

Specification for

**3.8/6.6 kV, 300 A bolted
flameproof cable
couplers and adaptors,
for use in coal mines**

Confirmed
January 2011

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee MRE/14, Cable glands, sealing boxes, couplers, plugs and sockets, upon which the following bodies were represented:

- Association of British Mining Equipment Companies
- Association of Mining Electrical and Mechanical Engineers
- BEAMA Transmission and Distribution Association
- Electric Cable Makers' Confederation
- Health and Safety Executive
- Institution of Mining Engineers
- National Coal Board
- National Union of Mineworkers
- Rotating Electrical Machines Association (BEAMA)

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 November 1995

© BSI 1995

First published August 1965
Second edition May 1984
Third edition November 1995

The following BSI references relate to the work on this standard:
Committee reference MRE/14
Draft for comment 93/76975 DC

ISBN 0 580 22639 5

Amendments issued since publication

Amd. No.	Date	Text affected

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
Specification	
1 Scope	1
2 References	1
3 Definitions	1
4 Information to be documented	2
5 Design and construction	2
6 Dimensions	6
7 Cable glands and cable sealing boxes	7
8 Type tests	7
9 Routine tests	9
10 Marking	11
Tables	
1 Properties of electrical insulating materials	3
2 Properties of sealing ring	6
3 Minimum creepage distances and clearances	7
4 Details of coupler glandsets	7
5 Tensile load	8
6 Bending forces	10
Figures	
1 6.6 kV, 300 A cable half coupler	13
2 Alternative front face for mouldings	15
3 Contact pin	16
4 Pilot contact pins	17
5 Sealing ring	18
6 Straight adaptor	19
7 Angle adaptor	20
8 Angle adaptor with access plate	21
9 Adaptor pin	22
10 Insulated end cover	23
11 Electrical creepage distances and clearances for cable coupler	24
12 Electrical creepage distances and clearances for adaptors to enclosures	25
13 Creepage distances and clearances	26
14 Coupler glandsets for pliable wire armoured cables	27
15 Coupler glandsets for single and double wire armoured cables	27
16 Gland for single or double wire armoured cable for non-metallic cable sealing box	28
List of references	30

Foreword

This British Standard has been prepared by Technical Committee MRE/14. It supersedes BS 3905 : 1984, which is withdrawn. Previously the flameproof enclosures were required to conform to BS 4683 : Part 2 : 1971; in this revision the opportunity has been taken to update the standard to the requirements of BS 5501 : Part 5 : 1977, which is identical with the European Standard EN 50018 : 1977. The 1984 edition of this standard allowed an arrangement with a centre pilot contact tube but did not specify requirements. As a result two British manufacturers each developed their own design of pilot contact tubes. This revision allows these to be accommodated.

This is a companion standard to BS 3454 : 1994, which covers 1.9/3.3 kV couplers and adaptors.

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 [1], the Mines and Quarries Act 1954 [2], 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 addresses of the recognised certification authorities in the UK for Group I (mines susceptible to firedamp) apparatus for flameproof purposes are as follows.

Health and Safety Executive
Mining Equipment Certification Service
Harpur Hill
Buxton
Derbyshire SK17 9JN

SIRA Certification Service
Saughton Lane
Saughton
Chester CH3 6EG

Specification

1 Scope

This British Standard specifies requirements for 300 A bolted flameproof cable couplers and adaptors of semi-screened three-phase, or unscreened three-phase with centre pilot tube type, with a voltage rating of 3.8/6.6 kV. The couplers are designed to enable two cables to be coupled together or to enable a cable to be coupled to apparatus by use of adaptors, in both cases the electrical connections being made by separate connecting pins. Provision is also made for insulated end covers.

The use of other forms of intermediate box, with coupling arrangements as specified in this standard, are not precluded provided that all other relevant requirements of this standard are met.

The semi-screened cable couplers are primarily intended for use with three- or four-core wire armoured cables where the fourth conductor is earthed. The cable couplers incorporating a centre pilot are primarily intended for use with three-core wire armoured cables having an additional pilot core(s).

Couplers and adaptors conforming to this standard are not intended to be coupled or uncoupled when the circuit is energized. The dimensions necessary to provide for the connection of enclosures of different manufacture and some electrical and mechanical requirements are specified. This standard does not however, purport to specify a fully detailed design.

NOTE. The figures in this standard show only those essential features and dimensions for function and interchangeability. Dimensions are in millimetres.

2 References

2.1 Normative references

This standard incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on page 30. Subsequent amendments to, or revisions of, any of these publications apply to this standard only when incorporated in it by updating or revision.

2.2 Informative references

This standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions

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

3.1 cable half coupler

A detachable cable sealing box utilizing contact tubes and pins to facilitate ready connection to, or disconnection from, a similar unit or other apparatus.

3.2 bolted flameproof cable coupler

Two cable half couplers together with contact pins and a sealing ring, that, when bolted together to form a straight-through connecting box, conforms to the relevant requirements of BS 5501 : Part 5 : 1977.

3.3 cable gland

A device designed to secure the end of the cable to the cable sealing box, by means appropriate to the type of cable, including provision for making electrical connection to the armouring and lead sheath of the cable, where applicable.

3.4 cable sealing box

A device designed to receive and protect the end of the cable, with provision for sealing the conductors and the insulating material of the cable with filling medium and having a cable gland for attaching the cable to the box, together with any terminals provided for connection to the conductors of the cable within the box.

3.5 adaptor

A device used to connect a cable half coupler to apparatus, which can either be separate from or be integral with the enclosure of the apparatus and which can include live-line indication.

3.6 intermediate box

A box that can be inserted between two cable half couplers or between a cable half coupler and an adaptor, to perform a specific function, e.g. live-line indication or metering.

3.7 insulated end cover

A metal cover, suitably insulated, that, when bolted to the coupling face of a cable half coupler or adaptor (with a sealing ring interposed), completes the flameproof enclosure of the cable half coupler or adaptor and enables full working voltage to be applied.

3.8 filling medium

A bituminous-based compound conforming to BS 1858 : 1986 or resin-based compound conforming to BS 7383 : 1990 that is suitable for the electrical stresses imposed in service.

CAUTION. Because of the increased fire risk, bituminous-based compounds are not accepted by the Health and Safety Executive as a filling medium in new cable couplers certified for use in British coal mines.

4 Information to be documented

The following information to be supplied by the purchaser shall be fully documented. Both the definitive requirements specified throughout the standard and the following documented items shall be satisfied before a claim of compliance with the standard can be made and verified.

a) *General*

- 1) The number and date of this British Standard, i.e. BS 3905 : 1995.
- 2) The working voltage of the system on which the equipment is to be used.
- 3) The group number, or group numbers, of the gases or vapours in which the cable half couplers or adaptors are to be used.

b) *Cable half couplers*

- 1) The nominal size of conductors (in square millimetres), also the under armour diameter and the overall diameter of cable.
- 2) The type of cable to be used.

NOTE 1. The number of an appropriate British Standard or other recognized specification should be quoted. For non-standard cables, complete details of the cable's construction and dimensions should be given.

- 3) The number of contact pins and/or tubes (phase and pilot) required.
- 4) The type of contact tube cable termination required (compression or clamping).
- 5) The number of sealing rings required.
- 6) Whether filling medium and jointing tapes are required.
- 7) The type of gland required.

NOTE 2. Certain types of cable core insulation, notably polyethylene, are liable to exhibit cracking when subjected to prolonged contact with some bituminous filling compounds. The advice of the cable manufacturer should be sought as to the recommended grade of filling medium.

c) *Adaptors*

- 1) The nominal size (in square millimetres) of conductor in the connecting leads.
- 2) Whether leads are stranded or flexible.
- 3) The number of contact tubes and/or adaptor pins (phase and pilot) required.
- 4) The type of contact tubes and/or adaptor pins (compression or clamping) required.
- 5) The number of sealing rings required.
- 6) Where appropriate, whether a filling medium and jointing tapes are required (see note 2).

5 Design and construction

5.1 General

The general arrangement (except for the front face for insulators) and essential dimensions of both semi-screened and unscreened cable half couplers shall be as shown in figure 1. The front face for insulators shall be as shown in either figure 1 or figure 2.

5.2 Temperature rise

The temperature rise of the cable half couplers shall conform to 8.2.1.

5.3 Flameproof enclosure

All enclosures and insulated end covers used with couplers and adaptors, shall be of a type that has been manufactured in accordance with BS 5501 : Part 5 : 1977 for Group I electrical apparatus. Only corrosion resistant ferrous alloys or non-ferrous metals permitted by BS 5501 : Part 1 : 1977, shall be used in the construction of the flameproof joint and the cable gland. The cable sealing box shall either be constructed from the same metals, or be an encapsulated assembly conforming to BS 5501 : Part 8 : 1988.

5.4 Cables

Cable half couplers shall be capable of receiving cables with phase conductors up to the following maximum sizes:

a) copper (stranded)	185 mm ² ;
b) aluminium (stranded)	185 mm ² ;
c) copper (flexible stranded)	150 mm ² .

5.5 Insulation

5.5.1 Materials

Properties of materials for insulating components shall conform to the values given in table 1.

5.5.2 Insulators

Insulators shall be free from voids and defects and each shall conform to 8.1.

5.5.3 Earthed metallic screen

Insulators used in semi-screened cable half couplers or adaptors shall have fitted to their front face an earthed metallic screen. The radial fins of the screen shall be located midway between the three contact spouts to provide earthed segregation.

The fins of the earthed metallic screen and its earth connections shall withstand a current of 300 A for 500 ms and the temperature rise shall not exceed 50 K.

Table 1. Properties of electrical insulating materials

Property	Value	Test method
Electric strength (90 °C)	8 kV/mm (min.)	BS 2782 : Method 220 and 221 : 1983 ¹⁾
Volume resistivity	$1 \times 10^{13} \Omega \cdot \text{cm}$ (min.)	BS 2782 : Method 230A : 1982 ²⁾
Tensile strength	34.5 N/mm ² (min.)	BS 2782 : Method 320D : 1976
Flexural strength	60 N/mm ² (min.)	BS 2782 : Method 335A : 1993
Impact strength	10 kJ/m ² (min.)	BS 2782 : Method 359 : 1993
Water absorption ³⁾	50 mg (max.)	BS 2782 : Method 430A : 1983
Comparative tracking index ³⁾	CTI 400 (min.)	BS 5901 : 1980
Oxygen index	28 % (min.)	BS 2782 : Method 141 : 1986

¹⁾ Also numbered BS 903 : Part C4 : 1983.

²⁾ Also numbered BS 903 : Part C2 : 1982.

³⁾ Preparatory to any testing for these properties, remove not less than 0.5 mm by machining from all the surfaces of the test specimen and then smoothly finish.

NOTE. 1 N/mm² = 1 MPa.

5.6 External body features

5.6.1 Enclosure

Assembled cable half couplers, intermediate boxes and insulated end covers, when joined together in any combination, shall have a minimum degree of protection of IP 54 conforming to BS EN 60529 : 1992.

Adaptors shall also have a minimum degree of protection of IP 54 conforming to BS EN 60529 : 1992 at the interface with a cable half coupler, intermediate box or insulated end cover. Metal castings shall conform to 9.2

5.6.2 External earthing

Provision shall be made on the cable gland assemblies for the fixing of a copper earth bond.

5.6.3 Internal earthing

5.6.3.1 General

Provision shall be made within the cable sealing box for bonding to earth the earth core and/or any screens that may be incorporated in the cable in accordance with 5.6.3.2 to 5.6.3.4.

Any support pillar or component used for bonding shall be capable of withstanding the short circuit requirements specified in 8.3.

5.6.3.2 Earth core

The earth core shall be terminated in either a brass or copper terminal (bored to accept the relevant core) with provision for attachment to either any support pillar or the box.

5.6.3.3 Braided wire core screens

The braided wire core screens shall be terminated in one or more brass or copper terminals (bored to accept the tails formed by unpicking the braid screens) with provision for attachment to either any support pillar or the box body.

5.6.3.4 Copper tape core screens

The copper tape core screens shall be terminated on the face of the glandset or box body by use of a stud terminal.

5.7 Separate contact pins

5.7.1 Separate phase contact pins shall be provided to afford electrical connection between the phase contact tubes of two mating cable half couplers or a cable half coupler and adaptor.

The contact pin shall be as shown in figure 3. It shall be solid and manufactured from medium-hard copper of grade C101 or C102 conforming to BS 1433 : 1970 or grade C111 conforming to BS 2874 : 1986, having a hardness of not less than 70 HB when tested in accordance with BS 240 : 1986 and a volume resistivity of not more than $1.7241 \Omega \cdot \text{cm}$ at a temperature of 20 °C.

5.7.2 A separate pilot contact pin shall be provided to afford electrical connection between the pilot contact tubes of two mating unscreened cable half couplers or an unscreened cable half coupler and adaptor.

The pilot contact pin shall be one of the three types shown in figure 4¹⁾. Type A pins shall be used to connect two type A contact tubes. Type B pins shall be used to connect two type B contact tubes. Type C pins shall be used to connect a type A contact tube to a type B contact tube.

The pilot contact pins shall be manufactured from hard drawn copper of grade C101 or C102 conforming to BS 1433 : 1970, having a volume resistivity of not more than $1.7241 \Omega \cdot \text{cm}$ at a temperature of 20 °C. The spring clips shall be silver plated in accordance with classification Cu/Ag25 of BS 2816 : 1989.

¹⁾ The reason for specifying three types of pilot pin is explained in the foreword.

5.8 Fixed contact tubes for phase conductors

5.8.1 General

Fixed contact tubes for cable half couplers and adaptors shall be designed to receive the separate contact pins at the coupling end in accordance with 5.8.2 or 5.8.3, as appropriate, and shall conform to 9.1.

Fixed contact tubes for cable half couplers shall either be designed to receive at the termination end copper cable conductors in accordance with 5.8.2.3 or 5.8.2.4, or aluminium cable conductors in accordance with 5.8.3.3.

Fixed contact tubes for adaptors shall provide terminations suitable for connecting leads to other apparatus, either directly or via an adaptor pin (see 5.11). (See figures 12a and 12b respectively.)

5.8.2 Contact tube for copper cable conductors

5.8.2.1 Design and construction

The contact tube shall be as shown in figure 1.

The part of the contact tube receiving the connecting contact pin shall facilitate good electrical connection by the provision of radial slits forming not fewer than four separate spring-leaf elements constrained by a circular spring arrangement and further diametrically constrained to a maximum clearance between the constraining device and the contact tube of 0.5 mm to prevent undue distortion of the tube when the mating pin is inserted.

The contact tube shall be provided with the following:

- a seal to prevent migration of the filling medium from one side of the insulating block to the other side;
- a locking ring that effectively retains the contact tube in its correct location in the insulator block; and
- a device that locates and prevents rotation of the contact tube in the insulator block.

5.8.2.2 Material

The contact tubes shall be manufactured from copper of grade C101 or C102 conforming to BS 1433 : 1970, having a hardness of not less than 70 HB when tested in accordance with BS 240 : 1986 and a volume resistivity of not more than $1.7241 \Omega \cdot \text{cm}$ at a temperature of 20 °C.

5.8.2.3 Compression termination of conductor

The part of the contact tube providing the termination for the cable conductor shall be so manufactured as to permit compression jointing of the copper cable conductor to the contact tube. The dimensions and tolerances of the tube shall be in accordance with the compression tool

manufacturer's recommendations. Markings shall be provided to assist in the location of the compression dies. These markings shall not remove or displace materials such as could affect the efficacy of the completed compression joint.

5.8.2.4 Clamped termination of conductor

The part of the contact providing the conductor termination shall be integral with the contact tube and provide for a clamped connection.

Where screws are used as the clamping device, not fewer than four shall be provided and they shall be cup pointed hexagon socket screws conforming to BS 4168 : Part 5 : 1981. Each contact tube terminal shall provide for the entry of the conductor to a depth of at least 25 mm.

5.8.3 Contact tube for aluminium cable conductors

5.8.3.1 Design and construction

The contact tube shall be as shown in figure 1. The contact tubes shall be formed by welding a copper billet onto an aluminium billet. The weld shall conform to 9.3.

NOTE. The accepted method of producing the bimetallic junction is by friction welding.

The part of the contact tube receiving the connecting contact pin shall facilitate good electrical connection by the provision of radial slits forming not fewer than four separate spring-leaf elements constrained by a circular spring arrangement and further diametrically constrained to a maximum clearance between the constraining device and the contact tube of 0.5 mm to prevent undue distortion of the tube when the mating pin is inserted.

The contact tube shall be provided with the following:

- a seal to prevent migration of the filling medium from one side of the insulating block to the other side;
- a locking ring that effectively retains the contact tube in its correct location in the insulator block;
- a device that locates and prevents rotation of the contact tube in the insulator block; and
- the internal bore of the aluminium sector free from any surface irregularities.

5.8.3.2 Material

The copper section shall be manufactured from copper of grade C101 or C102 conforming to BS 1433 : 1970, having a hardness of not less than 70 HB when tested in accordance with BS 240 : 1986. The aluminium section shall be manufactured from aluminium of grade 1050A conforming to BS 1474 : 1987.

5.8.3.3 *Compression termination of conductor*

The part of the contact tube providing the termination for the cable conductor shall be so manufactured as to permit compression jointing of the cable conductor to the contact tube. The dimensions and tolerances of the tube shall be in accordance with the compression tool manufacturer's recommendations. Markings shall be provided to assist in the location of the compression dies. These markings shall not remove or displace material such as could affect the efficacy of the completed compression joint.

5.9 *Contact tubes for pilot conductors*

5.9.1 *General*

A fixed pilot contact tube shall be fitted in place of the earthed metallic interphase screen in order to provide a termination for the cable pilot conductor and also as a mating contact for the separate pilot contact pin.

5.9.2 *Pilot contact tube for copper cable conductors*

5.9.2.1 *Design*

The pilot contact tube shall be one of the following two types²⁾.

- a) **Type A.** The part of the fixed tube receiving the pin shall have a bore between 6.96 mm and 6.91 mm diameter, with a depth between 18.0 mm and 17.5 mm.
- b) **Type B.** The part of the fixed tube receiving the pin shall have a bore between 6.91 mm and 6.86 mm diameter, with a depth between 19.3 mm and 18.8 mm.

The pilot contact tube shall be provided with the following:

- 1) a seal to prevent migration of the filling medium from one side of the insulating block to the other side;
- 2) a locking ring that effectively retains the contact tube in its correct location in the insulator block;
- 3) a device that locates and prevents rotation of the contact tube in the insulator block.

5.9.2.2 *Material*

The contact tube shall be manufactured from copper of grade C101 or C102 conforming to BS 1433 : 1970, having a hardness of not less than 70 HB when tested in accordance with BS 240 : 1986 and a volume resistivity of not more than $1.7241 \Omega \cdot \text{cm}$ at 20 °C.

5.9.3 *Compression termination of conductor*

The part of the contact tube providing the termination for the cable pilot conductor shall be so manufactured as to permit compression jointing of the pilot conductor to the contact tube. The dimensions and tolerances of the tube shall be in accordance with the compression tool manufacturer's recommendations.

5.10 *Sealing ring*

When any two cable half couplers are bolted together, the coupling faces of the material forming the respective contact tube housings, or contact tube housing and insulated end cover, shall be sealed by the interposition of a ring of resilient insulating material that shall conform to the dimensions shown in figure 5. The properties of the material of the sealing ring shall conform to the values given in table 2.

5.11 *Adaptors*

5.11.1 *General*

Dimensions of adaptors shall be as shown in figures 6, 7 and 8. If plug-in cable adaptor connections are required, the dimensions of the adaptor pin shall be as shown in figure 9. The insulating shroud shall be arranged to remain in position during normal handling and service.

5.11.2 *Adaptor pin for compression termination of conductor*

The part of the adaptor pin receiving the cable conductor shall be so manufactured as to permit compression jointing of the copper cable conductor onto the adaptor pin. The dimensions and tolerances of the pin shall be in accordance with the compression tool manufacturer's recommendations. Markings shall be provided to assist in the location of the compression dies. These markings shall not remove or displace material such as could affect the efficacy of the completed compression joint.

5.11.3 *Adaptor pin for clamped termination of conductor*

The conductor termination shall be integral with the adaptor pin and provide for a clamped connection. Where screws are used as the clamping device not fewer than four shall be provided and they shall be cup pointed hexagon socket screws conforming to BS 4168 : Part 5 : 1981. Each terminal shall provide for the entry of the conductor to a depth of at least 25 mm.

²⁾ The reason for specifying two types of contact tube is explained in the foreword.

Table 2. Properties of sealing ring		
Property	Value	Test method
Electric strength	100 kV/mm (min.)	BS 2918 : 1957
Volume resistivity	$1 \times 10^{13} \Omega \cdot \text{cm}$ (min.)	BS 2782 : Method 230A : 1982 ¹⁾
Relative permittivity	5.0 (max.)	BS 2782 : Methods 240A and 240B : 1982 ²⁾
Comparative tracking index	CTI 400 (min.)	BS 5901 : 1980
Water absorption (after 14 days at $(23 \pm 2) ^\circ\text{C}$)	1% (max.)	BS 2782 : Method 430A : 1983
Resistance to liquids (after immersion for 7 days at $(23 \pm 2) ^\circ\text{C}$ in transformer oil complying with BS 148 : 1992)		BS 903 : Part A16 : 1987
Tensile strength	7.5 N/mm ² (min.)	
Ultimate elongation	250 % (min.)	
Accelerated ageing (168 h at 120 °C)		BS 903 : Part A19 : 1986
Tensile strength	10 N/mm ² (min.)	
Ultimate elongation	300 % (min.)	
Compression set (70 °C for 24 h)	15 % (max.)	BS 903 : Part A6 : 1992
Hardness	55 to 65 IRHD	BS 903 : Part A26 : 1969
¹⁾ Also numbered BS 903 : Part C4 : 1983. ²⁾ Also numbered BS 903 : Part C3 : 1982. NOTE. 1 N/mm ² = 1 MPa.		

5.12 Filling holes

Metallic cable sealing boxes that are to be filled with a filling medium shall have a minimum of two orifices of not less than 30 mm diameter sited in the same plane and provided with suitable covers, or threaded to receive screwed plugs.

Where angled adaptors are designed to be filled in situ, they shall be provided with at least two filling orifices of not less than 30 mm diameter and provided with suitable covers, or threaded to receive screwed plugs (see figure 1).

Non-metallic cable sealing boxes shall be provided with either one aperture or two equal sized apertures, having a minimum total cross-sectional area of 2500 mm². The aperture or apertures shall be arranged (and augmented if necessary, by other means of venting) so as to facilitate the complete filling with a compound conforming to BS 5501 : Part 8 : 1988.

5.13 Insulated end covers

Insulated end covers shall be as shown in figure 10 and shall conform to 9.4.

6 Dimensions

6.1 Components

The dimensions of the components of cable half couplers, adaptors and insulated end covers shall be as shown in figures 1 to 10. The relative positions of the contact tubes and of the flange bolt holes shall be as shown in figure 1.

6.2 Electrical clearances

The clearance and creepage distances shown in figures 11, 12 and 13 shall be not less than those given in table 3.

6.3 Fasteners

All bolts, screws and studs used for attaching parts of the enclosure shall have a strength grade designation of 8.8, as specified for bolts and screws in BS 3692 : 1967 and for studs in BS 4439 : 1969, with grade 8 nuts as specified in BS 3692 : 1967. Coupling screws shall be size M10 of length 45 mm. If bolts are used, threaded length shall be not less than 25 mm.

Table 3. Minimum creepage distances and clearances

Description	In air		In filling medium	
	Reference letter (see figures 11 and/or 12)	Dimension mm	Reference letter (see figures 11 and/or 12)	Dimension mm
Clearance phase to phase direct	A	89	E	25
Clearance phase to earth direct	B	64	F	19
Creepage phase to phase over insulation	C	146	G	64
Creepage phase to earth over insulation	D	89	H	32
Creepage phase to earth over cable surface	—	—	J	48

7 Cable glands and cable sealing boxes

7.1 General

The design of the gland and sealing box shall be such as to minimize the transfer to the conductor connections stresses induced by bending of the cable.

NOTE. The problem is particularly acute for pliable wire armoured cables.

The gland shall include a clamp for securing and ensuring electrical contact with the armour of the cable. The cable gland shall be so designed that it does not impose on the armour wires of the cable a bending radius less than the diameter of the wire.

Where a coned draw-gland is used for double wire armoured cable, an inter-armour cone shall be interposed between the inner and outer layers of wire armour to facilitate uniform clamping of armour wires.

Provision shall be made on the cable gland for the fixing of an earth bond.

Coupler gland sets shall conform to table 4.

The glands shall conform to 8.4, 8.5 and 8.6.

7.2 Cable glands for non-metallic bodied cable sealing boxes

The minimum dimension between the start of the filling medium encapsulation and the termination of the cable outer sheath shall be 24 mm, as shown in figure 16.

8 Type tests

8.1 Insulators heat resistance

8.1.1 Requirement

When tested in accordance with 8.1.2, the dimensions of each insulator shall not depart from the original dimensions by more than 0.2 % and there shall be no form of surface cracking or scaling on the insulator.

8.1.2 Method

Heat the insulator in an oven at $(120 \pm 5) ^\circ\text{C}$ for a period of 24 h and then allow to cool to ambient temperature. Examine the insulator for surface cracking or scaling.

8.2 Temperature rise

8.2.1 Requirement

When tested in accordance with 8.2.2, the temperature rise of the components within the cable half coupler shall not exceed $45 ^\circ\text{C}$ in a maximum ambient temperature of $25 ^\circ\text{C}$ as measured in 8.2.2.1d. The temperature deviation of the components within the cable half coupler shall be equal to, or less than, that of the average temperature of the cable conductor.

NOTE. Because of the nature of this test, if a bad reading occurs, the parties concerned may need to reach agreement, for example, on whether to continue the test.

The tests shall be conducted, under draught-free conditions, on two filled cable half couplers, bolted together, and complete with three contact pins and a sealing ring that all conform to this standard.

Table 4. Details of coupler glandsets

Type of armour	Cable sheath	Minimum dimensions (see figures 14 and 15)	
		Support length A mm	Penetration B
Pliable wire armour (PWA)	Polychloroprene (PCP)	30	1.25 times the outside diameter of the cable (90 mm minimum)
Single wire armour (SWA) and double wire armour (DWA)	Polyvinylchloride (PVC)	20	0.67 times the outside diameter of the cable (30 mm minimum)