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Training – Cable Glands

Learning Objectives

Raise awareness of common types of cable glands, including correct selection, and installation

- Raise awareness of purpose and function
- Identify common types and their applications
- Explain the importance of correct selection
- Demonstrate correct installation techniques
- Provide an understanding of relevant standards
- Reinforce knowledge through recap and Question & Answers (Q&A)

Agenda

- Section 1: Introduction to Cable Glands
- Section 2: Material Choices, Ingress Protection Levels, and Accessories
- Section 3: Practical
- Section 4: Relevant British and European Standards
- Section 5: Recap and Q&A

We are the UK's longest-established cables distributor

70+

years

3,200+

SKUs in stock

Our wide range of cables and accessories are ready for immediate dispatch.

We can hold stock, ready for scheduled or just-in-time delivery.

Our vision is to be the Go-To Choice for cable solutions for our customers.

Section 1: Introduction to Cable Glands

In this section, we will explore the below:

- Purpose of cable glands
- Gland construction example
- Common glands for low-voltage (LV) armoured & screened Cable
- Origin of gland terminology
- Importance of selecting the right gland
- Overview of different cable types

Section 1: Purpose of Cable Glands

A device designed to permit the entry of a cable into an enclosure:

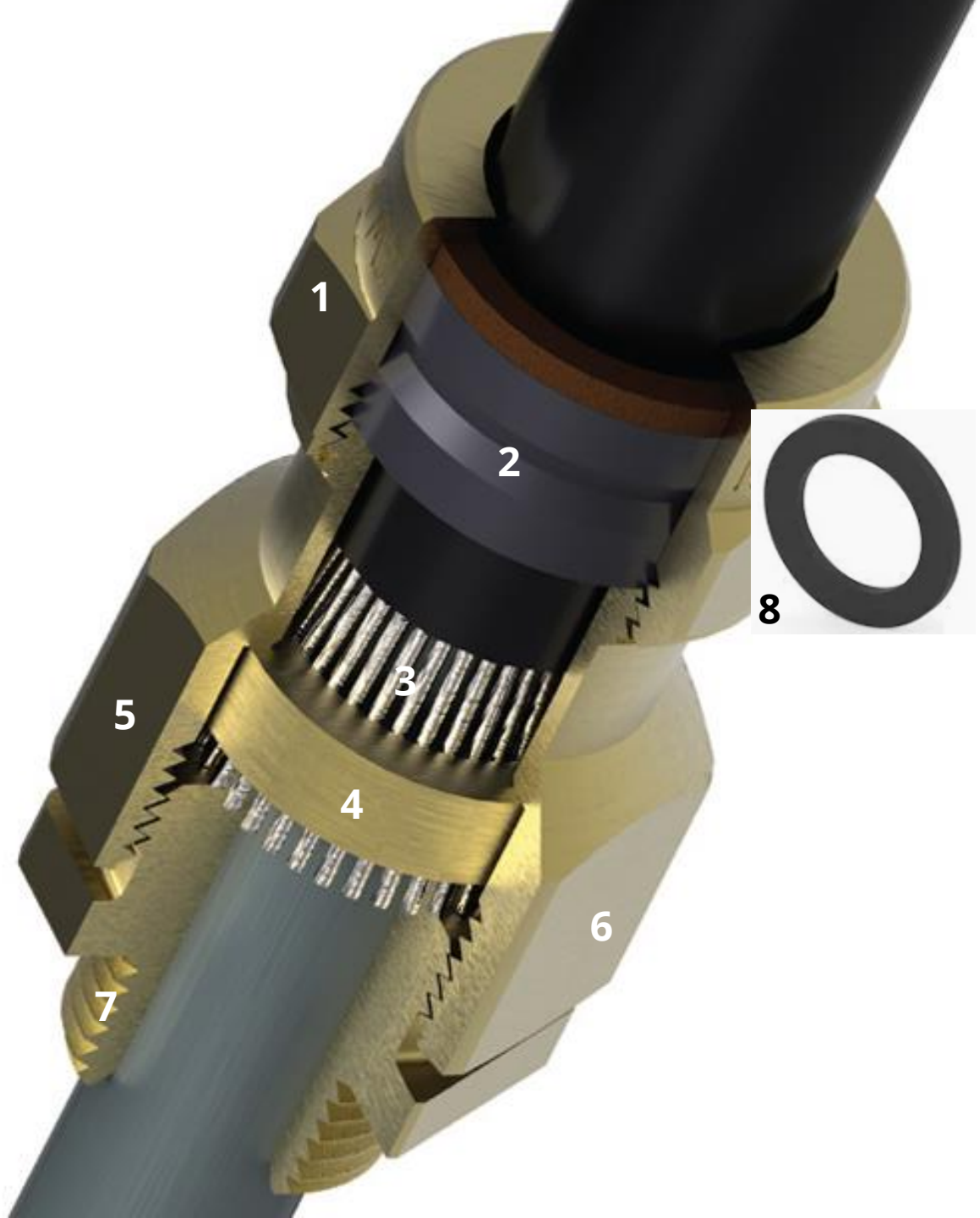
Depending on type & application it may also provide:

- Environment protection
- Earth continuity
- Holding force (pull out resistance)
- Additional sealing

Section 1: Gland Construction Example

This example is a CW gland

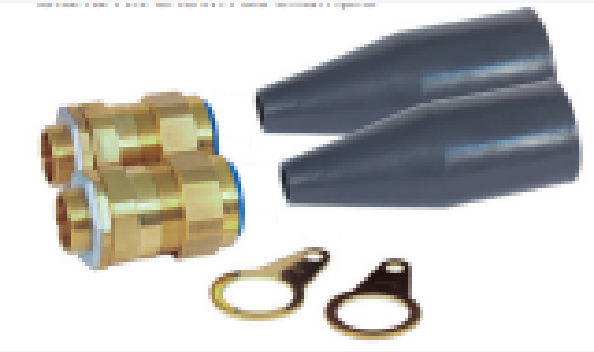
1. Sealing nut
2. Outer deal
3. Armour cone
4. Ring
5. Secondary nut
6. Outer seal
7. Thread entry
8. Additional seal on thread
   (normally purchased separately)



Section 1: Glands for LV Armoured & Screened Cable

BW Glands

- **B** – Armour clamp only
- **W** – Steel wire armoured (SWA) or aluminium wire armoured (AWA)
- IP2X
- Low Ingress Protection (IP) rating – Suitable for dry areas with minimal dust



E1W Glands

- **E** – Armour clamp and seal on inner and outer sheath
- **W** – SWA or AWA
- IP66*
- Higher IP rating – Suitable for dusty & wet environments

*If installed with an additional seal on the thread end

Section 1: Glands for LV Armoured & Screened Cable

CW Glands

- **C** – Armour clamp and seal on outer sheath
- **W** – SWA or AWA
- IP66*
- Higher IP rating – Suitable for dusty & wet environments

CXT Glands

- **C** – Armour clamp and seal on outer sheath
- **X** – Braid
- **T** – Pliable wire armour
- IP66*
- Higher IP rating – Suitable for dusty & wet environments

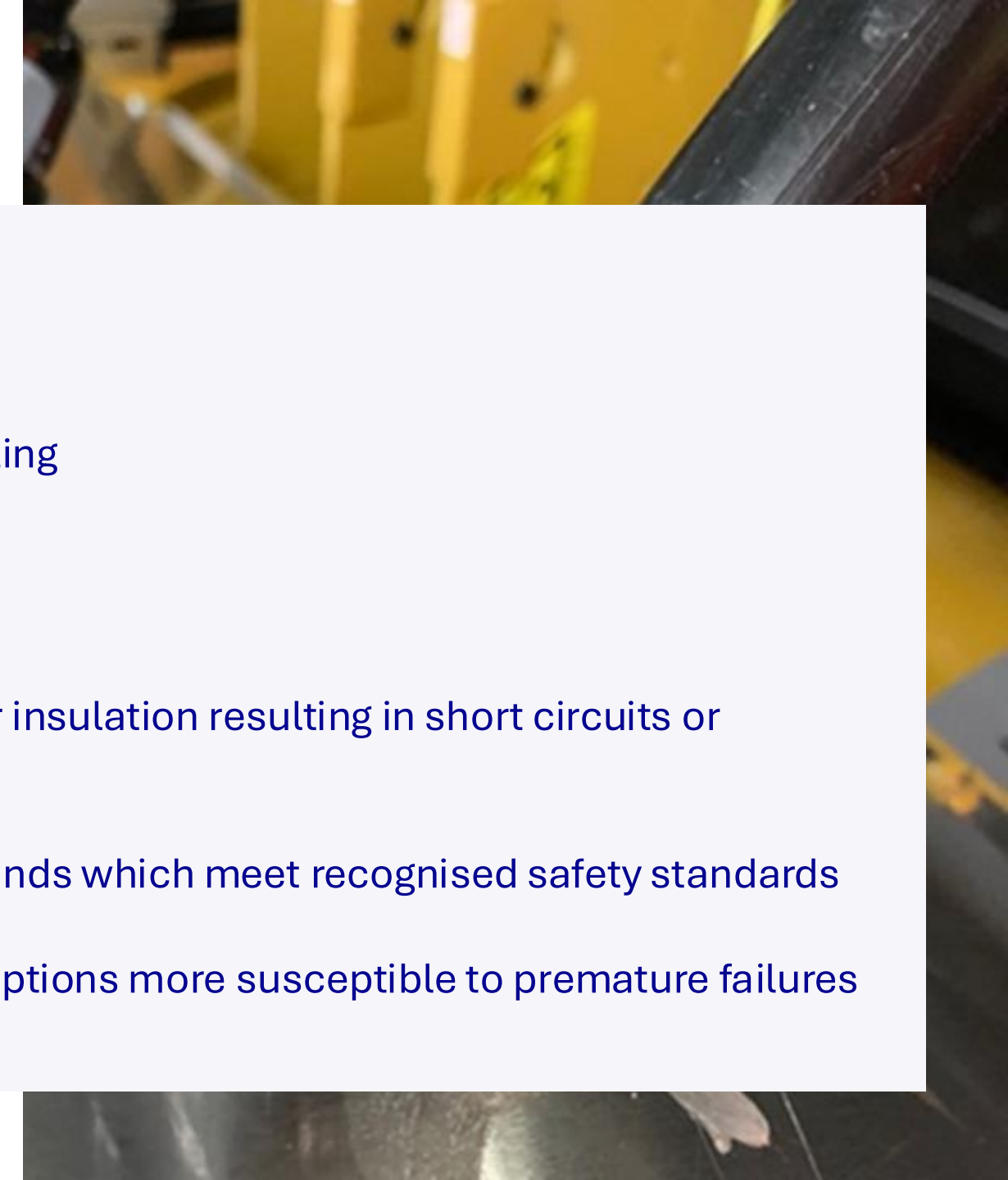
*If installed with an additional seal on the thread end

Section 1: Why are they called BW and CW glands?

They are “type designations” taken from BS 6121, Table A.1 to identify the gland type

W – SWA or AWA
X – Braid
T – Pliable wire armour
Y – Aluminium strip armour
Z – Double steel tape armour
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

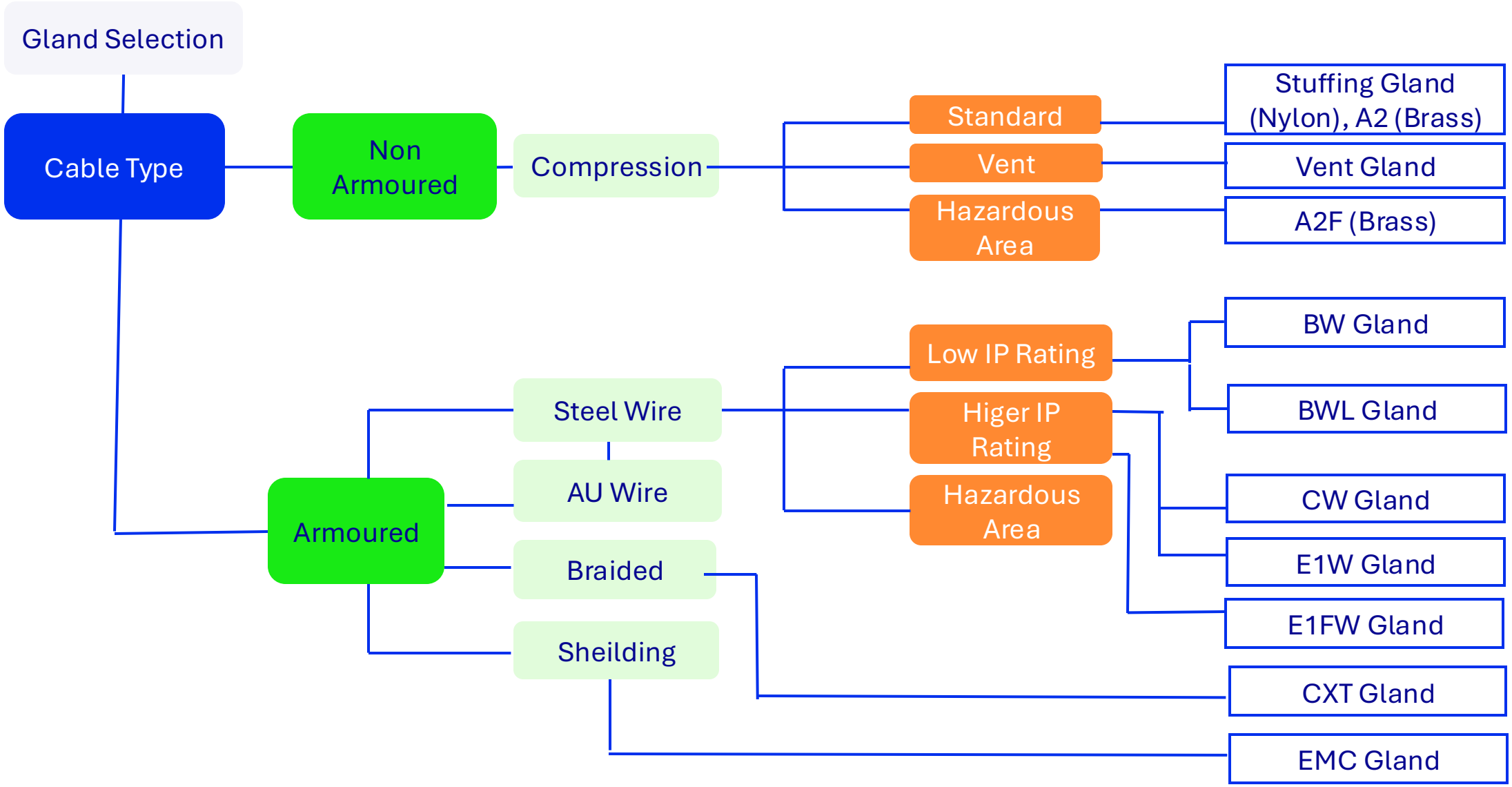
Section 1: Importance of Selecting The Right Gland



Correct selection can help prevent the following:

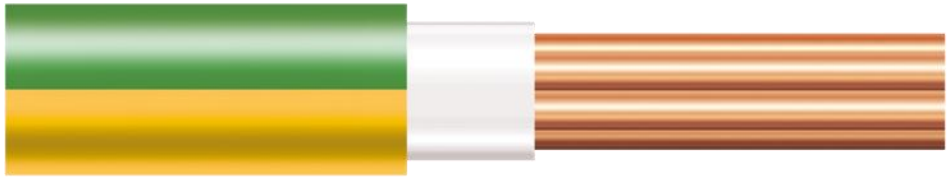
- **Cable damage** – Caused by incorrect gland sizing
- **Environmental exposure** – Due to inadequate IP rating
- **Electrical hazards** – Lack of proper earthing or insulation resulting in short circuits or electric shocks
- **Non-compliance Issues** – Failure to select glands which meet recognised safety standards
- **Increased maintenance costs –** Low quality options more susceptible to premature failures

Section 1: Importance of Selecting the Right Gland

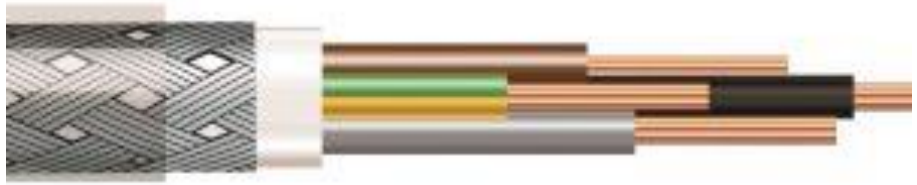


Section 1: Overview of Different Cable Types

Armoured



Unarmoured

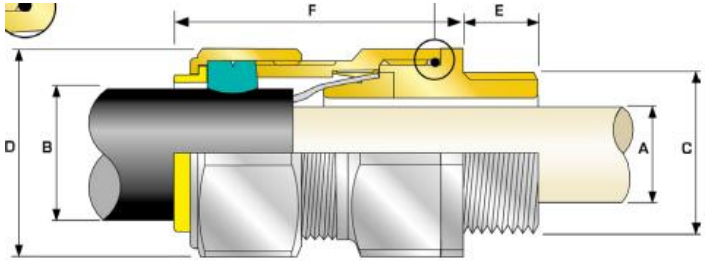


Braided/Screened

Section 1: Considerations for Correct Gland Sizing

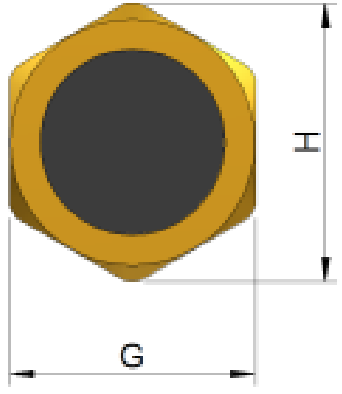
Cable outer diameter (OD) – These can differ across manufacturers!

- Consult cable MFR's datasheet
- If possible, measure the physical cable



Match the cables OD to the selected glands clamping range – These can also differ across gland manufacturers.

- Consult gland MFR's datasheet
- See "B" measurement on datasheeet



H = Across Corners (AC)
G = Across Flats (AF)

If possible, source cable and glands from the same supplier.

Section 1: Considerations for Correct Gland Sizing

ENTRY THREAD 'C'	THREAD LENGTH (METRIC) 'E'	CABLE BEDDING DIAMETER 'A'	OVERALL CABLE DIAMETER 'B'		ARMOUR RANGE		ACROSS FLATS 'D'	ACROSS CORNERS 'D'
		MAX	MIN	MAX	MIN	MAX	MAX	MAX
M20	10.0	8.7	6.1	13.1	0.8	1.25	24.0	26.4
M20	10.0	11.7	9.5	15.9	0.8	1.25	24.0	26.4
M20	10.0	14.0	12.5	20.9	0.8	1.25	30.5	33.6
M25	10.0	20.0	18.2	26.2	1.25	1.6	37.5	41.3
M32	10.0	26.3	23.7	33.9	1.6	2.0	46.0	50.6
M40	15.0	32.2	27.9	40.4	1.6	2.0	55.0	60.5
M50	15.0	38.2	35.2	46.7	2.0	2.5	60.0	66.0
M50	15.0	44.1	40.4	53.0	2.0	2.5	70.1	77.1
M63	15.0	50.0	45.6	59.4	2.0	2.5	75.0	82.5
M63	15.0	56.0	54.6	65.8	2.0	2.5	80.0	88.0
M75	15.0	62.0	59.0	72.0	2.0	2.5	90.0	99.0
M75	15.0	64.2	66.7	78.4	2.5	3.0	100.0	110.0

Section 2: Material Choices, Ingress Protection Levels, and Accessories

In this section, we will explore the below:

- Plastic vs. metal
- Application examples
- IP ratings explained
- Accessories (shrouds, seals, earth tags & locknuts)

Section 2: Plastic vs. Metallic

Plastic (Nylon):

- Lightweight
- Cost effective
- Non-conductive
- Resistant to UV & chemicals
- Lowest thermal resistance

Metallic (Brass, Nikel Plated Brass (NPB), Stainless Steel (SS)):

- Strong
- Durable
- Corrosion-resistant
- Provides earthing/ electromagnetic interference (EMI)
- Higher thermal resistance

Section 2: Plastic vs. Metallic

Plastic (Nylon):

- Lightweight
- chemicals
- Lowest thermal resistance

Metallic (Brass, NPB, SS):

- earthing/EMI
- Higher thermal resistance

Key Difference

Metallic glands offer superior strength and conductivity, while nylon is lighter and more resistant to chemicals

Section 2: Application Examples

What does IP mean?

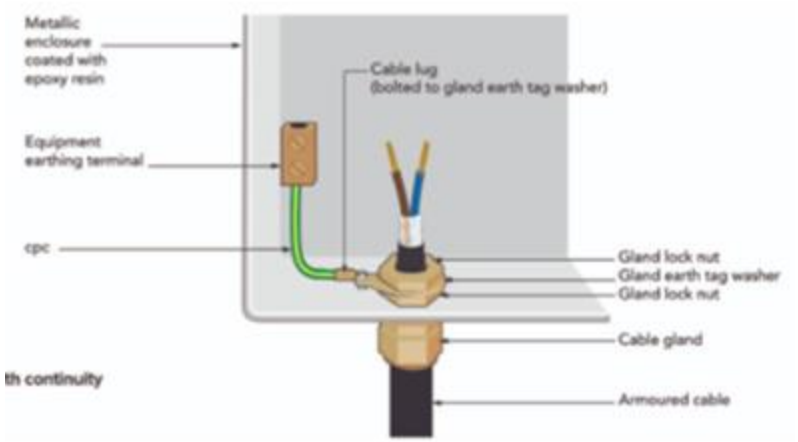
Ingress Protection

What level is right for my application? The relevant glands IP rating is tested using the method defined in IEC 60529

Section 2: IP Ratings Explained

IP Code	1st Digit: Solids Protection	2nd Digit: Liquids Protection	Typical Use for Cable Glands
0	No protection	No protection	—
1	≥50 mm objects (e.g. hand)	Dripping water	Indoor, non-wet areas
2	≥12 mm objects (e.g. finger)	Dripping water ≤15° tilt	Light-duty enclosures
3	≥2.5 mm tools/wires	Spraying water up to 60°	Outdoor awnings, splash zones
4	≥1 mm wires	Splashing water	General outdoor use
5	Dust-protected (limited ingress)	Water jets	Most industrial glands
6	Dust-tight (no ingress)	Powerful water jets	Harsh/wash-down environments
7	—	Immersion up to 1 m (30 min)	Temporary submersion
8	—	Continuous immersion (>1 m)	Permanent underwater use
9K	—	High-pressure, high-temperature wash-down	Sanitary/high-pressure cleaning

Section 2: Accessories – Earth Tags & Locknuts



Earth Tags

- Used on armoured cables
- Ensures a reliable connection between the cables metal armour and the systems earth
- Provides low resistance path for earth currents
- Reduces the risk of electric shock

Section 2: Accessories – Earth Tags & Locknuts

Locknuts

- Secure the gland to the equipment
- Available in brass, nylon and stainless steel
- Serrated options available

Section 2: Accessories – Shrouds and Seals

- Shroud Improves aesthetics
- Shrouds provide limited environmental protection
- Both available in: PVC, LSF or LSZH
- Seals used for ingress protection

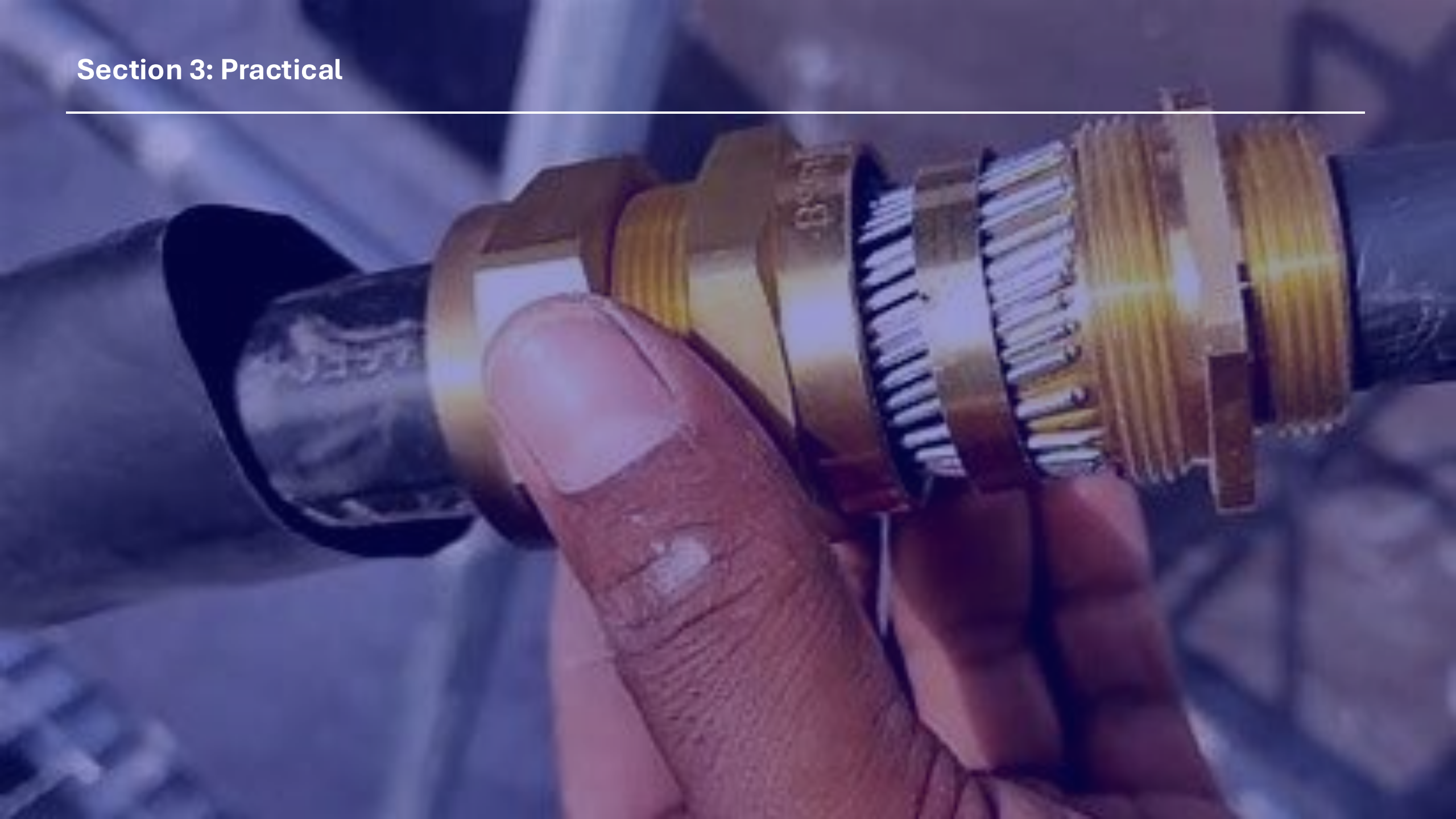
LSF: Low Smoke & Fume – made from PVC with reduced halogens

Estimated 18% to 28% toxic smoke

LSZH: Low Smoke Zero Halogen – not made from PVC

Estimated 0.5% toxic smoke

Section 3: Practical



Section 4: Relevant British and European Standards for Glands

There are three key standards to consider for glands
Selecting glands that comply with these standards ensures they meet industry-recognised safety standards

They are:

- BS 6121
- BS EN 62444
- BS EN 60079-0

The following slides will explore these in more detail

Section 4: Relevant British and European Standards for Glands

BS 6121

Part 1 – Performance requirements for cable glands, specifically armour glands

Part 5 - Selection, installation and inspection of cable glands and armour glands

Example BW glands

In summary:

BS 6121 is older, mechanical-focused, and does not include IP or flameproof testing

Section 4: Relevant British and European Standards for Glands

BS EN 62444

Details the requirements and range of tests for the construction and performance of cable glands using sealing washers for electrical installations

Replaced BS EN 50262

Examples include CW and E1W glands
Glands must be a minimum of IP54 to qualify
Nylon glands are also tested to this standard
Does not apply to BW's due to the glands low IP rating, 2X

In summary:

BS EN 62444 modernises general gland testing and introduces IP, thermal, and retention standards

Section 4: Relevant British and European Standards for Glands

BS EN 60079-0

Cable glands intended for use in ATEX (Atmospheres Explosibles) and IECEx (International Electrotechnical Commission Explosive) environments must undergo rigorous testing to ensure they meet safety and performance requirements for hazardous locations

Hazardous Area Glands

Examples include E1W or A2F Glands

Section 4: Relevant British and European Standards for Glands

Protection Category	Description	Typical Marking
Ex d (Flameproof)	Enclosure can withstand and quench an internal explosion.	Ex d IIB T6
Ex e (Increased Safety)	No arcs/hot-spots in normal operation; extra measures to prevent ignition.	Ex e II T4
Ex nR (Restricted Breathing)	For Zone 2: limits ingress of dust/gas; low energy.	Ex nR II T4
Ex t A (Protection by Enclosure for Dust)	Enclosure prevents dust ignition; for dust-hazard zones.	Ex t A IIIC T85 °C

In summary:

BS EN 60079 is for hazardous areas, with strict IP, flameproof, compound, and marking requirements

Section 4: Relevant British and European Standards for Glands

Test Schedule Comparison

Test / Requirement	BS 6121-1:1989	BS EN 62444	BS EN 60079 (e.g., Parts 0, 1, 14)
Scope	Mechanical cable glands (industrial)	General-purpose cable glands (armoured/unarmoured)	Glands for use in explosive atmospheres (ATEX/IECEx)
Ingress Protection (IP) Tests	X	Included (IP54/IP66/IP68, if claimed)	Required (e.g., IP54 for Ex e, IP66/IP68 common)
Cable Retention (Pull-out)	Included	Included	Included
Torsion / Mechanical Strength	Included	Included	Included
Electrical Continuity	Included (for metallic armoured glands)	Included (if required)	Required (for bonded glands and armoured types)
Thermal Performance	Limited	Included (thermal ageing, temp range)	Required (classified by max surface temperature)

Section 4: Relevant British and European Standards for Glands

Test Schedule Comparison

Test / Requirement	BS 6121-1:1989	BS EN 62444	BS EN 60079 (e.g., Parts 0, 1, 14)
Impact Resistance	Included (basic)	Included (defined impact test)	Required (especially for Ex e, Ex d)
Corrosion Resistance	Basic exposure test	Included (salt spray or chemical test)	Required (for environmental categories)
Flameproof Testing	X	X	Yes – for Ex d glands (explosion containment)
Barrier/Compound Gland Testing	X	X	Yes (compound curing, leak/void checks)
Dimensional Checks	Included	Included	Included
Material Requirements	General	Specified (for plastics, seals, etc.)	Specified (non-sparking, chemical resistant)
Marking / Identification	Basic	Required	Strictly defined (Ex marking, temp class, etc.)

Frequently Asked Questions

How do I choose the correct cable gland for my application?

Selection depends on factors such as cable type, diameter, environmental conditions (e.g., indoor/outdoor, hazardous areas), and required IP or ATEX ratings

What's the difference between armoured and unarmoured cable glands?

Armoured cable glands are designed to secure the metal wire armour and provide mechanical retention and earth continuity, while unarmoured glands are typically used for flexible or non-armoured cables

Frequently Asked Questions

What standards do cable glands need to comply with?

Common standards include BS 6121, BS EN 62444, BS EN 60079-0 ATEX (for explosive atmospheres), and IP ratings under IEC 60529 for ingress protection

Why is proper installation of cable glands so important?

Incorrect installation can lead to water or dust ingress, loss of earthing continuity, reduced strain relief, and potential safety hazards

We appreciate your feedback!

- **Clarity and relevance of the content**
  Was the information easy to understand and applicable to the participants' work?

- **Effectiveness of practical demonstrations**
  Did the hands-on elements help reinforce understanding of installation and selection techniques?

- **Confidence and knowledge gained**
  Do participants feel more confident in identifying, selecting, and installing cable glands after the training?

Learning Objectives: RECAP

By the end of this training, participants will have:

- Gained a foundational understanding of glands, including their purpose and key components
- Become familiar with common types and their typical applications
- Learned how to correctly select glands based on application requirements
- Received practical instruction on proper installation techniques
- Developed awareness of relevant industry standards
- Reinforced their learning through a recap session and Q&A discussion


Any Questions?

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