

# CABLE GLAND SELECTION FOR HAZARDOUS AREA INSTALLATIONS

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- Cable type / Cable gland type
- Hazardous Area Protection Method
  - When to use a barrier gland
- Environmental Conditions
- Installation / Inspection Considerations

# CABLE & CABLE GLAND TYPES

# CABLE TYPE

Unarmoured



W – Single wire armour SWA



Aluminium wire armour AWA

X – Braid



T – Pliable wire armour



Y – Aluminium strip armour

Z – Double steel tape armour

# CABLE GLAND TYPE

A – Single seal only

B – Armour clamp only

C – Armour clamp and seal on outer sheath

D – Armour clamp and seal on inner sheath

E – Armour clamp and seal on inner and outer sheath

BARRIER GLANDS



# EACH CABLE GLAND TYPE HAS SUB-SETS

e.g.

E1 = E type with IP66 seals on inner and outer sheath

E2 = As E1 but with an electrical bond for a metallic inner sheath (e.g. lead sheathed cable)

Cable glands are often named to describe their function, e.g. E1FX

E1FW, etc.

# CABLE GLAND SIZE

The cable gland size must be selected to match the cable size.

IEC 60079-14:10.2 Selection of cable glands  
The cable gland shall be selected to match the cable diameter. The use of sealing tape, heat shrink tube or other materials is not permitted to make the cable fit to the cable gland.

# EXPLOSION PROTECTION METHOD



# EXPLOSION PROTECTION METHOD

Ex d / Ex e / Ex nR

The protection method **MUST** meet or exceed the protection level of the equipment that the cable gland is connected to.

This is a requirement of IEC 60079-14: clause 10.2

# EXTRACT FROM TABLE 10 OF IEC 60079-14

Protection technique for the equipment	Cable gland protection technique		
	Ex d	Ex e	Ex nR
Ex d	X		
Ex e	X	X	
Ex nR	X	X	X
Ex i Group II	X	X	X
Ex p	X	X	X

# WHEN TO USE A BARRIER GLAND

Barrier glands are always certified Ex d, but can be used in an Ex e environment.

How do you know when to use them?

# WHEN TO USE A BARRIER GLAND – Ex d

A Barrier gland **MUST** be used in an Ex d environment unless the cables:-

Are circular and compact

Have an extruded bedding or sheath

Use non-hygroscopic fillers.

# WHEN A BARRIER GLAND MUST BE USED— Ex d



Unsuitable fillers



Cable is not round

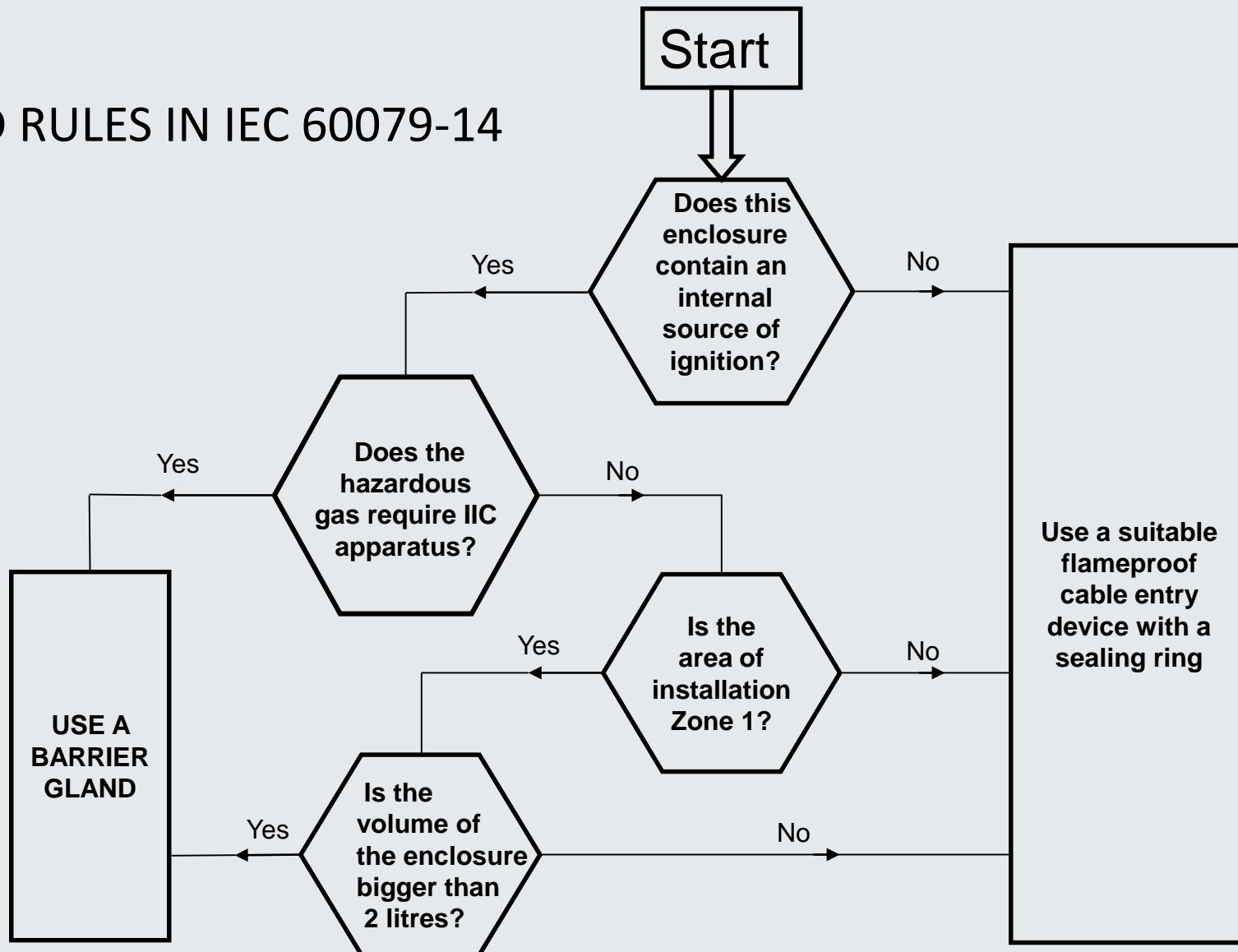


No inner sheath



# WHEN TO USE A BARRIER GLAND – Ex d

OLD RULES IN IEC 60079-14



# WHEN TO USE A BARRIER GLAND – Ex d (new rules)

The cable entry system shall comply with one of the following:

- a) Cable glands sealed with setting compound (barrier cable glands)
- b) Cables and glands meeting all of the following:
  - cable glands comply with IEC 60079-1 and are certified as equipment
  - cables used comply with 9.3.2(a)
  - the connected cable is at least 3 m in length;
- c) indirect cable entry using combination of flameproof enclosure with a bushing and increased safety terminal box;
- d) mineral-insulated metal-sheathed cable with or without plastic outer covering with appropriate flameproof cable gland complying with IEC 60079-1;
- e) flameproof sealing device (for example a sealing chamber) specified in the equipment documentation or complying with IEC 60079-1 and employing a cable gland appropriate to the cables used. The sealing device shall incorporate compound or other appropriate seals which permit stopping around individual cores. The sealing device shall be fitted at the point of entry of cables to the equipment.

# WHEN TO USE A BARRIER GLAND – Ex d (new rules)

The cable entry system shall comply with **one** of the following:

a) Cable glands sealed with setting compound (barrier cable glands)

b) Cables and glands meeting **all** of the following:

- cable glands comply with IEC 60079-1

- cables used comply with 9.3.2(a)

(They shall be circular and compact. Any bedding or sheath shall be extruded. Fillers, if any, shall be non- Hygroscopic)

- the connected cable is at least 3 m in length

# WHEN TO USE A BARRIER GLAND – Ex d (new rules)

The HSE in the UK has issued a bulletin stating that installations to the 'new rules' may not be safe and has suggested that the old flowchart is used.

If in doubt **USE A BARRIER GLAND**

# WHEN TO USE A BARRIER GLAND – Ex e / Ex nR

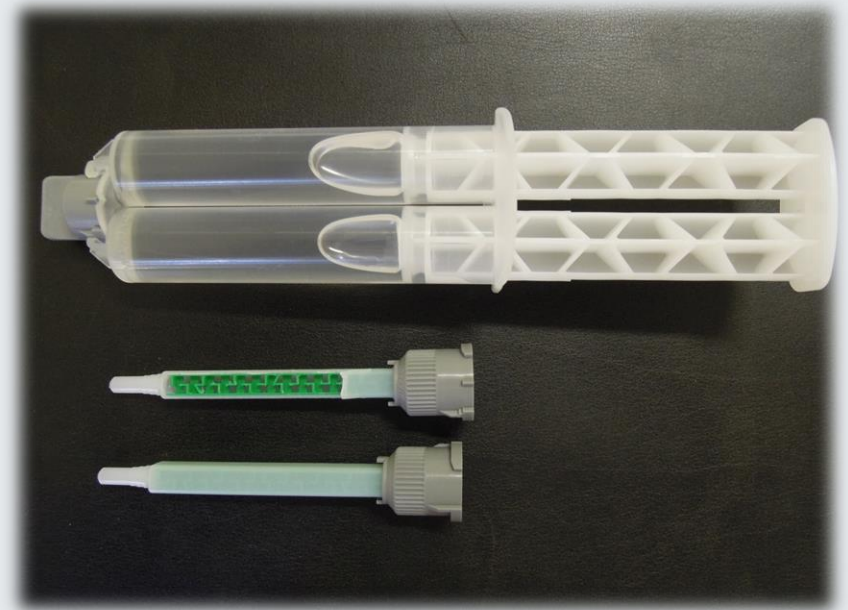
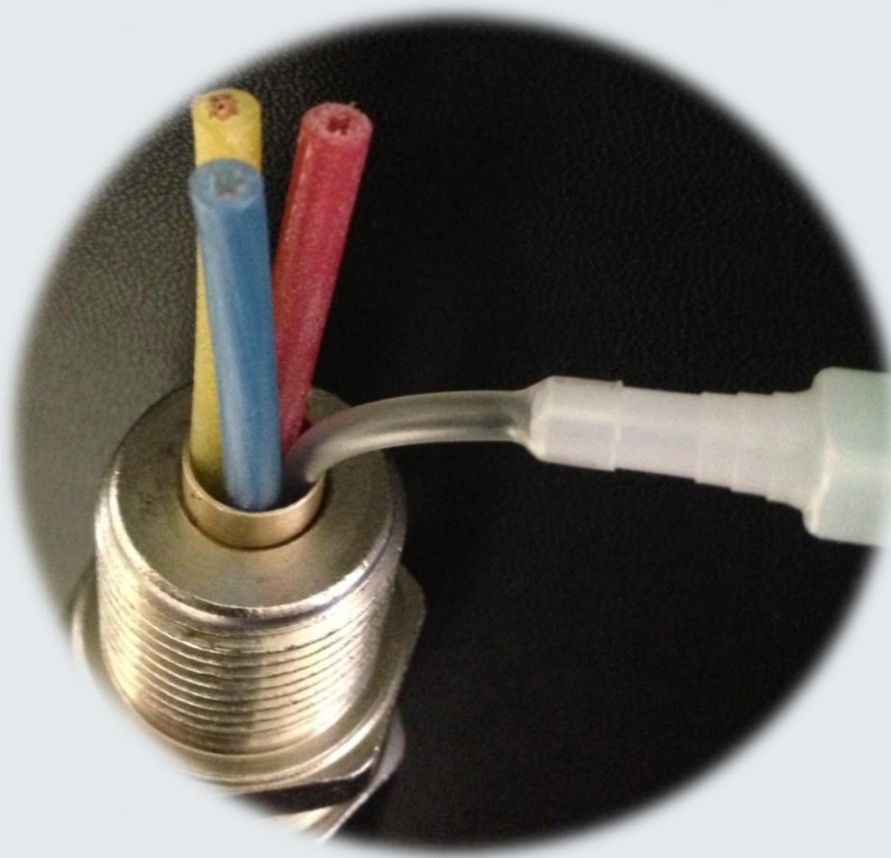
Barrier glands should also be used:-

- In Ex e applications when there is a risk of gas migrating down a cable.  
(IEC Ex 60079-14 clause 9.3.2)
- In Ex nR applications where the cable is not sealed.  
(IEC Ex 60079-14 clause 10.8)



# USE A BARRIER GLAND

Modern 'liquid resin' barrier glands are easy to install



# ENVIRONMENTAL CONDITIONS

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- TEMPERATURE
- INGRESS PROTECTION (IP)
- DISSIMILAR METALS
- CORROSIVE ENVIRONMENTS

# TEMPERATURE

- Cable glands do not have a 'T' rating.
- Under existing IEC Ex rules, the temperature rating of a cable gland does not have to include the thread sealing gasket.
- Responsible cable gland manufacturers test and certify their cable glands and sealing gaskets together.



# INGRESS PROTECTION

A sealing gasket may be needed to maintain the IP rating of the assembly.

(IEC Ex 60079-14 clause 10.2)

Check that the thread sealing washer has been tested with the cable gland as part of the certification process. (The IP rating will be shown on the IEC Ex certificate.)



# DISSIMILAR METALS / BI-METALLIC CORROSION

- Ideally the cable gland should be made of the same material as the equipment **and the cable armour** it is connected to.
- For most equipment electroless nickel plated brass is the best option.

# DISSIMILAR METALS / BI-METALLIC CORROSION



Brass gland fitted to  
an aluminium  
enclosure



Superior Marine  
grade nickel plated  
brass gland fitted to  
an aluminium  
enclosure.

# CORROSIVE ENVIRONMENTS

Corrosive environments may typically include:-

Salt / salty water

SO<sub>2</sub>

NH<sub>3</sub>

Etc.



# CORROSIVE ENVIRONMENTS

For many corrosive environments a good quality nickel plated brass cable gland is the best choice.

Not all plating is equal.

Specify at least 10 microns of plating thickness.

(The rules on plating thickness changed with the 2014 edition of IEC 60079-1. Clause 5.1 now allows a thickness greater than 8 microns.)

# NOT ALL ELECTROLESS NICKEL PLATING IS EQUAL

BEFORE



AFTER SALT SPRAY TEST



~ 4 microns



~ 4 microns



~ 12 microns



# HIGHLY CORROSIVE ENVIRONMENTS

For highly corrosive environments the choices are either:-

- Stainless steel
- Specialist corrosion protected cable glands



# INSTALLATION & INSPECTION CRITERIA

## CHOOSE CABLE GLANDS THAT ARE:-

- EASY TO INSTALL
- DON'T HAVE PARTS THAT CAN GET MIXED UP
- DON'T HAVE LOOSE PARTS
- CAN BE INSPECTED EASILY