Mechanical Packer and Accessories Brochure

Leak-Seal Product Line
Mechanical Packer Overview for Selection and Functionality

Mechanical packers and ports are used on almost every leak-seal chemical injection project. If a contractor is using chemical grout, then there is a high chance that they are also using mechanical packers. Considering that leak-seal injections are often performed in small cracks and joints, the mechanical packer portion of the project is often more significant than the chemical grout. Let’s begin with a brief overview of packer terminology as reference.

Several suppliers offer 2-3 standard mechanical packers and ports assuming that these are generic in design and commoditized. This assumption is incorrect. Not all mechanical ports are created equal, and we aim to define these functional differences in this brochure. Mechanical packers are most commonly defined by four key aspects; and these are Diameter, Length, Type, and Ball-Valve Location. Over the next few pages, we examine the functional differences of these key aspects.

Diameter

Mechanical Packer diameter is relevant for two reasons, 1) this dictates the size of the drill hole required, and 2) the overall surface area of the rubber in the drill hole is a key contributor to the pressure tolerance of a mechanical packer.

1) Size of drill hole considerations: Industry standards require 45-degree drilling to insert mechanical packers to a crack depth that is ½ the thickness of substrate. For thin substrates, for example 6” thick slabs, drilling at a 45-degree angle with a 5/8” drill bit may cause spalling and damage to the surface above the drilled angle as the outward heave force from the passage of the drill is greater than the strength of the concrete at that location, resulting in concrete spall and cracking damage at that location. For these applications, Alchemy-Spetec offers 5/16” (8mm) and 3/8” (10mm) diameter packers (see FIGURE 1).

The smaller cross section of drilling produces much less heave force against the face of the concrete and offers much better results when drilling into a thin concrete substrate.

Post-tension structures and/or structures with a significant amount of rebar also present an obstacle when drilling. By reducing the size of the drill bit by 40-50%, the contractor also decreases the probability of drilling into rebar or post-tensioning accordingly.
2) The tradeoff for smaller diameter is a decrease in pressure tolerances. Common \( \frac{3}{8}'' \) (13mm) or \( \frac{5}{8}'' \) (16mm) mechanical packers tolerate spikes in pressure greater than 4,000psi (see FIGURE 2). At 4,000psi, packers and ports can present a significant job-site hazard as they can exit the drill hole at dangerous velocities. While injecting at these pressures are never recommended, a \( \frac{1}{2}'' \) (13mm) or \( \frac{5}{8}'' \) (16mm) rubber base on the mechanical packer will prevent blow-out significantly better than the \( \frac{5}{16}'' \) (8mm) or \( \frac{3}{8}'' \) (10mm) counterpart.

![FIGURE 2. ACP-2006 (1/2'') and ACP-2012 (5/8'')]()

Length

Mechanical Packers are most commonly used in poured concrete substrates. In adequately consolidated poured concrete structures, the drill hole itself acts as a channel through which the chemical grout will travel as it reaches the cross-section of the crack or joint. In these conditions, only the entire rubber shaft of the mechanical must be recessed into the drill hole to create an adequate compression seal. In the example of a 3" long packer, this would leave approximately 1.5” of metal shaft for connection access from the coupler that connects the hose line to the mechanical packer. However, it is common to experience micro-spalling at the point of drilling as the drill catches the 45-degree drill line. In these cases, the packer must be set even further into the concrete to ensure the rubber is fully recessed into the drill hole. This condition decreases the length of shaft accessible at the face of the substrate for connection to the coupler and can present challenges for the applicator. For this reason, it is advised to utilize 4” or 6” long packers in deteriorated or defective concrete substrates (see FIGURE 3).

![FIGURE 3. ACP-2009 (4'') and ACP-2011 (6'')]()

Length can also be advantageous when the contractor is attempting to inject the material to a specific point within the substrate. For example, it may be desirable to deliver chemical grout to the backside of a 4” substrate, or to a certain depth for a pipe penetration, or to account or unknown consolidation of the concrete within the drill hole channel that could lead to lateral travel of chemical grout to undesired locations within the substrate. Each job-site and substrate condition is different, and length of mechanical packer can provide the contractor with more options and ultimately a more effective delivery of chemical grout.
Type

Mechanical Packers come in many types. In the concrete repair industry, contractors will find plastic, steel, brass, aluminum, zinc, and other metal alloys. The most commonly used type is steel. Steel offers the benefits of strength and resistance to oxidation through chemical grout oxidizing components found in grouts such as acrylics. Brass and Aluminum packers are weaker and allow for the shaft to be broken off by hammer for more timely patching efforts following injection. However, most Quality Control Managers and clients will require the removal of all metal from the substrate prior to patching. The chosen method of removal is the choice of the client and/or design professionals.

There are two types of plastic packers used (see FIGURE 4). The 5/8” (16mm) button top packer is used for high volume applications and for applications in which a button-top coupler is preferred to minimize leakage. The free-floating ball in the middle of the packer acts as an anti-return valve. A 5/8” (16mm) plastic sleeve is inserted first, with the threaded plastic base then screwed into compression via the hex head top. Another common port used is the 3/8” (10mm) plastic bang-in, or hammer-in port. These ports are simply inserted into a 3/8” (10mm) drill hole aided by the force of a hammer. The soft nature of the plastic allows the concrete to bite into the sides of the packer creating a compression seal. Because plastic packer compression is achieved through plastic to concrete friction, the overall pressure tolerances are typically lower than that of the mechanical packer counterpart.

FIGURE 4. ACP-2102 (5/8”) and ACA-550 (3/8”)

Aluminum packers have recently become more prevalent in the industry due to the combination of economical pricing with the benefits of mechanical packer pressure tolerances (see FIGURE 5). Due to the softness of the components, however, these packers have been known to strip threads at times. All functionality considered, aluminum packers do offer a reasonably price alternative to the steel mechanical packers.

FIGURE 5. ACP-2010 (Aluminum)

Alchemy-Spetec continues to offer a popular heavy-duty ½” (13mm) and 5/8” (16mm) packer with a soft grade of rubber and washer on the top of the packer that adds extra friction and bite to the concrete when tightened. The heavy-duty packer offering is in steel (see FIGURE 6). These heavy-duty packers are top-mounted ball-valve style and can be converted to button-top valve (see next section and below).
Ball-Valve Location

Perhaps the most misunderstood functionality of mechanical packer design is the ball-valve placement. The ball-valve placement is important because this is the functional element that keeps chemical grout in the substrate as it reacts and creates the density required to adequately seal the substrate. It is an applicator error to remove the packers prior to full product cure. Top-mounted zerk-valve packers allow for port-to-port travel observation. Port-to-port travel is injecting one packer until chemical grout is observed exiting the next packer which does not have an anti-return zerk-valve installed. Once the material is observed coming out of the next packer, the zerk-valve can be installed, and the process repeated (see FIGURE 7). This is only possible with top-mounted ball-valve placement. Another benefit of the top-mount packer is the ability to replace the standard zerk-valve with a button-top-valve (see FIGURE 8). Button top valves, as mentioned above, minimize leakage with a more secure connection to the packer that doesn’t allow the coupler/packer connection to flex (see FIGURE 9).

Bottom-mount ball-valves (as seen below FIGURE 10) are less common in the industry. The main benefit of bottom-mount ball-valves is the immediate removal of the top shaft following injection, and subsequent patching of the drill hole with the ball-valve still in the substrate. Bottom-mount ball-valve packers commonly have a bit more leakage and excess chemical grout as the shaft, above the ball-valve, is full of unreacted and unconfined chemical grout.
Alchemy-Spetec supplies a complete offering covering all of the functionalities detailed in this brochure. Below is a table detailing bottom-mount options and top-mount options. **Note:** All top-mount options can be converted to button-top style with by adding the equal quantity of Button-Top Fittings, ACP-2203.

<table>
<thead>
<tr>
<th>PACKER ID</th>
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<th>BOTTOM-MOUNT ZERK</th>
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<td>ACP-1045 w/ACP-2203</td>
</tr>
<tr>
<td>Plastic ACA-550</td>
<td>Plastic</td>
<td>ACA-550</td>
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</table>
Steel ACP-400 Standard Single
Standard 3-claw zerk coupler designed to work with all standard zerk valve configurations above. Steel design suitable for all grouts.

Steel HW-255 Standard Single
Heavy Duty steel buttonhead coupler provides 3-sided secure connection minimizing leaks at the coupler. Great for high volume and high-pressure applications. Repair kits available for internal seals. Steel design suitable for all grouts.

Steel ACA-570 1/4" NPT 100qty
Button Head Fittings are designed for high volume flow of resin and provide a smooth working surface for easy coupler engagement & removal. They are used as a quick coupling device to connect the MixMaster injection gun to a pipe used for soil stabilization or slab lifting. It is typically used with a coupler or a bell reducer depending on the size of the pipe it is attached to.

2018 Additions

Some selections in this document are custom-order. Please call for availability or samples. Replacement Product ID in (--) for duplicative packers.

Brass ACP-2001 5/16" x 2.5" 8m x 50mm 100qty

Steel ACP-2002 3/8" x 2.75" 10 x 60mm 100qty

Steel ACP-2003 3/8" x 3" 10 x 70mm 100qty
Removable anti-return valve on top allows for port-port travel technique and option of switching to buttonhead fitting (see below). Small diameter ideal for PT structures and shallow drill angles. Suitable for PU, EP, Polyacrylate, and Silicate grouts.
<table>
<thead>
<tr>
<th>Material</th>
<th>Model</th>
<th>Size</th>
<th>Quantity</th>
<th>Description</th>
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<tr>
<td>Steel</td>
<td>ACP-2003 w/ACP-2203</td>
<td>3/8” x 3” 10 x 70mm</td>
<td>100qty</td>
<td>Buttonhead top offers more secure connection and less leakage at coupler. Small diameter ideal for PT structures and shallow drill angles. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
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<tr>
<td>Steel</td>
<td>ACP-2004</td>
<td>3/8” x 4” 10 x 100mm</td>
<td>100qty</td>
<td>Bottom anti-return valve allows for removal of head prior to final grout set. Longer length more suited for poor concrete conditions causing spalls at drill hole. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
</tr>
<tr>
<td>Steel</td>
<td>ACP-2005</td>
<td>1/2” x 3” 13 x 70mm</td>
<td>100qty</td>
<td>Bottom anti-return valve allows for removal of head prior to final grout set. Most common industry size offers benefits of adequate surface area for grip with economical price. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
</tr>
<tr>
<td>Steel</td>
<td>ACP-2006</td>
<td>1/2” x 3” 13 x 70mm</td>
<td>100qty</td>
<td>Removable anti-return valve on top allows for port-port travel technique and option of switching to buttonhead fitting (see below). Most common industry size offers benefits of adequate surface area for grip with economical price. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
</tr>
<tr>
<td>Steel</td>
<td>ACP-2006 w/ACP-2203</td>
<td>1/2” x 3” 13 x 70mm</td>
<td>100qty</td>
<td>Buttonhead top offers more secure connection and less leakage at coupler. Most common industry size offers benefits of adequate surface area for grip with economical price. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
</tr>
<tr>
<td>Zinc</td>
<td>ACP-2007</td>
<td>1/2” x 3” 13 x 70mm</td>
<td>100qty</td>
<td>Bottom anti-return valve allows for removal of head prior to final grout set. Zinc type offers even more economical option to most common industry size. Suitable for PU, EP, and Silicate grouts</td>
</tr>
<tr>
<td>Steel</td>
<td>ACP-2008</td>
<td>1/2” x 4” 13 x 100mm</td>
<td>100qty</td>
<td>Bottom anti-return valve allows for removal of head prior to final grout set. Longer length more suited for poor concrete conditions causing spalls at drill hole. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
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<tr>
<td>Material</td>
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<td>Diameter</td>
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<tr>
<td>Steel</td>
<td>ACP-2009 (ACP-1030)</td>
<td>1/2” x 4” 13 x 100mm</td>
<td>100qty</td>
<td>Removable anti-return valve on top allows for port-port travel technique and option of switching to buttonhead fitting (see below). Longer length more suited for poor concrete conditions causing spalls at drill hole. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
</tr>
<tr>
<td>Steel</td>
<td>ACP-2009 w/ACP-2203 (ACP-1030 w/ACP-2203)</td>
<td>1/2” x 4” 13 x 100mm</td>
<td>100qty</td>
<td>Buttonhead top offers more secure connection and less leakage at coupler. Longer length more suited for poor concrete conditions causing spalls at drill hole. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
</tr>
<tr>
<td>Alum.</td>
<td>ACP-2010</td>
<td>1/2” x 4” 13 x 100mm</td>
<td>100qty</td>
<td>Conveniently sized dimensions coupled with ultra-economical aluminum design provides a great low-end option for general chemical injection. Suitable for PU, EP, and Silicate grouts.</td>
</tr>
<tr>
<td>Steel</td>
<td>ACP-2011</td>
<td>½” x 6” 13mm x 175mm</td>
<td>100qty</td>
<td>Removable anti-return valve on top allows for port-port travel technique and option of switching to buttonhead fitting (see below). Longer length more suited for poor concrete conditions causing spalls at drill hole. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
</tr>
<tr>
<td>Steel</td>
<td>ACP-2011 w/ACP-2203</td>
<td>½” x 6” 13mm x 175mm</td>
<td>100qty</td>
<td>Buttonhead top offers more secure connection and less leakage at coupler. Longer length more suited for poor concrete conditions causing spalls at drill hole. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
</tr>
<tr>
<td>Steel</td>
<td>ACP-2012</td>
<td>5/8” x 3” 16 x 70mm</td>
<td>100qty</td>
<td>Removable anti-return valve on top allows for port-port travel technique and option of switching to buttonhead fitting (see below). Larger diameter provides more surface area in hole for increased pressure tolerance. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
</tr>
<tr>
<td>Steel</td>
<td>ACP-2012 w/ACP-2203</td>
<td>5/8” x 3” 16 x 70mm</td>
<td>100qty</td>
<td>Buttonhead top offers more secure connection and less leakage at coupler. Larger diameter provides more surface area in hole for increased pressure tolerance. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
</tr>
<tr>
<td>Material</td>
<td>Part Number</td>
<td>Diameter</td>
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<tr>
<td>Steel ACP-2013 (ACP-1040)</td>
<td>5/8&quot; x 4&quot;</td>
<td>16 x 100mm</td>
<td>100qty</td>
<td>Removable anti-return valve on top allows for port-port travel technique and option of switching to buttonhead fitting (see below). Larger length and diameter combine benefits listed above. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
</tr>
<tr>
<td>Steel ACP-2013 w/ACP-2203 (ACP-1040 w/ACP-2203)</td>
<td>5/8&quot; x 4&quot;</td>
<td>16 x 100mm</td>
<td>100qty</td>
<td>Buttonhead top offers more secure connection and less leakage at coupler. Longer length and diameter combine benefits listed above. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
</tr>
<tr>
<td>Steel ACP-2014</td>
<td>1/2&quot; x 3&quot;</td>
<td>13 x 70mm</td>
<td>100qty</td>
<td>Removable anti-return valve on top allows for port-port travel technique and option of switching to buttonhead fitting (see below). High quality rubber sleeve and locking washer allow for extreme pressure tolerance. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
</tr>
<tr>
<td>Steel ACP-2014 w/ACP-2203</td>
<td>1/2&quot; x 3&quot;</td>
<td>13 x 70mm</td>
<td>100qty</td>
<td>Buttonhead top offers more secure connection and less leakage at coupler. High quality rubber sleeve and locking washer allow for extreme pressure tolerance. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
</tr>
<tr>
<td>Steel ACP-2015</td>
<td>5/8&quot; x 3&quot;</td>
<td>16 x 70mm</td>
<td>100qty</td>
<td>Bottom anti-return valve allows for removal of head prior to final grout set. Most common industry size offers benefits of adequate surface area for grip with economical price. Suitable for PU, EP, Polyacrylate, and Silicate grouts.</td>
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<tr>
<td>Plastic ACP-2102</td>
<td>5/8&quot; x 4&quot;</td>
<td>16 x 100mm</td>
<td>100qty</td>
<td>Removable, pre-placed sleeve provides grip for threaded plastic packer. Free-floating ball allows for high volume applications typical in 2-part foam applications. Buttonhead top provides secure connection for minimal leakage. Suitable for PU grouts.</td>
</tr>
<tr>
<td>Steel ACP-2204</td>
<td>Standard</td>
<td>Single</td>
<td></td>
<td>Steel buttonhead coupler provides 3-sided secure connection minimizing leaks at the coupler. Great for overhead and high-pressure applications. Repair kits available for internal seals. Steel design suitable for all grouts.</td>
</tr>
<tr>
<td>---------------------------</td>
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<tr>
<td>Standard 4-claw zerk coupler designed to work with all standard zerk valve configurations above. Steel design suitable for all grouts.</td>
<td>Steel buttonhead fitting purchased separately for all configurations of buttonhead packers listed in brochure. Internal anti-return valve. Suitable for all grouts. Ideal for overhead and high-pressure applications.</td>
<td>Steel ISO standard zerk valve. Suitable for interchangeable buttonhead and zerk functionality for all packers listed above with BH option. This is the item for extra zerk stock orders.</td>
<td>Long thread ISO standard zerk valve. Suitable for the ACA-550 3/8” hammer-in plastic port and for ACA-2103 5/8” plastic port.</td>
<td>F-assembly for 2-part chemical injection, or water flushing. Ideal for water metering, flushing, and simultaneous delivery for 2-part applications, including water as the second component. A must-have for experienced injection contractors.</td>
</tr>
</tbody>
</table>

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