

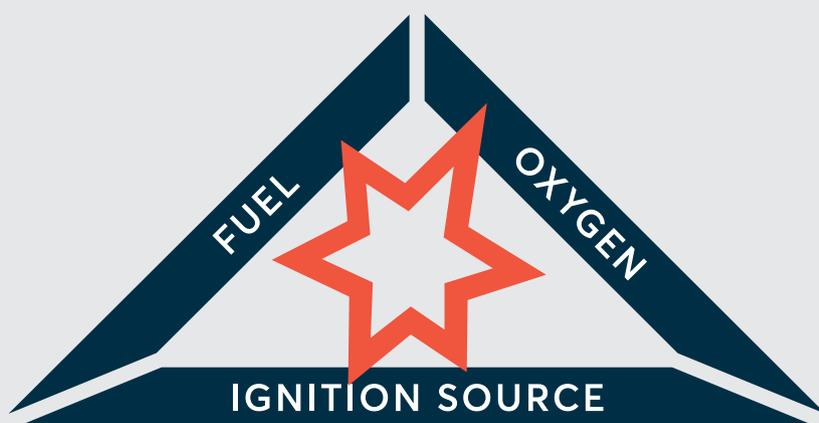


# Ex Cable Transit Devices

– an alternative to traditional cable glands

# Introduction

Explosive atmospheres, also known as Ex areas, are environments where the presence of flammable gases, vapors, or dust can create a risk of explosion. These environments require specialized equipment and stringent safety measures to ensure effective protection against potential ignition sources.



Ex areas are classified into zones based on the frequency and duration of the presence of explosive substances, and each zone requires specific equipment protection levels to mitigate the risk of explosion.

To ensure safety in explosive environments, Ex equipment and enclosures are utilized. Ex enclosures are engineered to house electrical equipment and prevent any sparks or elevated temperatures from igniting the surrounding explosive atmosphere. The construction of these enclosures must adhere to the rigorous requirements and conform to specific protection concepts. These concepts include intrinsic safety, flameproof enclosures, and increased safety, designed to prevent ignition in various

manners. Intrinsic safety limits the energy available for ignition, flameproof enclosures confine any explosion within the device, and increased safety ensures that components are secure and protected from generating sparks or excessive heat.

The integrity of Ex enclosures is paramount to prevent accidental ignitions. Cable entries into these enclosures are of critical importance because they represent one of the weakest points where hazardous substances could infiltrate or where ignitions could potentially occur. Ensuring that cables are properly sealed and installed helps maintain the enclosure's protective measures, such as its ability to prevent the ingress of flammable gases, vapors, or dust. The design and installation of cable entries are governed on a global level by IEC 60079 standards.

**The integrity of Ex enclosures is paramount to prevent accidental ignitions.**

The aim for this technical paper is to contribute to increasing safety and compliance regarding cable entry devices in explosive environments and prevent explosion risk by raising the awareness of Ex cable transit devices and describing differences and advantages compared to traditional cable gland solutions. The paper also discusses standard requirements for cable transits in walls and floors related to Ex areas and points out the importance of education, training and installation quality of Ex cable transit devices.

# Cable entries into Ex enclosures

It is important to know how cables are introduced into an enclosure that is designed to be used in explosive atmospheres. According to IEC 60079-0:2017, cable entries must be designed and installed to maintain the integrity of the enclosure's protection type and to prevent ingress of gases, dust, or other hazardous materials. Cable entries play a critical role in ensuring that the enclosure remains safe and effective in preventing explosions by maintaining its designated protection method. Proper sealing and installation are essential to avoid compromising the safety of the Ex enclosure.

There are primarily two types of cable entry solutions into an Ex enclosure: cable glands and cable transit devices.

## Cable Gland

Most cable gland variants are designed for one cable within each unit (single cable entry solution). Cable glands typically consist of several threaded components that work together to grip the cable and attach both the gland assembly and the cable to equipment or a panel. The number of components

depends on the specific application and necessary protection level. A basic cable gland includes a body section, an outer sheath seal, and a sealing nut. The entire assembly is attached to equipment or a panel through the threaded entry part; this part may be screwed directly into equipment with a pre-existing thread or fastened with a locknut when inserted into a plain hole. Once the gland is assembled, the cable is fed through the gland and the sealing cap is tightened, which compresses the inner seal and holds the cable securely.

Due to the cable gland size, in relation to the cable diameter, it can be hard and often not possible to install pre-terminated cables without cutting them. This could result in violation of original manufacturer certifications.

## Cable Transit Device

Cable transit devices are generally modular systems that allow multiple cables to be introduced into an enclosure through a single-entry point, also known as Multi Cable Transit (MCT) systems. These systems are beneficial in applications requiring high cable density,





as they can accommodate numerous cables while maintaining necessary sealing and protection. The modular nature of cable transit devices makes them adaptable to various configurations and requirements, offering flexibility and ease of installation in complex setups.

Ex cable transit devices represent an advancement in the field of electrical installations within hazardous environments. Traditional cable glands, while widely used, have limitations in scalability and flexibility. Ex cable transit devices are designed to accommodate various cable types and sizes, providing enhanced modularity without compromising the sealing performance.

**Area efficiency allows for smaller, lighter and less costly cabinets.**

Different sealing systems have their respective advantages and disadvantages. Below is a comparison of situations where an Ex cable transit device may be more advantageous than traditional cable glands.

### **Area efficiency**

Often, the limiting factor for cabinet sizing is the surface area of the cable gland plate. Using Ex cable transit devices instead of cable glands can reduce the cabinet footprint and weight by up to 50%. As this allows for more cables to be routed through a smaller area, the entire cabinet can be downsized, resulting in cost, space, and weight savings.

### **Preparing for the unknown**

Another benefit of Ex cable transit devices is that they can include spare capacity for additional cables. This eliminates the need for drilling new holes onsite or applying for hot work permits. Adaptable sealing modules can be chosen to allow for a wide range of cable dimensions to be used. Ex cable transit devices are highly efficient for accommodating numerous pre-terminated cables through a single cut-out. Installers can simply open the transit, route a new cable, and close the transit again.

**Using Ex cable transit devices instead of cable glands can reduce the cabinet footprint and weight by up to 50%.**

### **Faster installations**

Handling 50–150 cables routed into a single cabinet with Ex cable glands can be time-consuming. The design of modern Ex cable transit devices allows for faster and easier installations, saving time and money.

### **Savings through standardization**

Many process automation companies use Ex cable transit devices to enable standardization in their cabinets. This approach ensures consistent design regardless of changes to components inside the cabinet, saving significant design time and reducing risks associated with onsite installations.



# Penetrations in structures

Ex cable entries are typically tested and certified according to IEC standard 60079-0, in addition to specific protection type standards such as IEC 60079-1 (Ex d), IEC 60079-7 (Ex e), and/or IEC 60079-31 (Ex t).

These installations are usually performed with, or as part of, Ex rated equipment such as enclosures, cabinets, and junction boxes. Installations may also occur in walls and floors; however, the standard does not explicitly require Ex certified cable seals for these scenarios. Openings for cables and conduits need to be sealed to comply with the requirements of the wall or floor structure itself.

## The importance of sealing

For additional guidance, Ex electrical installations standard 60079-14 and section 8.2.4 can be consulted. This section specifies that penetrations in structures, such as openings in walls and floors for cables and conduits between different hazardous areas or between hazardous and non-hazardous areas, must be adequately sealed. Examples of sealing methods include sand seals, mortar sealing, gland plates, or transit barriers to maintain the relevant hazardous area classification.

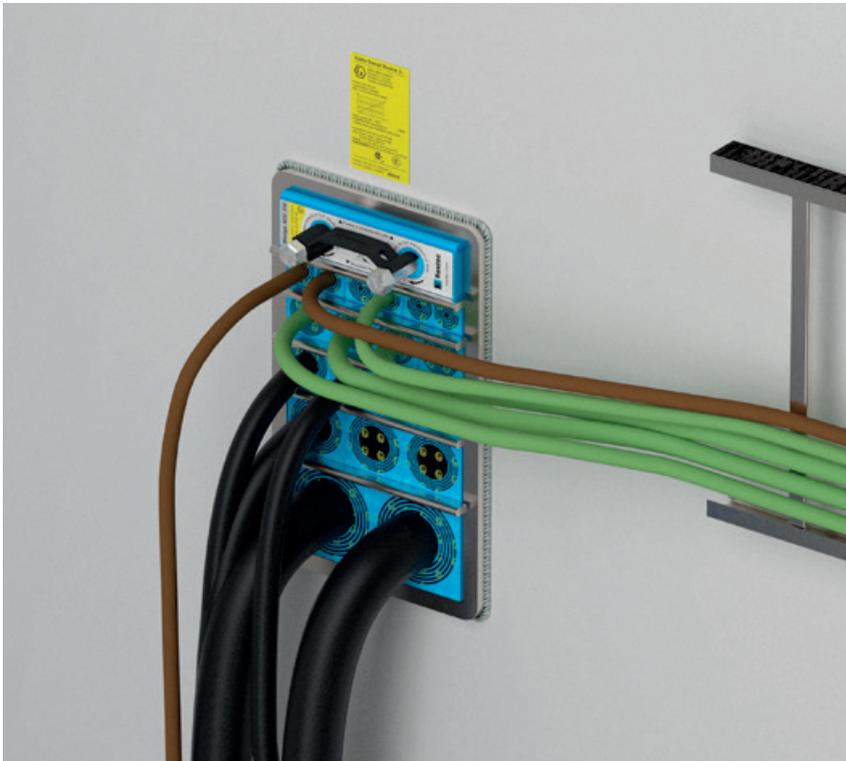
## Maintaining area classification

The conclusion from reviewing the IEC 60079-14 standard is that it does not explicitly mandate the use of Ex certified cable entry devices for structural openings. However, it states that the relevant hazardous area classification must be maintained. Also, specific project or other requirements should always be taken into consideration. The determination for using a certified or a non-certified solution in structure penetrations should be aligned with the risk and safety assessments performed for each individual site.

### 8.2.4 Penetrations in structures

Penetrations in structures for cables and conduits between different hazardous areas and between hazardous and non-hazardous areas shall be adequately sealed, for example by means of sand seals, mortar sealing, gland plates or transit barriers to maintain the hazardous area classification where relevant.

Ex electrical installations standard 60079-14



# Installation quality of certified sealing systems

The effectiveness of certified sealing solutions, whether traditional cable glands or cable transit devices, is dependent on proper installation to ensure the promised protection and maintain the right certification. Therefore, the quality of installation is crucial for the overall safety and functionality of the equipment. It is recommended to use a sealing solution provided by manufacturers that supply detailed installation instructions. Additionally, it is beneficial if the supplier can offer on-site installation advice and training, regardless of location.

## Instructions for installers

Installation procedures should adhere to the manufacturer's specifications, which may include torque settings or similar for tightening mechanisms, selection of original components and alignment of

components within specified tolerances. For instance, ensuring that the correct dimension is used for the specific cable diameter is essential to avoid undue stress and potential failure points.

## Avoiding the risk of errors

Choosing a sealing system from a manufacturer committed to promoting practical understanding of their devices enhances assembly efficiency and quality. Ensuring precise and effective installation is particularly important in large projects, where the cumulative effect of small errors can lead to significant issues.

Even with proper installation manuals and trained personnel, post-installation checks are necessary. Human errors, such as misunderstandings, can occur.



## Even with proper installation manuals and trained personnel, post-installation checks are necessary.

Conducting a visual inspection after each assembly can identify and prevent common issues arising from improper installation and thereby improve the reliability and safety of the sealing function.

It is recommended that the manufacturer of the sealing solution provides a comprehensive checklist to guide the user in performing necessary post-installation inspections. This checklist should include detailed procedures for verifying the integrity of the seal, such as confirming proper torque settings or similar, ensuring accurate alignment of components, and inspecting any signs of stress or failure points. Additionally, the checklist should specify methods for conducting diagnostic tests to detect potential compromises in the seal resulting from inadequate compression or leaks.

### Documented certification

The manufacturer must also prepare, or ensure the preparation of, a certification document verifying the equipment's compliance with the stipulated requirements along with additional applicable standards and regulations.

The type of certificate or approval required depends on the geographical location of the installation or where the equipment is to be shipped and installed. Certification exists at global, regional, and country-specific levels. Ensuring that all equipment has the appropriate level of certification from the beginning of the project is essential to avoid complications and delays in the project timeline due to lack of certification.

The table below presents a list of different approvals as well as region or level of approval.

In conclusion, the meticulous attention to detail during the installation of certified sealing solutions, combined with rigorous post-installation verification, is fundamental to maintaining the integrity and efficiency of these systems in safeguarding critical infrastructure.

Ex approvals	
Regional approvals	Region/country
IECEX	International and global
ATEX	European Union
NEC (NFPA 70)	USA
CEC/CSA	Canada
INMETRO	Brazil
ECAS-Ex	UAE
PESO	India
CCC	China
KCs	Korea
JPEX	Japan
EAC	Eurasia
UKCA	UK

# Conclusion

It is essential to raise awareness about Ex cable transit devices and their significant advantages over traditional cable gland solutions. Ex cable transit devices offer enhanced safety, reliability, and ease of maintenance, making them a superior choice for hazardous environments.

The conclusion from reviewing the IEC 60079-14 standard is that it does not explicitly mandate the use of Ex certified cable entry devices for structural openings. However, it states that the relevant hazardous area classification must be maintained. Also, specific project or other requirements should always be taken into consideration. The determination for using a certified or a non-certified solution in structure penetrations should be aligned with the risk and safety assessments performed for each individual site.

Moreover, the importance of education, training, and installation quality of Ex cable transit devices cannot be overstated. Proper education and training ensure that personnel know the unique requirements and best practices for these devices, leading to safer and more efficient installations.

**Ex cable transit devices offer enhanced safety, reliability, and ease of maintenance, making them a superior choice for hazardous environments.**

We hope that this technical paper has contributed to increasing safety and compliance regarding cable entry devices in explosive environments and to preventing the risk of explosion.

# Protecting life and assets

Roxtec is the world leader within flexible cable and pipe transits. Since the start in Sweden in 1990, we have grown successfully to cover all continents. Our passion is innovative sealing solutions, and our goal is to make our world a safer place.

- Extensive R&D resources and advanced test facilities
- Inventor of Multidiameter™
- Customers in more than 80 markets

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