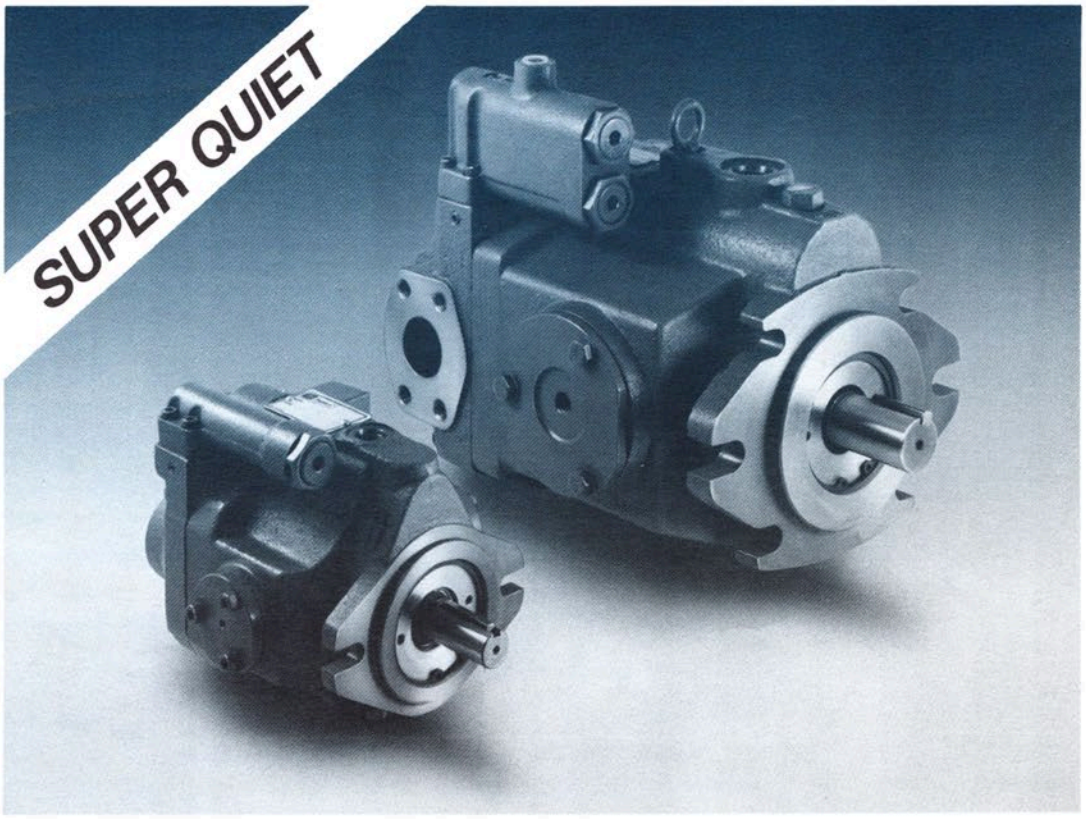
Double A Products

Application & Performance 11




# PVPQ *
## Axial Piston Pumps
### Variable Displacement
### Pressure Compensated
### 7 to 33 gpm (26 to 125 l/min) at
### Rated Speed 1800 rpm
### Rated Pressure 3000 psi (210 bar)
### SAE Mounting & Port Connections

BS Double A
Brown & Sharpe Fluid Power Division

11260-P

Double A

# Variable Displacement Axial Piston Pumps

## Super Quiet High Pressure


## Operating Principles

Nine piston assemblies are housed in the cylinder block which is rotated by the drive shaft. The free swiveling shoe on each piston assembly, which is hydraulically balanced, rides against the face of a movable swash plate. When the swash plate is perpendicular to the drive shaft, the position of the pistons within the cylinder bores are stationary and no pumping action takes place. As the swash plate angle is moved away from perpendicular, the rotating drive shaft and cylinder block cause the pistons to move back and forth within their respective bores, developing the pumping action.

The pump is controlled by a hydraulic compensator. Compensator options can respond to output pressure or both pressure and flow. In the pressure compensation control mode, the movable swash plate is positioned to provide maximum displacement until the compensator pressure setting is reached. At this setting the swash plate angle, and therefore displacement, is reduced automatically to produce only the output flow required to maintain the compensator pressure setting. By pressurizing only the volume of fluid needed to do the work, both input power and system heating are minimized.

These pumps also incorporate a maximum volume stop. This control limits the maximum displacement of the pump. Consequently, the flow of the pump can be tailored to virtually any system requirement and available input power.

## Features and Benefits

- **Superquiet Operation:** Rugged cast iron housing and optimized valve timing make this one of the quietest piston pumps available anywhere. Ideal for industrial plant environments or noise critical applications.
- **Low Deadhead Power:** Reduces operating costs and saves energy.
- **High Operating Efficiency:** Wastes little power and promotes cost savings by allowing the use of smaller heat exchangers (or no exchangers) and smaller drives.
- **Maximum Displacement Adjustment:** Flow can be conveniently adjusted to suit application.
- **High Pressure Capability:** Ratings to 3000 psi (210 bar).
- **Flange Mounting:** SAE flange mounting applicable to mobile and industrial systems, fits a wide variety of OEM and retrofit applications.
- **Porting:** SAE O-ring sealed ports allow use of standard fittings as well as eliminates possibility of cracked housings and oil leakage and weepage.
- **Fast Compensator Response:** Pump responds quickly to changing system flow and pressure requirements with less shock and pressure overshoot. Full flow to deadhead in 30 to 50 milliseconds. Deadhead to full flow in 70 to 110 milliseconds.
- **Hydraulic Compensation Control:** Displacement matches system flow demand, resulting in reduced heat generation and lower operating costs. A variety of compensator options are available.
- **Replaceable Valve Plate:** Economical and easily replaced in the field.
- **Wide Range Available:** Displacements of .91, 1.41, 2.30, 3.15, and 4.26 cu. in. per revolution (7, 11, 18, 25, and 33 gpm @ 1800 rpm). Pump can be matched to most all applications.

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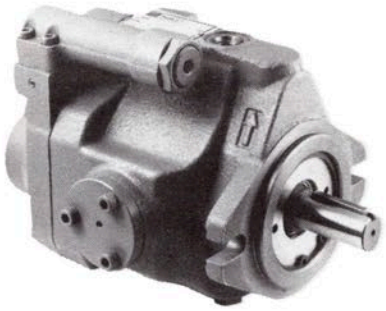
# Axial Piston Pumps, Variable Displacement



## PVPQ-7

## Typical Specifications

| | English Units | Metric Units |
|---|---|---|
| Theor. Displ. | 0.91 $in^3$/rev | 15 $cm^3$/rev |
| Del. @ 1800 rpm | 7.1 gpm | 26.9 l/m |
| Power input @ rated speed and pressure | 14.3 hp | 10.7 kW |
| Case press.(max)† | 5 psig | 0.4 bar |
| Rated pressure (continuous) | 3000 psi | 210 bar |
| Fluid range † | 100-250 Ssu | 20-55 cSt |
| Max. starting viscosity | 2000 Ssu | 440 cSt |
| Vol. adjustment @ 1800 rpm,0 psi | 1.5 to 7.1 gpm | 5.7 to 26.9 l/m |
| Min. inlet cond., vacuum | 5 in Hg | 127 cm Hg |
| Operating temp. | 32° to 180°F | 0° to 82°C |
| Min. compensator setting † | 120 psi | 8 bar |
| Weight | 25 lb | 11.3 kg |

| | |
|---|---|
| Speeds Rated | 1800 rpm |
| Speeds Min. | 500 rpm |
| Speeds Max. | 1800 rpm |
| Response time @ rated cond. | 30 ms per SAE J745C |
| Recovery time @ rated cond. | 70 ms per SAE J745C |
| Filtration Suct. | 149 micron or better |
| Filtration Disch. | 10 & 25 micron absolute † |
| Mounting | SAE A 2 bolt |
| Porting Inlet | $1^5/_{16}$-12 SAE O-ring |
| Porting Outlet | $1^5/_{16}$-12 SAE O-ring |
| Porting Drain | $^9/_{16}$ -18 SAE O-ring |
| Rotation | CW or CCW facing shaft |
| Shaft size | 3/4 dia. keyed |

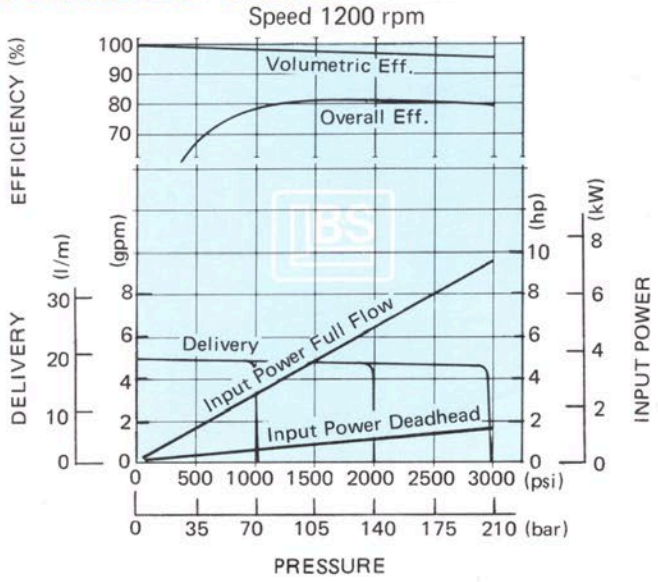
## Sound Levels ($dB_A$)△

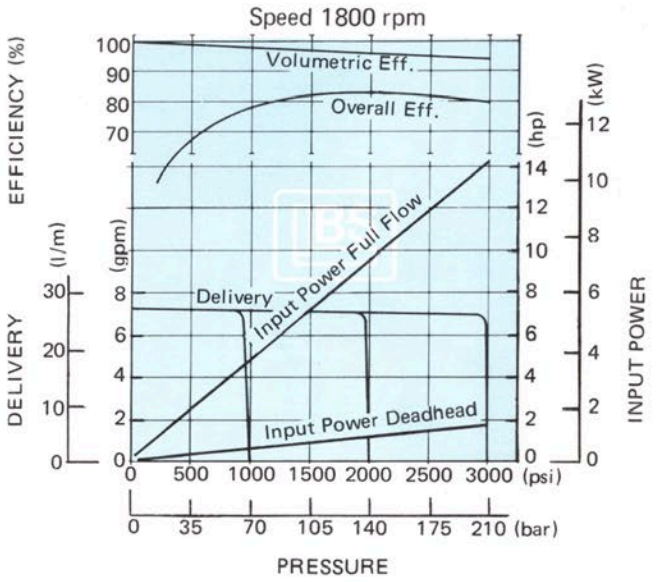
| Pressure | 1000 psi 70 bar | | 3000 psi 210 bar | |
|---|---|---|---|---|
| Speed \ Displ. | Dead-head | Full flow | Dead-head | Full flow |
| 1200 rpm | 55 | 59 | 63 | 66 |
| 1800 rpm | 60 | 64 | 69 | 72 |

△ Measured 3.3 ft. (1meter) from pump

† See application recommendations section for further details.

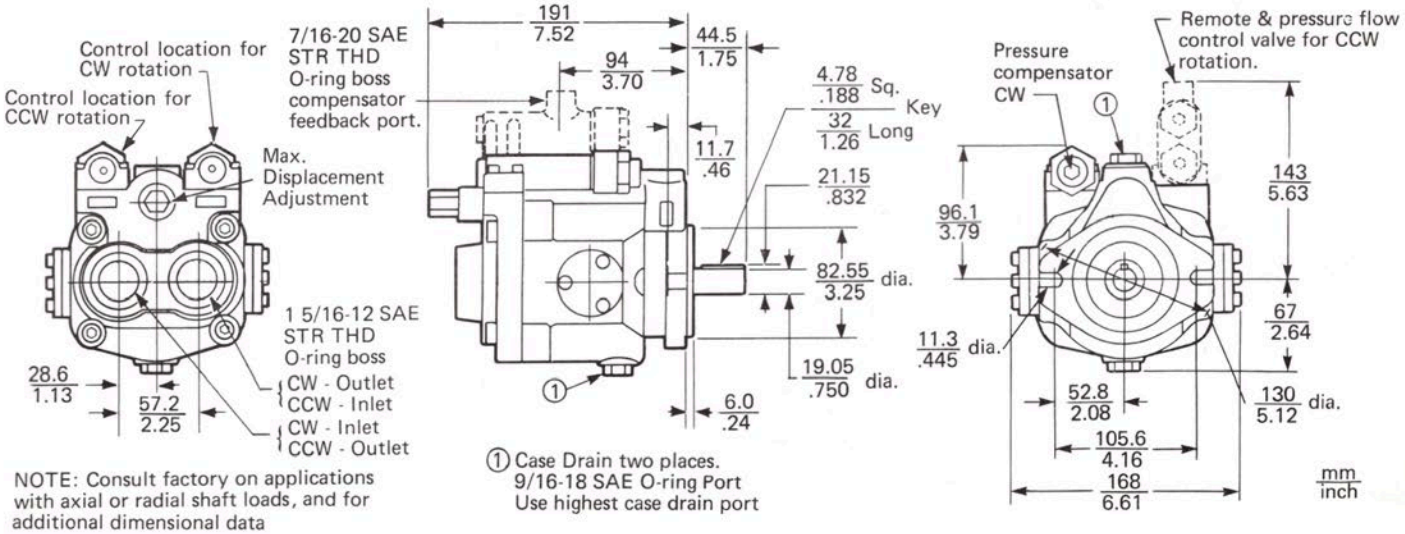
## Performance Characteristics




## Dimensional Data

Pump data based on hydraulic fluid at 120° F with a viscosity of 190 Ssu. Inlet pressure 5 inches Hg vacuum.




NOTE: Consult factory on applications with axial or radial shaft loads, and for additional dimensional data

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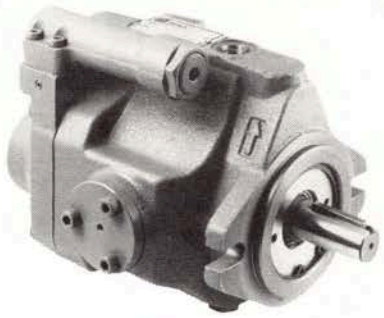
# Axial Piston Pumps, Variable Displacement



## PVPQ-11

## Typical Specifications

| | English Units | Metric Units |
|---|---|---|
| Theor. Displ. | 1.41 $in^3$/rev | 23.1 $cm^3$/rev |
| Del. @ 1800 rpm | 11.0 gpm | 41.6 l/m |
| Power input @ rated speed and pressure | 21.0 hp | 15.7 kW |
| Case press. (max) † | 5 psig | 0.4 bar |
| Rated pressure (continuous) | 3000 psi | 210 bar |
| Fluid range † | 100-250 Ssu | 20-55 cSt |
| Max. starting viscosity | 2000 Ssu | 440 cSt |
| Vol. adjustment @ 1800 rpm, 0 psi | 2.9 to 11.0 gpm | 11.0 to 41.6 l/m |
| Min. inlet cond., vacuum | 5 in Hg | 127 mm Hg |
| Operating temp. | 32° to 180°F | 0° to 82°C |
| Min. compensator setting † | 120 psi | 8 bar |
| Weight | 40 lbs | 18.2 kg |

| | |
|---|---|
| Speeds Rated | 1800 rpm |
| Min. | 500 rpm |
| Max. | 1800 rpm |
| Response time @ rated cond. | 40 ms per SAE J745C |
| Recovery time @ rated cond. | 80 ms per SAE J745C |
| Filtration Suct. | 149 micron or better |
| Disch. | 10 & 25 micron absolute † |
| Mounting | SAE B 2 bolt |
| Porting Inlet | $1^5/_{16}$-12 SAE O-ring |
| Outlet | $1^5/_{16}$-12 SAE O-ring |
| Drain | $^9/_{16}$-18 SAE O-ring |
| Rotation | CW or CCW facing shaft |
| Shaft size | 7/8 in dia. keyed |

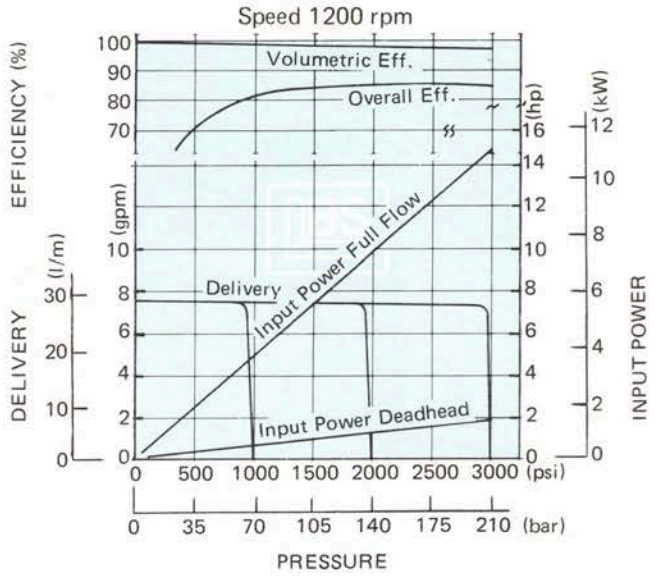
## Sound Levels ($dB_A$) ▵

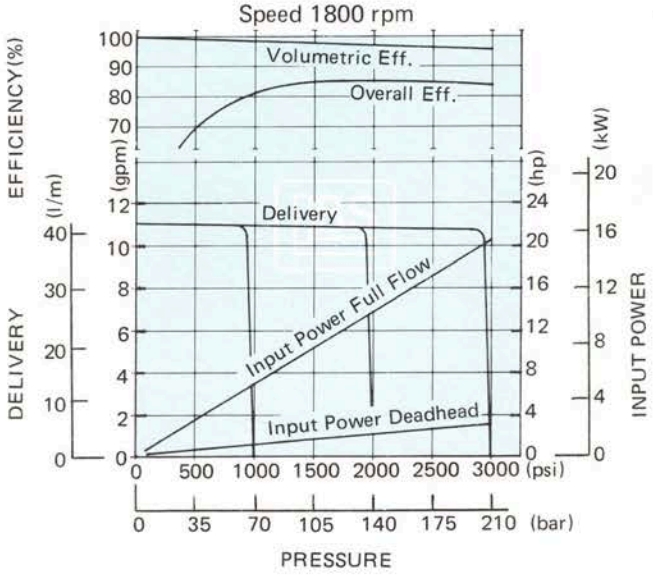
| Pressure | 1000 psi 70 bar | | 3000 psi 210 bar | |
|---|---|---|---|---|
| Speed \ Displ. | Dead-head | Full flow | Dead head | Full flow |
| 1200 rpm | 58 | 61 | 63 | 66 |
| 1800 rpm | 61 | 66 | 68 | 71 |

▵ Measured 3.3 ft (1meter) from pump

† See application recommendations section for further details.

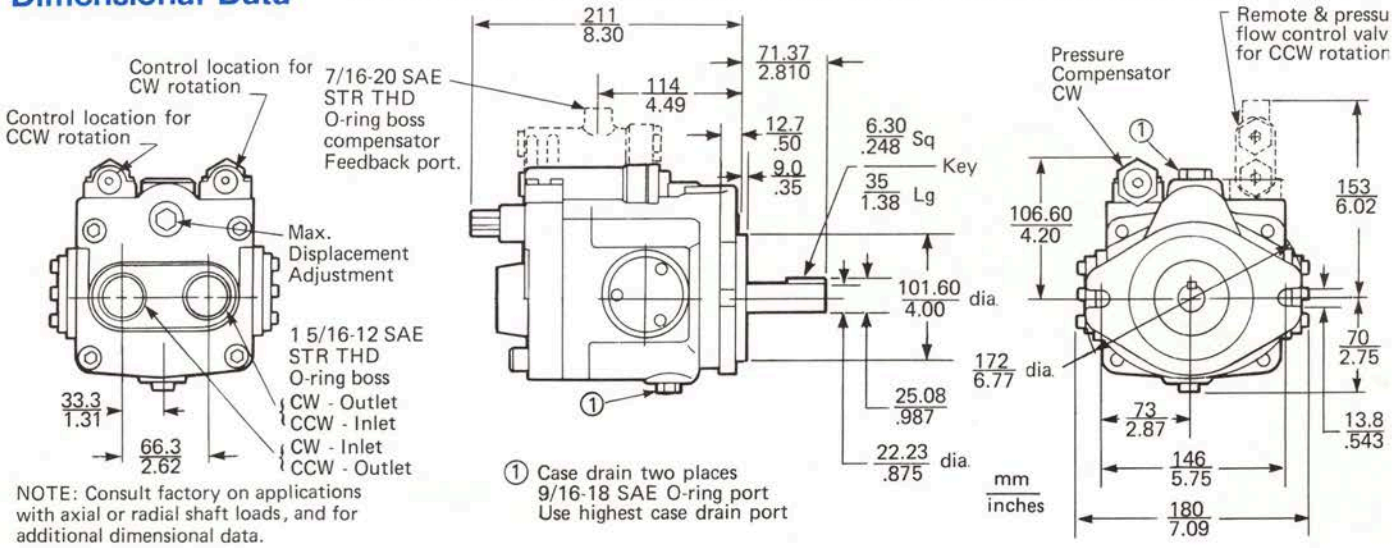
## Performance Characteristics




## Dimensional Data

Pump data based on hydraulic fluid at 120° F with a viscosity of 190 Ssu. Inlet pressure 5 inches Hg vacuum.




NOTE: Consult factory on applications with axial or radial shaft loads, and for additional dimensional data.

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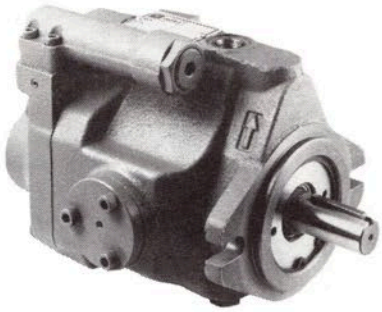
# Axial Piston Pumps, Variable Displacement



## PVPQ-18

## Typical Specifications

| | English Units | Metric Units |
|---|---|---|
| Theor. Displ. | 2.30 $in^3$/rev | 37.7 $cm^3$/rev |
| Del. @ 1800 rpm | 17.9 gpm | 67.8 l/m |
| Power input @ rated speed and pressure | 37.5 hp | 28.0 kW |
| Case press. (max) † | 5 psig | 0.4 bar |
| Rated pressure (continuous) | 3000 psi | 210 bar |
| Fluid range † | 100-250 Ssu | 20-55 cSt |
| Max. starting viscosity | 2000 Ssu | 440 cSt |
| Vol. adjustment @ 1800 rpm, 0 psi | 7.4 to 17.9 gpm | 28.0 to 67.8 l/m |
| Min. inlet cond., vacuum | 5 in Hg | 127 cm Hg |
| Operating temp. | 32° to 180°F | 0° to 82°C |
| Min. compensator setting † | 120 psi | 8 bar |
| Weight | 48 lb | 21.8 kg |

| | |
|---|---|
| Rated Speeds Min. Max. | 1800 rpm 500 rpm 1800 rpm |
| Response time @ rated cond. | 40 ms per SAE J745C |
| Recovery time @ rated cond. | 90 ms per SAE J745C |
| Filtration Suct. Disch. | 149 micron or better 10 & 25 micron absolute † |
| Mounting | SAE B 2 bolt |
| Inlet Porting Outlet Drain | 1⅝-12 SAE O-ring 1⅝-12 SAE O-ring ¾-16 SAE O-ring |
| Rotation | CW or CCW facing shaft |
| Shaft size | 7/8 dia. keyed |

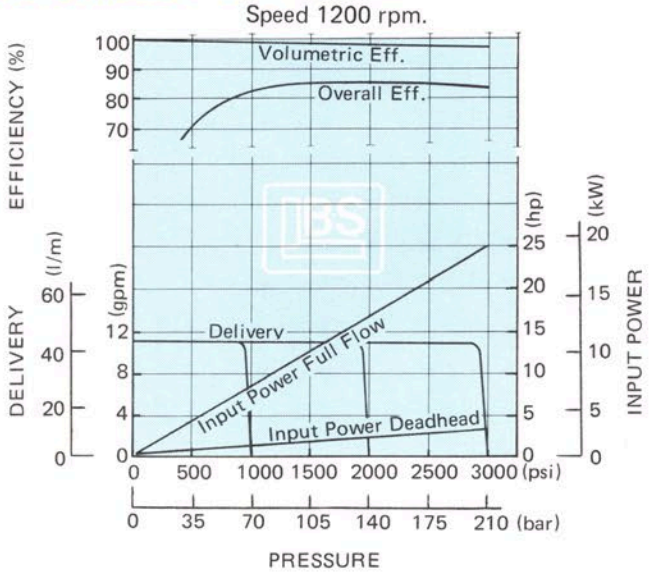
† See application recommendations section for further details.

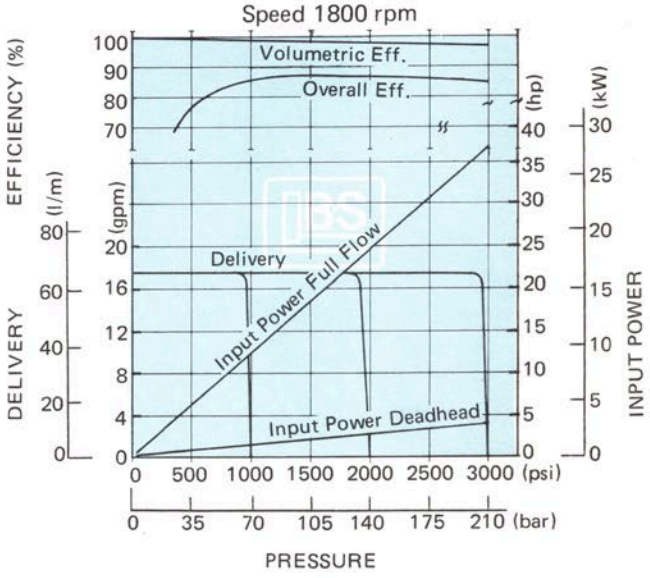
## Sound Levels ($dB_A$)△

| Pressure | 1000 psi 70 bar | | 3000 psi 210 bar | |
|---|---|---|---|---|
| Speed \ Displ. | Dead-head | Full flow | Dead-head | Full flow |
| 1200 rpm | 58 | 62 | 63 | 67 |
| 1800 rpm | 62 | 68 | 71 | 75 |

△ Measured 3.3 ft (1 meter) from pump

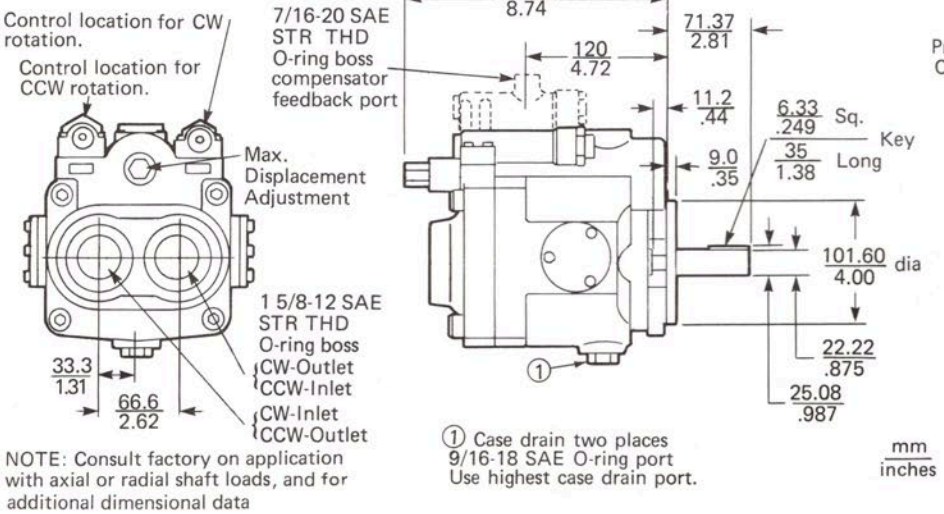
## Performance Characteristics




Pump data based on hydraulic fluid at 120°F with a viscosity of 190 Ssu. Inlet pressure 5 inches Hg vacuum.

## Dimensional Data




NOTE: Consult factory on application with axial or radial shaft loads, and for additional dimensional data

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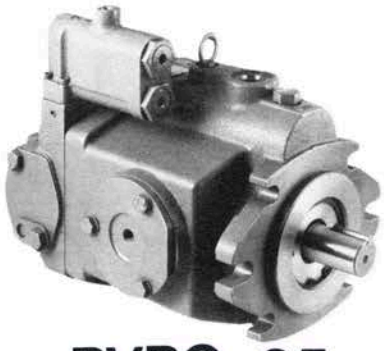
# Axial Piston Pumps, Variable Displacement



## PVPQ-25

## Typical Specifications

| | English Units | Metric Units |
|---|---|---|
| Theor. Displ. | 3.15 $in^3$/rev | 51.6 $cm^3$/rev |
| Del. @ 1800 rpm | 24.6 gpm | 93.1 l/m |
| Power input @ rated speed and pressure | 50 hp | 37.3 kW |
| Case press. (max) † | 5 psig | 0.4 bar |
| Rated pressure (continuous) | 3000 psi | 210 bar |
| Fluid range† | 100-250 Ssu | 20-55 cSt |
| Max. starting viscosity | 2000 Ssu | 440 cSt |
| Vol. adjustment @ 1800 rpm, 0 psi | 0 to 24.6 gpm | 0 to 93.1 l/m |
| Min. inlet cond., vacuum | 5 in Hg | 127 mm Hg |
| Operating temp. | 32° to 180°F | 0° to 82°C |
| Min. compensator setting † | 120 psi | 8 bar |
| Weight | 110 lbs | 50 kg |

| | |
|---|---|
| Speeds Rated | 1800 rpm |
| Min. | 500 rpm |
| Max. | 1800 rpm |
| Response time @ rated cond. | 50 ms per SAE J745C |
| Recovery time @ rated cond. | 100 ms per SAE J745C |
| Filtration Suct. | 149 micron or better |
| Disch. | 10 & 25 micron absolute † |
| Mounting | SAE C 2 or 4 bolt |
| Porting Inlet | 1½" SAE 4 bolt flange |
| Outlet | 1½" SAE 4 bolt flange |
| Drain | 7/8 -14 SAE O-ring |
| Rotation | CW or CCW facing shaft |
| Shaft size | 1¼ dia. keyed |

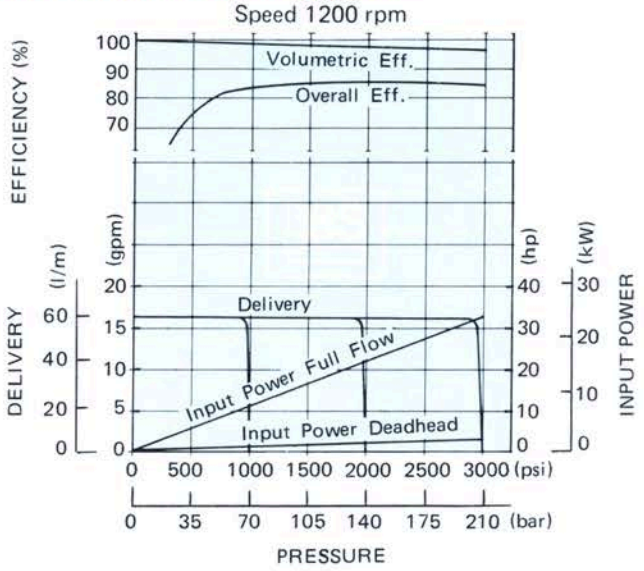
† See application recommendations section for further details.

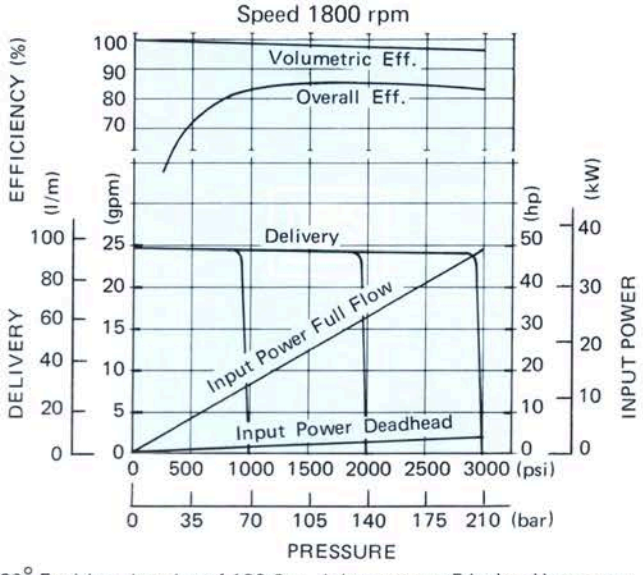
## Sound Levels ($dB_A$)△

| Pressure | 1000 psi 70 bar | | 3000 psi 210 bar | |
|---|---|---|---|---|
| Speed \ Displ. | Dead-head | Full flow | Dead-head | Full flow |
| 1200 rpm | 61 | 66 | 66 | 69 |
| 1800 rpm | 65 | 69 | 71 | 74 |

△ Measured 3.3 ft (1 meter) from pump

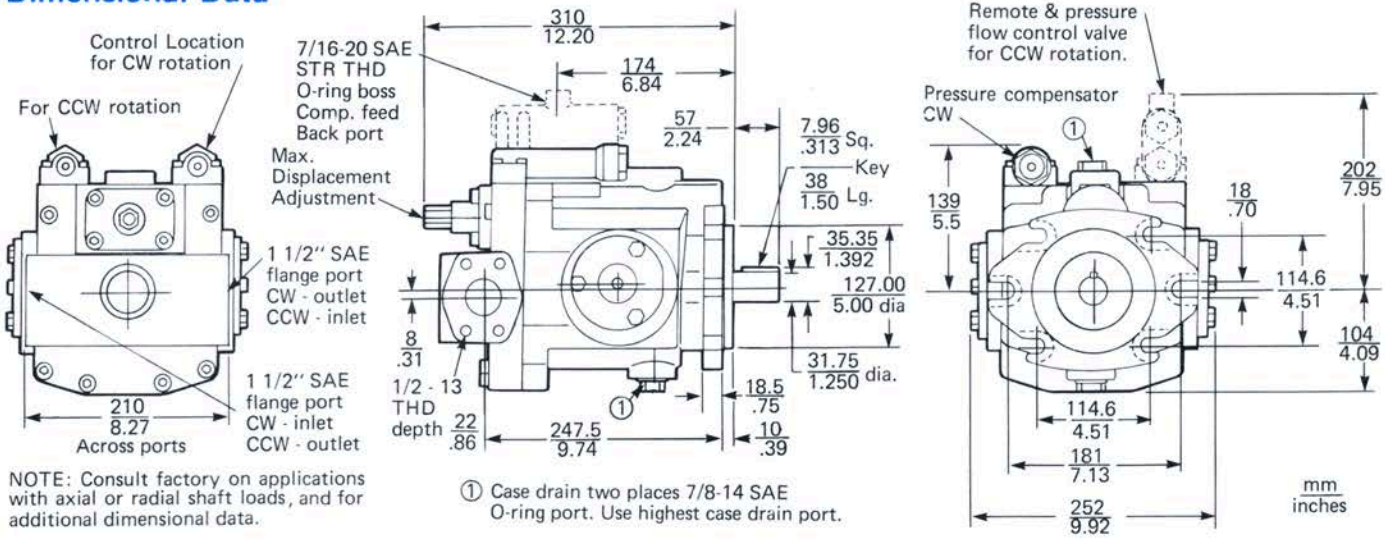
## Performance Characteristics




Pump data based on hydraulic fluid at 120° F with a viscosity of 190 Ssu. Inlet pressure 5 inches Hg vacuum.

## Dimensional Data




NOTE: Consult factory on applications with axial or radial shaft loads, and for additional dimensional data.

① Case drain two places 7/8-14 SAE O-ring port. Use highest case drain port.

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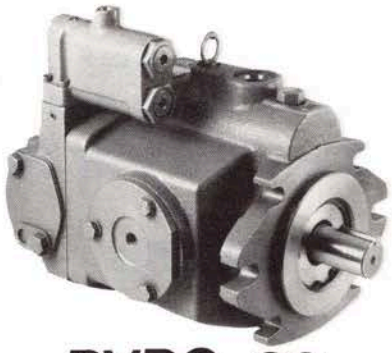
# Axial Piston Pumps, Variable Displacement



## PVPQ-33

## Typical Specifications

| | English Units | Metric Units |
|---|---|---|
| Theor. Displ. | 4.26 $in^3$/rev | 69.8 $cm^3$/rev |
| Del. @ 1800 rpm | 33.2 gpm | 125.7 l/m |
| Power input @ rated speed and pressure | 65 hp | 48.5 kW |
| Case press. (max) † | 5 psig | 0.4 bar |
| Rated pressure (continuous) | 3000 psi | 210 bar |
| Fluid range † | 100-250 Ssu | 20-55 cSt |
| Max. starting viscosity | 2000 Ssu | 440 cSt |
| Vol. adjustment @ 1800 rpm, 0 psi | 5.3 to 33.2 gpm | 20.1 to 125.7 l/m |
| Min. inlet cond., vacuum | 5 in Hg | 127 mm Hg |
| Operating temp. | 32° to 180°F | 0° to 82°C |
| Min. compensator setting † | 120 psi | 8 bar |
| Weight | 120 lb | 54.5 kg |

| | |
|---|---|
| Rated Speeds Min. Max. | 1800 rpm 500 rpm 1800 rpm |
| Response time @ rated cond. | 50 ms per SAE J745C |
| Recovery time @ rated cond. | 110 ms per SAE J745C |
| Filtration Suct. Disch. | 149 micron or better 10 & 25 micron absolute † |
| Mounting | SAE C 2 or 4 bolt |
| Porting Inlet Outlet Drain | 1½ SAE 4 bolt flange 1½ SAE 4 bolt flange 7/8 -14 SAE O-ring |
| Rotation | CW or CCW facing shaft |
| Shaft size | 1¼ dia. keyed |

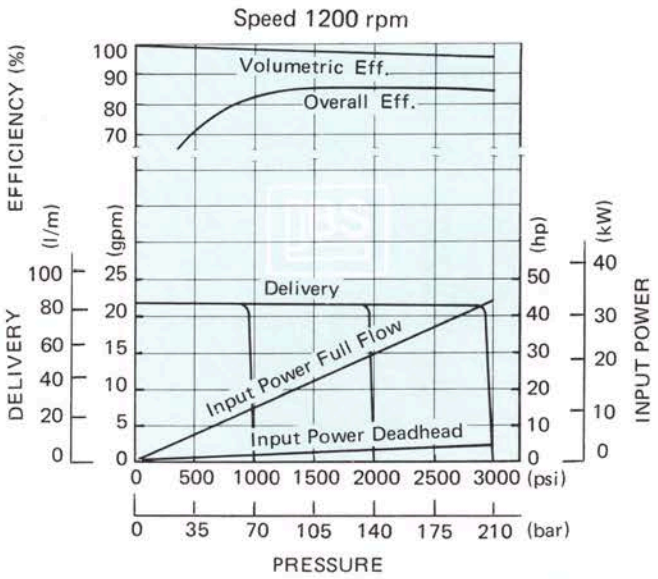
## Sound Levels ($dB_A$) △

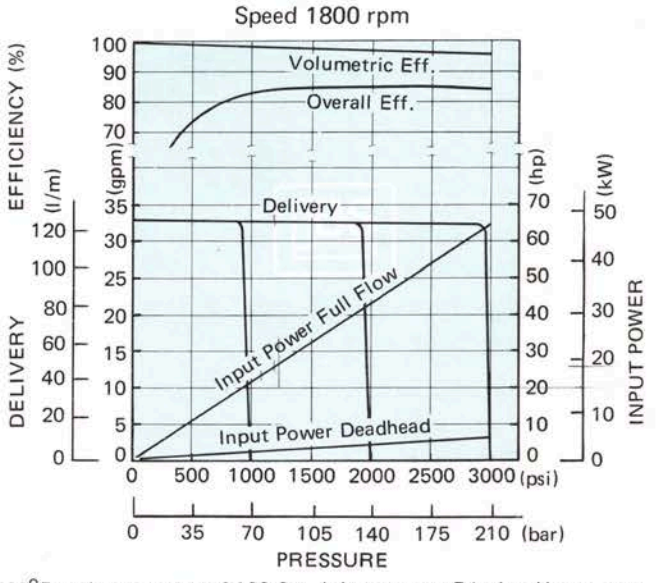
| Pressure | 1000 psi 70 bar | | 3000 psi 210 bar | |
|---|---|---|---|---|
| Speed \ Displ. | Dead-head | Full flow | Dead-head | Full flow |
| 1200 rpm | 64 | 67 | 68 | 72 |
| 1800 rpm | 68 | 73 | 74 | 77 |

△ Measured 3.3 ft (1 meter) from pump

† See application recommendations section for further details.

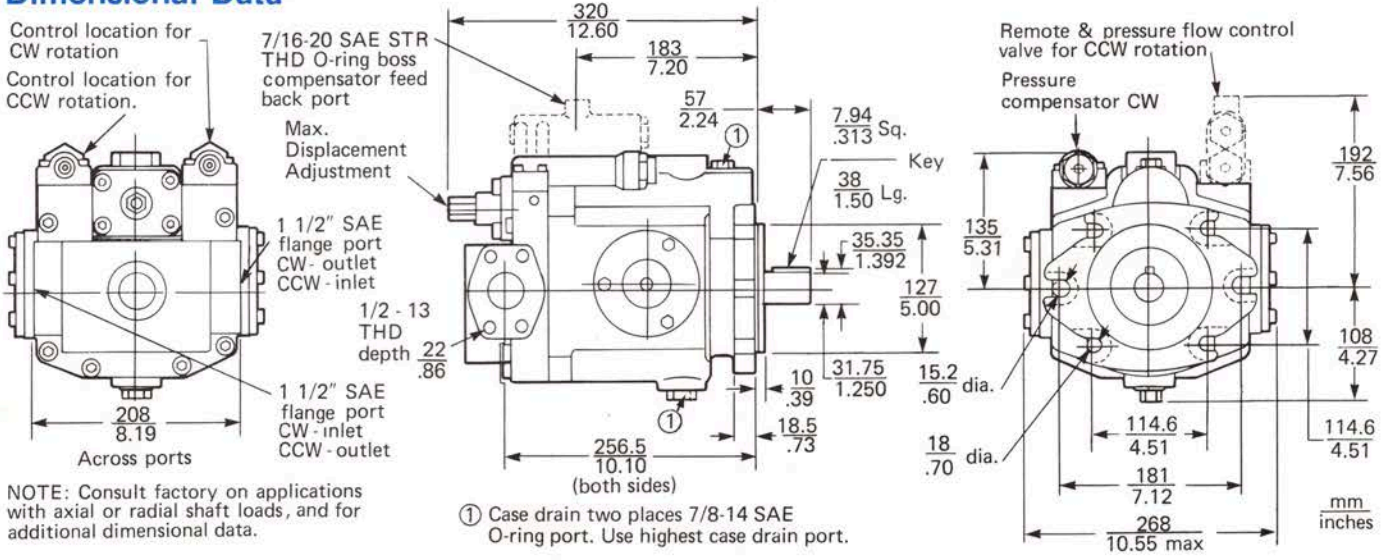
## Performance Characteristics




Pump data based on hydraulic fluid at 120°F with a viscosity of 190 Ssu. Inlet pressure 5 inches Hg vacuum.

## Dimensional Data

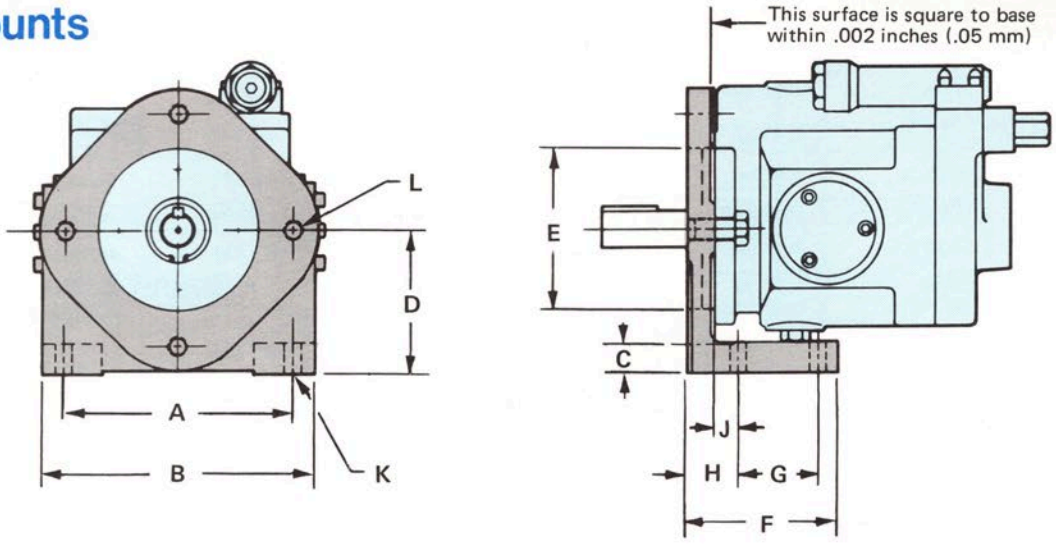



NOTE: Consult factory on applications with axial or radial shaft loads, and for additional dimensional data.

① Case drain two places 7/8-14 SAE O-ring port. Use highest case drain port.

# Variable Displacement Axial Piston Pumps

## Foot Mounts




| Size | Kit No. | A | B | C | D | E Dia. Thru | F | G | H | J | K | L | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAE A PVPQ 7 | P577-A | mm 127 / in 5.00 | 157 / 6.18 | 12.7 / .50 | 69.85 / 2.750 | 82.80 / 3.260 | 95.3 / 3.75 | 50.8 / 2.00 | 31.8 / 1.25 | 15.0 / .59 | 11.2 Dia. / .44 Thru 4-Holes | 3/8-16 UNC-2B THD 4-Holes | 1.8 kg / 4 lbs. |
| SAE B PVPQ 11, 18 | P578-A | mm 146 / in 5.75 | 175 / 6.87 | 12.7 / .50 | 92.1 / 3.625 | 101.85 / 4.010 | 95.3 / 3.75 | 50.8 / 2.00 | 31.8 / 1.25 | 12.7 / .50 | 11.2 Dia. / .44 Thru 4-Holes | ½-13 UNC-2B THD 4-Holes | 2.6 kg / 5 ¾ lbs. |
| SAE A PVPQ 25, 33 | P579-A | mm 235 / in 9.25 | 267 / 10.5 | 15.7 / .62 | 104.95 / 4.132 | 127.25 / 5.010 | 133.4 / 5.25 | 76.2 / 3.00 | 39.6 / 1.56 | 19.1 / .75 | 11.2 Dia. / .44 Thru 4-Holes | 5/8-11 UNC-2B THD 4-Holes | 5.1 kg / 11 ¼ lbs. |

## Port Flange Kits (For PVPQ 25 and 33 only)

## Model Code

**F92-12-S-***

- SAE 1 1/2 " 4 bolt flange
- **Nominal Size** Inlet and outlet in eighth's of an inch.
- **Thread Size** No symbol 1 1/2" NPTF; S- SAE O-ring port 1 7/8 - 12; E- 1 1/2" BSP
- **Seals** No symbol - Buna N; L - viton

Kits include: Inlet and outlet flange, O-rings, and cap screws.

# Variable Displacement Axial Piston Pumps

## Application Recommendations

### Installation
It is recommended that the pump be mounted with the shaft horizontal and the misalignment between the pump shaft and drive shaft be less than 0.002 inch (.05 mm) centerline to centerline. The drain line should be installed and sized such that the case pressure of the pump does not exceed 5 psi (0.3 bar) above inlet pressure and never exceeds 25 psia (1.7 bar absolute). A separate drain line back to the reservoir is recommended. The case drain port selected and the drain line must be installed in such a position as to insure a case oil level is maintained at or above the unit centerline.

### Start Up
Fill the pump case to the centerline or above with system fluid. Leave the outlet unrestricted and jog the pump to prime. Restrict the outlet and set the compensator to desired level.

### Drive Specifications
The shaft rotation is either clockwise or counter-clockwise as manufactured. Rotation is not reversible without changing the valve plate and pump rear cover. A flexible coupling between the prime mover and the pump is preferred to prevent excessive shaft loading. If the pump drive is subjected to axial and/or radial loads, please consult the factory for specific recommendations.

### Filtration
For pressures less than 2000 psi (140 bar), a fluid contamination rating of 18/15 (ISO 4406) or better is recommended. This corresponds to a contaminant level of less than 580 particles/milliliter greater than 10 micron. Generally this may be achieved by using either a pressure or return line filter with a 25 micron or finer absolute rating.

For pressures above 2000 psi (140 bar), a fluid contamination rating of 16/13 (ISO 4406) or better is recommended. This corresponds to a contaminant level of less than 125 particles/milliliter greater than 10 micron. Generally this may be achieved by using either a pressure or return line filter with a 10 micron or finer absolute rating.

System cleanliness is important for proper operation. Regularly scheduled filter changes will help to keep the fluid clean and ensure reliable operation and long component life.

### Safety Relief
A system relief valve capable of passing full pump output flow should be included in all hydraulic circuits to provide redundant protection. The purpose of the relief valve is to supress damaging pressure spikes in stiff hydraulic systems and provide overpressure protection in the remote possibility of a compensator malfunction. Typically the relief valve should be set at 100 to 300 psi (7 to 21 bar) above the pressure compensator set point.

### Fluid Recommendations
Petroleum base fluids are preferred. Recommended operating viscosity is 100-250 Ssu (20-55 cSt). Acceptable operating viscosity is 70-400 Ssu (13-90 cSt). Recommended temperature range is 32° to 180°F (0 to 82°C). Life factor on petroleum base fluids is 100%.

HF-A, oil in water emulsions, consult the factory for specific operating recommendations.

HF-B, water in oil emulsions, maximum of 1200 rpm and 2000 psi (140 bar). Life factor of 40%.

HF-C, water/glycol, maximum of 1200 rpm at 3000 psi (210 bar), and 1800 rpm at 2000 psi (140 bar). Life factor of 70%.

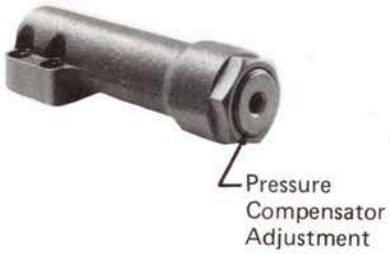
HF-D, phosphate ester base, must use viton seals. Life factor of 90%.

### Volume Control
The volume control screw can be adjusted to limit the maximum pump output by means of a mechanical stop on the pump swash plate. The control is set from the factory at maximum pump delivery. The range of adjustment of the screw is specified under the individual pump characteristics. Turning the screw clockwise facing the adjustment end will decrease pump maximum output volume. Adjustment sensitivity ranges from 0.7 gpm (2.6 l/m) per turn of the screw on the PVPQ 7 to 2.3 gpm (8.7 l/m) on the PVPQ 33 at 1800 rpm.

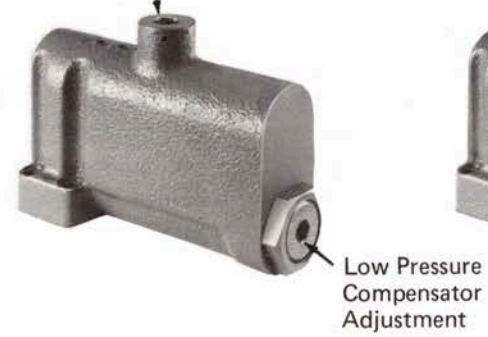
### Minimum Compensator Setting
The compensator should NOT be set below the minimum pressure of 120 psi (8 bar). This minimum pump output pressure is required to provide adequate lubrication to the pump internal rotating parts. Damage can result from operating below this minimum pressure for other than momentary conditions.

# Variable Displacement Axial Piston Pumps

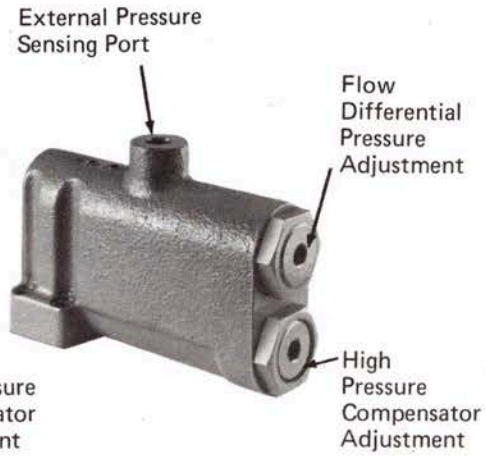
## Pump Controls




**Pressure Compensator (PC)**

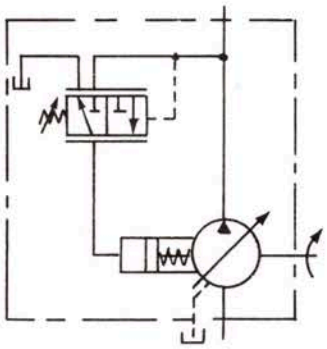



**Remote Pressure Compensator (PCR)**

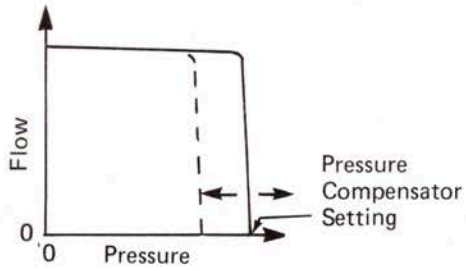



**Pressure Flow Compensator (PCF)**

### Pressure Compensator Control (PC)



**Schematic Diagram**



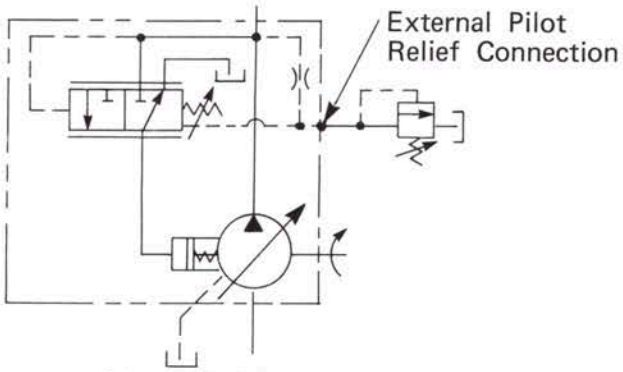

**Compensator Adjustability**

The pressure compensator control automatically adjusts pump delivery to produce only the output flow required to maintain the pressure compensator setting. The compensator is adjustable within the ordered range (see model code guide). The compensator is factory set at 500-600 psi (35-41 bar), with a minimum setting of 120 psi (8 bar) available (1M option only). Maximum pump delivery is maintained until approximately 50 psi (3 bar) below compensator setting is reached, when flow reduction commences. The pressure is adjusted by turning the adjusting screw on the pressure compensator. Clockwise rotation facing the screw increases pressure setting.

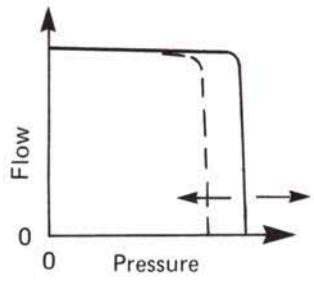
# Variable Displacement Axial Piston Pumps

## Pump Controls

### Remote Pressure Compensator (Option PCR)



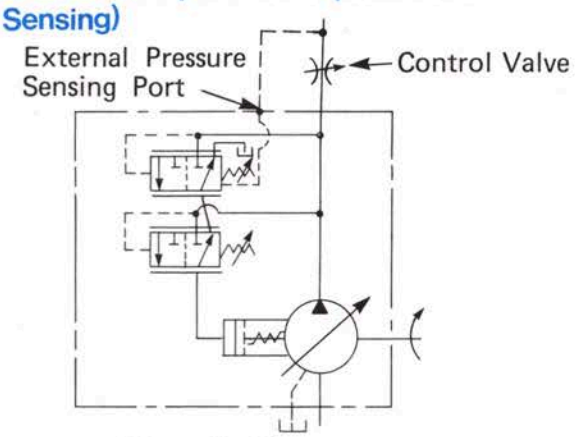

Schematic Diagram



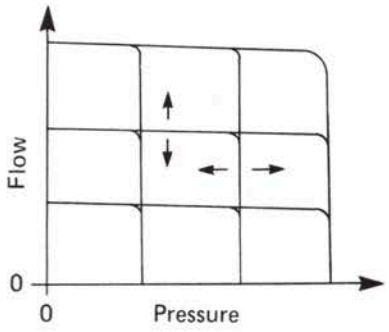

Compensator Adjustability

This control option is similar to the pressure compensator control except that the pressure setting is controlled by a remotely located relief valve. The relief valve must have a capacity of 0.5 gpm (1.9 l/m). Double A CA-02 or CQG-02 series relief valves are recommended. The low pressure adjustment range for the compensator is 250 - 1200 psi (17-83 bar) and typically set at 250 psi. This adjustment range is controlled by a spring in the pump compensator control with the remote relief valve vented. Pressures above the setting of the low pressure adjustment are controlled by the sum of the external relief setting and the low pressure adjustment setting. A maximum length of 5 feet (1.5 m) of ¼ inch (6.4 mm) steel tubing is recommended between the remote relief valve and the pump compensator. Compensator response and system stability are generally adversely affected by long pilot line lengths. For longer pilot line lengths consult your Double A representitive.

### Pressure Flow Compensator (Option PCF) (Load Sensing)




Schematic Diagram




Compensator Adjustability

The PCF compensator provides a highly efficient, very controllable system at the lowest possible power and noise levels. The pump control has a sensing port that is connected to measure pressure drop across a variable or fixed orifice (control valve). The differential pressure signal is then used to match pump output to system load requirements. When system flow is not required and the sensing port is vented, the pump standby pressure will be equal to the selected load sensing (flow) differential pressure of 200-250 psi (14-17 bar) rather than the much higher standby pressure in the PC compensator (up to 3000 psi, 210 bar). The PCF compensator, with its low standby pressure, results in a more efficient system with less heat build up in the fluid and unnecessary power consumption. The PCF compensator can be used to provide essentially constant flow output when either the system load or shaft speed varies. Exceptional flow control flexibility is acheivable by using Double A proportional valves for the control valve function.

Double A

# Model Code

**PVPQ-11-C-L-10A*-PCR-1M**

**PVPQ** – Variable Piston Pump Super Quiet

**NOMINAL SIZE at 1800 rpm**
**7**– 7 gpm (.91 $in^3$/rev)
**11** – 11 gpm (1.41 $in^3$/rev)
**18** – 18 gpm (2.30 $in^3$/rev)
**25** – 25 gpm (3.15 $in^3$/rev)
**33** – 33 gpm (4.26 $in^3$/rev)

**SHAFT ROTATION**
No symbol – CW as viewed from shaft end.
C – CCW as viewed from shaft end. **

**SEALS**
No symbol – Buna N
L – Viton

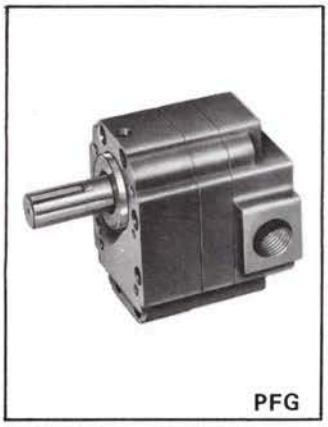
**COMPENSATOR ADJUSTMENT RANGE**
No symbol – 500 to 3000 psi
1M– 120 to 1000 psi
2M– 225 to 2000 psi

**CONTROL TYPE**
PC – Pressure compensated
PCR – Remote pressure compensator
PCF – Pressure flow compensator 200-250 psi adjustment

**DESIGN SERIES**
Numbers in * location are subject to change without notice due to design improvement. Changes will not affect installation dimensions but may affect service parts.

** Limited availability, except for full factory lead time delivery.
NOTE: Pumps with special options such as splined shafts, though drive shafts, side/end ports interchanged, and ganged pumps are available only on a factory lead time basis. Consult Double A Products for further details.

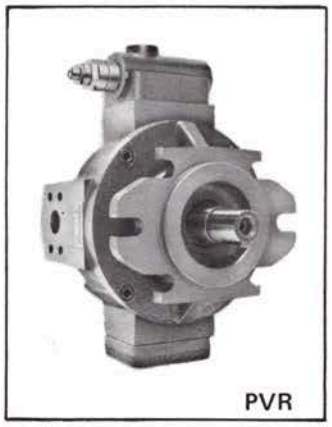
# Other Brown & Sharpe Fluid Power Division Products




External
Gear Pumps
Cat. No. 10025-P


Single and Double
Gerotor Pumps
Cat. No. 10,000-P


Variable Displacement
Vane Pumps
Cat. No. 11108-P




Variable Displacement
Radial Piston Pumps
Cat. No. 11250-P

**DOUBLE A VALVES AND PUMPS**
**GEROTOR PUMPS AND MOTORS**
**STAFFA MOTORS AND BRAKES**
**OLMSTED VALVES AND SYSTEMS**
**PACKAGED POWER SYSTEMS**

Double A

*. . . Innovative by Design*

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