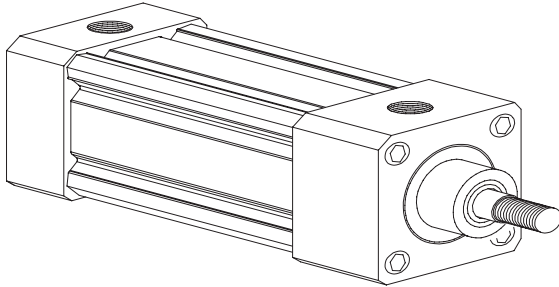
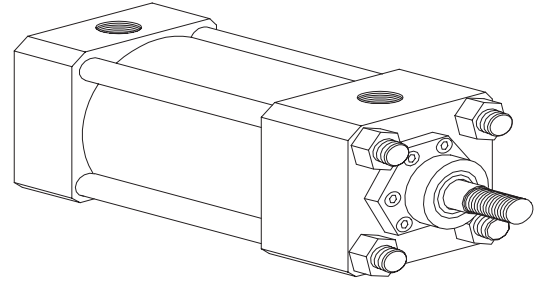


Provenair® Series AN Cylinders Parts List / Service Instructions



**1-1/2", 2", 2-1/2", 3-1/4" and 4" BORES
EXTRUDED BARREL CONSTRUCTION**



**5", 6", 8" and 10" BORES
TIE ROD CONSTRUCTION**

TYPE: Aluminum, repairable, square head, medium bore sizes, double-acting, light to medium duty.

BORE SIZES: 1-1/2", 2", 2-1/2", 3-1/4", 4", 5", 6", 8", 10".

MAXIMUM AIR INLET PRESSURE: 250 p.s.i.g (17.2 bar).

OPERATING PRESSURES: 250 p.s.i.g. (17.2 bar) – pneumatic.

STROKE: Up to 99-7/8".

THRUST RANGE: 1-1/2" thru 10". Up to 19,634 lbs.

OPTIONS: Cushioned and non-cushioned, 17 mounting styles, Reed and Hall effect switches, magnetic pistons and 3 packing options. NOTE: Wear strip is standard on 1-1/2" thru 4" bore sizes.

AIR SUPPLY REQUIREMENTS

ARO Cylinders are pneumatic devices which convert compressed air into linear motion. Cylinders are widely used for such things as: clamping, pushing or pulling motion, product assembly, stamping and tensioning. The product offering ranges from light to heavy duty industrial applications operating on air pressures up to 250 p.s.i.g. (17.2 bar). Model options include:

Stainless steel rod for corrosive environments, low friction packings and cushion versions used to decelerate heavy loads. For detailed information on models offered refer to the ARO Cylinder catalog.

WARNINGS AND PRECAUTIONS

⚠ WARNING EXCESSIVE AIR PRESSURE. Do not exceed maximum working pressure which can result in serious injury or property damage. Use an air regulator to limit pressure to the cylinder.

⚠ WARNING PRESSURIZED CYLINDERS CAN CAUSE INJURY. De-pressurize the system before cleaning, inspection, re-lubrication, servicing or disassembly to prevent injury from accidental cycling.

⚠ WARNING PINCH HAZARD. Keep clear of moving cylinders and fixtures to avoid injury.

AIR AND LUBE REQUIREMENTS

AIR PRESSURE: Limited to 250 p.s.i.g. (17.2 bar).

Proper moisture removal and filtration of contaminants will promote good service life and operation.

Install an air regulator to control the operating pressure, insure smooth operation and conserve energy.

LUBRICATION

ARO pneumatic cylinders are lubricated at the factory. This lubrication should provide satisfactory operation and cycle life. The use of lubricated air will however help to extend the cycle life.

INSTALLATION

Cylinders must only be installed by a competent technician who understands the system requirements, mechanical principles and equipment involved. NOTE: Improper alignment of the cylinder can cause excessive wear on the rod seals. Check rod alignment to the machine parts in both the retracted and extended positions.

- Install the air regulator as close as practical to the cylinder.
- Keep cylinder ports plugged or covered prior to assembly to prevent contamination which can contribute to premature failure.
- Use Teflon tape on the air fittings to prevent leakage.

OPERATION

Improper application, installation, service or maintenance of ARO Cylinders can cause bodily injury or shortened product life. Contact the ARO Corporation for questions concerning special applications.

CYLINDER MODELS WITH CUSHIONS

This feature can increase cylinder life. However, it should not be used exclusively to decelerate heavy loads. Cushioned cylinder models are equipped with adjustable needle valves in the end cap(s) for easy, precise adjustment of the cushion effect.

Theory of Operation: The cushion seal is a “floating” “O” ring which seals on a cushion boss, a part of the piston assembly. As the cushion boss enters the cushion “O” ring located in the head or cap, the main air exhaust flow is blocked and forced through a bypass passage containing the

needle valve. The cushion effect is created by the resulting back pressure. The cushion needle is used to vary the restriction (back pressure) and control the degree of cushioning. Upon application of the air in the opposite direction, the incoming air forces the “O” ring cushion seal towards the inside of the cylinder and acts as a check valve in the free flow direction. Incoming air flows around the o.d. of the seal providing full flow to the piston face with little or no pressure drop for quick stroke reversal.

CUSHION ADJUSTMENT NEEDLE

- Turn **CLOCKWISE TO INCREASE** cushion effect.
- Turn **COUNTERCLOCKWISE TO DECREASE** cushion effect.

ADJUSTMENT NOTE: DO NOT ROTATE CUSHION ADJUSTMENT NEEDLE COMPLETELY CLOCKWISE; Complete shutoff of the cushion adjustment needle valve will prevent the cylinder from completely extending or retracting.

MAINTENANCE

Periodic cylinder maintenance should be performed to insure maximum service life.

- Clean the air filter / regulator bowl regularly. Relieve system pressure, empty the contents of the bowl and clean or replace the filter element.
- Check the fluid level in the lubricator regularly, replenish with the appropriate air line lubricant.
- Filtered air should be used to operate cylinders. Dirty air will damage seals and reciprocating parts.

SERVICE

- Metallic parts should be cleaned with a non-flammable solvent.
- Rubber parts should be cleaned with soap and water.
- Cleaned parts should be rinsed and dried using low pressure air.
- Replace any parts which are worn or damaged. Selected parts and seals are available in repair kit form.
- Lubricate moving parts and seals.
- Do not attempt to disassemble pistons from rods. High heat is required and piston and / or piston rod damage will result.

NOTE: Do not attempt to grip the piston rod with pliers or wrenches which can cause scouring. Nicks or scratches on the piston rod will damage the rod seals.

ASSEMBLY

Verify that all seals are in the correct position and that the rod and piston seals have been properly lubricated with Accrolube or agnalube grease.

Torque Specifications:

	Cap Screws	Female Bolts
1-1/2"	9 ft lbs (12.2 Nm)	6 ft lbs (8.1 Nm)
2"	16 ft lbs (21.7 Nm)	10 ft lbs (13.6 Nm)
2-1/2"	21 ft lbs (28.5 Nm)	10 ft lbs (13.6 Nm)
3-1/4"	35 ft lbs (47.5 Nm)	20 ft lbs (27.1 Nm)
4"	49 ft lbs (66.4 Nm)	20 ft lbs (27.1 Nm)
5"	45 ft lbs (61 Nm)	N/A
6"	55 ft lbs (74.6 Nm)	N/A
8"	110 ft lbs (149.2 Nm)	N/A
10"	125 ft lbs (169.5 Nm)	N/A

The assembled cylinder can now be tested for leaks and proper operation.

1. Alternately apply 90 p.s.i.g. (6.2 bar) air pressure to each of the cylinder ports and test for internal leaks across the piston and external leaks at the barrel seals and the rod seal.
2. Test for proper cycling at 20 p.s.i.g. (1.4 bar) supply.

MODEL NUMBER IDENTIFICATION



CYLINDER TYPE

- A - Double Acting, Single Rod End
- B - Double Acting, Double Rod End

BORE SIZE

- Q - 1-1/2"
- S - 2"
- T - 2-1/2"
- W - 3-1/4"
- 4 - 4"
- 5 - 5"
- 6 - 6"
- 8 - 8"
- Y - 10"

ROD DIAMETER

- K - 5/8"
- M - 1"
- P - 1-3/8"
- Q - 1-3/4"
- S - 2"

ROD END

- A - KK1, chrome
- B - KK2, chrome
- C - CC, chrome
- D - KK1, female
- F - Blank, chrome
- G - KK1, stainless steel
- H - KK2, stainless steel
- J - CC, stainless steel
- K - KK1, female, stainless steel
- L - Blank, stainless steel

SEALS

- B - Nitrile
- G - Nitrile, Mag
- H - Viton, Mag
- J - Self-Lube, Mag
- S - Self-Lube
- V - Viton

STROKE LENGTH

Whole Inches	Fractions
01 - 1"	0 - None
02 - 2"	1 - 1/8"
03 - 3"	2 - 1/4"
04 - 4"	3 - 3/8"
	4 - 1/2"
	5 - 5/8"
	6 - 3/4"
99 - 99"	7 - 7/8"

MOUNTING STYLE

- | | |
|--------------|-----------|
| X - No mount | K - MP4 * |
| A - MS1 | L - MS7 |
| B - MS4 | M - MT2 * |
| C - MP1 * | P - MT1 |
| D - MP2 * | Q - MX1 |
| F - MF1 ● | T - MX2 * |
| H - MF2 * ● | U - MX3 |
- 1 - Female tap both ends
 - 2 - Female tap cap *
 - 3 - Female tap head
 - 4 - Female tap both ends + MS4
 - 5 - Female tap cap + MS4 *
 - 6 - Female tap head + MS4

PORT LOCATION

- A - Rot Ports H1, C1
- B - Rot Ports H1, C2
- C - Rot Ports H1, C3
- D - Rot Ports H1, C4
- F - Rot Ports H2, C1
- G - Rot Ports H2, C2
- H - Rot Ports H2, C3
- J - Rot Ports H2, C4

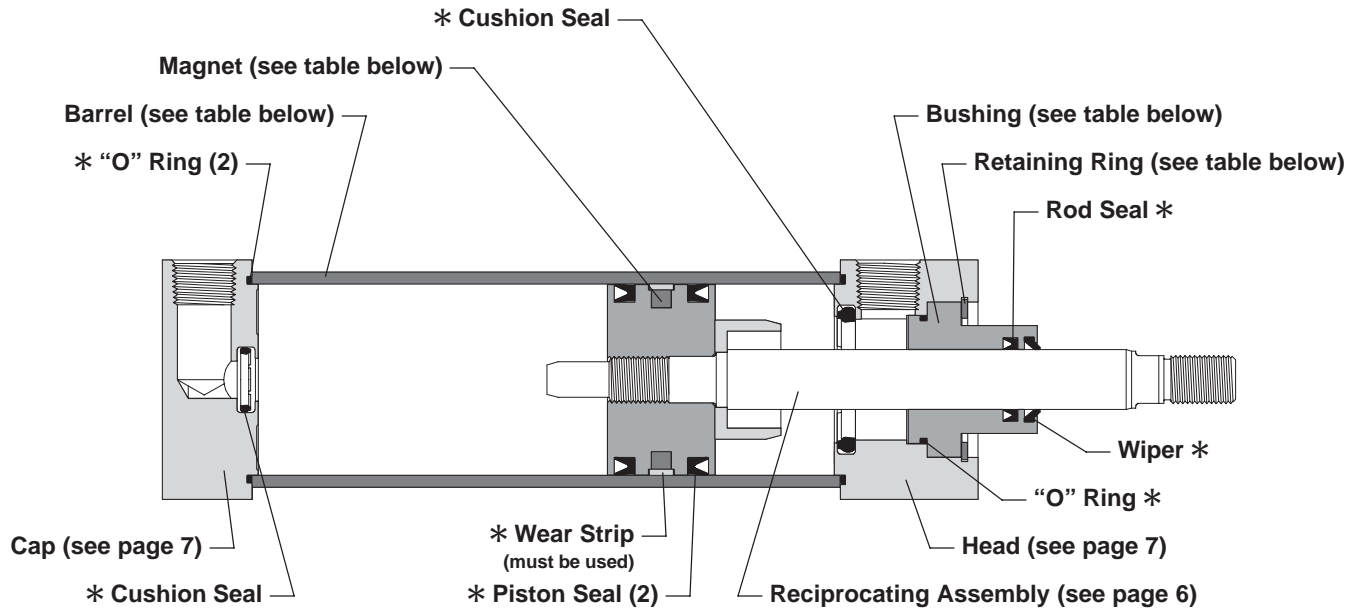
CUSHIONS

- X - No Cushion
- B - Cushion both ends
- C - Cushion cap end
- H - Cushion head end

* Not available on double rod end cylinders.

● On 8" and 10" bores, MF1 and MF2 become ME3 and ME4.

NOTE: The model number of a modified cylinder will not match the above identification table, contact the factory for assistance. Example of model numbers which will require factory assistance: MQ1001-010, BQ1001-010, ANAQ-F049-K46.



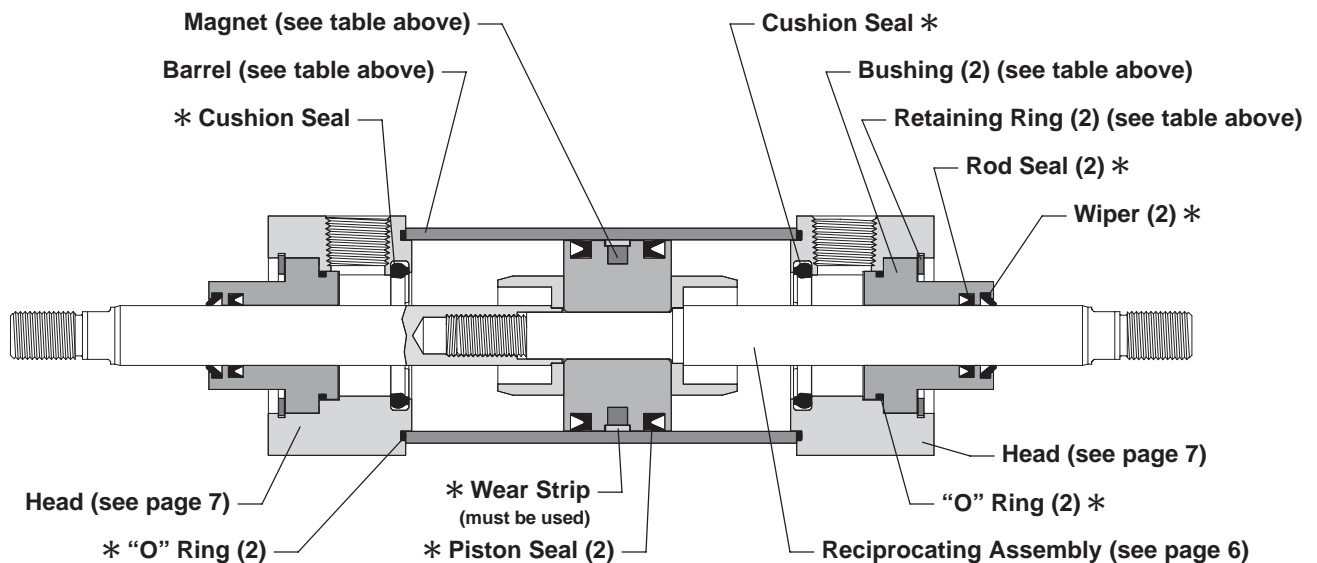
SINGLE ROD CYLINDERS

1-1/2", 2", 2-1/2", 3-1/4" and 4" BORE

BORE SIZE	BARREL NUMBER	BUSHING NUMBER		RETAINING RING	MAGNET (OPTIONAL)
		STANDARD ROD	OVERSIZE ROD		
1-1/2"	119572-X	119454	N/A	119549-125	119681-150
2"	119573-X	119455	119456	119549-162	119681-200
2-1/2"	119574-X	119455	119456	119549-162	119681-250
3-1/4"	119575-X	119457	119458	119549-212	119681-325
4"	119576-X	119457	119458	119549-212	119681-400

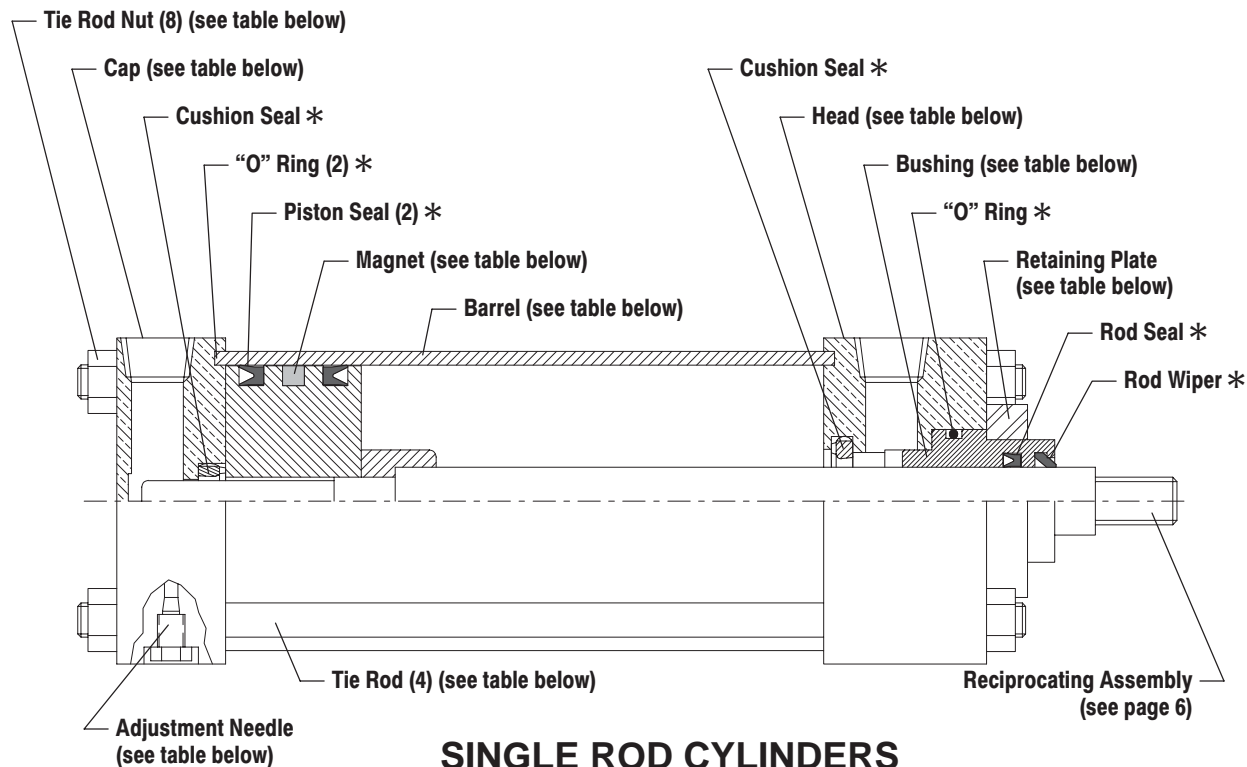
NOTE: "X" = Stroke Length.
 NOTE: Retaining ring must be replaced when replacing bushing.
 NOTE: Optional magnet resides under wearstrip.

* Included in Seal Kit (see page 7).



DOUBLE ROD CYLINDERS

1-1/2", 2", 2-1/2", 3-1/4" and 4" BORE

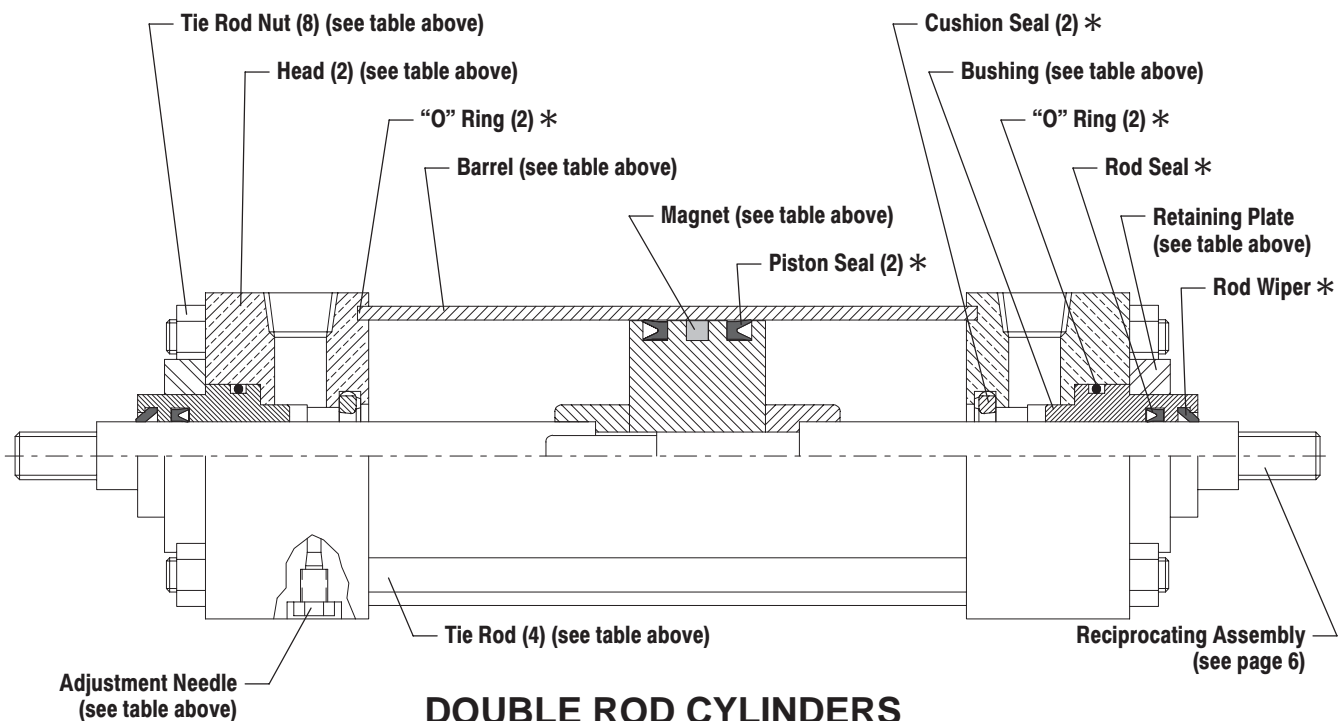


SINGLE ROD CYLINDERS 5", 6", 8" and 10" BORE

BORE SIZE	BARREL NUMBER	BUSHING NUMBER		RETAINING PLATE		MAGNET (OPTIONAL)	HEAD	CAP	TIE ROD NUTS	ADJUSTMENT NEEDLE
		STANDARD ROD	OVERSIZE ROD	STANDARD ROD	OVERSIZE ROD					
5"	114148-X	115074	115075	114145-50	114145-55	114152-50	114142-50	114143-50	114146-1	114147
6"	114149-X	115075	115076	114145-60	114145-65	114152-60	114142-60	114143-60	114146-1	114147
8"	114150-X	115075	115076	114145-60	114145-100	114152-80	114142-80	114143-80	114146-2	114147
10"	114151-X	115076	114130	114145-100	114145-105	114152-100	114142-100	114143-100	114146-3	114147

NOTE: "X" = Stroke Length.

NOTE: "*" Included in Seal Kit (see page 7).



DOUBLE ROD CYLINDERS 5", 6", 8" and 10" BORE

PROVENAIR RECIPROCATING ASSEMBLY

RAN **X** **X** **X** - **X** **X** - **XX** **X**

CYLINDER TYPE

- A - Double Acting, Single Rod End
- B - Double Acting, Double Rod End

BORE SIZE

- Q - 1-1/2"
- S - 2"
- T - 2-1/2"
- W - 3-1/4"
- 4 - 4"
- 5 - 5"
- 6 - 6"
- 8 - 8"
- Y - 10"

ROD DIAMETER

- K - 5/8"
- M - 1"
- P - 1-3/8"
- Q - 1-3/4"
- S - 2"

ROD END

- A - KK1, chrome
- B - KK2, chrome
- C - CC, chrome
- D - KK1, female
- F - Blank, chrome
- G - KK1, stainless steel
- H - KK2, stainless steel
- J - CC, stainless steel
- K - KK1, female, stainless steel
- L - Blank, stainless steel

STROKE LENGTH

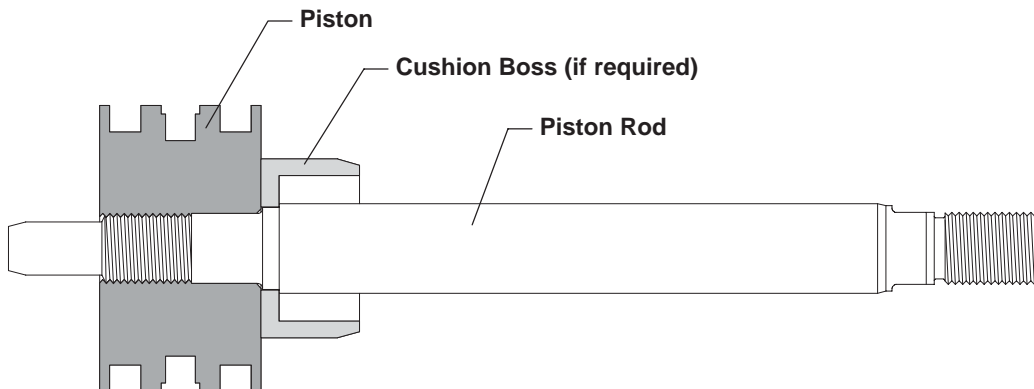
Whole Inches	Fractions
01 - 1"	0 - None
02 - 2"	1 - 1/8"
03 - 3"	2 - 1/4"
04 - 4"	3 - 3/8"
	4 - 1/2"
	5 - 5/8"
	6 - 3/4"
	7 - 7/8"

CUSHIONS *

- X - No cushion; Single rod cushion cap end
- B - Cushion both ends

* All single rod end reciprocating assemblies are automatically "cushion cap end".

NOTE: Reciprocating assembly is furnished assembled with all required components, less seals. It is recommended that new seal kits be used when replacing reciprocating assemblies. See page 7 for seal kit requirements.



PROVENAIR SEAL KITS

RKN X X X - X B

CYLINDER TYPE

A - Double Acting, Single Rod End
 B - Double Acting, Double Rod End

BORE SIZE

Q - 1-1/2" 5 - 5"
 S - 2" 6 - 6"
 T - 2-1/2" 8 - 8"
 W - 3-1/4" Y - 10"
 4 - 4"

NOTE: All seal kits include wear strip and cushion seals.

CUSHIONED BOTH ENDS

SEALS

B - Nitrile; Nitrile, Mag
 S - Self-Lube; Self-Lube, Mag
 V - Viton; Viton, Mag

ROD DIAMETER

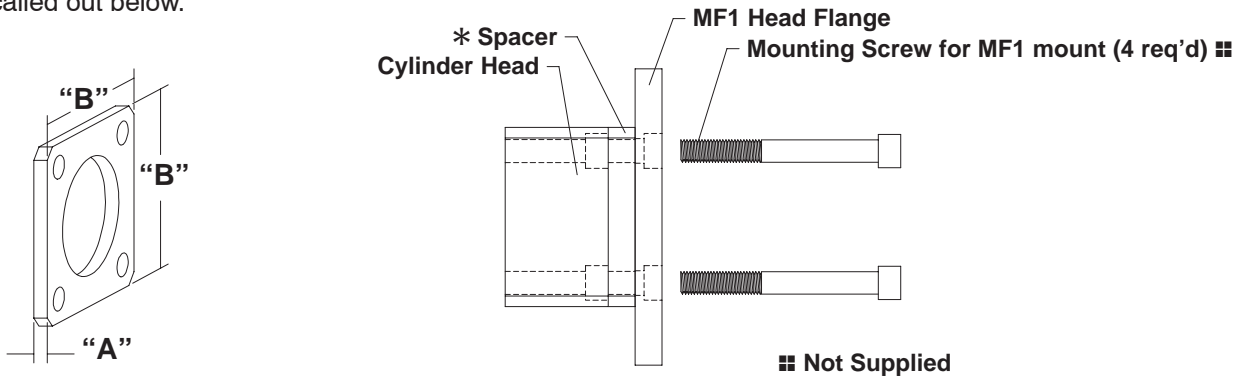
K - 5/8" Q - 1-3/4"
 M - 1" S - 2"
 P - 1-3/8"

HEADS AND CAPS

CYLINDER TYPE	1-1/2" BORE		2" BORE		2-1/2" BORE		3-1/4" BORE		4" BORE	
	HEAD	CAP	HEAD	CAP	HEAD	CAP	HEAD	CAP	HEAD	CAP
NON-CUSHIONED	119462	119471	119480	119489	119498	119507	119516	119525	119534	119543
CUSHIONED	119651	119666	119654	119669	119657	119672	119660	119675	119663	119678
NON-CUSHIONED MS4	119464	119473	119482	119491	119500	119509	119518	119527	119536	119545
CUSHIONED MS4	119652	119667	119655	119670	119658	119673	119661	119676	119664	119679
NON-CUSHIONED TRUNNION	119901	119902	119903	119904	119905	119906	119907	119908	119909	119910
CUSHIONED TRUNNION	119653	119668	119656	119671	119659	119674	119662	119677	119665	119680
NON-CUSHIONED FEM. RET. BOLT	119752	119754	119756	119758	119760	119762	119764	119766	119768	119770
CUSHIONED FEM. RET. BOLT	114063	114064	114065	114066	114067	114068	114069	114070	114071	114072
NON-CUSHIONED FEM. RET. BOLT MS4	119835	119836	119839	119840	119843	119844	119847	119848	119851	119852
CUSHIONED FEM. RET. BOLT MS4	119877	119878	119879	119880	119881	119882	119883	119884	119885	119886

119577-() SPACER INSTALLATION

To replace tie rod cylinders that have end caps made from castings (such as Wabco, Taiyo and Aro series 38 / 39), use spacers as called out below.



BORE SIZE	SPACER	"A"	"B"	CAP SCREW ■■	TORQUE (FT LBS)
1-1/2"	119577-150	.375"	2.000"	1/4" - 28 x 2-1/4"	9
2"	119577-200	.375"	2.500"	5/16" - 24 x 2-1/4" (Low Head)	16
2-1/2"	119577-250	.375"	3.000"	5/16" - 24 x 2-1/4" (Low Head)	21
3-1/4"	119577-325	.625"	3.750"	3/8" - 24 x 2-3/4"	35
4"	119577-400	.625"	4.500"	3/8" - 24 x 2-3/4"	49

- * When used with MF1 flange, spacer 119577-() is mounted between head and flange and requires 4 mounting screws of the size listed in the table.
- * When used without MF1 flange, spacer 119577-() is slid over piston rod and bushing, against cylinder head. No new mounting screws are required. Spacer is attached using Loctite or "superglue".

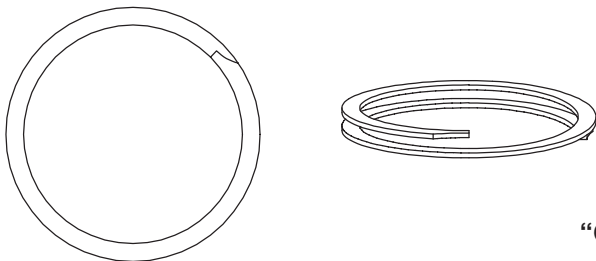
PISTON ROD BUSHING REPLACEMENT PROCEDURE (1-1/2", 2", 2-1/2", 3-1/4" and 4" bore cylinders only)

Using a small spade (flat) screwdriver, locate the end of the spiral retaining ring holding the rod bushing in its cavity. Pick the end of the spiral retaining ring, easily pry upwards to begin removal of the spiral ring from the retaining groove.

When the spiral retaining ring is free from its retaining groove, slide the rod bushing off the end of the piston rod. The rod bushing retains three replaceable seals. Remove the "O" ring located at the base (o.d.) of the bushing. The other two seals are internal to the bushing. Using the same screwdriver, pick the rod wiper from its retaining groove. Next, remove the rod seal in the same manner.

Before attempting to replace seals, it is advisable to coat them with a film of standard grease to ease installation.

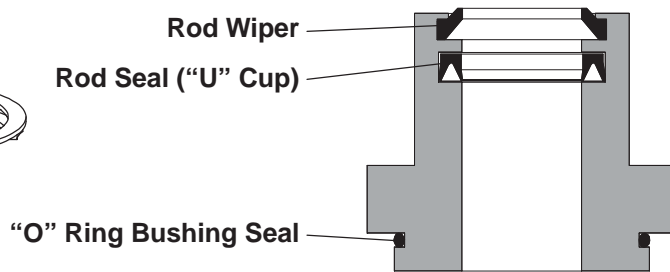
Replace the rod seal (it is a "U" cup seal) by squeezing the seal to position one end into its retaining groove and then pressing the seal downwards inside the bushing until the seal seats in its retaining groove. Gently use the screwdriver if necessary, being careful not to cut the seal. The seal "lip" should face the base of the bushing, as illustrated.



Replace the rod wiper by squeezing it to position one end into its retaining groove. Press downwards on the wiper to seat it into its retaining groove. Gently use the screwdriver if necessary, being careful not to damage the rod wiper. The "lip" of the rod wiper should face up (toward you), as illustrated.

Place the "O" ring into the cylinder head cavity. Place the bushing over the end of the piston rod and slide it into its cavity. Press the bushing into its cavity. Using the small screwdriver, push the end of the spiral retaining ring into its groove. Work counterclockwise around the bushing with the screwdriver to press the spiral retaining ring into its groove.

⚠ WARNING Make certain the spiral retaining ring is completely seated in its retaining groove before pressurizing the cylinder.



PISTON ROD BUSHING REPLACEMENT PROCEDURE (5", 6", 8" and 10" bore cylinders only)

Remove (4) cap screws from the retaining plate. When the retaining plate is free, slide the rod bushing off the end of the piston rod. The rod bushing retains three replaceable seals. Remove the "O" ring located at the base (o.d.) of the bushing. The other two seals are internal at the top of the bushing. Using a small screwdriver, pick the rod wiper from its retaining groove. Next, remove the rod seal in the same manner; it is located slightly further inside the bushing from the rod wiper.

Before attempting to replace seals, it is advisable to coat them with a film of standard grease to ease installation.

Replace the rod seal (it is a "U" cup seal) by squeezing the seal to position one end into its retaining groove and then pressing the seal downwards inside the bushing until the seal seats in its retaining groove. Gently use the screwdriver if necessary, being careful not to cut the seal. The seal "lip" should face the base of the bushing, as illustrated.

Replace the rod wiper by squeezing it to position one end into its retaining groove. Press downwards on the wiper to seat it into its retaining groove. Gently use the screwdriver if necessary, being careful not to damage the rod wiper. The "lip" of the rod wiper should face up (toward

you), as illustrated.

Place the "O" ring onto the base of the rod bushing, making sure it is seated into its retaining groove.

Place the bushing over the end of the piston rod and slide it into its cavity. Press the bushing into its cavity. Replace the retaining plate on the cylinder and retighten the (4) cap screws to 12 ft lbs (16.3 Nm).

