



**High Pressure Equipment**  
A **GRACO** Company

## **Air Driven High Pressure**

**Liquid Pumps, Gas Boosters  
and Power Systems**



# A Heritage of Air Driven Pump Leadership

Sprague Products developed the world's first air operated liquid pump in 1947 to solve a hydrostatic testing problem within the aerospace industry. The classic positive-displacement design of that first Sprague pump became the foundation for widespread adoption of high pressure hydraulic pumps to accomplish a wide range of testing, actuating and lifting operations. The proven designs and reliable operation of Sprague liquid pumps, gas boosters and power units allowed Sprague to become the market leader for air-driven products serving aerospace, oil and gas, chemical/petrochemical, general manufacturing, heavy construction and many other industries.

In 2017 High Pressure Equipment, a Graco Company, purchased Sprague Products and integrated the pump, booster and power system products into their family of high pressure valves, fittings, tubing, reactors and pressure vessels. Since that time HiP has brought the manufacturing of Sprague Products to their Erie, PA headquarters and implemented the extensive HiP/Graco world class quality and manufacturing systems and processes.

## Innovation to Meet Today's Emerging Needs

The synergy realized by combining HiP's high pressure expertise with Sprague and Graco's extensive pump engineering background has resulted in a steady flow of industry-first problem solving new product innovations. HiP has introduced the T-Series high performance air driven liquid pumps. These new products are the result of listening to our customers and developing solutions to their problems... and it carries-forward a tradition of innovation and market leadership dating back to the first Sprague pump more than 70 years ago.





# Pump Products & Systems

## T-Series

High Performance Liquid Pumps



## Sprague

Air Driven Liquid Pumps



## Sprague

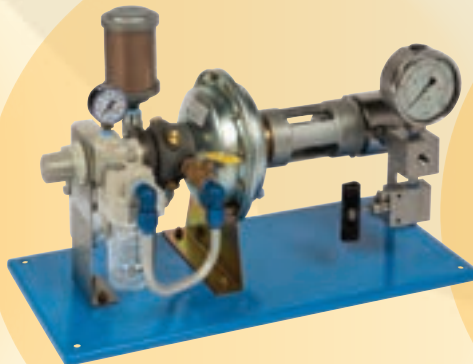
Gas Boosters



## T-Series Power Packs



## Sprague Hydraulic Power Units



## Manual Intensifiers & Other Pumps







# HiP...

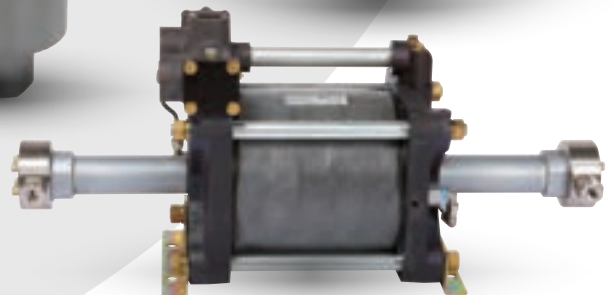
## Our Name is High Pressure

High pressure valves, fittings and tubing manufactured to the highest quality standards, delivered with the shortest lead times, and priced to make you money... it's been the focus at HiP throughout our more than 65 year history. We offer a broad product portfolio capable of handling pressures up to 150,000 psi and carry an extensive inventory allowing us to offer same day shipping of many items. In addition to our high pressure valves, we offer a complete line of reactors and pressure vessels and an expanded family of pumping systems and instrument valves.

In addition to our standard products, we offer a complete line of valves and fittings for oil and gas industry use with sour gas (H<sub>2</sub>S). For applications involving specialty gases, corrosive liquids, and extreme temperatures/conditions, we'll make our products using exotic alloys and temperature extensions, as well as design and build a solution to meet your exact requirements, such as our popular custom manifolds. This dedication to satisfying our loyal customers is the driving force behind our continued growth, including our passing the 4 million high pressure valves and fittings shipped milestone.

## Commitment to Quality

As a company that exclusively deals in elevated pressure applications, we understand that our customers depend on our products to provide safe and reliable operation at pressures as high as 150,000 psi. Throughout our history we have been dedicated to continuous improvement in all aspects of our manufacturing operation and customer service. This commitment has only increased over time, including our joining the Graco family of companies and implementing their world class quality systems.



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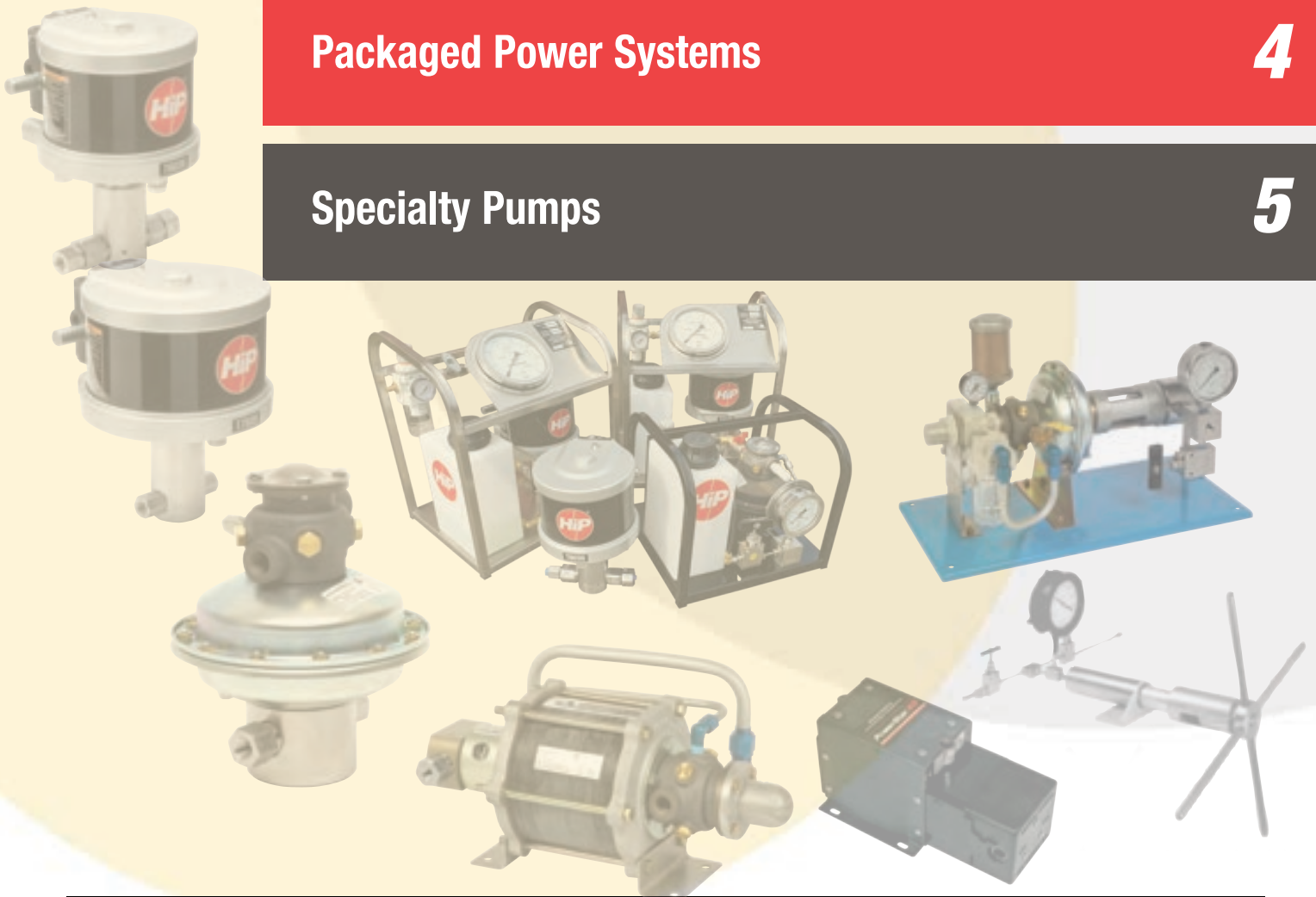
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# T-Series

## High Performance Air Driven Liquid Pumps

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High Pressure Equipment's new T-Series pneumatically operated liquid pumps have been engineered to provide an extremely safe, reliable and durable hydraulic power source for applications up to 68,000 psi (4,688 bar). Combining HiP's high pressure expertise with Graco's extensive pump engineering background, T-Series pumps address many of the shortcomings commonly found in today's air driven liquid pumps. Premium T-Series pumps are built to run at their maximum rated pressure and feature a robust motor and seal design that delivers a long service life. In addition, these pumps do not require a lubricated air source and incorporate several features to facilitate easy installation and service.

HiP T-Series pumps achieve a "bubble tight" pressure stall that can be used for high pressure applications such as bolt tensioning, pressure testing, power pressing, jacking, lifting, hydraulic power units, proof testing components, valve actuation and many more.



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# T-Series Pump Features



## Why a T-Series Pump?

### Merkur Air Motor from Graco

- One of the highest technology air motors on the market
- Low air consumption for increased efficiency
- Proven technology with over 10 years in the market
- Heavy duty muffler provides low operating sound levels
- External valve access allows for easy servicing to help minimize downtime

## Heavy Duty Operation

- Pump can achieve the maximum working pressure time and time again unlike intermittent duty rated pumps
- No need for additional mufflers
- Severe duty plunger seal for less downtime

## Easy to Service

- Can service air motor shuttle valve without disassembling the pump
- Quick and easy access to plunger seals
- Minimal tools required

## Robust Design

- Separated pump air section helps prevent fluid leaks into air motor
- Inlet/outlet connections match pipe connections
- Bubble tight checks

## Approvals

-   II 2 G Ex h IIA T6 Gb

NOTE: "h", Type of protection applied is Constructional Safety "c".



**GRACO MERKUR AIR MOTOR**

Proven design with low air consumption for increased efficiency

**AIR VALVE**

Does not require a lubricated air source and allows for a smooth and rapid changeover

**GRACO DATATRAK COMPATIBLE**

Accessory providing several benefits, (see below)

**EASY ACCESS  
CHANGE-OVER POPPETS**

Cartridge design allows for quick repair

**PUMP ASSEMBLY**

Retaining ring allows for 360° rotation for easy installation and service

**CHROMEX COATED PLUNGER**

Provides for a longer service life

**SAFETY**

Pump is cycle tested at maximum rated pressure for life expectancy

**SEPARATED FLUID SECTION**

Increases safety and life by helping prevent fluid leaks into air motor

**SEVERE DUTY PLUNGER SEAL**

Robust design delivers extended seal life significantly outlasting competitive o-rings

**CHECK VALVES**

Range of connection sizes and pressures to match pump rating, including HP coned and threaded outlet connections

**Optional T-Series Accessory****Graco Datatrak Electronic Monitoring System**

- Stroke counter
- Cycle rate display
- Runaway protection



# Performance & Applications



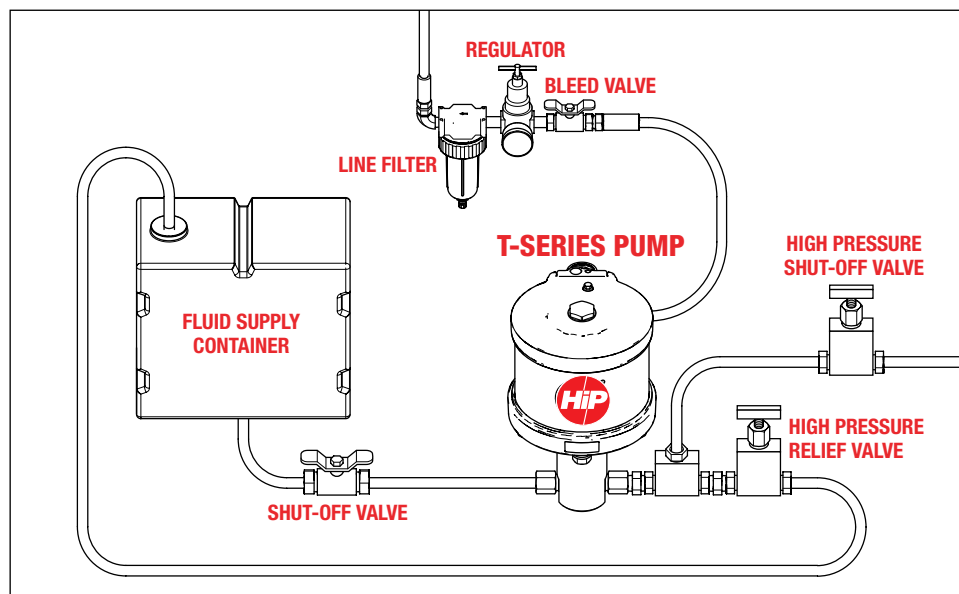
## Applications

- Bolt Tensioning
- Pressure testing
- Work holding and clamping
- Jacking and lifting
- Power pressing
- Hydraulic power units
- Valve actuation
- Proof testing components
- Hydraulic cylinder actuation
- Chromatography
- Lubrication and spraying
- Liquefied gas transfer

## T-Series Pump Maximum Pressure & Flow Ratings



## Typical Installation



NOTE: T-Series Pump is the only item supplied by HiP with order of pump. All other components are available from HiP to be ordered separately.

# T6000 Series Pumps

## Features

- 6 inch air cylinder
- Available in 9 different pump ratios
- 2.5 inch pump stroke
- Maximum operating pressure of 58,000 psi (4000 bar)
- Maximum flow rate of 177 in<sup>3</sup>/min (2.9 lpm) at 80 CPM
- Inlet air pressure 15 psi to 100 psi (1 to 7 bar)
- Four different plunger seal materials

\* 80 CPM recommended for optimal pump seal life



Part Number	Model	Ratio	Seal Material	Maximum Working Pressure psi (Mpa, bar)	Maximum Pneumatic Inlet Pressure psi (Mpa, bar)	Displacement per Stroke in3 (ml)
T6058-576-NBR-00	T6058	576:1	NBR	58,000	100 (0.69, 6.9)	0.12 (2.0)
T6058-576-EPR-00			EPR	(400, 4000)		
T6036-365-NBR-00	T6036	365:1	NBR	36,500		0.19 (3.2)
T6036-365-EPR-00			EPR	(252, 2520)		
T6025-254-NBR-00	T6025	254:1	NBR	25,250		0.28 (4.5)
T6025-254-FKM-00			FKM	(175, 1750)		
T6025-254-EPR-00			EPR			
T6016-163-NBR-00	T6016	163:1	NBR	16,250 (113, 1130)		0.43 (7.1)
T6016-163-FKM-00			FKM			
T6016-163-FFKM-00			FFKM			
T6016-163-EPR-00			EPR			
T6012-125-NBR-00	T6012	125:1	NBR	12,500 (87, 870)		0.56 (9.2)
T6012-125-FKM-00			FKM			
T6012-125-FFKM-00			FFKM			
T6012-125-EPR-00			EPR			
T6010-101-NBR-00	T6010	101:1	NBR	10,000 (69, 690)		0.70 (11.5)
T6010-101-FKM-00			FKM			
T6010-101-FFKM-00			FFKM			
T6010-101-EPR-00			EPR			
T6006-064-NBR-00	T6006	64:1	NBR	6,300 (44, 440)		1.11 (18.1)
T6006-064-FKM-00			FKM			
T6006-064-FFKM-00			FFKM			
T6006-064-EPR-00			EPR			
T6005-047-NBR-00	T6005	47:1	NBR	4,800 (34, 340)		1.49 (24.4)
T6005-047-FKM-00			FKM			
T6005-047-FFKM-00			FFKM			
T6005-047-EPR-00			EPR			
T6003-032-NBR-00	T6003	32:1	NBR	3,200 (23, 230)		2.20 (36.0)
T6003-032-FKM-00			FKM			
T6003-032-FFKM-00			FFKM			
T6003-032-EPR-00			EPR			

# T7500 Series Pumps

## Features

- 7.5 inch air cylinder
- Available in 9 different pump ratios
- 2.5 inch pump stroke
- Maximum operating pressure of 68,000 psi (4690 bar)
- Maximum flow rate of 177 in<sup>3</sup>/min (2.9 lpm) at 80 CPM
- Inlet air pressure 15 psi to 100 psi (1 to 7 bar)
- Four different plunger seal materials

\* 80 CPM recommended for optimal pump seal life



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Part Number	Model	Ratio	Seal Material	Maximum Working Pressure psi (Mpa, bar)	Maximum Pneumatic Inlet Pressure psi (Mpa, bar)	Displacement per Stroke in3 (ml)
T7568-900-NBR-00	T7568	900:1	NBR	68,000	75 (0.5, 5)	0.12 (2.0)
T7568-900-EPR-00			EPR	(469, 4690)		
T7557-571-NBR-00	T7557	571:1	NBR	57,100		0.19 (3.2)
T7557-571-EPR-00			EPR	(394, 3940)		
T7539-397-NBR-00	T7539	397:1	NBR	39,500	100 (0.69, 6.9)	0.28 (4.5)
T7539-397-EPR-00			EPR	(273, 2730)		
T7525-255-NBR-00	T7525	255:1	NBR	25,500		0.43 (7.1)
T7525-255-FKM-00			FKM	(176, 1760)		
T7525-255-EPR-00			EPR			
T7519-195-NBR-00	T7519	195:1	NBR	19,500		0.56 (9.2)
T7519-195-FKM-00			FKM	(135, 1350)		
T7519-195-EPR-00			EPR			
T7516-158-NBR-00	T7516	158:1	NBR	15,750		0.70 (11.5)
T7516-158-FKM-00			FKM	(109, 1090)		
T7516-158-FFKM-00			FFKM			
T7516-158-EPR-00	T7510	100:1	EPR			1.11 (18.1)
T7510-100-NBR-00			NBR	10,000		
T7510-100-FKM-00			FKM	(69, 690)		
T7510-100-FFKM-00			FFKM			
T7507-074-NBR-00	T7507	74:1	NBR	7,400	100 (0.69, 6.9)	1.49 (24.4)
T7507-074-FKM-00			FKM	(52, 520)		
T7507-074-FFKM-00			FFKM			
T7507-074-EPR-00			EPR			
T7505-050-NBR-00	T7505	50:1	NBR	5,000		2.20 (36.0)
T7505-050-FKM-00			FKM	(35, 350)		
T7505-050-FFKM-00			FFKM			
T7505-050-EPR-00			EPR			



# Sprague

## Air Driven Hydraulic Pumps

HIP offers a full line of Sprague hydraulic pumps for various liquid output pressures up to 36,500 psi (2516 bar). Sprague pumps service water, oil and most corrosive chemicals, and are rugged, service-proven and virtually maintenance-free.

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# Performance & Applications

## for Air Driven Hydraulic Pumps

The Sprague air driven positive-displacement type pump converts air inlet pressure to hydraulic output pressure. The pump uses low pressure air to act on a large area piston to produce high hydraulic pressure with a small area piston.

In operation, the pump reciprocates rapidly until the system liquid pressure nears the desired level, then slows to a stop when the liquid pressure equals or balances the air pressure. This liquid-air pressure balance is maintained indefinitely in a holding condition with minimal energy consumption or parts movement and with no increase in fluid temperature.

In contrast, a motor driven pump in a holding condition must continue to operate to maintain a pressure level. Excess liquid must be bypassed or recirculated back to the reservoir, resulting in energy loss, heat build-up, and the need for bypass components and a larger reservoir.

The Sprague pump is efficient in operation and simple in design. Compared to other types of hydraulic pumps, it provides cost effective and energy saving benefits for many industrial and research applications.

### Hydrostatic Testing Applications

The Sprague air driven pump offers economical advantages for the pressure testing of hoses, pipes, valves, fittings and other hydraulic vessels and products. The time saving and performance advantages offered by these pumps allow routine production testing to be converted from tedious hand-pump methods to automatic and precision testing methods.

### Production Machinery Applications

The Sprague air driven pump delivers high pressure liquids required by production machinery for holding, clamping, forming, shearing, punching, etc.

An application example: a hydraulic press where long holding cycles are necessary or where the work stroke is short and a high force is required. High and low volume pumps can be combined to produce a combination of high speed and high force at low cost.

### No Need For Central Power Source

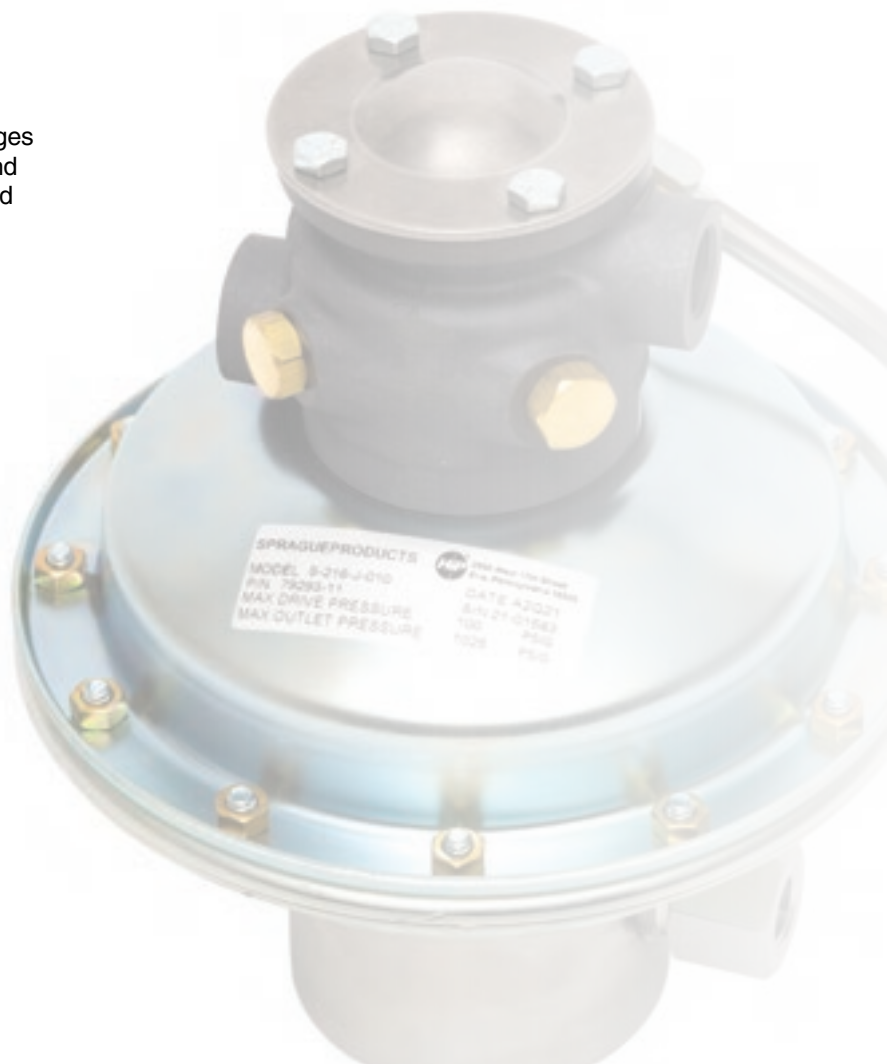
Because Sprague air driven pumps are relatively small, they can be installed directly on individual machines or test equipment in separate locations as direct power sources. Pumps so mounted eliminate need for a central power system, long plumbing runs and excess hydraulic power capacity.

### Safe Operation

Unlike motor driven pumps, Sprague air driven pumps are non-arcing and non-sparking, and can be used safely in hazardous or confined areas.

### Simpler Maintenance

When compared to other air driven pumps, Sprague pumps do the same job, but with fewer parts and seals for simpler maintenance.



# How Sprague Air Driven Hydraulic Pumps Work

The Sprague pump develops high output pressures by applying the principle of differential areas. The pump has a large area air piston, air driven at low pressures. This air piston drives a small area liquid piston that in turn pumps liquids at high pressures.

The liquid output pressure is determined by the ratio between the area of the air drive piston, the area of the liquid driven piston and the applied operating air pressure.

The area relationship of the air piston to the liquid piston is referred to as the pump ratio. This pump ratio is indicated in the dash number which follows the pump model basic number.

**Example:** S-216-J-10 pump has an approximate ratio of 10 to 1 or 10 psi liquid pressure for each 1 psi of operating air pressure.

In operation, an S-216-J-10 pump using 100 psi of input air pressure will produce a maximum liquid output pressure of 1000 psi; 80 psi air will produce an output pressure of 800 psi; 60 psi air . . . 600 psi output, and 40 psi air . . . 400 psi output. By regulating the incoming air supply at the pressure regulator, the liquid output can be infinitely adjusted through the pump's pressure range.

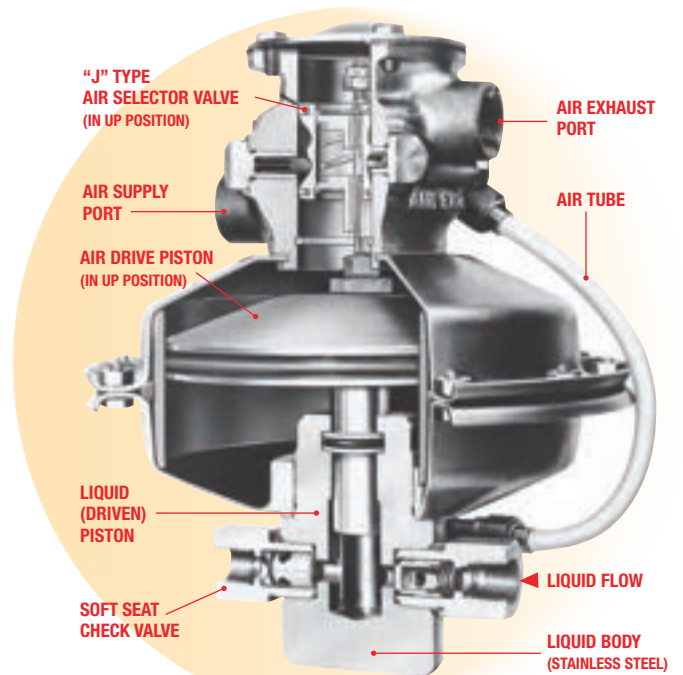
## Wetted Section Materials

The materials used in the wetted section of the Sprague basic pump are compatible to most liquids to be serviced.

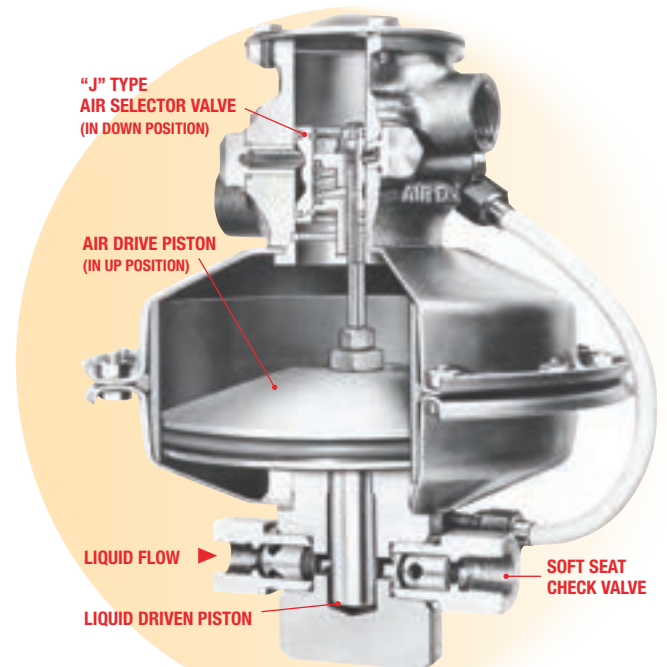
Pump components and materials include:

Liquid Body	303 Stainless steel
Liquid (driven) Piston	416 Stainless steel chrome plated
Piston O-ring	Nitrile
Piston Back-up Ring	Teflon® or equivalent compound
Check Valve Body	416 Stainless steel
Check Valve Poppet	17-4ph Stainless steel
Check Valve Spring	302 Stainless steel
Check Valve Seal	Nitrile

*Teflon is a registered trademark of the DuPont Company*



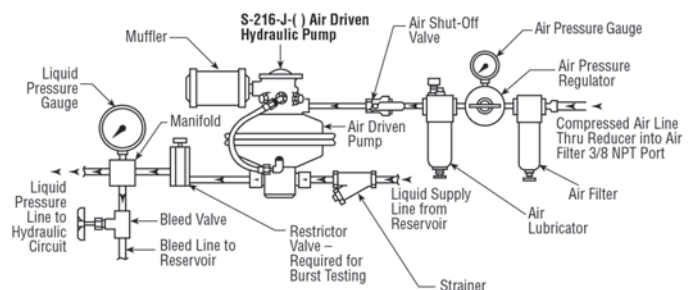
**Pump Air Piston in UP Position**



**Pump Air Piston in DOWN Position**

## Accessories

For optimum efficiency, certain accessories are recommended for use with pump. Noise can be dampened by installing muffler at pump's air exhaust port. For "J" type lubricated pumps, install an air control unit (filter, pressure regulator with air gauge and lubricator) in the supply line. For "JN" type non-lubricated pumps and boosters, install an air control unit (without lubricator) in the air supply line. These and other related accessory items are available from HiP.



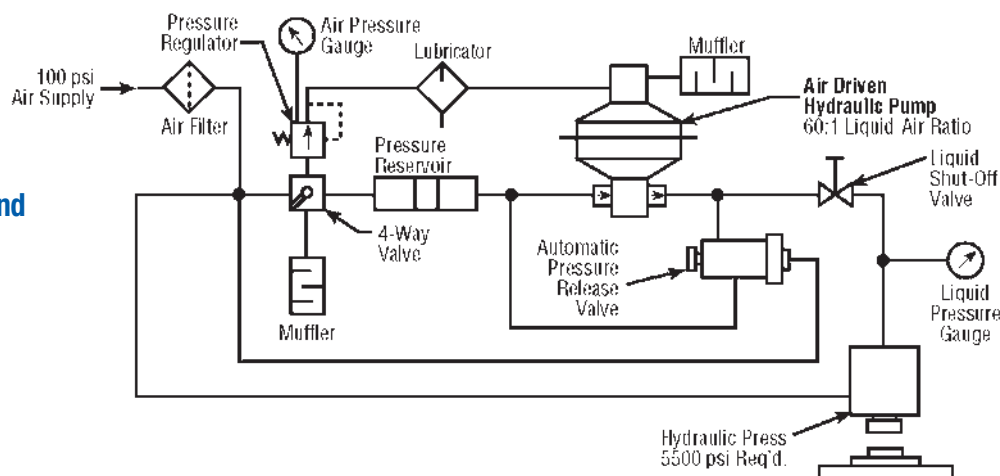
**Pump & Accessories – Typical Arrangement**



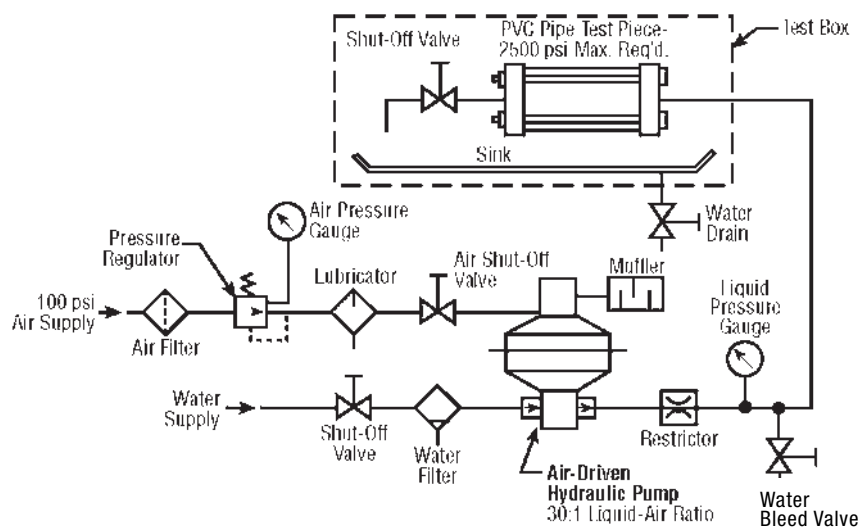
# Typical Circuits

## for Air Driven Hydraulic Pumps

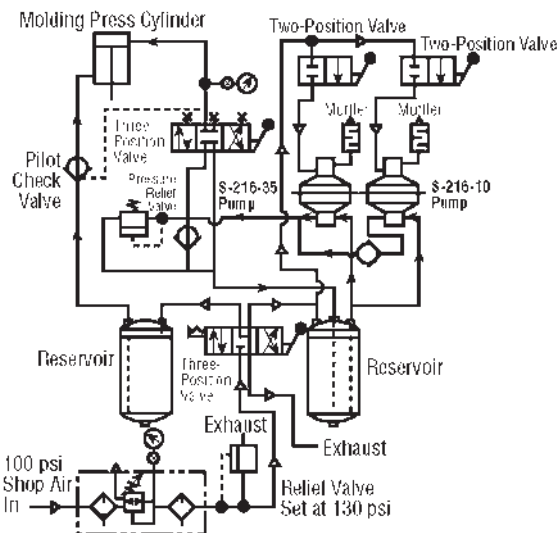
**Typical Set-Up for Hydraulic Swaging and Crimping Press**



**Typical Pump Set-Up For Hydrostatic Test**



**High-Low Pump System for Molding Press**



# Ordering Information

## Sprague Part Number System

The Sprague J and JB series pumps all start with S-216 as a standard part number. These pumps feature a 6 inch drive piston and are offered in the following nominal ratios:

10:1, 20:1 & 30:1 – J pumps

35:1, 60:1 & 100:1 – J pumps or JB pumps

101:1, 125:1, 150:1, 200:1 & 300:1 – JB pumps

JB series pumps include a bushing for improved wear life. The J and JB pump standard models are intended for use with lubricated air. The following optional configurations are also available:

**N** = Standard, non-lubricated air

**D** = Double-acting, lubricated air

**DN** = Double-acting, non-lubricated air

**R** = Standard with reservoir, lubricated air

**NR** = Standard with reservoir, non-lubricated air

**S** = Non-contaminating, separated, lubricated air

**SN** = Non-contaminating, separated, non-lubricated air

The appropriate letter(s) for these options are added directly after the J or JB pump is specified (see below). A dash follows and then a number which indicates the pump or booster nominal pump ratio.

**Example:** S-216-J-60 = 60:1 pump nominal ratio.

**-HO** = For increased flow capacity, high output pumps are also available, indicated after the ratio.



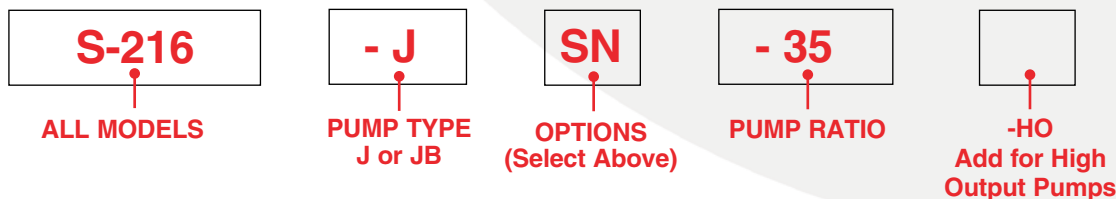
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## How to Order Pumps

To order a hydraulic pump or power unit, select a pump ratio based on the liquid pressure and flow requirements and the available air pressure to operate the pump. Refer to the Pump Ratio Selection Charts on page 17.

By adjusting the driving air supply at the pressure regulator, the pump can produce any liquid output pressure between 25% and 100% of rated pressure.

For example, a separated, non-lubricated pump is desired for a system requiring 1,000 psi liquid discharge pressure with a 170 cubic inch per minute flow rate capacity, with an available air supply of 100 psi. From the Chart on page 17, a suitable pump nominal ratio will be 35:1.



The part number for this pump would be: **S-216-JSN-35**

### Notes:

- The standard S-216-J pump has a stainless-steel liquid body and is furnished with nitrile O-rings.
- JB series pumps use a wear resistant polyurethane piston seal to reduce maintenance frequency.
- Sprague pumps can also be furnished with other O-ring materials including FKM, Neoprene, EPR. Consult factory for other soft seal compounds. For questions regarding liquid/seal compatibility, contact Sprague Products for recommendations for the seal compound suited to the application.

# Pump Ratio Selection Chart

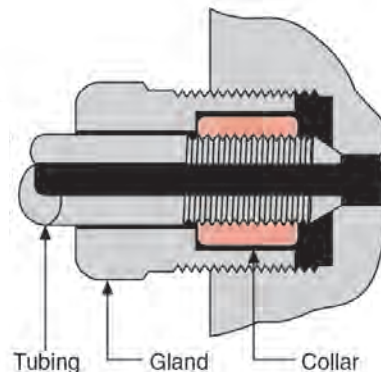
for the Following Pump Models: S-216-J, S-216-JN, S-216-JS and S-216-JSN

100 psi Driving Air Supply			Capacities - cubic inches / minute nominal																									
			Liquid Discharge Pressure - psi																									
Nom. Ratio	Max. Output Pressure psi	Displace- ment per Stroke CU. IN.	0	250	500	750	1000	1500	2000	2500	3000	4000	5000	7500	9000	10000	12500	15000	17500	20000	22500	25000	27500	30000	32500	Max Flow		
10	1025	3.26	457.0	433.1	374.7	278.4																				457.0		
20	1910	1.75	450.4	423.6	362.4	301.3	257.9	144.1																		450.4		
30	3200	1.04	332.0	288.3	242.2	208.0	191.0	157.2	119.0	64.9	24.5															332.0		
35	4760	0.708	298.9	222.9	199.0	176.3	171.3	154.3	125.6	109.9	89.0	25.0														298.9		
60	6330	0.527	213.0	178.3	161.6	146.3	137.5	123.5	113.5	100.1	87.7	63.3	35.0													213.0		
100	9100	0.366	160.4	131.0	119.5	113.7	107.3	99.5	89.6	82.5	75.9	64.4	51.4	15.3												160.4		
101	10000	0.33	122.0	122.0	122.0	121.4	120.6	119.1	114.7	108.9	102.9	92.3	81.8	55.7	33.2											122.0		
125	12400	0.266	103.5	99.6	95.8	93.0	90.2	83.3	76.4	75.7	74.9	65.2	56.3	41.5	33.5	28.1										103.5		
150	16200	0.205	78.0	77.0	76.0	74.0	72.0	69.0	66.0	63.0	60.0	56.0	53.0	44.5	37.6	33.0	24.5	12.2								78.0		
200	24900	0.132	53.0	51.5	50.0	49.0	48.0	47.0	46.0	44.5	43.0	41.0	38.0	34.0	31.6	30.0	23.9	20.0	15.6	13.8	11.5					53.0		
300	36500	0.092	37.0	36.0	35.0	34.0	33.0	32.5	32.0	31.5	31.0	30.0	28.2	26.2	23.7	22.0	20.2	18.3	16.2	13.8	12.2	10.0	8.0	5.5	2.1	37.0		

6.9 bar Driving Air Supply			Capacities - cc / minute nominal																								
			Liquid Discharge Pressure - bar																								
Nom. Ratio	Max Output Pressure bar	Displace- ment per Stroke cc	0	17	34	52	69	103	138	172	207	276	345	517	621	690	862	1034	1207	1379	1551	1724	1896	2069	2241	Max Flow	
10	71	53.4	7489	7097	6140	4563																				7489	
20	132	28.7	7382	6942	5939	4937	4227	2362																		7382	
30	221	17.0	5441	4725	3969	3409	3130	2576	1950	1064	401															5441	
35	328	11.6	4899	3653	3262	2889	2807	2529	2058	1801	1458	410														4899	
60	436	8.6	3490	2922	2649	2397	2254	2024	1860	1640	1437	1037	573													3490	
100	627	6.0	2628	2147	1959	1863	1758	1631	1468	1352	1244	1055	843	251												2628	
101	690	5.4	2000	2000	2000	1990	1977	1951	1880	1784	1687	1513	1340	913	544											2000	
125	855	4.4	1696	1633	1570	1524.5	1479	1365.5	1252	1240	1228	1068	923	680	548.6	461										1696	
150	1117	3.4	1278	1261.5	1245	1212.5	1180	1131	1082	1032.5	983	918	869	730	616	540	402	200								1278	
200	1717	2.2	869	844	819	803	787	770.5	754	729.5	705	672	623	557	518	492	392	328	255	226	188					869	
300	2517	1.5	606	590	574	557.5	541	532.5	524	516	508	492	462	429	387.6	360	331	300	266	226	200	164	131	90	35	606	

## High Pressure Connections

All pumps that are capable of pressures exceeding 10,000 psi are equipped with 9/16-18 HF4 outlet check valves that accept coned and threaded tube fittings.





# S-216-J Standard Pump

## and S-216-JN Non-Lubricated Pump

### S-216-J( ) STANDARD PUMP, LUBRICATED

This general use, air driven pump produces medium to high liquid pressures and services oil, water and compatible chemicals.

The Model S-216-J standard pump is offered in ten ratios (area of large air piston to area of small liquid piston) ranging from the 10:1 ratio pump which develops up to 1025 psi (70 bar) to the 300:1 ratio which develops up to 36,500 psi (2516 bar). By regulating the driving air pressure, the pump's liquid output can be adjusted through its pressure range.

The pump's wetted section components are stainless steel, compatible with most non-abrasive liquids.

Being air driven, the pump is safe for use in hazardous areas.

The S-216-J standard pump requires lubricated driving air to lubricate the pump's dynamic air seals and other internal parts within the air portion of the pump.

When determining the appropriate pump nominal ratio to order, refer to page 16-17, How To Order Pumps and Pump Ratio Selection Chart.

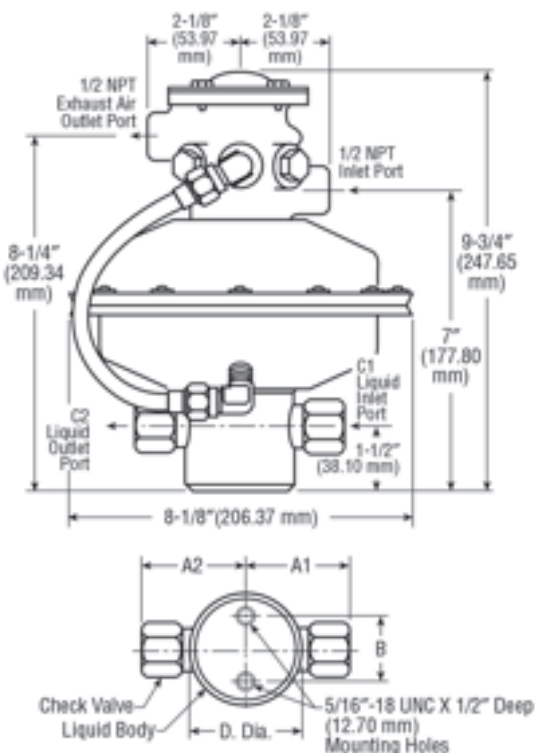
**Example:** S-216-J-60

Pump Model Number      Pump Nominal Ratio



**S-216-J( )**

## S-216-J



Nominal Ratio	A		B		C1	C2	D/Dia.	
	Inch	mm	Inch	mm	Inlet	Outlet	Inch	mm
<b>10:1</b>	2-29/32	73.82	2-7/16	61.90	NFC	NFC	3-1/2	88.86
<b>20:1</b>	2-29/32	73.82	2-7/16	61.90	NFC	NFC	3-1/4	82.51
<b>30:1</b>	2-29/32	73.82	2-7/16	61.90	NFC	NFC	3-1/4	82.51
<b>35:1</b>	2-3/8	57.15	1-1/2	38.10	NFC	NFC	2-1/2	63.47
<b>60:1</b>	2-3/8	57.15	1-1/2	38.10	NFC	NFC	2-1/2	63.47
<b>100:1</b>	2-3/8	57.15	1-1/2	38.10	NFC	NFC	2-1/2	63.47
<b>101:1</b>	2-3/8	60.45	1-1/2	38.10	NFC	NFC	2-1/2	63.47
<b>125:1</b>	2-1/4	57.15	1-1/2	38.10	NFB	HF4	2-1/2	63.47
<b>150:1</b>	2-1/4	57.15	1-1/2	38.10	NFB	HF4	2-1/2	63.47
<b>200:1</b>	2-1/4	57.15	1-1/2	38.10	NFB	HF4	2-1/2	63.47
<b>300:1</b>	2-1/4	57.15	1-1/2	38.10	NFB	HF4	2-1/2	63.47

Pump Model No.	Part Number	Maximum Output		Port Threads			Actual Weight	
		psi	bar	Driving Air	Inlet	Outlet	lbs.-oz.	kg
S-216-J-10	79293-11	1025	70	1/2 NPT	NFC	NFC	16-4	7.4
S-216-JN-10	89842-11	1025	70	1/2 NPT	NFC	NFC	16-4	7.4
S-216-JR-10	91612-11	1025	70	1/2 NPT	NFC	NFC	24-4	11
S-216-JNR-10	91613-11	1025	70	1/2 NPT	NFC	NFC	24-4	11
S-216-J-20	77894-11	1910	131	1/2 NPT	NFC	NFC	14-8	6.6
S-216-JN-20	89842-21	1910	131	1/2 NPT	NFC	NFC	14-8	6.6
S-216-JR-20	91612-21	1910	131	1/2 NPT	NFC	NFC	22-8	10.2
S-216-JNR-20	91613-21	1910	131	1/2 NPT	NFC	NFC	22-8	10.2
S-216-J-30	77894-21	3200	220	1/2 NPT	NFC	NFC	14-8	6.6
S-216-JN-30	89842-31	3200	220	1/2 NPT	NFC	NFC	14-8	6.6
S-216-JR-30	91612-31	3200	220	1/2 NPT	NFC	NFC	22-8	10.2
S-216-JNR-30	91613-21	3200	220	1/2 NPT	NFC	NFC	22-8	10.2
S-216-JB-035	94186-035-01	4760	328	1/2 NPT	NFC	NFC	12-8	5.7
S-216-JBN-035	94198-035-01	4760	328	1/2 NPT	NFC	NFC	12-8	5.7
S-216-JBR-035	94242-035-01	4760	328	1/2 NPT	NFC	NFC	20-8	9.3
S-216-JBNR-035	94243-035-01	4760	328	1/2 NPT	NFC	NFC	20-8	9.3
S-216-JB-060	94186-060-01	6330	436	1/2 NPT	NFC	NFC	12-8	5.7
S-216-JBN-060	94198-060-01	6330	436	1/2 NPT	NFC	NFC	12-8	5.7
S-216-JBR-060	94242-060-01	6330	436	1/2 NPT	NFC	NFC	20-8	9.3
S-216-JBNR-060	94243-060-01	6330	436	1/2 NPT	NFC	NFC	20-8	9.3
S-216-JB-100	94186-100-01	9100	627	1/2 NPT	NFC	NFC	12-8	5.7
S-216-JBN-100	94198-100-01	9100	627	1/2 NPT	NFC	NFC	12-8	5.7
S-216-JBR-100	94242-100-01	9100	627	1/2 NPT	NFC	NFC	20-8	9.3
S-216-JBNR-100	94243-100-01	9100	627	1/2 NPT	NFC	NFC	20-8	9.3
S-216-JB-101	94186-101-01	10000	689	1/2 NPT	NFC	NFC	12-8	5.7
S-216-JBN-101	94198-101-01	10000	689	1/2 NPT	NFC	NFC	12-8	5.7
S-216-JBR-101	94242-101-01	10000	689	1/2 NPT	NFC	NFC	20-8	9.3
S-216-JBNR-101	94243-101-01	10000	689	1/2 NPT	NFC	NFC	20-8	9.3
S-216-JB-125	94186-125-11	12400	854	1/2 NPT	NFB	HF4	12-8	5.7
S-216-JBN-125	94198-125-11	12400	854	1/2 NPT	NFB	HF4	12-8	5.7
S-216-JBR-125	94242-125-11	12400	854	1/2 NPT	NFB	HF4	12-8	5.7
S-216-JBNR-125	94243-125-11	12400	854	1/2 NPT	NFB	HF4	12-8	5.7
S-216-JB-150	94186-150-11	16200	1116	1/2 NPT	NFB	HF4	12-8	5.7
S-216-JBN-150	94198-150-11	16200	1116	1/2 NPT	NFB	HF4	12-8	5.7
S-216-JBR-150	94242-150-11	16200	1116	1/2 NPT	NFB	HF4	20-8	9.3
S-216-JBNR-150	94243-150-11	16200	1116	1/2 NPT	NFB	HF4	20-8	9.3
S-216-JB-200	94186-200-11	24900	1716	1/2 NPT	NFB	HF4	12-8	5.7
S-216-JBN-200	94198-200-11	24900	1716	1/2 NPT	NFB	HF4	12-8	5.7
S-216-JBR-200	94242-200-11	24900	1716	1/2 NPT	NFB	HF4	20-8	9.3
S-216-JBNR-200	94243-200-11	24900	1716	1/2 NPT	NFB	HF4	20-8	9.3
S-216-JB-300	94186-300-11	36500	2516	1/2 NPT	NFB	HF4	12-8	5.7
S-216-JBN-300	94198-300-11	36500	2516	1/2 NPT	NFB	HF4	12-8	5.7
S-216-JBR-300	94242-300-11	36500	2516	1/2 NPT	NFB	HF4	20-8	9.3
S-216-JBNR-300	94243-300-11	36500	2516	1/2 NPT	NFB	HF4	20-8	9.3

### S-216-JN-( ) STANDARD PUMP, NON-LUBRICATED

Mechanically the same as the S-216-J standard pump, this S-216-JN-( ) pump is suitable for use in cleanrooms or laboratories. The pump uses normal shop compressed air without lubrication to actuate the pump. Its dynamic air seals are self lubricating. The pump's exhaust air is identical to the driving air supply, so no additional contaminants are added to the exhaust air. Order in the same manner as the S-216-J and add an "N" to model number.

**Example:** S-216-JN-60

Pump Model Number | Pump Nominal Ratio

### S-216-J-( ) HO HIGH OUTPUT PUMP, LUBRICATED

### S-216-JN-( ) HO HIGH OUTPUT PUMP, NON-LUBRICATED

Mechanically the same as the S-216-J-( ) or S-216-JN-( ) pumps, the S-216-( )-( )HO pumps utilize larger air to

dramatically increase pump speeds. Flows of up to double the standard published flow rates are available with the high output pumps.

### S-216-JR-( ) STANDARD PUMP/RESERVOIR, LUBRICATED

This pump assembly combines the S-216-J standard pump (lubricated air type) with a one-gallon (3.8 liters) steel reservoir. Readily adaptable to portable power pack use or suitable for stationary use to provide hydraulic power for production machinery or for hydrostatic testing. Available in ten pump ratios.

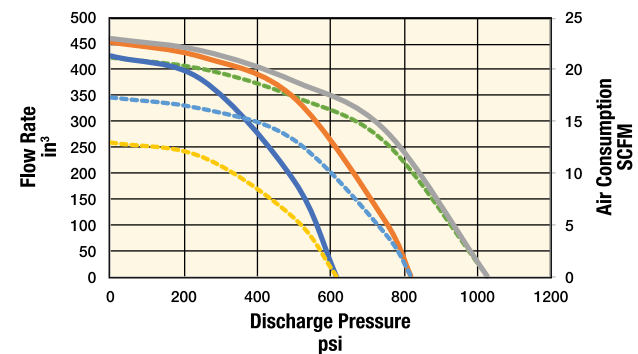
### S-216-JNR-( ) PUMP/RESERVOIR, NON-LUBRICATED

Same as S-216-JR-( ) assembly except that the S-216-JN-( ) standard pump (non-lubricated air type) is used. No additional contaminants are exhausted from the pump. Available in ten pump ratios.

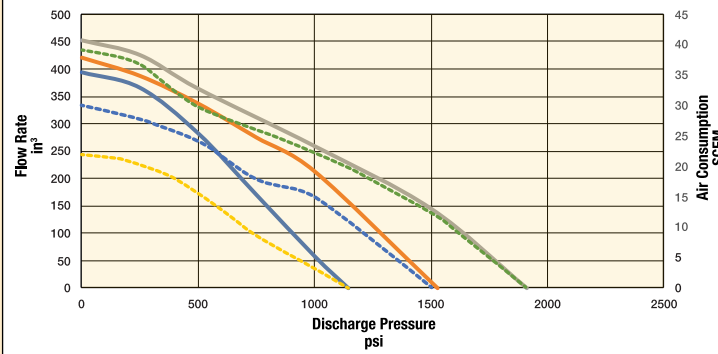
# S-216-J Flow Performance

2

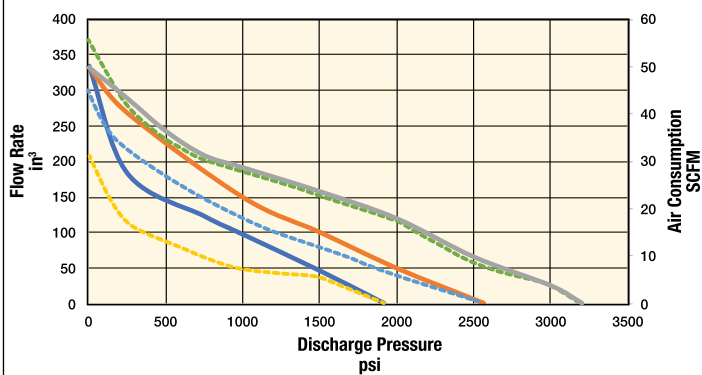
Nominal Ratio 10:1



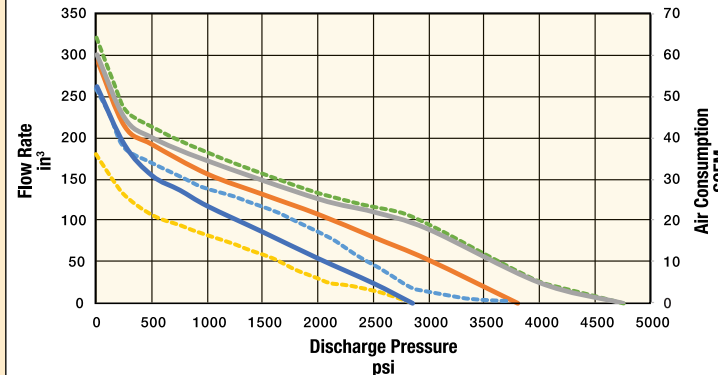
Nominal Ratio 20:1



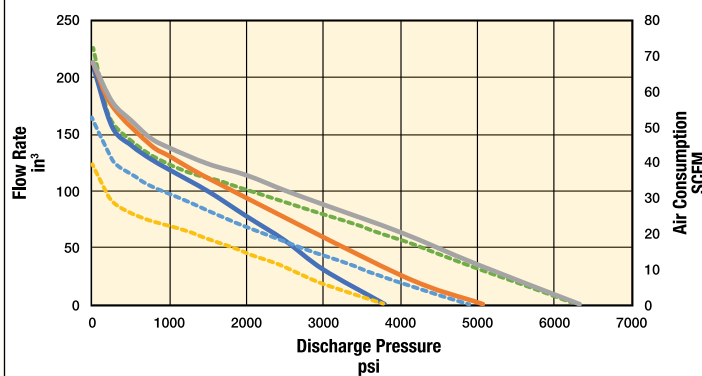
Nominal Ratio 30:1



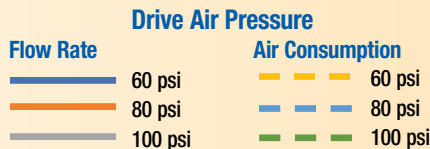
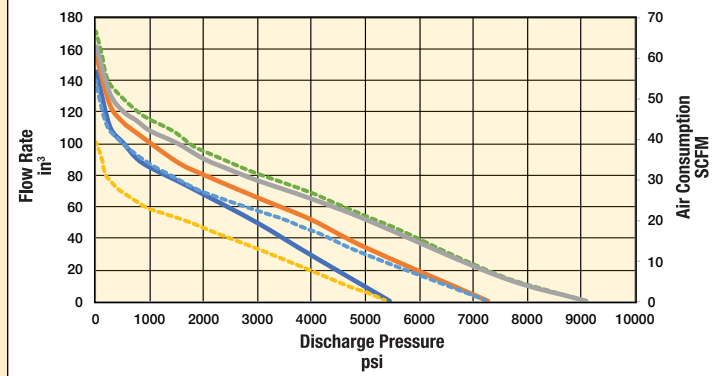
Nominal Ratio 35:1



Nominal Ratio 60:1



Nominal Ratio 100:1

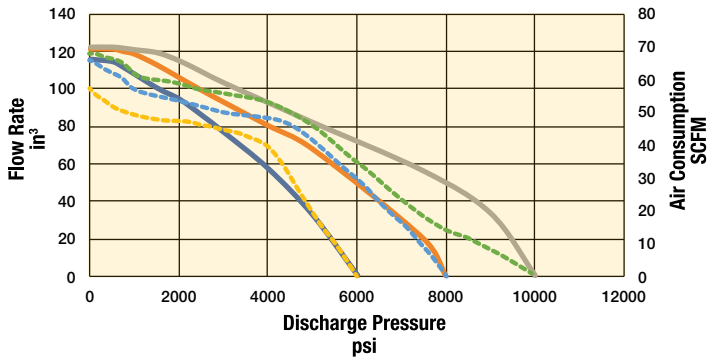




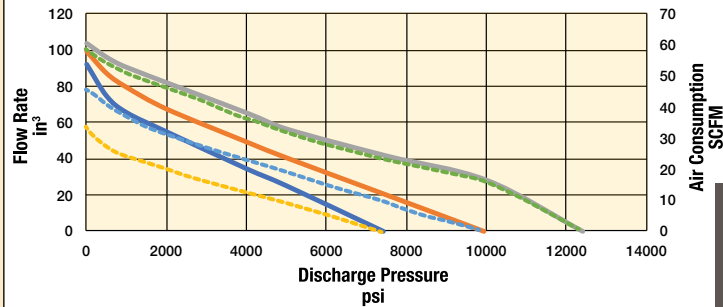
# S-216-J Flow Performance (cont.)

2

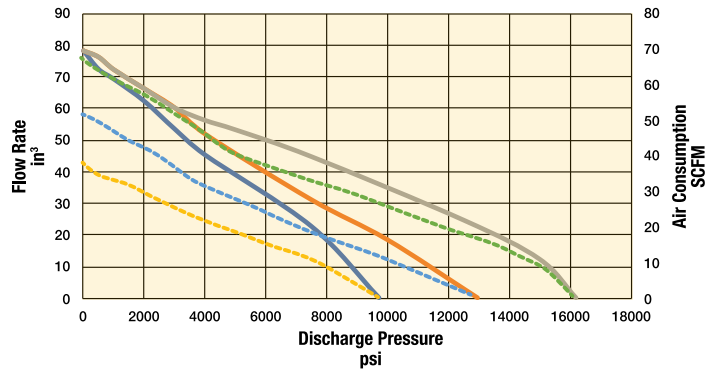
Nominal Ratio 101:1



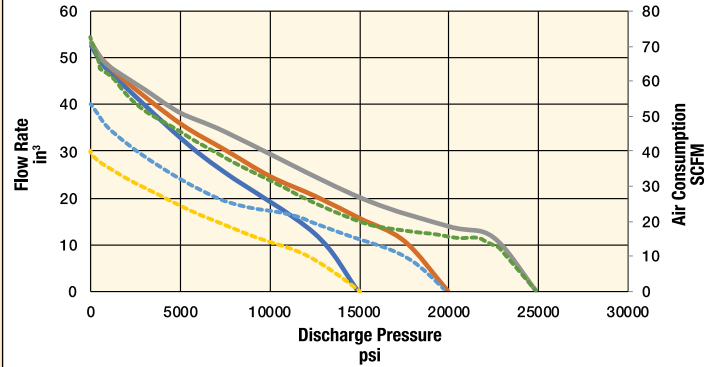
Nominal Ratio 125:1



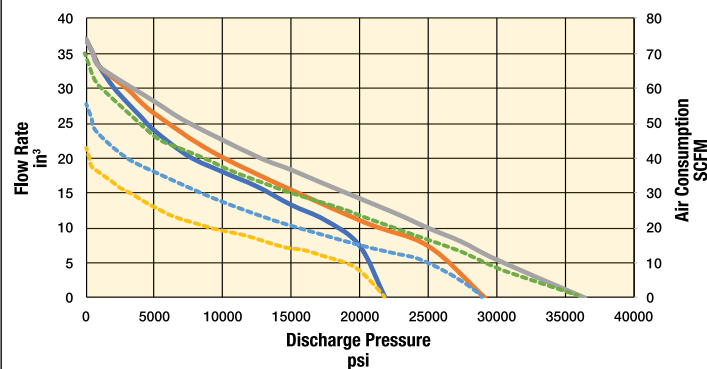
Nominal Ratio 150:1



Nominal Ratio 200:1

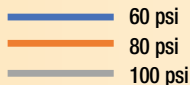


Nominal Ratio 300:1



Drive Air Pressure

Flow Rate



Air Consumption



# Double Acting JD Pump

## Class 1 J Series

These Sprague hydraulic pumps move relatively large flows of liquids at low to moderate pressures. The pumps deliver liquid with each up and down stroke of the liquid piston rather than, only with a down stroke like other J pumps. The pump's air-driving action is the same as the Sprague air driven S-216-J series hydraulic pumps described on page 18. Being air driven, these double-acting pumps are non-arcing and non-sparking, safe for use in hazardous or confined areas.

See Charts on page 17 for liquid discharge rates and pressures. See page 60 for power unit arrangements of these pump models.

2

### S-216-JD-6.8

Serves oil and non-corrosive liquids. **Not for water service.** With a 6.8 pumping ratio, this double-acting pump is well suited for liquid transfer, low pressure hydrostatic testing and other industrial uses.

This pump discharges volume liquids up to 12 gallons per minute and provides for selected discharge pressures up to 680 psi. With its liquid body and main components made from anodized aluminum alloy, the pump is reduced in weight and lower in cost. The standard pump's special seals in the wetted section are compatible with a wide range of chemicals while other seals in the pump are nitrile. Other seal compounds are optional.

### S-216-JD-34

Serves oil, water and many corrosive liquids. With a 34 to 1 pumping ratio, this double-acting pump discharges volume liquids at any selected pressure up to 3,400 psi, suitable to many industrial applications requiring volume liquid delivery at higher pressures and holding cycles.

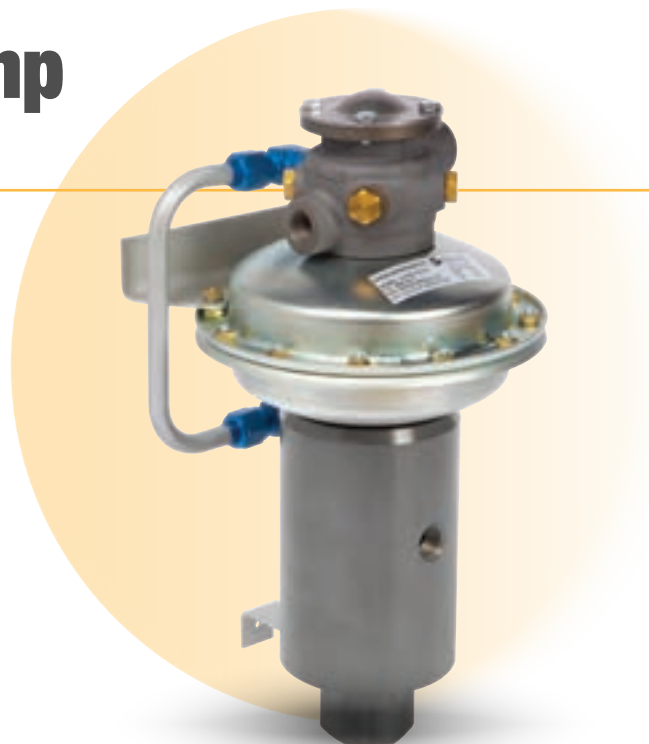
This pump uses an internal check valve in its liquid piston head, to obtain a double-acting, steady flow of liquid. This unique design results in higher pressures and uses material resistant to many corrosive liquids. The pump has special dynamic seals to accommodate low lubricity liquids. The pump body is brass. Mounting brackets facilitate installation.

### S-216-JD-36

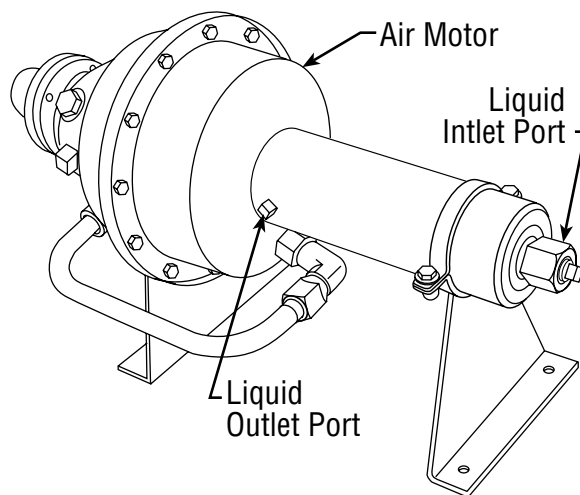
Serves oil and non-corrosive liquids. **Not for water service.** Its general design is identical to the S-216-JD-34 pump described above. The -36 pump has an aluminum body which significantly lowers the price of the pump and reduces its weight by four pounds. The pump has nitrile seals.

### S-216-JD-60

Non-contaminating pump for cleanroom or laboratory use has self-lubricating dynamic seals. The pump uses clean, dry driving air.



S-216-JD-( )



# Double Acting JD Pump - Dimensions

	S-216-JD-6.8	S-216-JD-34	S-216-JD-36	S-216-JD-60	S-216-JDN-60
<b>Height:</b>	8.3 in. (21.08 cm)	10-1/4 in. (26.0 cm)	10-1/4 in. (26.0 cm)	10-1/2 in. (26.7 cm)	10-1/2 in. (26.7)
<b>Length:</b>	15.75 in. (40.01 cm)	20-1/4 in. (51.4 cm)	20-1/4 in. (51.4 cm)	20-3/4 in. (52.7)	20-3/4 in. (52.7)
<b>Width:</b>	8 in. (20.32 cm)	8-1/8 in. (21.6 cm)	8-1/8 in. (21.6 cm)	8-1/8 in. (20.6 cm)	8-1/8 in. (20.6 cm)
<b>Reference:</b>	90615	89320-1	81557-20	90977-2	91616

Pump Model Number	Displacement per cycle (Cu. Inch)	DISCHARGE CAPACITY - gallons per minute, approximate, based on 50 SCFM* of driving air at 100 psi										
		Discharge Pressure - psi										
		0	100	250	350	500	1000	2000	3000	4000	5000	6000
<b>S-216-JD-6.8</b>	9.72	12.00	10.9	8.6	7.0	4.0						
<b>S-216-JD-34</b>	4.90	3.1	2.95	-	2.9	2.85	2.7	2.1	1.1			
<b>S-216-JD-36</b>	4.90	2.9	-	2.1	-	1.98	1.74	1.23	0.6			
<b>S-216-JD-60*</b>	2.82	-	-	-	-	2.23	2.10	1.84	1.44	1.07	0.71	0.14

\*Discharge capacity of S-216-JD-60 is based on 85 SCFM of driving air at 100 psi.

Pump Model Number	Displacement per cycle (liters)	DISCHARGE CAPACITY -liters per minute, approximate, based on 1.4 cubic meters* per minute of driving air at 6.9 bar										
		Discharge Pressure - psi										
		0	6.9	17.2	24.1	34.5	69	138	207	275	345	414
<b>S-216-JD-6.8</b>	0.159	45.1	41.3	32.5	26.5	15.1						
<b>S-216-JD-34</b>	0.080	11.7	11.1	-	10.9	10.8	10.2	7.9	4.2			
<b>S-216-JD-36</b>	0.080	11.0	-	7.9	-	7.5	6.6	4.7	2.3			
<b>S-216-JD-60*</b>	0.462	-	-	-	-	8.44	7.95	6.96	5.45	4.05	2.69	0.53

\*Discharge capacity of S-216-JD-60 is based on 2.41 cubic meters per minute of driving air at 6.9 bar.

# Separated JS Pumps

## Non-Contaminating

### S-216-JS-( )

The design feature of this “JS” type pump is the mechanical separation of the liquid portion from the air driven portion of the pump. This allows the pump to service contaminate-free fluids or fluids for human consumption.

Other applications may include liquids for food processing, liquids for atomic energy use, proof testing of pressure vessels such as oxygen and nitrogen bottles, injecting corrosive inhibitors into pipe lines or for other specialized uses.

The mechanical separation prevents undesirable elements or contaminants, normally present in compressed air or lubricants, from contacting the contaminate-free liquid being pumped. The separation also permits removal of the stainless steel liquid body (same body as S-216-J pump) for service or substitution with optional liquid bodies and liquid pistons to change the rated output pressure without disturbing the pump’s driving side. Refer to the Pump Ratio Selection Charts, page 17.

Like the “J” type basic pump, this “JS” pump uses lubricated driving air for the air driven portion of the pump. Mounting brackets are included as part of the pump assembly.

### S-216-JSN-( )

This pump is suitable for cleanroom or laboratory use. It has the same mechanical separation features as the model S-216-JS pump. Additionally, the “JSN” pump uses clean, dry air; thus no contaminants are added to the pump’s exhaust air. The air section of the pump has self-lubricating seals.



**S-216-JS-( )**

Pump Model No.	Part Number	Pump Maximum Output (See Note)		Ports		
		psi	bar	Driving Air	Liquid Inlet	Liquid Outlet
S-216-JS-10	79557-21	1025	71	1/2 NPT	NFC	NFC
S-216-JSN-10	90067-11	1025	71	1/2 NPT	NFC	NFC
S-216-JS-20	77896-61	1910	132	1/2 NPT	NFC	NFC
S-216-JSN-20	90067-21	1910	132	1/2 NPT	NFC	NFC
S-216-JS-30	77896-71	3200	221	1/2 NPT	NFC	NFC
S-216-JSN-30	90067-31	3200	221	1/2 NPT	NFC	NFC
S-216-JBS-35	94230-035-01	4760	328	1/2 NPT	NFC	NFC
S-216-JBSN-35	94233-035-01	4760	328	1/2 NPT	NFC	NFC
S-216-JBS-60	94230-060-01	6330	436	1/2 NPT	NFC	NFC
S-216-JBSN-60	94233-060-01	6330	436	1/2 NPT	NFC	NFC
S-216-JBS-100	94230-100-01	9100	627	1/2 NPT	NFC	NFC
S-216-JBSN-100	94233-100-01	9100	627	1/2 NPT	NFC	NFC
S-216-JBS-101	94230-101-01	10000	689	1/2 NPT	NFC	NFC
S-216-JBSN-101	94233-101-01	10000	689	1/2 NPT	NFC	NFC
S-216-JBS-125	94230-125-11	12400	855	1/2 NPT	NFB	HF4
S-216-JBSN-125	94233-125-11	12400	855	1/2 NPT	NFB	HF4
S-216-JBS-150	94230-150-11	16200	1117	1/2 NPT	NFB	HF4
S-216-JBSN-150	94233-150-11	16200	1117	1/2 NPT	NFB	HF4
S-216-JBS-200	94230-200-11	24900	1717	1/2 NPT	NFB	HF4
S-216-JBSN-200	94233-200-11	24900	1717	1/2 NPT	NFB	HF4
S-216-JBS-300	94230-300-11	36500	2517	1/2 NPT	NFB	HF4
S-216-JBSN-300	94233-300-11	36500	2517	1/2 NPT	NFB	HF4



# GJC Double Acting

## 10.5 HP Pumps

### S-218-GJC-( )

This 10.5 hp, double-acting piston pump services oil, water and compatible chemicals. It is ideal for hydrostatic testing, machine operations, charging accumulators and for deep-hole applications.

Offered in three pumping ratios (45:1, 65:1 and 200:1), the S-218 pump produces medium to high pressures for controlled flow or for holding pressures. By regulating the air supply, liquid outlet pressure can be infinitely adjusted throughout the pump's pressure range.

Being air-driven, the pump is safe for use in hazardous areas. It can be used in a wide variety of temperatures and in other hostile environments. The standard pump uses a lubricated driving air supply.

### Other Features

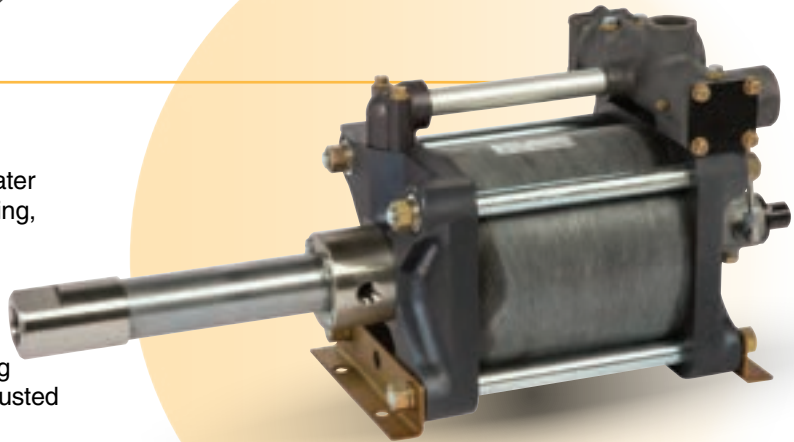
Pumps rapidly to desired pressure. Holds pressure indefinitely with minimal energy consumption, no increase in liquid temperature or parts movement. Automatically restarts to restore pressure balance when imbalance occurs.

Liquid pumping section materials are stainless steel and chrome-plated steel, both compatible with most non-abrasive liquids.

Air motor has water emitters to prevent water from collecting in humid conditions.

Can be driven with wellhead gases. Can operate in freezing or hostile conditions because of anti-icing device.

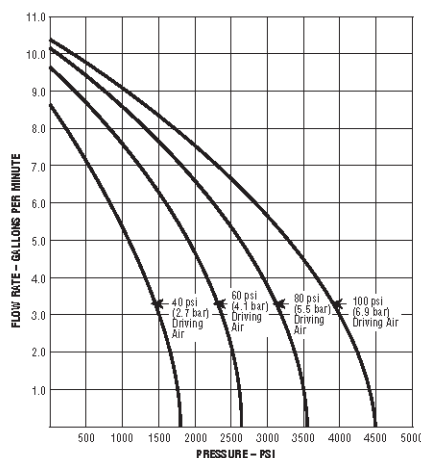
Safe for use in hazardous conditions because there are no electrical sparking risks or electrical connections.



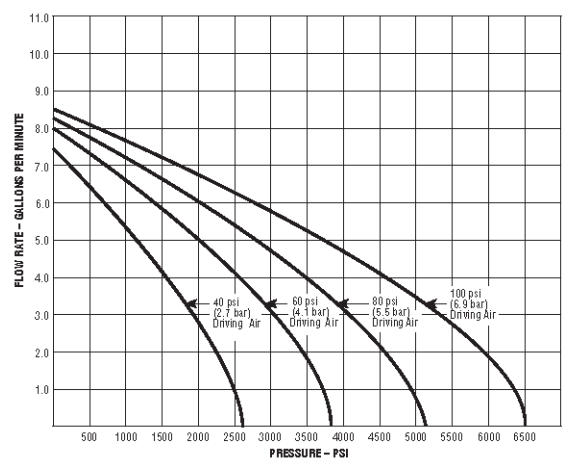
S-218-GJC-( )

2

S-218-GJC-45



S-218-GJC-65



S-218-GJC Pumps (45 & 65)	
<b>Length:</b>	29 in. (73.6 cm)
<b>Width:</b>	10-5/8 in. (27.0 cm)
<b>Height:</b>	12-1/2 in. (31.8 cm)
<b>Air Inlet Port:</b>	1 NPT
<b>Liquid Inlet Port:</b>	1 NPT
<b>Liquid Outlet Port:</b>	1/2 NPT
<b>Reference:</b>	1 NPT
-45	90226-1
-60	90225-1
-200	

Pump Model Number	DISCHARGE CAPACITY - GALLONS (liters) PER MINUTE - APPROXIMATE Based on 350 SCFM of driving air at 100 psi (9.9 Std. Cu. Meters driving air at 6.9 bars)									
	0 psi (0 bar)	500 psi (34.5 bar)	1000 psi (69 bar)	2000 psi (138 bar)	3000 psi (207 bar)	4000 psi (276 bar)	4500 psi (310 bar)	5000 psi (345 bar)	5500 psi (379.5 bar)	6000 psi (414 bar)
<b>S-218-GJC-45 (45:1 ratio)</b>	10.5 gal (39.7)	9.8 (37.1)	9.2 (34.8)	7.7 (29.1)	5.8 (22.0)	3.1 (11.7)	-	-	-	-
<b>S-218-GJC-65 (65:1 ratio)</b>	8.5 (32.2)	8.0 (30.3)	7.6 (28.8)	6.6 (25.0)	5.6 (21.2)	4.5 (17.0)	3.9 (14.8)	3.3 (12.5)	2.7 (10.2)	1.9 (7.2)

# S-218 Double Ended Pump

## Single Acting

### S-218-200D

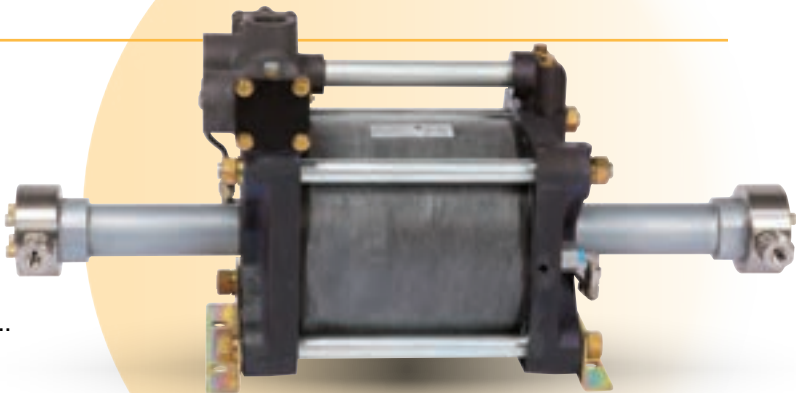
The S-218-200D air-driven, double ended pump produces high pressure liquid flows up to 2-1/2 gallons per minute and pressures up to 20,000 psi.

The pump services water, oil and compatible chemicals.

### Features

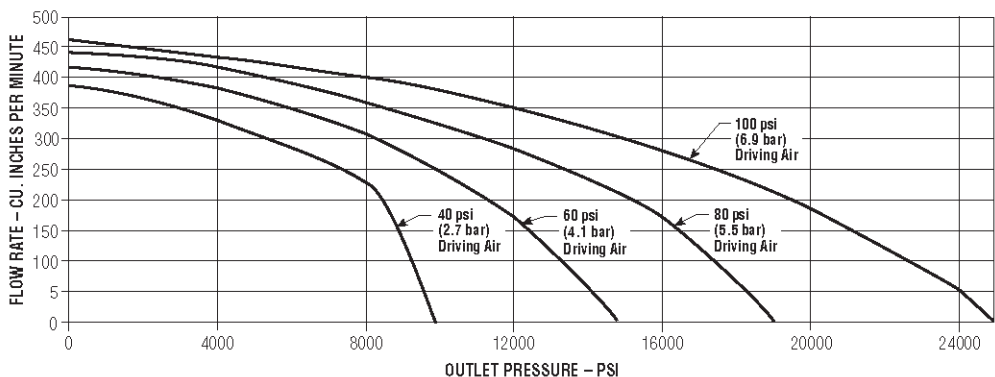
Has fewer moving parts and seals than comparable pumps... thus less maintenance. Safe for use in hazardous areas... no electrical connections.

Pump ideal for hydrostatic testing or water jet applications.



S-218-200D

### S-218-200D



S-218 Pumps (200D)	
Length:	28.5 in. (72.4 cm)
Width:	10-5/8 in. (27.0 cm)
Height:	12-1/2 in. (31.8 cm)
Air Inlet Port:	1 NPT
Liquid Inlet Port:	1/2 NPT
Liquid Outlet Port:	HF4 (3/8 in. OD)

Pump Model Number	DISCHARGE CAPACITY - CUBIC INCHES (liters) PER MINUTE - APPROXIMATE Based on 350 SCFM of driving air at 100 psi (9.9 Std. Cu. Meters driving air at 6.9 bars)					
	0 psi (0 bar)	4000 psi (276 bar)	8000 psi (552 bar)	12000 psi (828 bar)	16000 psi (1104 bar)	20000 psi (1380 bar)
S-218-200D	525	510	470	375	230	-
(200:1 ratio)	(8.60)	(8.36)	(7.70)	(6.15)	(3.77)	-

# Sprague SM-3

## High Pressure Air Operated Mini Pumps

The single acting air-driven SM-3 mini pump was designed for low volume and high pressure applications.

### Benefits

#### Easier and Lower Cost Maintenance –

Use of plastics in air drive module, unique air valve and non bolted construction make for simple overhaul. The SM-3 has less components than competitive products. No lubrication required.

#### Water or Oil Options –

Pump can be supplied to suit oil applications or more demanding water based systems.

#### Better Value for Money –

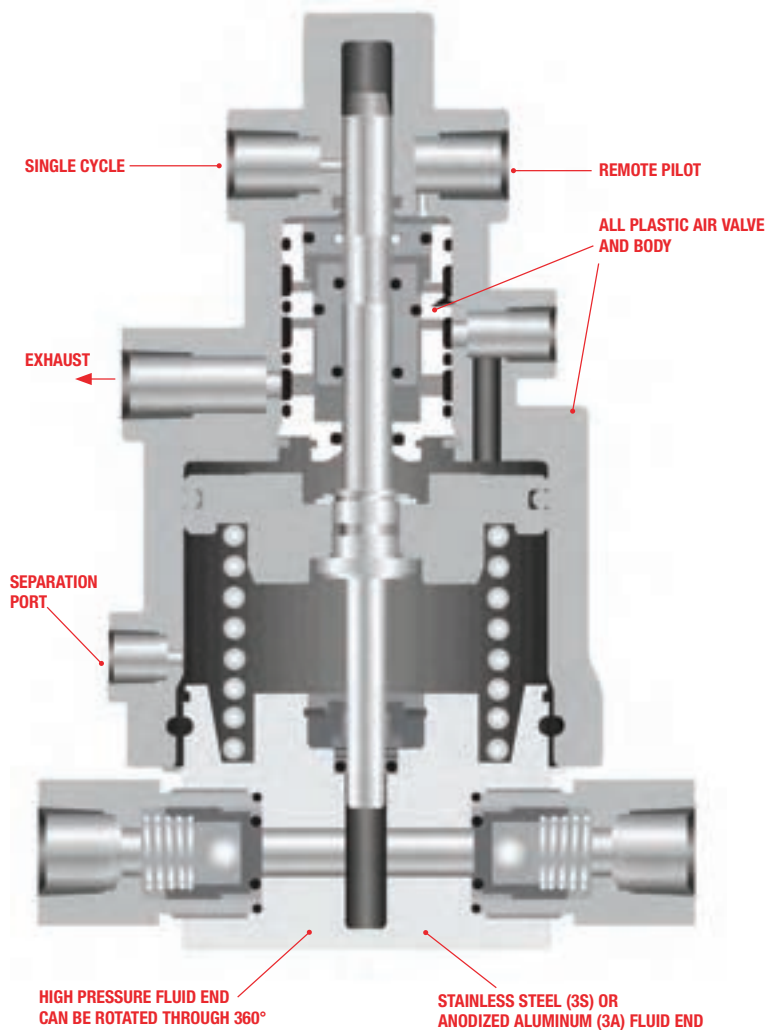
Various air valve operating modes are supplied as standard and can be readily field configured.

#### Flexibility –

Manual operation option available so pump can be used as a back up to main pump or in low volume lab applications.



2



### HIGH PRESSURE EQUIPMENT COMPANY

2955 West 17th Street, Erie, PA 16505 U.S.A. | Phone: (814) 838-2028 | 1-800-289-7447 | Fax: (814) 838-6075 | E-Mail: sales@highpressure.com | www.HighPressure.com

# SM-3 Mini Pumps

## How to Get the Best Performance

AIR FLOW dictates how fast the pump can cycle and hence flow rate depends on how much air is available. However as the pump pressure increases, the flow rate will decrease and the air consumption reduces to zero at stall pressure. Normal performance is based on maximum operating Air Supply of 15 SCFM @ 100 PSI.

AIR PRESSURE available produces a discharge pressure dependent on the RATIO of the pump.

2

Only need pressure -  
flow rate unimportant

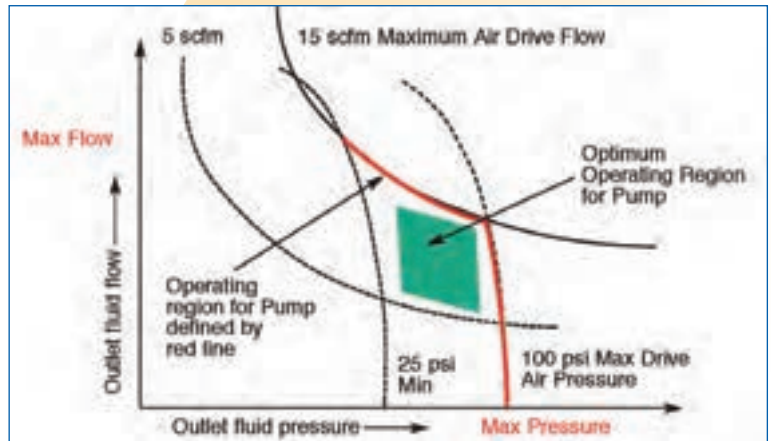
Where a maximum pressure is required and the flow rate is unimportant then the available air pressure has to be sufficient for the selected ratio.

**Air drive pressure x Actual Ratio = maximum discharge pressure.**

Where a maximum flow at a specified pressure is required this “duty point” has to be within the constraints of available air flow and pressure.

Need pressure and flow

This needs to be plotted on the flow curves for the pump and should, if possible, be within the optimum operating region as shown above, which is within the operating region dictated by the min and max limits for air flow and air pressure.



The pump performance is defined by a combination of outlet pressure and flow.

## Pump Ratio Selection Chart

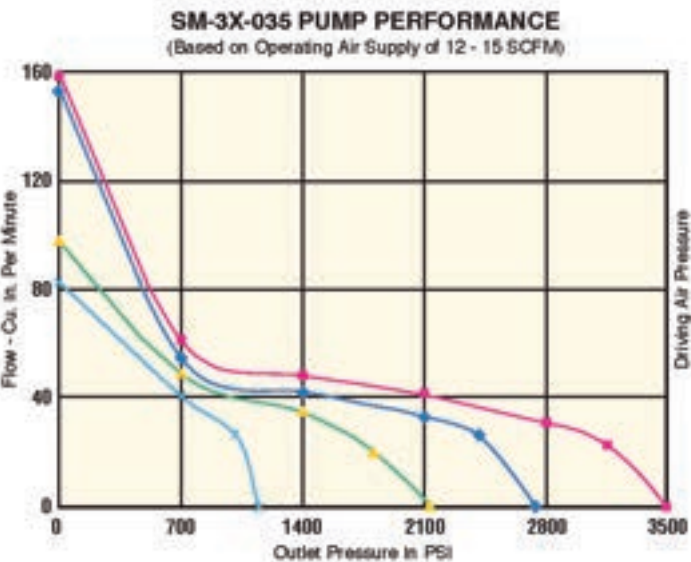
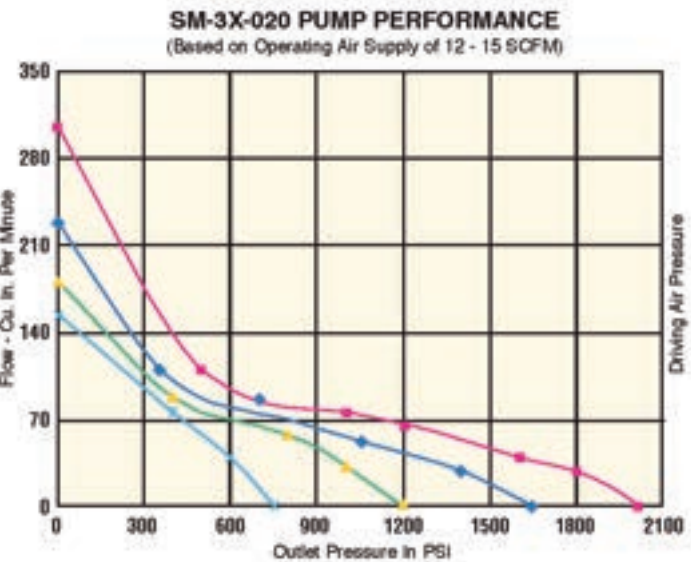
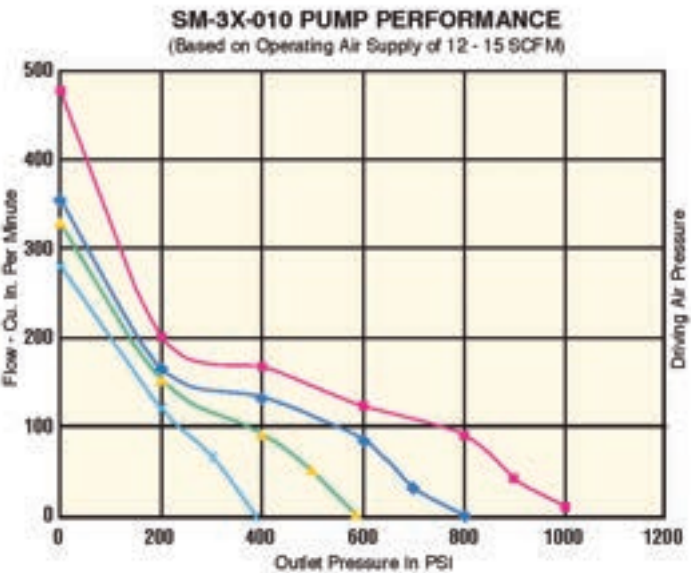
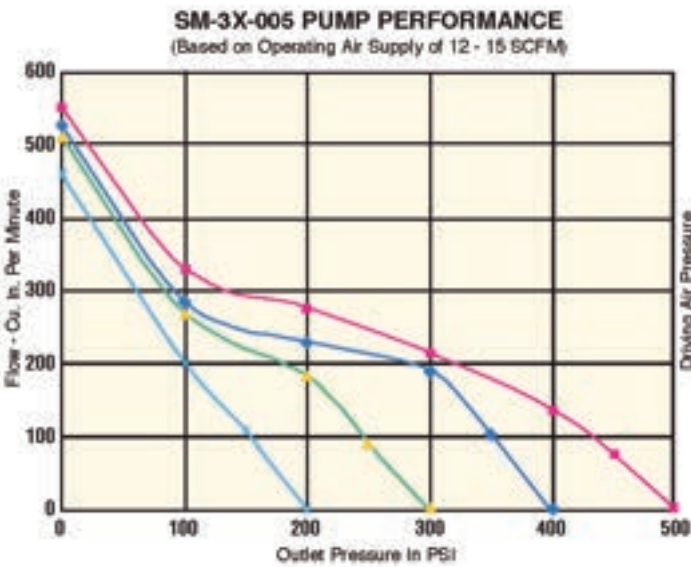
For the following pump models: SM-3A, SM-3S

Actual Ratio	Nominal Ratio	Nominal Output Pressure	Disp. Per Stroke Cu.In.	LIQUID DISCHARGE PRESSURE – PSI															
				0	100	200	350	500	1000	1500	2M	4M	6M	8M	10M	12M	15M	20M	
				CAPACITIES – CUBIC INCHES PER MINUTE APPROXIMATE															
5.75:1	5:1	500	1.050	550	330	275	180												
11.5:1	10:1	1000	0.527	476	350	200	180	150	10										
23:1	20:1	2000	0.263	305	280	210	160	110	75	60	15								
40.3:1	35:1	3500	0.150	158	140	120	100	90	60	50	40								
69:1	60:1	6000	0.085	98	90	80	75	60	31	25	22	17							
115:1	100:1	10000	0.053	58	55	53	50	48	40	30	21	16	14	10					
173:1	150:1	15000	0.035	39	38	37	36	35	28	25	20	12	11	9	7	6			
259:1	225:1	22500	0.023	24	23	22	21	20	18	17	16	9	8	7	6	5	4	3	



# SM-3 Flow Performance

2



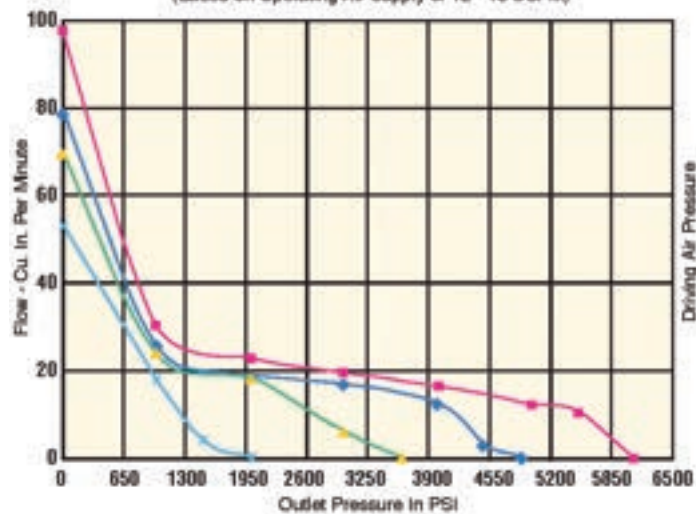
- Driving Air Pressures
- 100 psi
  - 80 psi
  - 60 psi
  - 40 psi

# SM-3 Flow Performance

2

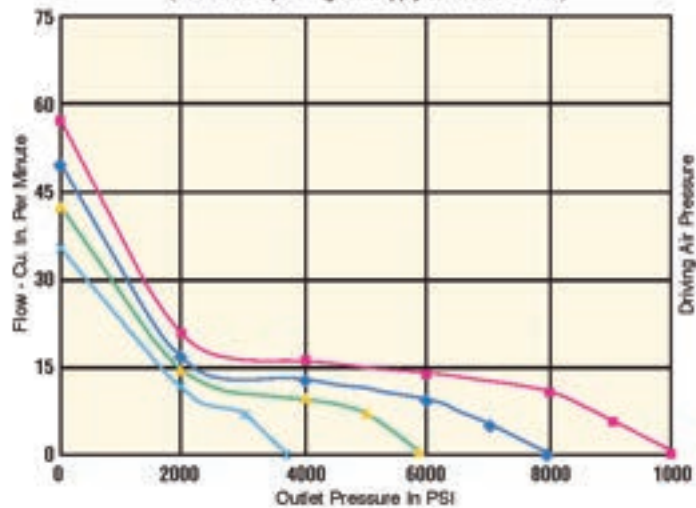
**SM-3X-060 PUMP PERFORMANCE**

(Based on Operating Air Supply of 12 - 15 SCFM)



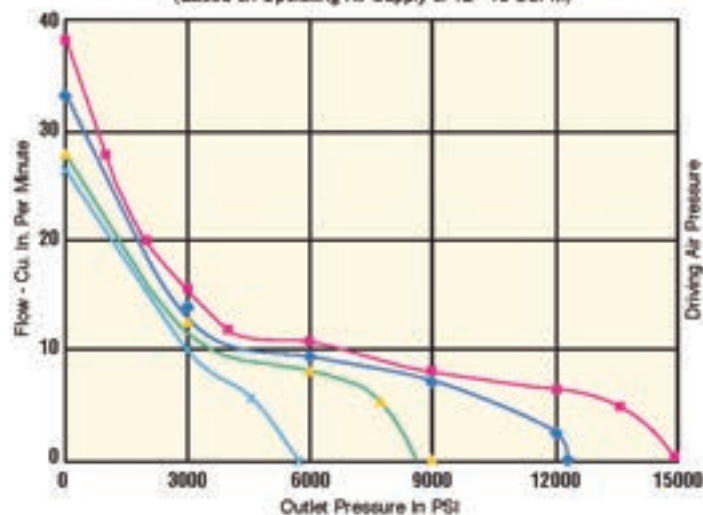
**SM-3X-100 PUMP PERFORMANCE**

(Based on Operating Air Supply of 12 - 15 SCFM)



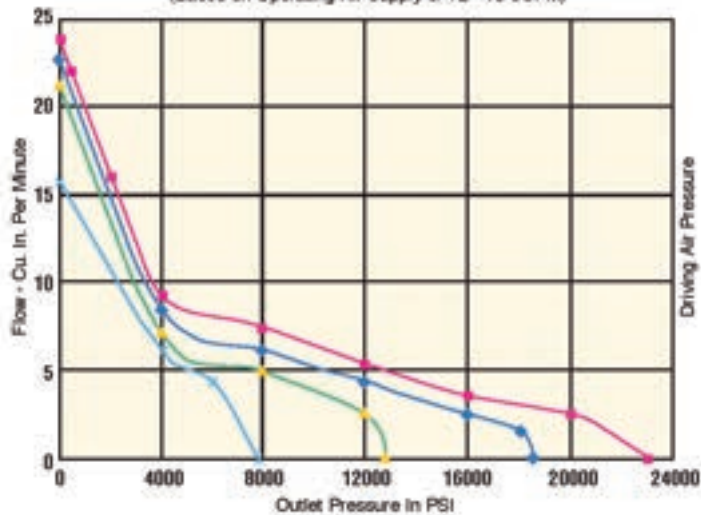
**SM-3X-150 PUMP PERFORMANCE**

(Based on Operating Air Supply of 12 - 15 SCFM)



**SM-3X-225 PUMP PERFORMANCE**

(Based on Operating Air Supply of 12 - 15 SCFM)



Driving Air Pressures

- 100 psi
- 80 psi
- 60 psi
- 40 psi

# SM-3 Options

## Materials –

SM-3 pumps are supplied with stainless steel (**SM-3S**) or Aluminium (**SM-3A**) fluid ends and all plastic air modules.

Anodized aluminium bodies are for oil and non-corrosive applications. SS bodies are for aqueous and most other fluids.

## Ratio –

See pump rate selection chart on page 28.

## Air and Fluid Ports –

SM-3 pumps are supplied with NPT as standard for air and fluid connections. However, pumps capable of pressures in excess of 10,000 psi have coned and threaded outlet fluid connections **HF4, 1/4 HP** in place of NPT as per the table below.

## Seals –

UHMWPE with Nitrile is supplied as standard. Selection of the best seal package is based on fluid temperature and chemical compatibility. Contact your local distributor or HiP for required assistance.

## Exhaust –

SM-3 pumps are supplied with a muffler/silencer as standard. When using non breathable gas to drive the pump, air pilot exhaust and main drive exhaust must be piped away to a safe area.

## Separation–

An 1/8" threaded port is provided in the air cylinder body as standard. This section of the pump separates the air drive from the fluid section.

## Air Control Options –

The SM-3 pumps are supplied with internal pilot as standard. Various control options can be configured at installation. The air valve is the heart of the pump and this feature provides the maximum flexibility in controlling how the pump operates and how the exhaust air is directed.

**Remote Pilot (R)** allows the customer to start and stop the pump by using a remote air pilot switch. In this mode the air pilot switch senses the pressure output from the pump and can be arranged to switch the pump on or off at preset high or low pressures. The customer supplies the remote air pilot switch. This feature is extremely useful for systems engineers where a specific pressure must be maintained.

**Single Cycle Mode (S)** is used where the pump is required to accurately discharge a given flow. The S configuration provides a control feature that when a pulse of air is supplied to the port the pump will travel one full cycle. The pulse rate can be set using standard air logic controls to govern the flow rate accurately. This feature is particularly useful in chemical injection applications.

## Manual Operation (H) –

The SM-3 can be supplied with a hand lever for manual operation. This option allows the pump to be used as a back up to a main pump or in low volume lab applications.

## ORDERING INFORMATION

Catalog Number	Pump Ratio
<b>SM - 3A</b>	- 005
<b>Aluminum</b>	- 010
<b>SM- 3S</b>	- 020
<b>Stainless</b>	- 035
	- 060
	- 100
	- 150*
	- 225*
	*(stainless steel only)

To order a standard stainless steel pump, specify ratio eg: SM-3S-10. To order a standard anodized aluminum pump, specify ratio eg: SM-3A-10.

To order options, simply add the option number(s) eg:

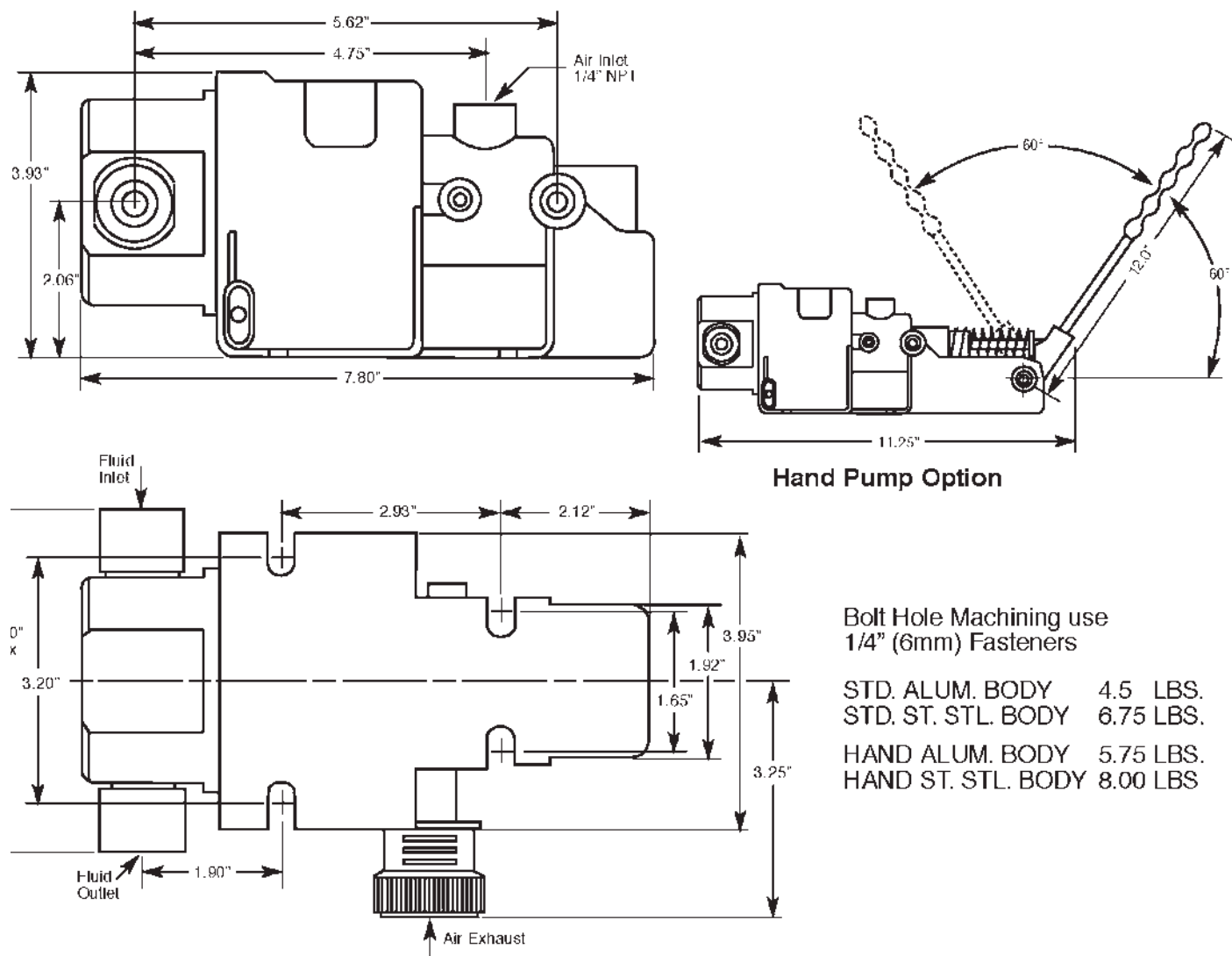
SM-3A-10-H  
SM-3S-10-R  
SM-3S-35-02-H  
SM-3A-150-H

## OPTIONS

PORTS	SEALS	CONTROLS
NPT – ratio's	UHMWPE/ NITRILE (STANDARD)	Internal Pilot Supply (STANDARD)
-005		
-010		
-020	- 02	- R
-035	PTFE/ NEOPRENE	Remote Pilot Supply (user configured)
-060		
(STANDARD)	- 03	
HF4 – ratio's	PTFE/VITON	- S
-100	- 04	Single Cycle (user configured)
- 150	PTFE/EPR	
- 225		- H
(STANDARD)		Manual Hand Lever
- 225*		

## SM-3 Dimensional Data

2



### Porting - Standard Pumps

Part No.	Fluid Inlet Port	Fluid Outlet Port B	Air Inlet Remote and Single Port
SM-3#-050	3/8" NPT	3/8" NPT	1/4" NPT
SM-3#-010	3/8" NPT	3/8" NPT	1/4" NPT
SM-3#-020	3/8" NPT	3/8" NPT	1/4" NPT
SM-3#-035	3/8" NPT	3/8" NPT	1/4" NPT
SM-3#-060	3/8" NPT	3/8" NPT	1/4" NPT
SM-3#-100	1/4" NPT	9/16"-18 NBS (1/4" HP)	1/4" NPT
SM-3#-150	1/4" NPT	9/16"-18 NBS (1/4" HP)	1/4" NPT
SM-3#-225	1/4" NPT	9/16"-18 NBS (1/4" HP)	1/4" NPT

### Mounting Bolts - 1/4" or M6



# Sprague PowerStar<sup>TM</sup> 4

## Advanced Air Driven Pump System

### Features

- A patented design
- One common air motor module for all eight ratios
- Easy conversion to separated (non-contaminating) configuration
- A double-ended unit that provides even higher flows
- Safe operation in hazardous environments
- Automatic shut-off at set pressure
- Stainless steel wetted parts
- Easy assembly and service for air motor and high pressure modules (field assembly requires careful alignment; (see Assembly & Operating Instructions)

### Ideal Use for:

- Hydrostatic testing of pressure vessels using various liquids (avoid running the pump dry or sudden release of outlet pressure)
- Low volume, high pressure testing
- Low volume, liquid transfer (higher pressure capability than double diaphragm pumps)

### Suitable for Most Water Applications

- Cleanliness and lubricity of liquid being pumped will affect pump seal life.
- A five-micron inlet filter is recommended.
- For applications that contain highly contaminated air and/or liquids, contact the Factory.



Single Ended



Double Ended

# How the PowerStar™ 4 Pump Works

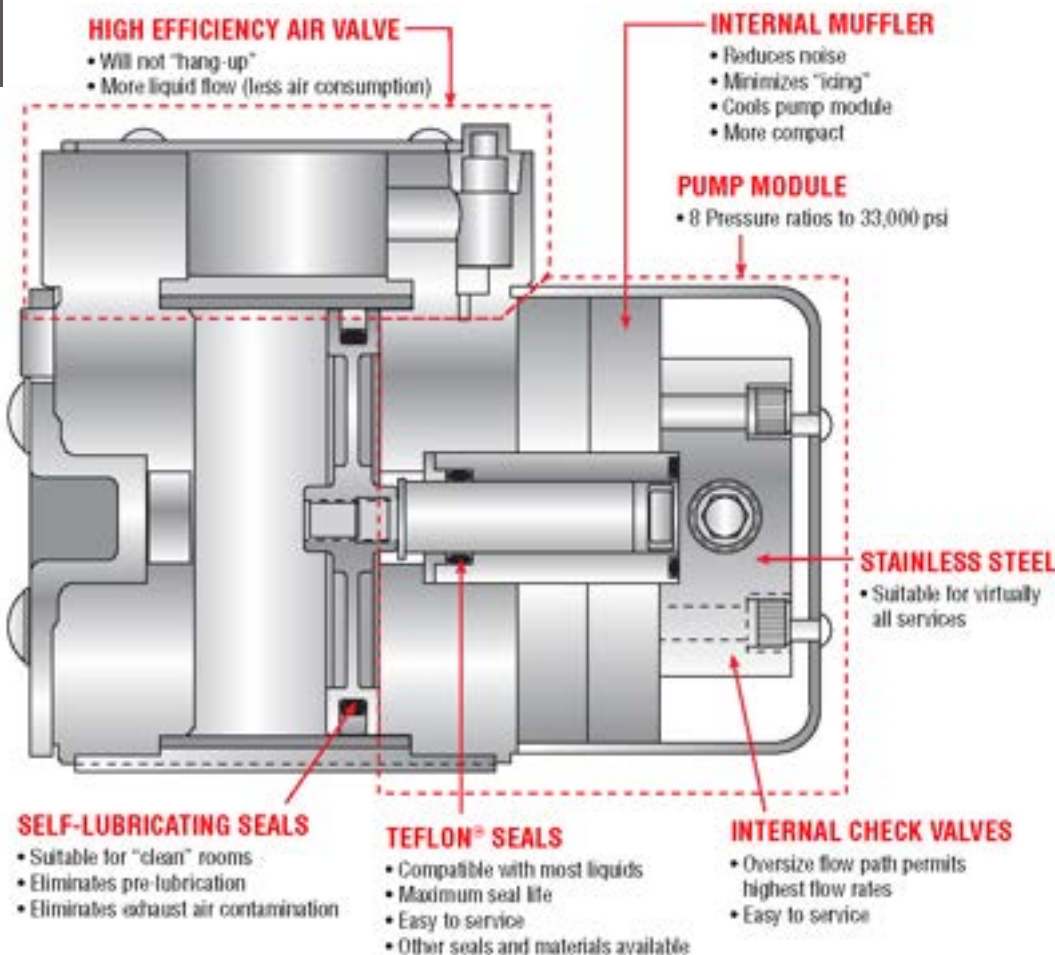
The PowerStar™ 4 pumps develop high output pressures by applying the principle of differential areas. The pump has a large area air piston (air driven at low 5 to 100 psi pressures). This air piston drives a small area liquid piston that pumps liquids to high pressures.

The liquid output pressure is determined by the ratio between the area of the air drive piston, the area of the liquid drive piston and the applied driving air pressure. The relationship of the area of the air piston to the liquid piston is referred to as the pump ratio which is indicated in the number following the air module number (P4).

**Example:** The P45 pump has a nominal ratio of 5 to 1 or 5 psi liquid pressure for each 1 psi of operating air pressure. In operation, the P45 pump using 100 psi of input air pressure could produce a maximum liquid output of 480 psi; 80 psi air - 370 psi output; 60 psi air - 270 psi output; and 40 psi air - 180 psi output. Output pressures will vary and be reduced by 5 to 10% through internal friction depending on the lubricity of the liquid.

By regulating the incoming air supply at the pressure regulator, the liquid output can be infinitely adjusted through the pump's pressure range.

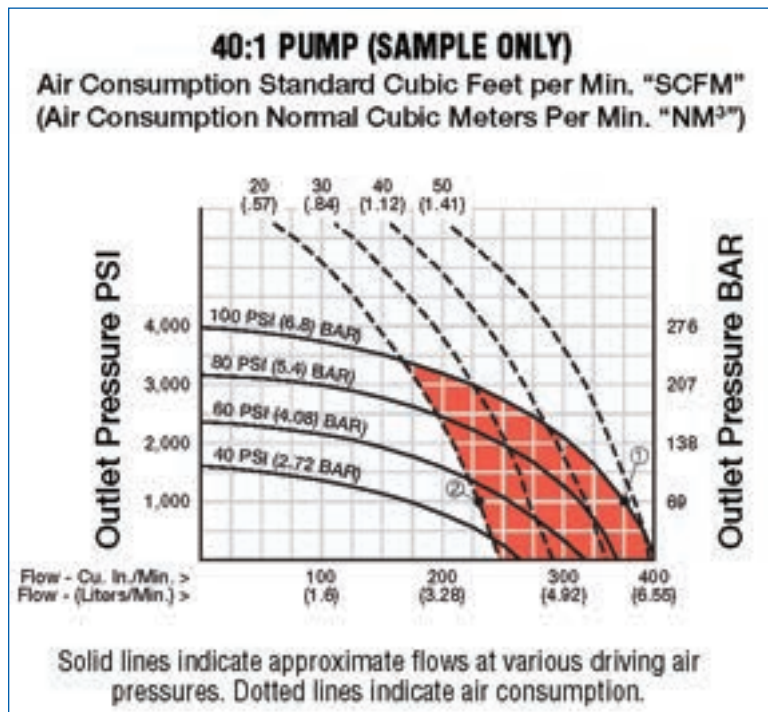
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# PowerStar™ 4 Performance

## SAMPLE PERFORMANCE CHART



### EXAMPLES:

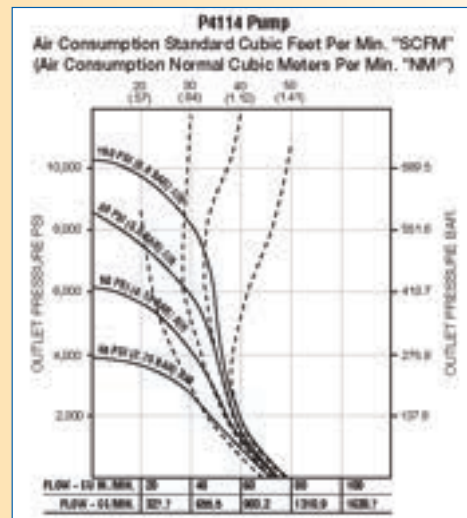
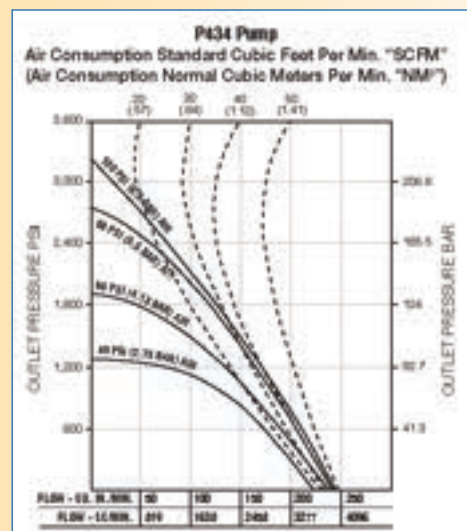
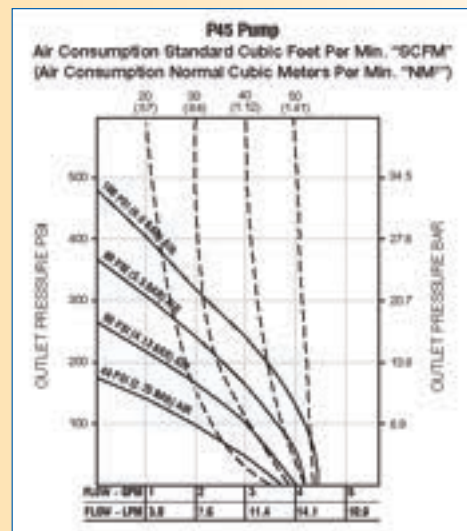
- 1** With **100 PSI (6.8 BAR)** driving air, the pump will consume **50 SCFM (1.41 NM³/MIN)** at an operating pressure of **1,000 PSI (68 BAR)** and will produce an outlet flow of **358 Cu. In./Min. (5.9 LPM)**.
- 2** If the volume of compressed air is reduced to **20 SCFM (.57 NM³/MIN)**, the flow will be reduced to **225 Cu. In./Min. (15.3 Liters)**. Shaded area indicated flow reduction.

### NOTES:

Most air compressors will produce **4 to 5 SCFM** of compressed air per horsepower at **100 PSI**.

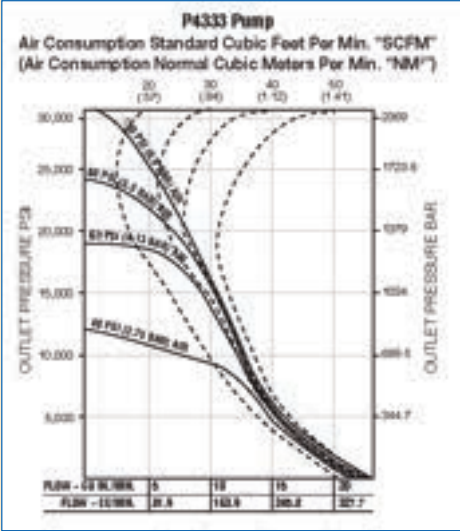
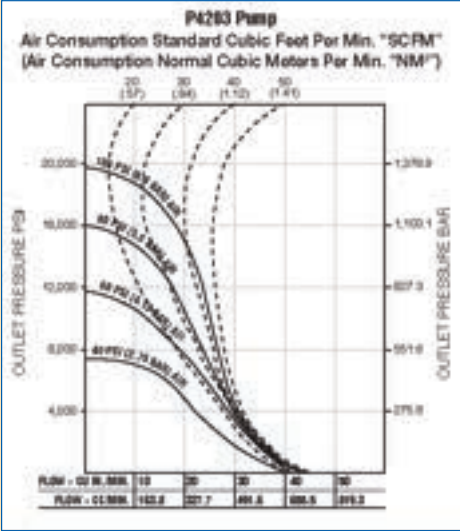
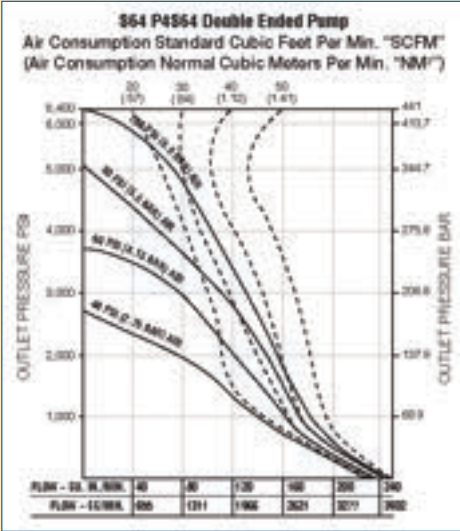
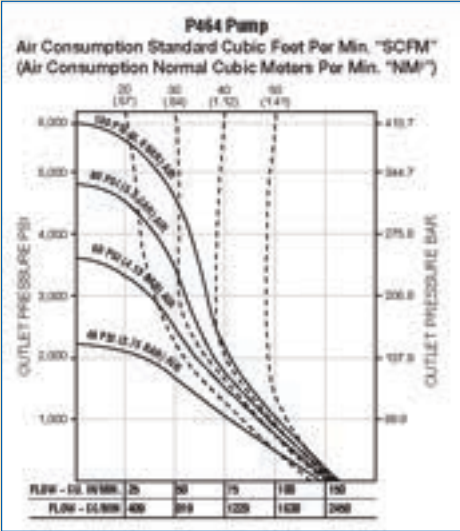
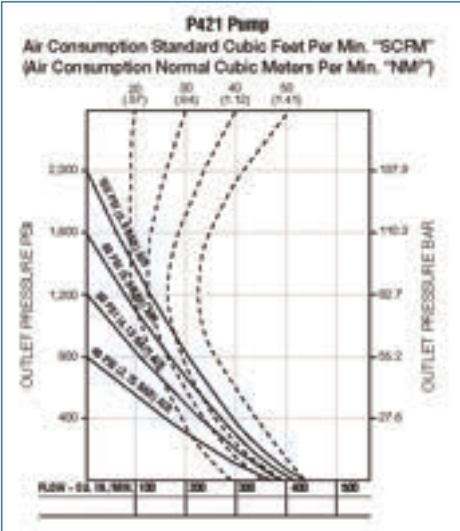
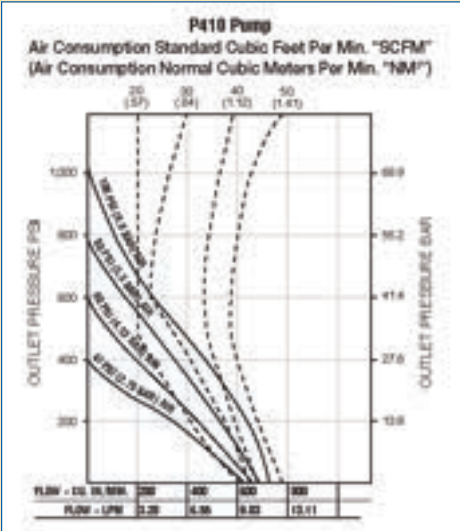
All air driven pumps will operate on low air volumes as long as the supply of air is sufficient to operate the air selector valve.

Performance charts are based upon air supply stated, pumping oil (Mil-H-5606) with flooded suction.



**"Typical" or "Nominal" Performance,  
Double Ended Pumps = 1.6% of  
Single Pump Flow.**





"Typical" or "Nominal" Performance, Double Ended Pumps = 1.6% of Single Pump Flow.



# PowerStar™ 4 Part Identification

## COMPLETE UNIT EXAMPLES

(USING A 64:1 RATIO):

Standard 64:1 ratio pump ..... P464  
Separated 64:1 ratio pump ..... P4S64  
Double ended 64:1 ratio pump ..... S64P4S64  
Double ended 64:1 ratio pump  
w/ air controls ..... S64P4S64C  
Double ended 64:1 ratio pump w/ air  
and high pressure controls ..... S64P4S64CP

	Air Module P4	Liquid Module 4F64	Sep Kit 4SK64	Air Controls 4ACKIT	Pressure Controls P
Air Motor Module P4	1				
Liquid Pump Module 4F64		1			
Single Air & Liquid Module P464	1	1			
Single Separated P4S64	1	1	1		
Double Ended S64P4S64	1	2	2		
Double Ended w/ Air S64PS64C	1	2	2	1	
Double Ended w/ Air & Pressure Controls S64P4S64CP	1	2	2	1	1

## How to Order

To order a hydraulic pump, the ratio of the pump must be selected.

Define the liquid pressure and flow requirements for the application as well as the available air pressure and volume; then refer to the Pump Performance graphs on pages 35 & 36.

From the chart, select a pump that exceeds the requirements. Drive air may be throttled if flow must be reduced.

Use this pump liquid module ratio number and add it to the end of the pump air motor module number. **Example:** P45.

Nominal liquid module displacements are as follows:

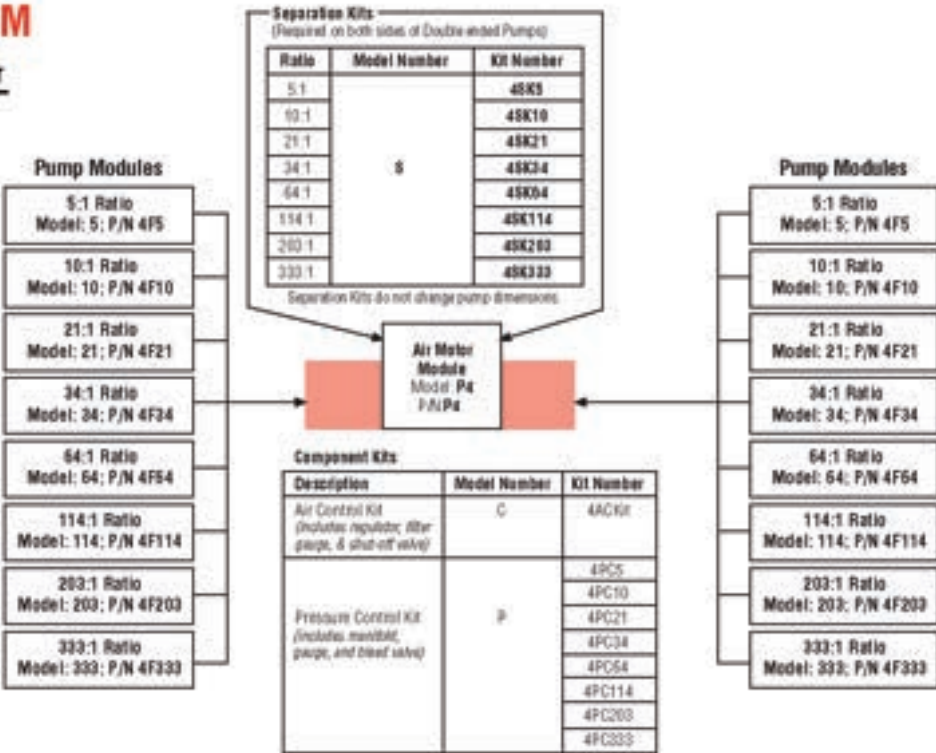
5:1	⇒	2.4 cu in
10:1	⇒	1.2 cu in
21:1	⇒	.6 cu in
34:1	⇒	.37 cu in
64:1	⇒	.2 cu in
114:1	⇒	.11 cu in
203:1	⇒	.06 cu in
333:1	⇒	.04 cu in

## PUMP NUMBERING SYSTEM

Typical Models	Model Number
Standard 64:1 Ratio Pump .....	P464
w/ separator kit .....	P4S64
w/ air controls .....	P464C
w/ pressure & air controls .....	P464CP
Double ended 64:1 Ratio Pump* .....	S64P4S64

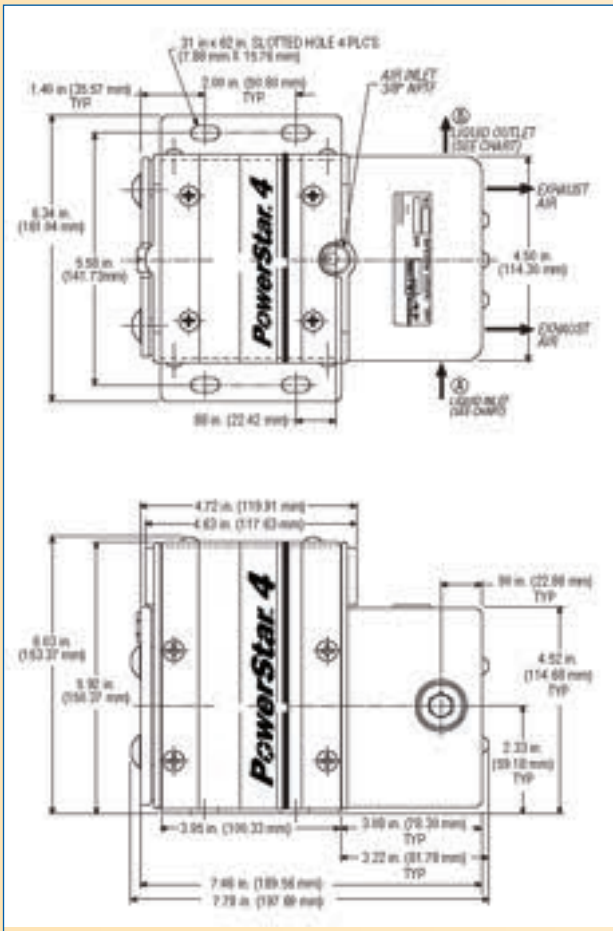
\* Double ended pumps require separation  
on both sides

Nitrile is the standard elastomer.  
The pumps can be furnished with other  
o-rings: Viton, EPR, Neoprene.

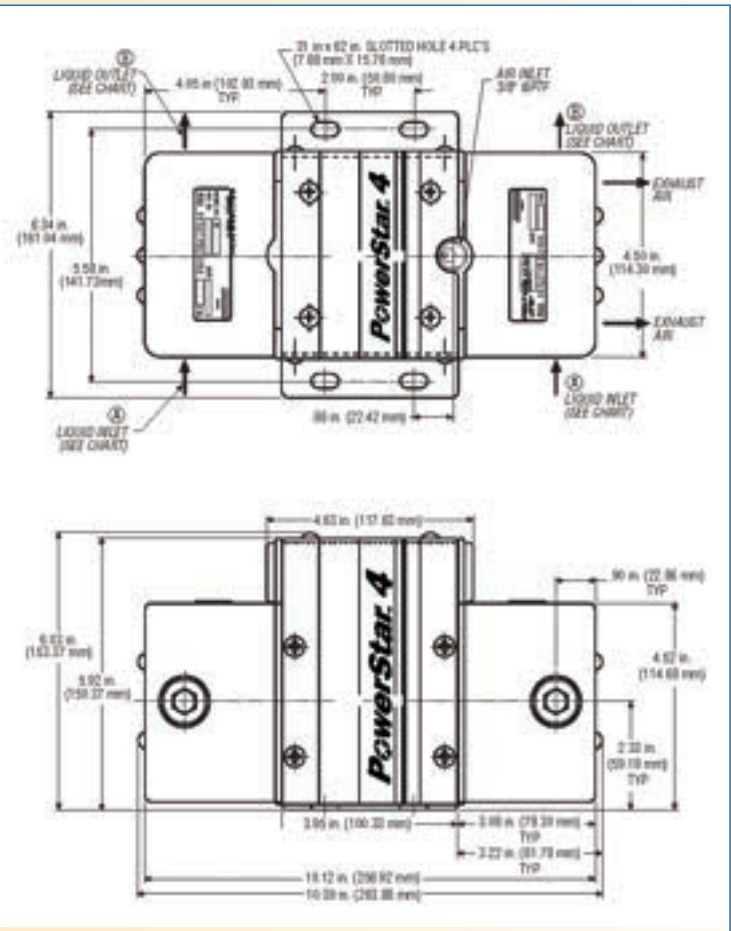


# PowerStar™ 4 Dimensions, Weights and Porting

## Single Ended



## Double Ended



**NOTE:** Double ended units, fully plumbed, available upon request.

Pump Model	Inlet Port Liquid	Outlet Port Liquid	Inlet Port Air	Approximate Shipping Weight
P45	3/4" NPTF	1/2" NPTF	3/8" NPTF	16 lbs (7.26 Kg)
P410	3/4" NPTF	1/2" NPTF	3/8" NPTF	16 lbs (7.26 Kg)
P421	1/2" NPTF	3/8" NPTF	3/8" NPTF	16 lbs (7.26 Kg)
P434	1/2" NPTF	3/8" NPTF	3/8" NPTF	16 lbs (7.26 Kg)
P464	1/2" NPTF	3/8" NPTF	3/8" NPTF	16 lbs (7.26 Kg)
P4114	3/8" NPTF	9/16-18 NBS	3/8" NPTF	16 lbs (7.26 Kg)
P4203	3/8" NPTF	9/16-18 NBS	3/8" NPTF	16 lbs (7.26 Kg)
P4333	3/8" NPTF	9/16-18 NBS	3/8" NPTF	16 lbs (7.26 Kg)
Double Ended	Same	Same	Same	21 lbs (9.53 Kg)

# High Pressure Hand Pump

## JB Series Hand Pump

### 94301-( )

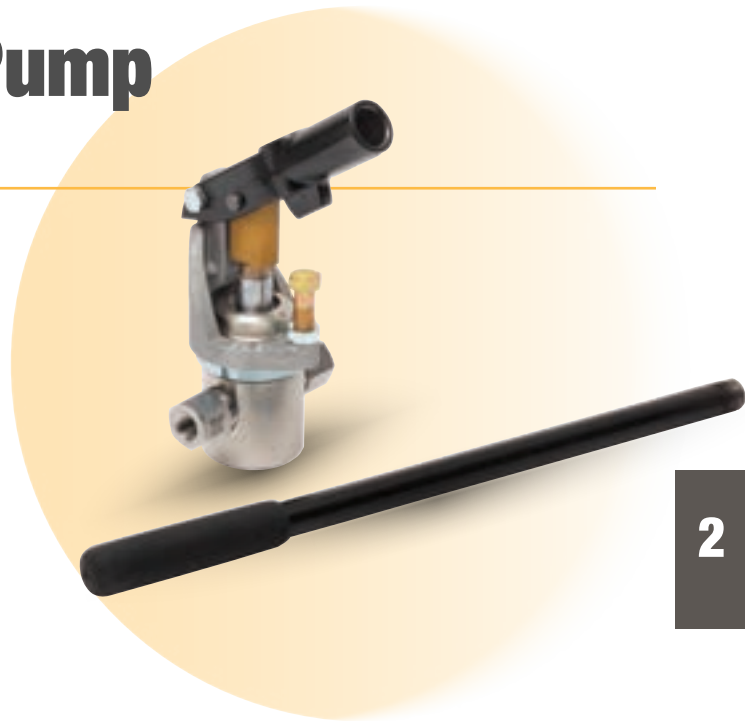
This single-acting, piston type hand pump is ideal for hydrostatic testing and other industrial applications that require low volumes at high pressures.

The pump's stainless steel liquid body assembly (wetted section) is identical to and interchangeable with the liquid body assembly in the S-216-J-( ) standard pump, so the hand pump will service water, oil and most corrosive chemicals.

Directional control of the liquid through the pump is maintained through the inlet and outlet soft seat, zero leakage, check valves.

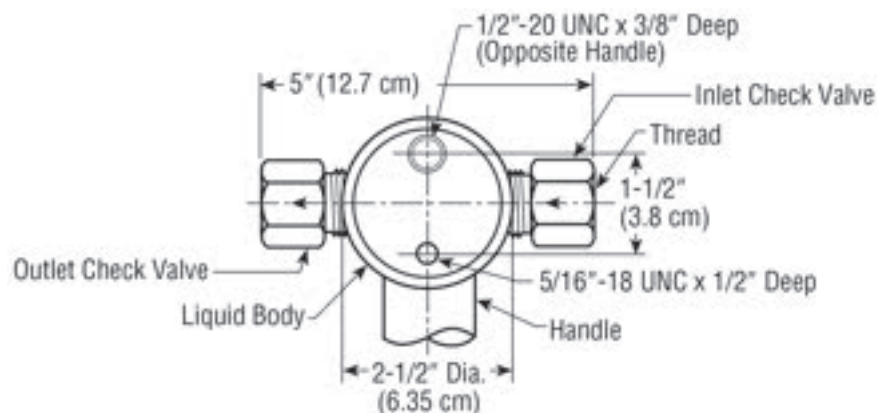
The pump is seven inches high from its base to the top of the pumping mechanism. The handle extends twenty-four inches and is furnished with a rubber grip.

The pump has two threaded mounting holes provided on the underside of the liquid body. The -35, -60, -100 and -101 pumps may be installed below or no more than two feet above the liquid source. The -125, -150, -200 and -300 pumps must be installed with the pump inlet below the liquid source.



2

## Nominal Dimensions and Clearances



Mounting Dimension – Bottom View

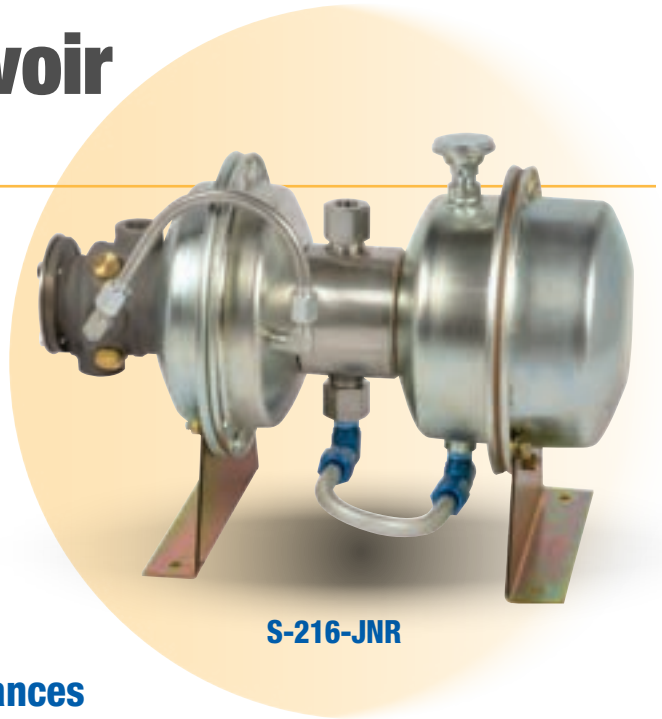
Part No.	Pump Output with 75 lbs. Handle Load	Liquid Inlet	Liquid Outlet
94301-035	2220 psi	NFC	NFC
94301-060	3020 psi	NFC	NFC
94301-100	4350 psi	NFC	NFC
94301-101	4750 psi	NFC	NFC
94301-125	5390 psi	NFB	NFB
94301-150	6800 psi	NFB	NFB
94301-200	12000 psi	NFB	HF4
94301-300	17400 psi	NFB	HF4

# Portable Pump Reservoir

## JR Series Pump/Reservoir

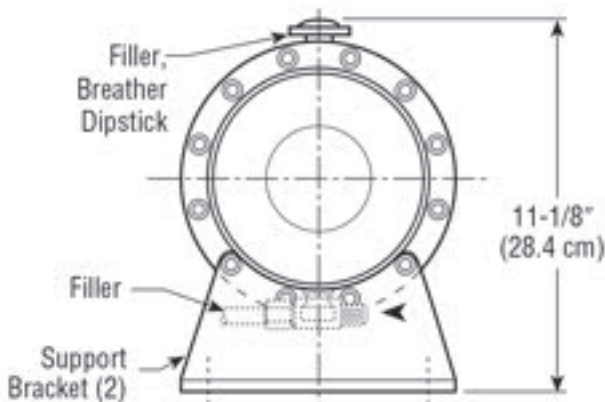
### S-216-JNR-( ) Pump/Reservoir Non-lubricated

This pump assembly combines the S-216-JN standard pump (non-lubricated air type) with a one-gallon (3.8 liters) steel reservoir. No additional contaminants are exhausted from the pump. Readily adaptable to portable power pack use. Also suitable for stationary use to provide hydraulic power for production machinery or for hydrostatic testing. This unit is not available in 150:1, 200:1 or 300:1 ratios.

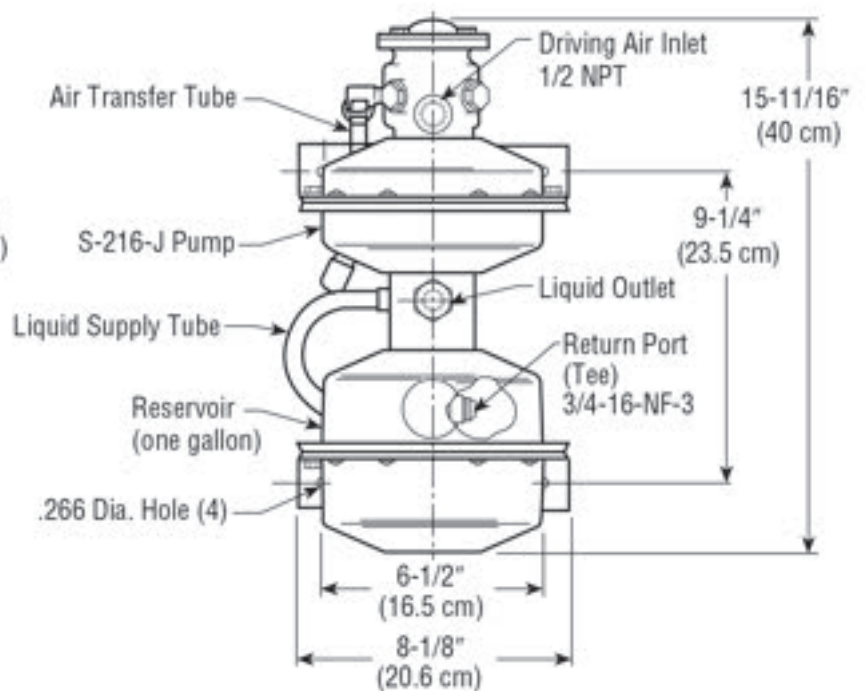


**S-216-JNR**

### S-216-JNR Nominal Dimensions and Clearances



**Reservoir End View**



**View Looking Down at Pump/Reservoir**



# Portable Pump Reservoir - JR Series

Model No.	Ref. No	Maximum Output - See Note		Port Threads			Actual Weight		Shipping Weight	
				Driving Air	Liquid					
		psi	bar		Inlet	Outlet	lbs.-oz.	kg	lbs.-oz.	kg
S-216-JNR-10	89842-1	1025	71	1/2 NPT	3/8 NPT	3/8 NPT	24-4	11.0	27-4	12
S-216-JNR-20	89842-2	1910	132	1/2 NPT	3/8 NPT	3/8 NPT	22-8	10.2	25-8	11.6
S-216-JNR-30	89842-3	3200	221	1/2 NPT	3/8 NPT	3/8 NPT	22-8	10.2	25-8	11.6
S-216-JBNR-35	94198-035	4760	328	1/2 NPT	3/8 NPT	3/8 NPT	20-8	9.3	23-8	10.7
S-216-JBNR-60	94198-060	6330	436	1/2 NPT	3/8 NPT	3/8 NPT	20-8	9.3	23-8	10.7
S-216-JBNR-100	94198-101	9100	627	1/2 NPT	3/8 NPT	3/8 NPT	20-8	20-8	23-8	10.7
S-216-JBNR-101	94198-101	10000	690	1/2 NPT	3/8 NPT	3/8 NPT	20-8	20-8	23-8	10.7
S-216-JBNR-125	94198-125	12400	855	1/2 NPT	1/4 NPT	9/16-18 NBS	12-8	5.7	15	6.8
S-216-JBNR-150	94198-150	16200	1117	1/2 NPT	1/4 NPT	9/16-18 NBS	20-8	9.3	23-8	10.7
S-216-JBNR-200	94198-200	24900	1717	1/2 NPT	1/4 NPT	9/16-18 NBS	20-8	9.3	23-8	10.7
S-216-JBNR-300	94198-300	36500	2517	1/2 NPT	1/4 NPT	9/16-18 NBS	20-8	9.3	23-8	10.7

**NOTE:** Pump maximum output pressure is based on 100 psi (6.9 bar) driving air pressure.

# Sprague

## Air Driven Gas Boosters

Sprague pneumatic boosters offer a cost effective way to compress shop air or bottled gas to meet various requirements for higher pressure, lower volume air or gas.

Industrial applications include charging accumulators, inflating high pressure tires or charging shock struts from lower pressure supply sources, the transferring of gas from a supply cylinder to another container or the actuating of air chucks in machine tools. Where production machinery or test set-ups require higher air pressures than normally provided by the shop air system, Sprague boosters can provide the extra muscle needed to operate the equipment.

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## Index

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# How Sprague Gas Boosters Work

The Sprague gas booster is a piston-type, air-operated booster. It uses a mechanically operated, snap-action air selector valve to cycle the booster.

The Sprague boosters, like Sprague air driven hydraulic pumps, employ the piston differential areas principle— a large area air piston, driven at low air pressure to drive a small area compression piston which converts input gas to higher pressure, lower volume output gas.

The booster gas output or discharge pressure developed by the compression piston is determined by the ratio between the area of the air piston, the operating air pressure and the available precharge pressure. The function of the precharge pressure to the booster is to charge the high pressure cylinder inside the booster with gas, reducing the time required to reach higher pressures, and the time to return the compression piston and the air piston for the next compression cycle.

The Sprague booster works rapidly to reach the required pressure, then stops at a pressure balance. The booster will hold the pressure balance indefinitely with minimal energy consumption, heat build-up or parts movement. When a pressure imbalance occurs, the booster will automatically restart to restore the pressure balance.

By using a pressure regulator on the operating air supply line, the outlet gas pressure can be accurately adjusted to any pressure level between the precharge pressure and the maximum discharge pressure.

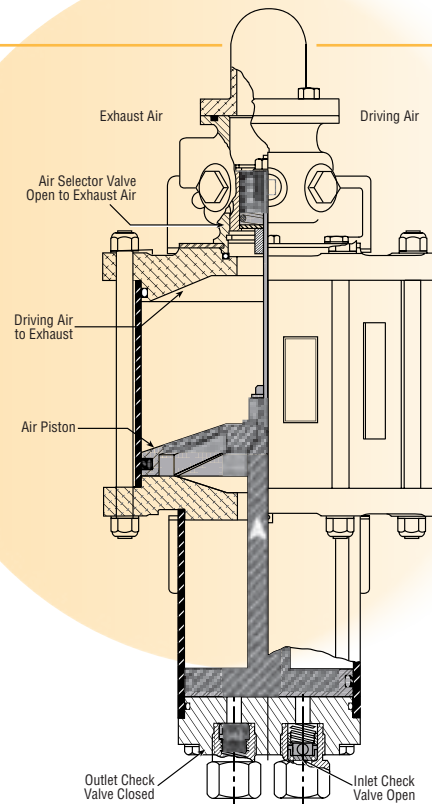
With some Sprague booster models, the pumping or high pressure section is cooled with exhaust air piped from the air-driving section of the booster. In other boosters, the pumping section employs external fins to dissipate the heat.

Compared to other air-operated gas boosters, the Sprague booster does the same job but with fewer moving parts and seals for less maintenance throughout its service life.

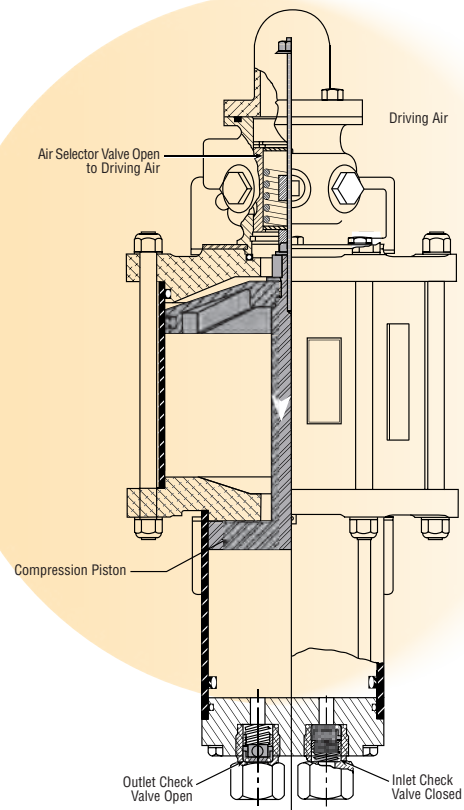
Because of their compact size and low cost, Sprague boosters can be used in high-low combinations to meet higher flow and pressure requirements.

Being air driven and having no electrical connections, Sprague pneumatic boosters are non-sparking. These boosters can be used safely in the presence of flammable or explosive liquids or vapors.

Sprague boosters and other Sprague pneumatic products are designed to a 4 to 1 minimum safety factor.



**Start of Suction Stroke**



**Start of Compression Stroke**

# Typical Circuits

## for Air Driven Gas Boosters & Accessories

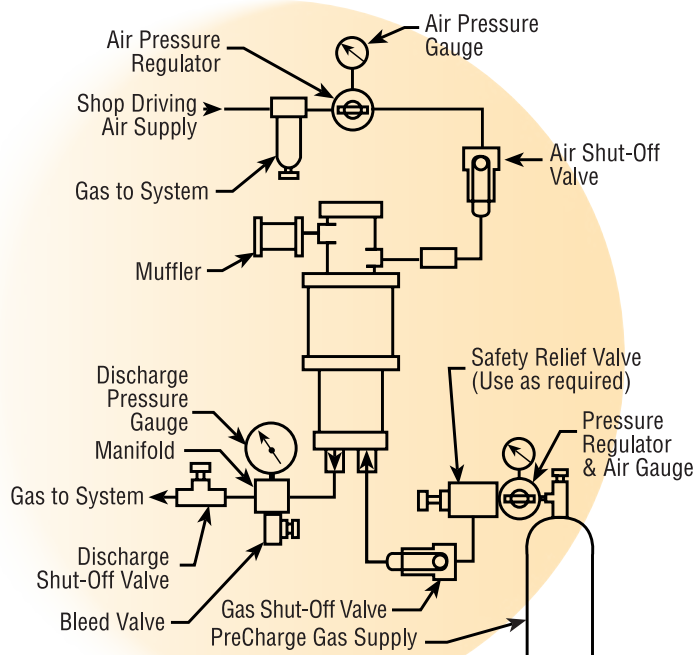
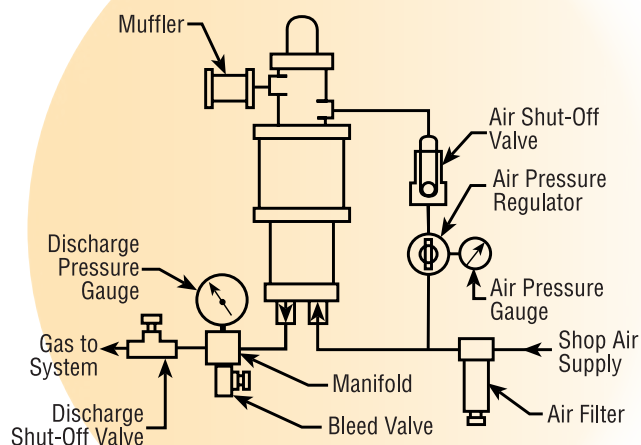
To compress shop air or bottled gas to higher pressures, Sprague boosters are combined with accessories to provide complete circuits as shown below.

An air control unit and shut-off valve are installed in the driving air side of booster. Noise is dampened with a muffler. An air filter (10 micron) is recommended in the gas precharge line. On the gas discharge side, a pressure gauge, shut-off and bleed valves are installed.

For convenience, boosters combined with compatible accessories can be obtained as complete, ready-to-use power units.

### SINGLE AIR SOURCE

**Non-lubricated shop air to driving side and to gas inlet of booster.**



### DUAL SOURCE AIR/GAS SOURCES

**Precharge gas supply to gas inlet of booster.**



# Gas Booster

## S-86 Selection

In general, an air or gas charging application requires a specific volume to be brought to a specific pressure within a given amount of time. The adjacent tables will assist you in selecting the most efficient ratio Sprague booster for your application requirements.

A typical hose pressure testing application:

- a. Hose with one cubic foot volume is to be pressure tested at 500 psig. Pressure level is to be reached in three minutes. Available shop air is 150 psi.
- b. Using Table 1, Low Pressure Gas Boosters Performance, page 46, find the required receiver pressure of 500 psi.  
Compare the figures found in the 500 psi discharge pressure column to the desired time of three minutes. The column figures nearest to three minutes is 2 minutes, 45 seconds with a discharge rate of 4.4 standard cubic feet per minute. So, the 5:1 ratio booster will do this job more efficiently than a 15:1 ratio booster.
- c. Note that the booster driving air pressure and above calculations are based on 100 psi, so the shop air pressure of 150 psi must be reduced to 100 psi driving air to operate the booster. Shop air of 150 psi should still be supplied to the inlet port of the compressing portion of the booster. The higher the precharge inlet pressure, the faster the discharge outlet pressure will be reached.
- d. For the above hose test, the S-86-JN-5 booster or S-486-JN-5 booster power unit could be used (See pages 47 & 48).



S-86

## S-86 Selection

Low Pressure Booster Ratio	Precharge Inlet Air Range-psi	Outlet Air Range-psi
2:1	25-450	50-450*
5:1	50-1100	125-1100*
15:1	100-3100	375-3100*

\*Based on 200 psi driving air

High Pressure Booster Ratio	Precharge Inlet Air Range-psi	Outlet Air Range-psi
30:1	200-6000	750-6000*
60:1	300-6100	1500-6100**
100:1	500-10300	2500-10300**
135:1	800-13500	3375-13500**

\*Based on 200 psi driving air.

\*\*Based on 100 psi driving air.

# S-86 Performance Data

## Low Pressure Gas Boosters Performance (approximate performance based on air consumption of 80 SCFM)

BOOSTER RATIO	INLET PORT PRECHARGE PRESSURE-psi	OUTLET PORT PRESSURE (with 100 psi driving air)	DISCHARGE CAPACITY - Standard Cubic Feet per minute (SCFM)										
			Discharge Pressure - psi										
			125	150	175	200	300	400	500	600	800	1000	1500
2:1	75	225	15.8	14.2	12.6	11.1							
	100	225		19.6	17.3	13.7							
	125	225		22.5	20.6	15.0							
5:1	50	550				4.1	3.6	2.7	1.6				
	100	550				8.7	6.8	5.2	3.0				
	150	550				13.7	11.1	8.0	4.4				
15:1	100	1500						2.2	1.9	1.7	1.4	1.2	-
	200	1500						6.5	5.7	5.2	4.5	4.1	1.1
	300	1550						10.7	9.5	8.4	6.2	5.1	1.5

Time required in minutes/seconds to fill a one cubic foot receiver to listed Discharge Pressures RECEIVER PRESSURE - psi (one cubic foot)

2:1	75	225	0-12	0-19	0-27	0-38							
	100	225		0-8	0-14	0-25							
	125	225		0-5	0-8	0-17							
5:1	50	550				2-4	2-58	5-40	9-22				
	100	550				0-42	1-40	2-50	4-50				
	150	550				0-12	0-36	1-27	2-45				
15:1	100	1550						7-30	10-48	14-56	23-6	33-12	
	200	1550						1-45	2-52	4-5	6-54	9-55	20-48
	300	1550						0-31	1-18	2-8	4-0	6-16	14-28

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## High Pressure Gas Boosters Performance (approximate performance based on air consumption of 80 SCFM)

BOOSTER RATIO	INLET PORT PRECHARGE PRESSURE-psi	OUTLET PORT PRESSURE (with 100 psi driving air)	DISCHARGE CAPACITY - Standard Cubic Inches per Minute (SCIM)											
			Discharge Pressure - psi											
			1000	2000	2500	2750	3000	4000	5000	6000	7000	8000	9000	10000
30:1	Min. 200*	3000	2800	2000	1400	950								
	300	3000	5200	4200	3200	2100								
	500	3000	12500	9500	7000	3800								
60:1	Min. 300*	6100	3800	3200	3100	3050	3000	3000	2900	2000				
	500	6100	6600	6000	5900	5850	5800	5750	5700	4500				
100:1	Min. 800*	10,300					5074	5000	4800	4700	4500	4250	3800	3000
	1000	10,300					7000	6700	6600	6400	6100	5600	5000	3500
135:1	Min. 800*	13,500												
	1000	13,500												

Time required in minutes/seconds to fill a one cubic foot receiver to listed Discharge Pressures RECEIVER PRESSURE - psi (one cubic foot)

30:1	Min. 200*	3000	1-15	3-52	6-35	9-50								
	300	3000	0-35	1-48	2-50	4-30								
	500	3000	0-10	0-45	1-0	1-30								
60:1	Min. 300*	6100	0-53	2-54	3-32	4-30	5-7	7-24	9-18	12-20				
	500	6100	0-40	1-30	1-50	2-15	2-38	3-25	4-25	6-40				
100:1	Min. 800*	10,300					2-47	4-7	5-22	6-25	7-40	8-38	9.46	11-13
	1000	10,300					1-30	2-50	3-45	4-30	5-20	6-10	7-0	8-30
135:1	Min. 800*	13,500												
	1000	13,500												

\*Minimum precharge required for satisfactory operation.

# Gas Boosters

## S-86-JN Non-Contaminating

A competitively priced series of versatile gas boosters is offered in six popular design ratios: 2:1, 5:1, 15:1, 30:1, 60:1 and 100:1.

These non-contaminating gas boosters are suitable for general use or for use in cleanrooms or laboratories. Since these boosters are provided with self-lubricating dynamic seals, they can be driven with clean dry air.

Being air driven, these boosters are non-sparking and safe for use in hazardous areas.



S-86-JN

3

## S-86-JN Gas Booster Performance And Data (Nominal)

Model No.	Ref. No	Ratio	Driving Air Supply-psi (See Note 1)	Precharge Inlet Air Range-psi	Outlet Air Range-psi	Port Thread Size		Size				Weight	
						Driving Air	Inlet-Outlet Air	Length		Width		Actual	
								in.	cm	in.	cm	lbs.	kg
<b>S-86-JN-2</b>	88734-1	2:1	25-200	25-450	50-450	1/2 NPT	NFC	18-1/4	46.3	7-3/4	19.6	17	7.7
<b>S-86-JN-5</b>	88621-1	5:1	25-200	50-1100	125-1100	1/2 NPT	NFC	18-1/4	46.3	7-3/4	79.6	16	7.3
<b>S-86-JN-15</b>	90081-1	15:1	25-200	100-3100	375-3100	1/2 NPT	NFB	17-1/2	44.5	7-3/4	19.6	18	8.2
<b>S-86-JN-30</b>	88186-101	30:1	25-200	200-6000	750-6000	1/2 NPT	NFB	15-1/2	39.4	11-5/8	29.5	19-1/2	8.8
<b>S-86-JN-60</b>	90404-1	60:1	25-100	300-6100	1500-6100	1/2 NPT	NFB	15-7/8	40.3	11-5/8	29.5	19-1/2	8.8
<b>S-86-JN-100</b>	90036-2	100:1	25-100	500-10300 (see Note 2)	2500-10300	1/2 NPT	NFB	15-7/8	40.3	11-5/8	29.5	19-1/2	8.8
<b>S-86-JN-135</b>	94319-135	135:1	25-100	800-13500	3375-13500	1/2 NPT	NFB	16-1/4	41.3	11-5/8	29.5	19-1/2	8.8

**Notes:** 1. Maximum driving air consumption of the boosters is approximately 80 SCFM @ 100 psi.

Boosters will operate with less than 80 SCFM and with less than 100 psi.

2. Minimum precharge of 800 psi is necessary to obtain a maximum output pressure of 10300 psi.

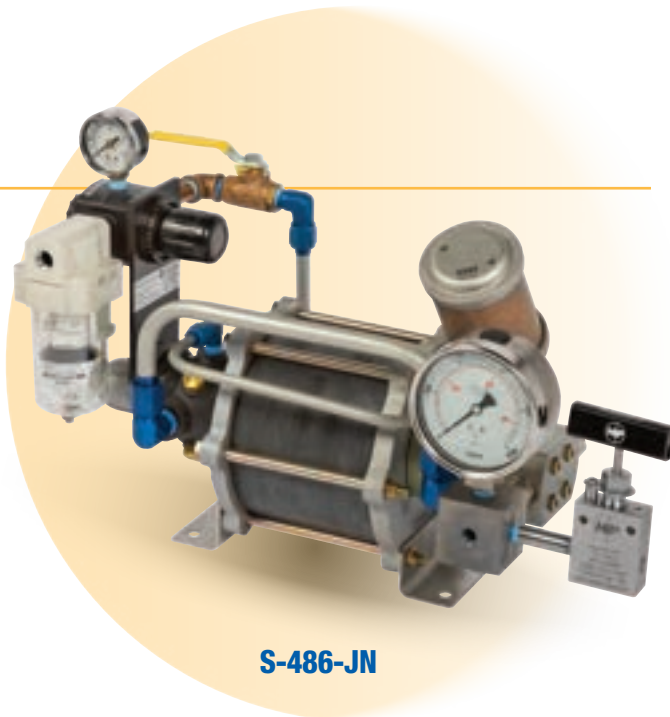
# Gas Booster

## Power Units

Assembled, ready-to-use gas booster power units are suitable for general use or for cleanroom or laboratory use. The power units can be used within portable power supply circuits or stationary pneumatic circuits.

Being air driven, the power units are non-sparking and safe for use in hazardous areas.

The power unit assembly includes an S-86-JN-( ) type booster, air filter, air pressure regulator, air gauges, driving air shut-off and bleed valves, high pressure manifold fitting and muffler.



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## S-486-JN Gas Booster Power Units Data (Nominal)

Model No.	Ref. No	Ratio	Gas Booster used in power unit	Port Thread Size			Size						Weight	
				Driving Air	Inlet Air	Outlet Air	Length		Width		Height		Actual	
							in.	cm	in.	cm	in.	cm	lbs.	kg
<b>S-486-JN-2</b>	90017-2	2:1	S-86-JN-2	3/8 NPT	NFC	NFC	23-1/2	59.7	10-3/4	27.3	13-1/2	34.3	27	12.2
<b>S-486-JN-5</b>	90017-5	5:1	S-86-JN-5	3/8 NPT	NFC	NFC	23-1/2	59.7	10-3/4	27.3	13-1/2	34.3	27	12.2
<b>S-486-JN-15</b>	90204-1	15:1	S-86-JN-15	3/8 NPT	NFB	NFB	23-7/8	60.6	9-1/2	24.1	13-1/2	34.3	26-1/4	11.9
<b>S-486-JN-30</b>	90018-1	30:1	S-86-JN-30	3/8 NPT	NFB	NFB	19-7/8	50.5	10-3/4	27.3	13-1/2	34.3	29-3/4	13.5
<b>S-486-JN-60</b>	90647-1	60:1	S-86-JN-60	3/8 NPT	NFB	HF4	22	55.9	10-3/4	27.3	13-1/2	34.3	30	13.6
<b>S-486-JN-100</b>	90153-1	100:1	S-86-JN-100	3/8 NPT	NFB	HF4	22	55.9	10-3/4	27.3	13-1/2	34.3	30	13.6
<b>S-486-JN-135</b>	94363	135:1	S-86-JN-135	3/8 NPT	NFB	HF4	24-1/4	61.6	11-7/8	30.2	13-1/3	35.3	30	13.6

**Note:** Inlet port: 1/4 NPT, Outlet port: 9/16-18UNF-3B (NBS port).



# Sprague PowerStar™ 4

## Advanced Gas Boosters

The PowerStar™4B gas booster is a reciprocating, single or double or dual stage air operated unit. It uses an air-piloted unbalanced type air directional valve to cycle the booster.

### Features

- Works off compressed air supplies
- Operates quietly
- Features mechanical separation between air drive and boosted gas
- Compatible with most gases

### The Principles of Operation

The PowerStar™4B gas booster operates on the differential piston area principle. A large area piston, driven at low air pressures, drives a small area compression piston which converts input gas to higher pressure. The output gas or discharge pressure is determined by the ratio between the area of the drive piston, the operating air pressure and the available precharge pressure supply.

The function of the precharge pressure is to charge the high pressure cylinder inside the booster with gas, reducing the time needed to reach higher pressures. In double-ended gas boosters, the precharge gas adds power to the compression stroke.

### The Actual Operation

The PowerStar™4B gas booster works rapidly at first, then slows and stops at a pressure balance. The booster holds the pressure balance indefinitely, assuming no leakage. When a pressure imbalance occurs, the booster automatically restarts and restores the pressure balance. During operation, exhaust air from the air drive section cools the high pressure boosting chamber.

### The Gas Booster in Action

Whether you use gas above normal cylinder pressure or require continuous high pressure and want to get the most out of the cylinder's gas supply, the PowerStar™4B Series is for you! It assures the optimum use of commercially-bottled gas. Some units draw a vacuum.



The applications for this versatile gas booster are extensive and include:

#### Aviation and Aerospace

- Static and dynamic testing of valves and components at overhaul facilities
- Inflating high pressure aircraft tires
- Instrument calibration

#### Automotive

- Air bag testing
- Gas spring charging systems for die and mold manufacturers
- Accumulator charging

#### Petrochemical

- Heel recovery from cylinders for gas transfer
- Gas blanketing

#### Diving

- Filling air tanks from larger cylinders
- Testing air pressure regulators
- Gas mixing

#### Fire Protection

- Filling breathing air cylinders
- Mobile filling stations for firefighters
- Halon and CO2 charging

#### Fluid Power

- Testing hoses and valves
- Testing and calibrating gas components
- Accumulator charging

#### Machine Tools

- Power clamping
- Quick die change

#### Plastics

- Ejecting parts from molds
- Gas injection

#### Packaging

- Injecting nitrogen into aerosol cans

3

# PowerStar™ 4 Gas Booster Performance Data

**TABLE 1** Approximate performance based on a maximum air consumption of 50 SCFM

MODEL NUMBER	INLET PORT PRECHARGE PRESSURE-psi	OUTLET PORT PRESSURE (with 100 psi driving air)	DISCHARGE CAPACITY - Standard Cubic Feet per minute (SCFM)											
			DISCHARGE PRESSURE - psi											
			200	400	600	800	1000	2000	3000	4000	5000	6000	7000	8000
P4BS010	100	1000	4593	4176	3854	3533								
P4BS010	200	1000	8598	7815	7215	6614								
P4BS034	400	3400			4388	4342	4296	3683	3314					
P4BS034	500	3400			5447	5390	5332	4571	4114					
P4BS050	400	5000			2747	2709	2517	2382	2248	2171				
P4BS050	500	5000			3410	3362	3124	2957	2790	2694				
P4BS080	600	8000							2353	2186	2002	1919	1852	
P4BS080	1000	8000							3883	3608	3305	3167	3057	
S010P4BS010	50	1050	4405	4004	3696	3388								
S010P4BS010	100	1100	7808	7099	6552	6006								
S010P4BS010	200	1200	14617	13286	12266	11244								
S034P4BS034	300	3700			5661	5602	5542	4752	4276					
S034P4BS034	400	3800			7460	7381	7303	6261	5634					
S034P4BS034	500	3900			9260	9163	9064	7771	6994					
S050P4BS050	400	5400			4670	4605	4279	4049	3822	3691	2117			
S050P4BS050	500	5500			5797	5715	5311	5027	4743	4580	2627			
S080P4BS080	600	8600							4000	3716	3403	3262	3148	1889
S010P4BS034	100	3840			3109	3109	3053	2855	2533					
S010P4BS050	100	5600			3109	3109	3053	2855	2691	2533	2329			
S010P4BS080	100	8900			3109	3081	3053	2940	2883	2770	2657	2544	2431	2318

**Table 2** Approximate performance based on a maximum air consumption of 50 SCFM

MODEL NUMBER	INLET PORT PRECHARGE PRESSURE-psi	OUTLET PORT PRESSURE (with 100 psi driving air)	Time required in minutes to fill a 100 cubic inch air receiver to discharge											
			DISCHARGE PRESSURE - psi											
			200	400	600	800	1000	2000	3000	4000	5000	6000	7000	8000
P4BS010	100	1000		0.4	0.8	1.2	1.7							
P4BS010	200	1000		0.2	0.4	0.7	0.9							
P4BS034	400	3400				0.8	1.1	3.0	5.3					
P4BS034	500	3400				0.4	0.9	2.5	4.3					
P4BS050	400	5000				1.0	1.5	4.4	7.6	11.1	15.1			
P4BS050	500	5000				0.6	1.0	3.3	5.9	8.7	11.9			
P4BS080	600	8000							6.9	10.0	14.7	18.8	23.1	27.9
P4BS080	1000	8000							3.5	5.4	8.1	10.6	13.1	16.0
S010P4BS010	50	1050		0.5	0.9	1.4	1.9							
S010P4BS010	100	1100		0.3	0.5	0.7	1.0							
S010P4BS010	200	1200		0.1	0.2	0.3	0.5							
S034P4BS034	300	3700				0.6	0.9	2.4	4.1	10.0				
S034P4BS034	400	3800				0.4	0.6	1.7	3.0	7.0				
S034P4BS034	500	3900				0.2	0.4	1.3	2.4	5.8				
S050P4BS050	400	5400				0.6	0.9	2.6	4.4	6.5	8.9			
S050P4BS050	500	5500				0.4	0.6	2.0	3.4	5.1	7.0			
S080P4BS080	600	8600							4.1	5.9	8.7	11.1	13.6	16.4
S080P4BS080	1000	9000							2.5	3.6	5.2	6.7	8.2	10.0
S010P4BS034	100	3840				1.5	2.0	4.4	7.2	11.4				
S010P4BS050	100	5600				1.5	2.0	4.4	7.2	10.0	13.7			
S010P4BS080	100	8900				1.5	2.0	4.3	6.7	9.4	12.3	15.4	18.9	22.6

# PowerStar™ 4 Gas Booster - Models, Porting & Dimensions

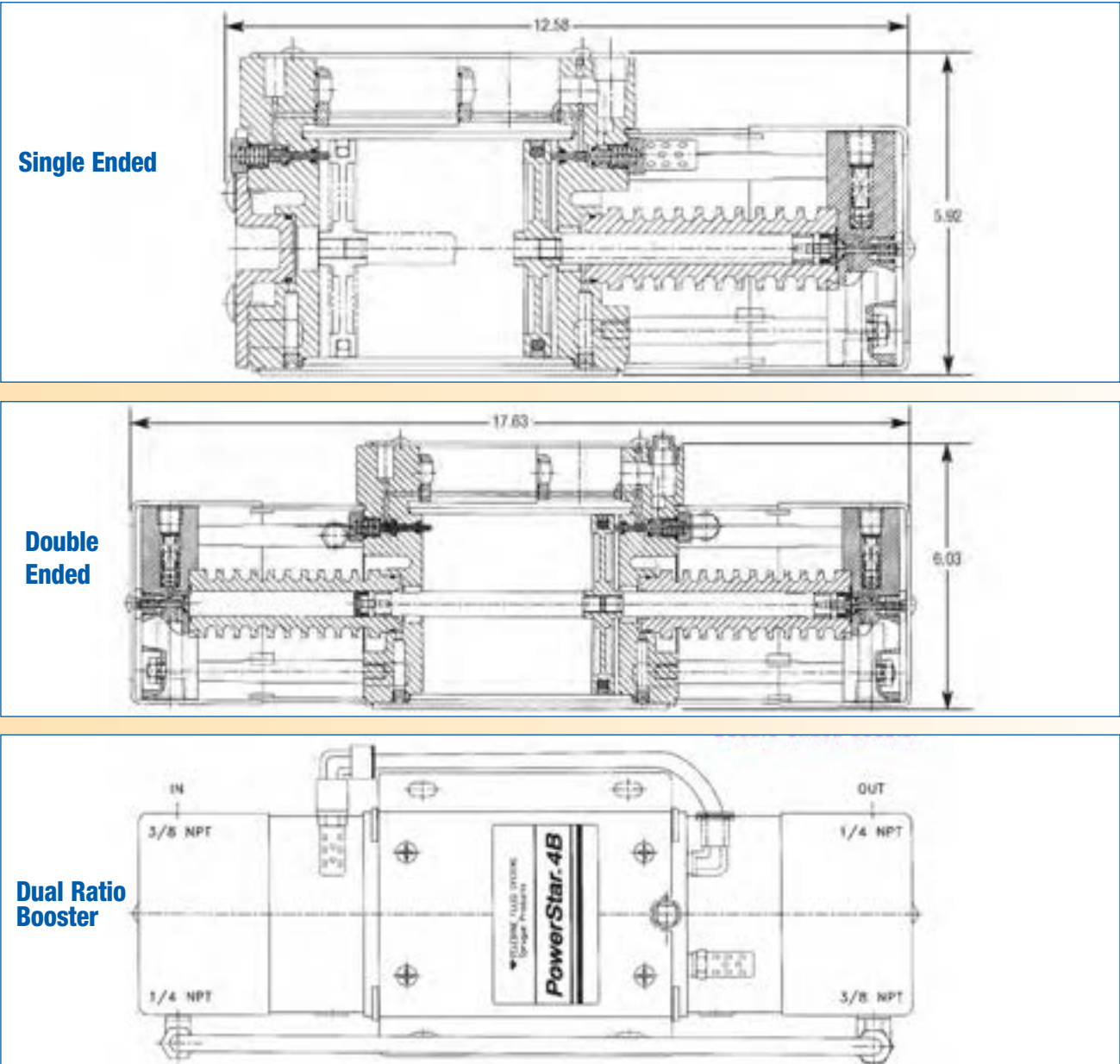
## Models

Single Ended Ratio Non Separated	Double Ended Ratio Non Separated	Dual Ratio Non Separated	Single Ended Ratio Separated	Double Ended Ratio Separated	Dual Ratio Separated
P4B010	010P4B010	010P4B034	P4BS010	S010P4BS010	S010P4BS034
P4B034	034P4B034	010P4B050	P4BS034	S034P4BS034	S010P4BS050
P4B050	050P4B050		P4BS050	S050P4BS050	S010P4BS080
			P4BS080	S080P4BS080	

## Porting

Model	Inlet Ports Gas	Outlet Ports Gas	Inlet Ports Air	Approximate Shipping Weight
All single-ended	3/8" NPT	1/4" NPT	3/8" NPT	20 lbs.
All double-ended	3/8" NPT	1/4" NPT	3/8" NPT	25 lbs.

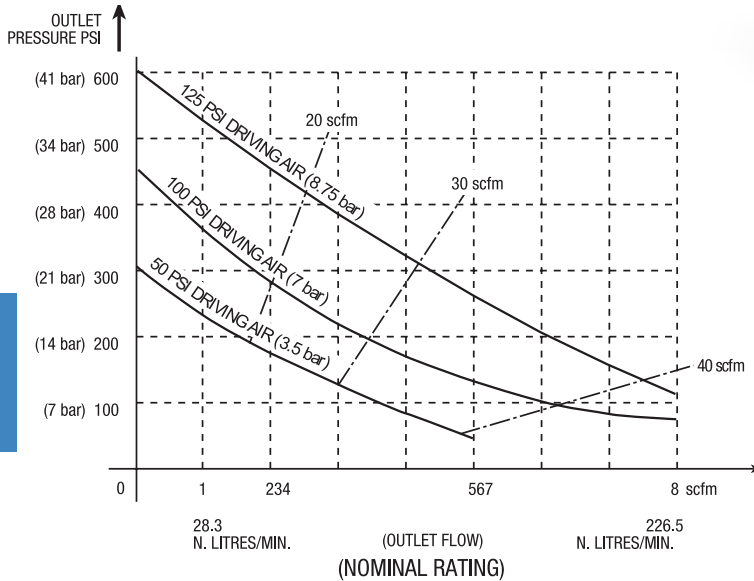
## Dimensions



# Sprague PowerStar™ 4

## Advanced Air Amplifiers

### Performance Chart AA4P4AA4 Double-Ended Air Amplifier



Solid lines indicate approximate flows at various driving air pressure. Dotted lines indicate air consumption in scfm.

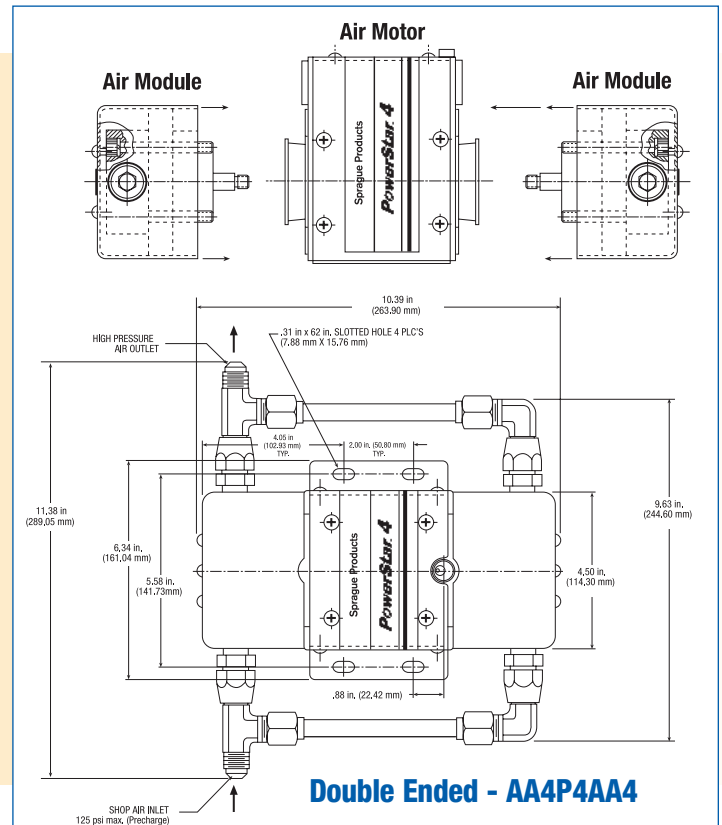
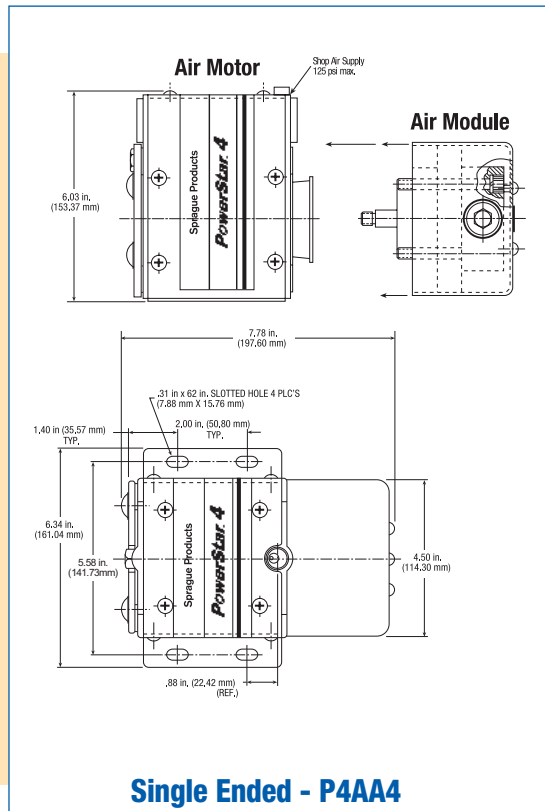
All air driven air amplifiers will operate on low air volumes as long as the supply is sufficient to overcome minor internal leakage and operate the air selector valve in the air motor section.

**Note:** Most air compressors produce 4-5 scfm of compressed air per horsepower at 100 psi. As an example, with 100 psi (6.8 bar) driving air, the air amplifier consumes 30 scfm at an operating pressure of 200 psi (14 bar) and produces an outputflow of 3.5 scfm.

**\*Note:** for applications above 450 psi (31.5 bar), consult factory.

**Note:** stall conditions on double ended units are best achieved by regulating air motor pressure 10% lower than precharge.

### Nominal Dimensions



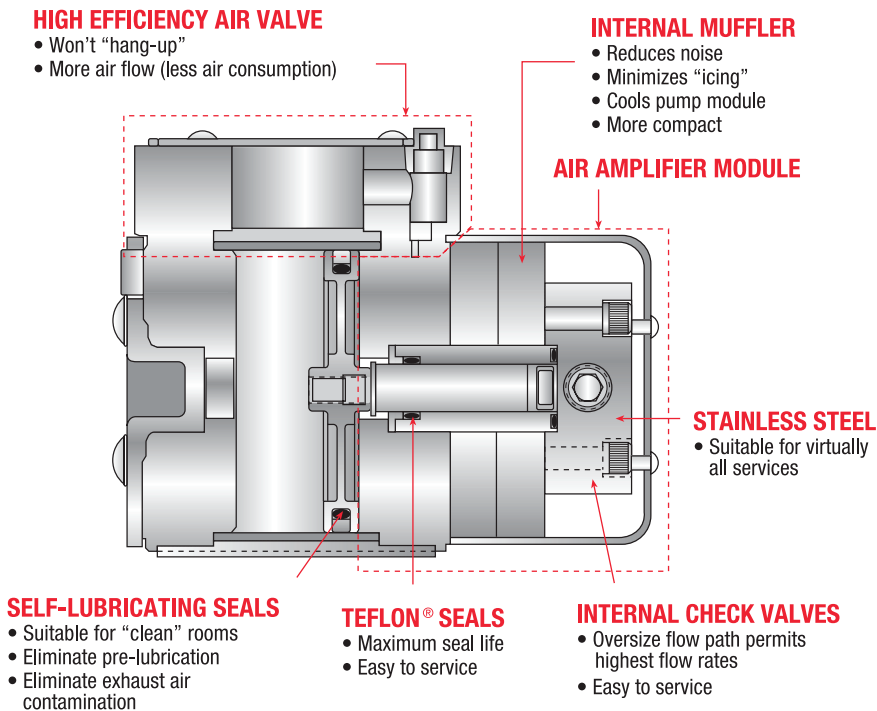


# How PowerStar™ 4 Air Amplifiers Work

The PowerStar™ 4 air amplifier develops high output pressures by applying the principle of differential areas. It features a large area air motor piston (air driven at low 10-125 psi pressures) that drives a small area air piston that amplifies the incoming air pressure.

Air output pressure is determined by the ratio between the area of the air motor piston, the area of the small high pressure piston and the applied driving air pressure. The relationship of the air motor piston to the small area piston is referred to as the Air Amplifier Ratio.

In operation, the AA4P4AA4 model using 125 psi input air pressure (at the air motor), can produce a maximum air output pressure of 600 psi (limited to 500 psi in the P4AA4PCT and AA4P4AA4PCT models with an ASME tank rated at 500 psi). At 100 psi input air pressure, the air amplifier can produce an output air pressure of 450 psi; at 50 psi input pressure, it can produce an output air pressure of 300 psi.

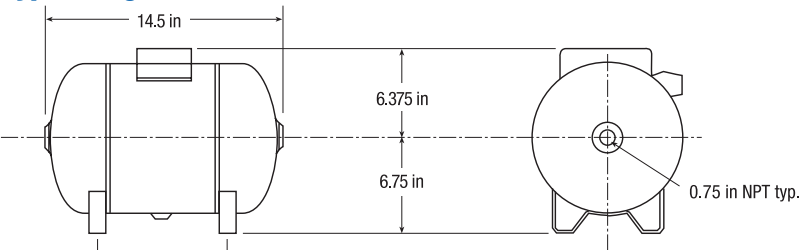


## Weights, Porting & Ordering Information

### Weights & Porting

Model Number	Inlet Port Air Module	Outlet Port Air Module	Inlet Port Air Motor	Approximate Shipping Weight
P4AA4	1/2"NPTF	3/8"NPTF	3/8"NPTF	16 lbs (7.26 Kg)
AA4P4AA4	-8, 37 deg. Male flare fittings		3/8"NPTF	21 lbs (9.53 Kg)
P4AA4PCT	1/2"NPTF	3/8"NPTF	3/8"NPTF	80 lbs (36.3 Kg)
AA4P4AA4PCT	1/2"NPTF	3/8"NPTF	3/8"NPTF	85 lbs (38.6 Kg)

### Typical 5 gallon ASME Tank



### Order Information

Components	Description
P4	Air Motor Module
AA4	Air Amplifier Module
P4AA4	Single Air Amplifier (Assembled)
AA4P4AA4	Double Air Amplifier (Assembled with plumbed inlets & outlets)
93744	Air Control Kit (Filter, regulator, gauge, fittings)
Systems	Description
P4AA4PCT	Single Air Amplifier, Complete System (5 gal. ASME tank, 500 psi rating, ASME relief valve, gauge, shut-off valve)
AA4P4AA4PCT	Double Air Amplifier, Complete System (5 gal. ASME tank, 500 psi rating, ASME relief valve, gauge, shut-off valve)

# Gas Boosters

## Model GBS-30, GBS-60

### MODEL GBS - 30

30,000 psi Gas Booster System  
(One-to-one ratio — 112 cubic inch  
per stroke displacement)  
(17-4PH stainless steel construction)

### MODEL GBS - 60

60,000 psi Gas Booster System  
(Thirty-to-one ratio — 4.7 cubic inch  
per stroke displacement)  
(4340 alloy steel construction)

The Model GBS-30 and GBS-60 Gas Booster Systems are complete and ready to operate. All that is required is an air supply for the pump (approximately 70 psi) and a commercially available container of compressed gas.

The steel console is 26" wide, 24" deep, 40" high and includes manual valves, air regulator, filter and lubricator, air gauge, high pressure gauge, reservoir, oil filter, pump, gas booster and related high pressure tubing and fittings.

Operation is by means of an air operated hydraulic pump which pressurizes one end of the gas booster which then compresses the gas in the opposite end of the booster. To accomplish this, the gas inlet valve is opened to permit gas to fill the gas end of the booster. Check valves are provided to permit gas flow in one direction only. With the gas outlet valve open, the hydraulic pump is operated in order to pressurize the hydraulic end of the booster. Thus, the gas is compressed in the booster. If required pressure is not reached by the end of the stroke, the gas booster can easily be recycled for additional strokes.

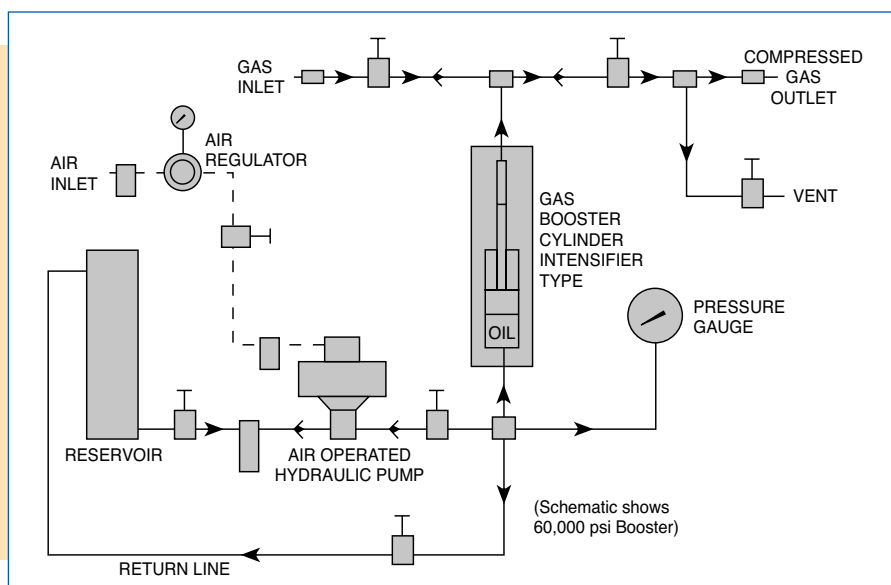
Note the gauge on these systems is connected to the hydraulic side of the booster. On the Model GBS-30 which has a 1 to 1 ratio, there is a direct reading of the pressure in the gas end of the booster. The Model GBS-60 has a 30 to 1 ratio and the gauge will accordingly indicate a reading of one-thirtieth ( $1/30$ ) of the actual pressure in the gas end of the booster. An additional gauge can be furnished for connection to the gas end of the booster to provide direct pressure readings of the gas pressure.

Details of the gas boosters are shown on page 55.

**These systems should not be used with hydrogen or oxygen.**



3



# Gas Booster Specifications

## GBS-30 - 30,000 psi

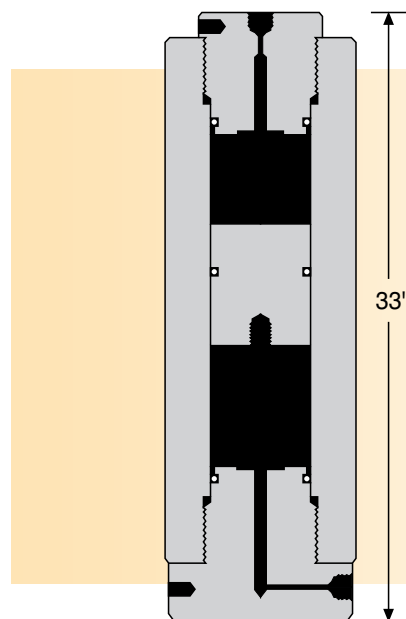
The Model GB-30 Gas Booster is rated for use up to 30,000 psi and has a one-to-one ratio. Displacement per stroke is 112 cubic inches (1835 ml).

**Material of construction** is 17-4PH stainless steel for the body and covers. The piston is supplied in brass with other materials available as an option. Standard O-ring material for the covers and piston is BUNA-N (nitrile).

**Standard connections** supplied are for 1/4" O.D. High Pressure tubing (HF4 connection) at each end.

The Model GB-30 can be supplied as a separate unit or with the complete system (Model GBS-30) shown on page 54.

The Model GB-30 should not be used with hydrogen or oxygen.



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## GBS-60 - 60,000 psi

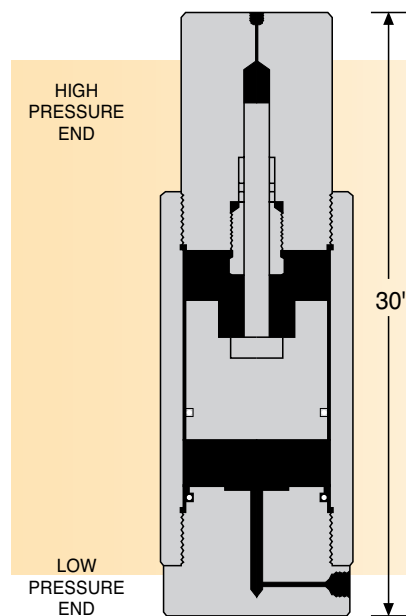
The Model GB-60 Gas Booster is rated for use up to 60,000 psi and has a thirty-to-one (30-1) ratio. Thus, 60,000 psi can be obtained at the high pressure end using only 2,000 psi inlet pressure. Displacement per stroke is 4.7 cubic inches (77 ml).

**Material of construction** is Type 4340 alloy steel (or equivalent) properly heat treated for use at high pressure. Other internal materials include 17-4PH stainless steel and aluminum bronze. Seals include BUNA-N (nitrile) O-rings and a Parker Poly Pak®.

**Standard connections** supplied are for 1/4" O.D. High Pressure tubing (HF4 on the high pressure end and AF4 on the low pressure end).

The Model GB-60 can be supplied as a separate unit or with the complete system (Model GBS-60) shown on page 54.

The Model GB-60 should not be used with hydrogen or oxygen.



Piston travel - 6"

# Special Gas Boosters & Intensifiers

High Pressure Equipment Company has designed and supplied numerous gas boosters and intensifiers to meet the customer's special requirements. A price quotation can be made by advising us of the requirements including: media (gas or liquid) to be pressurized, maximum outlet pressure required, available inlet pressure and required displacement per stroke.

# Packaged Power Systems

HiP offers a range of standard power packs that are typically in-stock or available with a short lead time, as well as custom power systems to satisfy your specific requirements. All HiP power systems are factory pressure tested prior to shipping.



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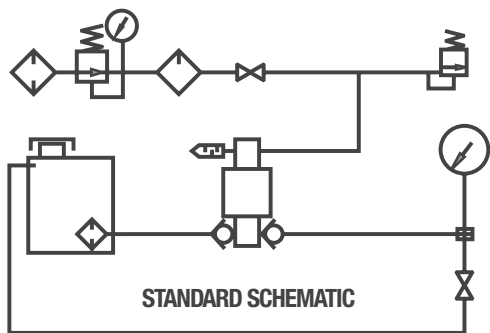


# T-Series

## Pump Power Packs

HiP packaged hydraulic power systems using our new high performance T-Series pumps are an excellent method to deliver high pressure hydraulic power to your field location. These turn-key systems only require a non-lubricated air supply to generate hydraulic power up to 68,000 psi and are designed for plain water or oil service. We offer a range of standard power packs that are typically in-stock or available with a short lead time, as well as custom power systems to satisfy your specific requirements. All HiP power packs are factory pressure tested prior to shipping.

T-Series Pump Power Packs can be used for a wide variety of high pressure applications such as bolt tensioning, pressure testing, power pressing, jacking, lifting, hydraulic power units, proof testing components, valve actuation and many more.



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## Ordering Information

**Part Number Example: 5065T-T6036-TB-SST** This is a T60 series pump with a maximum outlet pressure of 36,500 psi and options of a tank bypass and 316 stainless steel tank.

5065T

All Models

Pump Series

T60	6" Motor Series Pump
T75	7-1/2" Motor Series Pump

T6036

Pump Model/Max Pressure

T60 Series		T75 Series	
03	3,200psi	05	5,000psi
05	4,800psi	07	7,400psi
06	6,300psi	10	10,000psi
10	10,000psi	16	15,750psi
12	12,500psi	19	19,500psi
16	16,250psi	25	25,500psi*
25	25,250psi	39	39,500psi*
36	36,500psi	57	57,100psi
58	58,000psi	68	68,000psi

TB-SST

Additional Extras

TB	Tank Bypass
IV	Isolation Valve
CRO	Chart Recorder Outlet
SST	Stainless Steel 316 Tank
USB	USB Transducer
ATEX	ATEX certified

\* Optimum seal life is achieved at less than 80 cycles per minute. Intermittent duty above 30,000psi.

# T-Series Pump Power Packs

## Typical Pressure & Connection Sizes

T60 Series	Maximum Working Pressure		Air Inlet	Gauge Range	Outlet Connection
	psi	bar			
<b>03</b>	3,000	221	1/2" NPT(F)	0-5,000psi/bar	1/2" NPT(F)
<b>05</b>	4,800	331	1/2" NPT(F)	0-10,000psi/bar	1/2" NPT(F)
<b>06</b>	6,300	434	1/2" NPT(F)	0-10,000psi/bar	1/2" NPT(F)
<b>10</b>	10,000	689	1/2" NPT(F)	0-15,000psi/bar	HF9
<b>12</b>	12,500	862	1/2" NPT(F)	0-15,000psi/bar	HF9
<b>16</b>	16,250	1120	1/2" NPT(F)	0-20,000psi/bar	HF9
<b>25</b>	25,250	1740	1/2" NPT(F)	0-30,000psi/bar	HF4
<b>36</b>	36,500	2516	1/2" NPT(F)	0-40,000psi/bar	HF4
<b>58</b>	58,000	3998	1/2" NPT(F)	0-70,000psi/bar	HF4

T75 Series	Maximum Working Pressure		Air Inlet	Gauge Range	Outlet Connection
	psi	bar			
<b>05</b>	5,000	344	1/2" NPT(F)	0-10,000psi/bar	1/2" NPT(F)
<b>07</b>	7,400	510	1/2" NPT(F)	0-10,000psi/bar	1/2" NPT(F)
<b>10</b>	10,000	689	1/2" NPT(F)	0-15,000psi/bar	1/2" NPT(F)
<b>16</b>	15,750	1085	1/2" NPT(F)	0-20,000psi/bar	HF9
<b>19</b>	19,500	1344	1/2" NPT(F)	0-30,000psi/bar	HF9
<b>25</b>	25,500	1758	1/2" NPT(F)	0-30,000psi/bar	HF9
<b>39</b>	39,500	2723	1/2" NPT(F)	0-50,000psi/bar	HF4
<b>57</b>	57,100	3936	1/2" NPT(F)	0-70,000psi/bar	HF4
<b>68</b>	68,000	4688	1/2" NPT(F)	0-80,000psi/bar	HF4

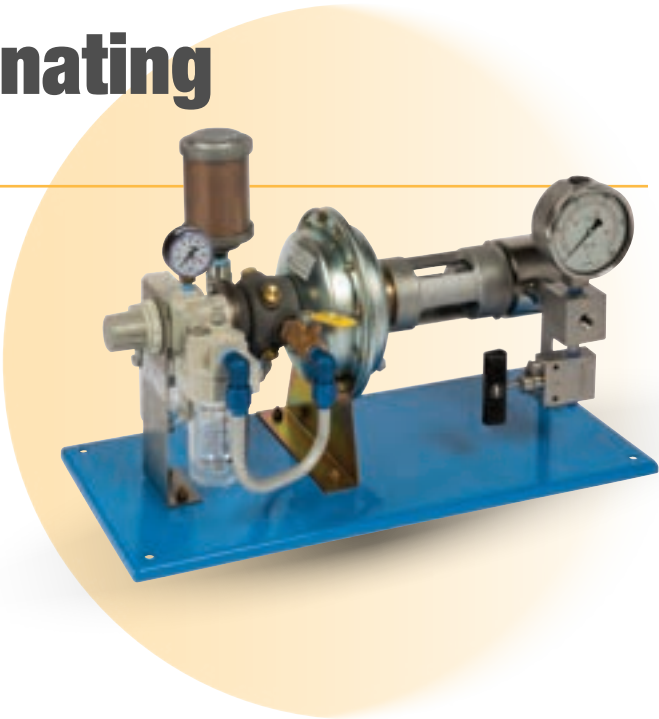
<b>Chart Recorder Port</b>	HF4 plugged
<b>Stainless Steel Tank</b>	316 SS, mesh in tank filter, sight glass
<b>USB Transducer</b>	Range to suit pump max pressure. 400bar, 1500bar, 2000bar, 3000bar, 4000bar
<b>Standard Seal Material</b>	NBR
<b>Optional Seal Materials</b>	EPR available upon request FKM, FFKM available for pumps with maximum pressures of 16,250 or less

# Sprague Non-Contaminating

## Hydraulic Pump Power Units

**S-440-JS-( )**—This contaminate-free hydraulic power unit uses the S-216-JS-( ) pump. The unit's components include an air filter, pressure regulator and lubricator (FRL), air shut-off valve, muffler, manifold, liquid bleed valve, air pressure gauge and liquid pressure gauge. The base is steel and has four mounting holes. All components in contact with the liquid being pumped are stainless steel.

**NOTE:** S-440-JS-10 thru -125 only (pumps with NPT liquid ports)



	S-440JS-( )SS
Length:	23-7/16 in. (59.8 cm)
Width:	11-7/16 in. (29.4 cm)
Height:	12 in. (30.5 cm)
Filter Air Inlet Port Threads:	3/8 NPT
Pump Liquid Outlet S-440-JS-10 thru 100	3/8 NPT (NFC)
Reference S-440-JS-( )	79546-11 thru -61

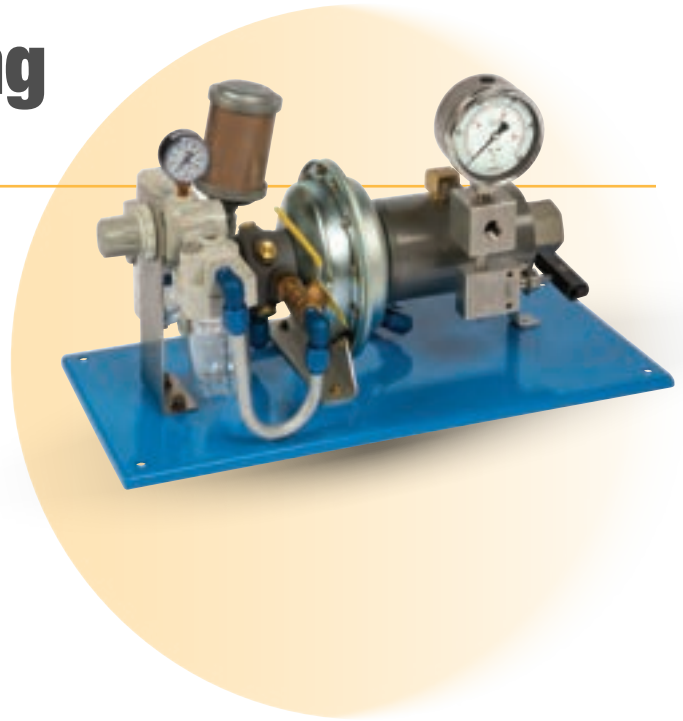
# Sprague Double-Acting

## Hydraulic Pump Power Units

Sprague S-440-JD double-acting hydraulic power units are assembled with compatible accessories, ready for portable power supply or for stationary use within a hydraulic system.

The “JD” power units include the selected type “JD” pump, see pages 22 and 23, air filter, pressure regulator, liquid and air pressure gauges, air lubricator, valves, fittings and mounting base.

**S-440-JD-6.8** Services oil, liquid refrigerants, many corrosive chemicals and low lubricity liquids.



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	S-440-JD-6.8
<b>Length:</b>	20 in. (58.4 cm)
<b>Width:</b>	11 in. (27.9 cm)
<b>Height:</b>	13-1/2 in. (34.3 cm)
<b>Filter Air Inlet Port Threads:</b>	1/2 NPT
<b>Liquid Inlet Port:</b>	1 NPT
<b>Liquid Outlet Port:</b>	1/2 NPT
<b>Liquid Bypass Port:</b>	1/4 NPT
<b>Reference:</b>	90763-11

**S-440-JD-34** Services oil, water and many corrosive liquids.

**S-440-JD-36** Services oil and non-corrosive liquids. **Not for water service.**

	S-440-JD-34	S-440-JD-36
<b>Length:</b>	23 in. (58.4 cm)	23 in. (58.4 cm)
<b>Width:</b>	11 in. (27.9 cm)	11 in. (27.9 cm)
<b>Height:</b>	12-1/2 in. (31.8 cm)	12-1/2 in. (31.8 cm)
<b>Filter Air Inlet Port Threads:</b>	3/8 NPT	3/8 NPT
<b>Liquid Inlet Port Threads:</b>	3/8 NPT	3/8 NPT
<b>Liquid Outlet Port Threads:</b>	1/4 NPT	1/4 NPT
<b>Reference:</b>	90029-11	90822-11

**S-440-JD-60** Uses lubricated driving air. Services petroleum or water based hydraulic fluids.

**S-440-JDN-60** Uses clean, dry driving air. For cleanroom or laboratory use.

	S-440-JD-60	S-440-JDN-60
<b>Length:</b>	23 in. (58.4 cm)	23 in. (58.4 cm)
<b>Width:</b>	11 in. (27.9 cm)	11 in. (27.9 cm)
<b>Height:</b>	12-1/2 in. (31.8 cm)	12-1/2 in. (31.8 cm)
<b>Filter Air Inlet Port Threads:</b>	3/8 NPT	3/8 NPT
<b>Liquid Inlet Port Threads:</b>	3/8 NPT	3/8 NPT
<b>Liquid Outlet Port Threads:</b>	1/4 NPT	1/4 NPT
<b>Reference:</b>	91614	91615



# Air Operated Pumping Systems

to 50,000 psi

- Model PS-10: 10,000 psi
- Model PS-20: 20,000 psi
- Model PS-30: 30,000 psi
- Model PS-40: 40,000 psi
- Model PS-50: 50,000 psi
- Model PS-90: 90,000 psi

High Pressure air operated hydraulic pumping systems are complete, selfcontained units and ready to operate. Just hook up standard shop air supply (maximum 100 psi) to connection supplied on the side of the console. Discharge capacities range to 64 in<sup>3</sup>/min.

## Features

System includes hydraulic oil reservoir, oil filter, air operated hydraulic pump, pressure gauge, panel mounted high pressure valves, safety head assembly, panel mounted air regulator and gauge and air line filter and lubricator. All components are enclosed in a steel console with only the back exposed. Dimensions of standard systems are 26" wide, 24" deep and 40" high.

## System Capabilities

The output pressure is predetermined by adjustment to the air regulator setting.

Output pressure is maintained constantly and pump compensates for pressure drops or losses.

Hydraulic input is gravity fed, however, if pump is used alone, the feed can be pressurized to the limit of the pump.

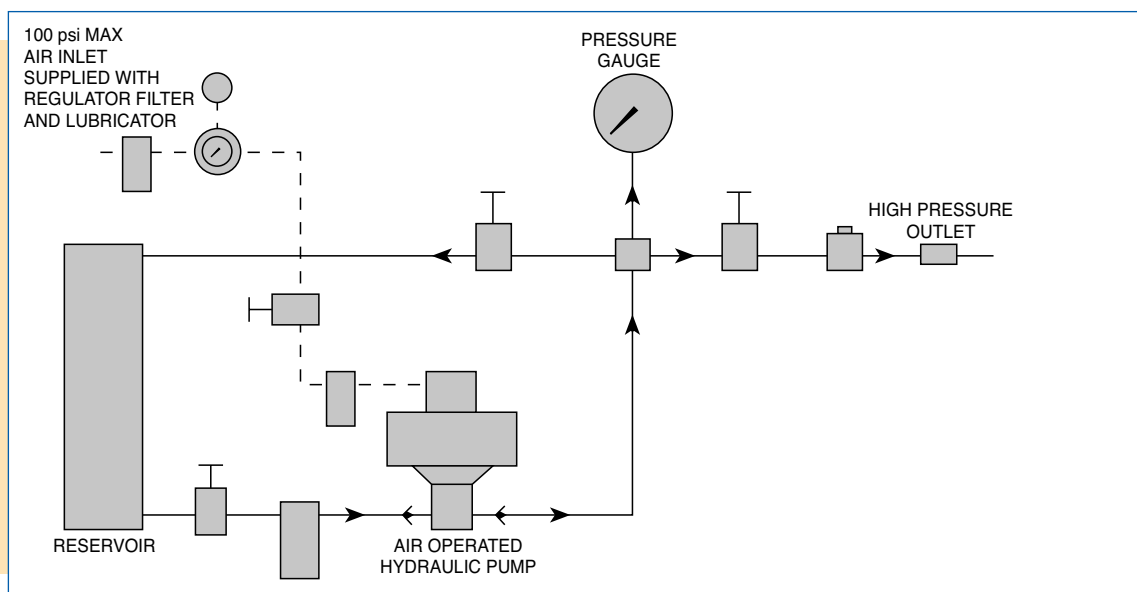
Within the pump the large diameter air piston drives a smaller piston to provide fluid flow at high pressure.

Air consumption will be approximately 56 CFM of free air at 100 psi input.

Reservoir = 4 gallon capacity, do not pressurize.



4



# Standard Pumping System Specifications

## Approximate Air to Hydraulic Pressure Ratio — Static Conditions

	Model No.	Air psi										
		10	20	30	40	50	60	70	80	90	100	110
Hydraulic Pressure psi	PS-10	1,500	3,200	5,200	7,100	9,000	10,800	12,500	14,500	16,300	18,000	19,800
	PS-20	3,000	6,000	9,500	12,600	16,000	19,100	22,300	25,600	29,000	32,300	35,600
	PS-30	4,000	8,800	13,700	18,000	22,500	27,000	31,500	36,500	41,400	45,800	50,300
	PS-40	6,000	13,000	21,000	27,000	34,000	40,500	46,000	52,000	59,000	65,000	70,000
	PS-50	6,000	13,000	21,000	27,000	34,000	40,500	46,000	52,000	59,000	65,000	70,000
	PS-90	Uses Dual Pump			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

## Approximate Rate of Discharge — CIPM

Model →		PS-10			PS-20			PS-30			PS-40			PS-50		
Air psi →		60	80	100	60	80	100	60	80	100	60	80	100	60	80	100
Pressure →	10,000 psi	27	52	64	31	40	44	28	33	35	19	23	24	19	23	24
	30,000 psi	0	0	0	0	0	14	0	16	21	12	15	17	12	15	17
	40,000 psi	0	0	0	0	0	0	0	0	14	2	12	15	2	12	15
	50,000 psi	0	0	0	0	0	0	0	0	0	0	6	11	0	6	11

# 150,000 psi Pumping System

## Model PS-150

The Model PS-150 Pumping System is designed for generating hydraulic pressure up to 150,000 psi by means of an air operated hydraulic pump and an intensifier. The 10 to 1 ratio intensifier is fully illustrated on page 73. This system is complete and ready to operate requiring only the connection of an air supply of approximately 80 psi.

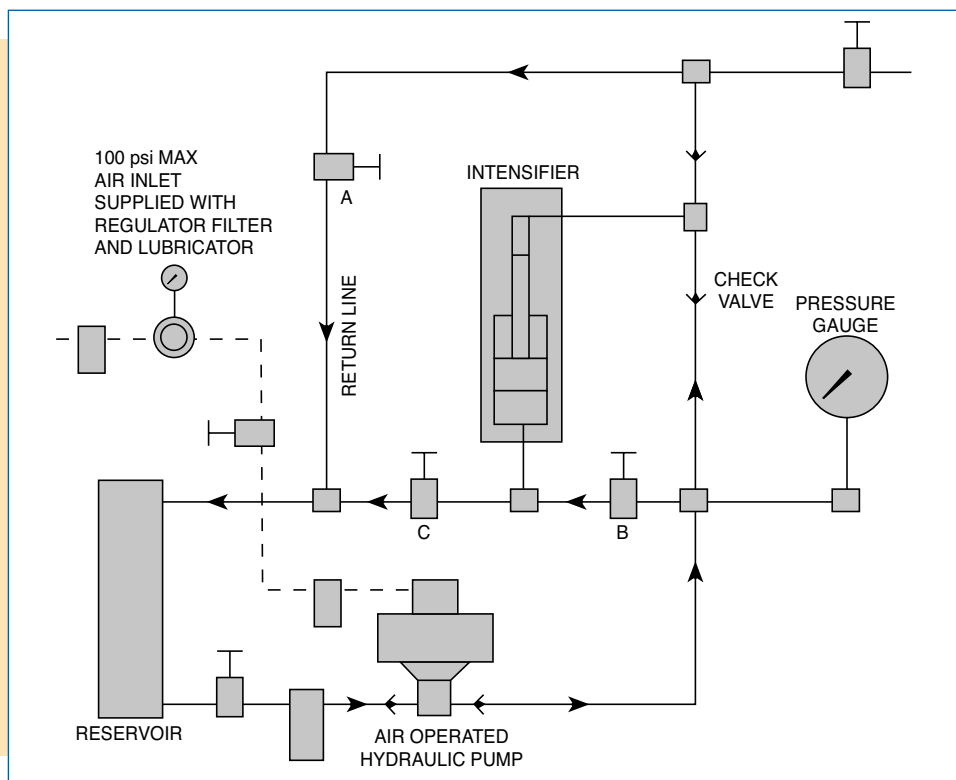
The steel console is 26" wide, 24" deep, 40" high and includes manual valves, air regulator, filter and lubricator, air gauge, high pressure gauge, reservoir, oil filter, pump (0-16,000 psi), related high pressure tubing and fittings.

The 0-20,000 psi pressure gauge is connected to the low pressure side of the intensifier which has a ratio of 10 to 1. Pressure on the high pressure side of the intensifier is thus determined by multiplying the gauge reading by 10. A small variation must be allowed for friction from the intensifier packing.

The air operated hydraulic pump pressurizes the system to 16,000 psi with valves "A" and "B" closed and the intensifier piston is automatically positioned to the low pressure end of its stroke. With valves "A" and "C" closed, valve "B" is opened to allow the pump to pressurize the low pressure end of the intensifier. The fluid in the high pressure end of the intensifier is thus pressurized with a 10 to 1 ratio. If the intensifier reaches the end of its stroke before the desired pressure is achieved, the intensifier may be recycled. The intensifier output is approximately 1.2 cubic inches per stroke.



4



# Air Driven Power Units

A variety of Sprague and PowerStar™ pumps are available as packaged systems with output pressures up to 36,500 psi. These air driven power units are designed for portable and stationary applications and delivered fully assembled, ready-to-use and factory tested.

## S-440

- Standard unit for general use.
- Components include S-216-J-(-)SS pump, air filter, pressure regulator and lubricator, air shut-off valve, muffler, liquid bleed valve, air pressure gauge, liquid-filled pressure gauge with quick disconnect fitting.
- Steel powder coated base has four mounting holes.
- Available as S-440 with the addition of a by-pass circuit that allows quick fills from your inlet source.

## S-1101

- Compact power unit has same components as S-440 with the addition of a three gallon (11.4 liters) stainless steel reservoir.
- Reservoir is fitted with filter-breather-screen assembly, suction filter inline to pump, and sight glass to show liquid fill point.
- Base flanges of reservoir have four mounting holes.
- Designed to improve suction capability of higher ratio pumps and eliminate dry start-ups.

## S-441

- Compact, lightweight unit for general use.
- Occupies slightly more than one cubic foot of space and weighs six lbs. (2.7kg) less than S-440.
- Components include S-216-(-) pump, air filter, pressure regulator and lubricator, air shut-off valve, muffler, manifold, liquid bleed valve, air pressure gauge, liquid-filled pressure gauge with quick disconnect fitting.
- Stainless steel base has four mounting holes.

## S-439

- Compact power unit has same components as S-441 with the addition of a five gallon (18.9 liters) stainless steel reservoir.
- Reservoir is fitted with filler-breather-screen assembly, suction filter inline to pump, and sight glass which shows liquid fill point.
- Base flanges of reservoir have four mounting holes.

S-440



S-1101



S-441



S-439





# Air Driven Power Units

## S-1400

- Sturdy, portable unit with 15" square tubular frame for general use.
- Components include S-216-( ) pump (ten ratios), air filter, pressure regulator and lubricator, muffler, manifold, liquid bleed valve, air pressure gauge, liquid-filled pressure gauge with quick disconnect fitting.
- Dual gauge set-up available.

## S-1500

- Air-operated piston pump mounted on tubular frame with wheels for extreme portability.
- Hydro gauges, valves and pump regulator all panel-mounted.
- Output pressure adjusted by setting air pressure regulator to pump.
- Pump automatically shuts off at set pressure; re-starts when pressure drops.

## P-1500

- Air-operated piston pump mounted on tubular frame with wheels for extreme portability.
- Hydro gauges, valves and pump regulator all panel-mounted.
- Output pressure adjusted by setting air pressure regulator to pump.
- Pump automatically shuts off at set pressure; re-starts when pressure drops.

## S-1401

- Air-driven lubricated J series pump with pressure ranges from 1000 to 36,500 PSI.
- 1" Square tubular frame stainless steel, glycerin-filled, quick disconnect.
- 3/8" Air inlet port with stainless steel ball valve, filter regulator with gauge, 50 micron filter.
- Stainless steel manifold block, extra quick disconnect port for relief valves.

S-1400



S-1500



P-1500

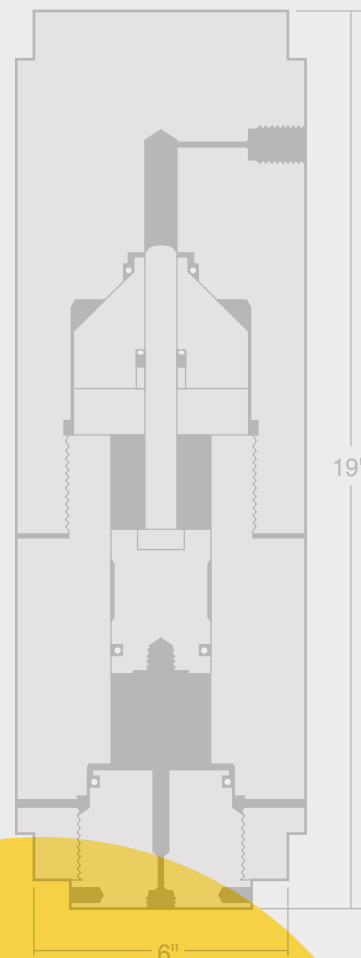


S-1401

# Specialty Pumps

High Pressure Equipment also manufactures hydraulic intensifiers and manual pressure generators for specific elevated pressure applications. HiP hydraulic intensifiers allow users to reach pressures as high as 150,000 psi by using a standard 15,000 psi pump. The manual pressure generators are designed for small volume liquids to be compressed to pressures as high as 100,000 psi.

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# Hydraulic Intensifiers

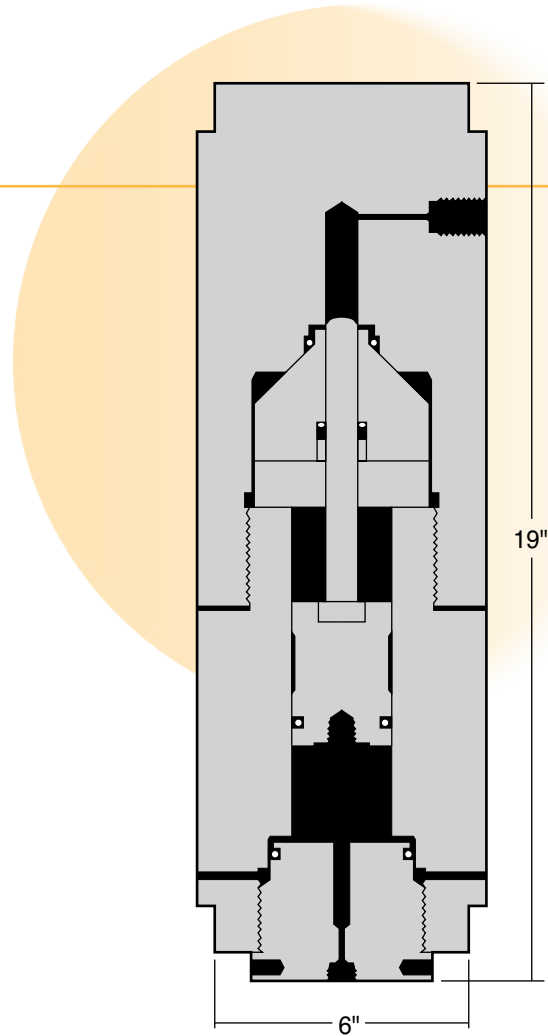
## 150,000 psi

The 150,000 psi Hydraulic Intensifier is designed with a ratio of areas on the two pistons of 10 to 1. Consequently, pressures up to 150,000 psi can be achieved by using a commercially available lower pressure (15,000 psi) pump.

Material of construction for the pressure containing parts is 4340 alloy steel (or equivalent) properly heat treated for use at elevated pressures. Only non-corrosive type fluids should be used. The high pressure packing is housed in a separate removable stuffing box. This design permits improved concentricity and facilitates close tolerance machining of the packing area.

Capacity per stroke at the high pressure end is 1.2 cubic inches. Capacity at the low pressure end is 12.6 cubic inches per stroke. Piston travel is 4 inches. Weight is approximately 150 pounds.

Standard connections are for 1/4" O.D. tubing (HF4) on the low pressure end and 3/8" O.D. x 1/16" I.D. tubing (XF6) on the high pressure end.



# High Pressure Generators

The HiP High Pressure Generator is a manually operated piston screw pump. It is designed for any application where a liquid\* is to be compressed within a small volume to develop pressure.

## Pressure Ranges

0-5,000 psi • 0-10,000 psi • 0-15,000 psi • 0-30,000 psi  
0-60,000 psi • 0-75,000 psi • 0-100,000 psi

All wetted parts are of 316 stainless steel and 17-4PH stainless steel. Parker Poly Pak® is standard.

The High Pressure Generator is easily mounted to a work bench and maximum pressures may be obtained with a minimum amount of effort by the operator.

The standard connection is a High Pressure coned-and-threaded (HF4) opening for 1/4" O.D. tubing up to 60,000 psi and XF4 connections for pressures above 60,000 psi. Adapters are available with optional Teflon packing at no additional cost for other type connections including pipe.

## Typical Applications

- Testing of instruments, gauges, component parts
- Pressure measurement studies
- Injection of liquid catalysts
- Pressurizing chemicals
- A convenient source of high pressure in the laboratory

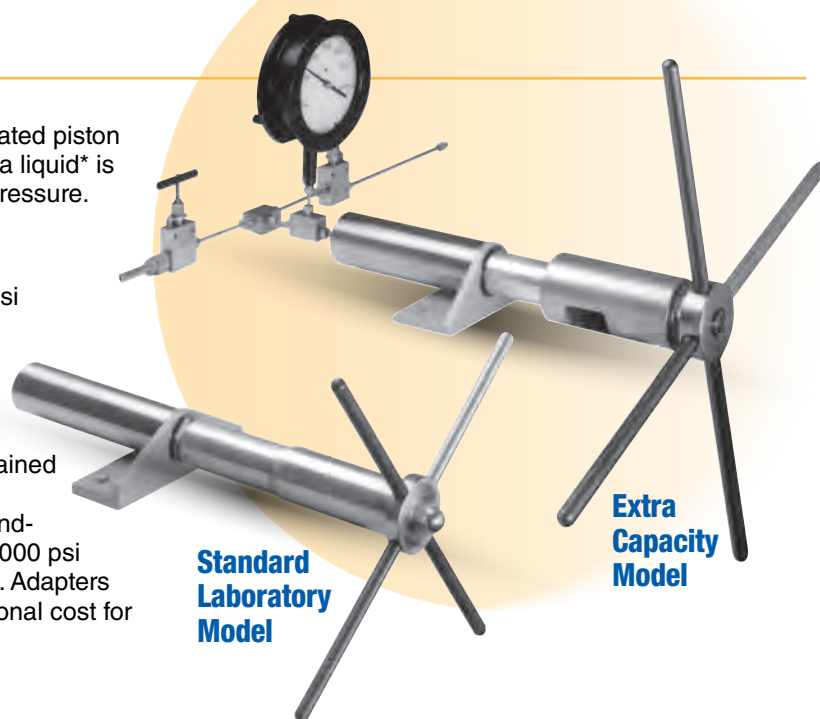
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The schematic illustrates a very basic layout for using a Pressure Generator. A reservoir (R) is shown connected by means of valves and fittings to a component (C) that is to be pressurized. A gauge has been included for determining pressure.

With valve "B" closed and valve "A" open, the handle of the Pressure Generator is rotated counter-clockwise to draw fluid from the reservoir into the cylinder body of the Pressure Generator. Valve "A" is then closed and valve "B" is opened. By rotating the Pressure Generator handle clockwise, the piston will now compress the fluid to develop pressure in the component that is to be pressurized.

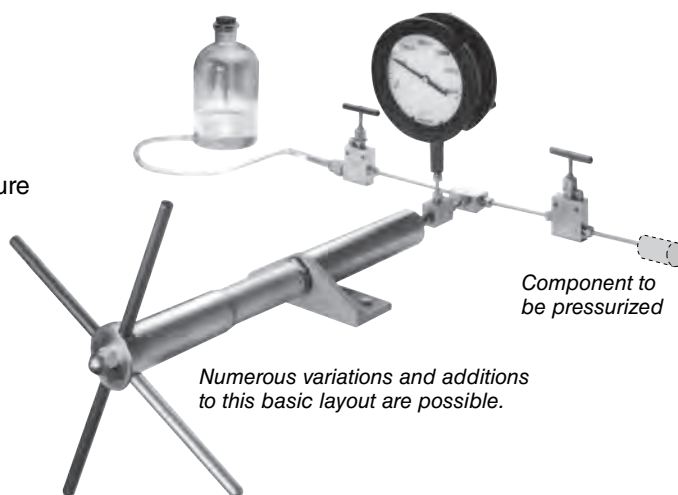
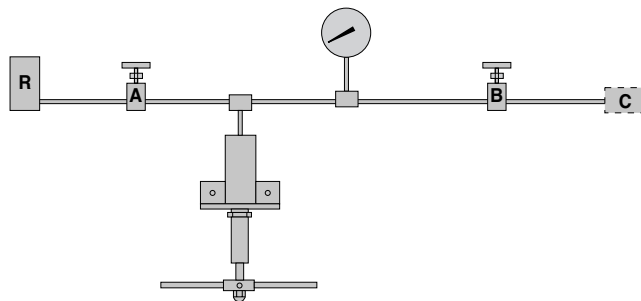
If sufficient pressure is not reached in one stroke, the system can be "recycled." Valve "B" can be closed in order to maintain pressure in the components. Valve "A" is then opened, and fluid is again drawn into the Pressure Generator from the reservoir. Closing Valve "A" and opening Valve "B" will now allow the Pressure Generator to be operated to develop increased pressure in the component.

Pressure in the component can be vented by opening both valves.



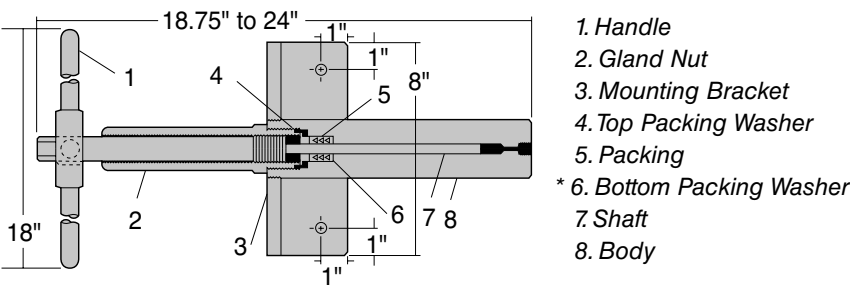
**Vernier Indicators** as shown in the photo at left are available as an accessory on all of the Standard Laboratory Models. These indicators provide controlled measurement of column displacement with an accuracy of  $\pm 0.003$ " movement of stroke.

**\* If required for GAS application, please consult factory.**



Numerous variations and additions to this basic layout are possible.

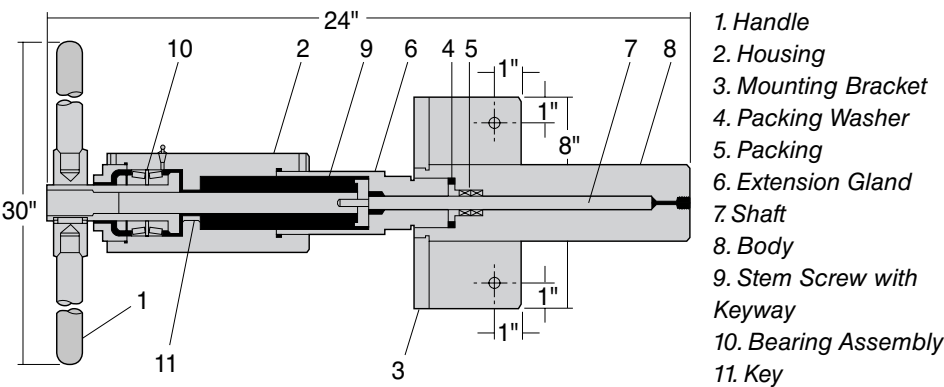
# Standard Laboratory Models



Model	Presure Rating psi	Capacity Per Stroke	Shaft Diameter
87-6-5	5,000	60 mL	7/8"
62-6-10	10,000	30 mL	5/8"
50-6-15	15,000	20 mL	1/2"
37-6-30	30,000	11 mL	3/8"

Length of stroke: 6 inches. 14 revolutions of handle produces one inch travel of shaft.  
 \* Use item six only with optional Chevron Teflon packing.

# Extra Capacity Models



Model	Presure Rating psi	Capacity Per Stroke	Shaft Diameter
112-5.75-5	5,000	93 mL	1-1/8"
81-5.75-10	10,000	48 mL	13/16"
68-5.75-15	15,000	35 mL	11/16"
50-5.75-30	30,000	18 mL	1/2"
37-5.75-60	60,000	10 mL	3/8"
31-5.75-75	75,000	7 mL	5/16"
25-5.75-100	100,000	4.5 mL	1/4"

Length of stroke: 5-3/4 inches. 14 revolutions of handle produces one inch travel of shaft.





## **High Pressure Equipment**

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