Series MHP Hydraulic Cylinders
Parts Identification, Maintenance Instructions & Seal Kits

Service Assemblies and Seal Kits
Service Assembly Kits and Seal Kits for MHP cylinders simplify the ordering and maintenance processes. They contain sub-assemblies which are ready for installation, and are supplied with full instructions. When ordering Service Assemblies and Seal Kits, please refer to the identification plate on the cylinder body, and supply the following information:

Serial Number - Bore - Stroke - Model Number - Fluid Type

Key to Part Numbers
1 Head
7 Cap
14 Piston rod bushing
15 Cylinder body
17 Piston
18 Cushion sleeve
19 Tie rod
23 Tie rod nut
26 Back-up washer
(not 25-50mm bore cylinders)

27 Retainer
34 Piston rod – single rod, no cushion
35 Piston rod – single rod, cushion at head end
36 Piston rod – single rod, cushion at cap end
37 Piston rod – single rod, cushion at both ends
40 Wiperseal – for 14 and 122
41 Lipseal – for 14
43 Back-up washer, bushing lipseal 41
(not Group 1 seals)
45 O-ring – bushing/head
47 O-ring – cylinder body
571 Piston rod – double rod, no cushion
581 Piston rod – double rod, cushion one end
601 Piston rod – double rod, no cushion
611 Piston rod – double rod, cushion one end
69 O-ring – needle valve and check valve screws
702 Needle valve, cushion adjustment
70a2 Needle valve, cushion adjustment – cartridge type
70b Cartridge screw
70c O-ring – cartridge screw
70d Needle screw
70e Back-up washer – needle screw

70f O-ring – needle screw
71 Ball – cushion check valve
72 Cushion check valve screw
73 Floating cushion bushing
74 Retaining ring for cushion bushing
125 Standard piston seal
126 Energizing ring for standard seal 125
127 Wear ring for standard piston

1Not illustrated
2In some cases, the adjusting screw is installed in a cartridge.

Piston and Seal Assembly

Piston Rod Bushing and Seals

Seal Pusher
Starter Mandrel

Cylinder Division (U.S.A.)
500 South Wolf Road
Des Plaines, IL 60016
(847) 298-2400

Cylinder Division (Canada)
8485 Parkhill Dr.
Milton, Ontario,
Canada L9T 5E9
(905) 693-3000

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Operating Fluids and Temperature Ranges

The table shows the main types of fluid used with hydraulic cylinders. If the operating conditions of the particular application cannot be met by the groups described, please consult the factory and supply complete application details.

<table>
<thead>
<tr>
<th>Group</th>
<th>Seal Materials – a combination of:</th>
<th>Fluid Medium to ISO 6743/4-1982</th>
<th>Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nitrile (NBR), PTFE, enhanced polyurethane (AU)</td>
<td>Mineral oil HH, HL, HLP, HLP-D, HM, HV, MIL-H-5606 oil</td>
<td>-20°C to +80°C</td>
</tr>
<tr>
<td>5</td>
<td>Fluorocarbon elastomer (FPM) Fluorocarbon, PTFE</td>
<td>Fire resistant fluids based on phosphate esters (HFD-R) Also suitable for hydraulic oil at high temperatures/environments. <strong>Not suitable for use with Skydrol.</strong> See fluid manufacturer's recommendations.</td>
<td>-20°C to +150°C</td>
</tr>
</tbody>
</table>

Service Kit Numbers

### Bushing Seal Kits

<table>
<thead>
<tr>
<th>Rod Dia.</th>
<th>Standard (Nitrile, PTFE, &amp; Polyurethane)</th>
<th>Fluorocarbon (Fluorocarbon Elastomer (FPM), PTFE)</th>
</tr>
</thead>
</table>

### Piston Seal and Tube Seal Kits

<table>
<thead>
<tr>
<th>Bore Size</th>
<th>Standard (Nitrile, PTFE, &amp; Polyurethane)</th>
<th>Fluorocarbon (Fluorocarbon Elastomer (FPM), PTFE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHP-ES100-25</td>
<td>MHP-KB100-25</td>
<td>MHP-ES200-25</td>
</tr>
<tr>
<td>MHP-ES100-32</td>
<td>MHP-KB100-32</td>
<td>MHP-ES200-32</td>
</tr>
<tr>
<td>MHP-ES100-40</td>
<td>MHP-KB100-40</td>
<td>MHP-ES200-40</td>
</tr>
<tr>
<td>MHP-ES100-50</td>
<td>MHP-KB100-50</td>
<td>MHP-ES200-50</td>
</tr>
<tr>
<td>MHP-ES100-63</td>
<td>MHP-KB100-63</td>
<td>MHP-ES200-63</td>
</tr>
<tr>
<td>MHP-ES100-80</td>
<td>MHP-KB100-80</td>
<td>MHP-ES200-80</td>
</tr>
<tr>
<td>MHP-ES100-100</td>
<td>MHP-KB100-100</td>
<td>MHP-ES200-100</td>
</tr>
<tr>
<td>MHP-ES100-125</td>
<td>MHP-KB100-125</td>
<td>MHP-ES200-125</td>
</tr>
<tr>
<td>MHP-ES100-160</td>
<td>MHP-KB100-160</td>
<td>MHP-ES200-160</td>
</tr>
<tr>
<td>MHP-ES100-200</td>
<td>MHP-KB100-200</td>
<td>MHP-ES200-200</td>
</tr>
</tbody>
</table>

An extreme pressure lubricant (such as molybdenum disulphide) should be used on tie rod threads and nut bearing surfaces to control friction and reduce tie rod twist.

*The tie rod torque values listed in this table are intended for MHP Series cylinders having a pressure envelope pressure rating of 210 bars or 3000 p.s.i. Consult factory for tie rod torque of MHP Series cylinders having a higher pressure rating.

### Contents and Part Numbers of Service Assemblies

#### Head Assembly
- Non-cushioned: 1, 26, 47
- Cushioned: 1, 26, 47, 69, 70, (70a), 71, 72

#### Cap Assembly
- Non-cushioned: 7, 26, 47
- Cushioned: 7, 26, 47, 69, 70, (70a), 73, 74

#### Cylinder Body
- All types: 15

#### Cushion Screw Assembly
- Screw type: 69, 70
- Cartridge type: 70b, 70c, 70d, 70e, 70f

#### Cushion Assembly
- Screw type: 69, 71, 72

#### Contents and Part Numbers of Seal Kits for Pistons and Bushings

* See key to part numbers on first page

#### Bushing Kits
- Contain items 14, 40, 41, 45. Where the original bushing incorporates a bushing drain, please consult factory.

#### Rod Seal Kits
- Contain items 40, 41, 45.

#### Contents and Part Numbers of Service Assemblies

* See key to part numbers on first page

#### Piston Rod Assemblies

- These kits contain a fully assembled piston and rod assembly which is ready to install. They comprise a piston assembly of the appropriate type, see parts list below, plus a rod assembly from the types listed below.

#### Piston Assemblies

- Standard: 17, 125, 126, 127 x 2

#### Standard Rod Assemblies

- Single rod, non-cushioned: 34
- Single rod, cushioned head: 35, 18
- Single rod, cushioned cap: 36
- Single rod, cushioned both ends: 37, 18
- Double rod, non-cushioned: 57, 60
- Double rod, cushioned stronger end: 58, 60, 18
- Double rod, cushioned weaker end: 58, 61, 18
- Double rod, cushioned both ends: 58, 61, 18 x 2
Repairs
Although MHP cylinders are designed to make on-site maintenance or repairs as easy as possible, some operations can only be carried out in our factory. It is standard policy to fit a cylinder returned to the factory for repair with those replacement parts which are necessary to return it to ‘as good as new’ condition. Should the condition of the returned cylinder be such that repair would be uneconomical, you will be notified.

Servicing Piston Seals
When a cylinder is overhauled, a new set of piston seals is required. Cylinders should always be reassembled with new cylinder body O-rings (47). O-rings, and back-up washers where fitted, are available as a CB kit, and are included in the piston seal kits described below.

Remove the old seals and wear rings from the piston, taking care not to damage the seal grooves. Carefully clean all parts. The cylinder bore and piston must be closely examined for signs of scoring and, if either is damaged, it must be replaced.

Standard Piston Seals – PN Kits
PN Kits comprise a polyurethane seal for Group 1 service or filled PTFE seal for Group 5 service (125), an energizing ring (126) and two wear rings (127), plus cylinder body O-rings (47) and their back-up washers (26), where fitted. Install the energizing ring followed by the seal. Position the wear rings in their grooves. Lubricate the cylinder body with a light oil, and insert the piston. For 25 and 32mm bore cylinders, best results will be achieved by using tools and technique as shown in Figure 1.

3) Ensuring that the head and cap are kept in alignment, refit the cylinder tie-rods and progressively tighten using a diagonal sequence, torquing the tie-rod nuts to the values shown in the table on page 2. DO NOT TORQUE ONE TIE ROD COMpletely AND THEN THE OTHERS.

4) In all cases, tighten the bushing firmly against the cylinder head, using an open end wrench on flats provided. The cylinder should, where possible, be gently stroked by hand to ensure that it moves freely over the entire stroke. This cannot be done immediately after assembly, due to seal friction. After a few strokes under pressure, movement by hand should be possible for most sizes.

Servicing Cushion Needle and Check Valves
Leakage from cushion adjusters or check valve screws indicates that the screw- or cartridge-type assembly must be replaced. The replacement assembly includes a new O-ring.

Removal
Where fitted, rivets should be drilled out to allow removal of the protective cover plate. The screw/cartridge assembly should be unscrewed and its mounting hole cleaned, paying close attention to the surface on which the O-ring seals.

Installation – Cushion Needle Valves
Where a cartridge-type adjuster is fitted, lightly lubricate the screw threads and torque to the figures shown in the table. With both types, the hex-headed screw may be adjusted to provide the required cushioning performance. Where originally fitted, replace cover plates using the rivets supplied.

Installation – Check Valve
Ensure that the ball is correctly positioned. Screw-type adjusters should be screwed fully home, then backed off by a full turn. Where originally fitted, replace cover plates using the rivets supplied.

Piston Seal Assembly Tools
You can order the Piston Seal assembly tools to fit the 25 and 32mm bore size cylinders. See chart below.
Servicing Cylinder Bushing Seals

Fluid leakage from the piston rod at the bushing normally indicates worn bushing seals. The cylinder should, if possible, be removed for overhaul, or the piston rod disconnected.

The Miller bushing is a cartridge design consisting of an iron bushing, primary rod seal and double lip wiper. It is threaded into the bushing retainer plate, and all sizes are removable without disturbing the tie rod torque.

Removal

1) Inspect the piston rod to make sure it is free from burrs or damage which would prevent the bushing sliding off the rod.

2) Where the bushing is screwed into a square retainer or directly to the head: unscrew bushing using open end wrench on flats provided, and slide the bushing off the piston rod.

Where the bushing is screwed into a circular retainer: undo the socket headed cap screws and slide the bushing/retainer assembly off the piston rod. Unscrew and withdraw the bushing from the inner face of the retainer.

3) Remove the seals using a sharp pointed instrument, taking care not to damage the bushing. Clean and inspect the bushing bore and seal grooves. If any wear is present, replace with a bushing kit containing seals of the correct type for the conditions.

Installation

Inspect the surface of the piston rod for damage which could cause early seal failure. When fitting the bushing over the rod thread, a slight rotary motion will help prevent damage to the seals. In addition, shim stock or other thin, tough material can be wrapped around the threads to protect the seal lips.

1) Ensure that the kit contains seals of the correct type. Lubricate the bushing and seals, and fit the wiper (40) into the groove closest to the outside face of the bushing.

2) If a “standard” material rod seal is being fitted to a standard bushing, no back-up washer is necessary. With a fluoro-carbon rod seal, a back-up washer (43) will be included in the kit. Install this in the rod seal groove, against the wall closest to the wiper. Install the lipseal (41) in the groove, with the lips facing the pressure (cylinder) side of the bushing.

3) Each bushing kit contains an O-ring (45) which acts as a seal and torque prevailing lock between the bushing and head. This O-ring is a static seal, and the original may be left in place unless it is faulty.

Note: Some seal kits contain more than one O-ring. In this case, fit the one which is identical in size and thickness to the existing O-ring. Any extra O-rings should be discarded.

4) Lubricate the bushing and seals. Slide the bushing cartridge over the piston rod and thread it into the retainer or cylinder head. Tighten the bushing firmly against the cylinder head using an open end wrench on flats provided. In some cases (especially large piston rod diameters) it may be necessary to loosen the tie rod nuts or retainer bolts, and remove the retainer, in order to thread the bushing back into place. In those cases, thread the bushing into the retainer about one thread short of the retainer face that contacts the cylinder head. Slide the bushing assembly over the piston rod and orient holes in large retainers with tie rod holes and holes in bolt-on retainers with threaded mounting holes. Seat the retainer against the cylinder head. Assemble bolts that secure bolt-on retainers finger tight. For both style retainers, torque tie rod nuts to values listed on page 2. Torque tie rods gradually starting at one corner and work in a diagonal pattern to ensure evenness of tightening. DO NOT TORQUE ONE TIE ROD COMPLETELY AND THEN THE OTHERS. Then, on cylinders with bolt-on retainers, torque bolts to the values listed on this page. To complete the assembly, in all cases tighten the bushing cartridge firmly against the cylinder head using an open end wrench on flats provided.

Bushing seals are pressure activated and do not need adjustment.

Retainer Bolt Torque

<table>
<thead>
<tr>
<th>Bolt Size</th>
<th>Torque</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>M4 X 0.7</td>
<td>4 - 4.5 N-m</td>
<td>36 - 40 in-lbs</td>
</tr>
<tr>
<td>M5 X 0.8</td>
<td>9 - 9.5 N-m</td>
<td>80 - 84 in-lbs</td>
</tr>
<tr>
<td>M6 X 1</td>
<td>15.5 - 16 N-m</td>
<td>11 - 12 ft-lbs</td>
</tr>
<tr>
<td>M8 X 1.25</td>
<td>35 - 39 N-m</td>
<td>26 - 29 ft-lbs</td>
</tr>
<tr>
<td>M10 X 1.5</td>
<td>70 - 77 N-m</td>
<td>52 - 57 ft-lbs</td>
</tr>
</tbody>
</table>