BRITISH STANDARD

BS 6121-5:2005

Mechanical cable glands —

Part 5: Code of practice for selection, installation and inspection of cable glands and armour glands

ICS 21.140; 29.080.20

Committees responsible for this British Standard

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Contents

Foreword

This part of BS 6121 has been prepared by Subcommittee GEL/20/11/1. It supersedes BS 6121-5:1993 which is withdrawn.

This part of BS 6121 has been updated to refer to the properties of cable glands and armour glands specified in BS EN 50262 and in the new edition of BS 6121-1, respectively, which specify performance, rather than construction as was the case in earlier editions of BS 6121. Some of the testing recommended in BS 6121-5:1993 has been removed because this testing is now specified in BS EN 50262 and/or BS 6121-1. This revision of BS 6121-5 includes new recommendations for selection of glands on the basis of mechanical and electrical properties, as well as new clauses relating electrical properties to installation practice.

As a code of practice, this part of BS 6121 takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

It has been assumed in the drafting of this standard that the execution of its provisions will be entrusted to appropriately qualified and competent people, for whose use it has been prepared.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its 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 14, an inside back cover and a back cover.

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1 Scope

This part of BS 6121 gives recommendations on the selection, installation and inspection of cable glands conforming to BS EN 50262, armour glands conforming to BS 6121-1, and accessories, for industrial, commercial and domestic use. It is not applicable to glands for use with fibre-optic cables or mineral insulated cables. It is not applicable to glands for installation in explosive atmospheres.

NOTE Requirements for installation of electrical equipment in explosive gas atmospheres are specified in BS EN 60079-14. Requirements for installation of electrical equipment in explosive dust atmospheres are specified in BS EN 50281-1-2.

This part of BS 6121 is intended for use by specifiers of electrical installations, by installers and by those responsible for carrying out inspections.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 6121-1:2005*, Mechanical cable glands — Part 1: Armour glands — Requirements and test methods.*

BS 7671:2001 including amendments 1:2002 and 2:2004*, Requirements for electrical installations — IEE Wiring Regulations. Sixteenth edition.*

BS EN 50262:1999 including amendments 1:2001 and 2:2004*, Cable glands for electrical installations.*

3 Terms and definitions

For the purposes of this part of BS 6121, the terms and definitions given in BS EN 50262:1999 and BS 6121-1:2005 and the following apply.

3.1
non-integral earth connection
accessory with a means of attaching an additional earth conductor which is fitted to a cable gland or armour gland and which, when installed, provides a protective connection to earth

NOTE A protective connection to earth is also known as a PE function.

3.2
integral earth connection
connection point with a means of attaching an additional earth conductor which is permanently attached to a cable gland or armour gland and which, when installed, provides a protective connection to earth

3.3
clearance hole
hole in the wall of an enclosure which is not threaded internally

3.4
functional earth
earth connection required for the correct operation of a piece of equipment

NOTE An example of a functional earth is the earth connection to a co-axial radio-frequency cable or screened data cable. This connection reduces external interference and is essential to the functioning of the equipment; it does not work properly without it.

3.5
circuit protective conductor
conductor used to protect people against electric shock by interrupting the supply in the event of an earth fault and so causing the fuse or circuit breaker to trip

4 General

4.1 Properties of glands

4.1.1 BS EN 50262 and BS 6121-1 each specifies requirements to which all glands have to conform in order to be deemed to conform to the respective standard. Each of these standards also specifies additional requirements to which glands have to conform if the manufacturer wishes to claim that the glands have particular additional properties.

4.1.2 BS EN 50262 also provides a "classification" of cable glands according to the material from which they are made, their mechanical and electrical properties, the degree of ingress protection they provide and whether they have a single orifice or a multi-orifice seal.

4.1.3 Glands conforming to BS EN 50262 or to BS 6121-1 are supplied with manufacturer's information including the following:

— the material(s) from which the glands have been manufactured;

— the type of seal (cable glands only);

— the entry thread length;

— the range of cable sizes with which the glands can be used;

— the impact category (indicating the impact resistance on a scale from 1 to 8, where 8 is the highest resistance).

4.1.4 BS EN 50262 and BS 6121-1 specify the following basic requirements for all glands:

— provision of basic cable retention;

— resistance to excess torque;

— provision of a minimum degree of ingress protection of IP54 (for cable glands) or of IP2X (for armour glands);

4.1.5 BS EN 50262 and BS 6121-1 specify the following additional requirements for glands for which the manufacturer claims the relevant additional properties:

— provision of cable anchorage (cable glands only):
  — Type A: glands resistant to repetitive cable pulling or twisting at low pull forces;
  — Type B: glands resistant to repetitive cable pulling or twisting at higher pull forces;
— provision of cable retention for armoured cable (cable glands only):
  — Class A: glands resistant to low pull forces;
  — Class B: glands resistant to higher pull forces;
— provision of equipotential bonding to the enclosure (see Note);
— provision of electrical bonding to metallic layer(s) in a cable;
— provision of a protective connection to earth;
  — Category A: glands resistant to low earth fault current;
  — Category B: glands resistant to intermediate earth fault current;
  — Category C: glands resistant to high earth fault current;
— electrical insulating characteristics (cable glands only);
— provision of a degree of ingress protection above IP54 (cable glands only);
— a working temperature range extending outside the range −20 °C to +65 °C (cable glands only);
— resistance to the corrosive effects of salt and sulfur dioxide laden atmospheres.

NOTE If a gland provides equipotential bonding to an enclosure this means that there is electrical continuity between the various metallic parts of the gland and that part of the gland which is used to make a connection to the enclosure.

4.2 Type designations for glands

Previous editions of BS 6121 specified requirements for design and construction of glands and gave type designations for these glands.

Manufacturers' literature no longer specifies glands by reference to these old type designations, but some catalogues still refer to them and manufacturers sometimes use them as product codes. To enable the specifier or installer to select the correct gland, descriptions of glands specified in BS EN 50262 and BS 6121-1:2005 which correspond to type designations given in BS 6121-1:1989 are given in Annex A. In case of doubt, the gland manufacturer should be consulted.

5 Selection of glands

5.1 Basic principles

5.1.1 *General*

The following basic principles should be applied to the selection of cable glands and armour glands.

— For domestic and commercial installations, a cable gland or armour gland which conforms to the basic requirements (i.e. is not claimed to have any additional properties) and which has an impact category of at least 3 should be selected. However, for installations where there is no risk of the gland suffering an impact (for example, because it is inside another enclosure) a gland of a lower impact category (1 or 2) may be selected.

— For light industrial installations, a cable gland or armour gland which conforms to the basic requirements and which has an impact category of at least 5 should be selected.

— For heavy-duty industrial installations, where there is a risk of damage by personnel or moving objects, a metallic or composite cable gland or armour gland which has an impact category of at least 7 and which provides equipotential bonding should be selected.

NOTE The test conditions corresponding to the different impact categories are given in BS EN 50262:1999, Table 4.

In case of doubt regarding any aspect of gland selection, the gland manufacturer should be consulted.

5.1.2 *Glands for applications in which a seal is not required*

For armoured cables, where a seal is not required, an armour gland should be selected.

5.1.3 *Glands for applications in which a seal is required*

For applications in which a seal is required between the cable sheath and the gland, a cable gland should be selected in accordance with the following recommendations.

— If the cable is unarmoured, a cable gland should be selected.

— If the cable is armoured, a cable gland providing retention for armoured cable should be selected.

— If a seal is required on two separate cable sheaths, then a cable gland with inner and outer seals should be selected.

— If the cable is to hang from the gland then a cable gland providing cable anchorage should be selected.

See also **5.8**.

5.1.4 *Glands for use in extreme conditions*

If a cable gland or armour gland is required which has resistance to extreme conditions not covered by the requirements specified in BS EN 50262 or BS 6121-1 (e.g. resistance to chemical attack, resistance to ingress of water in deluge conditions, resistance to strong ultraviolet light), advice should be sought from the gland manufacturer.

5.2 Selection according to size and profile of the cable

It is essential that the gland selected is of the correct size for, and suitable for the profile of, the cable with which it is to be used.

The specifier or installer should ensure that the diameter or other dimensions of the cable with which the gland is to be used are within the range for which the gland is suitable, as stated in the gland manufacturer's information.

In the case of a cable gland, if the gland is claimed to provide anchorage, the range of cable sizes for which the gland provides a seal might be different from the range of cable sizes for which the gland provides anchorage. This means that for cable sizes within the range for which a seal is provided, but outside the range for which anchorage is provided, the gland provides only retention. This needs to be taken into account when selecting the size of gland to be used.

5.3 Selection according to the gland material

Glands conforming to BS EN 50262 or BS 6121-1 can be made of the following materials:

— metallic;

— non-metallic (e.g. nylon);

— composite (i.e. comprising both metallic and non-metallic parts, or coated parts).

NOTE In the case of metallic glands, the composition of the sealing system is not taken into account in the classification. Thus, a metallic gland with a non-metallic seal would be classified as metallic rather than composite.

Metallic glands should be used where electrical continuity or high impact resistance is required.

Non-metallic glands should be used if a lightweight gland is required, or to avoid the need for a separate earth connection to the part of a metallic gland which protrudes inside a non-metallic enclosure.

Composite glands should be used for applications in which it is necessary to guard against particular risks such as electrolytic corrosion and/or chemical attack.

Metallic glands made of unplated steel should not be used in wet conditions.

Non-metallic and composite glands should not be used where electrical continuity is required.

A metallic gland should only be used with a metallic enclosure if:

— the combination of the metallic enclosure and the gland would not give rise to electrolytic action; or

— the gland is plated.

If the combination of the materials in the cable and the gland would give rise to electrolytic action then a metallic gland with plated components should be used. Alternatively, if no electrical continuity is required between the gland and any metallic layers of the cable, a composite gland may be used.

In case of doubt, advice should be sought from the gland manufacturer.

5.4 Selection according to mechanical properties

5.4.1 *Cable retention and anchorage other than retention of armoured cable (cable glands only)*

If the cable is prevented by external means from being pulled from the gland, then a gland not providing cable anchorage (i.e. just providing retention) should be selected. If this is not the case, glands should be selected as follows.

— For domestic and commercial installations, glands not providing cable anchorage (i.e. just providing retention) may be selected.

— For light industrial installations, glands providing Type A anchorage should be selected.

— For heavy-duty industrial installations, glands providing Type B anchorage should be selected.

5.4.2 *Cable retention for armoured cable*

5.4.2.1 Cable glands should be selected as follows.

— For domestic and commercial installations, Class A glands should be selected.

— For light industrial installations, Class A glands should be selected.

— For heavy-duty industrial installations, Class B glands should be selected.

5.4.2.2 Armour glands as specified in BS 6121-1 are suitable for all types of installations.

NOTE The cable retention requirement specified in BS 6121-1:2005 corresponds to the requirement specified for Class B in BS EN 50262:1999.

5.5 Selection according to electrical properties

5.5.1 *Equipotential bonding*

To eliminate the risk of electric shock in a situation where conductive parts of the cable gland or armour gland are exposed to contact and the gland is used in conjunction with an earthed metal enclosure, a gland which provides equipotential bonding should be used.

If a metallic or composite gland is to be used with a non-metallic enclosure, an accessory (e.g. an earth tag) or a gland with an integral earth connection should be used to permit any exposed conductive parts to be earthed in a situation where no other earth connection is available.

5.5.2 *Electrical connection to metallic layer(s) in a cable*

If it is necessary to provide a functional earth, or to enable a conducting layer of a cable to be bonded to earth, a gland which provides an electrical connection to metallic layer(s) in a cable (in conjunction with equipotential bonding if necessary) should be selected.

NOTE Metallic layers in a cable can include the following:

— a layer of armour or braid;

— a layer of foil or other metallic screening material;

— a layer of lead or other metallic sheath;

— a drain wire.

5.5.3 *Protective connection to earth*

If it is necessary for the gland to form part of the circuit protective conductor, a gland which provides a protective connection to earth should be selected, in accordance with the following recommendations.

— A category A gland should be selected for use in installations where the cable has light armour or braid, which might be the limiting factor for the magnitude and duration of the earth fault current.

— A category B gland should be selected of use in installations where the magnitude and duration of the earth fault current could exceed the maximum values at which a category A gland is tested.

— A category C gland should be selected for use in installations where the magnitude and duration of the earth fault current could exceed the maximum values at which a category B gland is tested.

NOTE 1 The minimum currents for testing each category are specified in BS EN 50262:1999, Table 5.

NOTE 2 Installations without secondary protection against earth fault current generally require a higher category of protective connection to earth.

NOTE 3 Where glands of category A are used, an adequate earth connection can be achieved by fixing the gland into a suitably earthed metal enclosure. Where glands of category B or C are used with sheet metal enclosures, additional earth connections are usually required to carry the potential earth fault current safely. For category C a gland with an integral earth connection should be used. For category B either a gland with an integral earth connection, or a suitable accessory (e.g. an earth tag) should be used.

5.5.4 *Insulation characteristics*

If the installation requires a level of resistance of not less than 5 MΩ, then a gland with insulating characteristics should be selected.

NOTE Glands with insulating characteristics include glands with an integral insulating portion and glands made from an insulating material. Alternatively, a gland supplied complete with a suitable accessory (in this case a non-integral insulating adaptor) can be used.

5.6 Selection according to degree of ingress protection (IP rating)

Because armour glands conforming to BS 6121-1 are only required to have a rating of IP2X they should be used only in indoor installations.

For cable glands (which provide a seal):

— If the enclosure into which the gland is being installed has a rating of IP54 or less, then any cable gland conforming to the basic requirements specified in BS EN 50262 may be selected.

— If the enclosure into which the gland is being installed has a rating above IP54, then a cable gland having an IP rating equal to or higher than that of the enclosure should be selected.

NOTE For a gland to have an IP rating equal to or higher than that of the enclosure, each digit of the rating for the gland has to be equal to or higher than the corresponding digit of the rating for the enclosure.

5.7 Selection according to operating temperature range (cable glands only)

For an installation that requires a cable gland to operate at temperatures outside the range −20 °C to +65 °C, a cable gland with an operating temperature range that includes the relevant temperatures should be selected.

When selecting the cable gland, temperature rises that could occur during operation of the installation should also be taken into account.

5.8 Selection according to sealing system (cable glands only)

In a cable gland with a multi-orifice seal, each orifice in the seal is designed to accommodate the outer sheath of a separate cable.

If a collection of separate cables are to pass through the same gland, a cable gland with a multi-orifice seal should be selected.

If the cable passing through the gland is to be a single cable with multiple inner cores, a cable gland which seals onto the outer sheath of the cable and/or onto each individual core should be selected.

NOTE Glands which are designed to accommodate a single multi-core cable are not classified as having multi-orifice seals. These glands are designed to accommodate only a single cable, and the testing is specified on this basis.

5.9 Resistance to salt and sulfur dioxide laden atmospheres

If the installation is in a salty atmosphere (e.g. near the sea) or a sulphur dioxide laden atmosphere (e.g. in a power station) a gland that is resistant to salt and sulphur dioxide laden atmospheres should be selected.

NOTE Unplated glands made of brass or stainless steel, including “free machining” brass or stainless steel, may be claimed to be resistant to salt and sulphur dioxide laden atmospheres without testing.

The test for resistance to salt and sulphur dioxide laden atmospheres given in BS EN 50262 simulates light industrial or coastal atmospheric conditions, and glands passing this test are not necessarily resistant to other chemical action. Where glands resistant to other chemicals are required, it might be necessary to:

— seek advice from the gland manufacturer;

— obtain the material manufacturer’s data sheet for the material from which the gland is made, particularly in the case of non-metallic or composite glands, to determine whether the material is resistant to the chemical or chemicals in question;

— use plated glands;

— have glands specially made from an alloy which is resistant to the chemical or chemicals in question.

5.10 Selection of accessories

5.10.1 *General*

The following accessories are available for use with glands and are often supplied by the gland manufacturer with the gland:

— Locknuts: to secure a cable gland or armour gland in a clearance hole;

— Sealing washers: to give additional sealing between a gland and an enclosure;

— Serrated washers: to provide resistance to loosening of a locking device due to vibration, or to improve electrical continuity between a gland and an enclosure;

— Shrouds: to protect a gland against adverse environmental conditions;

— Earth tags: a type of non-integral earth connection (see **3.1**);

— Adaptors and reducers: to allow a gland with a particular entry thread to be fitted into an enclosure with a different entry thread.

NOTE There are other types of adaptors which provide electrical insulation or electrical continuity. However, a gland supplied with one of these adaptors should be considered equal to a gland which itself has the equivalent properties, provided that the manufacturer states that the necessary testing has been carried out.

5.10.2 *Locknuts, washers and shrouds*

The following recommendations should be followed.

— For glands to be used in outdoor or wet situations, it is essential to ensure that any locknuts and metallic washers selected are made of a material that does not present a risk of electrolytic corrosion.

— Washers should be selected which are sufficiently wide that the across-flats dimension of the gland is greater than the inner diameter of the washer.

— If a gland and sealing washer have been tested in combination, a higher IP rating may be claimed by the manufacturer. In such a case it is essential that the two components of the combination are used together.

— Shrouds should not be used if the gland is likely to be submerged in liquid.

5.10.3 *Adaptors and reducers*

Only a single adaptor or reducer should be used with each gland.

5.10.4 *Mechanical properties*

The specifier should ensure that the following recommendations are followed.

— If an installation has a specific requirement for impact resistance then a gland with an adaptor or reducer should only be used if the impact resistance of the combination has been tested and meets the requirements for the relevant impact category.

— If the accessory manufacturer specifies a maximum torque which may be applied to a locking device during installation, it is essential that the installation specification for the selected gland does not require a higher torque value to be used.

5.10.5 *Electrical properties*

The specifier should ensure that the accessories selected do not interfere with the required electrical properties of the gland. For example, it is essential to ensure that the insulation characteristics of the gland are not compromised by the use of metallic accessories, and conversely that equipotential bonding or a protective connection to earth is not compromised by the use of non-metallic accessories.

6 Installation

6.1 General

Before installing a gland, the installer should ensure that the manufacturer's instructions for installation and use of the gland have been supplied.

Installation should be carried out in accordance with the manufacturer's instructions. Unless the manufacturer's instructions state otherwise, the installer should:

— never cut the seal provided in a cable gland;

— always use all parts supplied;

— always use any protective equipment supplied by the manufacturer e.g. protective gloves.

6.2 Cable size and construction

6.2.1 *Cable size*

The installer should ensure that the size of the cable with which the gland is being used is within the size range for which the gland is suitable, as given in the manufacturer's information.

If the cable is armoured, and the armour is being terminated in the gland, the installer should ensure that the size of the armour is within the size range for which the gland is suitable, as given in the manufacturer's information.

6.2.2 *Cable armour clamping*

If the gland is of a design which includes loose armour clamping components, the installer should ensure that the gland effectively clamps the armour, braid or screen of the cable.

This should be tested for by assembling a gland onto a cable of the type with which it is to be used, then undoing the gland leaving the armour clamping components in place. The armour clamping components should remain tightly fixed to the armour, braid or screen of the cable, unless the manufacturer's instructions state otherwise.

6.2.3 *Cable construction*

Glands which have been designed and tested for use with round cables might not function properly on cables with a sheath that is (due to a manufacturing or other defect) to some extent ellipsoid or triangular. If the cable is supposed to be round in profile, but is visibly not so, advice should be sought from the gland manufacturer.

Certain gland properties (for example high IP ratings) require that the cable with which the gland is to be used is properly "filled". Advice on whether a cable is "filled" or not should be obtained from the cable manufacturer.

Certain types of cable include materials which can exhibit significant "cold flow" characteristics which could reduce the effectiveness of cable gland seals and so have adverse effects on the protection provided by the enclosure. For cables of this type the cable manufacturer should be consulted for advice. If necessary, a special kind of cable gland (e.g. a gland with a resinous or compound seal) or a type of cable entry other than a gland, should be used.

6.3 Installation method and conditions

6.3.1 *Clearance holes*

The installer should ensure that clearance hole diameters are between 0.1 mm and 0.7 mm greater than the nominal diameter of the entry thread on the gland.

Glands fitted into clearance holes should be secured by a locking device (e.g. a locknut) inside the enclosure.

6.3.2 *Entry thread length*

The installer should ensure that:

— if the gland is being installed in a clearance hole, the gland to be installed has a long enough entry thread to go through the wall of the enclosure and all accessories, and still have enough threads remaining for a locknut to be screwed firmly in place;

— if the gland is being installed in a threaded hole, the gland to be installed has a long enough entry thread to pass through any externally fitted accessories and still screw through the entire thickness of the enclosure wall.

6.3.3 *Installation torque*

The installer should ensure that the components of the gland are assembled and installed using the installation torque given in the manufacturer's instructions.

NOTE Different torque levels might be given for the installation of different components of a gland.

Care should be taken to ensure that if a maximum torque is given for the enclosure, the gland is not screwed into the enclosure at a higher torque. In case of doubt, the enclosure manufacturer should be consulted for advice.

6.3.4 *Cable supports*

Where there is a danger that in service the cable might be pulled with a force greater than that which the gland is designed to resist, the installer should ensure that the cable is supported and restrained as near to the gland as is reasonably practicable. Generally the cable should be clamped with a cable cleat, or clamped onto a cable tray, within 300 mm of the point where it enters the gland, and at regular intervals along its length.

6.3.5 *Installation temperature*

If the manufacturer's instructions give the ambient temperature range within which the gland can be installed, installation of the gland should not be carried out if the ambient temperature is outside that range.

NOTE Ambient temperature can be critical to the correct installation of the cable seal.

6.4 Electrical integrity

6.4.1 *Equipotential bonding*

When a gland which provides equipotential bonding is being installed the following precautions should be taken.

— Where the interface between the gland and the enclosure is the sole means of creating equipotential bonding to the enclosure, no non-metallic accessories should be fitted between the gland and the enclosure, as these could impair electrical continuity.

— If the enclosure is made of non-metallic material, or is painted, an additional earth connection should be made from the gland to an earth connection on the enclosure.

In case of doubt regarding electrical continuity, the test given in Clause **7** should be carried out after installation.

6.4.2 *Protective connection to earth*

If a protective connection from a gland to earth is needed, the cable used to make the connection should be one that has the capacity to carry the maximum earth fault current, as given in the specification for the installation in accordance with BS 7671:2001, Chapter 51.

If a sealing washer is to be used in combination with a non-integral earth connection, advice on the best installation method should be obtained from the gland manufacturer.

6.4.3 *Insulation*

Where the interface between the gland and the enclosure is the sole means of ensuring insulation, no accessory should be allowed to make electrical contact between the gland and the enclosure.

6.5 Ingress protection (IP) rating

In order to maintain the IP rating of the system (i.e. the enclosure plus the cable gland and any accessories) the following recommendations should be followed.

— A cable gland should only be installed on a surface of the enclosure that is flat and smooth over the whole area that the gland will cover (i.e. the area within the across-corners diameters of the sealing face of the cable gland).

— If the area immediately around the entry hole in the enclosure is damaged in any way, a sealing device should be installed between the cable gland and the face of the enclosure.

— If the entry hole is not perpendicular to the surface of the enclosure, a sealing device should be installed between the cable gland and the face of the enclosure.

6.6 Installation of accessories

6.6.1 *Locking devices*

Where a locking device (usually a locknut) forms an essential part of the equipotential bonding to the enclosure, the installer should ensure that no non-metallic accessories are placed between the locking device and the other parts of the system to which electrical continuity has to be maintained.

In case of doubt regarding electrical continuity, the test given in Clause **7** should be carried out after installation.

6.6.2 *Serrated washers*

A serrated washer may be used to reduce the risk of a locking device working loose, by countering the effects of vibration, or to maintain equipotential bonding to a painted enclosure.

If a serrated washer is used for the latter purpose, the test given in Clause **7** should be carried out after installation.

If a serrated washer is used in combination with a sealing device, generally the serrated washer should be installed inside the enclosure and the sealing device outside.

7 Electrical continuity test

The resistance should be measured between an accessible metallic part of the enclosure, or its factory-fitted earth contact point, and either the gland component in contact with the enclosure, or its earthing or bonding terminal or contact. The resistance should not exceed 0.1 Ω.

8 Inspection and testing

8.1 General

Inspection should be carried out after installation has been completed, but before the system is commissioned or powered up. The person carrying out the inspection may be a representative of the client, the main contractor, or the installer's own employer.

If any test is failed, the installer should remove the failed gland and install a new one.

It is considered good practice for an interim inspection to be carried out after a few glands have been installed, in order to validate the method of installation, and to reduce the risk of every gland having to be reinstalled.

The results of all testing should be documented on a test certificate, and the completed certificate should be given to the chief electrical engineer responsible for the site.

8.2 Inspection and testing after installation

8.2.1 *Visual inspection*

The following checks should be made.

— Check that the gland used is the type specified for the installation, by checking the identification marking on the gland.

— Check that the gland used is the correct type for the application, by reference to its classification in the manufacturer's literature. In particular check that the cable used is within the size range for which the gland is stated to be suitable.

— Check that the gland has been installed in accordance with the manufacturer's instructions. In particular check that any special instructions relating to the system for protective connection to earth have been correctly followed, and that no parts have been omitted.

— Check that any required accessories have been installed in accordance with the manufacturer's instructions, or as found necessary, for example if the enclosure face is not flat.

— For cable glands, check that the outer seal is in full contact with the outer sheath of the cable.

— Where applicable, check that any cable cleat or other support is in place and effective.

8.2.2 *Mechanical inspection*

The following checks should be made.

— Where applicable, check that the threaded entry component of the gland has been screwed tightly enough into the enclosure to ensure that (in the opinion of the inspector) it will seal properly, but not so tightly as to damage to the enclosure (see **6.3.3**).

— Check that each part of the gland (and accessories, if any) have been assembled with the correct torque, as specified by the manufacturer or supplier (see **6.3.3**). Check this by removing a sample gland using a torque wrench, or by checking that no parts can be loosened by hand.

— Check that any locking devices have been fitted in accordance with **6.3.1** and **6.6.1**.

8.2.3 *Electrical tests*

BS 7671:2001, Chapter 71 specifies electrical testing of installations. Glands should be included in the following tests.

a) Glands with particular electrical properties selected in accordance with **5.5.1**, **5.5.2** or **5.5.3**, and their accessories, should be included in the following tests:

1) a test for continuity of protective conductors as specified in BS 7671:2001, **713-02**; and

2) where applicable, an earth fault loop impedance test as specified in BS 7671:2001, **713-11**; and

3) where applicable, a prospective fault current test as specified in BS 7671:2001, **713-12**.

b) Glands with particular electrical properties selected in accordance with **5.5.4**, and their accessories, should be included in the following tests:

1) an insulation resistance test as specified in BS 7671:2001, **713-04**; and

2) where applicable, a site applied insulation test as specified in BS 7671:2001, **713-05**; and

3) where applicable, an insulation of non-conducting floors and walls test as specified in BS 7671:2001, **713-08-02**.

8.3 Routine inspection

When periodic inspection and testing in accordance with BS 7671:2001, Chapter 73 is carried out the inspector should:

— check for any gland deterioration resulting from environmental conditions, in particular looking for signs of corrosion on external surfaces, signs of rusty water running from inside a gland, or water retention inside a shroud;

— check the gland for any mechanical damage which might impair the structural integrity or performance of the gland.

If any part of a gland is damaged or shows deterioration to the extent that, in the opinion of the inspector, its function might be impaired, the inspector should ensure that the whole gland is replaced.

Annex A (informative)
Cable glands and armour glands corresponding to the type designations given in BS 6121-1:1989

Descriptions of the cable glands and armour glands that correspond most closely to the type designations given in BS 6121-1:1989 are listed in Table A.1.

NOTE For details of glands corresponding to type designations given in previous editions of other parts of BS 6121 the gland manufacturer should be consulted.

Table A.1 — Cable glands and armour glands corresponding to the type designations given in BS 6121-1:1989

Type designation	Corresponding glands specified in BS EN 50262 and BS 6121-1:2005
A1	Basic cable gland with single seal
A2	Basic cable gland with seal giving an ingress protection rating of IP66
A3	As Type A1, but providing electrical bonding to layer(s) of the cable: specifically bonding to a metallic inner sheath
A4	As type A2, but providing electrical bonding to layer(s) of the cable: specifically bonding to a metallic inner sheath
B	Armour gland as specified in BS 6121-1:2005
C	Cable gland with seal to the outer cable sheath giving an ingress protection rating of IP66 and providing cable retention for armoured cable
D1	Cable gland with seal to the inner cable sheath giving an ingress protection rating of IP66 and providing cable retention for armoured cable
D2	As type D1, but providing electrical bonding to layer(s) of the cable: specifically bonding to a metallic inner sheath
E1	Cable gland with seals to the inner and outer cable sheath giving an ingress protection rating of IP66 and providing cable retention for armoured cable
E2	As type E1, but providing electrical bonding to layer(s) of the cable: specifically bonding to a metallic inner sheath

Glands of types B, C, D1, D2, E1 and E2 were designed for use with armoured or wire braided cables and were identified by a suffix, added to the type designation, to indicate the type of cable for which the gland was designed. These suffixes were as follows:

— W: single steel wire armoured cable;
— X: wire braided cable;
— Y: aluminium strip armoured cable;
— Z: double steel tape armoured cable
— T: pliable wire armoured flexible cable.

If the gland was designed for more than one type of cable, all the relevant suffixes were used.

NOTE There is no distinction in BS EN 50262 or in BS 6121-1:2005 between different types of armour or braid.

Bibliography

BS EN 50281-1-2:1999 including Amendments 1:1999 and 2:2000, *Electrical apparatus for use in the presence of combustible dust — Part 1-2: Electrical apparatus protected by enclosures — Selection, installation and maintenance.*

BS EN 60079-14:2003, *Electrical apparatus for explosive gas atmospheres — Part 14: Electrical installations for hazardous areas (other than mines).*

BS EN 60423:1995, *Conduits for electrical purposes — Outside diameters of conduits for electrical installations and threads for conduits and fittings.*

BS EN 60529:1992 including Amendments 1:1993 and 2:2000, *Degrees of protection provided by enclosures (IP code).*

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