National Standard of the People's Republic of China

GB 3836.1-2000

eqv IEC 60079-0：1998

Superseding GB 3836.1 — 1983

Electrical apparatus for explosive gas atmospheres—

Part 1：General requirements

Contents

Foreword

This Standard is a revision of National Standard GB 3836.1 — 1983 according to the international standard IEC 60079-0: 1998 《Electrical Apparatus for Explosive Gas Atmospheres — Part 0: General Requirements》. It is equivalent to IEC 60079-0:1998 in the technical contents and as same as it in the compilation rules and complies with the provisions made in National Standard GB/T 1.1 — 1993.

This standard is divided into the following parts under the general title - Electrical Apparatus for Explosive Gas Atmospheres:

Part 1: General Requirements

Part 2: Flameproof Type "d"

Part 3: Increased Safety Type "e"

Part 4: Intrinsic Safe Type "i"

Part 5: Positive Pressure Type "p"

Part 6: Oil-filled Type "o"

Part 7: Sand-filled Type "q"

Part 9: Encapsulation Type "m"

When the revisions were made to GB 3836.1 — 1983 according to IEC 60079-0:1998, the requirements of fire retardant property for the plastic enclosures have been added in order to solve the problem in fire prevention for non-metallic enclosures of Class I electrical apparatuses. Refer to Appendix E.

This Standard has still remained a part of contents of National Standard GB 3836.1 — 1983 as follows:

1). Inspection procedures are remained to meet the requirement for inspection of explosion-proof electrical products in our country. Refer to Appendix A.

2). Moisture proof requirement for Class I electrical apparatus is remained to meet the special requirements for damp environmental conditions for coal mines in our country. Refer to Appendix C.

3). The light alloy that has a tensile strength ≥ 120MPa and is qualified by the friction sparking test according to the provisions made in GB 13813 can be used to make the

enclosures of Class I hand-held or jig-type electrodrills (and attached plug-in devices), portable instruments and apparatuses and light fixtures. This content is remained for the purpose of solving the problem in lightening the weight of some special hand-held electrical apparatuses (see Clause 8.3).

Compared with GB 3836.1 — 1983, there are following important changes:

1). A revision is made to the title of the standard, i.e. "Electrical Apparatus for Explosive Atmospheres" is changed to "Electrical Apparatus for Explosive Gas Atmospheres".

2). Term "Explosive Gas Mixture" is revised as "Explosive Gas Atmospheres".

3). In order to resolving the problem in deposition of static electric charge for enclosures, the limitation of surface area of enclosures, measures taken in design of enclosures to prevent the deposition of static charge, provisions of light aging resistance, provisions of fire retardant properties, etc., have been added.

4). Revisions have been made to the provisions of magnesium content of light metal used for the enclosures of Class II electrical apparatus.

5). Revisions have been made to the dimensions of external ground connection facilities in order to be as same as that of the internal ground connection facilities.

6). Method for measuring the resistance on the surface of plastic enclosures is modified as measuring the resistance values between paralleled straight lines with a distance of 10mm ±0.5mm, a length of 100mm ±1mm and a width of 1mm ±0.2mm.

7). Contents of Ex components, fuses, plug-in devices, portable, cap-lamps, etc., have been added.

8). Fire retardant test for plastic, light aging test for plastic, safety test of friction spark for light alloy, etc., have been added into the part of tests.

9). For the no-protection transparent parts of Class I electrical apparatus, under the conditions of high mechanical hazard, the energy of impact test of 10 J as specified in GB 3836.1 — 1983 is lowered to 7J, and the ambient temperature of 25 $\pm 10^{o}$C for the impact test is modified as 20 $\pm 5^{o}$C.

10). The provision of using nylon punch for impact test of the glass transparent parts has been cancelled.

11). Manufacturers are only required to submit the relevant documentation related to the explosion-proof properties when submitting the documentation of explosion-proof electrical apparatuses for review and approval. However, the requirements for quality assurance documents and documentation related to the products of manufacturers are added.

This Standard is the basic standard for the Electrical Apparatus for Explosive Gas Atmospheres. When the product standard of explosion-proof electrical apparatus is in conflict with this Standard, this Standard shall prevail.

This Standard supersedes National Standard GB 3836.1 — 1983 as from the date when this Standard is enforced.

Appendices A, C, D, E and F to this Standard are the normative ones.

Appendix B and Appendix G are the reference ones.

This Standard is proposed by the State Bureau of Mechanical Industry.

This Standard is steered by the National Technical Committee for Explosion-proof Electrical Apparatus Standardization.

This Standard is drafted by Nanyang Explosion-proof Electrical Research Institute of the Ministry of Mechanical Industry, Fushun institute and Chongqing Institute under Coal Science Research Institution, Shenyang Electrical Driving Research Institute, etc.

The main drafting persons of this Standard are Guo Jiantang, Chen Zaixue, Huang Rongguang, Wan Shaopo, Ji Minghuan and Wang Jun.

This Standard was issued initially in August, 1983 and was revised for the first time in January, 2000.

National Technical Committee for Explosion-proof Electrical Apparatus Standardization is entrusted to be responsible for making explanations for this Standard.

Foreword of IEC

1). International Electrotechnic Commission (IEC) is an international standardization organization. It is composed of all the IEC National Committees. The purpose of IEC is to promote the international cooperation in all problems related to standardization in the electro-technical field. For this purpose, IEC also publishes international standards in addition to the other activities. Formulation of standards is entrusted to each technical committee. Any IEC National Committee interested in the subject may take part in the preparations. In formulation of standards, any international organization, government or non-government organization and any other organization related to IEC may also take part in this work. According to the conditions agreed between the two organizations through consultations, IEC cooperates closely with the International Standardization Organization (ISO).

2). All the formal resolutions or agreements of IEC regarding technical problems reflect as possible as they can the internationally uniform opinions, because all IEC National Committees that have special interest in the subject have their representatives in the technical committee.

3). They have forms of recommendation which are generally used internationally, and are published in a form of a standard, a form of a technical report or a guideline and are accepted by all IEC National Committee in this sense.

4). With view to promoting international uniformisation, All IEC National Committees agree to use IEC International Standards to the maximum extent in their national standards and regional standards. In case there is any difference between IEC standards and the relevant national standards or regional standards, it shall be clearly described in the test of the relevant national standard respectively.

5). There is no provision for the approval procedure made by IEC. Therefore, when it is stated that some equipment meets some standard of the international standard, IEC shall not bear any responsibility.

6). It is worth noting that some part of this international standard may cover patent rights, and IEC will not bear any responsibility for some equivalence or the equivalence as a whole.

International Standard IEC 60079-0 is formulated by IEC TC 31 "Technical Committee of Electrical Apparatus for Explosive Atmospheres".

This third edition will cancel and supersede the second edition published in 1983, and the technical revisions have been made.

This International Standard is formulated on the basis of European Standard EN 50014 (1992) published by CENELEC.

This Standard is based on the following documents:

FDIS	Report on Voting
31/248/ FDIS	31/252/RVD

The complete conditions for approval of this Standard by voting can be examined with the reference made to the Report on Voting indicated in the above table.

Appendix B and Appendix C constitute an integral part of this Standard. Appendix A and Appendix D are the non-standard contents.

National Standard of the People's Republic of China

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Superseding GB 3836.1 — 1983

Electrical apparatus for explosive gas atmospheres—

Part 1：General requirements

1. Scope

1.1 This Standard specifies the general requirements and inspection procedures for the design, inspection and marking of electrical apparatus, Ex cable entry and Ex component for explosive gas atmospheres [1].

1.2 This Standard is supplemented or modified with the following special standards for the types of protection for electrical apparatuses.

GB 3836.2 Electrical apparatus for explosive gas atmospheres — Part 2: Flameproof type “d”

GB 3836.3 Electrical apparatus for explosive gas atmospheres — Part 3: Increased safety type “e”

GB 3836.4 Electrical apparatus for explosive gas atmospheres — Part 4: Intrinsic safe type “i”

GB 3836.5 Electrical apparatus for explosive gas atmospheres — Part 5:Positive Pressure type “p”

GB 3836.6 Electrical apparatus for explosive gas atmospheres — Part 6: Oil-Filled type “o”

GB 3836.7 Electrical apparatus for explosive gas atmospheres — Part 7: Sand-filled type “q”

GB 3836.9 Electrical apparatus for explosive gas atmospheres — Part 9: Melt-cast type “m”

GB 7957 Safety Cap Lamp for Mines

1.3 The above listed and this Standard are not applicable to medical electrical apparatuses, blasters, blaster testers and igniting circuit tester.

Notes:

(1) In addition to the above-mentioned types of protection, National Standard GB 3836.8 regarding no-spark type "n" is also applicable to the explosive atmospheres.

(2) When electrical apparatuses use the type of protection that is not covered by this Standard and the special standards listed in Clause 1.2, they can be regarded as the special type electrical apparatuses and are marked with "s" after they are certified by inspection organizations.

2 Reference Standards

The clauses contained in the following standards constitute the provisions of this Standard with the references are made in this Standard. When this Standard is published, all the indicated editions are valid. All standards are subject to revisions, and all parties who apply this Standard shall explore the possibilities to use the latest editions of the following standards:

GB/T 70 — 1985 Hexagon socket cap head screws (eqv ISO 4762:1977)

GB/T 77 — 1985 Hexagon socket set screws with flat point (eqv ISO 4026:1977)

GB/T 78 — 1985 Hexagon socket set screws with cone point (eqv ISO 4027:1977)

GB/T 79 — 1985 Hexagon socket set screws with dog point (eqv ISO 4028:1977)

GB/T 80 — 1985 Hexagon socket set screws with cup point (eqv ISO 4029:1977)

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Application Note:

[1] There are no specific provisions of inspection procedures in IEC 60079-0. The inspection procedures

are specified in Appendix A to this Standard.

Approved by State Bureau of Quality and Technical Supervision on January 3, 2000 Implemented as of August 1, 2000

GB/T 2423.4—1993	Basic environmental testing procedures for electric and electronic products —Test DB: Damp heat, cyclic (eqv IEC 60068-2-30:1980)
GB 3836.11—1991	Electrical apparatus for explosive atmospheres — Method of test for ascertainment of maximum experimental safe gap (eqv IEC 60079-1A:1975)
GB 3836.12—1991	Electrical apparatus for explosive atmospheres — Classification of gases or vapors with air according to their maximum experimental safe gaps and minimum igniting currents (eqv IEC 60079 - 12:1978)
GB 4208 —1993	Degree of Protection provided by enclosure (IP Code) (eqv IEC 60529:1989)
GB/T 4942.1—1985	Classification of degrees of protection provided by enclosures for rotating machines (eqv IEC 60034 - 5:1981)
GB/T 5277—1985	Fasteners — Clearance holes for bolts and screws (eqv ISO 273:1979)
GB/T 5782—1986	Hexagon head bolts — Product Grades A and B (eqv ISO 4014:1979)
GB/T 5783—1986	Hexagon head bolts — Full-thread — Product Grades A and B (eqv ISO 4017:1979)
GB/T 6031—1998	Rubber, vulcanized or thermoplastic — Determination of hardness (30 ~ 85 IRHD) (idt ISO 48:1994)
GB/T 6170—1986	Hexagon nuts, Style 1 – Product Grades A and B (eqv ISO 4032:1979)
GB/T 7957—1987	Safety cap lamp for mines
GB/T 9145—1988	General purpose screw threads — Limits of sizes for commercial bolt and nut threads – Medium quality (eqv ISO 965/2:1980)
GB/T 9341—1988	Plastic — Determination of flexural properties of rigid plastic s (eqv ISO 178:1975)
GB/T 11020—1989	Test methods for the determination of the flammability of solid electrical insulating materials when exposed to an igniting source (eqv IEC 707:1981)
GB/T 11026.1—1989	Guide for the determination of thermal endurance properties of electrical insulating materials — General guidelines for ageing

	procedures and evaluation of test results (eqv IEC 60216-1:1987)
GB 13813—1992	Testing method and judging rule of safety to friction spark of metallic material for coal mines
JB/T 7192—1995	Selectable series of general purpose screw threads for commercial bolts and nuts
IEC 60079—4:1975	Electrical apparatus for explosive atmospheres — Part 4: Test method for determination of ignition temperature
IEC 60192: 1973	Low voltage sodium lamp
IEC 60216—2:1990	Guideline for determination of heat endurance property for electrical insulating materials — Part 2: Selection of testing and judging criteria
IEC 60662: 1980	High voltage sodium lamp
IEC 60947 —1:1996	Low voltage switch and controller — Part 1: General Procedures
ISO 179:1993	Plastic — Method for determination of pendulum impact test strength for rigid plastic
ISO 286-2:1988	ISO system of tolerance and fitting-up — Part 2: Table of standard tolerance grade and tolerance limits for holes and shafts
ISO 527-2:1993	Plastics — Determination of tensile properties Part 2: Formed plastics and molded plastics
ISO 1817:1985	Vulcanized rubber — Determination of effect of liquid
ISO 4892-1:1994	Plastics — Test method of exposure to laboratory light source

3 Definitions and Symbols

The following definitions and symbols are used in this Standard.

3.1 Electrical Apparatus

It refers to an integral or part of equipment that uses electrical energy, e.g. equipment for electricity generation, power transmission, power distribution, power storage, electrical logging, controlling, current transforming, power-consuming apparatuses, equipment for telecommunication and projects, etc.

3.2 Potentially Explosive Atmosphere

The atmosphere in which explosion may occur probably.

3.3 Explosive Gas Atmosphere

A mixture composed of gases, vapors or fog flammable substances and air under atmospheric

conditions. When this mixture is ignited, firing will propaganda the whole atmosphere filled with the unfired mixture.

3.4 Explosive Test Mixture

A specific explosive mixture, that is used for testing the explosion-proof electrical apparatuses.

3.5 Ignition Temperature of an Explosive Gas Atmosphere

Min. temperature on hot surface, that can ignite the mixture of explosive gas and air when the test is being performed according to the method specified in IEC 60079-4.

3.6 Service Temperature

The temperature that is reached during the apparatus operates at rating.

3.7 Maximum Service Temperature

Max. value of service temperature.

Note: Max. service temperature for different parts of each apparatus may vary.

3.8 Maximum Surface Temperature

The max. temperature that can be reached on the surface or any part of electrical apparatus and may probably ignite surrounding explosive gas atmospheres when they operate under the permissible, most unfavorable conditions.

Notes:

(1) Manufacturer shall specify the standards of their products and take into consideration the following conditions in their design:
   — Failure conditions specified in the standard related to the type of protection;
   — Operation conditions specified in the other standards including the overload conditions confirmed by manufacturers;
   — Any other operation condition specified by manufacturers.

(2) The max. surface temperature referred here may be the exterior surface temperature or the interior surface temperature, which depends on the types of protection.

3.9 Enclosure

An integral constituted by all wall, door, cover, cable entry, rod, shaft, spindle, etc. and for the purpose of realizing type of protection or degree of protection (IP) of electrical apparatuses.

3.10 Type of Protection

Particular measures taken to protect electrical apparatus from igniting the surrounding explosive gas atmospheres.

3.11 Degree of Protection of Enclosure (IP)

Code prefixed with Symbol "IP", which is used to identify enclosure of electrical apparatus.

— to prevent personnel from getting contact with the internal live parts and moving parts (excluding smooth shafts and equivalents);

— to prevent solid foreign matters from getting into the interior of apparatuses.

— to prevent liquid from immersing the interior of electrical apparatuses.

Note: It is not necessary for the enclosures provided with IP to be equal to the enclosures with types of protection as listed in Clause 1.2.

3.12 Rated Value

A set of values that is given by manufacturer to specify the service conditions for apparatuses, devices or components.

3.13 Rating

An integration of rated values and operation conditions.

3.14 Cable Entry

A device, which allows one cable or optical fiber cable or multiple cables or multiple optical fiber cables to enter into electrical apparatuses and can ensure the type of protection.

3.15 Ex Cable Entry

A cable entry device, which is tested and certified as a separate apparatus and installed together with the enclosure of apparatus, and it is not required to have a certificate.

3.16 Conduit Entry

A device, to be used to introduce the conduit into electrical apparatus while still to maintain its type of protection.

3.17 Compression Element

An element of cable entry, which is used to exert compression on the sealing ring and ensure the effective function of the cable entry.

3.18 Clamping Device

An element of cable entry, which is used to protect the cable from being stretched or strained resulting in effect on connection facilities.

3.19 Sealing Ring

A ring article, which is used in cable entry and conduit entry to ensure sealing between the entries and cables or conduits.

3.20 Terminal Compartment

A compartment, which is separated from the main enclosure body or belongs to a part of the main enclosure body, and is jointed or not jointed with the main enclosure body, including connection facilities.

3.21 Connection Facilities

Terminals, bolts or other parts, which are used to make electrical connections with the leads of external circuits.

3.22 Bushing

An insulation device, which is used to passing one conductor or multiple conductors through the enclosure wall.

3.23 Ex Component

It can not be used independently and has a symbol "U". When it is used with other electrical apparatus or system, it is necessary to add the parts or components which are certified for the electrical apparatuses for explosive gas atmospheres (except Ex cable entry).

3.24 Symbol "X"

A symbol, which is a suffix of Protection Type Certificate No. to specify its specific conditions for safe service.

3.25 Symbol "U"

A symbol, which is a suffix of Protection Type Certificate to indicate that this product is an Ex component.

Note: Symbols "X" and "U" can not be used simultaneously.

3.26 Certificate

A document, which is used to specify that the apparatus complies with the requirements made in the standard, type test and appropriate routine test. The certificate may regard Ex apparatus or Ex component.

Note: Certificates can be issued by manufacturers, users or the third parties e.g. the authentic organizations approved by IEC Ex system, the national authentication organizations or the authorized individuals.

4 Electrical Apparatus Classification and Temperature Group

4.1 Electrical apparatus for explosive gas atmospheres falls into the following classes:

Class I: Electrical apparatus for mines

Class II: Electrical apparatus used in the explosive gas atmospheres other than mines.

When there are also other explosive gases in addition to methane, in the explosive gas atmospheres, the electrical apparatuses used for the coal mines shall be manufactured and inspected according to requirements for the relevant gases of Class I and Class II. The electrical apparatus shall bear the appropriate mark (e.g. Exd I / II BT3 or Exd I / II (NH_3)).

4.2 Class II electrical apparatuses can be further classified according to the characteristics of explosive gases.

4.2.1 Electrical apparatuses of Class II flameproof type "d" and intrinsically safe type "I" are further classified as Class II A, Class IIB and Class IIC.

Notes:

(1). For such kind of classification, the flameproof type electrical apparatus is based on the Max. Experimental Safe Gap (MESG) and the intrinsic safe type electrical apparatus is based on the Min. Ignition Current (MIC) (refer to Appendix B).

(2). Apparatus with Mark IIB is applicable to the service conditions for Class IIA apparatuses, and apparatus with Mark IIC is applicable to the service conditions for Class IIA and Class IIB apparatuses.

4.2.2 All Class II electrical apparatuses of type of protection is classified as Groups T1 ~ T6 and are identified with the marks related to the max. surface temperature according to Clause 5.1.2.

4.3 Electrical apparatuses may be inspected and tested based on a certain specific explosive gas. In this case, the electrical apparatuses shall obtain the relevant certificates and marks.

5 Temperature

5.1 Max. surface temperature

5.1.1 For Class I electrical apparatuses, their max. surface temperature shall be specified in the relevant documents according to the requirements made in Clause 23.2.

The max. surface temperature shall not exceed :

— 150°C, when coal dust may deposit on the surface of electrical apparatus;

— 450°C, When coal dust can not deposit on the surface of electrical apparatus or measures are taken (e.g. air tightness for dust proof or ventilation) to prevent dust deposit on the surface. The actual max. surface temperature of electrical apparatuses shall be indicated on the nameplate, or a symbol "X" is suffixed to the Explosion Proof Certificate.

Note: When the user selects Class I electrical apparatus, if coal dust may deposit on the surface of the apparatus with a temperature exceeding 150℃, consideration shall be made to the effect of coal dust and its igniting temperature.

5.1.2 Class II electrical apparatuses shall be identified with temperature marks according to the provision of Point 6) of Clause 27.2. Preferentially, the temperature groups are marked according to Table 1, or the actual max. surface temperature is marked. If necessary, the

designation of gas, which it is limited to, shall be given out.

Table 1 Max. surface temperature grouping of Class II electrical apparatuses

Temperature Group	Max. Surface Temperature (℃)
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

5.2 Ambient temperature

Electrical apparatuses are designed to be operated at an ambient temperature of -20°C ~ +40°C, and in this case it is not necessary to have an additional mark.

If the ambient temperature exceeds the above specified limits, it shall be regarded as a special case. Manufactures shall give out the ambient temperature limits in their documentation and shall also indicate symbol "Ta" or "Tamb" and the special ambient temperature limits on the nameplates, or according to the provision of Point 9) of Clause 27.2 add a symbol "X" to the Explosion Proof Certificate (refer to Table 2).

Table 2 Service ambient temperature and additional marks

Electrical apparatus	Service ambient temperature	Additional marks
Normal conditions	Max. +40°C Min. -20°C	N/A
Special conditions	It is required to be given out in documentation or indicated on the certificates by manufacturers	Ta or Tamb specified rang e.g. “-30℃” Ta+40℃ or Symbol “×”.

5.3 Surface temperature and igniting temperature

Max. surface temperature shall be lower than the igniting temperature of the explosive gas atmospheres. When the total surface area of some structure elements is $\leqslant 10cm^2$ and its max. surface temperature corresponding to the actual igniting temperature for Class II or Class I electrical apparatuses has the following safety allowances, the max. surface temperature of this element is allowed to exceed the temperature group marked on the electrical apparatus:

a). Temperature of Groups T1, T2 and T3 electrical apparatuses is 50℃.

b). Temperature of Groups T4, T5 and T6 and class I electrical apparatuses is 25℃.

This safety allowance shall be ensured based on the experience in the similar structure elements, or by testing the electrical apparatus in the corresponding explosive mixture atmospheres.

Note: During test, the safety allowance can be achieved by the means of increasing the

ambient temperature.

The special allowance for max. surface temperature of small elements in the intrinsically safe circuits is based on the provisions made in GB 3836.4.

6 Provisions for all electrical apparatuses

6.1 Electrical apparatuses for explosive gas atmospheres shall comply with the provisions of this Standard and modifications as made to this Standard in the special standard for types of protection as listed in Clause 1.2.

Note: In case the electrical apparatus is subjected to some detrimental, special conditions (e.g. extreme operation conditions, effect of moisture, effect of chemical agents and variation in ambient temperature), users shall specify these requirements and the corresponding measures shall be decided through discussions between users and manufacturers. For the moisture-proof requirements for Class I electrical apparatuses, refer to Appendix C [1].

Application Notes:

[1] There is no specific provision made for the moisture-proof requirements for Class I electrical apparatuses in IEC 60079-0, for the moisture-proof requirements for Class I electrical apparatuses added in this Standard, refer to Appendix C.

6.2 Permissible time for opening door and cover of enclosure

6.2.1 The interval from power-off to opening cover for the enclosure of electrical apparatus with capacitor contained inside and quick-action door or cover must be greater than the time required to allow capacitor to discharge to the following residual energy:

— When the charging voltage is ≥ 200V:

Class IA and IIA electrical apparatus: 0.2mJ

Class IIB electrical apparatus: 0.06mJ

Class IIC electrical apparatus: 0.02mJ

— When the charging voltage is lower than 200V, the residual energy value shall be 2 times the above indicated energy values.

6.2.2 The interval from power-off to opening cover for the enclosure of electrical apparatus with thermal elements contained inside and quick-action door or cover must be greater than the time required to allow the temperature of thermal elements to decrease to the point lower than the permissible max. surface temperature of electrical apparatus.

6.2.3 Warning plate shall be provided for indicating the time interval specified in Clause 6.2.1 and Clause 6.2.2 (e.g. "it can be opened only ***X*** minutes after discharge", where ***X*** is the required delay time), or the warning plate "Don't open it when there is explosive gas" shall be set up.

7 Non-metallic enclosures and non-metallic components of enclosures

Non-metallic enclosures and non-metallic components of enclosures related to the type of protection shall be tested according to the provisions of Clause 23.4.7. Sealing rings related to the type of protection shall be tested according to the provisions of Appendix D3.3.

7.1 Provisions of materials

7.1.1 Documentation provided by manufacturer according to Clause 23.2 shall specify the materials of enclosures and components of enclosures as well as the manufacture process.

7.1.2 Provisions of plastic shall include:

— Name of manufacturer;

— Accurate and complete reference documentation, color, contained fillers or the contents of other additives (Standard No. can also be given);

— Surface treatment (e.g. finish, etc.);

— Temperature Index TI corresponding to the point 20 000 h on thermal stability curve. The decrease in the bending strength determined at this point according to GB/T 11026.1, IEC 60216-2 and GB/T 9341 shall not exceed 50%. If the material does not rupture during the test before heat radiation, the temperature index is defined by the tensile strength determined as using Class 1A or 1B coupons according to the standard ISO 527-2.

The values of the above mentioned characteristics shall be provided and responsible by

manufactures.

7.2 Thermal stability

At the max. ambient temperature (see Clause 5.2), the temperature at the hottest point of plastic enclosure or plastic components of enclosure (see Clause 23.4.6.1) shall be at least 20K lower than TI value at the corresponding point 20 000h. Plastic enclosures or the enclosure components shall also have heat endurance and cold endurance properties (see Clauses 23.4.7.3 and 23.4.7.4).

7.3 Static charge of plastic enclosures and components of enclosures

This requirement is only applicable to the plastic enclosures, plastic components of enclosures and other exposed plastic parts of the following apparatuses:

— Mobile electrical apparatuses;

— Stationary electrical apparatuses, the plastic parts of which may be frictioned or wiped.

7.3.1 Class I electrical apparatus

When the surface area of plastic enclosure is greater than 100 cm^2, it shall be designed to have a construction that can prevent the ignition-hazardous static charge from occurring under the conditions of normal maintenance and cleaning.

The insulation resistance measured on the surface of plastic surface at a temperature of 23℃ ±2℃ and a relative humidity of 50% ±5% according to Clause 23.4.7.8 shall not exceed 1 GΩ, or preventing the ignition-hazardous static charge by making selection of dimensions, shapes and arrangements of enclosure and components of enclosures or any other protection methods.

In case it is not possible to avoid ignition hazard in design, a warning sign shall be provided to indicate the safety measures that must be taken in operation.

Notes:

(1). When making selection of electrical insulation materials, consideration shall be made to the min. surface insulation resistance in order to prevent the problems due to the exposed plastic parts getting in contact with the live parts.

(2). Plastic enclosures used for a long time in the explosive gas atmospheres or the locations where the explosive gas exists continuously shall also have further limitations.

7.3.2 Class II electrical apparatus

Plastic enclosures shall be designed to be a construction that can avoid ignition-hazardous static charge under the conditions of normal operation, maintenance and cleaning. This requirement can be satisfied by taking one of the following measures:

a). To make a reasonable selection of materials, so that the surface insulation resistance measured at a temperature of 23℃ ±2℃ and a relative humidity of 50% ±5% shall not exceed 1 GΩ according to requirement in 23.4.7.8.

b). To limit the max. surface area (see Note 2) of plastic enclosure or plastic components of enclosure.

— For Class IIA and Class IIB electrical apparatuses, it is not allowed to exceed 100cm^2. If the exposed plastic part is surrounded with the grounded metallic frame, the max. area is allowed to be increased up to 400cm^2.

— For Class IIC electrical apparatus including the transparent parts, it is not allowed to exceed 20cm^2. If the plastic parts is provided with additional measures to prevent static charge, the max. area is allowed to be increased to 100cm^2.

c). To select reasonable dimensions, shapes and arrangements or to take other safety measures to prevent generation of hazardous static charge.

If it is not possible to avoid the ignition hazard in the design of enclosures, a warning sign shall be provided to indicate the safety measures to be taken in operations.

Notes:

1. When making selection of electrical insulation materials, consideration shall be made to the min. surface insulation resistance in order to prevent the problems due to the exposed plastic parts getting in contact with the live parts.

2. Plastic enclosures used for a long time in the explosive gas atmospheres or the locations where the explosive gas exists continuously (0 zone) shall also have further limitations.

7.4 Enclosure of Class I electrical apparatus shall be provided with the fire retardant property [1].

7.5 Threaded holes

As for the holes of set screws on the covers that will be opened during operation for make adjustment, inspection or other operations, only when the thread shape is adaptable to the plastic materials, can the threaded holes be tapped in plastic enclosures.

8. Enclosure containing light metal

8.1 For the materials used for manufacturing enclosures of Class I electrical apparatus, the total content of Al, Ti and Mg is not allowed to be greater than 15% (weight %) and the total content of Ti and Mg is not allowed to be greater than 6%.

For the materials used for manufacturing enclosures of Class II electrical apparatus, the content of Mg is not allowed to be greater than 6% (weight %).

8.2 As for the holes of set screws on the covers that must be opened during operation for make adjustment, inspection or other operations, only when the screw shape is adaptable to the materials used for the enclosure, can the threaded holes be tapped in the enclosures.

8.3 The light alloy material that has a tensile strength ≥ 120MPa and is qualified by friction spark test as specified in provisions of GB 13813, can be used for the enclosures for Class I

hand-held or jig-type electric drills (and its attached plug-in devices), portable instruments and apparatuses and the enclosures of light fixtures [2].

9 Fasteners

9.1 General Rule

It is only allowed to use the tools to unscrew or remove the fasteners necessary for ensuring the type of protection and preventing contacting the exposed and live parts. The setscrews used for the enclosures are allowed to be made from light metal or plastics as long as the materials of fasteners are applicable to the materials of enclosures.

9.2 Special fasteners

When it is required to use the special fasteners in the special standard for the type of protection, the special fasteners shall comply with the following requirements:

— Pitch shall comply with the requirements made in JB/T 7192 and the fitting tolerances shall comply with 6g/6H of GB/T 9145.

— Bolts and nuts shall comply with the requirements made in GB/T 5782, GB/T 5783, GB/T 6170 or GB/T 70. Socket head screws shall comply with the requirements made in GB/T 77, GB/T 78, GB/T 79 and GB/T 80.

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Application Notes:

[1]. There is no such specific provision in IEC 60079-0, and this requirement is added in this Standard. Refer to Appendix E.

[2]. Provision "the provision of Clause 8.1 is not applicable to Class I portable measuring instruments" as made in IEC 60079-0 is cancelled. The provision for Class I hand-held electric drills, portable instruments and apparatuses and enclosures of lights used in our county is added.

— Holes on electrical apparatuses shall comply with the requirements made in Clause 9.3.

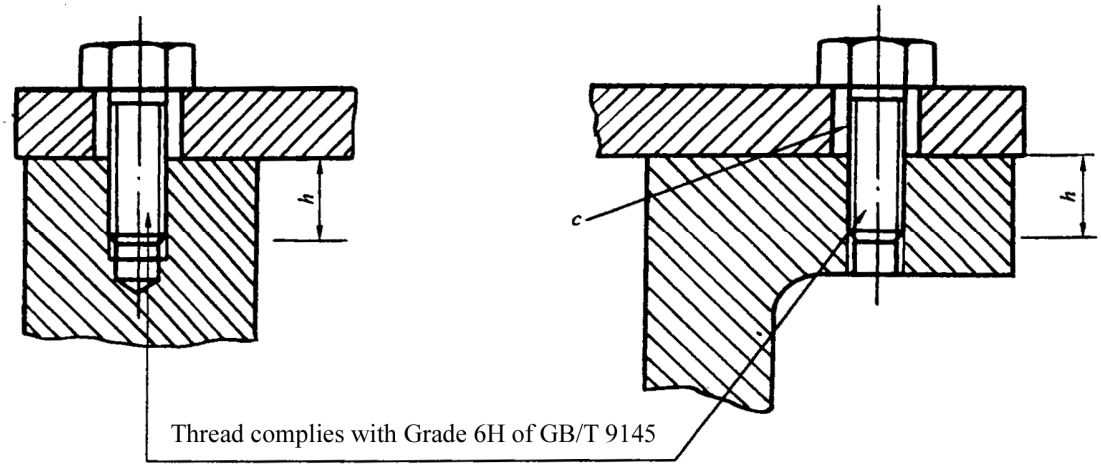
Note: Since the heads of Class I special fasteners tend to be damaged, resulting in losing explosion-proof properties, the protection measures such as retainers or knock-outs shall be provided.

9.3 Holes for special fasteners of electrical apparatus

9.3.1 The thread depth of the holes for the fasteners of electrical apparatus mentioned in 9.2 shall be at least equal to the full height of the nuts of fasteners with the corresponding sizes (see Fig. 1).

9.3.2 The tolerances of threads shall comply with Grade 6H of GB 9145 and satisfy one of the following provisions:

a). According to ISO 286-2 the permissible clearance of the hole below the bolt head shall not be greater than the intermediate tolerance of Grade H13 (see Fig. 1 and GB/T 5277).

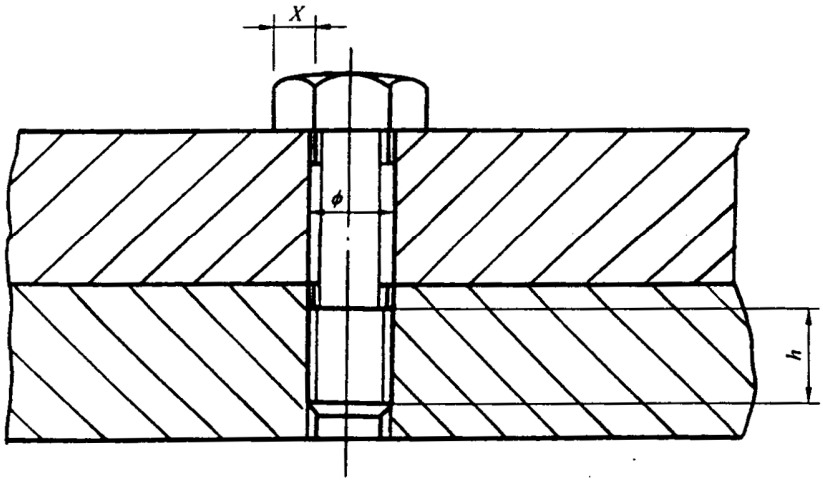


$h \geqslant$ outside diameter of thread of set bolt

$c \leqslant$ Grade H13 permissible max. clearance of ISO 286-2.

Fig.1 Tolerances and clearances of thread tightness

b). Holes below thin-stud bolt head or nut shall be threaded in order to ensure that bolt does not fall off. The size of threaded bolt shall ensure that the contact area of connected rod is at least equal to the contact area of non-thin-stud bolt in the unthreaded hole (see Fig. 2).



ϕ: Diameter of standard unthreaded hole corresponding to thread

$h \geqslant$ outside diameter of thread of set bolt

X: Contact diameter of thin-stud set bolt

$X \geqslant$ Contact diameters of standard bolt head of full-thread standard bolt

Fig. 2 Contact area below thin-stud set bolt head

9.3.3 Thread tolerance grade for socket head bolts is Grade 6H of GB/T 9145, but they must not projected from the threaded holes.

10 Interlock Device

In order to maintain the interlock device for a type of protection, its construction shall ensure that its function can not be easily removed by the non-special tool.

11 Bushing

When bushing is probably subjected to torque during wire connection and removing, it shall be installed solidly in order to ensure all parts do not rotate. For the corresponding torsion test, refer to the provision of Clause 23.4.5.

12 Adhesive Material

12.1 Manufacturer shall testify the safety-related adhesive materials has a sufficient thermal stability under the operation conditions to be adaptable to the maximum temperature of electrical apparatus according to the documents provided in Clause 23.2 of this Standard. Only when the temperature limit value of the material is 20 K higher than the max. temperature of electrical temperature, the thermal stability can be considered as being sufficient.

Note: In case the adhesive material is subject to the detrimental operation conditions, the solution shall be worked out through discussions between manufacturers and users.

12.2 Inspection organization need not to inspect its characteristics according to the documents specified in Clause 12.1.

13 Ex Components

13.1 Ex components shall satisfy the provisions made in Appendix F and they can be:

a). Empty enclosure;

b). One or multiple components or modules, which are used with apparatuses and as listed in Clause 1.2.

13.2 Ex components may be installed in the following ways:

a). Completely installed in an enclosure of an apparatus (e.g. the increased safety type wiring terminal, ammeter, heater or indicator; the flameproof switch element or thermostat; the intrinsic safe power supply);

b). Completely installed outside the enclosure (e.g. the increased safety type ground terminal and intrinsic safe transducer);

c). Partially installed inside and outside the enclosures (e.g. the flameproof button switch, limit switch or indication lights, the increased safety type ammeter, the intrinsic safe indicator).

13.3 For the component that is completely installed inside the enclosure, the inspection shall be made after installation only to the part that can not be inspected as a separate component (e.g. after installation of components, inspections are made to the surface temperature, electrical gap and creeping distance).

13.4 For the cases that the components are installed in the enclosures, or part of them installed inside the enclosures or part of them outside the enclosures, the jointing and connection areas of components and enclosure shall be inspected to see if they comply with the provisions of type protection and the mechanical test shall be made according to Clause 23.4.3.

14 Connection Facilities and Terminal Compartment

14.1 Electrical apparatuses shall be provided with connection facilities for connection with the external circuits with the exception of those electrical apparatuses that are provided with the permanent incoming cables in manufacture. All the apparatuses that are provided with the permanent incoming cables shall be marked with a symbol "X" to indicate that appropriate measures shall be taken to make connection with the free end of the cable. The free end of cable shall have an appropriate protection.

14.2 Connection compartment and wiring outlet shall have sufficient dimensions in order to facilitate the connection of wires.

14.3 Connection compartment shall comply with one of the types of protection listed in Clause 1.2.

14.4 Connection compartment shall be designed to allow the creeping distance and electrical gap to comply with the provision of the appropriate type of protection after the wires are connected according to the provisions.

15 Ground Connection Facilities

15.1 Ground connection facility shall be provided by the circuit connection facility in the connection compartment of electrical apparatus.

15.2 The metallic enclosure of electrical apparatus shall be provided with the auxiliary external ground connection facility, and the external ground connection facility shall be connected electrically with the connection facility required in Clause 15.1. Mobile electrical apparatuses are allowed to have no ground connection facility, however, the cables having ground core or equivalent ground core shall be used.

Note: "Electrical connection" means it may not to have a connection of a conductor.

15.3 It is not necessary for the electrical apparatuses that need not ground (e.g. the electrical apparatuses with dual insulation or strengthened insulation) or the electrical apparatuses that need not the additional ground (e.g. the electrical apparatuses with the metallic conduit system installed on the metallic enclosures) to provide internal and external ground connection facilities.

15.4 It must be ensured that the ground connection facility shall be at least connected with one conductor. For the cross-sectional area of conductor, see Table 3.

Besides, the external ground connection facility shall be connected effectively to a ground conductor with a min. cross-sectional area of $4mm^2$.

Table 3 Min. Cross-sectional Area of Protection Conductor

Cross-sectional area of conductor for each phase of main circuit (S, mm^2)	Min. cross-sectional area of corresponding protection conductor (S_p, mm^2)
$S \leq 16$	S
$16 < S \leq 35$	16
$S > 35$	0.5 S

15.5 Connection facilities shall be provided with effective anti-corrosion measures and their construction shall be able to prevent the loosening and twisting of conductors and effectively maintain the contact compressions.

Contact compression of electrical connections shall not be affected by the variation in dimensions of insulation materials under operations due to temperature or humidity, etc. When the connected part contains light metal material, the special protective measures shall be taken during connection (e.g. steel transition piece shall be used).

16 Cable and Conduit Entries

16.1 Manufacturer shall specify in the documents provided according to Clause 23.2, that the positions and max. permissible quantity of cable entries or conduit entries.

16.2 When the cable and conduit entries are assembled onto electrical apparatuses, their construction and fixing shall not damage the explosion-proof properties of electrical apparatuses. When the entries are selected for use, they shall be suitable for the full range of all the cable sizes specified by manufacturers.

16.3 Cable and conduit entries can be regarded as an integral part of the apparatus, i.e. it constitute a inseparable part of enclosure of apparatus, in this case, the entries shall be inspected and tested with the apparatuses.

Note: The separable type cable and conduit entries, which are installed on apparatuses, generally are tested and certified separately. But if required by the manufacturers, they can be tested and certified together with the apparatuses.

16.4 All cable entries, either they are an integral part of apparatus or a separated part, shall comply with the provisions made in Appendix D.

16.5 Class I cable entries shall be provided with clamping devices to prevent the turning of cable from being transmitted to the connection facility.

16.6 The entry of conduit can be screwed through threads to the threaded hole or fastened to the unthreaded hole, and the threaded hole and the unthreaded hole can be provided:

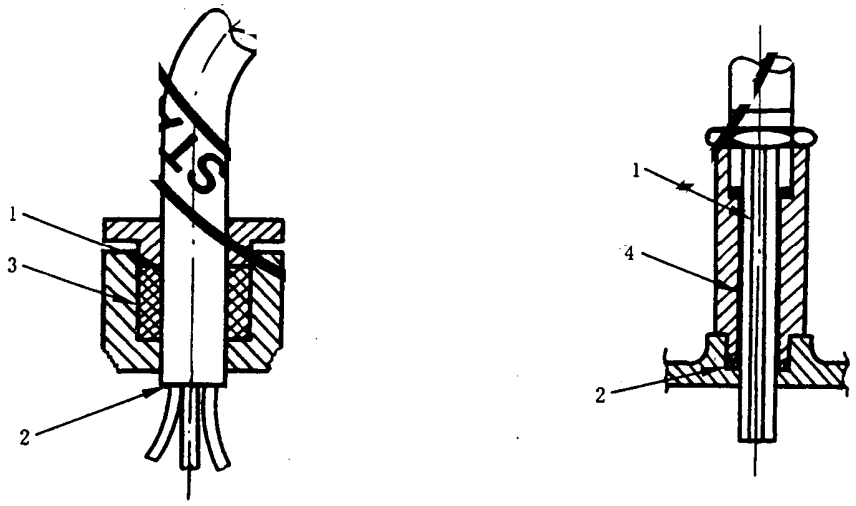
a). on the exterior wall;

b). connection board of the enclosure;

c). suitable packing box that is a part of the enclosure or attached on the wall of enclosure.

16.7 Blocking piece used for plugging the through holes on enclosures of apparatuses without connecting cable or conduit entries, shall comply with the provisions of the relevant type of protection listed in Clause 1.2 as the same as for the apparatus, and the blocking piece can be removed only by using the tools.

16.8 Under the rated operation conditions, if the temperature at the locations of cable or conduit entries is higher than 70℃or the temperature at the location of core tapping is higher than 80℃, an instruction sign shall be provided on the electrical apparatus so as to facilitate the users to make selection of cables and the wires to be laid in conduits.



Cable entry Conduit entry

1- Entrance point; 2- Wiring tapping point; 3- Sealing ring; 4- Packing

Fig.3 Entrance point and tapping point

17 Supplementary Provisions of Rotating Machines

The external fan driven by the shaft extension end of the motor shall be protected with fan guard, and the fan guard is not regarded as the enclosure of this electrical apparatus. The fan and fan guard shall comply with the following requirements.

17.1 Ventilating holes on fan guard

Degree of protection of ventilating holes on fan guard of rotating machines complies with provision of GB/T 4942.1.

— Air-inlet end shall be IP20 min.

— Air-outlet end shall be IP10 min.

Vertical rotating machine must be protected from the foreign matters dropping down and entering the ventilating holes. For Class I rotating machines, when the construction and arrangement of ventilating holes make the foreign matters > 12.5mm can not drop down into or enter into by vibration the rotating part of the motor, degree of protection IP10 can be used to satisfy the requirement.

17.2 Construction and installation of ventilation system

The impact resisting capability of fan, fan guard and ventilating hole shield shall comply with the provisions of Clauses 23.4.3.1 and 23.4.3.3.

17.3 Gaps in ventilation system

Under normal operation conditions, the min. distance between the external fan, fan guard, ventilating hole shield and their fastening parts shall be 1/100 of the max. diameter of fan and shall not be smaller than 1mm and not exceed 5mm. When the relevant parts are machined, this distance is allowed to be reduced to 1mm.

17.4 Materials of external fan and fan guard

17.4.1 The resistance measured on the external fan used for the rotating machines according to the method as specified in Clause 23.4.7.8 must not exceed 1 GΩ with the exception of Class II motors with the linear rotary speed of fan lower than 50m/s.

17.4.2 When the service temperature of plastics given by the manufacturer is 20 K higher than the max. rated operation temperature of fan (within a rated limits), the thermal stability of such plastics can be regarded as being qualified.

17.4.3 External fans made of the materials containing light metal for rotating machines shall comply with the provisions of Clause 8.1 or Clause 8.3.

18 Supplementary Provisions of Switches

18.1 It is not allowed to immerse the contact switch into the flammable insulation oil.

18.2 Isolating switch (it is not allowed to be operated with the rated load) shall be interlocked electrically or mechanically with the load disconnection device.

Warning plate "it is forbidden to be operated with load" can be set up nearby the actuator of isolating switch for Class II apparatuses.

18.3 When the switchgear is provided with the isolating switch, operation positions of the isolating switch must be distinct. ON position of the isolating switch shall be clearly indicated or OFF position of the isolating switch shall be reliably indicated in setting up (for the details, see IEC 60947-1). Each interlock between the isolating switch and the cover or door of the switchgear shall be ensured that the cover and door can not be opened unless the contact of the isolating switch is broken completely.

18.4 When the actuating mechanism of isolating switch for Class I switchgear is in OFF position, the position shall be locked by the means of a padlock.

18.5 If Class I switchgear is protected with short circuit fault relay and ground fault relay, the relays shall be locked after they are activated. If the switchgear is provided with the local reset device that can be reset outside the enclosure, the special fasteners as required in Clause 9.2 shall be used for the cover of the reset device.

18.6 When the connecting points of circuits with a remote-control circuit inside the enclosure is turned ON or OFF via non-manual operation (e.g. electric, mechanical, magnetic, photoelectric, pneumatic, hydraulic, acoustic, thermal functions), the door and cover of enclosure shall comply with the following provisions:

a). to be interlocked with the isolating switch unless otherwise the internal non-protective circuit is broken.

b). or to set up a warning plate of "it is forbidden to open cover with power ON".

In case of the above mentioned a), if there are still some internal parts being live after the isolating switch is turned off, one of the following ways shall be used for the live components in order to minimize the hazard to the maintenance personnel:

1). Types of protection as specified in Clause 1.2;

2). To take the following protective measures:

— electrical gap and creeping distance comply with the provision of the Increased Safety Type "e" of GB 3836.3; and

— there is an additional internal housing to protect the live part and the degree of protection for this additional housing shall be at least IP20 of GB 4208, and tools can not get direct contact with the live part through slots.

— A warning plate of "it is forbidden to open the cover with power ON" shall be added internally.

19 Supplementary Provisions of Fuses

The enclosures with fuses shall be provided with interlock devices. It is only possible to install or replace the internal elements when the power is turned off, and the fuse shall not be energized until the enclosure is closed reliably, or a warning plate of "it is forbidden to open the cover with power ON " shall be set up.

20 Supplementary Provisions of Plug-in devices

20.1 Plug-in devices shall comply with one of the following requirements:

a). Plug-in devices are interlocked using mechanical, electrical or other methods, and under the power-ON conditions they must not be disconnected. When they are disconnected, plugs must not be electrified.

b). They shall be connected using the special fasteners specified in Clause 9.2 and the warning plate of "it is forbidden to be disconnected with power ON" shall be set up additionally. When they are connected with batteries, if it is not possible to turn off the power before disconnection, the warning mark of "it is only allowed to be disconnected in non-hazardous location" shall be made.

20.2 When the rated current is < 10A and the rated AC voltage is < 250V or the rated DC voltage is < 60V, if the plug-in devices comply with all the following requirements, it is not necessary to comply with the provisions made in Clause 20.1:

— The socket is connected to the power supply side.

— There is a delay time for arc suppression before the plug is separated from the socket.

— During arc suppression, the plug and socket shall comply with the provisions of Flameproof Type "d" specified in GB 3836.2.

— The live part after separation shall comply with the provisions of any type of protection

specified in Clause 1.2.

20.3 It is forbidden the plug element unplugged in socket is electrified.

21 Supplementary Provisions of Light Fixtures

21.1 The light source in light fixture shall be provided with transparent protective hood, and the transparent protective hood shall be protected with the protective screen with a mesh size < 50mm × 50mm. If the mesh size exceeds 50mm × 50mm, the light fixture is considered as having no protection.

The transparent hood and protective screen shall be subject to the test specified in Clause 23.4.3.1.

The installation of light fixture shall not be relied on one screw. When the hanging ring is used for installation, the hanging ring can be cast on or welded onto the enclosure as a part of the light fixture. In case the hanging ring is screwed to the enclosure by the means of thread, the measures to prevent twisting or loosening shall be taken.

21.2 Except the intrinsically safe light fixtures specified in GB 3836.4, the light fixtures with removable covers shall:

a). be provided with an auto-interlock device, so that when the cover is opened, the power of all the poles of lamp sockets shall be broken automatically.

b). or be provided with a warning plate of "it is forbidden to open with power ON".

In case of the above mentioned a), if there are still some parts other than lamp sockets being live after the circuit breaker is off, one of the following ways shall be used for the live parts in order to minimize the hazard to the maintenance personnel:

c). Types of protection as specified in Clause 1.2;

d). To take the following protective measures:

— It is not possible for the set-up of circuit breaker to allow it energize the non-protected part by faulty manual operation.

— Electrical gap and creeping distance comply with the provision of the Increased Safety Type "e" of GB 3836.3; and

— There is an additional internal housing to protect the live part, and the degree of protection for this additional housing shall be at least IP30 of GB 4208, and tools can not get direct contact with the live part through slots.

A warning plate of "it is forbidden to open the cover with power ON" shall be added on the additional housing.

21.3 It is not allowed to use free metallic sodium lamp (LV sodium lamp in compliance with IEC 60192), but HV sodium lamp (in compliance with IEC 60662) can be used.

22 Supplementary Provisions of Hand-held Lamps and Cap Lamps

22.1 Class I cap lamp

Class I cap lamp shall comply with the provisions of safety cap lamps for mines made in GB 7957.

22.2 Class II cap lamp and hand-held lamps

22.2.1 Electrolyte shall be protected from flowing out when the light fixtures are in any position.

Note: The materials of hand-held lamps and cap lamps that probably get contact with electrolyte shall have chemical corrosion resistance characteristics.

22.2.2 If light source and power supply are set up in separated enclosures respectively and connected with a cable, the cable entry and the connecting cable shall be tested according to Clauses D3.1 and D 3.2 of Appendix D.

23 Type Inspection and Test

23.1 General rule

The purpose for type inspection and test is to confirm that the prototype or specimen of electrical apparatuses comply with the provisions of this Standard and the provisions of the special standards regarding the relevant type of protection.

23.2 Review of documentation

Inspection organization shall review the documentation provided by the manufacturer and check whether it can ensure the explosion-proof safety of electrical apparatus accurately and completely.

Inspection organization shall also review whether the drawings of electrical apparatus comply with the provisions of this Standard and the special standard for the corresponding type of protection.

23.3 Compliance of prototype and specimen with documentation

Inspection organization shall confirm whether the prototype and specimen of electrical apparatus submitted by the manufacturer for the type test comply with the above-mentioned documentation that is submitted by the manufacturer and qualified by review.

23.4 Type test

23.4.1 General rule

Prototype or specimen shall be tested by the inspection organization according to the provisions regarding the type test of this Standard and the special standards for the corresponding type of protection. However, the inspection organization:

— can cancel the test items that it is considered as unnecessary. The inspection organization shall record all the test results and the reasons for the cancelled test items.

— shall not re-test the tested items of Ex components.

The test can be performed in the laboratory of the inspection organization and can also be made

in other places under the supervision of the inspection organization.

In order to make electrical apparatuses comply with the provisions of this Standard and the special standards of relevant type of protection, the inspection organization can request the manufacturer to make modifications to the electrical apparatus according to the actual conditions.

23.4.2 Tests of all items shall be carried out under the conditions that are regarded as the most detrimental conditions by the inspection organization.

23.4.3 Mechanical test

23.4.3.1 Impact test

This test exerts the action of the impact hammer with a mass of 1kg dropping down from a height of h on the electrical apparatus. The height h is derived from the impact energy E. the impact energies E are listed respectively ($h = E/10$; h, m; E, J) in Table 4. The impact hammer shall be equipped with a semi-sphere quenched steel impact head with a diameter of 25mm.

Prior to performing the test each time, the impact head shall be checked for its good condition of the surface.

The test is usually made on an electrical apparatus which is assembled completely and be put into service. But if it is not possible to perform such test to the transparent part, the transparent part shall be tested after it is installed on its frame or similar frames. The manufacturer and inspection organization shall reach an agreement through consultation on such test to be performed on the empty enclosure.

Test for the transparent glass parts shall be made on three specimens, and each specimen shall be subject to the test for one time. Test for the other parts shall be made on 2 specimens, and each specimen shall have two different points subject to the test for one time respectively.

Electrical apparatuses tested by using impact energy at low degree of mechanical hazard shall be marked with a symbol "X" according to the provision of 9) of Clause 27.2.

The impacted point shall be the location that is considered as the weakest one by the inspection organization. The electrical apparatus shall be installed on an appropriate steel frame. When the tested surface is a plane, the impacting direction shall be perpendicular to this plane. When the tested surface is not a plane, the impacting direction shall be perpendicular to the cut plane that is contacted by the impact point. The mass of frame shall at least be 20kg and shall be fixed or buried on the ground (e.g. with concrete). For the example of testing device, refer to Appendix G.

The normal ambient temperature for test is $20^{o}C \pm 5^{o}C$. When the performance data of material shows that its impact resistance performance is reduced under low temperature, the test shall be performed at the min. temperature of the specified temperature limits.

When the enclosure or enclosure part of electrical apparatuses are made of plastic materials including the plastic air guard and air shield of the rotating machines, the test shall be made at the upper limit temperature and the lower limit temperature according to the provision of Clause 23.4.7.1.

Table 4 Energy of Impact Test

	Impact energy *E*, J			
Class of apparatus	I		II	
Degree of mechanical hazard	High	Low	High	Low
1. Protective screen, protective hood, fan guard and cable entry 2. Plastic enclosure 3. Light alloy or cast metallic enclosure 4. Metallic enclosures other than Item 3, with wall thickness: — smaller than 3mm for Class I apparatus — smaller than 1mm for Class II apparatus	20	7		4
5. Transparent part without protective screen	7	4		2
6. Transparent part with protective screen (during test, without protective screen)	4	2		1

23.4.3.2 Drop test

In addition to the impact test specified in 23.4.3.1, the portable electrical apparatuses shall be tested by dropping from a height of 1m down to a horizontal smooth concrete surface for four times under the service conditions. The dropping position of specimens shall be decided by the inspection organization.

The test of apparatus with non-plastic enclosure shall be performed at a temperature of 20°C ±5℃. When the data of material properties indicates that the impact resistance property is reduced at a lower temperature, the test shall be performed at the min. temperature of the specified temperature limits.

When the enclosure part of electrical apparatus is made of plastic materials, test shall be performed at the lower limit temperature of the ambient temperature as specified in Clause 23.4.7.1

23.4.3.3 Test requirements

The impact test and drop test shall not cause any damages that will affect the type of protection for electrical apparatuses.

Surface damages, surface coating damages, cracks and small depressions of fins and the similar parts of electrical apparatuses can be neglected.

After the test, the external fan guard and ventilating hole shield shall have no displacement or deformation so as to avoid rubbing against the moving parts.

23.4.4 Test for degree of protection for enclosures

The test procedures and acceptance criteria shall follow the provisions of GB 4208, but the provisions of GB/T 4942.1 shall be followed for the test of rotating machines.

When the manufactures' acceptance specifications (e.g. the relevant product standard) are stricter than GB 4208 or GB/T 4942.1, they can also be applied as long as the explosion-proof properties are not affected.

Apparatuses in compliance with GB 4208 shall be tested according to Type 1 enclosure specified in Clause 12.4 of that standard.

According to GB 4208, the tested apparatus is not allowed to be energized.

When the insulation performance test is performed according to Clause 11.3.b) of GB 4208, the effective value of testing voltage is $(2U_N + 1\ 000) \times (100\pm10)\%$V, the voltage application time is 10 ~ 12s, where U_N is the max. rated voltage of the apparatus.

If there are acceptance provisions in the standard for a certain electrical apparatus for explosive gas atmospheres, this standard shall be used to superseding GB 4208 or GB/T 4942.1.

When the acceptance provision of GB/T 4942.1 is applied to the rotating machines, it shall not only comply with the standard for type of protection but also comply with the requirements for normal operation conditions.

23.4.5 Torsion test of bushing

When the bushing of connection facility is connected or removed, the conductors may be subject to torsion, therefore, bushings shall be subject to the torsion test. When the conductor rod is subjected to the torque indicated in Table 5 during installation, both the conductor rod and bushing are not allowed to turn.

Table 5 Torque for torsion test of bushings

Size of bolts fitted with bushings	Torque (N·m)
M4	2.0
M5	3.2
M6	5
M8	10
M10	16
M12	25
M16	50
M20	85
M24	130
Note: The torque for the other sizes of bolts can be determined with the curve plotted with the above values, and the torque for the bolts with a size greater than the above ones can be obtained with curve extrapolation.	

23.4.6 Temperature tests

23.4.6.1 Determination of temperature

For the temperature tests, in addition to determining the max. surface temperature, other tests shall be made under the rating conditions. Determination of max. surface temperature shall be made under the most detrimental conditions at a voltage of 90% ~ 110% of its rated voltage.

The measured max. surface temperatures

— for Class I electrical apparatuses shall not exceed the value specified in Clause 5.1.1 of this Standard;

— for Class II electrical apparatuses that are tested one by one, shall not exceed the temperature indicated with the mark of electrical apparatus.

— for Class II electrical apparatuses that are not tested one by one, shall be 5K lower than the marked temperatures or the temperature groups when they are of Temperature Groups T6, T5, T4 and T3, and shall be 10K lower than the marked temperature or the temperature groups when they are of Temperature Groups T2 and T1.

The determined results shall be modified according to the max. ambient temperature under the rating conditions.

Surface temperatures, temperatures at entry port of cables or wires and the temperatures of other parts specified in this Standard and the special standards for the relevant types of protection shall be determined when the electrical apparatuses are in normal operation positions and the surrounding air is still.

When there are several operation positions for electrical apparatus, the temperature shall be determined in each operation position and the max. temperature shall be taken. If the determined temperature is only applicable to a specific operation position, it shall be specified in the test report and the electrical apparatus shall be marked with a symbol "X" or by using a small plate to indicate it.

Selection and arrangement of measuring elements (thermometers, thermocouples, etc.) and their connection leads shall not have remarkable effect on the heating property of electrical apparatuses. When the temperature variation does not exceed 2k/h during temperature test, it can be considered that the stable temperature is reached.

Inspection organization shall also determine the temperature at the hottest points of plastic enclosures or the parts of enclosures (see Clause 7.2).

23.4.6.2 Heat-rupture test

When the transparent glass part of lamp fixture and sight glass of electrical apparatus are subject to the heat-rupture test, allow them to be at the max. operation temperature and use a water jet with a temperature of $10^{o}C \pm 5^{o}C$ and a diameter of 1mm to shot them, and they shall not be ruptured.

23.4.7 Test of non-metallic enclosures and non-metallic parts of enclosure

23.4.7.1 Ambient temperature for test

When tests are performed according to this Standard or the special standards of types of protection as listed in Clause 1.2, they shall be carried out at max. and min. ambient temperatures. The ambient temperatures for tests shall be:

— for the upper limit temperature, it shall be 10K higher than the max. operation temperature

and 15K as the max.

— for the lower limit temperature, it shall be 5K lower than the min. operation temperature and 10K as the min.

23.4.7.2 Test of plastic enclosures and plastic parts of enclosures

The following tests shall be made for Class I electrical apparatuses:

Heat endurance test (23.4.7.3), cold endurance test (23.4.7.4) and mechanical test shall be made in turn on two specimens, and finally the relevant explosion-proof test shall be made.

Grease resistance test (23.4.7.6) and mechanical test (23.4.7.7) shall be made in turn on two specimens, and finally the relevant explosion-proof test shall be made.

Resisting action test of hydraulic fluid for mines (23.4.7.6) and mechanical test (23.4.7.7) shall be made in turn on two specimens, and finally the relevant explosion-proof test shall be made.

It is not necessary to make the tests that have no evident effect on the type of protection on each specimen, and the number of specimens can be reduced.

The following tests shall be made to Class II electrical apparatuses:

Heat endurance test (23.4.7.3), cold endurance test (23.4.7.4) and mechanical test (23.4.7.7) shall be made in turn on two specimens, and finally the relevant explosion-proof test shall be made.

23.4.7.3 Heat endurance test

When the max. operation temperature of the apparatus is $\leq 75^{o}C$, the plastic enclosures or the parts of enclosures related to the type of protection shall be kept continuously for 4 weeks in the atmospheres with a relative humidity of 90% ±5%, a temperature being 20K ±2K higher than the max. operation temperature, but with the min. temperature of $80^{o}C$. If the max. operation temperature of the apparatus is higher than $75^{o}C$, the enclosures and the parts of enclosures shall be kept continuously for 2 weeks in the atmospheres with a temperature of $95^{o}C \pm 2^{o}C$ and a relative humidity of 90% ±5%, and then they shall be kept continuously for 2 weeks in the atmospheres with a temperature being 20K ±2K higher than the max. operation temperature.

23.4.7.4 Cold endurance test

The plastic enclosures or the parts of enclosures related to the type of protection are maintained continuously for 24h at the min. testing ambient temperature specified in Clause 23.4.7.1

23.4.7.5 Light aging test

23.4.7.5.1 The light-aging test is only applicable to the plastic enclosures or parts of enclosures and the light fixtures for Class I electrical apparatus.

The test is performed according the provisions of ISO 179 on 6 coupons with a standard size of 50mm × 6mm × 4mm. The forming conditions for the coupons shall be as same as the manufacture conditions of actual enclosures and the conditions shall be described in the test report of electrical apparatus.

The test shall be performed according to ISO 4892. The specimens are put in a testing chamber, in which the xenon lamps and the analog sunlight filtering system are installed. The specimens are tested for 1000h at a blackbody temperature of 55°C ±3°C.

The judgement standard shall be based on the impact bending strength test made according to ISO 179. The bending strength with impacting on illuminated surface after illumination shall be above 50% of the bending strength of specimens before illumination. As for the material that can not be tested for the impact bending strength because rupture did not occur before illumination test, it is not allowed for the number of ruptured coupons after illumination test to be more than 3 pieces.

23.4.7.5.2 If the illumination protection measures (sunlight protection and light illumination protection) are taken during the installation of electrical apparatuses, the test described in Clause 23.4.7.5.1 may not be performed, but the symbol X shall be marked on apparatuses.

23.4.7.6 Chemical agent resistance test for Class I electrical apparatus

The chemical resistance test for the following agents shall be made for the plastic enclosures and parts of enclosures:

— Oil and grease

— Hydraulic fluids for mines

The relevant test shall be made on 4 specimens of enclosures. The enclosures shall be sealed to prevent the testing fluid from entering the internal compartment.

Two specimens shall be put into No. 2 oil specified in Appendix "Reference of Immersion Oil" to ISO 1817 with a temperature of 50°C ±2°C for a period of 24h ±2h.

Another two specimens shall be put into the hydraulic fluid made up of polymerized water solution containing 35% water (volume %) with a temperature of 50°C ±2°C (the service ambient temperature of apparatus is -20°C ~ +60°C) for a period of 24h ±2h.

After the test, the specimens of enclosures are taken out from the fluid and dried out by mopping, and stored in the laboratory atmosphere for 24h. Then the specimens shall comply with the requirements for the mechanical test described in Clause 23.4.7.7 of this Standard.

If one or more than one of the specimens fail to pass the mechanical test, a symbol X shall be marked on the nameplate according to the provision of Clause 27.2(9) of this Standard to specify the special conditions for the safe service, and it shall be described in the certificate.

23.4.7.7 Mechanical test

Mechanical test shall be made to enclosures according to the provision of Clause 23.4.3 of this Standard. The plastic enclosures shall comply with the requirements made in Clause 23.4.7.2.

The test shall be performed according to the following requirements:

a). Impact test

The impact point shall be selected on the exposed parts of enclosures. If the non-metallic enclosure is protected with another enclosure, the impact test is only made on the protective

enclosure.

The test shall be performed at the max. and min. test ambient temperatures respectively according to the provision of Clause 23.4.7.1.

b). Drop test

The portable electrical apparatuses shall be subject to the drop test according to the temperatures specified in Clause 23.4.7.1.

23.4.7.8 Surface resistance testing for plastic enclosure parts

The surface resistance testing shall be made on the parts in case the dimensions of the parts are permissible or on the rectangular specimens as shown in Fig. 4. Two parallel poles shall be drawn on the surface of specimens with conductive paint. The solvent of conductive paint shall have no evident effect on the insulation resistance.

The specimen shall have a complete surface and it shall be wiped with distilled water and cleaned up with isopropyl ethanol (or any other solvent that can be mixed with water and have no effect on the material properties of specimens) and then, cleaned up with distilled water and dried out. It is not allowed to be touched with hand. Put them in the atmosphere with the temperature and humidity specified in Clause 7.3 for a period for 24h, and the test shall be performed under this ambient conditions.

Apply DC voltage of 500V ±10V between two poles for 1min.

During the test the voltage shall be sufficiently stable so that the charging current generated by the variation in voltage can be neglected as it is compared with the current flowing the specimen. Under certain conditions, it is required to use battery or batteries.

The insulation resistance is equal to the ratio of DC voltage applied between two poles to the current that flows between two poles when the voltage is applied for 1min.

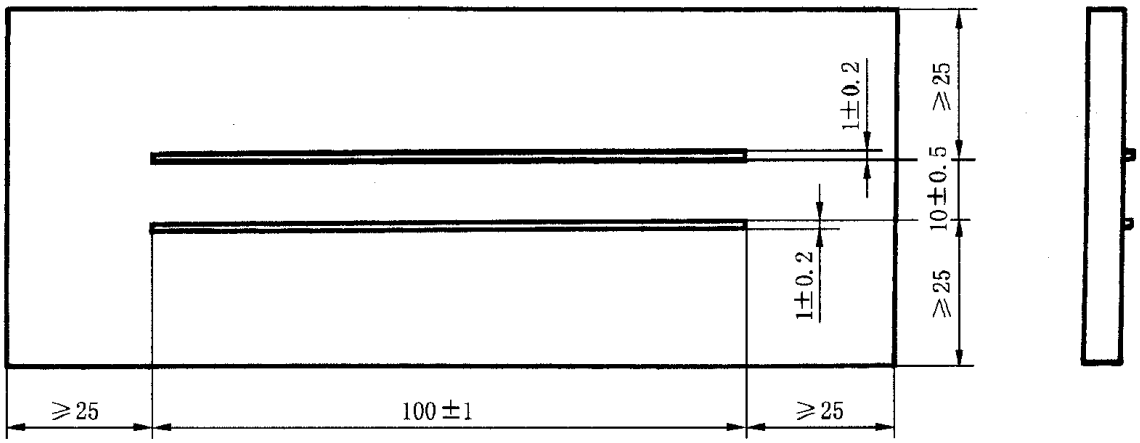


Fig.4 Specimen of Poles Formed with Conductive Paint Dimensions: in mm

23.4.8 Test in explosive mixture

The special standards for each type or protection has specified whether the test in explosive mixture is made and the explosive mixture used for the test.

Note: Generally the purity of industrial-used gases and vapors complies with the requirements for test. However, when the purity is lower than 95%, it shall not be used. The effect of variations in laboratory temperature, atmosphere and the humidity of explosive mixture can be neglected.

24 Routine Inspections and Tests

Manufacturers must make routine inspections and tests to ensure that the manufactured electrical apparatuses comply with the prototypes and documentation submitted to the inspection organizations. Manufacturers shall also carry out 1.2 the routine inspections and tests specified in the relevant standards.

25 Responsibilities of Manufacturers

According to the marks specified in Chapter 27 of this Standard, manufacturers shall take the responsibilities for:

— electrical apparatuses shall be provided with good safety properties;

— products shall pass all the routine tests specified in Chapter 24 and shall be comply with the specimens and technical documents submitted to inspection organizations.

26 Inspection and Test after Modification and Repair of Electrical Apparatuses

When modifications are made on electrical apparatuses, if they are related to the type of protection and the temperature for the apparatuses, the modified apparatuses shall be submitted to the inspection organizations for re-inspection.

Note: When the repair of electrical apparatuses is related to the type of protection, a routine test shall be made to the repaired part and this test need not to be made by the manufacturer.

27 Marking

Note: For the safety, it is very important that the following marking method shall only be used for the electrical apparatuses specified in the special standards for the relevant type of protection described in Clause 1.2.

27.1 Electrical apparatuses shall be provided with marks in obvious locations on the main bodies.

Considerations shall be made to keeping the marks legible and durable in the possible chemical corrosion atmosphere.

Notes:

(1). Marks of Ex, type of protection, classification and temperature group can be made in the evident

locations on enclosures with burrs or dimpled grains.

(2). The chemical-corrosion resisting materials shall be used for the mark plates, such as bronze, copper or stainless steel.

27.2 Mark plates (nameplates) must include the following items:

1). Manufacturer's name or registered trademark;

2). Product name and model No. specified by the manufacturer;

3). Symbol Ex, it indicates that these electrical apparatuses comply with the provisions of a certain type or several types of protection described in Clause 1.2.

4). Applied symbols of various types of protection:

Oil-filled Type	"o"
Positive Pressure Type	"p"
Sand-filled Type	"q"
Flameproof Type	"d"
Increased Safety Type	"e"
Intrinsic Safe Type, Class a	"ia"
Intrinsic Safe Type, Class b	"ib"
Melt-cast Type	"m"

Note: For No-spark Type "n", refer to Note (1) of Chapter 1. For the electrical apparatuses which do not comply with this Standard and the special standards listed in Clause 1.2, when they are confirmed by the inspection organizations, symbol "s" can be marked on those products to identify them as a special type.

5). Classification symbols for electrical apparatuses

I (Electrical apparatuses for coal mines)

II or IIA, IIB and IIC (Electrical apparatuses for explosive gas atmospheres other than coal fines)

If the electrical apparatus is only allowed to be used in a certain specific gas, symbol II is suffixed with the chemical symbol or designation of the gas.

6). Temperature group or max. surface temperature (℃) of Class II apparatus, or both symbols. When both symbols are used, the temperature group symbol shall be put with brackets after the surface temperature symbol.

For example: T1 or 350^{o}C, or 350^{o}C (T1).

For Class II electrical apparatuses with the max. surface temperature exceeding 450^{o}C, the temperature value shall be indicated.

e.g. 600℃

It is not necessary to indicate the relevant temperature for Class II electrical apparatus for the special gases. When complying with the provision of Clause 5.2, the marks shall include Ta or Tamb and ambient temperature limits or symbol X.

7). Product No., except for the following cases:

— Auxiliaries for connection of wires (cable and conduit entries, guards, connection boards, plug-in devices, bushings);
— Electrical apparatuses with a very small surface area.

8). Designation of inspection organization
9). If it is necessary for the inspection organization to specify the special conditions for safe service, symbol X can be suffixed to the Explosion Proof Certificate No. The inspection organization can approval a warning mark to take place of the required mark "X".

Note: Manufacturers shall ensure to hand over the special requirements for safe service and the relevant documents to the users.

10). The supplementary items specified in the special standards for relevant types of protection specified in Clause 1.2.
11). Items generally specified in the common standards for electrical apparatuses. Inspection organizations shall not re-make the inspection for the marks.
12). Others

27.3 When different types of protection are used for the different parts of an electrical apparatus, each relevant part shall be provided with the mark for the relevant type of protection.
If more than one type of protection is used on an electrical apparatus, the mark of the main type of protection shall be indicated first, followed by the marks for the other types of protection.

27.4 Makes 3) ~ 6) described in Clause 27.2 shall be ranked in the above described order.

27.5 Marks for Ex components specified in Chapter 13 shall be made in evident locations, and the marks shall be legible and durable with the following items to be indicated:

1). Manufacturer's name or registered trademark;
2). Product name and model No. specified by the manufacturer;
3). Symbol Ex;
4). Symbol for type of protection;
5). Group symbols for Ex components;
6). Name or designation of inspection organization;
7). Symbol "U" is suffixed to Explosion Proof Certificate No.
8). The additional marks specified in the special standards for the types of protection listed in Clause 1.2.
9). Marks specified in common standards for Ex components. No inspections shall be made for those marks by inspection organizations.

27.6 Inspection organizations are allowed to reduce part of the marking contents for small-sized electrical apparatuses and Ex components due to their limited volume. However, the following items shall be included at least:

1). Manufacturer's name or registered trademark;
2). Ex symbol and type of protection;
3). Name or designation of inspection organization;
4). Explosion Proof Certificate No;
5). Symbol X is marked for electrical apparatuses and Symbol U is marked for Ex components.

27.7 Examples of Explosion Proof Marks

27.7.1 Class I Flameproof type: EXD I

27.7.2 Class IIB Flameproof type, Group T3: Exd II BT3.

Class IIA, Intrinsically safe type ia, Group T5: Exia II AT5

27.7.3 When the composite type of more than one type is used, it is necessary to mark first the main type of protection and then the other types of protection, e.g. Class II main increased safety type with Group T4 pressurized type part: Exep II T4.

27.7.4 For the electrical apparatus which is only allowed to be used in one-type explosive gas atmosphere, its mark can be indicated with the chemical molecular formula or designation of such gas. In this case, it is not necessary to indicate the temperature group. For example, Class II Flameproof type used for the ammonia gas atmosphere: Exd II (NH_3) or Exd II ammonia.

27.7.5 For the marks of Class II electrical apparatuses, either the temperature group or the max. surface temperature can be indicated, or both of them can be indicated. For example, the increased safety type used for plants with the max. surface temperature of 125°C: Exe II T4, Exe II (125°C) or Exe II 125 °C (T4).

27.7.6 For the composite type electrical apparatuses, the relevant type of protection shall be marked respectively on the enclosures with different types of protection.

27.7.7 Apparatuses related to Class IIC Intrinsically safe type Grade ib, Group T5: Ex (ib) II CT5.

27.7.8 Class I Special type: Exs I.

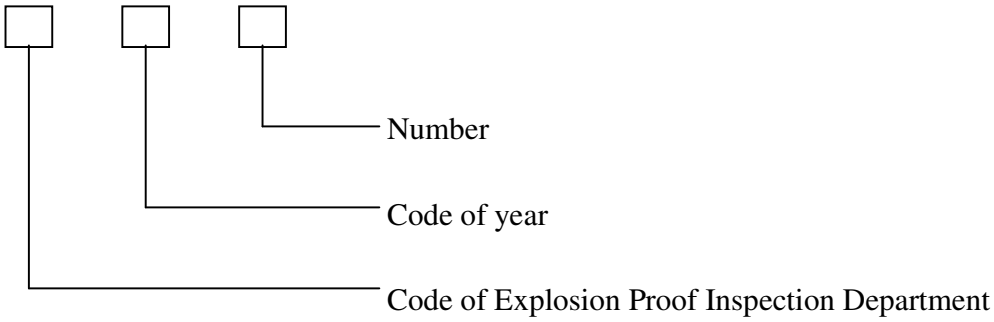
27.7.9 For the flameproof type used in coal mines for the explosive gases atmospheres other than methane, e.g. Class IIB Group T3 flammable gases: Exd I / II BT3

27.7.10 For the flameproof type which is not only applicable to Class I but also applicable to Class II B Group T4: Exd I / II BT4.

27.7.11 For assuring safety, the electrical apparatus is specified to be used under the specified conditions. For example, to specify the electrical apparatus has impact energy resistance, symbol "X" is suffixed to the Explosion Proof Certificate No., e.g. XXXX-X.

27.7.12 Marks of each item shall be legible and durable.

27.7.13 Number system of Explosion Proof Certificate is as follows:


Number
Code of year
Code of Explosion Proof Inspection Department

Appendix A

(Normative Appendix)

Inspection Procedures[1]

A1. Electrical apparatuses trial-manufactured by each unit according to this Standard and the special standards for the types of protection listed in Clause 1.2 must be submitted to the quality supervision and inspection departments authorized by the state authorities for inspection and test made according to the relevant standards. When product that has obtained the Explosion Proof Certificate is manufactured by the other manufacturers, it still needs to go through the inspection procedures.

A2. The inspection work covers two items, i.e. the review of technical documents and the inspection of prototype.

A3. The following documents must be submitted for review:

a). Product standard (or technical specification);

b). Product drawings related to explosion proof properties (must be signed and compiled in volumes)

The above mentioned documentation shall be in 2 copies. After it is qualified through review, the copies shall be stamped by the inspection department. One copy shall be kept by the inspection department while the other copy shall be kept on file by the submitting unit.

c). Other documentation that the inspection organization considers they are necessary for ensuring the safety of electrical apparatuses according to the provision of Clause 23.2.

A4. Following prototype and documentation shall be submitted for prototype inspection:

a). to submit the complete prototype that is in compliance with the qualified drawings, and its quantity shall meet the requirement for the test. When the inspection department considers necessary, it has right to retain the prototype.

b). the Operation and Maintenance Manual for the product shall be in 2 copies. After it is qualified through review, the copies shall be stamped by the inspection department. One copy shall be kept by the inspection department while the other copy shall be kept on file by the submitting unit.

c). to provide the parts and dismantling tools necessary for inspection and test.

d). the relevant test reports;

One copy for the above mentioned test report and record.

e). Documents and documentation of the manufacturer's Quality Assurance for the relevant product.

A5. After the prototype is qualified by inspection, the inspection department will issue a "Explosion Proof Certificate " with an effective period of 5 years.

A6. When the partial modification is made to the product that has obtained the Explosion Proof Certificate and related to the relevant provisions of the appropriate standard, the modified technical documents and relevant instructions shall be submitted in 2 copies to the original inspection department for re-inspection. In case the modified contents do not relate to the relevant provisions of the appropriate standard, the modified technical documents and relevant instructions shall be submitted to the original inspection department for keeping on file.

A7. Electrical apparatus manufactured using new designs, new materials and new technologies will be issued with "Industrial Test Permit" after it is qualified by inspection. The product provided with the "Industrial Test Permit" shall be subjected to the industrial test (based on the specified time, place and quantity). They shall not be put into production unless the Explosion Proof Certificate is issued by the original inspection department according to the submitted industrial test report and the relevant provisions of this Standard ad the special standards.

A8. Electrical apparatuses that are applicable not only to Class I but also to Class II must be qualified through inspections according to the requirements for Class I and Class II respectively and must be granted with the Explosion Proof Certificates.

A9. Inspection department has right to re-inspect the product that is granted with the Explosion Proof Certificate. In case the product is found not in compliance with the quality of originally inspected product and that the explosion proof property is effected, the inspection department shall make comments to manufacturers and the Explosion Proof Certificates originally issued shall be cancelled if necessary.

Note: Inspection department shall re-inspect the certified product at least for one time within the effective period of the Explosion Proof Certificate, including checking the product quality assurance conditions of the manufacturer.

Application Note:

[1] There is no this appendix in IEC 60079-0, and this appendix is put forward according to the specific

conditions of our country and the requirement of the inspection and the relevant provisions of GB 3836.1 (Edition 1).

Appendix B

(Reference Appendix)

Gradation Gases and Vapors

according to Max. Experimental Safety Gap (MESG)

and Min. Ignition Current (MIC)[1]

For the Flameproof type electrical apparatus, the classification of gases and vapors are based on the Max. Experimental Safety Gap (MESG) and is completed in a test vessel with a gap length of 25mm. The standard method for determination of MESG is to use the test vessel specified in the document IEC 79-1A. Regarding the method for determination made only in a sphere vessel with a volume of 8 L and with ignition nearby the gap, modification shall not be made to the method unless there is a new provision.

Limits shall be:

Grade A MESG > 0.9mm

Grade B MESG 0.5mm ~ 0.9mm

Grade C MESG < 0.5mm

For the Intrinsically Safe type electrical apparatus, the classification of gases and vapors are based on the ratio of the Min. Ignition Current (MIC) to the min. ignition current of laboratory methane. "Spark test device for intrinsically safe circuit" specified in IEC 79-3 must be used as the standard method for determination of the MIC ratio. It is not allowed to used other devices for determination unless there is a new provision.

Limits shall be:

Grade A MIC ratio > 0.8

Grade B MIC ratio 0.45 ~ 0.8

Grade C MIC ratio < 0.45

It is only necessary to make either one of two determinations for most of gases and vapors to be listed in an appropriate grade. It is only necessary to make one determination for the following cases.

Grade A MESG > 0.9mm or MIC ratio > 0.9

Grade B MESG 0.55mm ~ 0.9mm or MIC ratio 0.5 ~ 0.8

Grade C MESG < 0.5mm or MIC ratio < 0.45

In the following cases, it is not only necessary to determine MESG, but also necessary to determine MIC ratio.

1). When only MIC ratio is determined, the ratio is 0.8 ~ 0.9. It is also necessary to determine MESG for making grading.

2). When only MIC ratio is determined, the ratio is 0.45 ~ 0.5. It is also necessary to determine MESG for making grading.

3). When MESG is determined, the value is 0.5mm ~ 0.55mm. It is also necessary to determine MIC ratio for making grading.

For a certain gas or vapor of the same series of substances, it is possible to predicted this type of gas or vapor belongs to which grade from the determination results of another substance having a smaller molecular within the series.

The gases and vapors listed in the table below are worked out according to this basic rule.

The letters attached to various gases and vapors have the meanings as follows:

a) Grading according to MESG

b) Grading according to MIC ratio

c) Determinations of MESG and MIC ratio

d) Grading according to similarity of chemical structure (preliminary grading).

Note:

(1). Based on volume, all methane mixtures containing ≤ 15% hydrogen shall be listed as "industrial methane".

(2). In order to allow the mixture of carbon monoxide and air to be saturated at the standard ambient temperature, carbon monoxide may contain sufficient moisture.

Gases that are not listed in the table can be graded according to MIC and MESG. But their special characteristics must be noticed (e.g. based on MIC and MESG, it is listed in Class IIC, but its explosion pressure exceeds that of hydrogen and methane and it shall be listed outside Class IIC).

———————————

Application Note:

[1] This appendix is Appendix A to IEC 60079-0.

(3). The reference documents regarding the temperature groups are listed in the table.[1]

Table B

Designation of Gas and Vapor	Molecular Formula	Grading Method	Temperature Group
Grade A			
1 Hydrocarbons			
Alkanes			
Methane	CH_4	c	T1
Ethane	C_2H_6	c	
Propane	C_3H_8	c	T1
Butane	C_4H_{10}	c	T2
Pentane	C_5H_{12}	c	T3
Hexane	C_6H_{14}	c	T3
Heptane	C_7H_{16}	c	T3
Octane	C_8H_{18}	a	T3
Nonane	C_9H_{20}	d	T3
Decane	$C_{10}H_{22}$	a	T3
Cyclobutane	$CH_2(CH_2)_2CH_2$	d	—
Cyclopentane	$CH_2(CH_2)_3CH_2$	a	T2
Cyclohexane	$CH_2(CH_2)_4CH_2$	c	T3
Cycloheptane	$CH_2(CH_2)_5CH_2$	d	—
Methyl cyclobutane	$CH_3CH(CH_2)_2CH_2$	d	—
Methyl cyclopentane	$CH_3CH(CH_2)_3CH_2$	d	T2
Methyl cyclohexane	$CH_3CH(CH_2)_4CH_2$	d	T3
Ethyl cyclobutane	$C_2H_5CH(CH_2)_2CH_2$	d	T3
Ethyl cyclopentane	$C_2H_5CH(CH_2)_3CH_2$	d	T3
Ethyl cyclohexane	$C_2H_5CH(CH_2)_4CH_2$	d	T3

Decahydronaphthaline (naphthalene)	$CH_2(CH_2)_3CHCH(CH_2)_3CH_2$	d	T3
Carbapenems	$CH_3CH=CH_2$	a	T2
Propylene			
Aromatics	$C_6C_5CH=CH_2$	b	T1
Styrene	$C_6H_5C(CH_3)=CH_2$	a	T1
Vinyltoluene			
Benzenes	C_6H_6	c	T1
Benzene			

Application Note:

[1] In order to facilitate the design, manufacture and inspection, the temperature groups of relevant gases are added in the tables of this Standard.

Table B（continue）

Designation of Gas and Vapor	Molecular Formula	Grading Method	Temperature Group
Grade A			
Olefines			
Propene	$CH_3CH=CH_2$	a	T2
Aromatic hydrocarbons			
Stylene	$C_6C_5CH = CH_2$	b	T1
Methyl stylene	$C_6H_5(CH_3) = CH_2$	a	T1
Benzenes			
Benzene	C_6H_6	c	T1
Methylbenzene	$C_6H_5CH_3$	d	T1
Dimethyl benzene	$C_6H_4(CH_3)_2$	a	T1
Ethylbenzene	$C_6H_5C_2H_5$	d	T2
Trimethyl benzene	$C_6H_3(CH_3)_3$	d	T1
Naphthalene	$C_{10}H_8$	d	T1
Cumene	$C_6H_5CH(CH_3)_2$	d	T2
Cymene cumene	$(CH_3)_2CHC_6H_4CH_3$	d	T2
Hydrocarbon mixture			
Methane (industrial)	(Note1)	a (Calculated)	T1
Turpentine oil		d	T3
Naphtha		d	T3
Coal-tar naphtha		d	T3
Petroleum (including gasoline)		d	T3
Solvent petroleum or detergent petroleum		d	T3
Fuel oil		d	T3
Kerosene		d	T3
Diesel oil		d	T3
Motor benzene		a	T1
2 Oxygen-containing compound (including Ethers)			
Carbon monoxide	(Note2)	c	T1
Dipropyl ether	$(CH)_2O$	a	—
Alcohols and phenols			
Methanol	CH_3OH	c	T2
Ethanol	C_2H_6OH	c	T2

Propanol	C_3H_7OH	c	T2
Butanol	CH_4OH	a	T2
Amyl alcohol		a	T3

Table B（continue）

Designation of Gas and Vapor	Molecular Formula	Grading Method	Temperature Group
Grade A			
Hexyl alcohol		a	T3
Enanthol	$C_7H_{15}OH$		—
Actanol	$C_8H_{17}OH$	d	—
Nonanol	$C_8H_{19}OH$	d	—
Cycloethanol	$CH_2(CH_2)_4CHOH$	d	T3
Methyl cycloethanol	$CH_3CH(CH_2)_4CHOH$	d	T3
Phenol	C_6H_5OH	d	T1
Methyl hydroxybenzene	$CH_3C_6H_4OH$	d	T1
4-hydroxyl-4-methyl amyl ketone (Diacetone alcohol)	$(CH_3)_2C(OH)CH_2COCH_3$	d	T1
Aldehydes			
Acetaldehyde	CH_3CHO	a	T4
Metacetaldehyde	$(CH_3CHO)_n$	d	—
Ketoses			
Acetone	$(CH_3)_2CO$	c	T1
Butanone (ethyl methyl ketone)	$C_2H_5COCH_3$	c	T1
Penta-2-ketone (ethyl propyl methyl ketone)	$C_3H_7COCH_3$	a	T1
Hexa-2-ketone (ethyl butyl methyl ketone)	$C_4H_9COCH_3$	a	T1
Amyl methyl ketone	$C_5H_{11}COCH_3$	d	—
Pentanedione (acetylacetone)	$CH_3COCH_2COCH_3$	a	T2
Cyclohexanone	$CH_2(CH_2)_4CO$	a	T2
Esters			
Methyl formate	$HCOOCH_3$	a	T2
Ethyl formate	$HCOOC_2H_5$	a	T2
Acetic methyl ether	CH_3COOCH_3	c	T1
Acetic ether	$CH_3COOC_2H_5$	a	T2
Acetic propyl ester	$CH_3COOC_3H_7$	a	T2
Acetic butyrin	$CH_3COOC_4H_9$	c	T2

Acetic amyl ester	$CH_3COOC_5H_{11}$	d	T2
Methyl methacrylate	$CH_2 = C(CH_3)COOCH_3$	a	T2
Ethyl methacrylate	$CH_2 = C(CH_3)COOC_2H_5$	d	—

Table B（continue）

Designation of Gas and Vapor	Molecular Formula	Grading Method	Temperature Group
Grade A			
Vinyl acetate	$CH_3COOCH = CH_2$	a	T2
Acetyl acetic ether	$CH_3COCH_2COOC_2H_5$	a	T2
Acids			
Acetic acid	CH_3COOH	b	T1
3 Halogen-containing compound			
Oxygen-free compound			
Chloromethane	CH_3Cl	a	T1
Chloroethane	C_2H_5Cl	d	T1
Bromethyl	C_2H_5Br	d	T1
1-Chloropropane	C_3H_7Cl	a	T1
Chlorobutane	C_4H_9Cl	a	T3
Butyl bromide	C_4H_9Br	d	T3
Dichloroethane	$C_2H_4Cl_2$	a	T2
Dichloropropane	$C_3H_6Cl_2$	d	T1
Chlorobenzene	C_6H_5Cl	d	T1
Benzyl chloride	$C_6H_5CH_2Cl$	b	T1
Be nzene dichloride	$C_6H_4Cl_2$	d	T1
All yl chroride	$CH_2 = CHCH_2Cl$	d	T2
Acetylenedichloride	$CHCl = CHCl$	a	T1
Chlorethylene	$CH_2 = CHCl$	c	T2
d.d.d.-benzotrifluoride	$C_6H_5CF_3$	a	T1
Dichloromethane	CH_2Cl_2	d	T1
Oxygen-containing compound			
Acetyl chloride	CH_3COCl	d	T3
Chlorethanol	CH_3ClCH_2OH	d	T2
4 Sulfocompound			
Ethanethiol	C_2H_5SH	c	T3
Propyl sulfhydrate-1	C_3H_7SH	a (calculated)	—
Thiofuran	$CH = CHCH = CHS$ (|_____|)	a	T2
Butylene sulfide	$CH(CH_2)CH_7S$ (|_____|)	a	T3
5 Nitrogenous compound			

Ammonia	NH_3	a	T1
Cyanomethane	CH_3CN	a	T1
Ethyl nitrite		a	T6

Table B（continue）

Designation of Gas and Vapor	Molecular Formula	Grading Method	Temperature Group
Grade A			
Nitromethane		d	T2
Nitroethane	$C_2H_5NO_2$	d	T2
Amines			
Aminomethane	CH_3NH_2	a	T2
Dimethyllamine	$(CH_3)_2NH$	a	T2
Secaline	$(CH_3)_3N$	a	T4
Diethylamine	$(C_2H_5)_2NH$	d	T2
Triethylamine	$(C_2H_5)_3N$	d	T1
n- propylamine	CH_7NH_2	d	T2
n-butylamine		d	T2
Cyclohexylamine		d	T3
2-aminoethyl alcohol (ethanolamine)	$NH_2CH_3CH_9OH$	d	—
2-diethylethanol	$(C_2H_5)_2NCH_2CH_2OH$	d	—
Diamonoethane	$NH_2CH_2CH_2NH_2$	a	T2
Aminobenzene	$C_6H_5NH_2$		T1
NN-dimethylaniline	$C_6H_5N(CH_3)_2$	d	T2
Anilinopropane	$C_6H_5CH_2CH(NH_2)CH_3$	d	—
Toluidine	$CH_3H_6H_4NH_2$	d	T1
(aza-)pyridine	C_5H_5N	d	T1
Grade B			
1 Hydrocarbons			
Allylene (methyl ethyne)	$CH_3C = CH$	b	T1
Ethene	C_2H_4	c	T2
Cyclopropane	$CH_2CH_2CH_2$ |_____|	b	T1
Divinyl-1,3	$CH_2 = CH—CH = CH_2$	c	T2
2 Nitrogenous compound			
Acrylonitrile	$CH_2 = CHCN$	c	T1
Isopropyl nitrate	$(CH_3)_2CHONO_2$	b	—
Hydrogen cyanide	HCN		T1
3 Oxygen-containing compound			
Dimethyl ether	$(CH_3)_2O$	c	T3
Ethyl methyl ether	$CH_3OC_2H_5$	d	T4

Diethyl ether	$(C_2H_5)_2O$	c	T4
Dibutyl ether	$(C_4H_9)_2O$	c	T4

Table B （completed）

Designation of Gas and Vapor	Molecular Formula	Grading Method	Temperature Group
Grade B			
Epoxyethane	CH_2CH_2O	c	T2
1,2-Propylene epoxide	CH_3CHCH_2O	c	T2
1,3-Dioxapentane	$CH_2CH_2OCH_2O$	d	—
1,4-Dioxane	$CH_2CH_2OCH_2CH_2O$	a	T2
1,3,5-Trioxane	$CH_2OCH_2OCH_2O$	b	T2
Hydroxyacetic acid bytyrin	$HOCH_2COOC_4H_9$	a	—
Methyl hydrofurfuralcohol	$CH_2CH_2CH_2OCHCH_2OH$	d	T3
Methyl acrylate	$CH_2 = CHCOOCH_3$	a	T2
Ethyl acrylate	$CH_2 = CHCOOC_2H_5$	a	T2
Furan	$CH = CHCH = CHO$	a	T2
Crotonaldehyde	$CH_3CH = CHCHO$	a	T3
Acrylaldehyde	$CH_2 = CHCHO$	a (calculated)	T3
Furanidine	$CH_2(CH_2)_2CH_2O$	a	T3
4 Mixture			
Coke oven gas		d	T1
5 Halogn-containing compound			
Tetrafluoroethylene	C_2F_4	a	T4
1-Chlor-2,3-cyclopropane	OCH_2CHCH_2CI	a	T2
6 Sulfocompound			
Ethanethiol	C_2H_5SH	a	T3
Grade C			
Hydrogen	H_2	c	T1

Acetylene	C_2H_2	c	T2
Carbon bisulfide	CS_2	c	T5

Appendix C

(Normative Appendix)

Requirements for Moisture Proof of Class I Electrical Apparatus [1]

C1. Damp heat test shall be made for all Class I electrical apparatuses according to the provision of C2. The severity of the test shall comply with the provisions of the relevant current standards for the electrotechnic products for the damp heat region and shall at least be 40℃, 6d.
C2. The damp heat test shall be performed according to the provisions of GB/T 2423.4 - 1993 and GB/T 14048.1 - 1993.

Appendix D

(Normative Appendix)

Ex Cable Entry [2]

D1. General rule
D1.1 This Appendix specifies the general requirements for the construction, test and mark of Ex cable entries, and it can be supplemented and modified with the standards listed in Clause 1.2.

Note: The max. diameters of cables suitable for entries shall be given by manufacturers. Users shall ensure that the min. sizes of the selected cables including the tolerances shall be greater or equal to the values required by the sealing rings of cables.

D2. Requirements for construction
D2.1 Sealing of cables
D2.1.1 One of the following methods can be used to ensure the leak tightness of cables and cable entries (see Fig. D1):

— Elastic sealing ring;
— Metallic or composite sealing ring;
— Packing.

The sealing rings of cables are made of single type material or composite materials and their shapes are suitable for the cables to be used.

Note:

(1). When select the materials for sealing rings, pay attention to the requirements made in Clause 6.1.

(2). The type of protection of enclosures also depends on the internal construction of cables.

D2.2 Material

D2.2.1 Requirement related to the static charge of materials made in Clause 7.3 is applicable to the exposed parts of cable entries.

D.2.2.2 Materials of elastic sealing rings shall comply with the aging test of the type test specified in D3.3.

D2.2.3 Packing materials shall comply with the provisions of adhesive materials specified in Chapter 12.

D2.3 Clamping

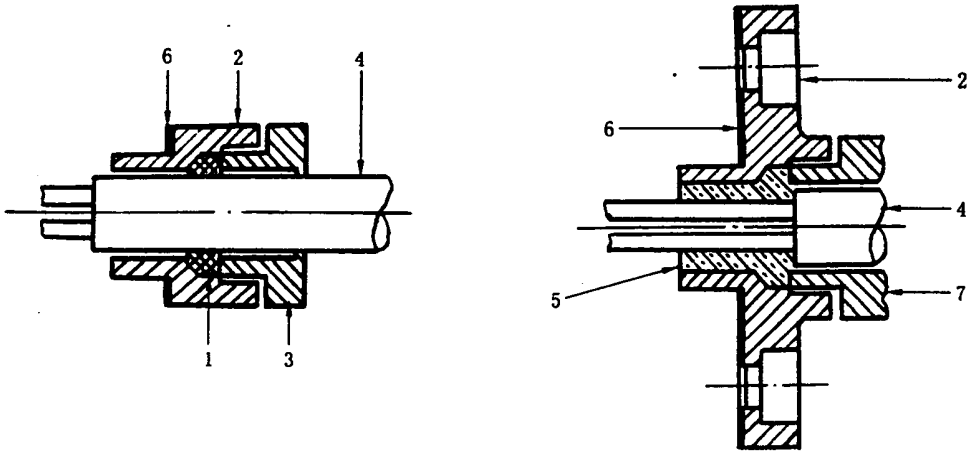
D2.3.1 Cable entries shall be able to clamp cables to protect the cables from being pulled off or twisted. Such clamping action can be realized by clamping device, sealing ring or packing. Any type of clamping measures shall comply with the relevant requirements for type test specified in D3. For non-sheathed cables, it can be realized by sealing ring or packing.

D2.3.2 For Class II cable entry without clamping device, if the provision of D3 is decreased to 25% for making the clamping test and the test is qualified while the document specifies that this device is only used in a Class II stationary installation location and users ensure to clamp cables, it can be considered that this cable entry is acceptable. However, such device shall be marked with an additional symbol "X".

Application Note:

[1] There is no this Appendix in IEC 60079-0.

[2] This Appendix is Appendix B to IEC 60079-0.



1-Sealing ring; 2-Entry; 3-Compression element; 4-Cable;
5-Packing; 6-Gasket; 7-Packing compression element

Fig. D1 Cable Entry

D2.4 Cable entrance

D2.4.1 Cable entries shall have no sharp edges in order to avoid the damages to the cables.

D2.4.2 There shall be a circular arc of 75° min. at flexible cable entrance, and the radius shall at least be 1/4 of the max. diameter of the permissible cables, however, it need not to exceed 3mm (see Fig. D2).

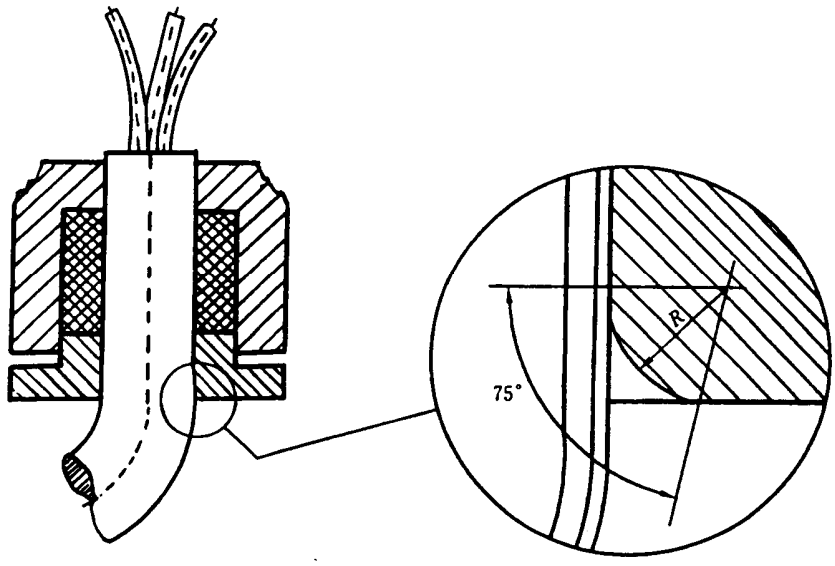


Fig. D2 Circular arc of flexible cable entrance

D2.5 After cable entries are installed, they can be removed only by tools.

D2.6 The measures taken to fixing cable entry to enclosure of electrical apparatus shall be able to remain unchanged after the entry has been subjected to the clamping mechanical strength test and the impact test as specified in D3.

D2.7 Entry devices shall be able to ensure the enclosures which they are fixed on, to comply with the required degree of protection. For the testing method, see D3.5.

D3 Type test

D3.1 Clamping test for non-sheathed cables and braided cables

D3.1.1 Cable entries clamped with sealing rings

This clamping test shall be made for the max. and min. sizes of each type of sealing rings for cable entries.

For the round cable, each type of sealing ring is installed on a clean, dry and polished round spindle made of low carbon steel. The diameter of the spindle is equal to the min. diameter of the cable specified for the sealing rings by the manufacturers of cable entries.

For the non-round cable, the sealing ring is installed on a clean and dry cable with a size equal to the size specified by the manufacturer of cable entries.

For the metallic sealing ring, each type of the sealing ring is installed on a clean and dry cable specimen. The diameter of the cable is equal to that permissible to the sealing ring and the min. diameter specified by the manufacturer of cable entries.

Fit the sealing rings with the spindle or the cable in the entry devices, exert torque to the bolts (pressing disc type) or nuts (clamping nut type) to clamp the sealing rings in order to prevent sliding of the spindle or cable. Apply the following tension (in N) to the spindle or the cable:

— 20 times the diameters of the spindle and the cable (in mm) when the entry is designed for round cables;

— 6 times the perimeter of the cable when the entry is designed for non-round cables (in mm).

For the acceptance standard and test conditions, see D3.1.4.

Note: The above torque values are determined by test or provided by the manufacturers of cable entries.

D3.1.2 Cable entries clamped with packing

Two clean and dry cable specimens shall be used for making the clamping test for the cable entry. One specimen is of the min. permissible size and another one is of the max. permissible size.

The packing prepared by the manufacturer for the cable entry is filled into the effective space. The test shall be performed after the packing becomes hard according to the specification of the manufacturer.

When the following tensions (in N) are applied, the packing shall be able to prevent loosening of cables:

— 20 times the diameters of the spindle and the cable (in mm) when the entry is designed for round cables;

— 6 times the perimeter of the cable when the entry is designed for non-round cables (in mm).

For the acceptance standard and test conditions, see D3.1.4.

D3.1.3 Cable entries with clamping devices

Clamping test shall be made for each type of entry by using it with different sizes of permissible cables.

Each type of cable entry is fitted with a clean and dry cable specimen that is supplied by the manufacturer and complies with the requirement of this entry. For the non-round cable, the sealing ring shall be installed on the cable with the same size as the cable that is specified to use.

The clamping device of the cable is installed on the entry specified by the manufacturer in combination with the sealing ring of the permissible max. size of cables, and then the sealing rings fitted on the entry is tightened and the clamping device is also tightened. Proceed the test according to the test procedures of D3.1.1.

D3.1.4 Tensile test

Install the prepared specimen on the tensile tester and exert the above specified tensions for 6h under a test ambient temperature of $20^{o}C \pm 5^{o}C$. If the displacement of spindle or cable specimen does not exceed 6mm, the sealing ring, packing or entry can be regarded as the qualified.

D3.1.5 Mechanical strength

After the tensile test, remove the specimen from the tensile tester and make the following test.

D3.1.5.1 For the entries clamped with sealing rings or clamping devices, 1.5 times the torque specified in D3.1.1 is applied to the bolts or nuts to make the mechanical strength test and then dismantle them to inspect the elements. When no damages that effect the type of protection is found, the test can be qualified. It is allowed to neglect the deformation of sealing rings.

When the entry is made of plastic material, if the specified torque can not be reached during test due to the temporary deformation of threads and there is no evident damage is found, the entry is regarded as the qualified.

D3.1.5.2 For the entry clamped with packing, the sealing compartment is opened for inspection on condition that the packing is not damaged. When the packing has no evident damages that effect the type of protection, it shall be qualified.

D3.2 Clamping test for sheathed cable

D3.2.1 Clamping test for sheathed cable with clamped sheath

D3.2.1.1 The test shall be made for various sizes of entries used with the specified min. size of cables.

The sheathed cable specimen is installed on the clamping device of entries, and then torque is applied to the bolts (pressing disc type) or nuts (clamping nut type) to press the clamping device to stop sliding of cables, and apply the following tension (in N) to the cable:

— 80 times the diameter of the cable, for Class I sheathed cables.

— 20 times the diameter of the cable, for Class II sheathed cables.

Note: the above torque values can be determined by test or provided by manufacturers.

D3.2.1.2 Tensile test

Put the prepared specimen on the tensile tester and apply the above specified tension for 120s ±10s under the test ambient temperature of 20°C ±5°C.

If the displacement at the sheathed part is actually equal to zero, the clamping function of entries shall be qualified.

D3.2.1.3 Mechanical strength

Apply 1.5 times the torque specified in D3.2.1.1 to the bolts or nuts, and then remove the entry. When there is not any damage that effect the type of protection, the test shall be considered as the qualified.

D3.2.2 The sheathed cable entry with the sheath unclamped shall be tested as the non-sheathed cable as specified in D3.1.

D3.3 Aging test for material of elastic sealing rings

The test specimen of the material used for manufacturing elastic sealing rings shall be prepared according to the provision of GB/T 6031, and the hardness testing shall also be made according to the standard under the ambient temperature.

Put the specimen into a high temperature test chamber with a temperature of 100°C ±5°C for 168h and then put it under the ambient temperature for 24h. Then put it I a lower temperature test chamber with a temperature of -20 °C ±2°C for 48h. Finally put it under the ambient temperature for 24h. Then the hardness is tested.

After end of the test, change in IRHD value shall not exceed 20% based on the specified hardness of the standard.

In case the service temperature of entries is higher than the temperature specified in Clause 16.8, the temperature of aging test shall be 20K higher than the max. operation temperature. In

case the lower temperature is below -20°C, the temperature of the low temperature chamber used for the test shall be the min. operation temperature ±2K.

D3.4 Impact test

The test shall be performed according to the provision of Clause 23.4.3 and the entry shall be fitted with the cable of specified min. size.

For the test, the entry shall be fixed on the stationary hard steel plate or shall be fastened according to the manufacturer's specification. The cable entry fixed with threads shall be tightened with the torque specified in D3.1.5 or D3.2.1.1.

D3.5 Degree of protection (IP) for entries

The test conditions shall be based on the provisions of GB 4208, and the test shall be made for the permissible sizes of different sealing rings used for each type of entry.

For the test, each sealing ring is installed on a clean and dry entry specimen with a diameter as the permissible min. diameter of sealing rings specified by the manufacturer, and the cable entry is installed in combination with cable on the air- tight enclosure.

D4 Markings

D4.1 Mark of entries

The entries are marked according to the provision of Clause 27.2. The thread size shall be marked for the threaded entrance of the entries.

In case the space for marking is limited, number of marks can be reduced according to the provisions of Clause 27.6.

D4.2 Mark for sealing rings of cables

The sealing rings of entries are suitable for several types of cables. The min, and max. diameters (in mm) of permissible cables shall be indicated.

When the sealing ring is used in combination with the metallic washer, it is possible to make the mark on the metallic washer. Sealing rings of cables shall have clear mark in order to facilitate users to select the entries suitable for sealing rings.

When the service ambient temperature of entries and sealing rings exceed the limits of –20℃ ~ +80℃, the test shall be made according to D3.3 and the temperature range shall be marked.

Appendix E

(Normative Appendix)

Special Requirements for Plastic Enclosures of Class I Electrical Apparatus [1]

E1 The plastic enclosures of Class I electrical apparatus shall be made of incombustible or fire-retardant materials and be able to withstand the combustion property test specified in E2.

E2 The combustion property test for plastic enclosures for Class I electrical apparatus shall be made using the method of flame vertical to specimen (FV method) as specified in GB/T 11020.

E3 When the test results are not lower than the requirement for Grade FV2, they are qualified.

Appendix F

(Normative Appendix)

Provisions Applied for Ex Components[2]

Table F

Clause of this Standard	Applicable (Yes/No)	Remark
1~4 (included)	Yes	Except for 4.2.2
5	No	Excluding those with the operation temperature limits specified
6.1	Yes	
6.2	No	
7.1	Yes	
7.2	Yes	The case that the component is installed in the other enclosures is considered.
7.3	Yes	If it is external (ditto)
7.4	Yes	If it is external (ditto)
7.5	Yes	If it is external (ditto)
8	Yes	

9.1	Yes	
9.2	Yes	Only for enclosures of apparatuses
9.3	Yes	Only for enclosures of apparatuses
10	Yes	
11	Yes	
12	Yes	
13	Yes	
14	Yes	Expect for those that need not to be marked with "X"
15.1	Yes	Only for enclosures of apparatuses
15.12	Yes	Only for enclosures of apparatuses
15.3	Yes	
15.4	Yes	
15.5	Yes	
16	Yes	Only for enclosures of apparatuses
17	No	Except for enclosures of machines

———————————————

Application Notes:

[1] There is no this Appendix in IEC 60079-0.

[2] This Appendix is Appendix C to IEC 60079-0.

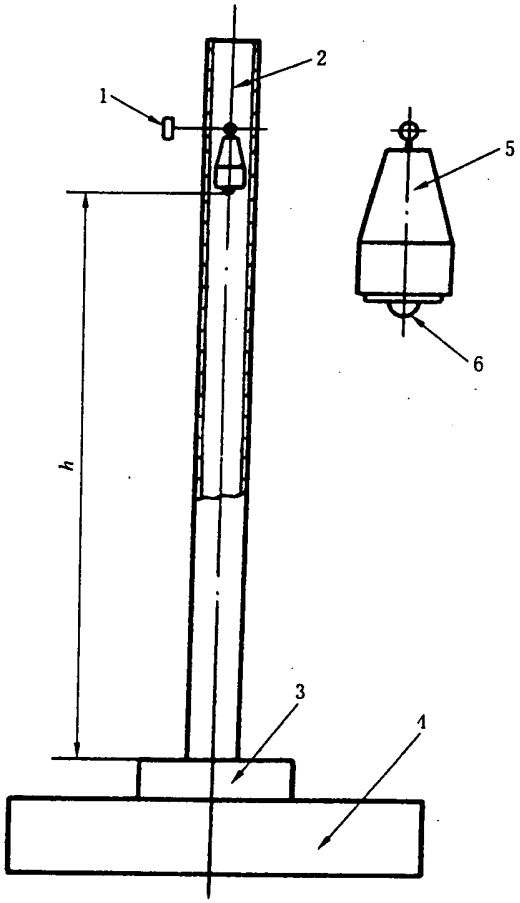
Table F (completed)

Clause of this Standard	Applicable (Yes/No)	Remark
18	Yes	
19	Yes	
20	Yes	
21	Yes	
22.1	Yes	
22.2	No	
23.1	Yes	
23.2	Yes	
23.3	Yes	
23.4.1	Yes	
23.4.2	No	
23.4.3	Yes	Only for enclosures of apparatuses
23.4.4	Yes	Only for enclosures of apparatuses
23.4.5	Yes	
23.4.6.1	No	
23.4.6.2	Yes	When the max. temperature is specified
23.4.7	Yes	When the max. temperature is specified
23.4.8	Yes	
24	Yes	
25	Yes	
26	Yes	
27*	Yes	
27.1	No	
27.2	No	
27.3	No	
27.4	No	
27.5	Yes	
27.6	Yes	
27.7	Yes	
* Temperature grouping is not applicable to Ex components.		

Appendix G

(Reference Standard)

Example of Impact Test Device [1]



1-Bolt for adjusting height; 2-Plastic duct; 3-Specimen; 4-Steel base (mass ≥20kg);
5- 1kg steel hammer body; 6-ϕ25mm hammer head; h- Dropping height

Fig. G1

Application Note:

[1] This Appendix is appendix D to IEC 60079-0.