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Specification for

Electrical apparatus for explosive atmospheres —

Part 4: Type of protection “e”

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Foreword

This part of BS 4683 is based on IEC Publication 79-7 — Type of protection “e” — and covers the requirements for achieving type of protection “e” for electrical apparatus. In some parts of this standard there are some deviations from IEC Publication 79-7 in order to provide for greater clarity. A summary of the variations is given in Appendix E.

The increased safety concept can be usefully applied to several different forms of electrical equipment, including squirrel-cage induction motors, luminaires, hand-lamps, instruments and instrument transformers. The requirements for achieving type of protection “e” may vary according to the type of electrical equipment.

NOTE *Obsolescence.* This standard has been declared obsolescent, that is, it is not recommended for the design of new equipment, but is retained to provide a standard for servicing existing equipment and installations that are expected to have a long working life. A later standard for electrical apparatus with type of protection “e” is BS 5501-6 which is identical with European Standard EN 50019.

Official Certificates to give assurance that a particular design complies with this British Standard may be issued by the Department of Trade and Industry, BASEEFA, Harpur Hill, Buxton, Derbyshire.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Introduction

BS 4683, “Electrical apparatus for explosive atmospheres”, is a new and comprehensive British Standard, and is published in several parts. Some parts detail the constructional requirements and conditions of test for specific types of protection and other parts give requirements and conditions applicable to more than one type of protection.

This British Standard is similar to, but not identical with, IEC Publication 79, “Electrical apparatus for explosive gas atmospheres”, and the technical details in some parts of the British Standard may differ from the Recommendations in the corresponding parts of Publication 79.

1 Scope

This Part of this British Standard relates to the construction and test of electrical apparatus, type of protection “e”. This type of protection can only be applied to such kinds of electrical apparatus, or parts of apparatus, as do not produce sparks or arcs or dangerous temperatures in normal service. The measures to be applied in order to increase the safety of such apparatus, so that it is suitable for operation in areas endangered by explosive gas atmospheres, are specified.

NOTE The titles of the British Standards referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of this British Standard, the following definitions apply.

2.1

type of protection “e”

the method of protection by which additional measures are applied to electrical equipment so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks during the service life of the apparatus. It applies only to electrical equipment no parts of which produce sparks or arcs or exceed the limiting temperature in normal service

2.2

limiting temperature

the maximum permissible temperature for apparatus or parts of apparatus. It is determined by:

- a) the danger of ignition of the explosive gas atmosphere;
- b) the thermal stability of the materials used.

the lower temperature is the one to be taken into consideration and is the critical limiting temperature

2.3

starting current I_A

the highest r.m.s. value of that current which flows in the primary part of a stalled cage rotor motor or in an alternating current magnet with a seized armature after the transient phenomena have ceased, when the apparatus is supplied at rated voltage and rated frequency. It is normally measured a few seconds after application of rated voltage

2.4

starting current ratio I_A/I_N

the ratio between starting current I_A and rated current I_N

2.5

time t_E

the time taken for a.c. windings, when carrying the starting current I_A , to be heated up from the temperature reached in rated service and at maximum ambient temperature, to the limiting temperature

2.6

thermal current limit I_{th}

the r.m.s. value of the current which, when it flows for one second, heats up the conductors to the limiting temperature

2.7

dynamic current limit I_{dyn}

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

2.8

creepage distance

the shortest distance between two conducting parts along the surface of the insulating parts

2.9

clearance

the shortest distance through air between two conducting parts

3 General constructional requirements

In addition to complying with the relevant British Standards, the apparatus shall also comply with the requirements stated below.

3.1 Inlet devices for cables and insulated conductors

3.1.1 Cable inlet devices for apparatus intended for use in the mining industry shall be designed so that the cable conductors are not subjected to tensile stresses and so that they cannot be twisted.

In other industries, the above-mentioned requirements apply only to inlet devices for non-permanently fixed cables.

The packing of any gland incorporated in the cable inlet device is not recognized as a sufficient means for withstanding tensile stresses. Inlet devices for flexible cables shall be shaped in such a way that the cable cannot be bent near the rim of the point of entry to a degree involving danger of damage to the cable.

A schematic example of a cable inlet for a flexible cable is shown in Figure 2.

3.1.2 The temperature during rated service shall not exceed 70 °C at the cable entry point and 80 °C at the branching point of the cores (see 4.2). For apparatus for use in non-mining industries, higher temperatures are permissible in exceptional cases, provided that insulated conductors having a correspondingly high heat resistance are used. In these cases, the method of wiring or cabling shall be specified on the apparatus, or the marking plate may state “See certificate before connecting this apparatus”.

3.2 Terminals for external wiring. If terminals are used for electrical connections to the apparatus, they shall be designed so that the conductor to be connected can be inserted or connected readily without reducing its cross-section and can be clamped in such a manner that its contact pressure will be reliably maintained.

In general, cable ends, ferrules, lugs, etc., shall not be in contact with material which is prevented from relative movement by friction alone. All threads shall include a spring-loaded or positive-locking device to prevent the respective parts from working loose by vibration.

Furthermore, the design shall be such that loose strands from stranded conductors can be easily avoided. Terminals for conductors of cross-sections up to 4 mm² shall be designed in such a manner that conductors having a smaller cross-section can be safely connected.

NOTE The smallest size of conductor permitted under the IEE Wiring Regulations is 0.5 mm².

3.3 Internal connections. In the interior of apparatus, the following means of connection between conductors shall be permitted.

- 1) Screwed or bolted connections which are locked against loosening.
- 2) Crimped connections.
- 3) Soldering, provided that the conductors to be connected are joined together by mechanical means.
- 4) Brazing.
- 5) Welding.

NOTE Special care is required to ensure mechanical and electrical reliability if connections involving aluminium are used.

3.4 Clearances. The dimensions of clearances shall satisfy the requirements stated in Table 1.

Table 1 — Minimum clearance distances in air

Rated voltage for the insulation of the equipment	Minimum clearance
V	mm
60	6
250	6
380	6
500	8
660	10
1 000	14
3 000	36
6 000	60
10 000	100

NOTE 1 The rated voltages of the apparatus may exceed the values stated in the table by 10 %.

NOTE 2 The working voltages (of the system) may exceed the rated voltage of the apparatus by an additional 6 %.

3.4.1 For apparatus with rated voltages less than 10 kV, the voltage to be taken into consideration for the calculation of the clearances between live parts and earth shall be the line voltage, even when the supply neutral is directly connected to earth.

If apparatus with rated voltages of 10 kV or more is intended for use only in networks with solidly earthed neutrals, the clearances may be reduced to those appropriate to the phase voltage. When this is done, the equipment shall be marked that it is for this use only.

3.5 Creepage distances. The required lengths of creepage paths are dependent on the tracking resistance of the insulating material and on the shape of the surface of the insulating parts.