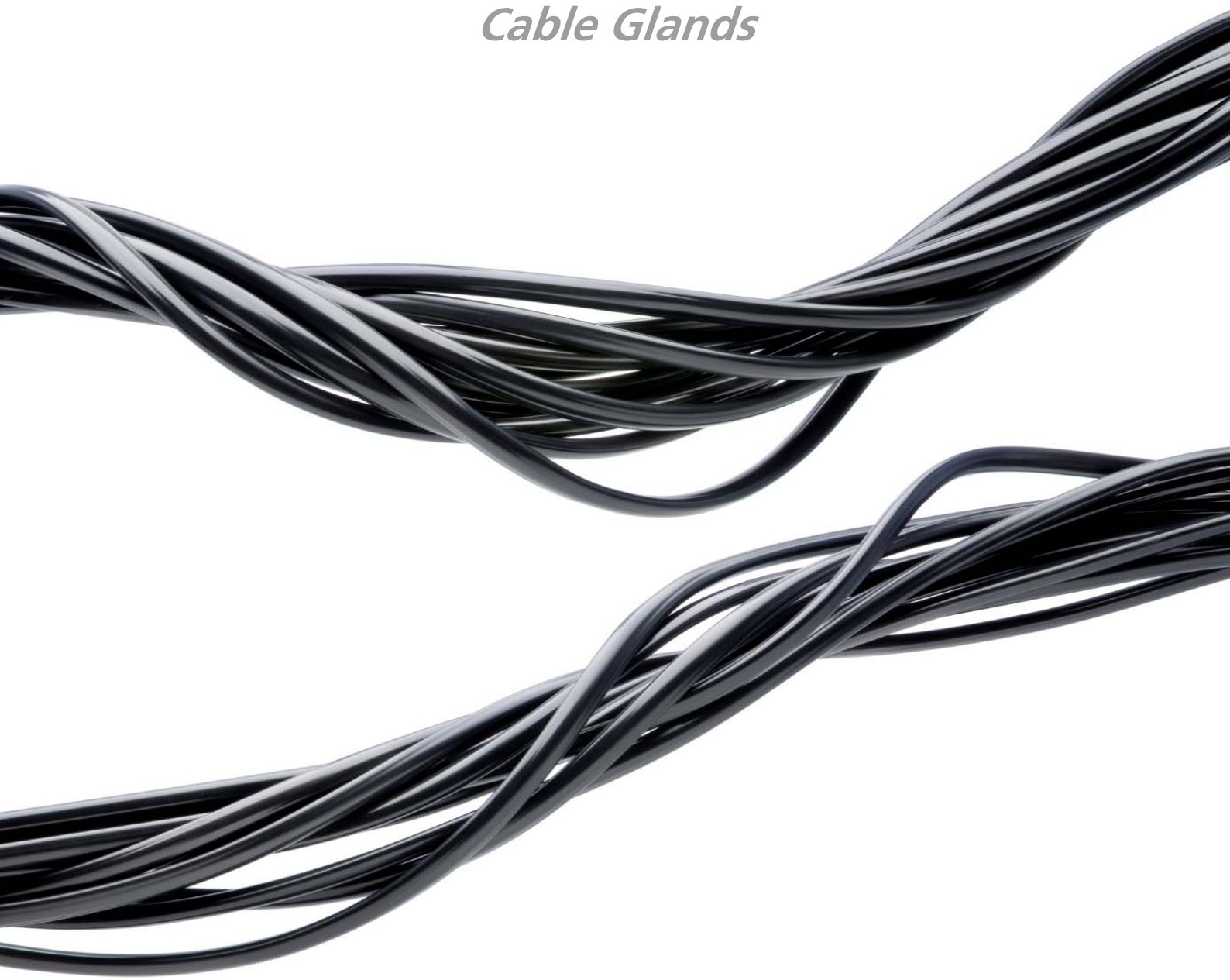
HazLoc Essential Guides:

Cable Glands



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Introduction

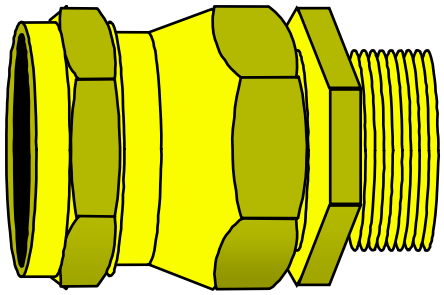
Cable glands are used to terminate electric cables to electrical equipment or electrical enclosures. For the majority of electrical installations cable glands are required to be fitted. The type of gland selected will be dependant on a number of factors:

a) Type of installation: domestic, commercial or industrial;
b) Indoor or outdoor environment;
c) Explosive atmosphere;
d) Corrosive atmosphere;
e) Cost

Cable glands are regarded as a low priority device and are often the last thing to be considered when purchasing equipment and cables. Cable glands are "critical safety" devices in the overall electrical system of a plant or installation. The importance of using and selecting the correct cable gland type should not be overlooked. There are various types of cable glands from the simple 'A' type gland right through to the compound barrier gland.

This booklet is intended as a guide to the end user (the electrician) to help in understanding the different types of cable glands available and when to select one type of gland rather than another type.

Fig 1: Standard industrial cable gland

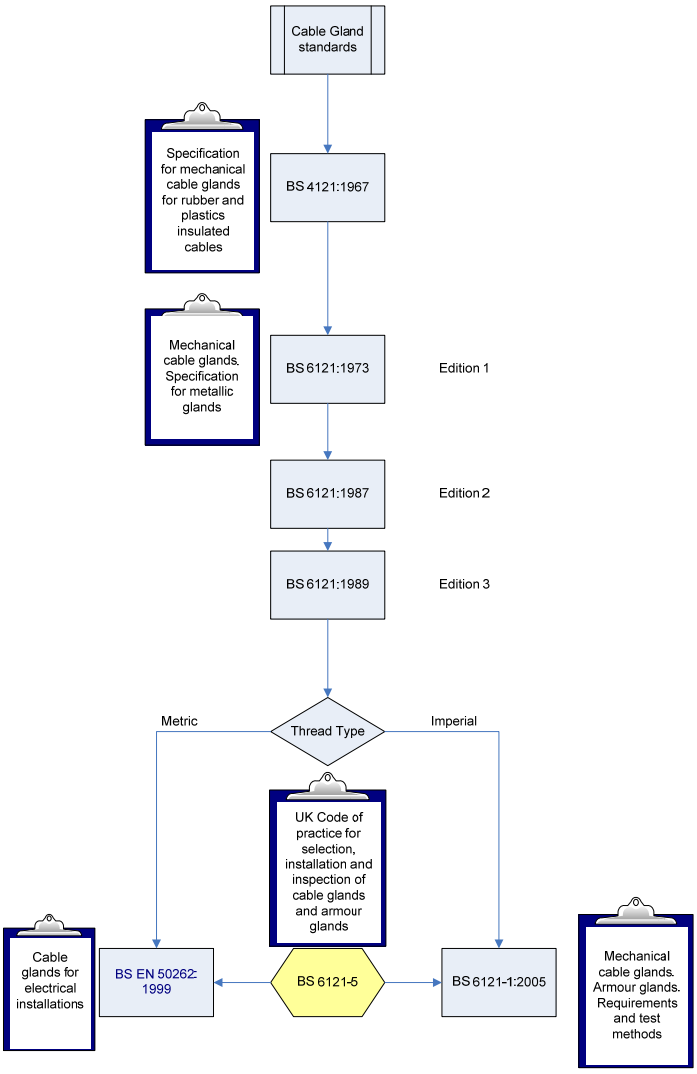


Cable glands are designed to be used on armoured or non-armoured cables.

It must be emphasised that it does not matter what type of gland is used or how much it costs, the gland must always be fitted in accordance with the gland manufacturers' instructions.

Legislation

Cable glands are designed, manufactured and tested to meet the stringent standards laid down by British, European and international standards. The flow chart shown below shows the standards used in the UK over the last forty years.



The European Standard EN 50262 for metric cable glands was published in September 1998. As a result the previous UK national standard BS 6121 for mechanical cable glands was withdrawn. EN 50262 was published in the UK as BS EN 50262 in March 1999.

The latest edition of BS 6121 part 1- mechanical cable glands. Armour glands. Requirements and test methods and part 5 - code of practice for selection, installation and inspection of cable glands and armour glands was published in 2005.

Cable Types

For cable types refer to booklet entitled "Cable used in potentially explosive atmospheres".

Types of Cable Glands

BS 6121 specified requirements for the design and construction of cable glands and gave type designations to glands.

The following designations are sometimes used by cable gland manufacturers in their product codes. The basic designations of the glands where as follows:

- Type A1. For unarmoured cable with an elastomeric or plastic outer sheath, where the function of the gland is to secure the outer sheath of the cable.
- Type A2. As type A1, but with an IP66 seal between the outer sheath and gland.
- Type A3. As type A1, but with an electrical bond for the metallic inner sheath.
- Type A4. As type A2, but with an electrical bond for the metallic inner sheath.
- Type B. For armoured or wire braid cable, where the function of the gland is to secure the armour or metallic braid and to provide electrical continuity between such armour or braid and the threaded fixing component of the gland.
- Type C. For armoured or wire braid cable with elastomeric or plastic outer sheath. As type B, but with an IP66 seal between outer sheath and gland.
- Type D1. For armoured or wire braid cable with elastomeric or plastic outer sheath. As type B, but with an IP66 seal between inner sheath and threaded fixing component.
- Type D2. As type D1, but with an electrical bond for the metallic inner sheath.
- Type E1. For armoured or wire braid cable with an extruded elastomeric or plastics inner sheath and elastomeric or plastics outer sheath. As type C, but with an IP66 seal between inner sheath and gland and between the inner sheath and threaded fixing component.
- Type E2. As type E1, but with an electrical bond for the metallic inner sheath.

Glands of type B, C, D1, E1 and E2 suitable for armoured or wire braided types of protection shall be identified by a suffix, added to the designation, to indicate the type of protection for which the gland is suitable. The suffix for each type of protection shall be as follows.

Single wire armoured	W
Pliable wire armoured flexible	T
Wire braided	X
Aluminium strip armoured	Y
Double steel tape armoured	Z

If a gland is suitable for more than one type of protection, all of the relevant suffixes are used.

Note: The following is an example of type designations

> Type CW. A gland for armoured cable with an IP66 seal between outer sheath and gland, for single wire armoured cable.

Gland Sizes

There are numerous sizes of glands. Refer to cable gland manufacturers' literature for full details.

Marking

All glands shall be marked in accordance with the appropriate standards. An appropriate part of the gland shall be legibly and permanently marked with the following particulars:

a) the number of this standard, i.e. BS EN 50262

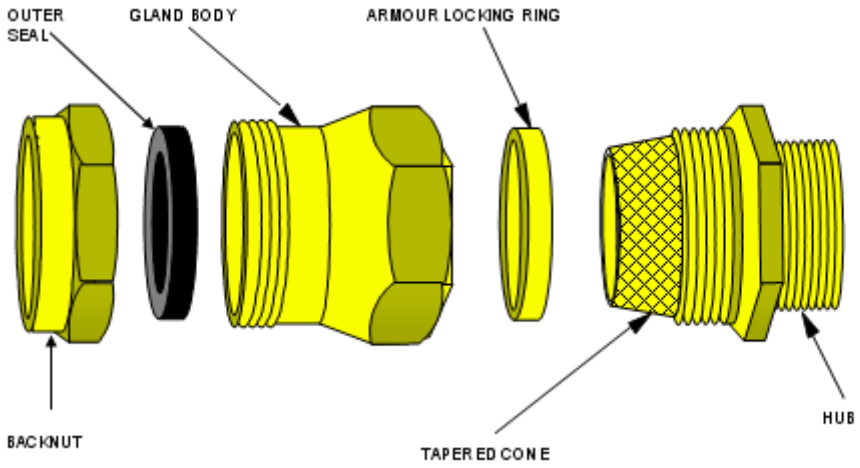
b) the size designation of the gland

c) Whenever possible, the type of the gland and the appropriate suffix.

Construction

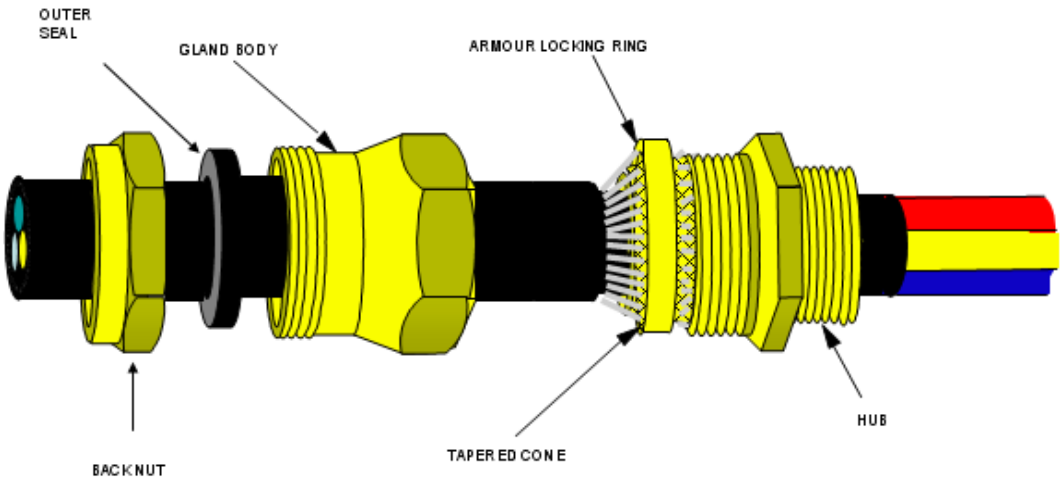
Cable glands for armoured or braided cables generally have an armour-locking ring refer to figure 2 with the exception of the B type gland. Refer to figure 4.

Fig 2: Armoured cable gland



The length of the thread on the hub is dependant on the size of the cable gland e.g. a gland size of 20 the hub length is approximately 16mm whilst for a larger cable gland size 90 then the hub thread length is 25mm.

Fig 3: Steel wired armoured cable plus gland

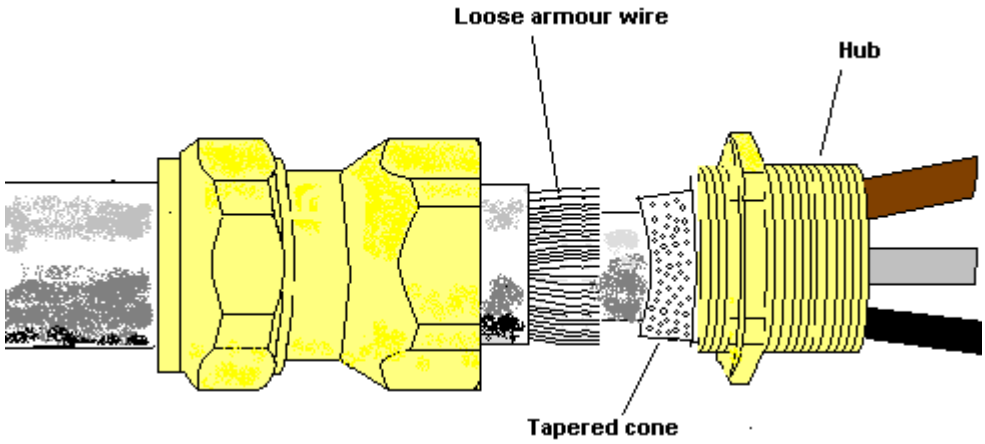


The armour wires are trapped between a locking ring and the armour cone of the threaded fixing component by the action of screwing the gland body to the hub.

This ring will continue to trap the armour wires even if the gland body became loose through heat cycling, vibration or during maintenance.

The earth continuity can be visually inspected and electrically tested after installation. This is not possible to do with the two-part gland because of the absence of the locking ring. See figure 4. If the gland body is slackened off the earth continuity has gone and there is nothing to inspect.

Figure 4: Two Part Gland (C Type)



Outdoor cable glands contain either one seal or two seals. As the cable gland is tightened it compresses the seal, which grips the cable. The seals have been tested to IP66 and meet the requirements of the standard.

Gland Selection Guide

The following list should be used to ensure that the cable gland selected is correct:

- Select the type of cable and identify the correct gland type
- Check the type, size and voltage rating of the cable.
- Check ACTUAL size of cable over the inner sheath.
- Check ACTUAL size of overall cable diameter.
- Check the size and type of armour or braiding, if any.
- Check any special environment conditions including enclosure material in relation to corrosion.
- Check whether installation is in Hazardous Areas, and consider seal protection for indoor/outdoor use.
- Check that an entry thread seal is required for IP66 conditions.
- Check accessories, (i.e. Shrouds, slip on earth tags, locknuts etc).

IP Rating

To maintain IP66 between the equipment and the cable gland, the use of a nylon entry seal is recommended. Refer to section on sealing washers. A threaded joint sealed with a suitable setting compound will maintain IP66. Care should be taken however, to preserve any electrical continuity requirement. With this in mind, glands in conjunction with good quality enclosures (at least 6mm thick) shall maintain an IP rating of IP54 without any additional sealing.

Earthing

Electrical continuity is normally achieved via the screwed entry into metal boxes.

Whenever there is a clearance hole entry situation it is essential to obtain direct metal-to-metal contact between the glands, and therefore an earth tag is used between the gland and the enclosure. For situations where there is a requirement for positive earthing due to high potential currents, the use of armouring alone as the only earthing is not recommended, a range of integral earth glands are available. Insulated adaptors are available for installations where it is necessary to avoid connection between the cable armour/braid and earth at one end of the route, e.g. the break in the earth loop that can otherwise generate spurious signals.

Corrosion

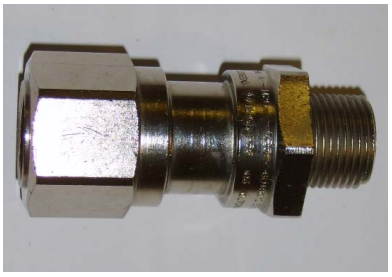
The standard material used in gland manufacture in the UK is brass; the majority of other countries tend to go for nickel chromium or in special conditions stainless steel. Brass and nickel chromium is suitable for the majority of applications. However, certain environments, notably ammonia and derivatives can cause severe corrosion problem for cable glands.

Due to the possibility of bi-metallic corrosion and electrolytic action, especially in moist atmospheres, it is advisable to avoid the contact of dissimilar metals where possible.

Brass glands installed in plants or outside areas (moist conditions) should be fitted with brass locknuts.

Nickel Chromium/Stainless Steel Glands

Resistant to alkalis, like caustic and potash; to salt solution and brines, like seawater; to acid gas environments, like those found in the petro-chemical industry. The glands also have good resistance to ammonia solutions; organic acids, like lactic or acetic, like hydrochloric or sulphuric.



Gland Types

Cable Glands 'A' Type

'A' type glands more commonly known as 'stuffing' glands. There are two types of 'A' gland. A1 and A2, A1 is retained on the cable whilst the 'A2' gland seals and retains on the cable.

Suitable for unarmoured, plastic or rubber sheathed cables.

- Indoor and outdoor applications.
- For unarmoured, plastic or rubber sheathed cables.
- Suitable for most indoor and outdoor applications.
- Plastic or brass
- Seal rated to IP66 (A2 version)

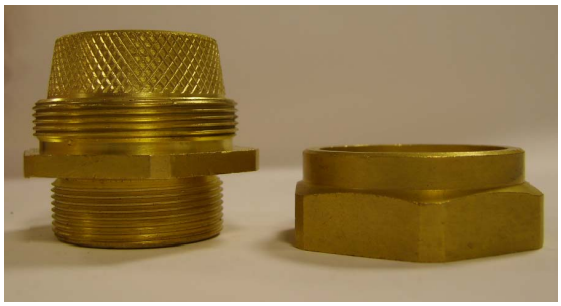
A1 Cable Gland - A1 cable gland, Plastic only (IP4X) non-certified version only.

A2 Cable Gland - 'A2' cable gland, Plastic and/or brass (IP66) non-certified and certified versions available.

Cable Glands ‘B’ Type

Suitable for single wire armoured, plastic or rubber sheathed cables.

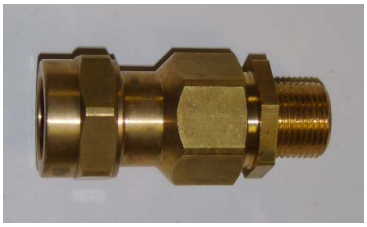
- Application - for use in dry, indoor situations only.
- Brass only
- IP30



Cable Glands ‘C’ Type

Suitable for cables that are:

- Plastic or rubber sheathed
- Extruded or lapped bedded
- Armoured or braided
- Outer seal grips sheath of cable
- Seal rated to IP66
- For use in most climatic conditions weatherproof and waterproof.
- Brass or Stainless steel
- Design has separate armour locking ring.



Cable Glands ‘E’ Type

Suitable for cables that are:

- Plastic or rubber sheathed
- Extruded or lapped bedded
- Armoured or braided
- Outer seal grips sheath of cable
- Inner seal grips bedding layer of cable
- Inner and outer seal rated to IP66
- For use in most climatic conditions weatherproof and waterproof.
- Brass or Stainless steel
- Design has separate armour locking ring.

Electrolytic Action

There maybe in some cases electrolytic action between two dissimilar metals e.g. gland and enclosure if incompatible materials are selected. This can shorten the lifetime of the gland and the enclosure

Gland Kits

Advantage: convenient, ready to use.

Shrouds

For fitting over cable glands where additional protection against onerous weather conditions and corrosion is required. Three types of shrouds available:

- PCP: used in most hostile conditions and cannot be effected by ultraviolet rays contained in sunlight.
- PVC: for fast and simple installation.
- LSF: Low smoke and fume

Cable gland shrouds can be used where additional protection against environmental conditions is required. Great care should be taken to ensure that the shroud is a snug fit over the cable gland and where necessary the shroud should trimmed to suit the cable diameter.

Locknuts

There are five types of locknuts available, these are:

- Mild steel;
- Stainless steel;
- Brass;
- Aluminium;
- Plastic;

Each type has its advantages and disadvantages.

Brass locknuts are recommended for most outdoor industrial applications. For corrosive environments, stainless steel locknuts may be the preferred option.

Aluminium locknuts should only be used with aluminium glands.

Cable glands fitted into clearance hole should be secured by a locking device e.g. locknut, inside the apparatus which is capable of meeting the gland torque requirements. Where a lock nut is the sole means of providing earth continuity to the equipment, it should be brass or mild steel.

Contacts

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Peter started work with the National Coal Board (British Coal) in 1970 as an indentured apprentice electrician. Following a 4-year apprenticeship he worked as a mine craft electrician, and then after further additional studies, became a supervisory electrician and finally qualified as an Electrical Engineer for the mines. In 1987 he moved from the coal mines to the chemical industry and was employed as an Electrical Technician and ultimately becoming the electrical inspector for the 150 Acre site with responsibility for the electrical infrastructure both for the non-hazardous and hazardous areas associated with a top tie COMAH site.

Over his many years in the industry, Peter has worked on all types of electrical equipment both hazardous and non-hazardous and on a wide range of voltages from 7.5v dc up to and including 11000 volts. After 15 years in the chemical industry he joined Epsilon, which has recently become part of Intertek. He is now one of the Principal Engineers associated with the site services department with responsibility for on-site work at locations throughout the world. Peter is also involved as Lecturer/Trainer/Assessor for the UK's national recognised CompEx Training scheme.

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