

# OPERATOR'S MANUAL / SALES AND ENGINEERING DATA

INCLUDING: SPECIFICATIONS, SERVICE KITS, GENERAL INFORMATION, PARTS, TROUBLESHOOTING.  
 INCLUDE MANUALS: AF044X-XX Air Motor (pn 97999-1466) and S-632 General Information Manual (pn 97999-624).

RELEASED: 9-15-10  
 REVISED: 11-15-17  
 (REV: F)

**4-1/4" AIR MOTOR**  
**9:1 RATIO**  
**4" STROKE**

## AF0409AX3XXXXXX Basic Oil Pump



**READ THIS MANUAL CAREFULLY BEFORE INSTALLING,  
 OPERATING OR SERVICING THIS EQUIPMENT.**

It is the responsibility of the employer to place this information in the hands of the operator. Keep for future reference.  
 The original language of this manual is English.

### SERVICE KITS

- Use only genuine ARO® replacement parts to assure compatible pressure rating and longest service life.
- **637489** for repair of AF0444-XX air motor.
- **637486** for repair of lower pump end.

### SPECIFICATIONS

<b>Model Series</b> (refer to option chart)	AF0409AX3XXXX-XX-X
<b>Pump Type</b>	Air Operated, Two-Ball Pump
<b>Drum Size</b>	models AF0409A13XXXX .. Remote Mounting
	models AF0409A14XXXX .. 16 gallon
	models AF0409A15XXXX .. 55 gallon
<b>Ratio</b>	9:1
<b>Air Motor</b>	AF0444-XX
<b>Motor Repair Kit</b>	637489
<b>Motor Diameter</b>	4-1/4" (10.8 cm)
<b>Stroke (double acting)</b>	4" (10.2 cm)
<b>Air Inlet (female)</b>	1/2 - 14 NPTF - 1
<b>Air Exhaust (female)</b>	1-1/4 - 11-1/2 NPTF - 1
<b>Material Outlet (female)</b>	3/4 - 14 NPTF - 1
<b>Lower End Pump</b>	
models AF0409A13XXXX	60873
models AF0409A43XXXX	65033-1
models AF0409A53XXXX	65033
<b>Dimensional Data</b>	see figure 1

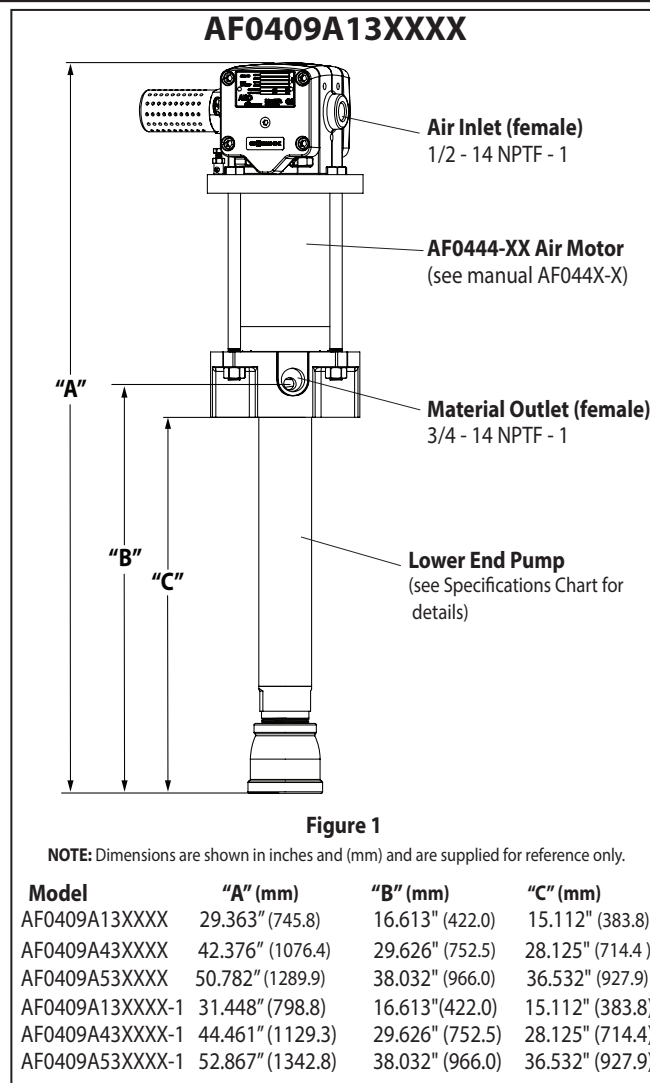
### PUMP PERFORMANCE

<b>Air Inlet Pressure Range</b>	30 - 150 psig (2 - 10.3 bar)
<b>Fluid Pressure Range</b>	270 - 1350 psig (18.6- 93.1 bar)
<b>Maximum Rec'd Cycles / Minute</b>	60
<b>Displacement Per Cycle</b>	11.0 in <sup>3</sup> (180.3 cc)
<b>Cycles Per Gallon (L)</b>	21 (5.5)
<b>Flow at 60 Cycles/Minute</b>	2.9 gpm (10.8 lpm)
<b>Noise Level @ 60 psig - 40 cpm</b>	89.2 dB(A)①

① The pump sound pressure level has been updated to an Equivalent Continuous Sound Level (LA<sub>eq</sub>) to meet the intent of ANSI S1.13-1971, CAGI-PNEUROP S5.1 using four microphone locations.

### GENERAL DESCRIPTION

The 9:1 ratio is an expression of the relationship between the effective air motor area and the effective lower pump area. When 150 psig (10.3 bar) of air pressure is supplied to the air motor, the lower pump end will develop a maximum 1350 psig (93.1 bar) of fluid pressure (at no flow). As the fluid control is opened, the flow rate will increase as the air motor cycle rate increases to keep up with demand.



### IMPORTANT

**This is one of five documents which support the pump. Replacement copies of these forms are available upon request.**

- AF0409AX3XXXX** Model Operator's Manual (pn 97999-1490)
- S-632** General Information - Air / Hydraulic Operated Piston Pumps (pn 97999-624)
- AF044X-XX** Air Motor Operator's Manual (pn 97999-1466)

# MODEL DESCRIPTION CHART

AF0409 A X 3 X X X X X

**Check Type / Wetted Material**

A - Two Ball, Carbon Steel

**Container Suitability**

1 - Remote Mounting  
4 - 16 Gallon (120 lbs)  
5 - 55 gallon (400 lbs)

**Inlet / Outlet Thread Type**

3 - SAE - Fluid Outlet In Air Motor Base

**Upper Packing**

H - Polyurethane

**Lower Packing**

F - UHMW-PE

**Spring Type / Solvent Cup**

L - Coil Spring, No Solvent Cup

**Plunger Type**

1 - Carbon Steel

**Air Motor Option**

Blank - No Option  
1 - Integrated Ball Valve Regulator

**Pump Option**

Blank - No Option

## OPERATING AND SAFETY PRECAUTIONS

**⚠ WARNING HAZARDOUS PRESSURE. Do not exceed maximum operating pressure of 1350 psig (93.1 bar) at 150 psig (10.3 bar) inlet air pressure.**

**Pump Ratio X = Maximum Pump  
 Inlet Pressure to Pump Motor Fluid Pressure**

Pump ratio is an expression of the relationship between the pump motor area and the lower pump end area. EXAMPLE: When 150 psig (10.3 bar) inlet pressure is supplied to the motor of a 4:1 ratio pump, it will develop a maximum of 600 psig (41.4 bar) fluid pressure (at no flow) - as the fluid control is opened, the flow rate will increase as the motor cycle rate increases to keep up with the demand.

**⚠ WARNING Refer to general information sheet for additional safety precautions and important information.**

- The two-ball pumps are primarily designed for the pumping of medium viscosity fluids. The two-ball design provides better priming of the lower foot valve. The double acting feature is standard in all ARO industrial pumps. Material is delivered to the pump discharge outlet on both the up and down stroke.

**NOTICE:** Thermal expansion can occur when the fluid in the material lines is exposed to elevated temperatures. Example: Material lines located in a non-insulated roof area can warm due to sunlight. Install a pressure relief valve in the pumping system.

**Replacement warning label (pn 92325) is available upon request.**

## PUMP CONNECTION - UPPER / LOWER

**NOTE: All threads are right hand.**

- Unscrew the lower pump assembly from the air motor.
- Pull the air motor from the lower pump end until motor piston rod is in the "down" position and lower pump end rod is in "up" position.
- For AF0409A43XXXX and AF0409A45XXXX: Using e-ring pliers, slide the retaining ring up far enough to allow the sleeve to move upward and release the two connectors. Refer to figure 4, page 5.
- Remove (3) seal, (2) spacer, (5) spring and (6) washer from cavity in bottom of motor.

## REASSEMBLY

- Assemble (3) seal, (2) spacer, (5) spring and (6) washer into cavity in bottom of motor. **NOTE:** Refer to figure 3, page 4 for packing lip direction.
- Align the pump motor with the lower pump end.
- For AF0409A13XXXX: Assemble nut and piston rod and components to motor rod, tightening nut against motor rod. Apply Loctite 242 to threads of piston rod before assembly. **NOTE:** Tighten nut to 60 - 70 ft lbs (81.3 - 94.9 Nm) refer to figure 3, page 4.

- For AF0409A43XXXX and AF0409A45XXXX: Install the two connectors and retain with the sleeve, slide the retaining ring back into position. Refer to figure 4, page 5.
- Screw the lower pump assembly to the air motor. **NOTE:** Tighten tube to 90 - 100 ft lbs (122 - 135.6 Nm).

## LOWER PUMP END DISASSEMBLY

**NOTE:** All threads are right hand.

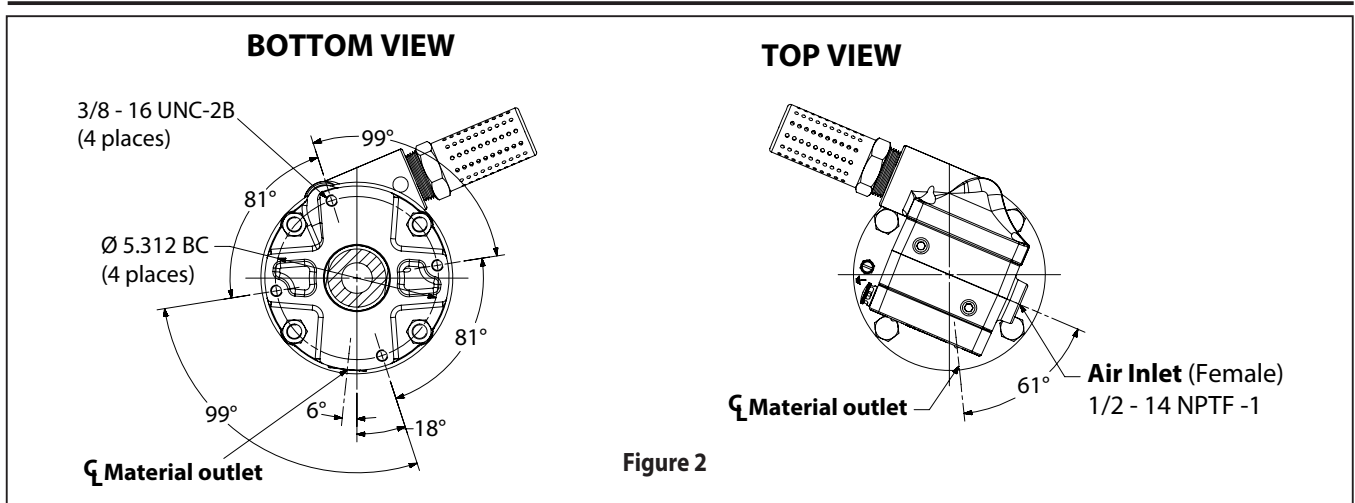
- While holding pump securely with a strap wrench, unthread and remove tube.
- Loosen nut against motor rod and unthread piston rod from motor rod.
- Unthread and remove inner check seat, releasing washer, cup and ball.
- Loosen nut to unthread and remove cup follower from piston rod.
- While holding tube securely, unthread and remove foot valve seat and components.
- Remove ball stop pin, releasing ball.

## LOWER PUMP END ASSEMBLY

**NOTE: Thoroughly clean and lubricate all seals. Replace all soft parts with new ones included in the repair kit.**

- Assemble "O" ring, ball and ball stop pin to foot valve seat.
- Assemble foot valve seat and components to tube. **NOTE:** Tighten foot valve seat to 125 - 150 ft lbs (169.5 - 203.4 Nm).
- Assemble piston rod and nut to cup follower. **NOTE:** Apply Loctite 242 to threads of piston rod before assembly. **NOTE:** Tighten nut to 50 - 60 ft lbs (67.8 - 81.3 Nm).
- Assemble cup, washer and ball to cup follower, securing with inner check seat. **NOTE:** Tighten (8) inner check seat to 65 - 70 ft lbs (88.1 - 94.9 Nm).
- Assemble nut and piston rod. **NOTE:** Apply Loctite 242 to threads of piston rod before assembly. **NOTE:** Tighten nut to 60 - 70 ft lbs (81.3 - 94.9 Nm).
- Assemble "O" ring to tube and assemble tube over cup follower and components and into air motor base. **NOTE:** Tighten tube to 90 - 100 ft lbs (122.0 - 135.6 Nm).

## DIMENSIONS



## AF0409A13XXXX / PARTS LIST

Item	Description (size)	Qty	Part No.	Mtl
1	Air Motor AF0409A13XXXX	(1)	AF0444	
	AF0409A13XXXX-1	(1)	AF0444-1	
2	Spacer	(1)	96624	[Br]
3	Seal	(1)	96625	[U]
5	Spring	(1)	90120	[C]
6	Washer	(1)	90125	[Co]
7	"O" Ring (1/16" x 2-1/8" o.d.)	(1)	Y325-33	[B]
8	Nut (1/2" - 20)	(2)	Y11-108-C	[C]
9	Piston Rod	(1)	76507	[C]
10	Cup Follower	(1)	75678	[C]
11	Ball (1.0000" diameter)	(1)	Y16-232	[C]
12	Cup	(1)	92867-1	[UH]
13	Washer	(1)	75682	[C]

Item	Description (size)	Qty	Part No.	Mtl
14	Inner Check Seat	(1)	75681	[C]
15	Tube	(1)	76506	[C]
16	Ball Stop Pin (3/16" o.d. x 1-13/16")	(1)	83009	[C]
17	"O" Ring (1/8" x 1-7/8" o.d.)	(1)	Y325-223	[B]
18	Ball (1.2500" diameter)	(1)	Y16-240	[C]
19	Foot Valve Seat	(1)	77006	[C]
20	Reducer (1-1/2 11-1/2 NPT x 2 - 11-1/2 NPT)	(1)	Y202-12	[I]
	<b>Lower Pump Assembly</b> (includes items 7 - 20)	(1)	60873	
1	<b>Items included in packing kit</b>	(1)	637486	

### ASSEMBLY TORQUE REQUIREMENTS

**NOTE: DO NOT OVERTIGHTEN FASTENERS.**

- (8) nut, 50 - 60 ft lbs (67.8 - 81.3 Nm).
- (14) seat, 65 - 70 ft lbs (88.1 - 94.9 Nm).
- (15) tube, 90 - 100 ft lbs (122.0 - 135.6 Nm).
- (19) seat, 125 - 150 ft lbs (169.5 - 203.4 Nm).

### LUBRICATION / SEALANTS

- ① Apply Loctite 242 to threads.

### MATERIAL CODE

- [B] = Nitrile
- [Br] = Brass
- [C] = Carbon steel
- [Co] = Copper
- [U] = Urethane
- [UH] = UHMW-PE

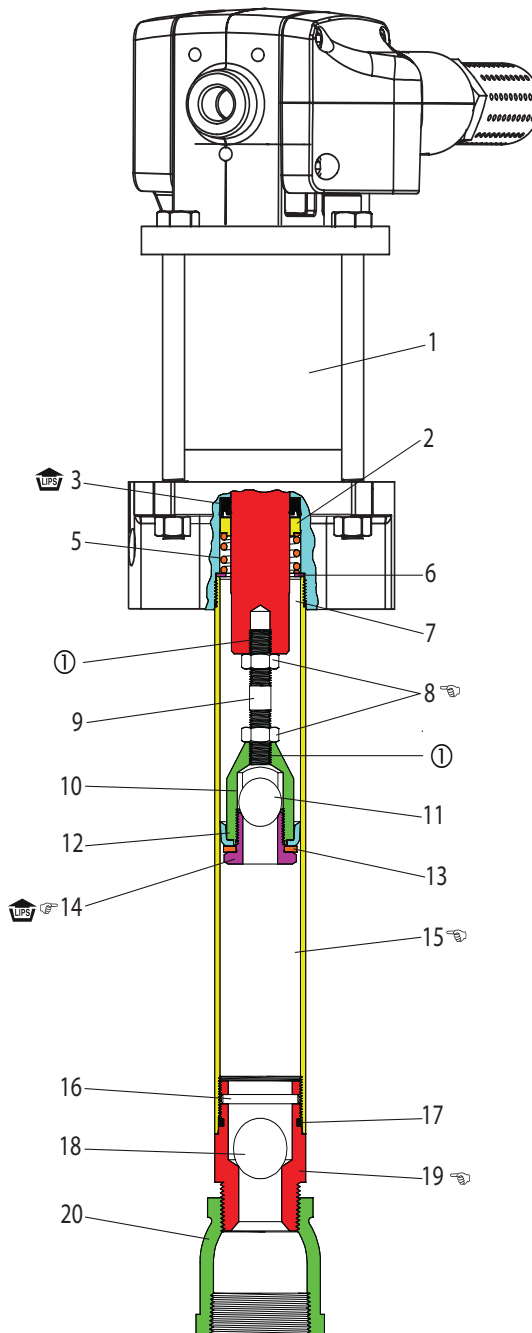


Figure 3

## AF0409A43XXXX, AF0409A53XXXX / PARTS LIST

Item	Description (size)	Qty	Part No.	Mtl	Item	Description (size)	Qty	Part No.	Mtl
1	Air Motor AF0409A43XXXX	(1)	AF0444		15	Nut (1/2" - 20)	(1)	Y11-108-C	[C]
	AF0409A43XXXX-1	(1)	AF0444-1		16	Cup Follower	(1)	75678	[C]
	AF0409A53XXXX	(1)	AF0444		17	Ball (1.0000" diameter)	(1)	Y16-232	[C]
	AF0409A53XXXX-1	(1)	AF0444-1		① 18	Cup	(1)	92867-1	[UH]
① 2	Spacer	(1)	96624	[Br]	① 19	Washer	(1)	75682	[C]
① 3	Seal	(1)	96625	[U]	20	Inner Check Seat	(1)	75681	[C]
① 5	Spring	(1)	90120	[C]	21	Ball Stop Pin (3/16" o.d. x 1-13/16")	(1)	83009	[C]
① 6	Washer	(1)	90125	[Co]	① 22	"O" Ring (1/8" x 1-7/8" o.d.)	(1)	Y325-223	[B]
① 7	"O" Ring (1/16" x 2-1/8" o.d.)	(1)	Y325-33	[B]	23	Ball (1.1875" diameter)	(1)	Y16-238	[C]
8	Adapter	(1)	76661	[C]	24	Foot Valve Seat	(1)	90119	[C]
9	Retaining Ring	(1)	90102	[C]					
10	Connector	(2)	90096			AF0409A53XXXX Lower Pump Assembly	(1)	65033	
11	Sleeve	(1)	90109	[C]		AF0409A43XXXX Lower Pump Assembly	(1)	65033-1	
12	Adapter	(1)	76660	[C]	①	Items included in packing kit	(1)	637486	
13	Piston Rod (AF0409A43XXXX - 6.531" long)	(1)	92308	[C]					
	(AF0409A53XXXX - 14.938" long)	(1)	90122	[C]					
14	Tube (AF0409A43XXXX - 27.531" long)	(1)	92307	[C]					
	(AF0409A53XXXX - 35.937" long)	(1)	90121	[C]					

**ASSEMBLY TORQUE REQUIREMENTS**  
 NOTE: DO NOT OVERTIGHTEN FASTENERS.  
 (14) tube, 90 - 100 ft lbs (122.0 - 135.6 Nm).  
 (15) nut, 60 - 70 ft lbs (81.3 - 94.9 Nm).  
 (20) seat, 65 - 70 ft lbs (88.1 - 94.9 Nm).  
 (24) seat, 125 - 150 ft lbs (169.5 - 203.4 Nm).

**LUBRICATION / SEALANTS**  
 ① Apply Loctite 242 to threads.  
 ② Assemble (21) pin to farthest hole from (23) ball.

MATERIAL CODE	
[B]	= Nitrile
[Br]	= Brass
[C]	= Carbon steel
[Co]	= Copper
[U]	= Urethane
[UH]	= UHMW-PE

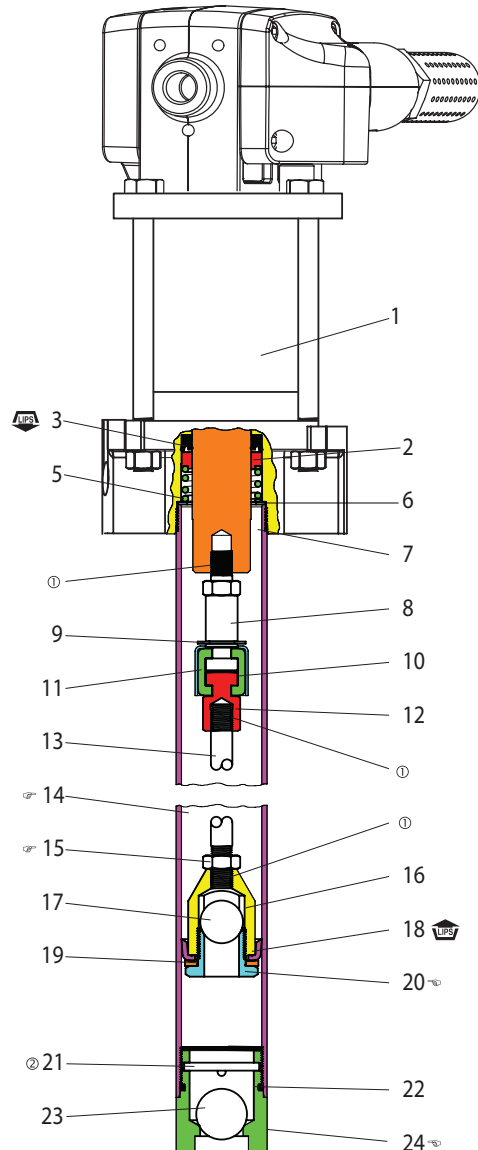
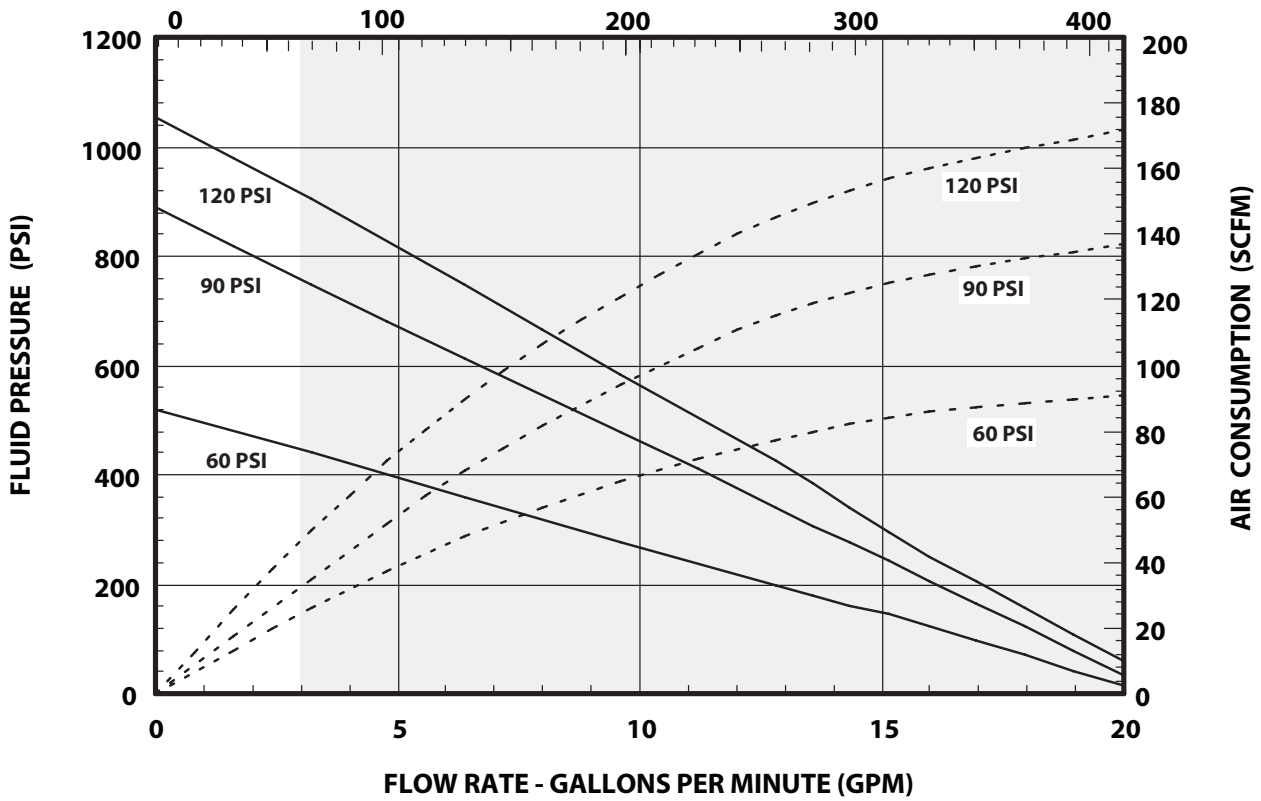


Figure 4

## PERFORMANCE CURVES

**PERFORMANCE BASED ON 30wt. OIL (100cSt) AT 40° C TEMPERATURE**

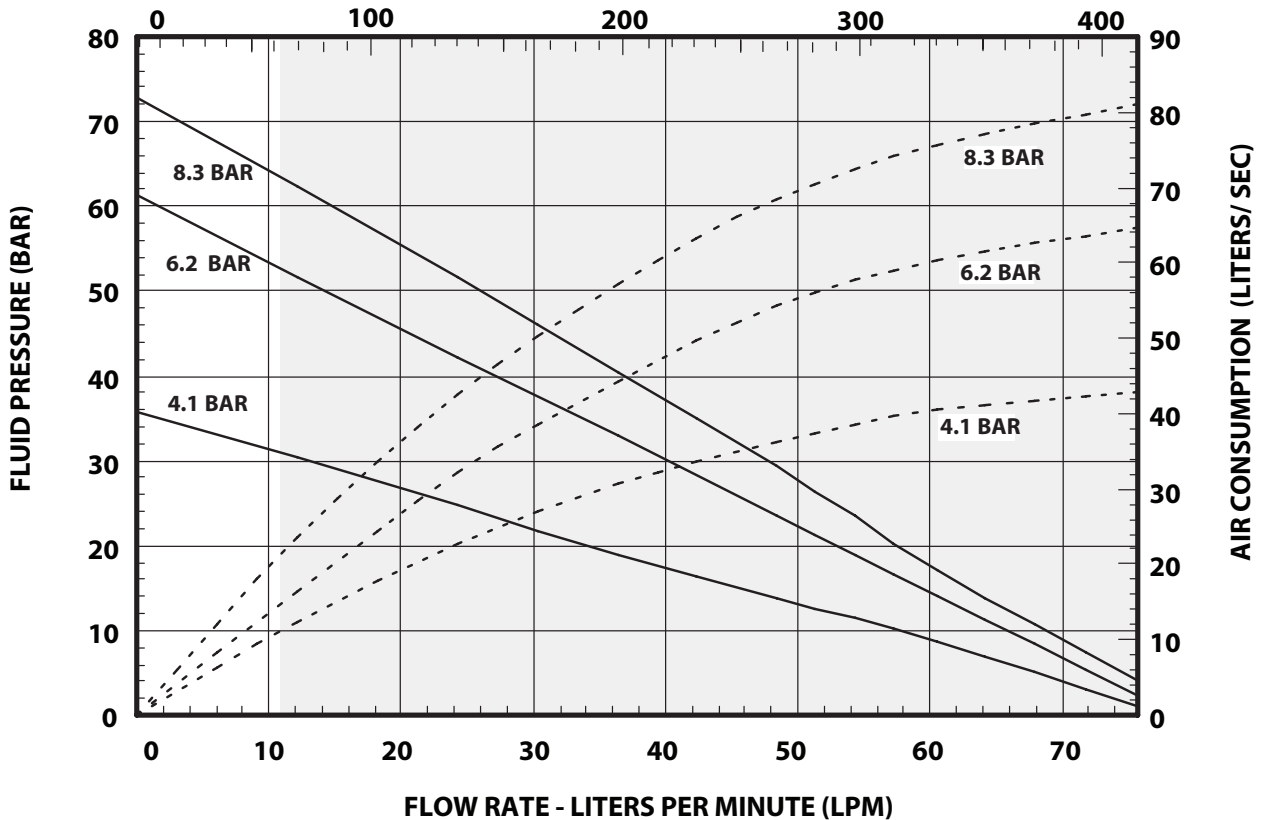
**CYCLE PER MINUTE (CPM)**



**NOTE: NON SHADED AREA OF THE GRAPH REPRESENTS RECOMMENDED OPERATING RANGE**

**PERFORMANCE BASED ON 30wt. OIL (100cSt) AT 40° C TEMPERATURE**

**CYCLE PER MINUTE (CPM)**



**NOTE: NON SHADED AREA OF THE GRAPH REPRESENTS RECOMMENDED OPERATING RANGE**

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## NOTES

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