Description and application guidelines

Roxtec selection guide – frames and gaskets
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.

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 ground lugs for bonding and grounding applications. Single frames have only one. The separate earthing points provide a dedicated electrical path to ground when the mounting surface is not conductive.

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

1.3 GH FL 100
The GH FL 100 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 FL 100
The GH BG FL 100 frame is a GH FL 100 frame equipped with two diagonally placed ground lugs for bonding and grounding applications. Single frames have only one. The separate earthing points provide a dedicated electrical path to ground when the mounting surface is not conductive.

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

1.5 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 an EMC 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.

1.6 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 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.

2.1 SLFR/SLFRS

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 solutions. It is used to cover existing openings in steel, gypsum, wood or sandwich panels. Ground lugs can be added upon request.

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.

3 Customized solutions

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

Contact your Roxtec representative for more information.
4 Sealing methods per structure

4.1 Concrete walls
For installations in concrete a frame with wide flange such as the GH FL 100, GH BG FL 100, GKO or SLF EXT is recommended. The roughness of the structure determines the gasket to be used between the flange and the structure.

4.1.1 Smooth concrete
For concrete with a smooth grinded surface we recommend using sealant or TSL 8x8 butyl sealing strip to achieve a good sealing for any small structural irregularities. Cracks or voids might need plastering before installation.

4.1.2 Uneven or rough concrete
For uneven concrete we recommend using sealant or TSL 8x8 butyl sealing strip to fill up the irregularities in the structure. Cracks or voids need plastering before installation.
4.2 Brick walls
For installations in brick walls a frame with wide flange such as the GH FL 100, GH BG FL 100, GKO or SLF EXT is recommended.

GH FL 100  GH BG FL 100  GKO  SLFO EXT

For brick walls, we recommend using TSL 8x8 butyl sealing strip or sealant to achieve a good sealing for the structural irregularities. Cracks or voids need plastering before installation.

4.3 Gypsum/wood
In flat walls or floors in wood or gypsum, we recommend installing the GH, GH BG™, SLF or SLFO frames and sleeves. The structure might need framing to take the load of the penetration, see chapter 7.1.

GH  GH BG  SLF  SLFO
Roxtec frames and sleeves bolted in flat walls and floors are recommended to be installed using a TSL 8x8 butyl sealing strip or sealant. Make sure the wall can carry the weight of the transit.

4.4 Steel structures
In flat steel structures such as cabinets, containers or decks/bulkheads, we recommend GH, GHM, GH BG, SLF or SLFO frames and sleeves.

For metal structures, all sealing strips, sealants or pre-punched gaskets are recommended.

For shielded EMC applications, the contact area between the EMC gasket and mounting surface must be conductive. Remove any paint or dirt to secure earth continuity.
4.5 Sandwich panels

In sandwich panels it is recommended to use the more narrow hole pattern in GHM frames. The structure often needs reinforcements to bear the weight of the frame. The structure might need framing to take the load of the penetration, see chapter 7.1.

For sandwich panels, TSL 8x8 butyl sealing strip or sealant are recommended.

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

<table>
<thead>
<tr>
<th></th>
<th>CONCRETE</th>
<th></th>
<th>BRICK</th>
<th>BOARD</th>
<th>STEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Uneven</td>
<td>Smooth</td>
<td></td>
<td>Gypsum Wood</td>
<td>Steel structures</td>
</tr>
<tr>
<td>GKO</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>GH</td>
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<td>X</td>
<td>X</td>
</tr>
<tr>
<td>GH FL 100</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
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<tr>
<td>GH BG</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>GH BG FL 100</td>
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<tr>
<td>GHM</td>
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<td>-</td>
<td>X</td>
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<tr>
<td>SLF</td>
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<td>SLFO</td>
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<td>X</td>
<td>X</td>
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<tr>
<td>SLFO EXT</td>
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<td>X</td>
<td>X</td>
<td>-</td>
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</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>TSL 20x8</th>
<th>TSL 8x8 BUTYL</th>
<th>TSL 15x6</th>
<th>Pre-punched gaskets*</th>
<th>Sealant**</th>
</tr>
</thead>
<tbody>
<tr>
<td>GKO</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>GH</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>GH FL 100</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>GH BG</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>GH BG FL 100</td>
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<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>GHM</td>
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<td>X</td>
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<td>X</td>
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<td>X</td>
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<tr>
<td>SLFO EXT</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
</tbody>
</table>

* 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.

<table>
<thead>
<tr>
<th></th>
<th>CONCRETE</th>
<th>BRICK</th>
<th>BOARD</th>
<th>STEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Uneven</td>
<td>Smooth</td>
<td>Gypsum Wood</td>
<td>Sand structures</td>
</tr>
<tr>
<td>TSL 20x8</td>
<td>0.3 bar*</td>
<td>1 bar*</td>
<td>IP 66/67</td>
<td>1 bar*</td>
</tr>
<tr>
<td>TSL 8x8 butyl</td>
<td>0.3 bar</td>
<td>0.3 bar**</td>
<td>IP 66/67</td>
<td>IP 54</td>
</tr>
<tr>
<td>TSL 15x6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.5 bar</td>
</tr>
<tr>
<td>Pre-punched gaskets</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.5 bar</td>
</tr>
<tr>
<td>Sealant</td>
<td>0.3 bar***</td>
<td>0.3 bar***</td>
<td>IP 66/67</td>
<td>IP 54</td>
</tr>
</tbody>
</table>

* 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.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3, 3S</th>
<th>3R</th>
<th>4, 4X</th>
<th>5</th>
<th>6</th>
<th>12, 12K, 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL/NEMA</td>
<td>IP 20</td>
<td>IP 22</td>
<td>IP 55</td>
<td>IP 24</td>
<td>IP 66</td>
<td>IP 53</td>
<td>IP 67</td>
<td>IP 54</td>
</tr>
</tbody>
</table>
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 EMC gaskets.

5 Gaskets and sealants

5.1 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)

5.2 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

5.3 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: Cellular rubber or solid
- Thickness: 3 or 4mm
- Shore: 50˚ or 60˚
5.4 **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

5.5 **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

5.6 **EMC gaskets**

We recommend and supply different gaskets for EMI applications depending on the application and the environmental ratings. Visit www.roxtec.com for more information.

6 **Fasteners**

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 FL 100 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. If necessary, the panel should be supported or attached with bolts going through the panel.

7 Arrangements

7.1 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.
7.2 Bonding and grounding
Frames with integrated ground lugs 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.

Frames and sleeves directly bolted to an earthed structure may not require external connections to earth if the electrical continuity is safely secured through bolts.

7.3 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.
7.4 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.

7.5 Product selection

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