

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

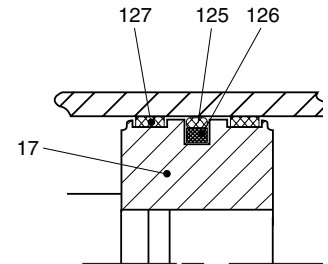
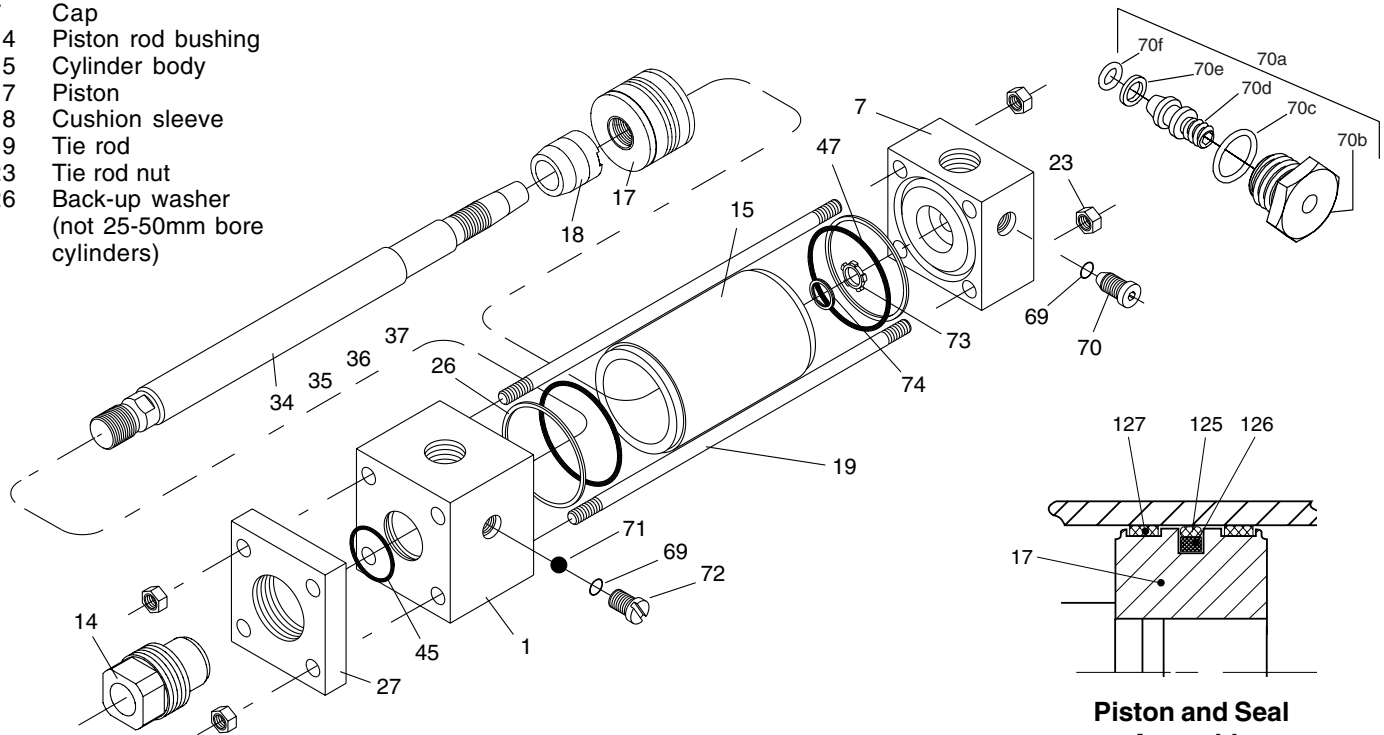
Key to Part Numbers

- 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)

- 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

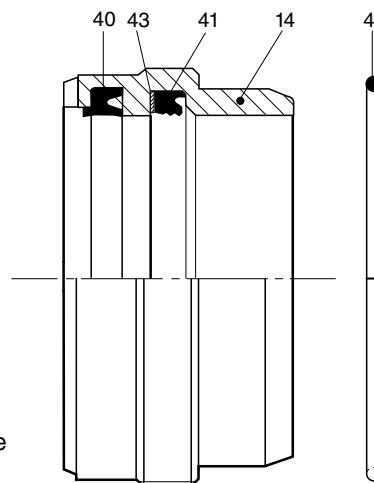
¹Not illustrated

²In some cases, the adjusting screw is installed in a cartridge.

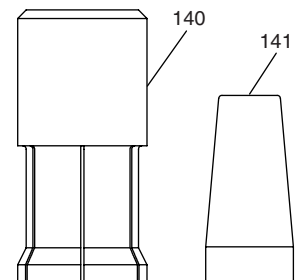


Piston and Seal Assembly

- 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



Piston Rod Bushing and Seals



- 140 Seal Pusher
- 141 Starter Mandrel

Piston Seal Assembly Tools

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.

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

Service Kit Numbers

Bushing Seal Kits

Rod Dia.	Seal Type			
	Standard (Nitrile, PTFE, & Polyurethane)		Fluorocarbon (Fluorocarbon Elastomer (FPM), PTFE)	
	Bushing Kits†	Rod Seal Kits†	Bushing Kits†	Rod Seal Kits†
12	MHP-KR100-12	MHP-KR300-12	MHP-KR200-12	MHP-KR400-12
14	MHP-KR100-14	MHP-KR300-14	MHP-KR200-14	MHP-KR400-14
18	MHP-KR100-18	MHP-KR300-18	MHP-KR200-18	MHP-KR400-18
22	MHP-KR100-22	MHP-KR300-22	MHP-KR200-22	MHP-KR400-22
28	MHP-KR100-28	MHP-KR300-28	MHP-KR200-28	MHP-KR400-28
36	MHP-KR100-36	MHP-KR300-36	MHP-KR200-36	MHP-KR400-36
45	MHP-KR100-45	MHP-KR300-45	MHP-KR200-45	MHP-KR400-45
56	MHP-KR100-56	MHP-KR300-56	MHP-KR200-56	MHP-KR400-56
70	MHP-KR100-70	MHP-KR300-70	MHP-KR200-70	MHP-KR400-70
90	MHP-KR100-90	MHP-KR300-90	MHP-KR200-90	MHP-KR400-90
110	MHP-KR100-110	MHP-KR300-110	MHP-KR200-110	MHP-KR400-110
140	MHP-KR100-140	MHP-KR300-140	MHP-KR200-140	MHP-KR400-140

Piston Seal and Tube Seal Kits

Bore Size	Seal Type				Tie Rod Torque Nm*
	Standard (Nitrile, PTFE, & Polyurethane)		Fluorocarbon (Fluorocarbon Elastomer (FPM), PTFE)		
	Body Seal Kits†	Piston Seal Kits†	Body Seal Kits†	Piston Seal Kits†	
25	MHP-ES100-25	MHP-KB100-25	MHP-ES200-25	MHP-KB200-25	4.5-5.0
32	MHP-ES100-32	MHP-KB100-32	MHP-ES200-32	MHP-KB200-32	7.6-9.0
40	MHP-ES100-40	MHP-KB100-40	MHP-ES200-40	MHP-KB200-40	19.0-20.5
50	MHP-ES100-50	MHP-KB100-50	MHP-ES200-50	MHP-KB200-50	68-71
63	MHP-ES100-63	MHP-KB100-63	MHP-ES200-63	MHP-KB200-63	68-71
80	MHP-ES100-80	MHP-KB100-80	MHP-ES200-80	MHP-KB200-80	160-165
100	MHP-ES100-100	MHP-KB100-100	MHP-ES200-100	MHP-KB200-100	160-165
125	MHP-ES100-125	MHP-KB100-125	MHP-ES200-125	MHP-KB200-125	450-455
160	MHP-ES100-160	MHP-KB100-160	MHP-ES200-160	MHP-KB200-160	815-830
200	MHP-ES100-200	MHP-KB100-200	MHP-ES200-200	MHP-KB200-200	1140-1155

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 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.

Body Seal Kits† Contain two each of items 47, 26 (not 25-50mm bore).

Piston Seal Kits† (includes Cylinder Body End Seals). Contains two each of items 47, 26 (not 25-50mm bore), two of item 127, and one each of items 125, 126.

Contents and Part Numbers of Service Assemblies (see key to part numbers on first page)

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

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

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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.

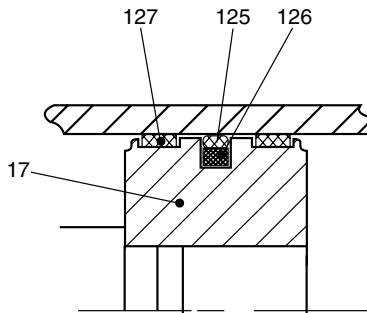
Servicing Piston Seals

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 Ref. Fig. 2

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.



Cylinder Assembly

The cylinder should be re-assembled as follows:

1) The back-up washers, where fitted, and then the body O-rings should be lightly oiled and pressed into the grooves in the head and cap, without twisting. The cylinder body, with the piston and rod already fitted, can then be assembled to the cap by 'rocking' it down over the O-ring until the cylinder body is in contact with the cap. The head is then fitted over the piston rod and assembled to the cylinder body. Rock gently until the body and head are in metal-to-metal contact.

2) Lightly lubricate the bushing seals.

Bushings with retainer: screw the bushing into the retainer about one thread short of the retainer face that contacts the cylinder head. Slide the bushing/retainer assembly over the piston rod end, taking care not to damage the seal lips, and position the retainer against the head.

Bushings without a retainer: slide the bushing over the piston rod end, taking care not to damage the seal lips, and hand tighten.

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.

Bore Ø	Seal Pusher (Symbol 140)	Starter Mandrel (Symbol 141)
25	0884960000	0884950000
32	0885610000	0885600000

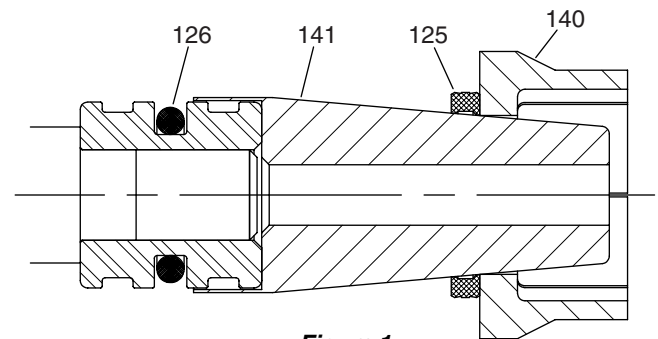


Figure 1

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.

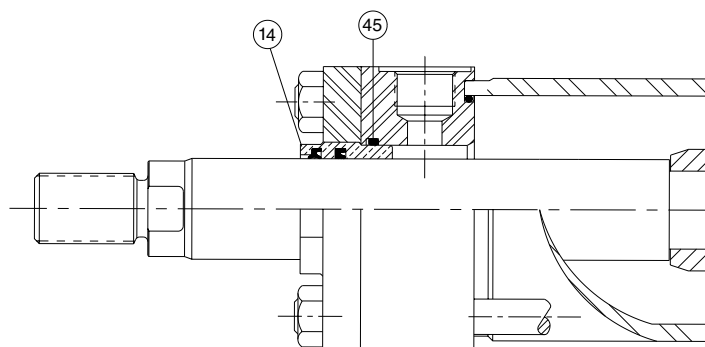
- 3) Remove the seals using a sharp pointed instrument, taking care not to damage the bushing. Clean and inspect the bushing bore and seal grooves. If any wear is present, replace with a bushing kit containing seals of the correct type for the conditions.

Installation Ref. Fig. 5

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 For Cylinders with Round Bushing Retainers

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