National Standard of the People's Republic of China

GB 3836.3-2000

eqv IEC 60079-7：1990

Superseding GB 3836.3 — 1983

Electrical apparatus for explosive gas atmospheres—

Part 3：Increased Safety "e"

GB3836.3-2000

Foreword

This standard is prepared by modifying GB 3836.1-1983 in accordance with IEC 60079-7:1990 (second edition) and its amendment A1 (1991) and A2 (1993), which is equivalent to each other in terms of the technical content and the writing format.

The technical content and section arrangement of this standard is consistent with IEC 60079-7, and a small amount of the supplemental informative content is listed under corresponding provisions in the annotation way. Furthermore, it adds two informative appendixes (appendix F and G). The appendix F is the classified example of the comparative tracking index (CTI) for the frequently used insulating materials for the reference when manufacturers select the insulation materials. The appendix G is the guided supplementary requirement proposed for the structure and test of the increased safety type high voltage motor in accordance with relative provisions of European tentative standard ENV 50296-1997 evaluation and test of high voltage motor together with our experience in the design, manufacturing and test of the increased safety type high voltage motor.

In addition that the description of provisions is compiled in accordance with the international standard in this standard, the main technical content with obvious change compared to GB 3836.3-1983 includes the classification method of the comparative tracking index (CTI) for the solid insulating material, minimum creepage distance and clearance, calculation method of radial unilateral air gap value between stator and rotor of rotating electric machine and test voltage value of insulation dielectric strength for electrical equipment, and he added content includes the relevant provisions and tests of the special equipment, such as the battery, resistance heating device, Resistance Heating Unit, universal junction box and non-instrument transformer.

The GB 3836 under the general topic of electrical equipment for explosive gas atmospheres includes several parts as follows:

Part 1 (namely, GB 3836.1): General Requirements

Part 2 (namely, GB 3836.2): Explosion-proof "d"

Part 3 (namely, GB 3836.3): Increased Safety "e"

Part 4 (namely, GB 3836.4): Intrinsic Safety "i"

……

This standard will take effect since it is implemented and it will replace GB 3836.3-1983.

The appendix A, B and C in this standard are of the normative appendix.

The appendix D, E, F and G in this standard are of the informative appendix.

This standard is proposed by State Bureau of Machine Building Industry.

This standard is under the jurisdiction of the National Standardization Technical Committee of explosion-proof electrical equipment.

This standard is drafted by Nanyang Explosion-proof Electrical Research Institute of Ministry of Machinery Industry, Fushun Branch of Coal Research Institute for Ministry of Coal Industry.

This standard is mainly drafted by Li Hede, An Cuntong, Zou Shenggui, Li Baocheng and Gao Xiaohua.

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

The National Standardization Technical Committee of explosion-proof electrical equipment will be responsible for explaining this standard.

GB3836.3-2000

IEC Foreword

1) The formal decisions or agreements of International Electrotechnical Commission (IEC) on technical issues are developed by various technical committees, and various national commissions particularly interested in this topic dispatch representatives to participate in the development of decisions or agreements. Hence, it can reflect the international consensus as much as possible.

2) These decisions or agreements take the international common recommended forms and are accepted by various national commissions.

3) In order to promote the international unification, IEC hopes that various national commissions shall take the IEC recommended standard as various national standards in the case that it is allowed under various national conditions. If there is some difference between the IEC recommended standards and corresponding national standards, it shall be described in various national standards in detail as much as possible.

4) IEC had never enacted the program about the sign of qualified inspection. Hence, IEC shall not undertake any responsibility for it if some equipment claims to meet certain IEC recommendations.

This part of the international standard IEC 60079 is developed by the 31C Technical Sub-committee Increased Safety for Electrical Equipment of 31st Technical Committee of International Electrotechnical Commission (IEC) (Electrical Apparatus for Explosive Gas Atmospheres).

The second edition of IEC 60079-7 replaces the first edition issued in 1969.

This part is one of a series of publications about the electrical apparatus for explosive gas atmospheres.

The following parts are published for the IEC 60079 publications Electrical Apparatus for Explosive Gas Atmospheres.

- General Requirements (IEC 60079-0:1983)

- Construction and Test of Flameproof Enclosures for Electrical Apparatus (IEC 60079-1:1971)

- "p" Pressurized Electrical Apparatus (IEC 60079-2:1983)

Spark Test Apparatus for Intrinsically Safety Circuits (IEC 60079-3:1990)

- Test Methods of Ignition Temperature (IEC60079-4: 1975 and 60079-4A: 1970)

- Sand Filled Electrical Apparatus (IEC 60079-5:1967 and its supplementary A: 1969)

- Oil-filled Electrical Apparatus (IEC 60079-6:1968)

- Classification of Hazardous Areas (IEC 60079-10:1986)

- Construction and Test of Intrinsically Safety Electrical Apparatus and Its Associated Apparatus (IEC 60079-11: 1984)

- Classification of Gas or Vapor and Air Mixture in accordance with the maximum experimental safe gap and minimum igniting current of the gas and vapor (IEC60012: 1978).

- Structure and Use of Pressurized Rooms or Buildings (IEC 60079-13: 1982)

- Electrical Installation in Explosive Gas Atmospheres (With Exception of Mine) (IEC 60079-14:1984)

- "n" Explosion-proof Electrical Apparatus (IEC 60079-15: 1987)

This part of standards takes the following documents as the foundation.

Six-month Law	Voting Report	February Law Program	Voting Report
31C (Central Office) 8	31C (Central Office) 10	31C (Central Office) 11	31C (Central Office) 12

For the details on the voting approval for this part, refer to the voting report listed in the table above.

The appendix A and B are the supplementary part of the standard.

The appendix C is the reference part of the standard.

National Standard of PRC

GB3836.3-2000
eqv IEC 60079-7:1990

Electrical Apparatus for Explosive Gas Atmospheres

Substitute GB 3836.3—1983

Part 3: Increased Safety "e"

1 Scope

This standard specifies the special requirements for the design, structure testing and marking of the increased safety “e” explosion-proof electrical equipment when it doesn’t cause sparks, arc or dangerous temperature under normal operating conditions and the rated power supply does not exceed the 11kV (AC R.M.S or DC value).

These special requirements are the supplement of GB 3836.1 General requirements. The provisions in CB 3836.1 also apply to the increased safety electrical apparatus in addition to the special noted not available (NA) part.

2 References

The following standards contain provisions which, through reference in this standard, constitute provisions. The editions indicated are valid which this standard is published. All standards will be revised, and the parties to use the standard should discuss on the possibility for the use of the latest version for the following standards.

GB/T 755-1987 Basic Technical Requirements for Rotating Electric Machine

GB 1208-1997 Current Transformer (eqv IEC 60185: 1987)

GB/T1993-1993 Cooling Method of Rotating Electric Machine (eqv IEC 60034-6: 1991)

GB/T2423.5-1995 Environmental Testing for Electric and Electronic Products - Part 2: Test Methods - Test Ea and Guidance: Shock Method (idt IEC 60068-2-27: 1987)

GB/T 2900.35-1998 Electrical Apparatus for Explosive Gas Atmospheres (eqv IEC 60050(426): 1990)

GB 3836.1-2000 Electrical Apparatus for Explosive Gas Atmospheres – Part 1: General Requirements (eqv IEC 60079-0:1998)

CB 3836.2-2000 Electrical Apparatus for Explosive Gas Atmospheres – Part 2: Flameproof “d” (eqv IEC 60079-1: 1990)

CB/T 4207-1984 Testing Method of Comparative Tracking Index and Proof Tracking Index of Solid Insulating Materials under Moist Conditions (eqv IEC 112: 1979)

GB4208-1993 Degrees of Protection Provided by Enclosure (IP Code) (eqv IEC 60529: 1989)

GB/T4942.1-1985 Degrees of Protection Provided by Enclosure of Motors (eqv IEC 60034-5: 1981)

GB/T 6109.2-1990 Enameled Round Winding Wires - Part 2: 155 Modified Polyester Enameled Round Copper Wires (eqv IEC 60317-3: 1988)

GB/T 6109.5-1988 Enameled Round Winding Wires - Part 5: Temperature Index 180 Polyesterimide Enameled Round Copper Wires

GB/T 6109.6-1988 Enameled Round Winding Wires - Part 6: Temperature Index 220 Polyesterimide Enameled Round Copper Wires

GB6829-1995 General Requirements for Residual Current Action Protector (eqv IEC 60755)

GB/T 11021-1989 Thermal Evaluation and Classification of Electrical Insulation (eqv IEC 60085: 1984)

GB/T 16935.1-1997 Insulation Coordination for Equipment within Low-voltage Systems – Part 1: Principles, Requirements and Tests (idt IEC 60664-1: 1992)

IEC 60061-1 Lamp Header, Lamp Holder and Gauge for Interchangeability Test – Part 1: Lamp Header

Approved by Bureau of Technical Supervision on January 3, 2000 Implementation Date: August 1, 2000

GB3836.3-2000

IEC 60061-2 Lamp Header, Lamp Holder and Gauge for Interchangeability Test – Part 2: Lamp Holder

IEC 60064:1987 Performance Requirements of Incandescent Lamp for General Lighting

IEC 60079-4:1975 Electrical Apparatus for Explosive Gas Atmospheres – Part 4: Test Methods of Ignition Temperature

IEC 60238: 1987 Screw Lamp Holder

IEC 60364-3:1977 Electrical Installations of Buildings – Part 3: Evaluation of General Characteristics

IEC 60364-5-52:1983 Electrical Installations of Buildings – Part 5: Selection and Installation of Electrical Apparatus – Chapter 52: Cabling System

IEC432#: 1984 Safety Requirements for Tungsten Filament Lighting Lamp for Household and Similar Purpose

3 Definitions

It will take the terms and definitions in GB 3836.1. Furthermore, it will also take following terms and definitions. For the general terms and definitions, refer to the GB/T 2900.35 relevant provision.

3.1 Increased Safety "e"

It is the explosion-proof type that takes further measures to improve their safety and reduce the possibility that the electrical apparatus causes the dangerous temperature, arc and spark when the electrical apparatus doesn't cause sparks, arc or dangerous temperature under normal operating conditions.

Note:

1 This explosion-proof is indicated as "e".

2 This definition doesn't include the electrical apparatus that causes the spark or arc under normal operating conditions.

3.2 Limiting Temperature

It refers to the maximum allowed temperature of the electrical apparatus or its component, which is equal to the lower one of two temperatures determined by the following conditions.

a) Ignition danger of explosive gas mixtures

b) Thermal stability of materials used in electrical apparatus

3.3 Initial Starting Current "I_A"

It is the maximum current R.M.S when the rated voltage and rated frequency is input from the power supply line under the condition that the AC motor is in the static state or the AC solenoid armature is in the maximum air gap position.

Note: The transient phenomenon is ignored.

3.4 Starting Current Ratio "I_A/I_N"

It is the ratio of the initial starting current I_A to the rated current I_N.

3.5 Time t_E

It is the time from the initial starting current I_A is passed through to it is up to the limiting temperature after the AC winding is up to the rated stable operating temperature at the maximum ambient temperature (see Figure B1).

3.6 Rated Short-time Thermal Current I_{th}

It is the current R.M.S when the conductor is up to its limiting temperature from the stable temperature within 1s under the rated operating condition at the maximum ambient temperature.

3.7 Rated Dynamic Current I_{dyn}

It is the peak current when the electrical apparatus can withstand the electrical power without any damage.

3.8 Short-circuit Current Limit "I_{sc}"

It is the maximum short-circuit current R.M.S that the electrical apparatus can withstand during the operation.

Note: The short-circuit current will be recorded in the document specified in the provision 23.2 of GB 3836.1.

3.9 Creepage Distance

It is the shortest distance along the surface of the insulating material between two conductive parts.

3.10 Clearance

It is the shortest spatial distance between two conductive parts.

3.11 Working Voltage

It is the maximum DC voltage of AC voltage R.M.S that is allowed to be generated for the electrical apparatus during the no-load or normal operation under the rated supply voltage (the transient voltage is ignored).

GB3836.3-2000

3.12 (Electrochemical) Cells or Battery

It is an electrochemical device which can store the obtained electric energy in the form of the chemical and convert it into the electrical energy for the output.

3.12.1 (Secondary) Cell

It is composed of the electrode and the electrolyte, to form the basic unit of the battery.

Note:

1 The cell is essentially composed of the positive and negative electrode plates, partition wall, spare parts for installation and connection (the lug, terminal strip and terminal post), container and electrolyte.

2 Figure 1 indicates the schematic diagram of various spare parts for cells, which is only for the illustration, but not taken as the requirement or selection of the concrete structure.

3.12.2 Battery

It is two or more cells which are connected in the electric way to act as the energy.

3.12.3 (Cell) Container
It is the container to contain the battery pole group and electrolyte, but it is not eroded by the electrolyte.

3.12.4 (Battery) Container
It is the container to contain the battery.

3.12.5 (Battery) Capacity
It is the electricity that the fully charged battery can supply under the specified condition, which is usually expressed by Ampere-hour (A·h).

3.12.6 Plate Pack
It is the component which is composed of the partition wall and the positive and negative electrode pair.

3.12.7 Partition Wall
It is the component that divides the (battery) container into several individual parts and improves the mechanical strength of the (battery) container.

3.12.8 Insulating Barrier
It is the insulating barrier that divides the cell into the battery.

3.12.9 Intercell Connector
It is the conductor to conduct the intercell current.

3.13 Resistance Heating Device and Resistance Heating Unit

3.13.1 (Resistance) Heating Device

It is a part of the resistance heating unit, which includes one or more heating resistors and is usually composed of the metallic conductor or other conductive materials and provided with proper insulation and sheath protection.

3.13.2 Resistance Heating Unit
It is the heating unit composed of one or more resistance heating device and necessary temperature protection device.

Note: If the temperature protection device is installed in the explosion hazardous areas, it is necessary to be manufactured into other increased safety explosion-proof types.

3.13.3 Workpiece

It is the object which is installed with the resistance heating device to form the resistance heating unit.

3.13.4 Self-limiting Property

It is the property of the resistance heating device. Namely, the thermal output power of the resistance heating device is reduced with the rising of the ambient temperature until the temperature of the resistance heating device is up to the value that the thermal output power is reduced to be the ambient temperature without any rising.

Note: The surface temperature of the resistance heating device is actually the ambient temperature.

3.13.5 Stabilized Design

It is the stabilized design that the temperature of the resistance heating device or the resistance heating unit is stabilized under the limiting temperature under the most unfavorable conditions without the limiting temperature protection by the provision of the design and use state.

4 General Requirements

The requirements in this chapter are applicable for all increased safety “e” explosion-proof electrical apparatus unless other specified in chapter 5.This is the supplement of GB 3836.1 General Requirements (see chapter 1), and it will provide the further supplement for some electrical apparatuses in chapter 5.

4.1 Connecting Parts

The connecting part that connects to the external circuit shall be of sufficiently large size, so as to connect to the conductor whose cross area is equal to corresponding rated current of the electrical apparatuses at least reliably. The quantity and size of the conductor that can connect to the conducting part reliably shall comply with the provision of the description document in section 23.2 of GB 3836.1-2000.

Note: The working state can require the connecting part with larger size, and the size of conductor corresponding to the rated current depends on the usage. Refer to IEC 60364-5-52.

The connecting parts shall:

a) Be fixed reliably, but not loosened itself.

b) Be provided with the structure to prevent the conductor from sliding out of the specified position.

c) Ensure proper contact pressure, and don’t damage the connecting conductor that has any effect on the function. It is especially applicable for the method that the connecting part clamps to multi-strand conductors directly.

Note: The method to extrude the cable terminal is allowed when a), b) and c) are met.

Connecting Part Not Allowed to Using:

a) Have not any sharp edge that may damage the conductor.

b) It will rotate, twist or generate permanent deformation during the normal tightening that is specified by the equipment manufacturer.

The structure of the connecting part shall ensure its contact pressure is not reduced for the change in temperature under the normal operation. It shall not convey the contact pressure by the ground insulating material.

The connecting part used to clamp multi-strand conductors shall be provided with the elastic spare parts. The connecting part that connects to the conductor with the cross area no more than $4mm^2$ shall also connect to the conductor with smaller cross area reliably.

Note:

1. It may require take special measures against the vibration and mechanical shock.

2. It shall take the special measures against the electrolytic corrosion into account when the aluminum material is used.

4.2 Internal Conductor Connections

The internal conductor connections of the electrical apparatus are not allowed to undertaking any undue mechanical stress. It is only allowed to take the following conductor connecting method:

a) Anti-loosening threaded fasteners

b) Extruding connection

c) The conductor is soldered after it is connected mechanically.

d) Brazing

e) Melt welding

f) Any connection method that complies with the requirement of article 4.1.

4.3 Clearance

The clearance between exposed conductive parts with different potentials shall comply with the provisions in Table 1, and the minimal value when it connects to the external conductor is 3mm.

Note 1: For the requirement of the clearance for the screw lamp header, refer to A2.

The clearance is determined by the working voltage specified by the equipment manufacturer (see article 3.11 Terminology).

If there are several rated voltages or some voltage range for the electrical apparatus, the working voltage value used shall be determined by the maximum voltage. When the clearance is determined, the example 1-11 in Figure 2 illustrates the characteristics of spare parts to be considered and corresponding clearance value.

Note 2: The examples in the figure are the same as the examples in the GB/T 16935.1 document.

GB3836.3-2000

Table 1 Clearance and Creepage Distance

Working Voltage U V'	Minimum Creepage Distance (mm) Material Level I	II	IIIa	Minimum Clearance (mm)
U≤15	1.6	1.6	1.6	1.6
15<U≤30	1.8	1.8	1.8	1.8
30<U≤60	2.1	2.6	3.4	2.1
60<U≤110	2.5	3.2	4	2.5
110<U≤175	3.2	4	5	3.2
175<U≤275	5	6.3	8	5
275<U≤420	8	10	12.5	6
420<U≤550	10	12.5	16	8
550<U≤750	12	16	20	10
750<U≤1 100	20	25	32	14
1 100<U≤2 200	32	36	40	30
2 200<U≤3 300	40	45	50	36
3 300<U≤4 200	50	56	63	44
4 200<U≤5 500	63	71	80	50
5 500<U≤6 600	80	90	100	60
6 600<U≤8 300	100	110	125	80
8 300<U≤11 000	125	140	160	100

Note 1]: The minimum creepage distance and the minimum clearance of the type I Electrical Apparatus with the rated voltage 1,140V may be calculated by the linear interpolation.

4.4 Creepage Distance

4.4.1 The requirement of the creepage distance is determined by the working voltage, resistance to tracking property of the insulating material and the surface shape of the insulating material.

Table 2 lists the classification of the insulating material by the comparative tracking index (CTI), which is determined by the provision of GB/T 4207.There is not any tracking for the inorganic insulating material, such as the glass and the ceramics material. Hence, it is not necessary to determine its CTI, and it is listed into the class I in accordance with established practice.

Note:

1 The listed material class Is the same as the material level listed in GB/T 16935.1.

2 For the instantaneous over-voltage has not any effect on the tracking under normal conditions, it may be ignored. However, it shall take the short-time over-voltage and the over-voltage with the effect in accordance with the duration and frequency (for the more detailed material, refer to GB/T 16935.1).

Table 2 Tracking Resistance of Insulating Materials

Material Level	Comparative Tracking Index (CTI)

I	600≤CTI
II	400≤CTI＜600
IIIa	175≤CTI＜400

4.4.2 The creepage distance between the exposed conductive parts with different potential shall be determined by the working pressure specified by the equipment manufacturer and comply with the provisions in Table 1.The minimal value is 3mm when it connects to the external conductor.

4.4.3 The example (1 – 11) in Figure 2 is the instance of corresponding creepage distance determined by different concrete structures. The value X is 2.5mm in Figure 2.

Note 1: The bonding part is taken as one part of the whole part.

The action of the effective rib and recess at the surface of the insulating material shall comply with the following condition:

a) The rib at the surface of the insulating material shall be 2.5mm height at least, and the thickness of the rib shall match with the mechanic strength and thickness of the material and insulating material, which shall be 1mm at least.

b) The depth and width of the recess shall not be less than 2.5mm.

Note 2: The convex and concave part at the surface of the insulating material may be taken as the rib and recess, which is independent of the geometry.

4.5 Solid Insulating Material

Note: This terminology refers to the state during the use of materials, not necessarily refers to the state during the supply of materials. For example, It may be considered as the solid insulating material after the insulating varnishes are solidified.

4.5.1 The mechanical behavior that has an effect on the function of the insulating material shall meet the requirements under the following condition, such as the strength and rigidity:

a) The maximum temperature is 20K at least during the rated operation of the electrical apparatus, and the minimum temperature is 80℃.

b) For the Insulated Winding (see article 4.7.3 and Table 4), internal wiring (see article 4.8) and cable permanently connected to the electrical apparatus (see article 14.1 in GB 3836.1-2000), it is the maximum temperature when the electrical apparatus operates under the rated condition.

4.5.2 The insulating part composed of the molded plastic or laminate material shall be coated by the insulating paint with the same level of the comparative tracking index (CTI) as the insulator itself at least. It is other than the material, whose surface is damaged, but it has not any effect on the comparative tracking index (CTI) or the undamaged part can meet the requirement of the specified creepage distance.

4.6 Winding

4.6.1 The insulating conductor shall comply with the requirement of the article 4.6.1.1 or 4.6.1.2.

4.6.1.1 The conductor shall be coated with two insulating layers at least.

4.6.1.2 The round enameled wire for the winding shall comply with one of two schemes as follows:

a) For the level 1 of GB/T 6109.2, GB/T 6109.6 or CG/T 6109.5, there is not any breakdown when the level 2 of the minimum breakdown voltage is applied if the test is carried out in accordance with chapter 13 of GB/T6109.2, GB/T6109.6 or GB/T6109.5-1988. Furthermore, there shall not be more than 6 defects for the conductor every 30m in accordance with chapter 14 of GB/T 6109.2, GB/T 6109.6 or GB/T 6109.5. This provision is not related to the diameter of the conductor.

b) Comply with the level 2 of GB/T 6109.2, GB/T 6109.6 or GB/T 6109.5.

4.6.2 The winding shall be dried after the fastening and wrapping and then treated by the appropriate dipping agent in the immersing, dripping or vacuum dipping method. The painting or spraying method can not be taken for the dipping treatment.

The dipping shall comply with the process method specified by the dipping agent manufacturer, to fill with the gap between conductors as much as possible fully and enable the bonding between conductors to be firm.

It is not necessary to take above measures for the forming coil and conductor with the overall high voltage (1,100V or higher) winding insulation if its groove and end part is dipped, and the packing material is sealed or the equivalent insulating treatment is carried out in other ways before the electrical apparatus is loaded.

If the dipping agent with the solvent is taken, it will carry out the dipping and drying treatment for two times at least.

4.6.3 The winding shall not be wound by the conductor with the nominal diameter less than 0.25mm. However, it is the exceptional condition for the resistance temperature sensor that is embedded into the motor slot, carried out the dipping treatment or encapsulated with the motor winding.

The winding that is wound by the round conductor with the nominal diameter less than 0.25mm shall be of other explosion-proof type that complies with the standard listed in GB 3836.1.

4.7 Limiting Temperature

4.7.1 The temperature of the electrical apparatus part shall comply with the following requirement:

a) Don't exceed the maximum surface temperature specified in chapter 4 of GB 3836.1-2000.

b) Don't exceed the heat resistance temperature of the used materials specified in article 4.7.2, 4.7.3 and 5.1.4.

c) For the lamp of the light fixture, its limiting temperature shall not exceed the temperature measured in accordance with the article 5.2.4 and 5.2.6.

4.7.2 The allowed temperature of the conductor and other metal parts shall also comply with the following requirements:

a) Don't allow to reduce the mechanical strength of materials.

b) Don't allow to exceed the allowable stress of materials for the thermal expansion.

c) Don't allow to damage the adjacent insulating parts.

In addition to take the heat radiation of the conductor itself into account, it is also necessary to take the effect of the adjacent heat radiation part into account when you measure the temperature of conductors.

4.7.3 In addition to comply with the requirement in article 4.7.1 for the electrical apparatus, the limiting temperature of the Insulated Winding shall not exceed the specified value in Table 3.The value in Table 3 takes the heat resistance performance of the insulating material into account.

GB3836.3-2000

Table 3 Limiting Temperature of Insulated Winding

	Temperature Measurement Method (See Note 1)	Heat Resistance Level of GB/T 11021-compliant Insulating Material (℃) (see Note 2)				
		A	E	B	F	H
1 Limiting Temperature during Rated Operation						
a Single-layer Insulated Winding	Resistance Method or Thermometer Method	95	110	120	130	155
b Other Insulated Winding	Resistance Method	90	105	110	130	155
	Thermometer Method	80	95	100	115	135
2 Limiting Temperature at End of tE (See Note 3)	Resistance Method	160	175	185	210	235

Note:

1 The thermometer method may be used to measure the temperature only when the resistance method may not be used to measure the temperature. The thermometer method in this standard is the same as the meaning in GB/T 755.

2 The heat resistance level expressed by the symbol in GB/T 11021 is higher than the H level of the insulating material, and its limiting temperature is considered as the H level.

3 These values are composed of the ambient temperature, temperature rise of winding during the rated operation and temperature rise during t_E.

4.7.4 The winding shall be protected by appropriate protection device, to ensure the limiting temperature is not exceeded (see article 4.7.1, 4.7.2 and 4.7.3).

If it will not exceed the limiting temperature during the rated operation specified in article 4.7.3 when the winding is overload continuously (such as the rotor of the motor is blocked) or the winding is not overload (such as the ballast of the fluorescent lamp), the protection device may not be taken.

Note: The protection device may be set within or out of the electrical apparatus.

4.8 Internal Conductor Arrangement

The conductor that may contact the metallic parts shall be provided with the mechanical protection or proper fixing to prevent from the damage.

4.9 Degree of Protection for Enclosure

The degree of protection for the enclosure shall comply with the following provisions (unless otherwise specified in chapter 5).

The classification of the degree of protection for the enclosure in this standard is the same as GB/T 4942.1 and GB 4208.

a) The enclosure with the exposed live parts internally shall be provided with the degree of protection IP54 at least.

b) The enclosure with only insulated live parts internally shall be provided with the degree of protection IP44 at least.

If the enclosure is set with the drain hole or the ventilation hole to prevent from gathering the moisture, the degree of protection for the drain hole shall not be lower than IP44 under the condition a) and IP24 under the condition b).The details on the drain hole and the ventilation hole (location and dimension) are specified by manufacturers and listed in the document. The marking shall comply with the provisions in article 27.2 of GB3836.1-2000 plus the symbol X and the degree of protection for the enclosure.

4.10 Fastener

It takes the special fasteners comply with the provision in article 9.2 of GB 3836.1-2000 for the class I electrical apparatus with the exposed live part internally.

5 Supplementary Requirements for Dedicated Electrical Apparatus

These requirements are the supplement of chapter 4 in this standard. Unless otherwise specified, the requirements of Chapter 4 also apply to the electrical apparatus in article 5.1-5.7. Furthermore, it also applies to other electrical apparatus in article 5.8.

5.1 Rotating Electric Machine

5.1.1 Degree of Protection for Enclosure

The degree of protection for the enclosure is allowed o be lower than that specified in article 4.9 under the following conditions (other than the junction box and the exposed live parts).

a) For the enclosed air-cooled motor equipped with the inlet and outlet pipe joint of the cooling air (the GB/T1993-compliant cooling method IC3X), the degree of protection for the inlet and outlet of the pipe joints shall comply with the provision of IP20.

Note: The enclosure shall also provide the degree of protection IP44 after the pipeline is installed.

In this case, it shall be added with the sign x in accordance with the provision in article 27.2 of GB 3836.1-2000.

b) The motor which is mounted in the clean room and checked and managed by the specially trained personnel.

The enclosure of the class I motor shall comply with the provision of IP23.

GB3836.3-2000

The enclosure of the class II motor shall comply with the provision of IP20.

It shall prevent solid foreign objects from falling into the enclosure of the motor via the ventilation hole vertically.

It is necessary to indicate the limited use conditions in the nameplate of the motor and add the sign x in accordance with the provision in article 27.2 of GB 3836.1-2000.

5.1.2 Internal Fan

The internal fan shall comply with the requirement of the external fan in terms of the gap and the material in article 17.3 and 17.4 of GB 3836.1-2000.

5.1.3 Minimum Radial Unilateral Air Gap

The minimum radial unilateral air gap (mm) between the stator and the rotor shall not be less than the value calculated by the following formula when the rotating electric machine is stationary.

Minimum Radial Unilateral Air Gap (mm) = [0.15+(D－50)/780* (0.25+0.75N/1000)]rb

Where, D – Diameter of rotor (mm), the minimum value of D is 75 and the maximum value is 750 in the minimum radial unilateral air gap formula.

n – Maximum rated rotating speed r/min, whose minimum value is 1,000.

The value r is calculated by the following formula, whose minimum value is 1.0.

r= Core length (mm)/(1.75* Diameter of Rotor D(mm)) Value b: Take 1.0 for the motor which takes the rolling bearing and 1.5 for the motor with the sliding bearing.

Note:

1 There is not any direct corresponding relationship between this formula and the power frequency or polarities as we know from the example of the motor with two or four poles rolling bearing. The power supply of this motor is 50Hz/60Hz and the rotor diameter is 60mm. The core length is 80mm, the value D is 75, which is the minimum value. The n value is 3,600, which is the maximum value. The value b is 1.0. r=80/(1.75×60).It is approximate to 0.76 and gets 1.0. At this time, the minimum radial unilateral air gap is [0.15+(75-50)/780*(0.25+(0.75*3600/1000))*1.0*1.0, which is approximate to 0.25mm.

2 The motor with the sliding bearing shall be set with the feeler hole 1].

5.1.4 Squirrel Cage Rotor Motor

The squirrel cage rotor motor includes the synchronous motor with the starting cage or the damping cage winding, and it shall comply with the requirement of this article in addition to the requirement of the article 5.1.1, 5.1.2 and 5.1.3.

5.1.4.1 If the guide bar and end ring of the squirrel cage rotor is not die cast as a whole, the guide bar and end ring shall take the brazing or welding connection. The guide bar shall closely match with the guide slot, to prevent from generating the spark between the guide bar and the core of the rotor during the starting.

Note: For example, we take the pressure cast aluminum, and take the additional slot liner, slot wedge or other swelling measures for the single guide bar.

5.1.4.2 The surface temperature of rotors shall comply with the requirement of article 4.7 during the starting, and the limiting temperature shall not exceed 300℃.

5.1.4.3 It is necessary to determine the t_E time and the starting current ratio I_A/I_N and indicate it in the nameplate of the motor, to select the proper thermal overload protection device and prevent the motor from generating the not-allowed temperature.

The t_E time shall not be less than the time required for the thermal overload protection device to switch off the power supply of the motor when the rotor is blocked. If the t_E time of the motor is greater than the minimum value of the t_E time determined in accordance with the starting current ratio I_A/I_N in Figure 3, it can generally meet above requirements.

If the t_E time of the motor is less than the specified value in Figure 3, it is necessary to take the special protection device. Furthermore, it is necessary to demonstrate it functions reliably by the test before the use. This device shall be indicated in the nameplate of the motor.

The t_E time is not allowed to be less than 5s. The starting current ratio I_A/I_N is not allowed to be greater than 10.

For the temperature protection of the squirrel cage motor during the operation, see Appendix D.

5.1.4.4 The test shall be carried out for the variable frequency-powered motor together with the variable frequency power supply.

For the motor which only takes the temperature measurement device embedded into the winding for the protection, it is necessary to demonstrate the requirement of article 4.7.4 can be met when the rotor of the motor is blocked by the test, and the protection device used shall be indicated in the nameplate of the motor.

5.2 Lamps Powered By Feed Network

GB3836.3-2000

5.2.1 Light Source to Be Used:

a) The IEC 60061-1-compliant (Fa6) type fluorescent lamps with the single plug and without starter

b) The incandescent lamp that complies with the general purpose of the IEC 60064-compliant and IEC 60432 publications.

c) Compound light (self-ballasted high pressure mercury lamp MBTF)

d) Other type light whose temperature is no higher than the limiting temperature after the lamp breaks for 10s. However, it is not allowed to use the light with the free metal sodium.

5.2.2 The distance between the fluorescent tube and the transparent cover shall not be less than 5mm. However, the minimum distance between the fluorescent tube and the tubular transparent cover shall not be less than 2mm.

For other lights, the distance between the lamp and transparent cover shall not be less than the specified value in Table 4.

Table 4 Minimum Distance between Lamp and Transparent Cover

Lamp Power P (W)	Distance (mm)
P≤60	3
60＜P≤100	5
100＜P≤200	10
200＜P≤500	20
500＜P	30

5.2.3 The lamp holder shall comply with the requirements of Appendix A. It is necessary to prevent the spiral lamp from loosening in the lamp holder, and the type test as specified in article 6.3.1 shall be carried out for the light fixture.

5.2.4 If the maximum surface temperature of the internal lamp for the light fixture is 50℃ lower than the ignition temperature measured in the ignition test of the explosive gas mixture in the use environment within light fixture (take the stricter condition into account) at least, the temperature of lamps within the light fixture may exceed the provision in chapter 5 of GB3836.1-2000.

5.2.5 The temperature at the edge of the lamp header and the welding part of the lamp shall not exceed 195℃ and shall comply with the requirement of article 4.7.

5.2.6 The ballast of the fluorescent lamp shall withstand the rectifying effect after the aging of the lamp, and the temperature is not allowed to exceed the limiting temperature.

5.3 Hand Lights and Headlights with its Own Power Supply (Other Than Class I)

The lamp shall be protected by the transparent cover, to prevent from the mechanical damage. The distance between the lamp and the transparent cover shall be 1mm at least after the lamp is mounted. If the lamp is mounted into the spring lamp holder and contacts the transparent cover, the spring travel is 3mm at least. The transparent cover shall be protected in one of the following ways:

a) Protected by the protection network.

b) If the exposed area of the transparent cover is not greater than 50cm^2, it can take the flange protection with the height no less than 10mm.

c) If the exposed area of the transparent cover is greater than 50cm^2, but the transparent cover can withstand the mechanical strength test specified for the protection network in article 23.4.3 of GB 3836.1-2000.

The switching devices that generates the arc or spark in the light fixture circuit under normal operating conditions (including the air tight type reed switch) shall take the mechanical or electric interlocking, to prevent the contact is disconnected in the dangerous area, or take one of the standard explosion-proof types listed in GB 3836.1 for the protection.

5.4 Measuring Instrument and Instrument Current Transformer

5.4.1 The measuring instrument and the instrument current transformer shall operate continuously under 1.2 times of the rated current or 1.2 times of the rated voltage, and its temperature doesn't exceed the provision of article 4.7.

5.4.2 The carrying part of the instrument current transformer and the measuring instrument (other than the voltage circuit) shall withstand the rated short-time heating current I_{th} and the rated dynamic current I_{dyn} specified in Table 5 within the time in article 6.4, and it shall not reduce the explosion-proof performance after the test.

5.4.3 The temperature generated by the carrying part of the instrument current transformer and the measuring instrument shall not exceed the limiting temperature specified in article 4.7 when it passes the rated short-time heating current I_{th}. Furthermore, the temperature shall not exceed 200℃.

5.4.4 The rated short-time heating current I_{th} and the rated dynamic current I_{dyn} of the carrying part for the measuring instrument feed by the instrument current transformer shall not be less than the current value generated in the short-circuit secondary winding when the rated short-time heating current and the rated dynamic current passes through the primary winding of the transformer.

5.5 Other Transformers

GB3836.3-2000

Other transformers shall comply with the test specified in article 6.5.

Table 5 Short-circuit Current Withstand

Current	Carrying Part of Instrument Current Transformer and Measuring Instrument
I_{th} (rated short-time heating current)	$\geq 1.1\times I_{sc}$
I_{dyn} (rated dynamic current)	$\geq 1.25\times 2.5I_{sc}$
Note: **1. 2.5I_{sc} is the maximum peak value of the short-circuit current, and I_{sc} shall be indicated in the technical document delivered by manufacturers for the inspection.** **2. 1.1 and 1.25 are the safety factor. Hence, the allowed short-circuit current R.M.S during the operation shall not exceed I_{th}/1.1, and its peak value shall not exceed I_{dyn}/1.25.**	

5.6 Battery

The battery shall be of the lead-acid, iron-nickel or nickel-cadmium type and comply with the requirement of this standard.

For the battery with the capacity greater than 25A·h (5 hour rate), it is necessary to comply with the following supplementary requirements.

Note: Complying with these requirements will not ensure the safety during the charging. Hence, the charging shall be carried out in the non-hazardous area other than other safety measures.

5.6.1 Container

5.6.1.1 The container (including the partition wall and the cover) shall be composed of the steel plate. It is allowed to take other materials for the class II container. All inner surfaces of the container body and the cover shall be covered firmly and reliably by the bonding insulating layer completely if it is composed of the metal material, and the inner surface of the cover may be coated by the appropriate paint. The electrolyte shall not have any adverse effect on the inner surface.

5.6.1.2 The container shall undertake the mechanical stress during the use, including the stress generated during the transportation and handling. To meet this requirement, it is necessary to mount the partition wall in the container.

5.6.1.3 The container shall be set with the insulating barrier if necessary. The partition wall may be taken as the insulating barrier if the structure is proper, and the insulating barrier shall be deployed in the appropriate place, to prevent the nominal voltage generated at any part is more than 40V.The insulating barrier shall prevent the creepage distance is reduced to the not-allowed value during the operation. The height of the insulating barrier shall be 2/3 of the container at least. It is not allowed to take the method specified in the example 2 in Figure 2 when you calculate these creepage distances.

The creepage distance between the adjacent cell electrodes and the creepage distance between the electrode and the battery shall be 35mm at least. When the normal working voltage between the adjacent cells exceeds 24V, the creepage distance shall be added for 1mm at least every 2V when it exceeds 24V.

5.6.1.4 The fixing of the container cover shall prevent from opening or displacing at random.

Each cover shall be set with the special fasteners that comply with article 9.2 of GB 3836.1-2000.

5.6.1.5 The installation of the cell in the container shall prevent from generating obvious displacement during the operation. The materials to mount the polar column and other embedded components (such as the packing and insulating barrier) shall use the insulating material without any porous, resistance to electrolyte effect and flame retardation.

5.6.1.6 The liquid into the container without any drain hole shall discharge the liquid under the condition that the cell is not removed.

5.6.1.7 The container shall be set with the ventilation hole, and the degree of protection for the enclosure may not be lower than IP23.

The ventilation hole shall provide excellent ventilation effect. The hydrogen concentration in the container (by volume) shall not exceed 2% during the type test (6.6.3).

5.6.1.8 The plug and socket shall comply with the requirement in chapter 20 of GB 3836.1-2000.This requirement is not applicable for those plug devices which can be only separated by tools and are set with the warning sign “It can be separated in the non-hazardous location only”. The single-pole plug and the positive and negative plug of the socket shall be of the structure that is not interchangeable.

5.6.1.9 The polarity marks of the plug and socket for the cell shall be durable and striking.

5.6.1.10 Any other electrical apparatus that is fixed or assembled within the container shall comply with one of the explosion-proof types listed in GB3836.1.

5.6.2 Cell

5.6.2.1 The cell cover shall be sealed with the cell container, to prevent from disengaging the cell cover and leaking the electrolyte. It is not allowed to take the flammable materials.

5.6.2.2 The positive and negative electrode plates shall be supported firmly.

GB3836.3-2000

5.6.2.3 The electrolyte level of the cell shall be maintained between the minimum allowed level and the maximum allowed level of the electrolyte. When the electrolyte is at the minimum level, it is necessary to take measures (such as add the acid-proof lower insulating jacket) to prevent from the excessive corrosion of the lower end for the pole plate and the busbar.

5.6.2.4 There shall be enough space within each cell, to prevent the electrolyte overflow caused by the expansion of electrolyte and the sedimentation of suspension. This space (by volume) shall be compatible with the expected service life of the cell.

5.6.2.5 The liquid injection and exhaust plug shall prevent the electrolyte spilling and facilitate the installation and maintenance under the normal use condition.

5.6.2.6 It shall be sealed between each polar column and cell cover, to prevent the electrolyte leakage.

5.6.2.7 The insulation resistance between the live part and the container after the new cell is charged enough shall be 1MΩ at least.

Note: The insulation resistance of the cell during the operation shall be 50Ω at least per volt rated voltage, which is 1000Ω at least.

5.6.3 Connection

5.6.3.1 The connection between adjacent cells which can move relatively shall be non-rigid. Each end of the non-rigid connection cable shall connect to the polar column by one of the following methods:

a) Welding or brazing to the polar column.

b) Press to the copper jacket that casts in the pole column of the cell.

c) Embedded into the copper terminal, and then fasten to the copper connector that casts in the pole column by the screw thread. The connection cable between the cells shall be the copper cable under the condition b) and c).

5.6.3.2 It is necessary to prevent the loosing when you take the threaded connection in c) of article 5.6.3.1.

The effective contact area that connects the conductor and the polar column of the cell shall be equal to the cross section of the connection cable between the cells at least. When the current carrying capacity of the connected conductor is equal to the continuous rated current of the connection cable, the thread connector shall suffer from the temperature test in article 23.4.6.1 of GB 3836.1-2000, and this current value shall be specified in the document submitted by manufacturers.

The concave and convex contact area of the thread shall not be taken into account when you calculate the effective contact area.

5.6.3.3 The connection cable shall withstand the current required for the operating status and it shall not exceed the specified temperature (see article 4.5.1, 4.7.1 and 4.7.2).If the operating status can not be determined, determine the discharge rate of the cell capacity by the cell manufacturers. When you use the dual connection cable, each connecting part shall carry all current separately, and it is not allowed to exceed the specified temperature.

5.6.3.4 All exposed conductors that may be eroded by the electrolyte shall take the protective measures, for example, the un-insulated metal connecting conductor of the lead-acid batteries (other than the lead) shall be covered by the lead. However, it is not applicable for the thread.

5.6.3.5 Each live part shall be provided with the insulating layer in the class I battery, to prevent the tracking current and any accidental contact.

5.7 General Junction Box and Distribution Box

The general junction box and the distribution box shall determine the allowed maximum power consumption in accordance with article 6.7, to ensure it will not exceed the limiting temperature in article 4.7 during the operation.

The general junction box and the distribution box are allowed to configure several terminal blocks. The quantity of terminal blocks is determined by the structure and dimension of the enclosure, while the allowed maximum power consumption is determined in accordance with article 6.7.

The power consumption of each terminal block is determined by the resistance value of this terminal block and its connected conductor at the temperature 20℃ (it is assumed that the length of this conductor is equal to the maximum linear length out of the enclosure) and the maximum current value of this terminal block. The total power consumption of each terminal block is the total power consumed under this structure and circuit condition.

5. 8 Resistance Heating Device and Resistance Heating Unit

This article specified the supplementary requirement for the resistance heating device and the resistance heating unit defined in the article 3.13.1 and 3.13.2.It is not applicable for the induction heating, skin effect heating, dielectric heating or any other heating system, including the heating system that the current passes through the liquid, enclosure or pipeline.

5.8.1 This standard takes the following content:

- The heating resistance is not considered as the winding, and the article 4.6 of this standard is not applicable.

- The chapter 6 of GB 3836.1-2000 is not applicable for the insulating material of the heating resistance and the sheath of the heating cable and the heating tape.

5.8.2 The heating resistance shall be provided with the positive temperature coefficient, and manufacturers shall describe the resistance value and the tolerance of the resistor at the temperature 20℃.

5.8.3 Manufacturers shall specify the maximum operating temperature T_p (℃).The material used for the resistance heating device shall withstand the temperature (T_p+20)℃ when the test is carried out in accordance with the requirement of article 6.8.3.

GB3836.3-2000

5.8.4 The cold starting current of the resistance heating device shall not exceed 10% of the current value specified by manufacturers at any time within 10s after the current passes through when the test is carried out in accordance with the article 6.8.5.

5.8.5 The resistance heating device shall be made into the structure that can take the electrical protection device as mentioned in the appendix E. It doesn't include the situation that the protection of the resistance heating device combines with the protection of the electrical apparatus, such as the anti-condensation heating device for the motor.

* The general junction box and the distribution box in this article refer to the general junction box and the distribution box that are not specified to match with the dedicated electrical apparatus and can be used individually.

5.8.6 When the surface conductive coating of the resistance heating device can ensure the protection device as mentioned in article 5.8.5 functions normally, it shall be covered to the surface of the entire insulation covering. Furthermore, it shall be composed of the evenly distributed conductive layer that covers 70% of the insulating surface at least.

The resistance of the conductive layer shall be less than the heating resistance of the resistance heating device with the identical length.

If it can demonstrate that the protection device as mentioned in article 5.8.5 can prevent the high temperature under the fault condition or the resistance of the conductive layer shall not be less than the resistance of one bus conductor under the condition that the resistance heating device is self-limiting.

5.8.7 The insulating layer shall ensure the heating resistance will not contact the explosive gas.

Note: For example, the pearl insulation material can not meet this requirement.

5.8.8 Taking the mechanical strength into account, the cross area of the conductor that connects to the resistance heating device shall be $1mm^2$ at least.

5.8.9 It shall not be considered that the insulating layer can prevent the explosive gas from passing through it generally when you determine the temperature group of the resistance heating device.

5.8.10 It is necessary to take one of the following measures to prevent the resistance heating device and the resistance heating unit from exceeding the limiting temperature during the power-on:

- Steady state structure (under the specified use condition)

- Self-limiting characteristics of the resistance heating device.

- The electrical protection system that complies with article 5.8.11, which can switch off the power supply of the resistance heating device or the resistance heating unit at the specified surface temperature. This protection system shall be completely independent on the temperature control system that is used to adjust the resistance heating device or the resistance heating unit under the normal condition.

The temperature of the resistance heating device is related to the following parameters:

- Thermal output power.

- Ambient temperature, gas, liquid and workpiece.

- Resistance heating device and its surrounding thermal conductivity.

The desired data related to these contents shall be provided by manufacturers in accordance with the descriptive document specified in article 23.2 of GB 3836.1-2000.

5.8.11 The protection system shall be implemented in the following way:

- Measure the temperature of the resistance heating device or the ambient temperature around it (if possible).

- Measure the ambient temperature and one or more other parameters.

Note: The parameter sample is shown as follows: Level, flow rate, current, leakage current and power consumption.

If it is necessary to describe the special condition for the safe use, it is necessary to be specified in the descriptive document (see article 23.2 of GB 3836.1-2000). For example, when the resistance heating device is installed with the incomplete protection system, all data for the signal processing shall be indicated in the descriptive document (for example, the compatibility between the sensor and the receiver).

The protection system shall switch off the power supply of the resistance heating device or the resistance heating unit directly or indirectly, which shall be changed manually or reset manually after it restores the normal operating status, so that the resistance heating device or the resistance heating unit is switched on again. However, it doesn't include the protection system that is monitored continuously. If the sensor fails, the resistance heating unit shall be switched off before it is up to the limiting temperature. The protection system with the manually reset shall be debugged or replaced by the tools as much as possible.

The adjuster of the protection device shall be locked and sealed, and it shall not be loosened frequently during the operation.

Note: The fuse can only be replaced by parts specified by manufacturers, and the protection system shall be set individually and can operate under abnormal condition.

5.8.12 The resistance heating device and the resistance heating unit shall subject to the type test of article 6.8 and the factory inspection of the chapter 7.

5.9 Other Electrical Apparatus

The electrical apparatus that is not mentioned in article 5.1 – 5.8 specially shall comply with the structural requirement in chapter 4 and refer to the supplementary requirement in chapter 5.

6 Type Test

The following requirements are the supplement in chapter 23 of GB 3836.1-2000. The requirements in chapter 23 of GB 3836.1-2000 shall also be applicable for the increased safety electrical apparatus “e” unless otherwise specified.

GB3836.3-2000

6.1 Dielectric Strength

The dielectric strength shall be tested in accordance with the following provisions:

- The test voltage specified in the dedicated standard of various electrical apparatuses (such as the guidance 2 of ISO/IEC).However, it is different for the resistance heating device and the resistance heating unit that take the supplementary requirement in article 5.8, whose test voltage is (1000+2U_N)V (R.M.S) and the tolerance range is +5% - 0%. Where, U_N is the rated voltage of the electrical apparatus.

- If there is not any test requirement for the dedicated standard, the test voltage is 500V (R.M.S) and the tolerance range is +5% - 0% for the electrical apparatus whose supply voltage doesn't exceed 90V (peak), and the test voltage is (1000+2U_N)V (R.M.S) or 1500V (R.M.S), the higher one will be taken and the tolerance range is +5% - 0% for the electrical apparatus with the higher supply voltage.

The duration to apply the test voltage is 1min and the tolerance range is +5% - 0%.

6.2 Rotating Electric Machine

6.2.1 The rotor blocking test shall be carried out for the squirrel cage rotor motor, to ensure the starting current ratio I_A/I_N and the t_E time.

For the motor whose power exceeds 160kW, the temperature rise and the TE time during the (rated) operation may be calculated by the calculation method.

The test can not be carried out at the inspection station of manufacturers for the motor whose power exceeds 75kW, and it is allowed to take the calculation method after it is negotiated with each other by the manufacturer and the inspection station.

The calculation method and the test method are listed in the appendix B.

6.2.2 If the test condition and operation condition is equivalent to each other, the test is allowed for the rotating electrical machine with other installation mode under the horizontal installation condition.

6.3 Lamps Powered By Feed Network

6.3.1 Mechanical Test of Screw Lamp Holder

In addition to the E10 lamp header, the test lamp header that complies with the specified dimension in IEC60238 shall be screwed into the lamp holder by the screw torque specified in Table 6.And then screw out the lamp header after the test amp header is screwed out for 15°. The torque required shall not be less than the minimum screw-out torque specified in Table 6.

Table 6 Screw-in Torque and Minimum Screw-out Torque

Lamp Header Dimension	Screw-in Torque (N·m)	Minimum Screw-out Torque (N·m)
E14	1.0±0.1	0.3
E27	1.5±0.1	0.5
E40	3.0±0.1	1.0

6.3.2 Heating Test of Tubular Fluorescent Lamp

When the diode is connected to the fluorescent tube in serial, apply 1.1 times of the rated voltage to the fluorescent lamp. The stable temperature is not allowed to exceed the temperature of corresponding temperature group specified in article 5.1 of GB 3836.1-2000.Furthermore, the temperature of the ballast is not allowed to exceed the corresponding limiting temperature in the item 1b of Table 3 when the rated voltage is applied.

6.4 Measuring Instrument and Instrument Current Transformer

6.4.1 The temperature rise when the secondary winding of the current transformer is in the short-circuit state and the temperature rise of the current carrying part for the measuring instrument may be obtained by the test or the calculation method when the rated short-time heating current I_{th} is passed through within 1s.It is necessary to take the temperature coefficient of the winding into account during the calculation. However, the heat radiation may be ignored.

6.4.2 The dynamic stability of the current carrying part shall be measured by the test. The secondary winding shall be short circuit during the dynamic stability test of the current transformer. The shortest duration of the test is 0.01s. There shall not be one peak current no less than I_{dyn} at least for the primary peak current.

The duration for the rated short-time heating current test is 1s at least, and the R.M.S of the primary current shall not be lower than I_{th}.

The dynamic stability test and the rated short-time heating current test may be carried out jointly only when the following conditions are met at the same time:

- The first maximum peak current for the test is not lower than I_{dyn}.

- The value of ($I^2{}_t$) is not less than $(I_{th})^2$ and the value t is between 0.5s and 5s when the test is carried out under the time *t* and the current I.

6.4.3 The inter-turn over-voltage test shall be carried out for the current transformer in accordance with the method specified in GB 1208. However, the R.M.S of the primary current shall be equal to 1.2 times of the rated primary current.

6.5 Transformer (Other than for Instrument)

The temperature of the transformer shall be determined by the test under the specified load. The protection device shall be placed in the circuit during the test.

GB3836.3-2000

Furthermore, the test shall be carried out for the transformer under the most unfavorable load condition if the load of the transformer is not specified specially, including the short-circuit state of the secondary winding. The protection device shall be placed in the circuit during the test.

6.6 Battery

The following type test is applicable for the battery which complies with the provision of article 5.6.

6.6.1 Insulating Resistance

6.6.1.1 Test Condition:

a) Take the 100V megohmmeter at least.

b) Disconnect the battery from the external circuit.

c) The electrolyte injecting into the battery shall be up to the allowed maximum level.

6.6.1.2 If the measuring value meets the specified value in article 5.6.2.7, it is considered that the insulating resistance is qualified.

6.6.2 Impact Test

This test shall be carried out for the battery which may suffer from the mechanical impact during the normal operation. This test may not be carried out for other batteries. However, it is necessary to mark the sign X in accordance with the provision in article 27.3 of GB 3836.1-2000.

The test shall be carried out by taking the battery with the complete connection. If the batteries are provided with the identical structure and different capacity levels, it is only necessary to select a certain quantity of batteries for the test, to evaluate the performance of the entire series.

6.6.2.1 Test Condition

There are two groups of the test samples at least, and each group of samples is composed of two new batteries with enough electricity at least. The samples are connected by the use status, and fixed to the mounting plane of the impact machine in the normal mounting method or by the rigid fixture. The mounting shall comply with the requirement in article 3.3 of GB/T 2423.5.

The impact machine shall generate the half wine wave. As shown in Figure 1 of GB/T 2423.5, the speed variation error, lateral movement and measurement system shall meet the requirement in article 3.1.2, 3.1.3 and 3.2 of GB/T 2423.5 respectively. The acceleration peak is $5g_n$.

6.6.2.2 Test Procedure

a) Measure the capacity of each sample.

b) The battery shall discharge the current at the 5 hour rate during the test.

c) The independent impact test shall be carried out for each sample for 15 times. The test requirement is shown as follows:

- 3 impact tests are carried out continuously in the vertical direction.

- 3 impact tests are carried out at the horizontal plane along two vertical axis lines continuously.

d) Measure the capacity of each sample after the recharging.

6.6.2.3 Judgment Standard

Each sample shall comply with the following provisions after the test:

a) The voltage does not change suddenly during the test.

b) There is not any obvious damage or deformation.

c) The reduction of the capacity doesn't exceed 5%.

6.6.3 Ventilation Test of Container

This test aims to check whether the ventilation hole of the container can discharge the hydrogen released by the battery in the container, so that the hydrogen concentration can meet the requirement.

6.6.3.1 The hydrogen volume released from the container is calculated by the following formula:

Hydrogen (M3/h) = Number of batteries * Capacity (A·h) * 5 * 10 - 6

Note: This formula is only applicable for the pure hydrogen condition. When you take the hydrogen with the impurity, it is necessary to increase the flow rate of the hydrogen, to offset the effect of the hydrogen with the impurity.

6.6.3.2 The test is carried out in one of the following methods:

a) Method 1: Mount the simulated battery box in the container whose structure type, quantity and location are the same as the actual situation. And it will not change the original natural ventilation status between batteries.

The hydrogen may be injected evenly by the injection hole or the drain hole in the container, and its flow rate may be calculated in accordance with the formula in article 6.6.3.1.

b) Method 2: It is necessary to mount the new battery in the container, whose structure type, quantity and location are the same as the actual situation. Furthermore, the capacity of the battery is up to its rated capacity.

GB3836.3-2000

The discharge current for the test is calculated by the following formula:

Overload current(A)= Hydrogen (M3/h)/ (Number of batteries)*0.44*10^{-3}

6.6.3.3 The test shall be carried out in the test site without obvious ventilation. The temperature difference between the ambient temperature, container temperature and the cell container temperature or the simulated battery box shall not exceed 4K during the test, and above temperature shall be within 15℃ - 25℃.

6.6.3.4 This test shall be carried out continuously. It is necessary to test the hydrogen concentration for 4 times during the test, and each time interval is not less than 30min, the hydrogen concentration measured for each time shall not exceed 5% of the average value for four measurements. To ensure the accuracy of the measured data, the sample shall be far away from the injection hole and the ventilation hole as much as possible.

6.6.3.5 This test is carried out for two times at least.

6.6.3.6 The test is qualified if the measured hydrogen concentration doesn’t exceed 2%.

6.7 General Junction Box and Distribution Box

The general junction box and the distribution box are mounted into all terminals, and the terminals are in the most unfavorable state (possible). The terminals are connected in serial via the connecting conductor with the maximum cross area specified by various terminals. The length of the connecting conductor for various terminals is equal to the maximum linear dimension within the enclosure. The connecting conductor is bound in bundle within the container by six groups.

Note: The most unfavorable state of the terminals refers to the maximum temperature rise status when the rated current is passed through.

Measure the temperature at the hottest part after it is up to the stable status when the rated current of the terminals passes through the serial circuit.

The allowed maximum power consumption under the measured temperature rise is calculated by the resistance of the series circuit at the temperature 20℃±2℃ and the rated current of the terminals.

6.8 Resistance Heating Device and Resistance Heating Unit

The following type test is applicable for the resistance heating device and the resistance heating unit specified in article 5.8.

6.8.1 The test shall be carried out for the sample or specimen of the resistance heating device. For the heating cable or the heating tape, the test shall be carried out for the sample or specimen with the length no less than 3m. Furthermore, it shall include the uneven part in the structure to suffer from these tests. The following test shall be carried out within the temperature range 10℃ - 25℃ unless otherwise specified.

6.8.2 For the insulating dielectric strength test of the sample and specimen, relevant parts are dipped into the tap water for 30min firstly, and then the test a) and b) are carried out for the sample or specimen.

a) The test voltage is (500+2U_N) V (R.M.S), and the time is l min. Where, U_N is the rated voltage of the electrical apparatus. The conductive layer as mentioned in article 5.8.6 is dipped into the water completely. The test voltage is applied between the heating conductor and the conductive layer. If there is not any conductive layer, it is applied between the heating conductor and the water.

If two or more conductors are electrical insulation with each other, the voltage is applied between each conductor pair, and then the voltage is applied between each conductor and the conductive layer or the water. The conductors shall be disconnected with each other if necessary.

b) Measure the insulating resistance by the 500VDC voltage. The insulating resistance of the specimen or sample is 20MΩ at least. However, the insulating resistance shall not be less than 1.5MΩ·km if the mounting length of the cable or tape type resistance heating device may exceed 75m (for example, the sample with the length 3m is 500MΩ).

6.8.3 For the thermal stability test of the insulating material for the resistance heating device, it is necessary to store the sample or specimen in the air with the temperature (T_p+20)℃ and no lower than 80℃ for four weeks, and store the sample or specimen at the temperature -25℃ - - 30℃ for 24h at least. And then the insulating dielectric strength test is carried out in accordance with a) and b) of article 6.8.2.

6.8.4 The impact resistance test shall be carried out for two new samples or specimens. As shown in Figure D1 of Appendix D for GB 3836.1-2000, the test device takes the quenched hemispherical steel punch with the impact energy 7J or 4J. The mechanical hazard rating complies with the provision in article 23.4.3.1 of GB3836.1-2000. However, it doesn’t include the resistance heating unit which takes the enclosure that complies with the requirement in article 23.4.3 of CB 3836.1-2000 for the protection.

For the heating cable or the heating tape, the hemispherical punch is replaced with the cylinder steel punch. The diameter of the cylinder is 25mm, and the length of the cylinder is greater than the diameter of the cable or the width of the heating tape. The impact direction is vertical to the axis line of the sample or specimen. The sample or specimen shall withstand the insulating dielectric strength test in a) and b) of article 6.8.2 after the impact test.

6.8.5 The cold starting current test shall be carried out after three samples or specimens are laid to the heat absorption body or the heat radiation body in the thermostat. The temperature in the thermostat is maintained at the cold starting temperature specified by manufactures with the error ±2℃.Apply the operating voltage for the sample in the cold environment and record the current value continuously within 1min after the power-on.

6.8.6 The test for the special type of the resistance heating device or the resistance heating unit shall be carried out in accordance with requirement of Appendix C.

7 Factory Inspection

These tests are the supplement in chapter 24 of GB 3836.1-2000.

7.1 The insulating dielectric strength test shall be carried out in accordance with the provision in article 6.1.

7.2 The insulating resistance of the battery shall be measured in accordance with the provision in article 6.6.1.

8 Markings

These requirements are the supplement in chapter 27 of GB 3836.1-2000.It is necessary to add the following markings for the increased safety electrical apparatus:

a) Rated voltage and rated current.

b) Starting current ratio I_A/I_N and t_E time of rotating electrical motor and AC electromagnet.

c) Rated short-time heating current I_{th} and rated dynamic current I_{dyn} of measuring instrument and instrument current transformer.

d) Technical data of light source for light fixture, such as the rated value, including the dimension if necessary.

e) Allowed maximum power consumption of general junction box and the distribution box.

f) Limit condition for the use, for example, it is only allowed to be used in the clean environment.

e) Characteristics of dedicated protection device required (such as the temperature control or harsh starting condition), and special power supply condition (such as the inverter).

h) For the battery that complies with the article 5.6, the structure type of the cell, the number of cells, rated voltage and warning sign corresponding to set the “Charging is not allowed in hazardous locations".

Note: The battery shall be attached with the specification (maintenance manual) and the charging description, which shall include all necessary descriptions about the charging, use and maintenance.

The specification shall include the following content at least:

- Names or registered trademarks of manufacturers or suppliers

- Model marking of manufacturers

- Quantity of cells and nominal voltage of batteries

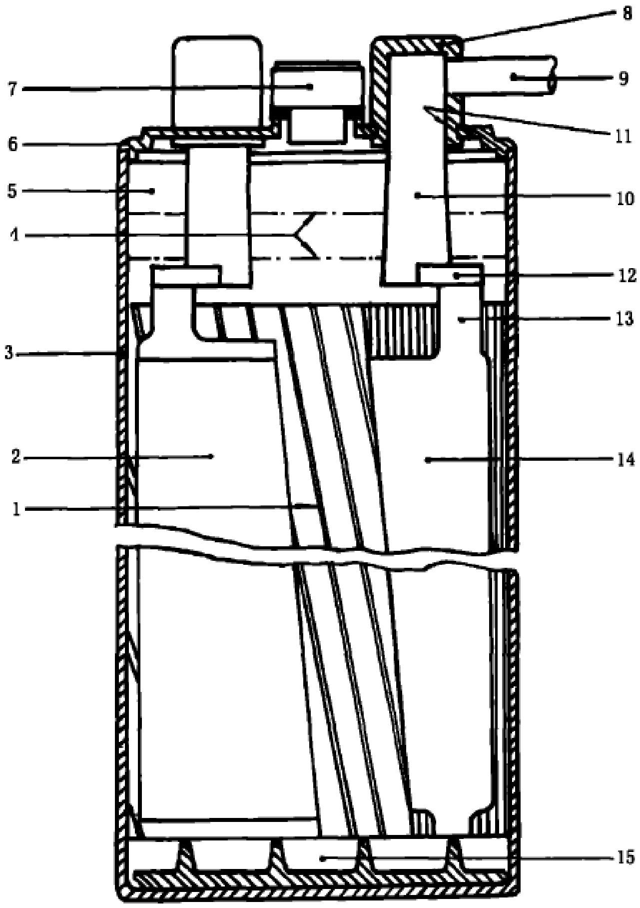
- Rated capacity during continuous discharging

- Charging description

- any other conditions related to the safety operation of cells, for example, it is necessary to open the cover during the charging, provide the minimum waiting time before the closing of the cover required to discharge the subsequent escaping gas after the charging, check the electrolyte level, understand the characteristics of the injected electrolyte and water, as well as the mounting location.

i) Resistance heating device or resistance heating unit, indicating the temperature T_P.

GB3836.3-2000



Note: This schematic diagram doesn't include the structural requirements and recommendations.

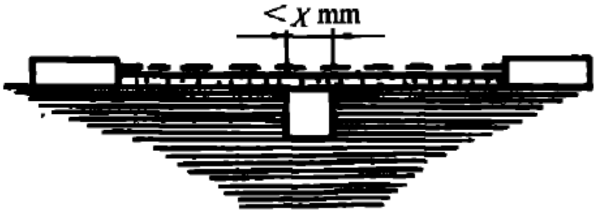
1- Partition, 2- Positive Plate, 3- Cell Container, 4- Electrolyte Level (Maximum/Minimum)

5- Head Space, 6- Electrolyte Sealing Cover, 7- Liquid Injection and Exhaust Plug, 8- Sealing Enclosure,

9- Connecting Cable, 10- Polar Column, 11- Electrolyte Sealing of Polar Column, 12- Pole Bridge, 13-Lower End of Polar Plate,

14- Negative Plate, 15- Sediment Space

Figure 1 Cell Parts



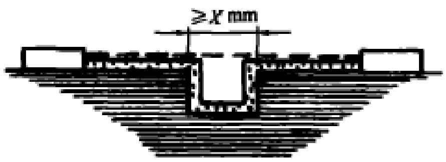
Example 1

Condition: It is the parallel or necking groove at both sides. The width is less than X mm, and the depth is not taken into account.

Rule: The creepage distance and the clearance are measured by penetrating through the groove directly as shown in the figure below.

Figure 2 Determinations of Creepage Distance and Clearance

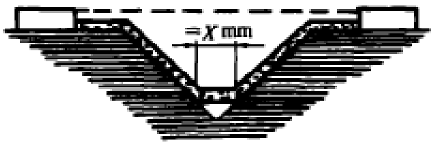
GB3836.3-2000



Example 2

Condition: It is the parallel groove at both sides. The width is equal to or greater than X mm, and the depth is not taken into account.

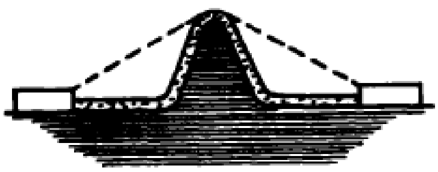
Rule: The clearance is measured by penetrating through the groove directly. The creepage distance is measured along the contour of the groove.



Example 3

Condition: It is the V-shape groove, whose width is greater than X mm.

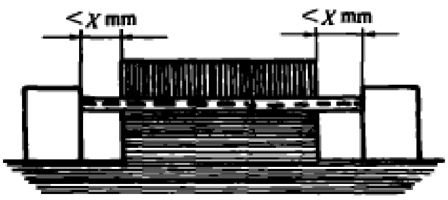
Rule: The clearance is measured by penetrating through the groove directly, and the creepage distance is measured along the contour of the groove. However, it is penetrated through at the width X mm under the groove.



Example 4

Condition: Rib.

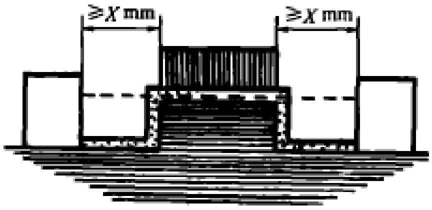
Rule: The clearance is the shortest broken line in the air that crosses the top of the rib. The creepage distance is measured along the contour of the rib.



Example 5

Condition: The route includes the un-bonded engaging member, and the groove width is less than X mm at both sides.

Rule: The creepage distance and the clearance are measured by penetrating through the rib directly...



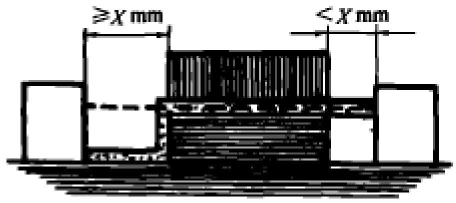
Example 6

Condition: The route includes the un-bonded engaging member, and his groove width is equal to or greater than X mm at both sides.

Rule: The clearance is measured by penetrating through the rib directly. The creepage distance is measured along the contour of the groove.

Figure 2 (Continued)

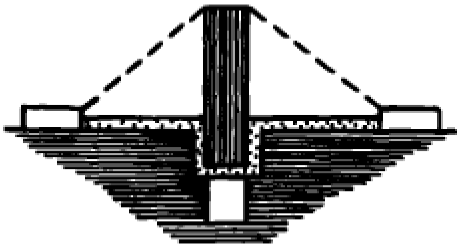
GB3836.3-2000



Example 7

Condition: The route includes the un-bonded engaging member, the groove width is less than X mm at one side, and the groove width is equal to or greater than X mm at the other side.

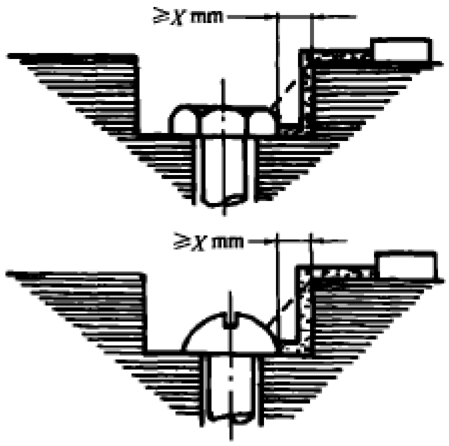
Rule: The clearance and the creepage distance are shown in the figure below.



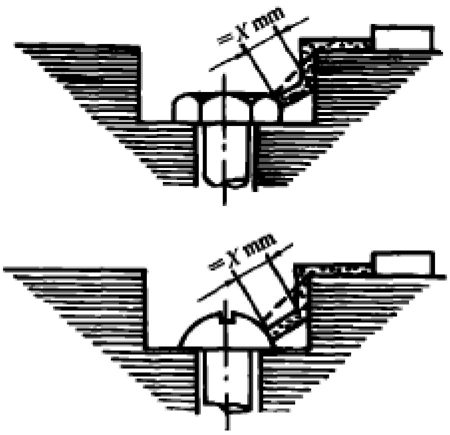
Example 8

Condition: The creepage distance that penetrates through the un-bonded engaging member is less than the creepage distance that crosses the insulating barrier.

Rule: The clearance is the shortest broken line distance in the air that crosses the tope of the insulating barrier.



Example 9: The gap between the bolt head and the recess wall is wide and shall be counted.

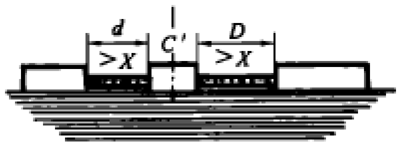


Example 10: The gap between the bolt head and the recess wall is narrow and shall not be counted.

Measure the creepage distance to the recess wall from the bolt head at the place where the distance between the bolt head and the recess wall is X mm.

Figure 2 (Continued)

GB3836.3-2000



Example 11 *C'* - Uncharged Conductor without Grounding

Clearance = d + D

Creepage Distance = d + D

Clearance   Creepage Distance

Figure 2 (Completed)

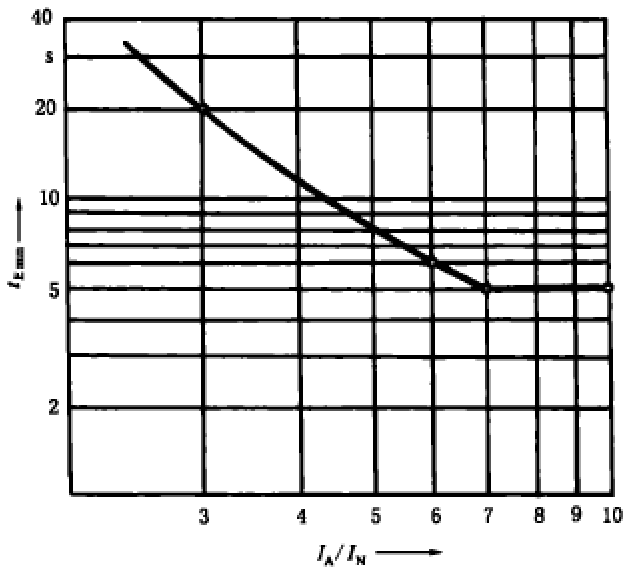


Figure 3 Relationship between Minimum t_E Time and Starting Current Ratio I_A/I_N of Motor

GB3836.3-2000

Appendix A

(Normative Appendix)

Lamp holder and lamp header of light fixture powered by feed network

A1 The lamp holder with corresponding lamp header shall comply with the test requirement of the class I or II grade C interior lighting of detonation structure in GB 3836.2-2000.

A2 The screw lamp holder with corresponding lamp header shall comply with the requirement of A1, or the lamp holder is mounted with the flameproof chamber that complies with the test requirement of the class I or II grade C interior lighting of detonation structure in GB 3836.2-2000 and is provided with the linkage switch. It is necessary to take measures to prevent the lamp from loosening within the lamp holder.

The screw lamp holder shall meet the test requirement of the lamp header screw-in and screw-out torque in article 6.3.As the exception condition required in article 4.3 and 4.4, the insulating level of the insulating material used for the screw lamp header shall be the level I, and it shall comply with the requirement in Table A1 Creepage Distance and Clearance.

A1 Creepage Distance and Clearance of Screw Lamp Holder and Lamp Header

Voltage U (V)	Creepage Distance and Clearance (mm)
U≤60	2
60＜U≤250	3

A3 The lamp holder of the tubular fluorescent lamp shall comply with the Fab data and dimension requirement of IEC 60061-2.

A4 In addition to the lamp holder specified in A2 and A3, the path length of the flameproof joint surface between other lamp holder and the lamp header or the plug pin shall be 10mm at least when the contact is separated instantly.

Appendix B

(Normative Appendix)

Increased safety squirrel cage rotor motor – test and calculation method

For the squirrel cage rotor motor, it is necessary to measure the temperature rise of the stator and rotor during the rated operation and blocking of the rotor.

For the motor with the rated power more than 160 kW (or 75kW, if it complies with article 6.2.1), it is allowed to determine the temperature rise during the rated operation and blocking status by the calculation method. In this case, it is necessary to carry out the comparison test and simulation test in the similar motor for comparison purposes as much as possible, to check the correctness of the calculation.

B1 The temperature rise of the stator and rotor winding shall be determined by the method specified in article 5.2.7.1 and 5.2.7.2 of GB/T 755 during the rated operation. However, the table in article 5.2.7.l of GB/T 755 shall be replaced with Table B1.

Table B1 Time after Power-off for Measurement of Rated Operation Temperature

Rated Power P (kW)	Time after Power-off (s)
P≤50	30
50＜P≤200	90
200＜P	120

B2 Measurement of Temperature Rise during Blocking of Motor

B2.1 Connect it to the power supply with the rated voltage and the rated frequency after the blocking of the motor at the ambient temperature.

B2.2 The stator current measured after the power-on for 5s is the initial starting current I_A.

B2.3 The temperature rise of the guide bars and end ring of the rotor shall be measured by the thermocouple. Furthermore, it shall take the temperature rise rate into account and select the measuring instrument with the smaller time constant for the measurement. What's more, it can be measured by the thermal sensitive element and other methods. The measurement result takes the maximum temperature value obtained from various measurements.

B2.4 The average temperature rise of the stator winding shall be measured by the resistance method.

B2.5 The measured current value shall be converted into the starting current I_A in accordance with the linear relationship with the voltage and the measured temperature rise shall be converted into the blocking temperature rise in accordance with the square relationship with the voltage if there is not any saturation effect if the blocking test of the motor is carried out when it is lower than the rated voltage (see article B2.2). If there is any saturation effect, it is corrected during the conversion.

GB3836.3-2000

B3 Calculation Method of Temperature Rise during Blocking of Motor

B3.1 The temperature rise during the blocking of the motor rotor may be calculated in accordance with the Joule effect I^2R. Furthermore, it is necessary to take the heat generated within the guide bar and the end ring, the heat capacity of the squirrel cage, the effect of the skin effect on the heat distribution within the guide bar and the heat conduction in the core into account.

B3.2 The ratio of the temperature rise △θ to the time t for the stator winding may be calculated by the following formula during the blocking of the motor:

$$\frac{\Delta\theta}{t} = a \cdot j^2 \cdot b$$

Where, j – Starting current density (A/mm^2)

a – Calculated constant of materials

For the copper winding, a=0.0065.

b - Attenuation coefficient, b=0.85 (taking the heat conduction of the dipping winding into account).

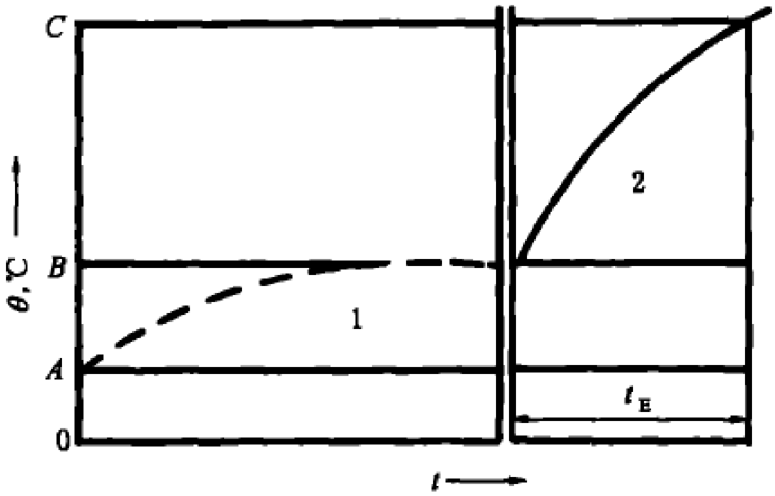
B4 t_E time is calculated by the following method (see figure B1):

0C is determined by the limiting temperature specified in article 4.7, 0A is the maximum ambient temperature (it is usually 40℃) and AB is the temperature rise during the rated operation in Figure B1.The t_E time can be determined by the difference BC and the temperature rise rate during the blocking of the motor (obtained by the measuring method or the calculation method).

Above calculation shall be carried out for the rotor and the stator respectively. Take the smaller value as the t_E time that the motor corresponds to corresponding temperature group.

B5 The test shall be carried out for the motor designed for the harsh starting condition or the motor taking the special protection device (such as the protection device which monitors the winding temperature directly) together with the configured protection device.

B6 The motor powered by the variable frequency power supply and the connected protection device shall determine it doesn't exceed corresponding limiting temperature within the specified operating condition range of the combined device of the motor and the variable frequency power supply by the test.



0A – Allowed Maximum Ambient Temperature, 0B – Temperature during Rated Operation, 0C – Limiting Temperature, t - Time

Θ- Temperature, 1- Temperature Rise during Rated Operation, 2 – Temperature Rise during Blocking of Rotor

Figure B1 Legend to Determine t_E

Appendix C

(Normative Appendix)

Type Test of Resistance Heating Device or Resistance Heating Unit with Special Structure

C1 Mechanical Stress Test of Resistance Heating Unit

If the flexible resistance heating unit doesn't take the enclosure protection that complies with the requirement in article 23.4.3.1 of GB 3836.1-2000, such as the heating cable or the heating tape, it shall withstand C1.1 and C1.2 Squeezing Test and Low Temperature Bending Test.

C1.1 Squeezing Test

The sample shall be placed in the steel support of the rigid plane. It takes the steel bar with the overall length at the hemispherical end is 25mm and the diameter is 6mm, to apply the 1500N squeezing force to the sample for 30s without the impact. The steel bar shall be placed in the sample horizontally during the test. For the heating cable or the heating tape, it is necessary to span the sample, and the steel bar is vertical to the axis line of the sample.

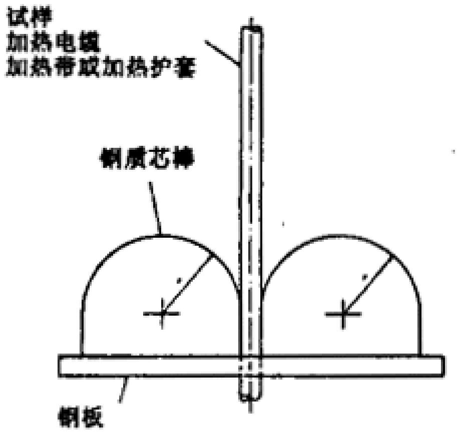
GB3836.3-2000

C1.2 Low Temperature Bending Test

The device for the bending test is shown in Figure C1.The test device with the specimen shall be placed at -10℃ or the lowest temperature specified by manufacturers (error ±3℃) 4h.Bend the specimen for 90° along the first cylinder after it is taken out, then bend the specimen for 180° along the second cylinder in the reverse direction, and then correct it to the original location. The bending is carried out for two times cyclically, and each cycle will take about 5s.

And then the specimen shall withstand the insulating dielectric strength test in a) and b) of article 6.8.2.

Note: Manufacturers shall indicate the conditions and measures to be taken. However, it is necessary to identify the minimum bending radius and temperature value of the allowed bending for the resistance heating device.



试样	Specimen
加热电缆	Heating Cable
加热带或加热护套	Heating Tape or Heating Jacket
铜质芯棒	Copper Rod
铜板	Copper Plate

Note: r – Bending radius (the minimum value specified by manufacturers).

Figure C1 Low Temperature Bending Test Device

C2 Immersion Resistance Heating Device or Resistance Heating Unit

Immerse the part of the specimen or sample that is specified to immerse into the liquid into the tap water for 50mm (error mm) with the duration 14 days. The specimen shall withstand the insulating dielectric strength test in a) and b) of article 6.8.2.

Note: This test is not applicable for the resistance heating device or the resistance heating unit that is specified to immerse into other liquid other than the water or the liquid pressure is higher than 500Pa.

C3 Resistance Heating Device or Resistance Heating Unit with Hygroscopic Insulating Materials

The airtight part shall be placed at the temperature (80 ± 2)℃ and the relative humidity no lower than 90% for four weeks. The specimen shall withstand the insulating dielectric strength test in a) and b) of article 6.8.2 after the wiping. However, it may be free from the water immersion.

It is necessary to specify the manufacturing method and the sealing material for the resistance heating device or the resistance heating unit in the description document specified in article 23.2 of GB 3836.1-2000.

C4 Limiting Temperature Test

This test shall be carried out in accordance with the method specified in C4.1, C4.2 or C4.3.

C4.1 The resistance heating unit is protected in accordance with the protection device in article 5.8.11.

The voltage applied during the test shall be raised by 10% based on corresponding rated voltage of the equipment, and the resistance value of the resistance heating unit is not allowed to exceed the specified value (only the negative tolerance is allowed).

GB3836.3-2000

Note: For the resistance heating unit that is protected in accordance with article 5.8.1l Protector, the test is considered as passed only when the test condition and the operating condition are identical if the test is carried out without the protector. Otherwise, the resistance heating unit is only taken as the Ex part, and it is necessary to carry out the supplementary test by configuring the electrical apparatus.

C4.1.1 Monitor Temperature Protector

The maximum allowed temperature for the protector setting shall be measured when other auxiliary adjustment devices don't play their role. However, the thermal inertia shall be taken into account.

C4.1.2 Protector to monitor temperature and one or more other parameters

It is necessary to consider the most unfavorable condition allowed for the device with other parameters during the measuring of the maximum temperature.

C4.2 Resistance Heating Unit with Stable Structure

For the heating cable or the heating tape, wrap the sample with the length 3 m - 4 m within the box cavity composed of the insulating material, and the inner cavity shall be sealed and can withstand the generated temperature. The box shall be insulated effectively. The thermocouple shall be fixed to the sample, so as to measure the maximum surface temperature. The sample shall be powered on until it is up to the thermal equilibrium state at the rated voltage +10% and the initial temperature (-20±3)℃.

It is necessary to measure the maximum temperature.

The similar test shall be carried out for the enclosure with appropriate thermal insulation for other resistance heating unit with the self-limiting characteristics.

Appendix D

(Informative Appendix)

Increased safety squirrel cage rotor motor - thermal protection during operation

This appendix provides users with the guidance note for the selection of protection devices, which mainly refers to the measures that are different to the general industrial installation or it is necessary to supplement the general industrial installation.

D1 The inverse time delay overload protection device that complies with the requirement of the article D2 may be taken to meet the requirement of the article 4.7.4 (for example, the motor switch with the thermal overload relay).

D2 The inverse time delay overload protection device shall not only monitor the current of motors, but also switch off the power supply of the motor within the tE time when the motor is blocked. It is necessary to provide the current – time characteristic curve for the protection device to indicate the relationship between the relay overload delay and the starting current.

The characteristic curve shall indicate the delay time measured from the cool state when the ambient temperature is 20℃ to the starting current is 3 – 8 at least. The error range of the tripping time for the protection device shall not be greater than ±20%.

D3 In general, the motor in the continuous operating status, including the easy to start and not frequently starting will not cause obvious additional temperature rise, is allowed to take the inverse time delay overload protection device. For the motor with the harsh starting or frequent starting, it is necessary to take the appropriate protection device, to ensure it will not exceed the allowed maximum temperature.

The harsh starting refers to the starting status that the power supply of the motor is switched off before the thermal overload delay protection device used under normal operating condition in accordance with article D2 of this appendix is up to the rated rotating speed after the starting. In general, it is of the harsh starting if the staring time exceeds 1.7 times of the t_E time.

Appendix E

(Informative Appendix)

Resistance heating unit – additional electrical protection

E1 Purpose

This protection function is the supplement of the over-current protection, which is used to limit the high temperature and possible arc generated due to the abnormal ground fault and the earth leakage current.

E2 Protection Method

It will depend on the protection ground type (see the definition in chapter 31 of IEC 60364-3:1977).

E2.1 TT and TN System

It is suggested to take the leakage current protector with the rated leakage (residual) current no more than 300 mA. It is suggested to select the leakage current protector with the rated leakage current 30MA preferentially. The maximum breaking time of this protector at the leakage current doesn't exceed 5s, and the maximum breaking time at the 5 times of the rated leakage current doesn't exceed 0.15s.

Note: It specifies the supplementary requirement of the leakage current protector in GB 6829.

E2.2 IT System

It is suggested to mount the insulation monitoring device, to ensure the power supply is switched off when the insulating resistance is less than 50Ω/V (rated voltage) in any case.

Appendix F

(Informative Appendix)

Example of comparative tracking index (CTI) for Common Insulating Material 1]

Comparative tracking index (CTI) of insulating material	Insulating material
Ⅰ	Glazed ceramic, mica and glass
Ⅱ	Melamine asbestos arc resistant plastics, silicon organic asbestos arc resistant plastics and unsaturated polyester group materials
Ⅲa	PTFE plastic, melamine glass fiber reinforced plastics and arc resistant paint surface treatment epoxy glass cloth

Note: The classification of other insulating materials shall be determined in accordance with the test method specified in GB/T 4207. Furthermore, it is necessary to take the arc resistance performance of the material into account.

Appendix G

(Informative Appendix)

Supplementary Provisions on Structure and Test of Increased Safety High Voltage Motor

G1 Scope

This appendix specifies the supplementary requirement for the structure and test of the large- and middle-sized increased safety motor. It is applicable for the motor with the rated operating voltage greater than 1.5 kV.

G2 Potential Equalization Connection of Motor Enclosure

G2.1 The potential equalization connection shall be carried out at the appropriate location for the joint of the motor enclosure with the power greater than 400 kw.

G2.2 Manufacturers shall specify the cross section, location and structure of the potential equalization connection in accordance with the structure and rated value of motors.

G2.3 The anti-corrosion and anti-loosening measures of the potential equalization connection shall comply with relevant requirement in chapter 15 of GB 3836.1-2000.

G2.4 The potential equalization connection may not be required if the insulation can ensure to block the circulating current. However, it is necessary to take appropriate grounding measures for the separated bare conductor. The insulation among these spare parts shall withstand the l00 V (r.m.s) test voltage for 1min without the breakdown.

GB3836.3-2000

G3 Insulation System Test of Stator Winding

G3.1 The following test shall be carried out for the complete stator and cable wiring, and it is allowed to carry out the test by the simulated specimen if it can simulate the actual situation of the complete stator completely.

G3.2 Apply the sine wave test voltage with 1.5 times of the rated line voltage (r.m.s) to various phases in turn for 3min for. The maximum voltage rise rate is 0.15 KV/s. Others are grounded correspondingly during the test, and all bare conductors shall be grounded. The insulation shall not be broken down during the test, and the spark or obvious corona shall not be observed by the naked eyes or the instruments in dark.

G3.3 The inter-phase and the phase to ground for the stator winding shall withstand 10 pulse voltage tests with three times of the peak phase voltage, the tolerance range is +3% - -3%.The rise time of the pulse voltage waveform is within 0.2μs - 0.5μs, and the time that the amplitude is more than half of the peak value is 20μs at least. However, it doesn't exceed 30us generally. The breakdown and flashover shall not occur during the test.

G4 Squirrel Cage Rotor Test

G4.1 The following test shall be carried out for the non-cast aluminum squirrel cage rotor.

G4.2 The squirrel cage rotor shall withstand the aging process which includes five blocks at least. The maximum surface temperature of the cage shall be cycled between the maximum designed surface temperature (temperature group) and the temperature lower than 70℃.The used voltage shall not be lower than 50% of the rated voltage.

G4.3 The squirrel cage rotor after the aging test shall withstand the no-load starting test for 10 times. The voltage of the motor terminal shall not be reduced to be lower than 90% of the rated voltage during the test. The duration for each starting test is 1s at least. There shall be the time interval between the starting tests, so as to cool the motor enough.

The spark shall not be observed at the surface of the motor rotor and the air gap by the naked eyes or instruments in the dark during the test.