BS 6709:1986

Specification for

Interconnection of electrical apparatus, constructed to two or more British Standards, for use in mines susceptible to firedamp

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Committees responsible for this British Standard

The publication of this British Standard was entrusted by the Mining and Quarrying Requisites Standards Committee (MQE/-) to Technical Committee MQE/28 upon which the following bodies were represented:

Association of British Mining Equipment Companies
Council for Electrical Equipment for Flammable Atmospheres (BEAMA)
Health and Safety Executive
National Coal Board

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Contents

Foreword

This British Standard has been prepared under the direction of the Mining and Quarrying Requisites Standards Committee.

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. Attention is drawn to the Health and Safety at Work etc. Act 1974, the Mines and Quarries Act 1954, the Regulations made under these Acts, and also any other appropriate statutory requirements or byelaws. These place responsibility for complying with certain specific safety requirements on the manufacturer and the user. The address of the recognized certification authority in the United Kingdom for Group I mining apparatus is as follows:

Health and Safety Executive

HSE(M) Certification Support Unit

Harpur Hill, Buxton, Derbyshire SK17 9JN.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10, 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.

Section 1. General

1.0 Introduction

For several decades electrical apparatus[1)], including systems and components, for use in mines susceptible to firedamp (Group I[2)] apparatus) has been designed and constructed in accordance with BS 229, BS 1259 and/or BS 4683 as appropriate. So far as the gas ignition risk is concerned, such apparatus satisfies the legal requirements applying to the use of electricity where potentially explosive atmospheres can occur below ground. Virtually all the electrical apparatus currently in use in mines is of this type and most has considerable further expectation of life.

Following the publication of BS 5501-1 to BS 5501-7 in 1977, implementing European Standards EN 50014 to EN 50020, and of BS 5501-9 in 1982, implementing European Standard EN 50039, in accordance with the responsibilities of the United Kingdom as a member of CENELEC, the mining interests in the United Kingdom have recognized the need for, and the benefit of, requiring that new Group I apparatus complies with BS 5501.

The certification and use of individual self-contained items of Group I apparatus, e.g. hand-held apparatus, complying solely with BS 5501 present no problems. However, any claim or certificate of compliance with BS 5501 would be invalidated by any deviations from the requirements of BS 5501 that may be necessary to provide for the functional electrical and/or mechanical connecting of such apparatus with apparatus complying with (or that would otherwise be required to comply with) the previously established standards (i.e. BS 229, etc.).

In these circumstances, this standard has been prepared to meet two objectives:

a) to specify technical requirements for Group I apparatus in accordance with which a manufacturer may submit new items that are generally in accordance with BS 5501 for use as functionally connected units or systems with existing apparatus generally in accordance with BS 229, etc., for the certification and approval necessary to permit the use of the functionally connected units or systems in the potentially explosive atmospheres that occur in mines susceptible to firedamp;

b) to promote the increasing use of BS 5501 for Group I apparatus in parallel with the progressive phasing out of Group I apparatus in accordance with the earlier standards and thereby to minimize barriers to trade in keeping with the commitments of the United Kingdom within the European Community.

It is anticipated that this standard will only be necessary for a transitional period, after which it will be withdrawn.

1.1 Scope

This British Standard specifies requirements for the construction and testing of interconnected electrical apparatus, including systems and components[1)], for use in mines susceptible to firedamp.

NOTE 1 The means of interconnection covered by this standard may be electrical, mechanical or involve the housing of one constituent within another.

This standard applies in circumstances where new apparatus, that has been designed and constructed generally in accordance with BS 5501, cannot fully comply with BS 5501 because of the provision made for connection by electrical and/or mechanical means to existing apparatus previously certified as complying with BS 229[3)], BS 1259 or BS 4683 to comprise a single unit or system.

NOTE 2 For the purpose of this standard, apparatus that would otherwise be required to comply specifically with BS 5501, BS 229, etc., is described as, for example, "BS 5501 type", "BS 4683-2 type", etc. However, it is important to appreciate that the use of such descriptions is not intended to imply that the apparatus actually complies in all respects with the standard referred to although it may have been designed, constructed and certified in accordance with the standard referred to prior to being functionally connected.

References to apparatus previously certified to BS 1259 and any requirements specified in this standard for such apparatus are not intended to apply to circuits designed in accordance with BS 3101, or to earth fault monitoring circuits associated with motor control gear, unless otherwise stated.

NOTE 3 The titles of the publications referred to in this standard are listed on the inside back cover.

[1)] For the convenience of this standard the term "apparatus" is used throughout to include systems and components except where otherwise stated.

[2)] In BS 1259 the expression "Class 1" is used, but for the purposes of this standard "Class 1" and "Group I" are regarded as synonymous. In BS 229, Group I refers to the gas group but for the purposes of this standard apparatus for gas Group I is regarded as Group I apparatus.

[3)] For the purposes of this standard existing apparatus certified to the current or any earlier edition of BS 229 may be interconnected with BS 5501 type (see note 2 to **1.1**) apparatus.

Section 2. Flameproof interconnected apparatus

2.1 General

Flameproof interconnected apparatus, comprising one or more BS 5501-5 type constituents interconnected by mechanical means with one or more BS 229 type or BS 4683-2 type constituents, shall comply with **2.2** to **2.5**.

2.2 Design and construction

2.2.1 The BS 5501-5 type constituent(s) shall be designed and constructed in accordance with BS 5501-5, except for those departures necessary to provide for the flameproof mechanical interconnection (see **2.2.3**).

2.2.2 The BS 229 type or the BS 4683-2 type constituent(s) shall be designed and constructed in accordance with BS 229 or BS 4683-2 respectively, except for those departures necessary to provide for the flameproof mechanical interconnection (see **2.2.3**).

2.2.3 The design, construction, fixing arrangements and fasteners comprising the flameproof mechanical interconnection(s) between the two constituents (see **2.2.1** and **2.2.2**) of the apparatus shall comply with either of the standards to which the constituents have generally been designed and constructed.

2.3 Verification and tests

2.3.1 Each constituent (see **2.2.1** or **2.2.2**) shall, prior to interconnection, be subjected to the requirements for verification and tests specified in the standard to which it has been generally designed and constructed.

For the purpose of verification and tests on the incomplete constituents, completion of the enclosure by either of the following means shall be permitted:

a) connecting to it apparatus of the BS 5501-5, BS 229 or BS 4683-2 type, as appropriate, with which it is intended to be interconnected in service; or

b) fitting suitable covers or plugs, simulating the interconnections, that are not intended to be used in service but which enable the testing to be carried out.

2.3.2 The flameproof interconnected apparatus, when fully assembled, shall be verified and tested either:

a) in accordance with whichever one of the following British Standards has been nominated by the manufacturer:

BS 229, BS 4683-2, or BS 5501-5; or

b) in the absence of such nomination, in accordance with any one of the standards referred to in a).

2.4 Documentation

The manufacturer shall document how each constituent of the interconnected apparatus complies with the standard to which it has been generally designed and constructed and shall identify the constituents of the interconnected apparatus that are of the BS 5501-5 type, those that are of the BS 229 and/or BS 4683-2 type(s) and their interconnections.

2.5 Marking

2.5.1 The BS 5501-5 type constituent(s) of the interconnected apparatus shall be marked, in a visible place, in accordance with **2.5.2** and **2.5.3**.

NOTE The non-BS 5501 type constituent(s) need not be marked in accordance with this standard.

The marking in accordance with **2.5.2** shall be deemed to supersede any pre-existing marking.

2.5.2 The marking shall include the following:

a) the name of the manufacturer or his registered trade mark;

b) the manufacturer's product type identification;

c) the number of this British Standard, i.e. BS 6709;

d) the code Ex d l;

e) where a certificate has been obtained, the name or registered mark of the certifying authority and the certificate reference in the following form: the last two digits of the year of certification followed by the serial number of the certificate in that year.

NOTE 1 A reproduction of the registered flameproof mark may be added, if the manufacturer holds a licence to apply this mark (see Appendix A).

NOTE 2 The sign X may be placed after the certification reference [**2.5.2** e)] if the certifying authority considers that it is necessary to indicate special conditions of use.

2.5.3 The marking shall not invalidate the type(s) of protection and shall be legible and durable, taking into account possible chemical corrosion, in accordance with Appendix B.

Section 3. Interconnected apparatus with mixed types of protection excluding intrinsic safety

3.1 General

Interconnected apparatus with mixed types of protection, excluding intrinsic safety, comprising either

a) one or more BS 5501-2, BS 5501-3, BS 5501-4, BS 5501-5 or BS 5501-6 type constituents interconnected by mechanical means with one or more BS 4683-4 type constituents, or

b) one or more BS 5501-2, BS 5501-3, BS 5501-4 or BS 5501-6 type constituents interconnected by mechanical means with one or more BS 229 or BS 4683-2 type constituents

shall comply with **3.2** to **3.5**.

NOTE The interconnection of BS 5501-6 type constituents to BS 4683-4 type constituents, although not strictly a "mixed" type of protection, is included in this section.

3.2 Design and construction

3.2.1 The BS 5501 type constituent(s) shall be designed and constructed in accordance with BS 5501-2, BS 5501-3, BS 5501-4, BS 5501-5 or BS 5501-6 as appropriate, except for those departures necessary to provide for the interconnection (see **3.2.3**).

3.2.2 The BS 229 type or the BS 4683 type constituent(s) shall be designed and constructed in accordance with BS 229, BS 4683-2 or BS 4683-4 as appropriate, except for those departures necessary to provide for the interconnection (see **3.2.3**).

3.2.3 The design, construction, fixing arrangements and fasteners comprising the mechanical interconnection(s) between the two constituents (see **3.2.1** and **3.2.2**) of the apparatus shall comply with the relevant requirements of each of the standards to which the two constituents have generally been designed and constructed (see Appendix C).

3.3 Verification and tests

3.3.1 Each constituent (see **3.2.1** or **3.2.2**) shall, prior to interconnection, be subjected to the requirements for verification and tests specified in the standard to which it has generally been designed and constructed.

For the purpose of verification and tests on the incomplete constituents, completion of the enclosure by either of the following means shall be permitted:

a) connecting to it apparatus of the BS 5501, BS 229 or BS 4683 type, as appropriate, with which it is intended to be interconnected in service; or

b) fitting suitable covers or plugs, simulating the interconnections, that are not intended to be used in service but which enable the testing to be carried out.

3.3.2 The interconnected apparatus, when fully assembled, shall be verified and tested either:

a) in accordance with whichever British Standard has been nominated, from those given in **3.1**, by the manufacturer for each constituent; or

b) in accordance with both of the British Standards nominated, from those given in **3.1**, by the manufacturer for the constituents each side of the interconnection.

3.4 Documentation

The manufacturer shall document how each constituent of the interconnected apparatus complies with the standard or standards to which it has been generally designed and constructed and shall identify the constituents of the interconnected apparatus that are of the BS 5501 type, those that are of the BS 229 and/or BS 4683 type(s) and their interconnections.

3.5 Marking

3.5.1 The BS 5501 type constituent(s) of the interconnected apparatus shall be marked in a visible place, in accordance with **3.5.2** and **3.5.3**, except that when the constituent(s) is housed in a protective enclosure the marking need not be visible.

NOTE The non-BS 5501 type constituent(s) need not be marked in accordance with this standard.

The marking in accordance with **3.5.2** shall be deemed to supersede any pre-existing marking.

3.5.2 The marking shall include the following:

a) the name of the manufacturer or his registered trade mark;

b) the manufacturer's product type identification;

c) the number of this British Standard, i.e. BS 6709;

d) the code for the type of protection used for the constituent apparatus to which the label is fixed, i.e.:

1) for oil immersion: Ex o l;

2) for powder filling: Ex q l;

3) for flameproof enclosure: Ex d l;

NOTE A reproduction of the registered flameproof mark may be added, if the manufacturer holds a licence to apply this mark (see Appendix A).

4) for increased safety: Ex e l;

e) where a certificate has been obtained, the name or registered mark of the certifying authority and the certificate reference in the following form: the last two digits of the year of certification followed by the serial number of the certificate in that year.

NOTE The sign X may be placed after the certification reference [**3.5.2** e)] if the certifying authority considers that it is necessary to indicate special conditions of use.

3.5.3 The marking shall not invalidate the type(s) of protection of the enclosure(s) and shall be legible and durable, taking into account possible chemical corrosion, in accordance with Appendix B.

Section 4. Apparatus comprising intrinsically safe circuits interconnected within protective enclosures

4.1 General

4.1.1 Interconnected apparatus (including components but excluding systems, see section 5) comprising either

a) BS 5501-7 type apparatus within a BS 229 type or a BS 4683-2 or BS 4683-4 type enclosure, or

b) BS 1259 type apparatus and associated non-intrinsically safe circuits within a BS 5501-3, BS 5501-4, BS 5501-5 or BS 5501-6 type enclosure

shall comply with **4.2** to **4.5**.

4.1.2 For interconnected apparatus comprising pilot circuits (designed, for example, to comply with BS 3101) or earth fault monitoring circuits for motor control, certified in each case to BS 1259, connected within a BS 5501-3, BS 5501-4, BS 5501-5 or BS 5501-6 type enclosure, the circuits shall comply with **4.2.5**, **4.3.2**, **4.4** and **4.5**.

4.2 Design and construction

4.2.1 The BS 5501 type constituent(s) shall be designed and constructed in accordance with BS 5501-3, BS 5501-4, BS 5501-5, BS 5501-6 or BS 5501-7, as appropriate, except for those departures necessary to provide for the interconnection(s) (see **4.2.3**).

4.2.2 The BS 229 type, BS 1259 type or BS 4683-2 or BS 4683-4 type constituent(s) shall be designed and constructed in accordance with BS 229, BS 1259, BS 4683-2 or BS 4683-4, as appropriate, except for those departures necessary to provide for the interconnection(s) (see **4.2.3**).

4.2.3 The interconnection(s) between the constituents (see **4.2.1** and **4.2.2**) of the apparatus shall comply with the relevant requirements of the standards to which the constituents have generally been designed and constructed.

4.2.4 Plugs, sockets and cable entries shall be designed and constructed in accordance with the requirements of:

a) BS 5501, BS 4683 or BS 229, as appropriate, that are relevant to the enclosure; and

b) clause **5** of BS 5501-7:1977 that are relevant to the separation of intrinsically safe circuits from other circuits.

4.2.5 Pilot circuits and earth fault search circuits associated with motor control shall be designed and constructed to comply with BS 1259.

4.3 Verification and tests

4.3.1 The interconnected apparatus, when fully assembled, shall comply with the following requirements for verification and testing:

a) for the enclosure, in accordance with the standard to which it has generally been designed and constructed (see **4.1.1**); and

b) for intrinsically safe circuits of the BS 5501-7 type, in accordance with BS 5501-7; or

c) for intrinsically safe circuits of the BS 1259 type, in accordance with BS 1259 and clauses **5** and **9** of BS 5501-7:1977.

4.3.2 Pilot circuits and earth fault search circuits associated with motor control shall be verified and tested in accordance with BS 1259 before the circuits are installed in their enclosures.

4.4 Documentation

The manufacturer shall document how each constituent of the interconnected apparatus complies with the standard or standards to which it has been generally designed and constructed and shall identify the constituents of the interconnected apparatus that are of the BS 5501 types, those that are of the BS 229, BS 1259 and/or BS 4683 type(s) and their interconnections.

4.5 Marking

4.5.1 The BS 5501 type constituent(s) of the interconnected apparatus shall be marked in a visible place, in accordance with **4.5.2** to **4.5.6**, except that when the constituent is housed in a protective enclosure the marking need not be visible externally.

NOTE The non-BS 5501 type constituent(s) need not be marked in accordance with this standard.

The marking in accordance with **4.5.2** shall be deemed to supersede any pre-existing marking.

4.5.2 The marking shall include the following:

a) the name of the manufacturer or his registered trade mark;

b) the manufacturer's product type identification;

c) the number of this British Standard, i.e. BS 6709;

d) the code for the type of protection used for the constituent apparatus to which the label is fixed, i.e.:

1) for pressurized apparatus: Ex p l ,

2) for powder filling: Ex q l ,

3) for flameproof enclosure: Ex d l,

NOTE A reproduction of the registered flameproof mark may be added, if the manufacturer holds a licence to apply this mark (see Appendix A).

4) for increased safety: Ex e l;

5) for intrinsic safety: Ex ia l or Ex ib l as appropriate;

e) where a certificate has been obtained, the name or registered mark of the certifying authority and the certificate reference in the following form: the last two digits of the year of certification followed by the serial number of the certificate in that year.

NOTE The sign X may be placed after the certificate reference [**4.5.2** e)] if the certifying authority considers that it is necessary to indicate special conditions of use.

4.5.3 The marking shall not invalidate the type(s) of protection of the enclosure(s) and shall be legible and durable, taking into account possible chemical corrosion, in accordance with Appendix B.

4.5.5 Where the internal apparatus has been designed, tested and certified in accordance with BS 5501-7, a label shall be fixed to that apparatus with the marking in accordance with the requirements of BS 5501-7.

4.5.6 All external plugs, sockets or connecting facilities for the connection of intrinsically safe circuits shall be marked “IS Circuit”. The marking may be on, or adjacent to, the outlets.

Section 5. Interconnected intrinsically safe systems

5.1 General

Interconnected intrinsically safe systems comprising BS 5501-7 type apparatus, or constituents of BS 5501-9 type systems, interconnected by electrical means with constituents of BS 1259 type apparatus and systems shall comply with **5.2** to **5.5**.

NOTE BS 5501-9 includes associated apparatus, as defined in BS 5501-7, that may be either:

a) situated outside the hazardous area; or

b) housed in an enclosure complying with the relevant requirements of section 4.

5.2 Design and construction

5.2.1 The BS 5501 type constituent(s) shall be designed and constructed in accordance with BS 5501-7 or BS 5501-9, as appropriate, except for those departures necessary to provide for the interconnection(s).

5.2.2 The BS 1259 type constituent(s) shall be designed and constructed in accordance with BS 1259 except for those departures necessary to provide for the interconnection(s).

5.2.3 Associated apparatus or parts of systems of the BS 1259 type shall comply with **5.3.3**.

5.2.4 Intrinsically safe systems which include intrinsically safe apparatus, or associated apparatus, of the BS 1259 or BS 5501-7 types shall comply with the requirements of BS 5501-9 for category ia systems.

5.3 Verification and tests

5.3.1 Apparatus of the BS 5501-7 type and systems of the BS 5501-9 types shall be verified and tested in accordance with clause **9** of BS 5501-7:1977.

5.3.2 Apparatus and systems of the BS 1259 type shall be assessed in accordance with that standard.

5.3.3 BS 1259 type associated apparatus and parts of systems (see **5.2.3**) shall be tested or assessed in accordance with the requirements of clause **9** of BS 5501-7:1977, with the exception of those tests concerned with the measurement of surface temperatures.

5.4 Documentation

5.4.1 The manufacturer shall document how each constituent of the interconnected apparatus complies with the standard to which it has been generally designed and constructed and shall identify the constituents of the interconnected apparatus and/or system that are of the BS 5501-7 and/or BS 5501-9 type(s), those that are of the BS 1259 type and their interconnections.

The documentation shall identify those constituents of the system that are of the BS 5501-9, category ia, type.

5.4.2 Where connections are to other apparatus or systems that are defined only by circuit characteristics (e.g. maximum voltage, maximum current), they shall be identified by one of the following:

a) the manufacturer's apparatus or system type number; or

b) the limiting electrical characteristics (e.g. maximum voltage); or

c) indicating compliance with another British Standard in which the limiting electrical parameters are specified, e.g. BS 5754, BS 6182.

5.5 Marking

5.5.1 The BS 5501 type constituent(s) of the interconnected system shall be marked, in a visible place, in accordance with **5.5.2** and **5.5.3**.

NOTE The non-BS 5501 type constituent(s) need not be marked in accordance with this standard.

The marking in accordance with **5.5.2** shall be deemed to supersede any pre-existing marking.

5.5.2 The marking shall include the following:

a) the name of the manufacturer or his registered trade mark;

b) the manufacturer's product type identifications;

c) the number of this British Standard, i.e. BS 6709;

d) the code Ex i syst l;

e) where a certificate has been obtained, the name or registered mark of the certifying authority and the certificate reference in the following form: the last two digits of the year of certification followed by the serial number of the certificate in that year.

NOTE The sign X may be placed after the certificate reference [**5.5.2** e)] if the certifying authority considers that it is necessary to indicate special conditions of use.

5.5.3 The marking shall not invalidate the type(s) of protection of the enclosure(s) and shall be legible and durable, taking into account possible chemical corrosion, in accordance with Appendix B.

Appendix A The registered mark for flameproof apparatus

The registered mark consists of the outline of a crown with the letters FLP inscribed therein, as shown in Figure 1.

Figure 1 — Registered mark for flameproof apparatus

This mark is registered in the name of the Health and Safety Executive for use on electrical apparatus for which a flameproof certificate has been granted by HSE(M), the British national testing, certification and approval authority for such apparatus for use in mining.

The purpose of the mark is to aid the identification of appropriately certified and manufactured apparatus, and its use is governed by licence granted subject to conditions intended to maintain satisfactory standards of manufacture and safe use.

The issue of a certificate does not therefore automatically confer the right to use the mark, but any *bona fide* manufacturer may be licenced so to do, subject to satisfying the appropriate conditions.

Further details may be obtained from:

Health and Safety Executive
HSE(M) Certification Support Unit
Harpur Hill
Buxton
Derbyshire
SK 17 9JN
(Tel: 0298 6211)

Appendix B Methods of legible and durable marking

B.1 Methods of marking

The marking shall appear as one of the following:

a) recessing or raising directly as part of the casting or moulding, where such casting or moulding is metallic; or

b) engraving directly on the surface of a metallic enclosure; or

c) engraving on a label in accordance with **B.3**.

engraving on a plate, in accordance with **B.3**.

NOTE Engraving includes indentation (by mechanical, electrical or chemical methods) either of the characters or of the surrounding material).

B.2 Character size requirements

B.2.1 Characters shall have a minimum height of 5 mm, except in the following cases:

a) on small electrical apparatus or parts, where space available is limited, where the height shall be at least 3 mm;

b) subsidiary parts of symbols or trade marks.

B.2.2 The depth of recess of engraved characters or recesses shall be not less than 0.3 mm.

The height of relief of raised cast or moulded characters shall be at least 1/10 of the character height.

B.3 Labels

B.3.1 Labels shall consist of bronze, brass or stainless steel.

B.3.2 Bronze or brass labels shall have a minimum thickness of 2 mm. Stainless steel labels shall have a minimum thickness of 1 mm.

B.3.3 Labels shall be fixed to the principal part of the enclosure by any one of the following methods:

a) soldering or brazing, either directly or by means of a frame; or

b) sunken headed screws; or

c) hammer drive screws, or bolt-nut combinations where the bolt or nut has been deformed to prevent removal of the label;

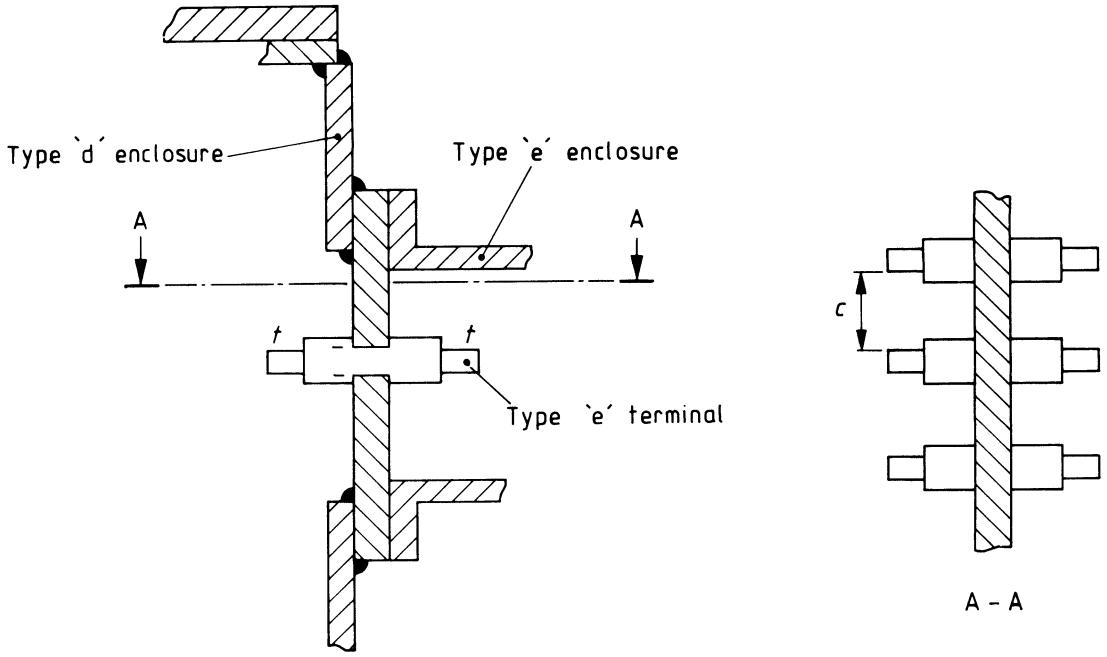
NOTE In these cases the screws and bolts need not be sunken headed.

d) riveting, if permitted by the type of protection concerned; or

e) bonding with an adhesive into a recess on enclosures made of plastics.

Appendix C Example of interconnection of type d and type e apparatus

The following figure shows how the temperature rating of a type e terminal affects a type d enclosure.



NOTE 1 The maximum temperature *t* in the type d enclosure should not adversely affect the temperature rating of the type e enclosure due to heat conduction.

NOTE 2 The clearance *c* in the type d enclosure may have to comply with the requirements of type e.

NOTE 3 Bushings may be required to have torque tests.

Figure 2 — Interconnection of type d and type e apparatus

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Publications referred to

BS 229, *Flameproof enclosure of electrical apparatus*[4)].

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

BS 3101, *Intrinsically-safe remote-control circuits associated with restrained plugs and sockets for use in coal mines.*

BS 4683, *Electrical apparatus for explosive atmospheres.*

BS 4683-2, *The construction and testing of flameproof enclosures of electrical apparatus.*

BS 4683-4, *Type of protection "e".*

BS 5501, *Electrical apparatus for potentially explosive atmospheres.*

BS 5501-1, *General requirements.*

BS 5501-2, *Oil immersion "o".*

BS 5501-3, *Pressurized apparatus "p".*

BS 5501-4, *Powder filling "q".*

BS 5501-5, *Flameproof enclosure "d".*

BS 5501-6, *Increased safety "e".*

BS 5501-7, *Intrinsic safety "i".*

BS 5501-9, *Specification for intrinsically safe electrical systems "i".*

BS 5754, *Specification for electrical analogue and state signals for use in coal mines.*

BS 6182, *Intrinsically safe power supplies for use in coal mines.*

[4)] See footnote (3) to **1.1**.

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W4 4AL