

Code of practice for

The repair and overhaul of certified electrical apparatus intended for use in mines susceptible to firedamp

ICS 29.260.20

Confirmed
January 2011

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI
Documents



Document Sharing Hub

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee MRE/3, Mining electrical equipment, to Subcommittee MRE/3/2, Transformers and supply control units, upon which the following bodies were represented:

Association of British Mining Equipment Companies
Health and Safety Executive
Transmission and Distribution Association (BEAMA Ltd.)

The following bodies were also represented in the drafting of the standard, through a panel:

Association of Electrical Machinery Trades
Confederation of United Kingdom Coal Producers
Institution of Electrical Engineers
Rotating Electrical Machines Association (BEAMA Ltd.)
Co-opted members

This British Standard, having been prepared under the direction of the Engineering Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 November 1999

© BSI 11-1999

Amendments issued since publication

Amd. No.	Date	Comments

The following BSI references relate to the work on this standard:
Committee reference MRE/3/2
Draft for comment 96/715959 DC

ISBN 0 580 33053 2

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
0 Introduction	1
1 Scope	2
2 Normative references	3
3 Terms and definitions	3
4 General	4
5 Statutory requirements	4
6 Responsibilities of the manufacturer	4
7 Responsibilities of the user	4
8 Responsibilities of the repairer	4
9 Identification of repaired and overhauled apparatus	6
10 Reclamation	6
11 Removal of damaged windings	7
12 Encapsulated parts	7
13 Light-transmitting parts	7
14 Temporary repairs	7
15 Cleaning agents and finishes	7
16 Repair of flameproof apparatus (type “d”)	8
17 Repair of intrinsically safe (IS) apparatus (type “i”)	11
18 Repair of increased safety apparatus (type “e”)	13
Annex A (informative) Statutory duties	15
Bibliography	16
Figure 1 — Symbols indicating status of repair/overhaul	6
Table 1 — Resistance of insulation on windings	9

Foreword

This British Standard has been prepared by Subcommittee MRE/3/2.

Attention is drawn to the Health and Safety at Work etc. Act 1974, the Mines and Quarries Act 1954 and the Regulations made under these Acts, and also to any other appropriate statutory requirements or bylaws. These place responsibility for complying with certain specific requirements on the manufacturer, user and persons performing overhaul or repair of apparatus, to ensure that it is safe for use and that any relevant information relating to its safe use is available to the user.

Three certification test houses are currently recognized by the Secretary of State for Employment under the Electrical Equipment For Explosive Atmospheres (Certification) Regulations 1990. Their addresses are as follows:

1. The Electrical Equipment Certification Service (EECS)
[Mining Equipment Certification Service (MECS)]
Harpur Hill
BUXTON
SK17 9JN
2. SIRA Test & Certification Service Ltd.
Saughton Lane
Saughton
CHESTER
CH3 6EG
3. ERA Technology
Cleeve Road
Leatherhead
Surrey
KT22 7SA

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

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

The BSI copyright notice displayed in this document indicates when the document was last issued.

0 Introduction

0.1 The legal requirements for zoning and explosion protection in mines

The Electricity at Work Regulations 1989 [1] require the manager of every British mine to assess the risk of flammable gas occurring in the mine workings and to indicate these places on a plan.

Such places are defined as zones in which firedamp, whether or not normally present, is likely to occur in a quantity sufficient to indicate danger.

NOTE The same regulations define firedamp as a mixture of flammable gases naturally occurring in mines.

Having designated the zones on a plan, the manager must ensure that these places are identifiable underground so that workers know where the zones start and finish. The manager must also ensure that mine workers are made aware of the fact that any electrical apparatus is not energized inside a zone unless it is protected in such a way as to prevent it from being an igniting source for an explosive firedamp/air atmosphere.

The Electricity at Work Regulations 1989 [1] contain a list of the various types of apparatus which may be energized in the zones and, with the exception of mining type cables and certain apparatus which is constantly supervised under Manager's Operating Rules, the majority of electrical apparatus is expected to be of a type which is certified by a third-party test house, i.e. having a certificate testifying that the design conforms with a recognized published standard relating to the protection of electrical apparatus intended for use in a potentially explosive atmosphere.

Such certificates are usually issued to the manufacturer of the apparatus (or to an agent) by one of the recognized European test houses.

0.2 Nature and limits of the explosion protection

The nature of the explosion protection applied to the apparatus will vary depending upon the type of apparatus and its intended duty. Other factors such as its physical size, electrical rating and the amount of energy it can release will also influence the protective measures adopted. With the exception of one form of explosion protection known as intrinsically safe, or type "i" (which attempts to protect apparatus both during normal working and during faults), it is universally recognized in European Directives, such as 82/130/EEC (commonly called the "Gassy Mines Directive") [2] and 94/9/EC (commonly called the "ATEX Directive") [3], that the explosion protection can only be considered to be effective during normal working of the apparatus.

0.3 Second line of defence

Because a single fault in the explosion protective measures could cause the majority of explosion-protected apparatus to become unsafe in respect of firedamp ignition, British law incorporates a second line of defence. This requires all electrical apparatus, other than that given approval by the Health and Safety Executive, to be either isolated or made safe if firedamp concentrations in the general body of mine air exceed 1.25 %.

0.4 Standards and special certificates

The majority of explosion-protected electrical apparatus is constructed in accordance with recognized national standards (e.g. British Standards) or, more recently, with CENELEC European Standards. Exceptions include rare items of apparatus allowed by special certificates (type "s") or inspection certificates.

0.5 Test houses (notified bodies)

In Britain, a government-owned mining certification service was set up in 1931 to issue certificates for explosion-protected apparatus intended for use in mines. This service has continued to the present day, being joined in 1991 by a privately owned UK test house. Both test houses have been approved by the Secretary of State for Employment as notified bodies under the Electrical Equipment for Explosive Atmospheres (Certification) Regulations 1990 [4], and are able to issue European Certificates of Conformity to the European Standards in the series EN 50014 to EN 50039, until 2003. After that date, only certificates indicating conformity with Directive 94/9/EC [3] (see 0.6) may be issued.

Until the 1960s, only two types of concept protection certificates were issued for mining apparatus in the UK, these being for flameproof apparatus (FLP) and intrinsically safe apparatus (IS). In 1977 the British Standards for flameproof apparatus (i.e. BS 229 and BS 4683) and intrinsically safe apparatus (i.e. BS 1259) were joined by, and coexisted with, the BS 5501 series of standards, the latter being identical with the first editions of CENELEC European Standards in the series EN 50014 to EN 50039. This resulted in small quantities of other types of explosion-protected apparatus entering British mines, in particular, apparatus known as increased safety (type "e") and moulded/encapsulated (type "m"). When the second editions of the CENELEC standards replaced the first editions in 1994/95, they were published in the UK by BSI as BS EN standards with European numbering. Thus, the second edition of the European Standard EN 50014 was published as BS EN 50014.

A list of the various types of explosion protection, suitable for use in mines susceptible to firedamp, can be found in Appendix 1 of the HSE Code of Practice *The Use of Electricity in Mines* [5]. This code of practice is approved under section 16 of the Health and Safety at Work etc. Act 1974 [6], and accompanies the Electricity at Work Regulations [1].

The list in the HSE Code of Practice includes the earlier types of protection defined in British Standards BS 1259, BS 4683 series and BS 5501 series, and also the types of protection given in the European Standard EN 50014, with the exception of oil-filled apparatus (type “o”) defined and described in EN 50015 (BS 5501-2). Restrictions are placed upon the use of oil-filled apparatus in British mines because of the risk of atmospheric pollution of the mine ventilation system should the oil catch fire.

0.6 Effects of Directive 94/9/EC

On 23 March 1994, a new Article 100A Directive, 94/9/EC, concerning equipment and protective systems intended for use in potentially explosive atmospheres [3] was published in the Official Journal of the European Communities. The Directive applied from 1 March 1996 and includes both electrical and mechanical equipment. The Directive is implemented in Britain by the Equipment and Protective Systems for use in Potentially Explosive Atmospheres Regulations 1996 [7].

In the case of apparatus intended for use in gassy mines susceptible to firedamp, the Regulations/Directive do not apply to apparatus placed on the market or put into service for the first time before 1 March 1996. After that date, and up to 30 June 2003, apparatus may be placed on the market or put into service for the first time if it conforms to either the Regulations/Directive or the UK statutory requirements/certification arrangements in place on 23 March 1994.

After 30 June 2003, apparatus may not be placed on the market or put into service for the first time unless it conforms to category M1 or M2 of the Directive 94/9/EC [3]. Apparatus which is legally in service on 30 June 2003, but which does not conform to 94/9/EC, may be repaired or overhauled and put back into service after 30 June 2003 without the need to conform to 94/9/EC, provided that no modifications are made affecting the design.

0.7 The objective of this standard

The duties of manufacturers and users of explosion-protected equipment in British mines are more clearly detailed in mining law than those involved in the repair and reclamation of such apparatus after it has been used. The objective of this standard is therefore not to specify procedures for the construction of explosion-protected apparatus by the original manufacturer, nor its selection for use in mines, but to set down recommendations for overhaul and repair of apparatus which has already been in use at a mine and is intended to be put back into service following such overhaul or repair. The recommendations are especially relevant if the work involves alterations or modifications which affect the type of explosion protection afforded. Companies undertaking repair work should establish and maintain a quality

assurance system such as that described in BS EN ISO 9002, and any statutory duties and obligations should be transferred or apportioned to the appropriate responsible party.

This standard is supplementary to the existing explosion protection concept (construction) standards recognized in Britain. These include BS 229, BS 4683 parts 2 and 4, BS 1259, BS 5501 parts 1 to 9, and the EN 50014 to EN 50039 series.

1 Scope

This British Standard gives recommendations for the repair, overhaul, reclamation and modification of certified electrical apparatus intended for use in mines susceptible to firedamp (defined as “Group I” apparatus in the explosion protection concept standard BS EN 50014:1998).

Maintenance is not covered, other than where this cannot be dissociated from repair and overhaul. It does not give advice on the use of electrical apparatus or the prevention of any hazards other than ignition of an explosive atmosphere. Similarly, it does not give advice on cable entry systems which may require renewal when the apparatus is re-installed.

NOTE 1 Recommendations regarding routine maintenance, and the selection and installation of intrinsically safe electrical apparatus for use in potentially explosive atmospheres in mines, are given in BS 6704.

NOTE 2 The contract between the user and the repairer will need to address other safety-related matters beyond the scope of this document, e.g. prevention of electric shock, electrical protection (overload, short circuit, earth leakage) and electrical/mechanical interlocking.

Clauses 4 to 9 give general recommendations applicable to persons involved in the repair and/or overhaul of electrical apparatus intended for use in potentially explosive atmospheres found in coal mines. They also identify certain specific responsibilities under the Health and Safety at Work etc. Act 1974 [6] as applicable to those who are likely to be concerned with the repair of certified apparatus.

Clauses 10 to 15 cover those aspects of repair and overhaul which are common to all explosion protected apparatus.

Clauses 16 to 18 give recommendations applicable to specific types of explosion protected apparatus.

This standard excludes apparatus having the following forms of protection, which is generally considered irreparable: oil immersion “o”; pressurized “p”; powder filling “q”; and encapsulation “m”.

NOTE 3 Apparatus which contains oil is installed in British mines, but such equipment should be repaired in accordance with this standard and that to which it was certified.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 229:1957, *Specification. Flameproof enclosure of electrical apparatus*.

BS 1259:1958, *Intrinsically safe electrical apparatus and circuits for use in explosive atmospheres*.

BS 4683-2:1971, *Specification for electrical apparatus for explosive atmospheres — Part 2: The construction and testing of flameproof enclosures of electrical apparatus*.

BS 4683-4:1973, *Specification for electrical apparatus for explosive atmospheres — Part 4: Type of protection “e”*.

BS 5501-5:1977, *Electrical apparatus for potentially explosive atmospheres — Part 5: Flameproof enclosure “d”*.

BS 5501-6:1977, *Electrical apparatus for potentially explosive atmospheres — Part 6: Increased safety “e”*.

BS 5501-7:1977, *Electrical apparatus for potentially explosive atmospheres — Part 7: Intrinsic safety “i”*.

BS EN 50014:1998, *Electrical apparatus for potentially explosive atmospheres — General requirements*.

BS EN 50018:1995, *Electrical apparatus for potentially explosive atmospheres — Flameproof enclosures “d”*.

BS EN 50019:1994, *Electrical apparatus for potentially explosive atmospheres — Increased safety “e”*.

BS EN 50020:1995, *Electrical apparatus for potentially explosive atmospheres — Intrinsic safety “i”*.

3 Terms and definitions

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

3.1

flameproof apparatus (type “d”)

apparatus conforming to BS 229:1957, BS 4683-2:1971, BS 5501-5:1977 (EN 50018:1977) and/or BS EN 50018:1995

3.2

intrinsically safe (IS) apparatus (type “i”)

apparatus conforming to BS 1259:1958, BS 5501-7:1977 (EN 50020:1977) and/or BS EN 50020:1995

3.3

increased safety apparatus (type “e”)

apparatus conforming to BS 4683-4:1973, BS 5501-6:1977 (EN 50019:1977) and/or BS EN 50019:1994

3.4

serviceable condition

state of the apparatus such that it is fit for use and is in accordance with the explosion protection concept standard to which the apparatus was originally certified

3.5

overhaul

action intended to restore apparatus to its serviceable condition, where inspection has established that the apparatus is neither faulty nor damaged, which does not involve the replacement of any part that can affect the explosion protection

3.6

repair

action intended to restore apparatus to its serviceable condition, where inspection has established that the apparatus is either faulty or damaged, which involves the replacement or reclamation of a part that can affect the explosion protection

3.7

repairer

person or organization performing repair or overhaul

NOTE A repairer can be the manufacturer, the user or a third party (e.g. a repair agency).

3.8

manufacturer

maker of the apparatus in whose name any certification of the apparatus was originally registered

NOTE The manufacturer can also be the supplier, the importer or the agent.

3.9

reclamation

means of repair involving the removal or addition of material and/or the replacement of components not supplied by the manufacturer as user-replaceable parts, which affects the explosion protection afforded to the apparatus

NOTE The term “recovery” is sometimes used as a synonym for “reclamation”.

3.10

certification

issuing of a document by a notified body testifying that a type of apparatus or a type of component conforms to a published national or international standard