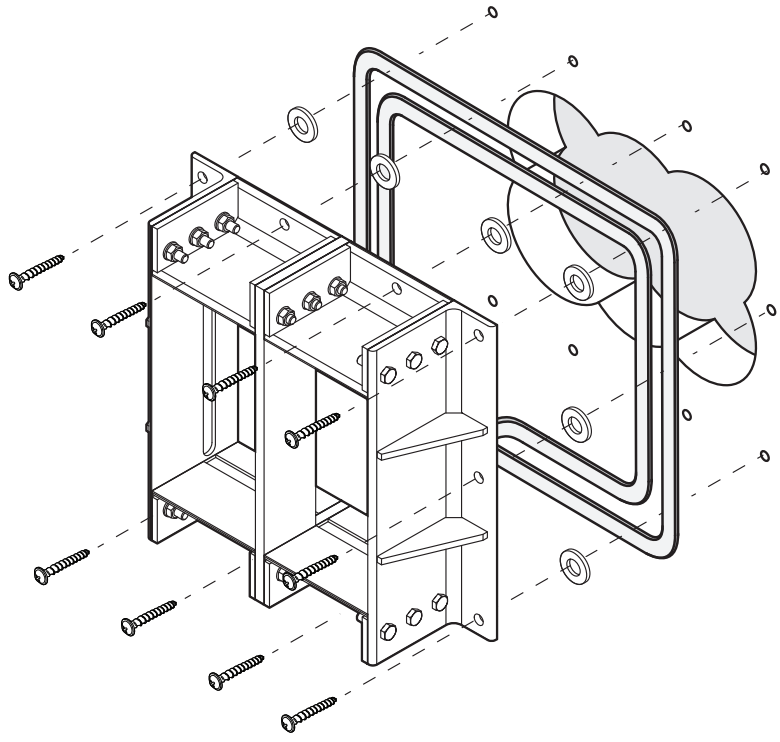
Roxtec

Description and application guidelines

Roxtec selection guide for metal frames, sleeves and gaskets



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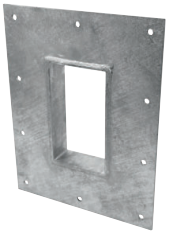
Contents

1 Bolted rectangular frames – G series

Roxtec G series is a steel frame intended for bolting onto walls/floors and enclosures. When used with corresponding Roxtec sealing components, the frame provides environmental protection against fire, water and gas as well as protection against rodents and pests. The rectangular frame allows for high cable and pipe packing density.

GH

GH BG



GH FL100

GH BG FL100

GOH FL100

GHM

GKO

GHM

1.1 GH

The GH frame is suitable for apertures in steel, gypsum or wood. The flange is 60mm wide to cover a rough aperture.

1.2 GH BG™

The GH BG™ frame is a GH frame equipped with two diagonally placed earthing terminals for bonding and grounding applications. Frames with only one opening have one. The separate earthing terminals provide a dedicated electrical path to ground when the mounting surface is not conductive.

When needed, the frame can be earthed/grounded from both sides of the flange.

1.3 GH FL100

The GH FL100 is a frame suitable for bolting in concrete and brick walls, thanks to the wide 100mm flange. The wide flange distances the fasteners from the aperture to prevent cracks in the concrete during assembly.

1.4 GH BG™ FL100

The GH BG™ FL100 frame is a GH FL100 frame equipped with two diagonally placed earthing terminals for bonding and grounding applications. Frames with only one opening have one earthing terminal. The separate earthing terminals provide a dedicated electrical path to ground when the mounting surface is not conductive.

When needed, the frame can be earthed/grounded from both sides of the flange.

1.5 GOH FL100

The Roxtec GOH FL100 frame is an excellent alternative for installations where cables are already routed. It is an openable frame suitable for anchoring into concrete and brick walls, thanks to the wide 100mm flange. The wide flange increases the distance between the fasteners and the aperture, reducing the risk of cracks in the concrete during assembly.

1.6 GHM

The GHM frame has a more narrow hole pattern to fit in pressurized installations or in shielded environments such as computer rooms or enclosures using a conductive gasket. For the same reason, it can be useful also in decks/bulkheads, sandwich panels or advanced buildings. The frame provides extended pressure withstand capabilities for water and gas as well as improved shielding capability compared to the standard hole pattern.

1.7 GKO

The GKO frame is a bolted together frame. It extends from the structure so that it can be bolted over multiple or irregular apertures. It is suitable for installation around existing cables and pipes.

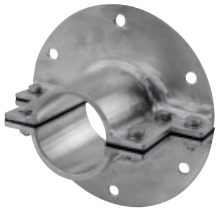
2 Bolted sleeves – SLF series

Roxtec SLF series is a sleeve intended for bolting made for walls/floors and enclosures. The sleeves are intended for the round R frames, H seals and RS seals. When used with corresponding Roxtec sealing components, they provide environmental protection against fire, water and gas as well as against rodents and pests.

SLF R

SLF RS

SLFO



SLFO EXT

SLF RS BG

2.1 SLF R/SLF RS

This pipe sleeve is to be used in steel, gypsum, wood or sandwich panels. The flange covers a rough aperture. Wider flanges are available upon request.

2.2 SLFO

The SLFO is an openable sleeve intended for retrofit, or new pipe installations where connection flanges are present. It is used to cover existing openings in steel, gypsum, wood or sandwich panels.

2.3 SLFO EXT

The SLFO EXT is an openable sleeve intended for retrofit solutions. It is used to cover existing openings in concrete. The wide flange distances the fasteners from the aperture to prevent cracks in the concrete during assembly. The dept is also increased.

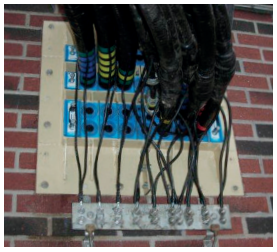
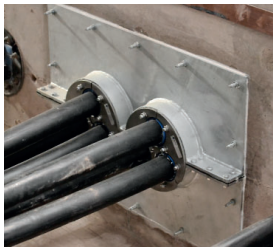
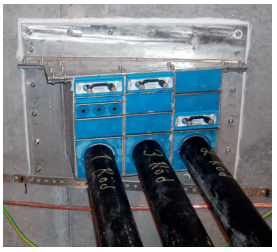
2.4 SLF RS BG™

The SLF RS BG™ sleeve has an integrated earthing terminal to provide a dedicated electrical path to ground when the mounting surface is not conductive. It is suitable for steel, gypsum, wood or sandwich structures.

3 Customized solutions

All standard frames and sleeves can be customized to fit existing apertures or hole patterns. Earthing terminals are available upon request for all frames and sleeves.

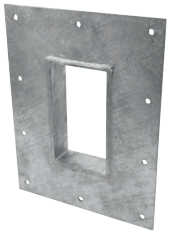
Contact your Roxtec representative for more information.


4 Sealing methods per structure

4.1 Concrete

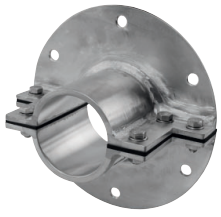
Roxtec frames and sleeves for concrete structures have wider flanges to cover rough hole cuts and to secure the appropriate distance from the aperture edge to the fasteners. Expansion bolts risk to crack the concrete unless a sufficient edge distance is achieved. Suitable metal frames and sleeves are the GH FL100, GH BG™ FL100, GOH FL100, GKO or SLFO EXT to provide this distance. Retrofitting, small or irregular hole cuts are easily handled with the GOH FL100, GKO and SLFO EXT.


GH FL100

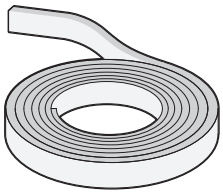

GH BG FL100


GOH FL100

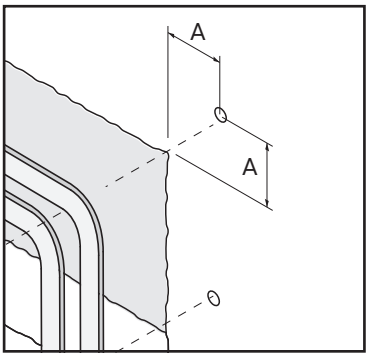

GKO


SLFO EXT

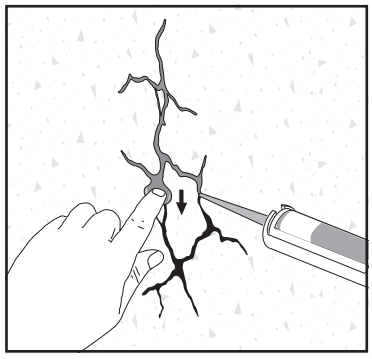
The interface between frame and structure is sealed by using the TSL 8x8 butyl sealing strip or a suitable sealant. The bead must be thick enough to cover structural irregularities. It might be necessary to patch any cracks or voids in the proximity to the aperture and flange by plastering. Make sure this is done in a material corresponding to the surrounding structure or fulfilling the requirements of the application.



TSL 8x8 butyl sealing strip

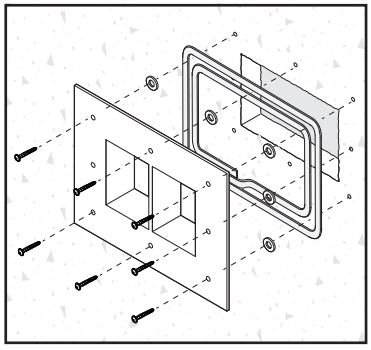


A = edge distance

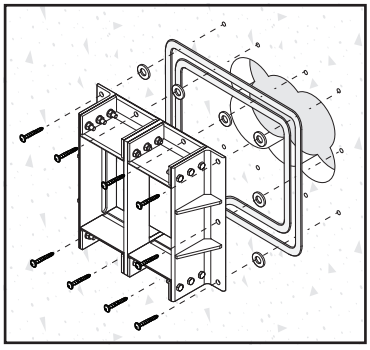


Plastering of wall

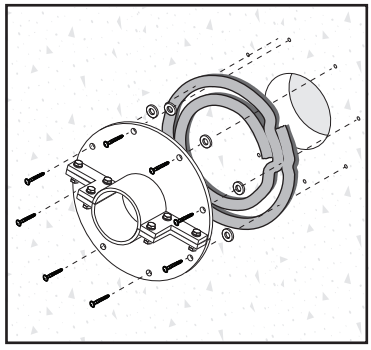
The frame attachment using the butyl sealing strip requires the proper alignment of gasket, compression stops and concrete screws. The sealing strip can be mounted on the wall or flange due to its sticky surface. Sealant is applied according to the manufacturer's specifications on the wall or flange. Make sure to install a compression stop to keep the sealing strip and sealant in shape over time.



GH FL100 and GH BG FL100 with butyl sealing strip



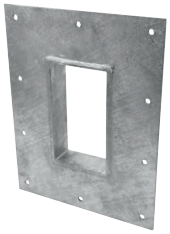
GKO with butyl sealing strip



SLFO EXT with butyl sealing strip

4.2 Masonry, brick and block

Roxtec frames and sleeves for brick walls have wider flanges to cover rough hole cuts and to secure the appropriate distance from the aperture edge to the fasteners. Expansion bolts risk to crack the concrete unless a sufficient edge distance is achieved. Suitable metal frames and sleeves are the GH FL100, GH BG™ FL100, GOH FL100, GKO or SLF EXT to provide this distance. Retrofitting, small or irregular hole cuts are easily handled with the GKO and SLFO EXT.



GH FL100

GH BG FL100

GOH FL100

GKO

SLFO EXT

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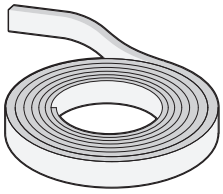
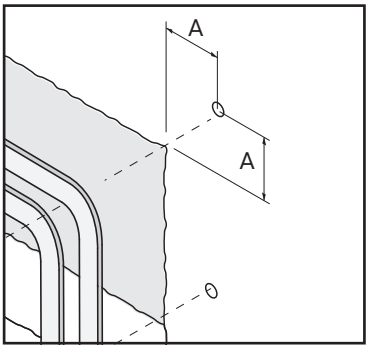
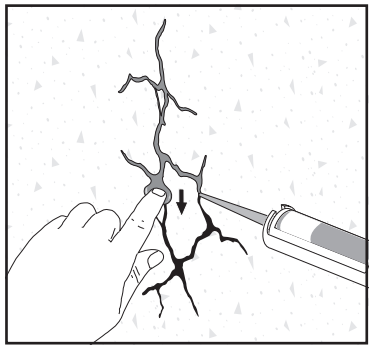


TSL 8x8 butyl sealing strip



A = edge distance



Plastering of wall

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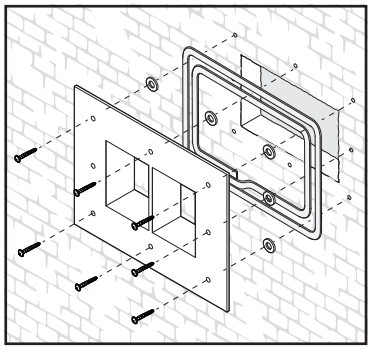
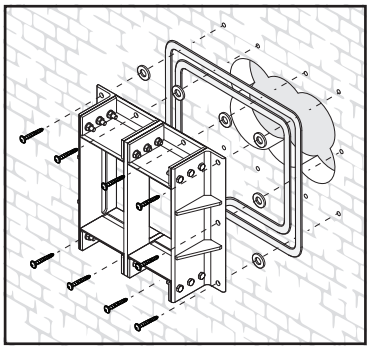
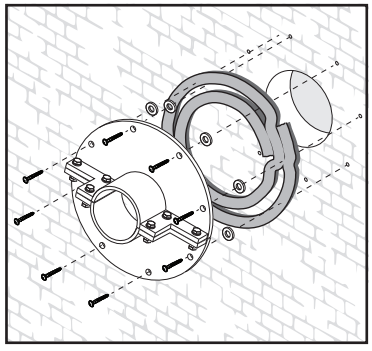


GH FL100/GH BG FL100 with butyl sealing strip



GKO with butyl sealing strip



SLFO EXT with butyl sealing strip

4.3 Gypsum/wood

For walls and floors in gypsum and wood, we recommend installing the GH, GH BG™, SLF, SLFO or SLF RS BG™ frames and sleeves.

GH

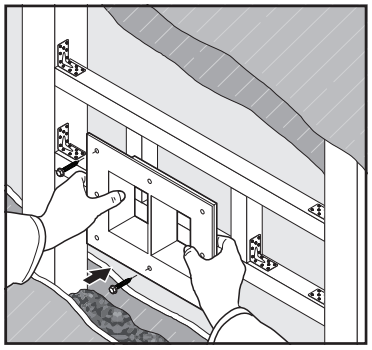
GH BG

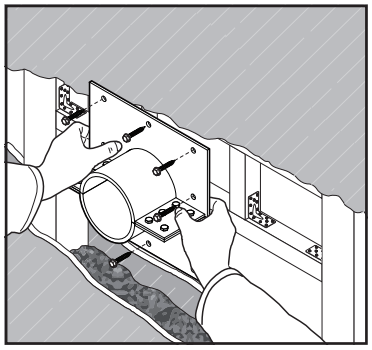
SLF

SLFO

SLF RS BG

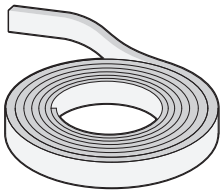
As gypsum and boards cannot take much load it is often required to add framing to take the weight of the penetration with cables and pipes installed. This framing must be firmly attached to the structure as well as cover the flange screw hole pattern.



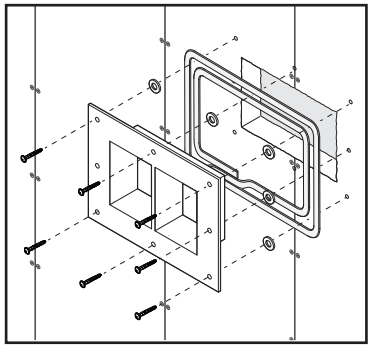


Examples of reinforcement by added framing.

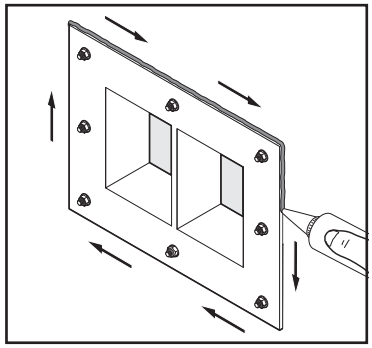
Roxtec frames and sleeves bolted onto flat walls and floors are recommended to be installed using a TSL 8x8 butyl sealing strip or by using a suitable sealant if needed. The gypsum structures often have no requirements of ingress protection and can be sealed for dust by a bead of sealant around the flange.



TSL 8x8 butyl sealing strip



GH/GH BG with butyl sealing strip



Sealant application

4.4 Steel

Steel structures have more rigid apertures and can handle the compression force required for high pressure installations without wide flanges. As the requirement is often higher, the hole pattern is narrower making the pressure distribution more even. For steel, we recommend GHM, GH BG™, GOH FL100, SLF, SLFO and SLF RS BG™. For steel structures, Roxtec also offers solutions for attachment by welding.

GHM

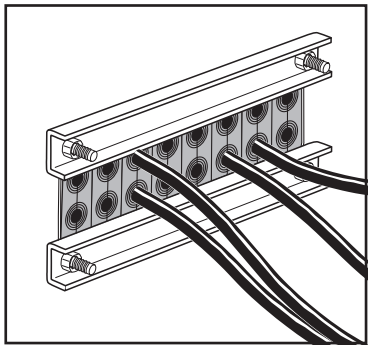
GH BG

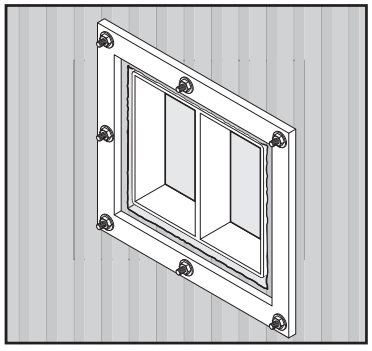
SLF

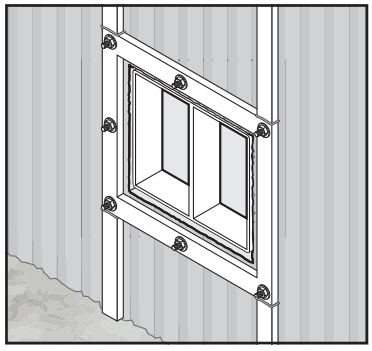
SLFO

SLF RS BG

Thinner steel structures such as sandwich panels and enclosures might require counter flanges or reinforcements if the weight exceeds the load bearing capabilities. Follow the panel manufacturer recommendations on how to reinforce the structure.

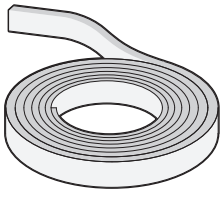




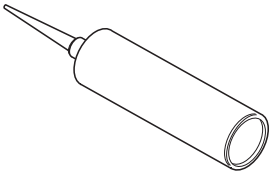


Examples of reinforcement with counter frames.

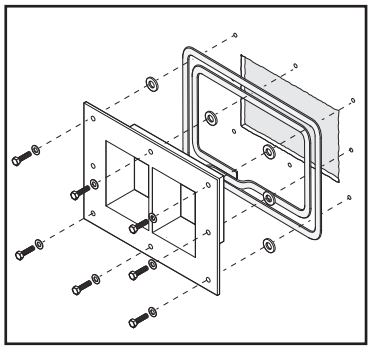
For steel structures, the TSL sealing strips, pre-punched gaskets or sealant can be used depending on the requirements. Sandwich panels having small partitions between the panels can be sealed with the sealing strips and sealant. Larger corrugation in some steel structures like containers cannot be handled by a gasket alone and require special attention. Contact your Roxtec representative for guidance.



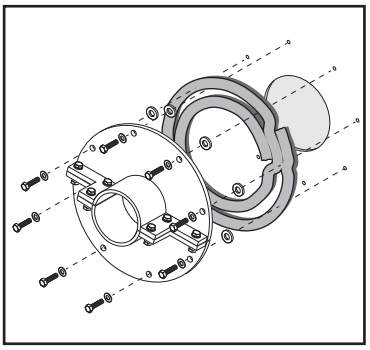
TSL 8x8 butyl sealing strip



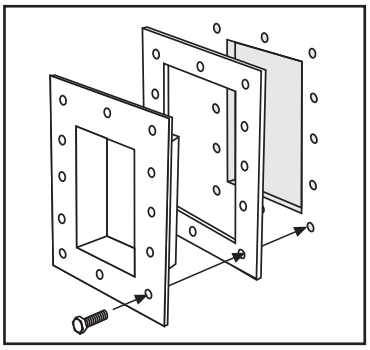
Sealant



GHM/GH BG with butyl sealing strip



SLFO with pre-punched gasket



GHM/GH BG with pre-punched gasket

For electromagnetically shielded applications, the contact area between the gasket and mounting surface must be conductive.

For more information, please read "Roxtec selection guide – gaskets for electromagnetic shielding applications", available on roxtec.com.

4.5 Sandwich panels

Installation in sandwich panels can be done using frames with 60mm flange width such as GH, GHM and GH BG. It is recommended to use GHM with the narrower hole pattern when the load must be distributed onto more screws. Round pipe sleeves recommended are SLF and SLF RS BG.

GH

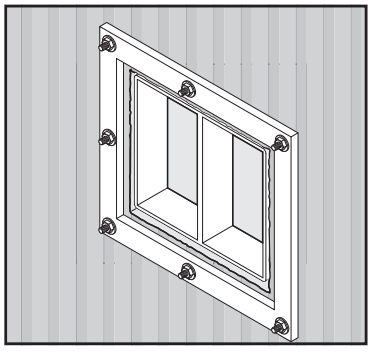
GHM

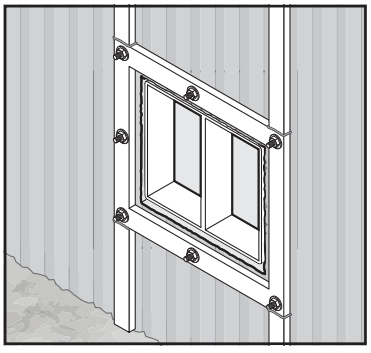
GH BG

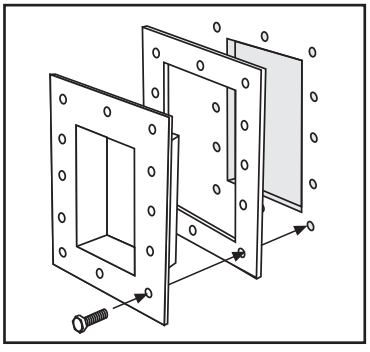
SLF

SLF RS BG

Sandwich panels might, as a thinner steel structure, require counter frames or reinforcements if the weight exceeds the load bearing capabilities. Follow the panel manufacturer's recommendations on how to reinforce the structure.

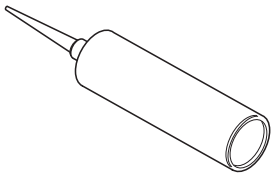






Examples of reinforcement with counter frames.

For sandwich panels, sealant is recommended between the structure and the frame. Choose the appropriate sealant depending on the requirements.



Sealant

4.6 Table 1 – Recommended combination of frames/sleeves and structures

	CONCRETE	BRICK	BOARD Gypsum/Wood	STEEL STRUCTURES	SANDWICH PANELS
GH			●	●	●
GH BG			●	●	●
GH FL100	●	●			
GH BG FL100	●	●			
GOH FL100	●	●		●	
GHM				●	●
GKO	●	●		●	
SLF			●	●	●
SLFO			●	●	
SLFO EXT	●	●			
SLF RS BG			●	●	●

The table shows the primary choices per structure. Most frames can however be used on all structures if needed. Contact Roxtec for more information.

4.7 Table 2 – Recommended combination of gaskets/sealing strips and frames/sleeves

	TSL 8x8 Butyl	Pre-punched gaskets*	TSL 15x6	TSL 20x8	Sealant**
GH	●	●	●		●
GH BG	●	●	●		●
GH FL100	●			●	●
GH BG FL100	●			●	●
GOH FL100	●			●	●
GHM	●	●	●		●
GKO	●			●	●
SLF	●	●	●		●
SLFO	●	●			●
SLFO EXT	●			●	●
SLF RS BG	●	●	●		●

* Pre-punched gaskets are per default in solid rubber. Cellular rubber is preferred on thin metal structures such as sandwich panels and enclosures.

** Consider sealant manufacturer recommendations regarding adhesion to the structure and surface treatment of the frame and sleeve.

4.8 Table 3 – Rating of gaskets and sealing strips in the general application

The ratings provided are a guideline of what can be expected in the general application for water ingress. The stated ratings are defined by third party testing as well as internal testing. The mounting structure must be prepared for a watertight seal and have the strength to allow compression of the gaskets. A flat surface for the flange is required while the fasteners must be positioned away from the aperture to avoid cracks. Make sure to comply with the installation instructions and aperture dimensions found at roxtec.com.

	CONCRETE	BRICK	BOARD Gypsum/Wood	STEEL STRUCTURES	SANDWICH PANELS
TSL 8x8 butyl	0.3 bar**	IP 66/67	IP 54	0.3 bar**	–
Pre-punched gaskets	–	–	–	2.5 bar	–
TSL 15x6	–	–	–	2.5 bar	–
TSL 20x8	1 bar*	–	–	1 bar*	–
Sealant	0.3 bar***	IP 66/67	IP 54	0.3 bar	IP 66

* The TSL 20x8 can be used for high pressure installations for many sorts of structures. Contact Roxtec for more information.

** The TSL 8x8 butyl can be used for higher ratings. Contact Roxtec for more information.

*** Consider sealant manufacturer recommendations for the application.

4.9 Table 4 – Conversion from UL/NEMA to IP ratings

The ingress protection can only be referenced from NEMA to IP ratings because of the different test requirements. The first digit in the IP rating is ingress of solid objects such as dust and the second digit is water ingress. The higher number the better protection per ingress category. The table only considers ingress protection and no environmental parameters or chemicals.

UL/NEMA							
1	2	3, 3S	3R	4, 4X	5	6	12, 12K, 13
IP 20	IP 22	IP 55	IP 24	IP 66	IP 53	IP 67	IP 54

Note:

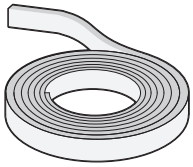
- Sandwich panels must be supported to carry the weight of the transit.
- Through-holes must be sealed using sealing washers or sealant.
- Consider curing time and adhesion to structures and surface treatments for sealant. Follow the manufacturer instructions.
- Consult the installation instructions for application of gaskets.
- Shielded installations require conductive gaskets.

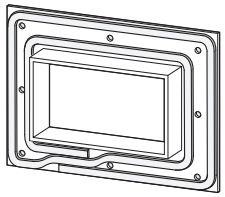
5 Gaskets and sealants

5.1 TSL 8x8 butyl sealing strip

The TSL 8x8 butyl sealing strip is a solid rubber gasket made of butyl. It has a sticky surface and is to be mounted on a dry surface.

- Color: Black/grey
- Material: Butyl rubber
- State: Sticky solid
- Thickness: 8mm
- Delivered in rolls
- Requires a compression stop creating a 2mm gap

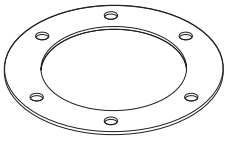


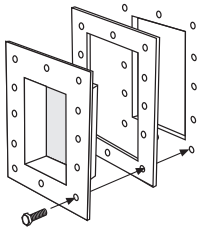


5.2 Pre-punched gaskets

Pre-punched gaskets are solid EPDM gaskets with a pre-defined hole pattern corresponding to the frame or sleeve.

- Color: Black
- Material: EPDM
- State: Solid
- Thickness: 3 or 4mm
- Shore: 50° or 60°

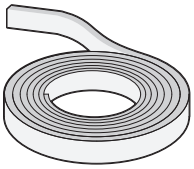


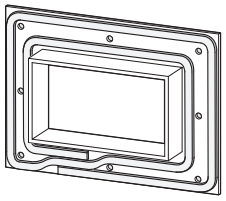


5.3 TSL 15x6 sealing strip

The TSL 15x6 sealing strip is a solid cellular rubber sealing strip made of EPDM. It has a self-adhesive liner and is to be mounted on the flange of the frame.

- Color: Black
- Material: EPDM/self-adhesive
- State: Cellular rubber
- Thickness: 6mm
- Delivered in rolls

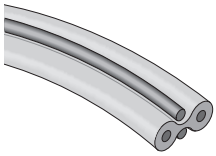


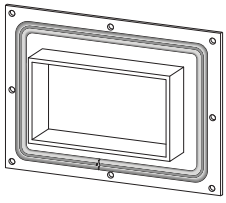


5.4 TSL 20x8 sealing strip

The TSL 20x8 sealing strip is a solid EPDM gasket with butyl. It has sticky surface and is to be mounted on dry surfaces. The sealing strip is primarily for high pressure installations.

- Color: Blue/black
- Material: EPDM and butyl rubber
- State: Sticky solid
- Thickness: 8mm
- Shore: 65° (EPDM)

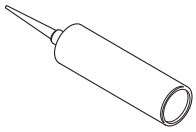


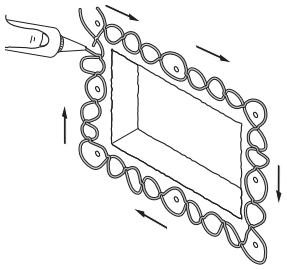


5.5 Sealant

The sealant is primarily used to seal against structures with a rough surface but it is suitable for any surface. Below properties should be fulfilled. Follow the sealant manufacturer instructions.

- Fire retardant where required
- Environmental sealing capabilities
- UV resistant
- Ability to take dynamic loads
- Adhesion to most construction materials
- Requires a compression stop creating a 2mm gap (not applicable for sandwich panels or gypsum structures)





5.6 Gaskets for EMI applications

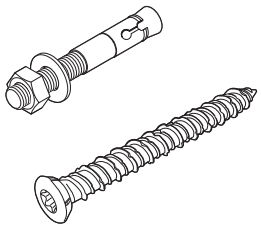
We recommend and supply different gaskets for EMI applications depending on the application and the environmental ratings. For more information, please read "Roxtec selection guide – gaskets for electro-magnetic shielding applications", available on roxtec.com.

6 Fasteners

Fasteners should be chosen after considering the load bearing capabilities of the structure, the weight of the whole sealing system and the environmental conditions. The manufacturer of the fasteners often provides tables of drill bit sizes, minimum edge distance and strength.

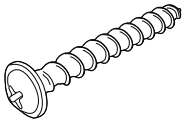
6.1 Concrete and brick walls

Anchor bolts are recommended for concrete and brick walls to provide a strong joint for heavy design elements. To avoid cracks in the structure, wide flanged frames such as GH FL100 should be used. In structures where there is a considerable risk of cracks due to the anchor bolt, a concrete screw should be used. The fasteners should be of the same type of material as the frame. An edge distance of 60mm is recommended.



6.2 Lightweight concrete

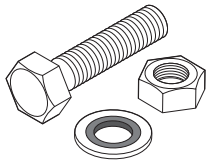
In lightweight materials, a concrete screw is recommended. The safe distance from the aperture to avoid cracks in the structure is smaller than for anchor bolts but wide flanged frames are still recommended. The fasteners should be of the same type of material as the frame. An edge distance of 60mm is recommended.



6.3 Steel structures

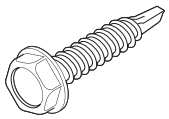
In steel structures, a standard socket/hexagonal head screw is recommended. The fasteners should be of the same type of material as the frame.

Note: When mounted in through-holes, a sealing washer should be applied to prevent leakage through the joint.



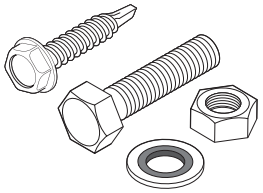
6.4 Wood/steel studs

When bolted in construction elements, the frame must be firmly attached to the load-bearing structure. A standard wood screw should be used in wood and in steel studs a self-drilling, self-tapping screw is recommended. Fasteners should be of the same type of material as the frame.



6.5 Sandwich panels

When bolting a frame in a sandwich panel using steel screws, the structural integrity must be secured before applying the weight of the frame.



The selection of the appropriate fastening method should be determined based on site location, height of building and environmental conditions as well as the properties of the sandwich panel such as maximum load capacity, panel spans and thickness, etc. Follow the recommendations provided by the panel manufacturer.

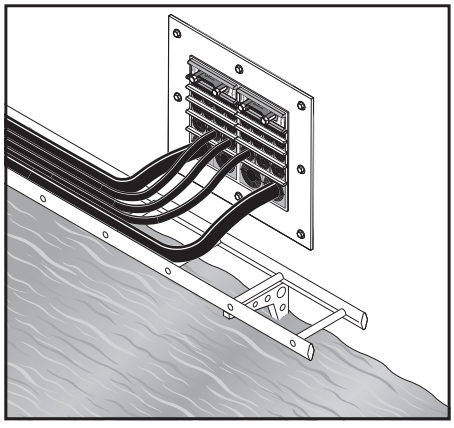
- Through-bolting: Fastening screws through the full thickness of the panel, securing the bolts to the rear sheet or additional steel fixing.
- Front-sheet fastening: Short self-drilling metal screws to fasten the frame to the front sheet of the panel.

For any ingress requirement, both types of methods shall be used with an additional sealing washer or as integrated in the screw head.

7 Arrangements

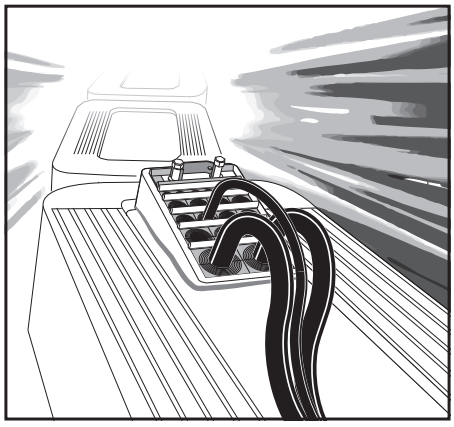
7.1 Positioning

Frames and sleeves positioned at weather exposed areas can benefit from precautions with regard to the climate and the surroundings. A proactive approach can reduce the service need and prolong the interval for maintenance. If in doubt, contact your Roxtec representative for guidance.



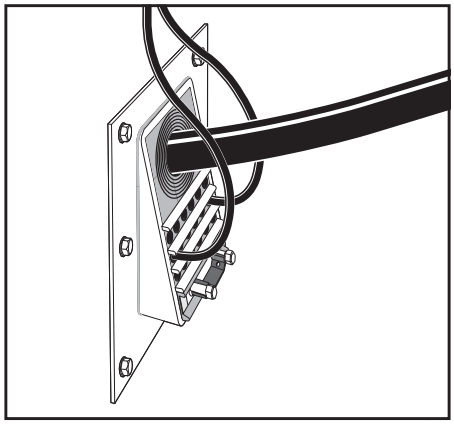
7.1.1 Standing water and icing

To protect cables, pipes and other installation material from corrosion and icing, it is, if possible, recommended to avoid installing transits below the water line in areas suspected to be flooded on a regular basis.



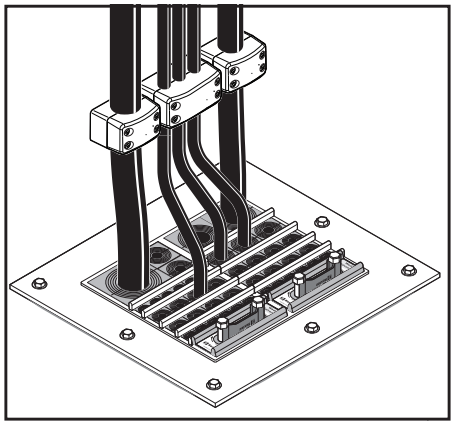
7.1.2 Moving structures

On moving structures, it is recommended to tilt the frames and sleeves away from the direction of travel. High speed and harsh environments can in combination induce unexpected strain to the transits.



7.1.3 Angled cables and pipes

If the intended cables and pipes are very rigid and suspected to come in an angle relative the transit, it is important to consider tilting the frame accordingly. This can be done in the welding process or by tilting the flange on the frames. If required, frames and sleeves can be supplied in extended depths or custom designs.

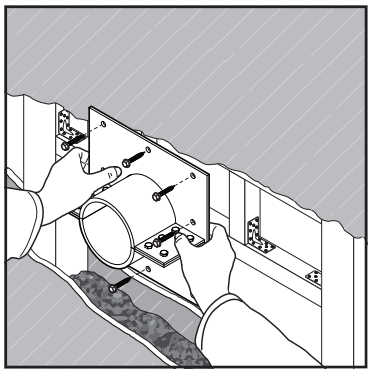


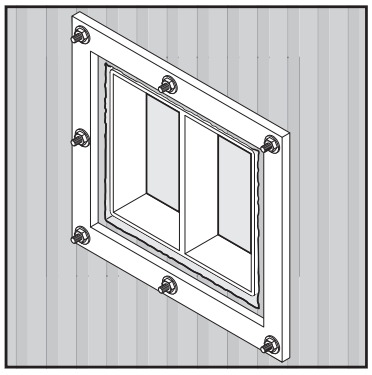
7.1.4 Horizontal installations

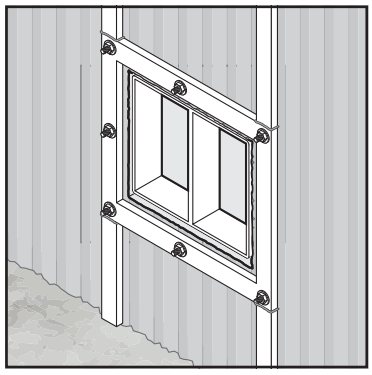
The Roxtec transits can take the load of most cables in horizontal installations. With heavy cables and pipes it is however often important to support the weight of the services by clamping.

7.2 Framing of non load-bearing structures

Sandwich panels and gypsum walls might need reinforcements to take the load of the penetrations. This can be done by adding aperture framing inside the wall structure or by adding counter frames on the back side of the penetration. Follow the panel manufacturer recommendations on how to reinforce the structure.

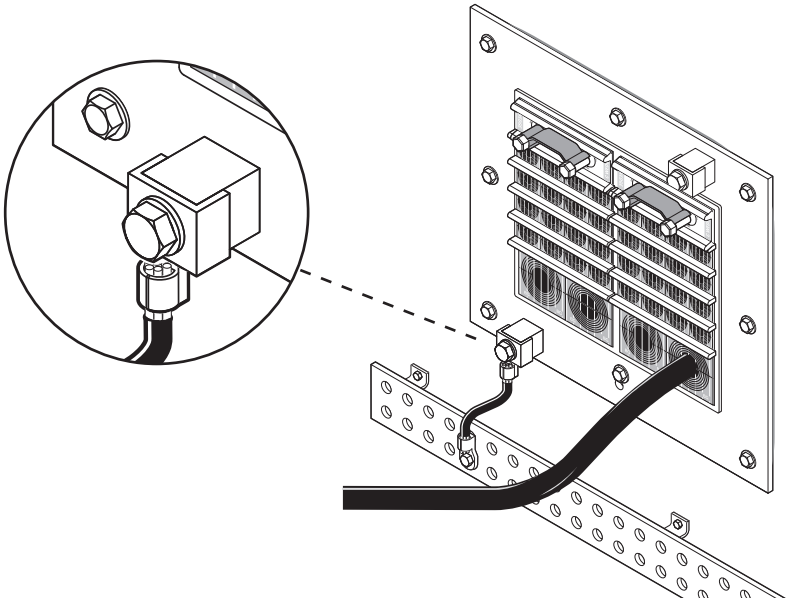


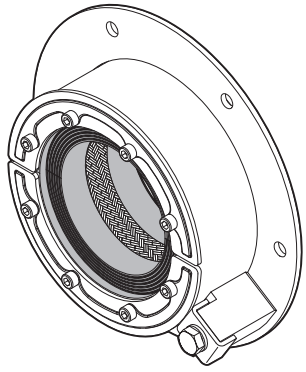




7.3 Bonding and grounding

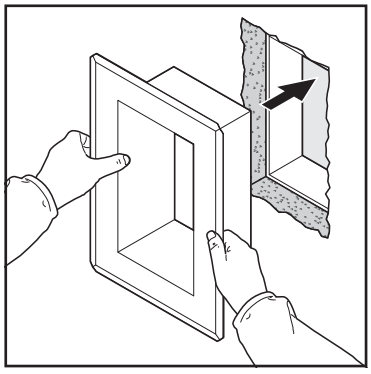
Frames with integrated earthing terminals are strongly recommended for bonding and grounding applications to simplify the connections to the earthed structure. This is good practice also for EMI/EMP applications.

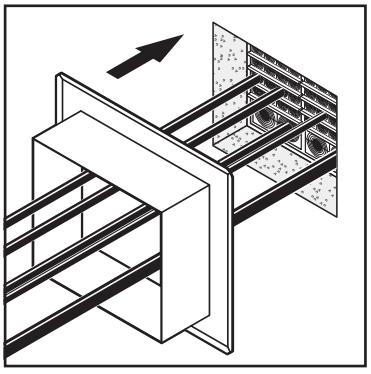




7.4 Channelization

In thick walls or floors, a GE extension frame can be used for channelization from the back side of the penetration. This covers rough edges and hides insulation. For some fire resistance approvals, a Roxtec GE frame may be required on the cavity side of the frame/wall. This frame can be installed either recessed into the wall or protruding from it, according to the relevant certification drawing.





7.5 Certificates and approvals

Ratings may differ between structures and chosen sealing methods. Consult the certificate for approved gaskets and frame combinations or contact your local Roxtec representative.

7.6 Product selection

Available solutions and product data such as aperture dimensions, frame material and sealing components, are available at roxtec.com

Disclaimer

"The Roxtec cable and pipe entry sealing system ('the Roxtec system') is a modular-based system of sealing products consisting of different components. Each and every one of the components is necessary for the best performance of the Roxtec system. The Roxtec system has been certified to resist a number of different hazards. Any such certification, and the ability of the Roxtec system to resist such hazards, is dependent on all components that are installed as a part of the Roxtec system. Thus, the certification is not valid and does not apply unless all components installed as part of the Roxtec system are manufactured by or under license from Roxtec ('authorized manufacturer'). Roxtec gives no performance guarantee with respect to the Roxtec system, unless (I) all components installed as part of the Roxtec system are manufactured by an authorized manufacturer and (II) the purchaser is in compliance with (a), and (b), below.

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(b) Installation shall be carried out in accordance with Roxtec installation instructions in effect from time to time.

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