enamelled round copper wire, class 220 (IEC 60317-7:1990 + A1:1997 + A2:1997)
EN 60317-8 + A1 + A2	1994 1997 1998	Specifications for particular types of winding wires - Part 8: Polyesterimide enamelled round copper wire, class 180 (IEC 60317-8:1990 + A1:1997 + A2:1997)
EN 60400		Lampholders for tubular fluorescent lamps and starter holders (IEC 60400:1999, modified)
EN 60432-1		Safety specifications for incandescent lamps - Part 1 Tungsten filament lamps for domestic and similar general lighting purposes (IEC 60432-1:1999, modified)
EN 60529		Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)
EN 60623		Vented nickel-cadmium prismatic rechargeable single cells (IEC 60623:1990 + A1:1992 and A2:1992)
EN 60662		High-pressure sodium vapour lamps (IEC 60662:1980 + A2:1987 and A3:1990)
EN 60947-1		Low voltage switchgear and controlgear. Part 1: General rules (IEC 60947-1:1999, modified)
EN 61056-1		Portable lead-acid cell and batteries (Valve-regulated types) - Part 1: General requirements, functional characteristics - Methods of test (IEC 61056-1:1991)
EN 61150		Alkaline secondary cells and batteries - Sealed nickel-cadmium rechargeable monobloc batteries in button cell design (IEC 61150:1992 + corrigendum March 1992)
EN 61195		Double-capped fluorescent lamps - Safety specifications (IEC 61195:1999)
EN 954-1		Safety of machinery - Safety related parts of control systems - Part 1: General principles for design
HD 214 S2		Recommended method for determining the comparative tracking index of solid insulating materials under moist conditions (IEC 60112:1979)
HD 384.3 S2	1995	Electrical installations of buildings - Part 3: Assessment of general characteristics (IEC 60364-3:1993, modified)
HD 553 S2		Current transformers (IEC 60185:1987 + A1:1990, modified)
HD 566 S1		Thermal evaluation and classification of electrical insulation (IEC 60085:1984)
IEC 60050-426	1990	International Electrotechnical Vocabulary - Chapter 426: Electrical apparatus for explosive atmospheres
IEC 60050-486	1991	International Electrotechnical Vocabulary - Chapter 486: Secondary cells and batteries
IEC 60068-2-42		Environmental testing - Part 2: Tests - Test Kc : Sulphur dioxide test for contacts and connections
IEC 60079-4		Electrical apparatus for explosive gas atmospheres - Part 4: Method of test for ignition temperature
IEC 60664-1	1992	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests (harmonized as HD 625.1, modified)
IEC 60755		General requirements for residual current operated protective devices

3 Definitions

For the purposes of this European Standard, the definitions of EN 50014 and also the following apply.

NOTE Where a word, for example "battery", is shown in parentheses in a term, it may be omitted when no risk of confusion or misunderstanding is likely to arise.

3.1
increased safety "e"
a type of protection in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks inside and on external parts of electrical apparatus which does not produce arcs or sparks in normal service [IEC 60050-426-08-01]

NOTE 1 This type of protection is denoted by "e" and the "additional measures" are those required for compliance with this European Standard.

NOTE 2 Apparatus producing arcs or sparks in normal service is excluded by this definition.

3.2
limiting temperature
the maximum permissible temperature of apparatus or parts of apparatus equal to the lower of the two temperatures determined by:

a) the danger of ignition of the explosive gas atmosphere;

b) the thermal stability of the materials used. [IEC 60050-426-08-02]

3.3
initial starting current I_A
highest r.m.s value of current absorbed by an a.c. motor when at rest or by an a.c. magnet with its armature clamped in the position of maximum air gap when supplied at rated voltage and rated frequency

NOTE Transient phenomena are ignored.

3.4
starting current ratio I_A/I_N
rRatio between initial starting current I_A and rated current I_N

3.5
time t_E
the time taken for a.c. windings, when carrying the starting current I_A, to be heated up from the temperature reached in rated service and at maximum ambient temperature, to the limiting temperature
[IEC 60050-426-08-03]

3.6
rated short-time thermal current I_{th}
R.M.S. value of the current required to heat up the conductor within 1 s from the temperature reached in rated service at the maximum ambient temperature to a temperature that does not exceed the limiting temperature

3.7
rated dynamic current I_{dyn}

peak value of the current, the dynamic effect of which the electrical apparatus can sustain without damage

3.8

short-circuit current I_{SC}
maximum r.m.s. value of the short-circuit current to which the apparatus may be subjected in service

3.9
creepage distance
shortest distance along the surface of an insulating material between two conductive parts

3.10
clearance
shortest distance in air between two conductive parts

3.11
working voltage
the highest r.m.s. value of the a.c. or d.c. voltage across any particular insulation which can occur when the equipment is supplied at rated voltage [definition 1.3.5 of IEC 60664-1:1992]

NOTE 1 Transients are disregarded.

NOTE 2 Both open circuit conditions and normal operating conditions are taken into account

3.12 Component part of cells and batteries

3.12.1
container (of a cell)
a container for the plate pack and electrolyte of a cell made of a material impervious to attack by the electrolyte [IEC 60050-486-02-20]

3.12.2
(battery) container
enclosure to contain the battery

NOTE The cover is a part of the battery container.

3.12.3
plate pack
an assembly of the positive and negative plate groups with separators [IEC 60050-486-02-15]

3.12.4
partition wall
integral part of a battery container dividing it into individual sections and increasing its mechanical strength

3.12.5
insulating barrier
electrical insulating material between groups of cells subdividing the battery

3.12.6
intercell connector
a conductor of electricity used for carrying current between cells [IEC 60050-486-02-31]

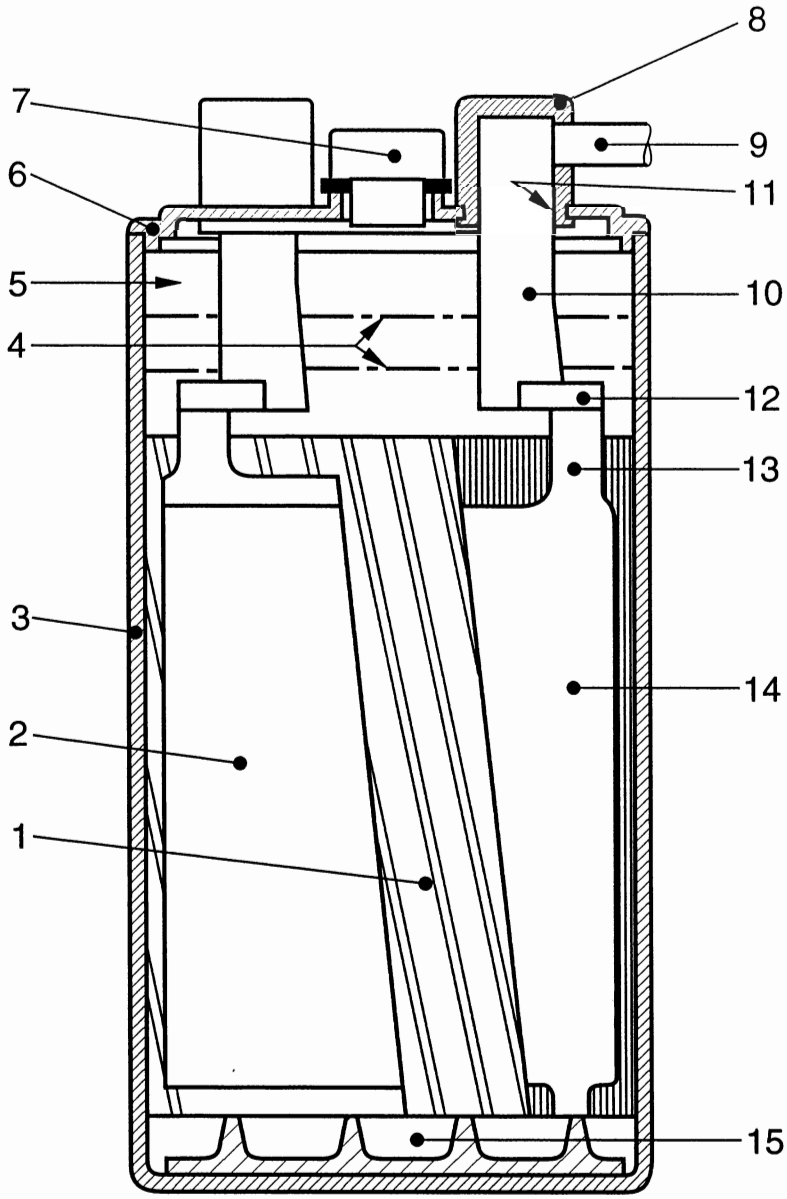
3.13 Resistance heating device and resistance heating unit

3.13.1
resistance heating device
part of a resistance heating unit, comprising one or more heating resistors, typically composed of metallic conductors or an electrically conductive compound suitably insulated and protected

3.13.2
resistance heating unit
apparatus comprising an assembly of one or more resistance heating devices, associated with any devices necessary to ensure that the limiting temperature is not exceeded

NOTE This standard does not require that protective devices outside the hazardous area have type of protection "e".

3.13.3
workpiece
object to which a resistance heating device or unit is applied



1 - Separator

2 - Positive plate

3 - Cell container

4 - Electrolyte level (max/min)

5 - Headspace

6 - Electrolyte-tight lid seal

7 - Filler and vent plug

8 - Post encapsulation

9 - Intercell connector

10 - Terminal post

11 - Electrolyte-tight terminal post seal

12 - Group bar

13 - Plate lug

14 - Negative plate

15 - Slurry space

Figure 1 – Typical parts of a secondary cell

3.13.4
self-limiting characteristic
characteristic of a resistance heating device, where the thermal output at its rated voltage decreases as the temperature of its surroundings increases until the device reaches a temperature at which its thermal output is reduced to an insignificant amount

NOTE The temperature of the surface of the resistance heating device is then effectively the temperature of the environment.

3.13.5
stabilized design
concept where the temperature of the resistance heating device or unit will, by design and use, stabilize below the limiting temperature, under the most unfavourable conditions, without the need for a protective system to limit the temperature

4 Constructional requirements for all electrical apparatus

The requirements of this clause apply, unless otherwise stated in clause 5, to all electrical apparatus with type of protection "e". They are additional to the general requirements of EN 50014 (see clause 1) and are themselves supplemented for certain electrical apparatus by the supplementary requirements in clause 5.

4.1 Terminals for external connections

Terminals for connections to external circuits shall be generously dimensioned to permit the effective connection of conductors of cross section at least equal to that corresponding to the rated current of the electrical apparatus.

The number and sizes of conductors that can be safely connected to terminals should be specified in the descriptive documents according to 23.2 of EN 50014.

NOTE 1 Service conditions may require the provision of larger terminals and the conductor size corresponding to the rated current may depend upon the application.

These terminals shall

- be fixed in their mountings without possibility of self-loosening; and
- be constructed in such a way that the conductors cannot slip out from their intended location; and
- be such that proper contact is assured without such damage to the conductors as would impair their ability to fulfil their function, even when multi-stranded conductors are used in terminals intended for direct clamping of a conductor.

NOTE 2 The use of "crimped" cable terminations is not forbidden provided that the above requirements are fulfilled.

In particular, terminals shall not

- have sharp edges which could damage the conductors;
- be able to turn, twist or be permanently deformed during normal tightening, for which the conditions shall be defined by the manufacturer of the apparatus.

Terminals shall be such that the contact they assure is not appreciably impaired by temperature changes occurring in normal service. The contact pressure shall not be transmitted through insulating material.

Terminals intended for clamping stranded conductors shall include a resilient intermediate part. Terminals for connecting conductors of cross sections not exceeding 4 mm^2 shall also be suitable for the effective connection of conductors having a smaller cross section.

NOTE 3 Special precautions against vibration and mechanical shock may be required.

NOTE 4 Special precautions against electrolytic corrosion should be considered.

4.2 Internal connections (integral part of the apparatus)

Connections within electrical apparatus and forming an integral part of that apparatus shall not be subject to undue mechanical stress. Only the following means for the connection of conductors are permitted:

a) screwed fasteners with locking;

b) crimping;

c) soldering, provided that the conductors are not supported by the soldered connections alone;

d) brazing;

e) welding;

f) any means of connection complying with 4.1.

NOTE Special precautions against electrolytic corrosion should be considered.

4.3 Clearances

Clearances between bare conductive parts at different potentials shall be as given in Table 1 with a minimum value for external connections of 3 mm.

NOTE 1 For the requirements for lamps with screw caps see B.1.4.

Clearances shall be determined as a function of the working voltage (definition 3.11) specified by the manufacturer of the apparatus. Where the apparatus is intended for more than one rated voltage or for a range of rated voltage, the value of working voltage to be used shall be based on the highest value of rated voltage. In determining the clearances, examples 1 to 11 inclusive in Figure 2 illustrate the features to be taken into account and the appropriate clearances.

NOTE 2 These examples are identical with those given in IEC 60664-1.

Table 1 — Creepage distances and clearances

Working voltage *U* V	Minimum creepage distance Material group, mm			Minimum clearance mm
	I	II	IIIa	
$U \leq 15$	1,6	1,6	1,6	1,4
$15 < U \leq 30$	1,8	1,8	1,8	1,8
$30 < U \leq 60$	2,1	2,6	3,4	2,1
$60 < U \leq 110$	2,5	3,2	4	2,5
$110 < U \leq 175$	3,2	4	5	3,2
$175 < U \leq 275$	5	6,3	8	5
$275 < U \leq 420$	8	10	12,5	6
$420 < U \leq 550$	10	12,5	16	8
$550 < U \leq 750$	12	16	20	10
$750 < U \leq 1100$	20	25	32	14
$1100 < U \leq 2200$	32	36	40	30
$2200 < U \leq 3300$	40	45	50	36
$3300 < U \leq 4200$	50	56	63	44
$4200 < U \leq 5500$	63	71	80	50
$5500 < U \leq 6600$	80	90	100	60
$6600 < U \leq 8300$	100	110	125	80
$8300 < U \leq 11\,000$	125	140	160	100

4.4 Creepage distances

4.4.1 The required values of creepage distance are dependent on the working voltage, the resistance to tracking of the electrical insulating material and its surface profile.

Table 2 gives the grouping of electrical insulating materials according to the Comparative Tracking Index (CTI) determined in accordance with HD 214 S2. Inorganic insulating materials, for example glass and ceramics, do not track and need not therefore be subjected to the determination of the CTI. They are conventionally classified in Material group I.

The grouping given in Table 2 is applied to insulating parts without ribs or grooves. If there are ribs or grooves in accordance with 4.4.3, the minimum permissible creepage distances for working voltages up to 1100 V shall be based on the next higher group, for example Group I instead of Group II.

NOTE 1 The material groups are identical with those given in IEC 60664-1.

NOTE 2 Transient overvoltages are ignored as they will not normally influence tracking phenomena. However, temporary and functional overvoltages may have to be considered, depending upon the duration and frequency of occurrence (see IEC 60664-1 for additional information).

Table 2 — Tracking resistance of insulating materials

Material group	Comparative tracking index
I	600 ≤ CTI
II	400 ≤ CTI < 600
IIIa	175 ≤ CTI < 400

4.4.2 Creepage distances between bare conductive parts at different potentials shall be as given in Table 1, with a minimum value for external connections of 3 mm and shall be determined as a function of the working voltage specified by the manufacturer of the apparatus.

NOTE For the requirements for lamps with screw caps see B.1.4.

4.4.3 In determining the creepage distance, examples 1 to 11 (see Figure 2) inclusive illustrate the features to be taken into account and the appropriate creepage distance. The value of dimension *X* is 2,5 mm.

The effect of ribs and grooves may be taken into account provided that:

a) ribs on the surface are at least 2,5 mm high and of a thickness appropriate to the mechanical strength of the material with a minimum value of 1,0 mm and;

b) grooves in the surface are at least 2,5 mm deep and at least 2,5 mm wide. If the associated clearance distance is less than 3 mm, the minimum groove width may be reduced to 1,5 mm.

NOTE 1 Projections above or depressions below the surface are considered as being either ribs or grooves irrespective of their geometric form.

NOTE 2 Cemented constructions (see clause 12 of EN 50014) are considered to be solid parts.

4.5 Solid electrical insulating materials

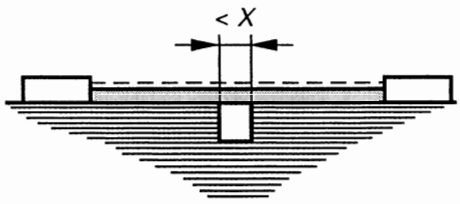
NOTE This term describes the form in which the materials are used and not necessarily that in which they are supplied, for example insulating varnishes when cured are considered as being solid electrical insulating materials.

4.5.1 The mechanical characteristics of the insulating materials that affect their functional behaviour, for example strength and rigidity, shall be satisfactory either:

a) at a temperature up to at least 20 K above the maximum temperature attained in rated service and at least 80 °C, or

b) for insulated windings (see 4.7.3 and Table 3), for internal wiring (see 4.8) and for cables permanently connected to electrical apparatus (see 14.1 of EN 50014) up to the maximum temperature attained in rated service.

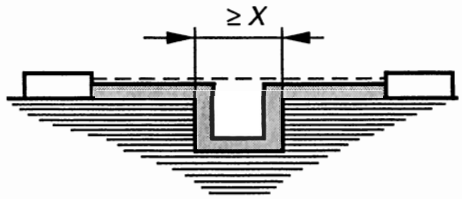
Example 1



Condition: Path under consideration includes a parallel-or converging-sided groove of any depth with a width less than X mm.

Rule: Creepage distance and clearance are measured directly across the groove as shown.

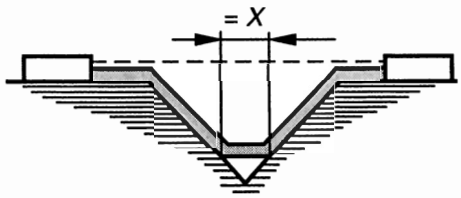
Example 2



Condition: Path under consideration includes a parallel-sided groove of any depth d equal to or more than X mm.

Rule: Clearance is the "line of sight" distance. Creepage path follows the contour of the groove

Example 3



Condition: Path under consideration includes a V-shaped groove with a width greater than X mm.

Rule: Clearance is the "line of sight" distance. Creepage path follows the contour of the groove but "short-circuits" the bottom of the groove by X mm link.

Example 4

Condition: Path under consideration includes a rib.

Rule: Clearance is the shortest direct air path over the top of the rib. Creepage path follows the contour of the rib

1 Clearance

2 Creepage distance

Figure 2 — Determination of creepage distances and clearances