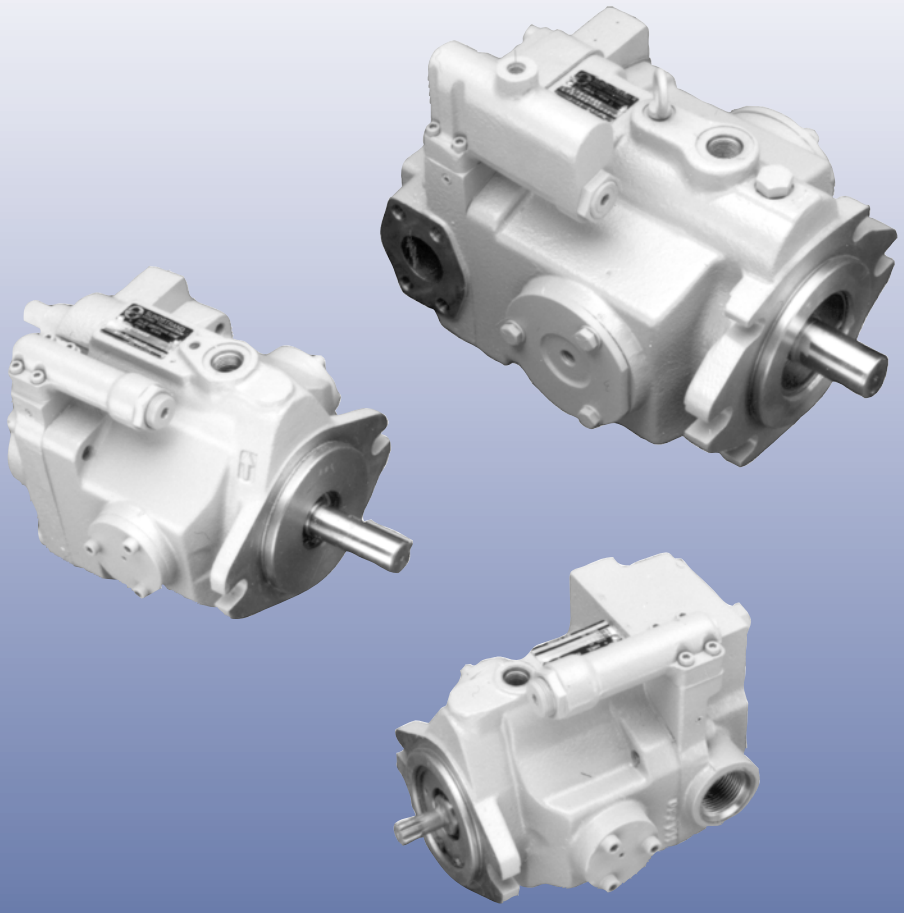
SAUER DANFOSS

Series L



Open Circuit

Axial Piston Pumps

Technical Information

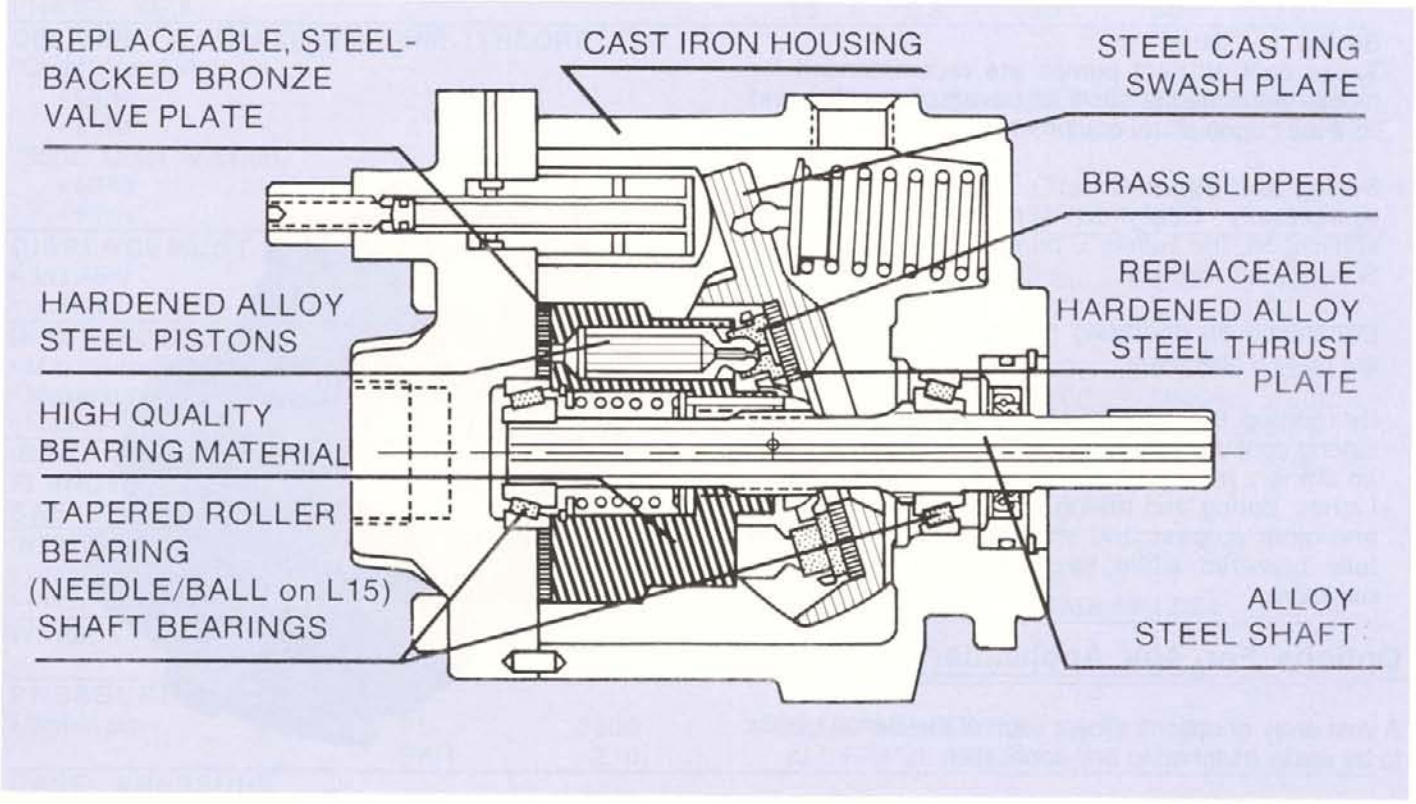
Open Circuit Pumps

Design Features

- Variable Displacement, Axial Piston Pumps
- Multiple Control Options
- Proven Mobile and Industrial Applications
- Two Versions Available: "Quiet (Mobile)" and "Super Quiet" (Industrial)
- Operating Pressures to 3000 PSI (210 BAR)
- Drive Speeds to 3600 RPM
- Atmospheric Inlet
- Worldwide Service

Printed in U.S.A. 0193 H

Open Circuit Pumps



Proven Components

All Sauer-Sundstrand Series L variable displacement, axial piston pumps use the same basic materials, processes, and design of piston/slipper and cylinder block that have already been field proven in numerous closed circuit applications. The replacement valve plate is made of steel or steel backed bronze which offers a superior bearing surface. The rugged composition of the valve plate reduces repair costs and decreases susceptibility to lubrication failures.

Series L pumps feature standard SAE mounting flanges with continuous pilot diameters. This allows direct mounting on surfaces that need to be sealed with a gasket or O-ring.

Precise Control

The pump will always deliver a volume of fluid in proportion to the angle of the swashplate at any given input speed. Varying the swashplate angle provides a means of varying the pump flow. During normal operation, the swashplate angle varies from its maximum displacement position to the minimum "deadhead" position. The standard flow adjusting screw enables the maximum pump delivery to be externally adjusted to match precise system flow requirements.

The speed of the actuator (cylinder, motor, etc.) used in the system depends on the volume of fluid being pumped, while the load on the actuator determines the operating pressure. If the actuator is to be reversed, a directional control valve is necessary since the pump swashplate operates on one side of center only.

Two Versions Available

Two versions of the Series L pumps are available:

- **Series L "Quiet"**
  These cost efficient pumps are recommended for mobile applications such as pavers, man lifts, and light duty agricultural equipment.

- **Series L "Super-Quiet"**
  Specifically designed for the noise-critical application, the Series L pumps are available in a Super-Quiet version.

  Depending on operating parameters, noise levels are up to 6 dbA lower.

  By utilizing the appropriate automatic and energy saving controls, the Series L "Super-Quiet" pump is an efficient means of operating industrial machines. Lathes, boring and milling equipment, pipe cutters, and other process and shaping machinery can be fully powered while keeping noise levels to a minimum.

Options For Any Application

A vast array of options allows each of the Series L units to be easily matched to any application.

A choice of clockwise or counterclockwise input shaft rotation is available on all Series L units. SAE splined and straight keyed shafts are available as well as auxiliary mounting pads on certain models.

Optional side or end porting allows the Series L units to further adapt to any mounting position. Pump drive may be direct from the prime mover, or indirect using belt, chain, or gear drive.

Series L units are available for use with high-water-content and other fire resistant fluids. Contact your Sauer-Sundstrandsales representative for details.

The selection of field proven controls allows you to match the proper control function to the application. Benefits include circuit simplification as well as potential energy savings.

Worldwide Sales and Service

Sauer-Sundstrand sales and service representatives are located worldwide in major industrial trade areas to provide experienced application assistance and prompt delivery of "standardized" models to meet your hydraulic system needs.

Variable Displacement Pumps

FRAME SIZE			15	23	38	50	70
DELIVERY AT MAXIMUM RPM (THEORETICAL)							
"Quiet" Version							
• GPM			14.0	19.5	29.8	32.7	41.0
• l/min			53.0	73.8	113.0	124.0	155.0
"Super Quiet" Version							
• GPM			7.1	11.0	17.9	24.5	33.2
• l/min			26.9	41.6	67.8	92.7	125.7
DISPLACEMENT							
• In3 /Rev			.913	1.41	2.30	3.15	4.26
• cc/Rev			15	23	38	50	70
INPUT SPEED							
• Maximum-RPM- "Quiet" Version			3600	3200	3000	2400	2200
• Maximum-RPM- "Super Quiet" Version			1800	1800	1800	1800	1800
• Minimum-RPM			500	500	500	500	500
INPUT MOUNTING FLANGE PER SAE J744			SAE A	SAE B	SAE B	SAE C	SAE C
INPUT SHAFT (STD. SPLINE)							
• Number of Teeth			9	13	13	14	14
• Pitch			16/32	16/32	16/32	12/24	12/24
WEIGHT	LBS		25	40	48	110	120
	KG		11.5	18.0	22.0	50.0	54.5
PRESSURE							
• Maximum	PSI	3000	ALL FRAME SIZES				
	BAR	210	ALL FRAME SIZES				
CASE PRESSURE							
• Maximum	PSI	10	ALL FRAME SIZES				
	BAR	0.7	ALL FRAME SIZES				
TEMPERATURE AT HOTTEST POINT IN SYSTEM (NORMALLY AT CASE DRAIN)							
• Maximum	°F	200	ALL FRAME SIZES				
(not to exceed 5 minutes)	°C	93	ALL FRAME SIZES				
• Continuous	°F	180	ALL FRAME SIZES				
	°C	82	ALL FRAME SIZES				
FLUID VISCOSITY LIMITS -- SUS (CST)							
• Optimum		70 (13)	ALL FRAME SIZES				
• Minimum Continuous		55 (9.0)	ALL FRAME SIZES				
• Minimum Intermittent		47 (6.4)	ALL FRAME SIZES				
• Maximum Continuous		500 (110)	ALL FRAME SIZES				
SUGGESTED FILTRATION							
• Inlet		150 Mesh Strainer	ALL FRAME SIZES				
• Return		Beta 10 = 10 to 20	ALL FRAME SIZES				
INLET VACUUM AT SEA LEVEL							
• Maximum	in. Hg	5	ALL FRAME SIZES				
	BAR (abs)	0.8	ALL FRAME SIZES				

NOTE: Positive inlet pressure is required at maximum pump speeds.

Equations

The following equations are typically used when selecting a pump for a particular application. Sauer-Sundstrand Application Engineering can assist in sizing components for your application.

Terminology

D - Displacement (cu. in./rev.)
P - Fluid Pressure (PSI)
Q - Flow Rate (GPM)
N - Shaft Rotational Speed (RPM)
T - Shaft Torque (lb. in.)
d - Hydraulic Line I.D. (in.
t- Hydraulic Line Wall Thickness (in.)
S - Material Stress (PSI)
e_v - Volumetric Efficiency (%)
e_t - Torque Efficiency (%)
e_o - Overall Efficiency (%)

Horsepower

$$\text{Fluid HP} = \frac{QP}{1714}$$

$$\text{Mechanical HP} = \frac{TN}{63025}$$

Theoretical Power Conversions

$$Q = \frac{DN}{231}$$

(Modified by volumetric efficiency for real case)

$$T = \frac{DP}{2\pi}$$

(Modified by torque efficiency for real case)

Power Conversions With Efficiencies

Volumetric Efficiency (e_V)

$$Q = \frac{DN\,ev}{231} \qquad (1/100)$$

or

$$e_v = \frac{231\,Q}{DN} \qquad (100)$$

Torque Efficiency (e_t)

$$T = \frac{DP}{2\pi\,e_t} \qquad (1/100)$$

or

$$e_t = \frac{DP}{2\pi T} \qquad (100)$$

Power Conversions With Efficiencies (cont.)

Overall Efficiency (e_o)

$$e_o = \frac{\text{Mech. HP}}{\text{Fluid HP}} \quad (100)$$

$$e_o = \left[\frac{TN}{QP}\right]\left[\frac{1714}{63025}\right] \quad (100)$$

or

$$\left[\frac{eo}{100}\right] = \left[\frac{ev}{100}\right]\left[\frac{et}{100}\right]$$

Sizing Hydraulic Line I.D.

For Pressure Lines, Fluid Velocity = 15 feet/sec. maximum.

$$Q = 2.45\ V\ d^2$$

$$d = \frac{(Q)\ 1/2}{6.06}$$

For Suction Lines, Fluid Velocity = 6 feet/sec. maximum

$$d = \frac{(Q)1/2}{3.83}$$

Sizing Line Wall Thickness

$$t = \frac{d}{2}\left[\left\{\frac{(S+P)}{(S-P)}\right\}^{1/2} - 1\right]$$

Note: Working stress for steel hydraulic tubing is normally about 14,000 PSI.

Conversion Factors

Cubic Centimeters = Cubic Inches x 16.39

Cubic Inches = Cubic Centimeters x 0.06102

Cubic Feet = Gallons x 0.1337

Liters = Gallons x 3.785

Kilowatts = Horsepower x .0.7457

Kilograms/Sq. Cm. = Pounds/Sq. In. x 0.0703

Degrees/Second = Revolutions/Minute x 6.0

Centimeters = Inches x 2.54

Millimeters = Inches x 25.4

BAR = PSI x 0.06897

Newton Meters = Pounds Feet x 0.737

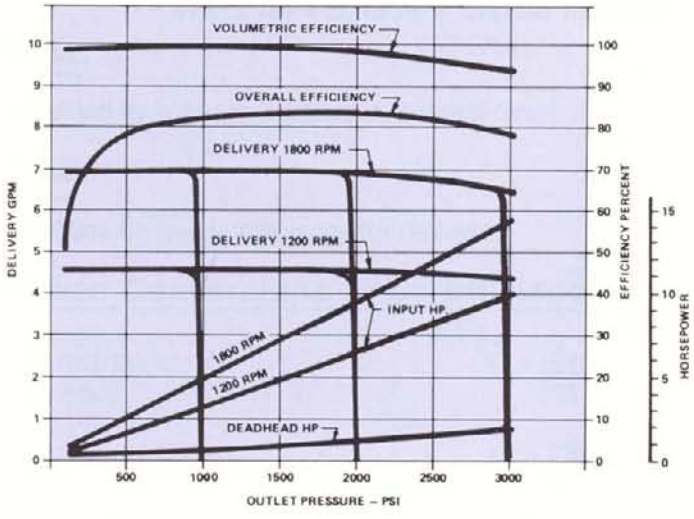
Frame Size 15 - Variable Displacement Pump Specifications

DELIVERY AT MAX. RPM	14 GPM (53 l/min)
MIN INLET PRESSURE	5" Hg Vacuum (0.8 BAR abs.)
FILTRATION	
• Inlet	150 Mesh
• Return Line	25 Micron
CASE PRESSURE	10 PSI (0.7 BAR) Max.
FLUID TEMPERATURE	180°F (82°C) Continuous 200°F (93°C) Intermittent*
MOUNTING FLANGE	SAE "A"
SHAFT OPTIONS	SAE "A" spline or Straight Keyed
WEIGHT	
• Flange Mounted	25 lbs. (11.5 kg)
BEARING B-10 LIFE**	
• 1000 PSI (70 BAR)	130,000 Hrs.
• 2000 PSI (140 BAR)	16,300 Hrs.
• 3000 PSI (210 BAR)	4800 Hrs.

* Not to exceed 5 minutes

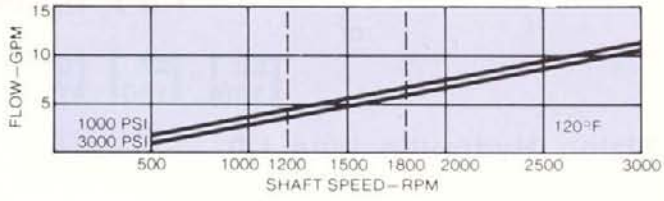
** Based on operation at 1800 RPM and maximum swashplate angle.

Performance Characteristics L-15 Open Circuit Pump

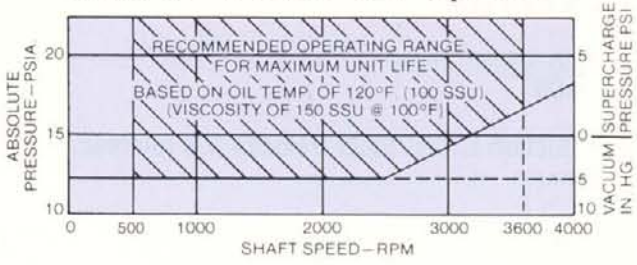


Note: Performance curves based on 120°F oil temperature and ISO VG46 oil, and are representative of this series size.

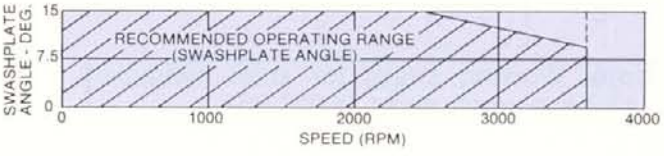
Outlet Flow - GPM



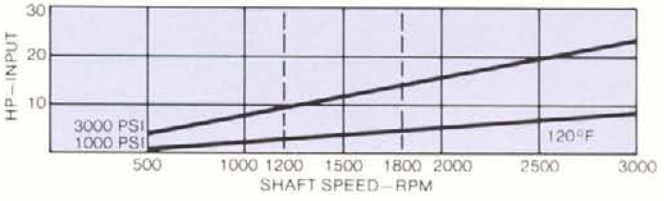
Inlet Pressure vs. Speed



Swashplate Angle vs. Shaft Speed



Input Horsepower



Noise Levels - db(a)

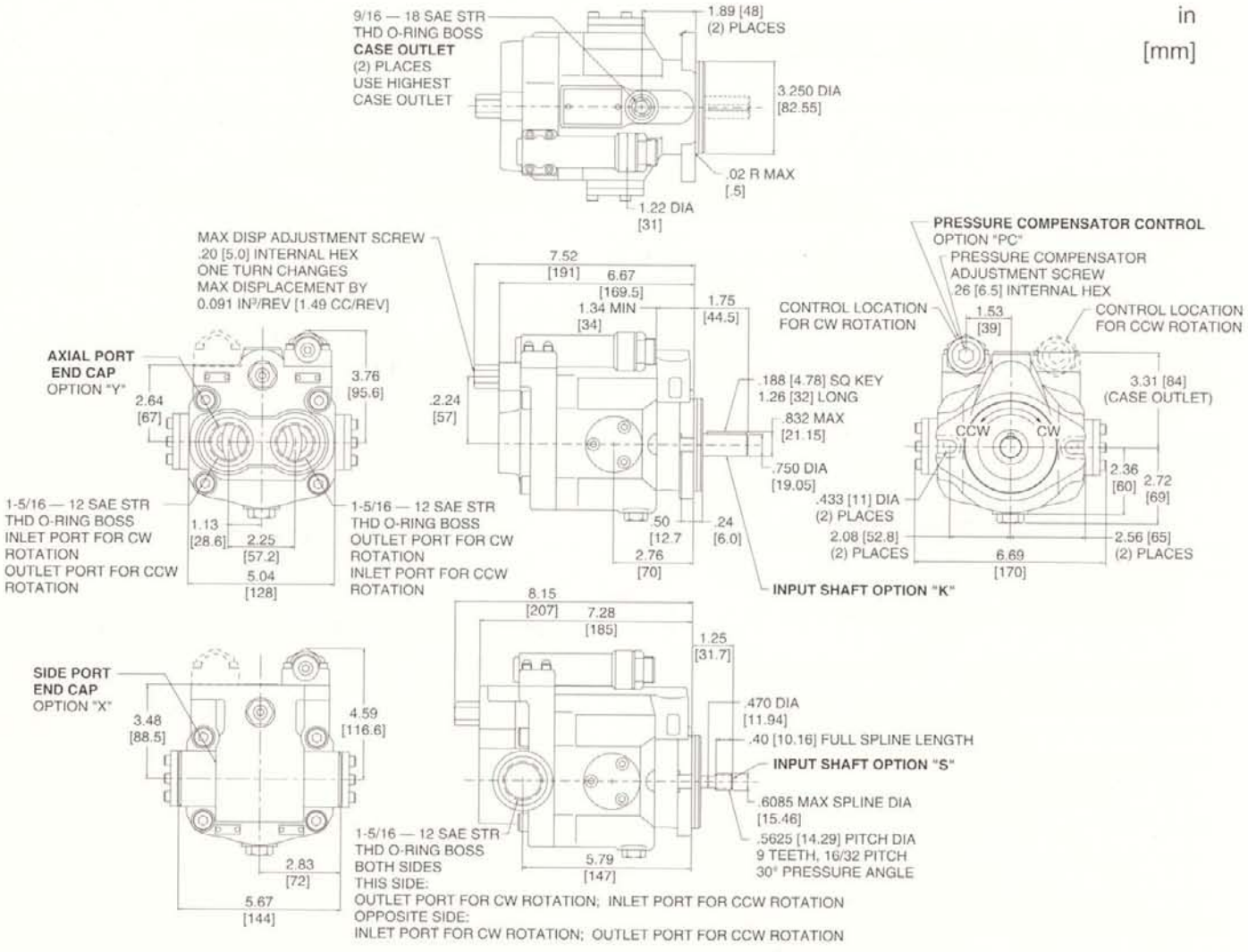
Measured 3.3 ft. (1 m) from pump - 1800 RPM

QUIET L-15							
Pressure - PSI	0	500	1000	1500	2000	2500	3000
Full Flow	71	71	72	72.5	76	77.5	77.5
Dead Head	--	70	72	73	74	75.5	77

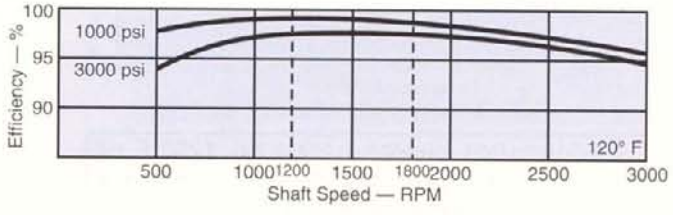
SUPER QUIET L-15							
Pressure - PSI	0	500	1000	1500	2000	2500	3000
Full Flow	56	61	64	66	68	70	72
Dead Head	--	58	60	62.5	65	67	69

L15 Variable Displacement Pump - Installation Drawings

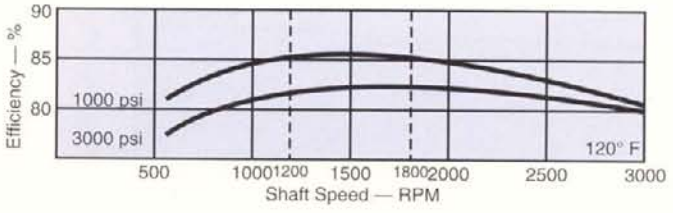
in
[mm]



Volumetric Efficiency (%)



Overall Efficiency (%)



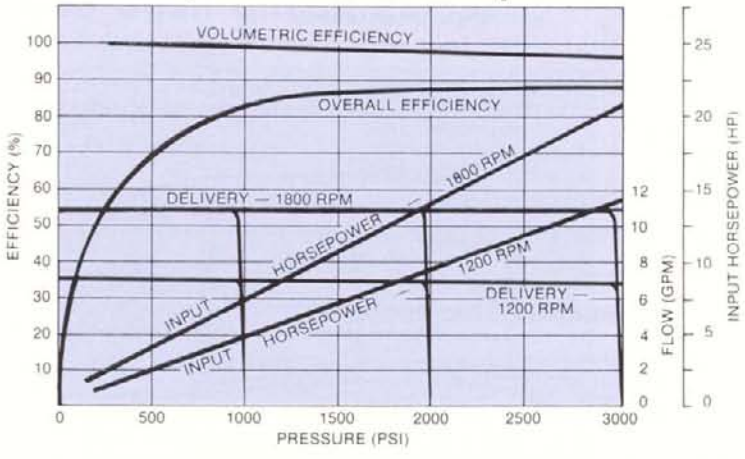
Frame Size 23 - Variable Displacement Pump Specifications

DELIVERY AT MAX. RPM	19.5 GPM (73.8 l/min)
MIN INLET PRESSURE	5" Hg Vacuum (0.8 BAR abs.)
FILTRATION	
• Inlet	150 Mesh
• Return Line	25 Micron
CASE PRESSURE	10 PSI (0.7 BAR) Max.
FLUID TEMPERATURE	180°F (82°C) Continuous 200°F (93°C) Intermittent
MOUNTING FLANGE	SAE "B"
SHAFT OPTIONS	SAE "B" spline or Straight Keyed
WEIGHT	
• Flange Mounted	40 lbs. (18.0 kg)
BEARING B-10 LIFE**	
• 1000 PSI (70 BAR)	100,000 Hrs.
• 2000 PSI (140 BAR)	33,600 Hrs.
• 3000 PSI (210 BAR)	8700 Hrs.

* Not to exceed 5 minutes

** Based on operation at 1800 RPM and maximum swashplate angle.

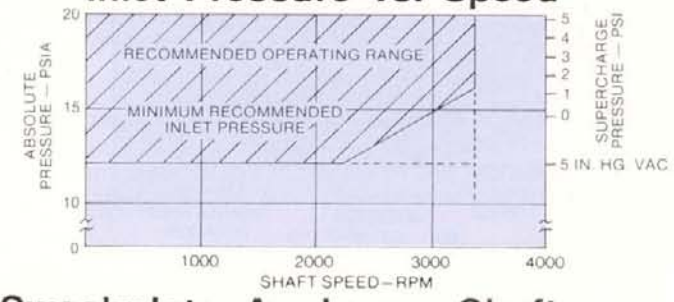
Performance Characteristics L-23 Open Circuit Pump



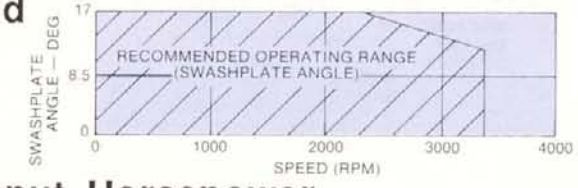
Note: Performance curves based on 120° F oil temperature and ISO VG46 oil, and are representative of this series size.

Outlet Flow - GPM

Inlet Pressure vs. Speed



Swashplate Angle vs. Shaft Speed



Input Horsepower

Noise Levels - db(a)

Measured 3.3 ft. (1 m) from pump - 1800 RPM

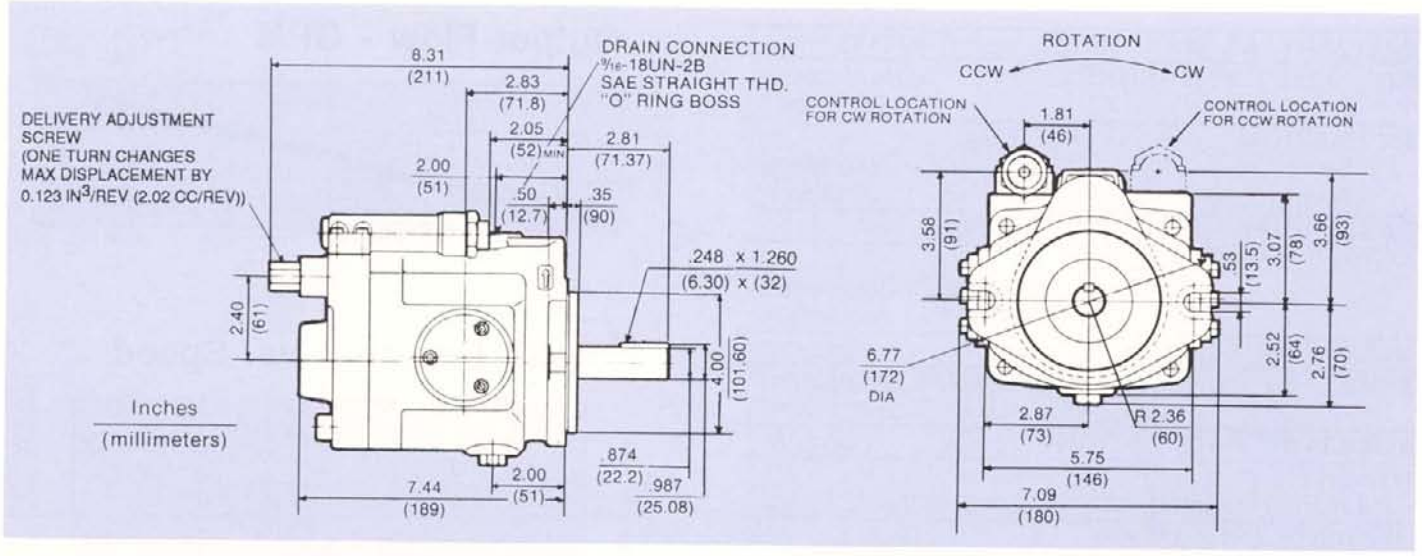
QUIET L-23

Pressure - PSI	0	500	1000	1500	2000	2500	3000
Full Flow	69	71	73	74	76	78	79
Dead Head	--	68	69	70	72	73	75

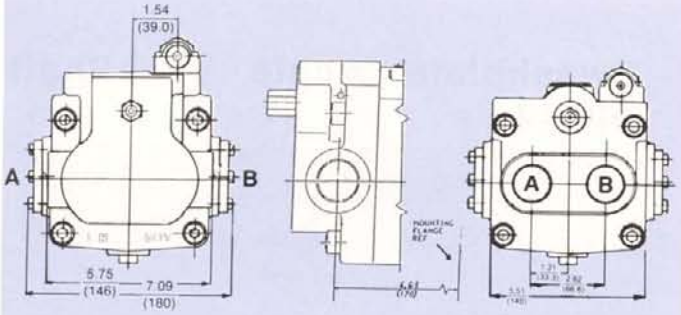
SUPER QUIET L-23

Pressure - PSI	0	500	1000	1500	2000	2500	3000
Full Flow	62	64	66	68	69	70	71
Dead Head	--	58	61	64	66	67	68

Frame Size 23 - Variable Displacement Pump Installation Drawings

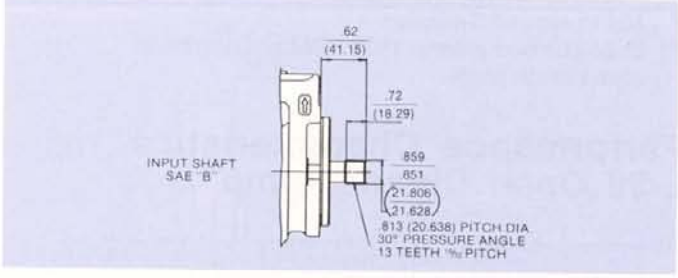


End Cap Porting

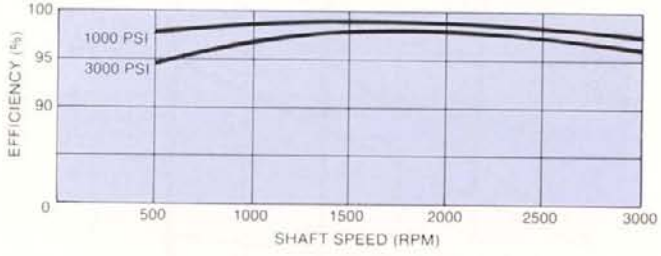


Direction Rotation	Ports	
	Inlet	Outlet
CW	A	B
CCW	B	A

SAE Spline Shaft



Volumetric Efficiency - Percent



Overall Efficiency - Percent

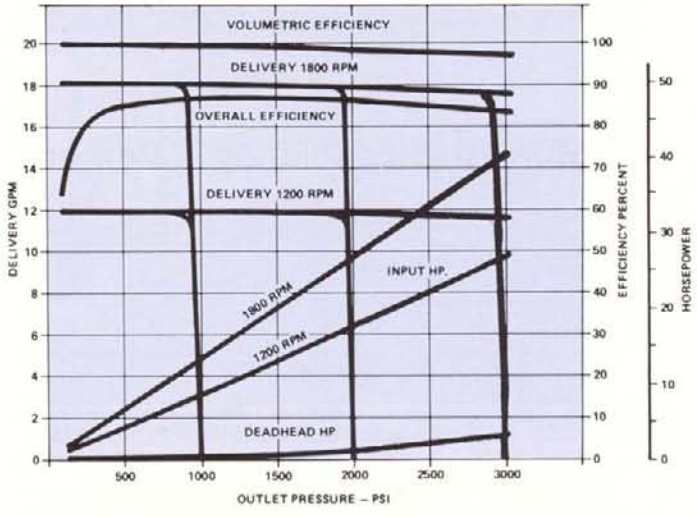
Frame Size 38 - Variable Displacement Pump Specifications

DELIVERY AT MAX. RPM	29.8 GPM (113 l/min)
MIN INLET PRESSURE	5" Hg Vacuum (0.8 BAR abs.)
FILTRATION	
• Inlet	150 Mesh
• Return Line	25 Micron
CASE PRESSURE	10 PSI (0.7 BAR) Max.
FLUID TEMPERATURE	180°F (82°C) Continuous 200°F (93°C) Intermittent
MOUNTING FLANGE	SAE "B"
SHAFT OPTIONS	SAE "B" spline (std or long) or Straight Keyed
AUXILIARY PAD OPTION	SAE"A"
WEIGHT	
• Flange Mounted	48 lbs. (22.0 kg)
BEARING B-10 LIFE**	
• 1000 PSI (70 BAR)	62,600 Hrs.
• 2000 PSI (140 BAR)	6200 Hrs.
• 3000 PSI (210 BAR)	1600 Hrs.

* Not to exceed 5 minutes

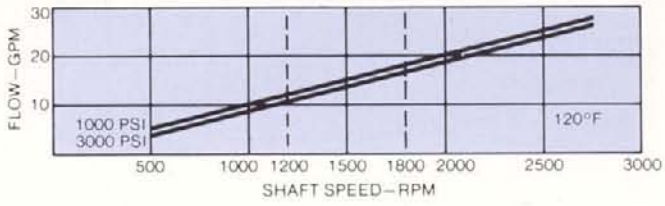
** Based on operation at 1800 RPM and maximum swashplate angle.

Performance Characteristics L-38 Open Circuit Pump

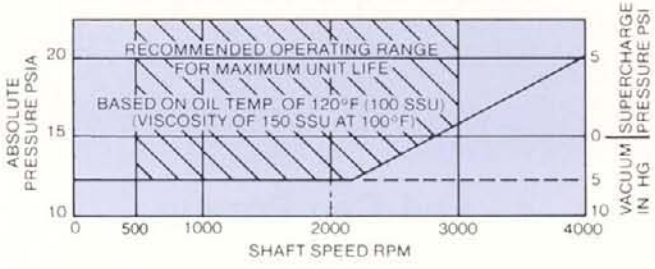


Note: Performance curves based on 120° F oil temperature and ISO VG46 oil, and are representative of this series size.

Output Flow - GPM

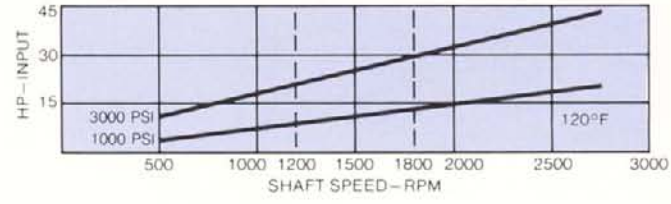


Inlet Pressure vs. Speed



Swashplate Angle vs. Shaft Speed

Input Horsepower



Noise Levels - db(a)

Measured 3.3 ft. (1 m) from pump - 1800 RPM

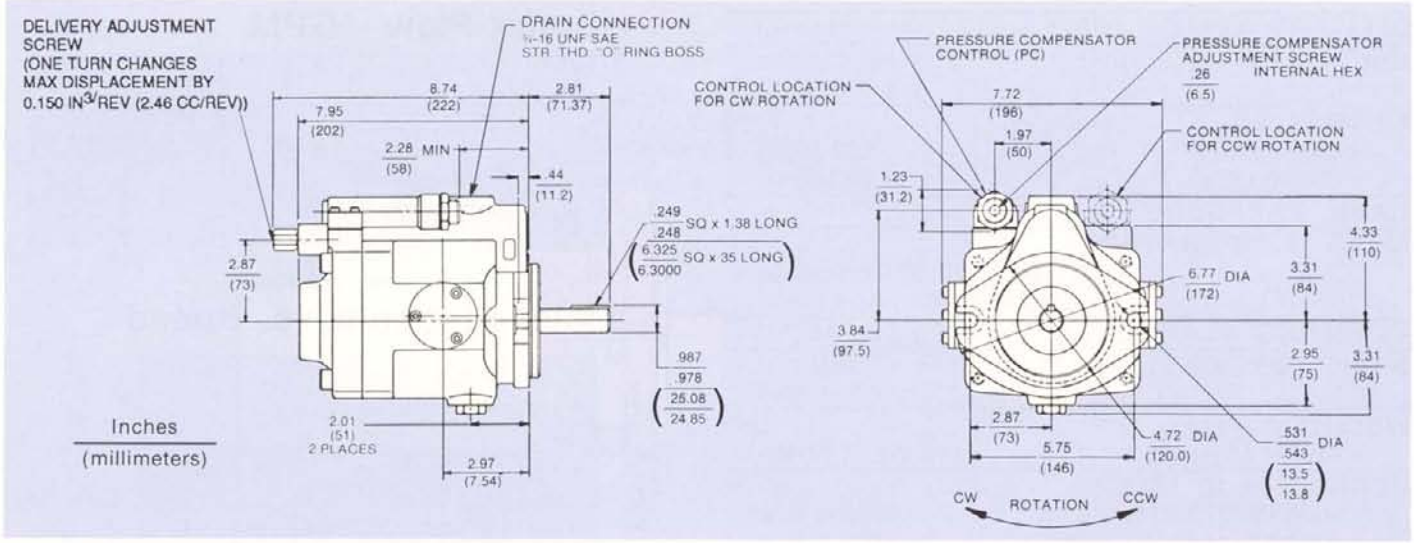
QUIET L-38

Pressure - PSI	0	500	1000	1500	2000	2500	3000
Full Flow	73.5	73.5	74.5	76	77	77.5	80
Dead Head	--	71	73	73.5	75	77	79

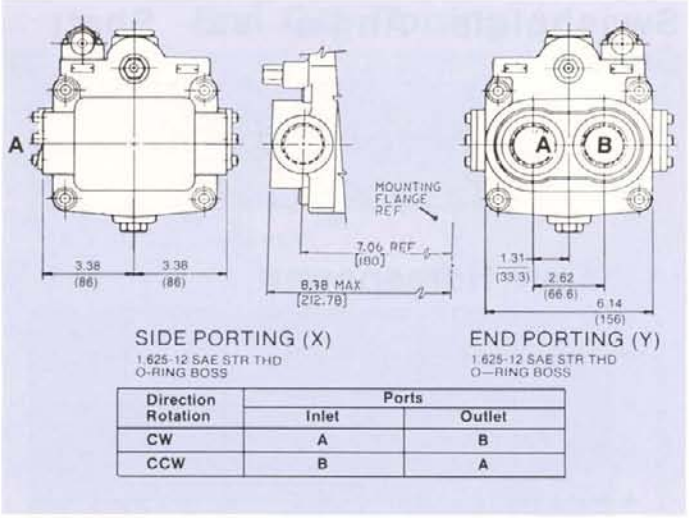
SUPER QUIET L-38

Pressure - PSI	0	500	1000	1500	2000	2500	3000
Full Flow	64	65.5	67	69	71	73	75
Dead Head	--	60	62	64	66	68	70.5

Frame Size 38 - Variable Displacement Pump Installation Drawings

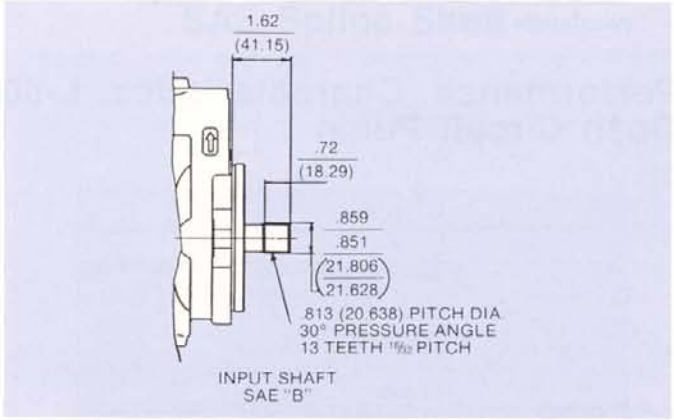


End Cap Porting

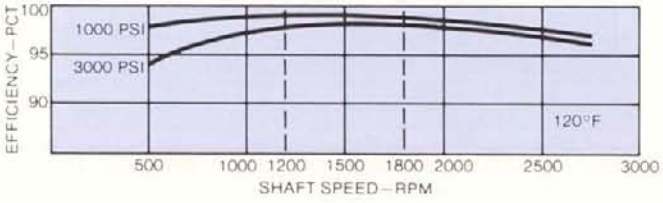


Direction Rotation	Ports	
	Inlet	Outlet
CW	A	B
CCW	B	A

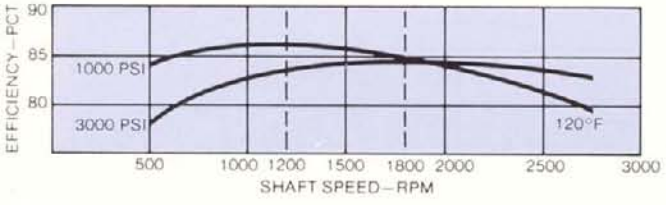
SAE Spline Shaft



Volumetric Efficiency - Percent



Overall Efficiency - Percent



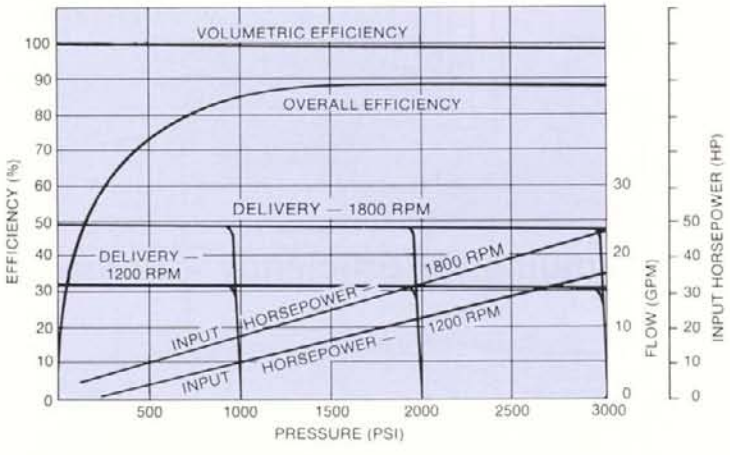
Frame Size 50 - Variable Displacement Pump Installation Drawings

DELIVERY AT MAX. RPM	32.7 GPM (124 l/min)
MIN INLET PRESSURE	5" Hg Vacuum (0.8 BAR abs.)
FILTRATION	
• Inlet	150 Mesh
• Return Line	25 Micron
CASE PRESSURE	10 PSI (0.7 BAR) Max.
FLUID TEMPERATURE	180°F (82°C) Continuous 200°F (93°C) Intermittent*
MOUNTING FLANGE	SAE "C"
SHAFT OPTIONS	SAE "C" spline or Straight Keyed
WEIGHT	
• Flange Mounted	110 lbs. (50.0 kg)
BEARING B-10 LIFE**	
• 1000 PSI (70 BAR)	100,000 Hrs.
• 2000 PSI (140 BAR)	45,000 Hrs.
• 3000 PSI (210 BAR)	11,700 Hrs.

* Not to exceed 5 minutes

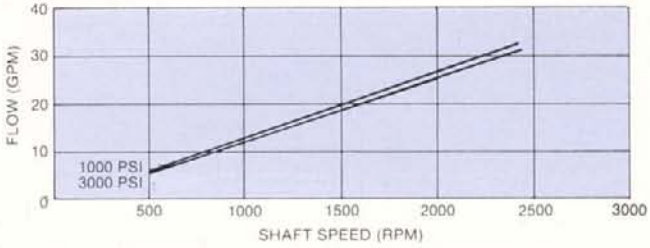
** Based on operation at 1800 RPM and maximum swashplate angle.

Performance Characteristics L-50 Open Circuit Pump

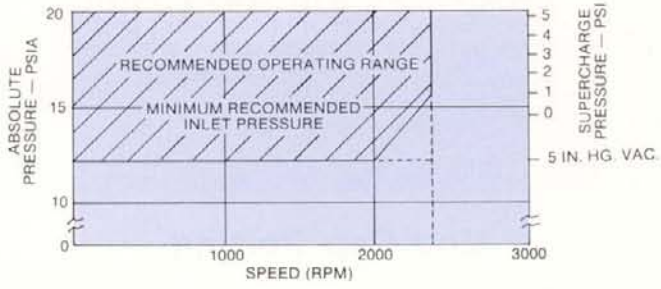


Note: Performance curves based on 120° F oil temperature and ISO VG46 oil, and are representative of this series size.

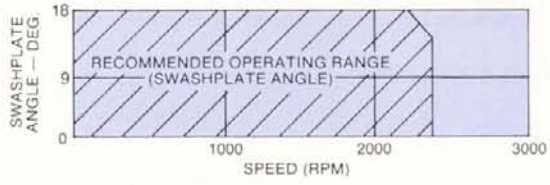
Outlet Flow - GPM



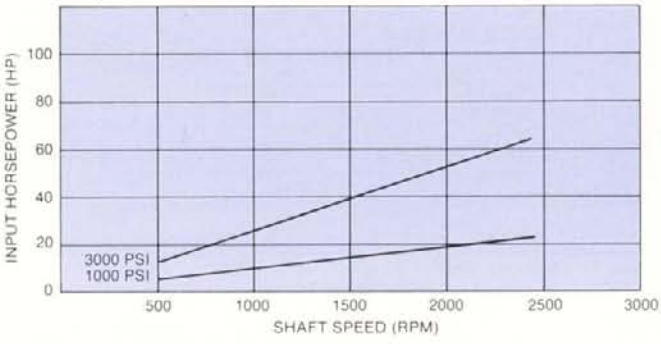
Inlet Pressure vs. Speed



Swashplate Angle vs. Shaft Speed



Input Horsepower



Noise Levels - db(a)

Measured 3.3 ft. (1 m) from pump - 1800 RPM

QUIET L-50

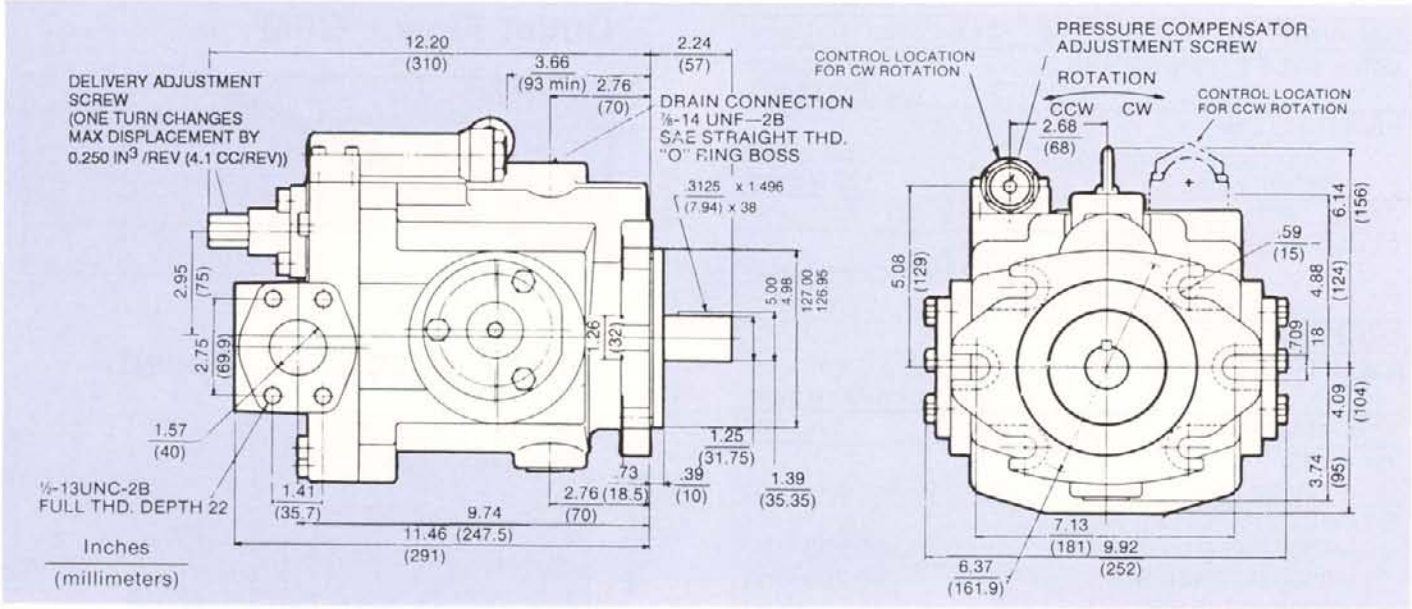
Pressure - PSI	0	500	1000	1500	2000	2500	3000
Full Flow	74	75	76	77	78	80	82
Dead Head	--	70	71	73	75	76	78

SUPER QUIET L-50

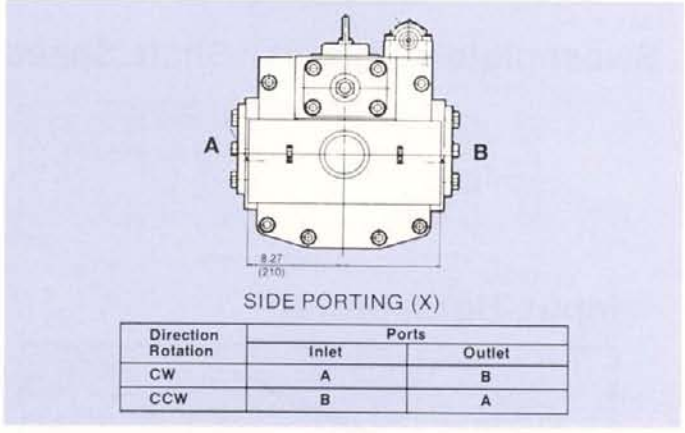
Pressure - PSI	0	500	1000	1500	2000	2500	3000
Full Flow	70	70.5	71	71.5	72	72.5	73.5
Dead Head	--	60.5	64.5	67	68.5	69.5	70

NOTE: Noise Data per JIS B-8350-1984 @ 120°F (49° C).

Frame Size 50 - Variable Displacement Pump Installation Drawings

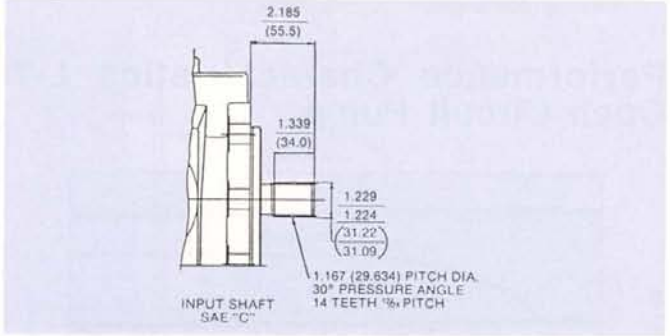


End Cap Porting

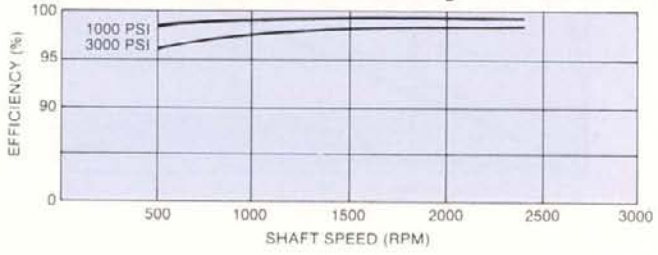


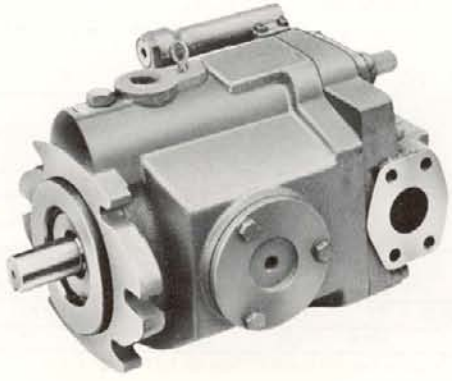
Direction Rotation	Ports	
	Inlet	Outlet
CW	A	B
CCW	B	A

SAE Spline Shaft



Volumetric Efficiency - Percent





Overall Efficiency - Percent

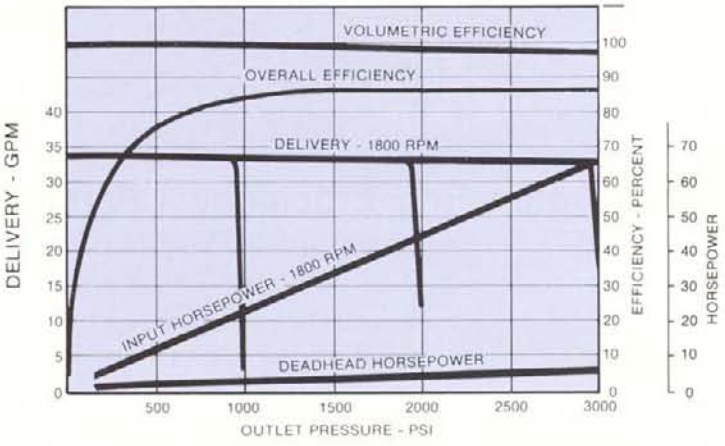
Frame Size 70 - Variable Displacement Pump Specifications

DELIVERY AT MAX. RPM	41.0 GPM (155 l/min)
MIN INLET PRESSURE	5" Hg Vacuum (0.8 BAR abs.)
FILTRATION	
• Inlet	150 Mesh
• Return Line	25 Micron
CASE PRESSURE	10 PSI (0.7 BAR) Max.
FLUID TEMPERATURE	180°F (82°C) Continuous 200°F (93°C) Intermittent*
MOUNTING FLANGE	SAE "C"
SHAFT OPTIONS	SAE "C" spline or Straight Keyed
AUXILIARY PAD OPTION	SAE "A"
WEIGHT	
• Flange Mounted	120 lbs. (54.5 kg)
BEARING B-10 LIFE**	
• 1000 PSI (70 BAR)	100,000 Hrs.
• 2000 PSI (140 BAR)	48,200 Hrs.
• 3000 PSI (210 BAR)	12,500 Hrs.

* Not to exceed 5 minutes

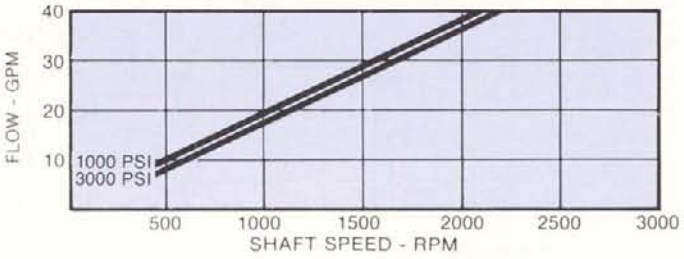
** Based on operation at 1800 RPM and maximum swashplate angle.

Performance Characteristics L-70 Open Circuit Pump

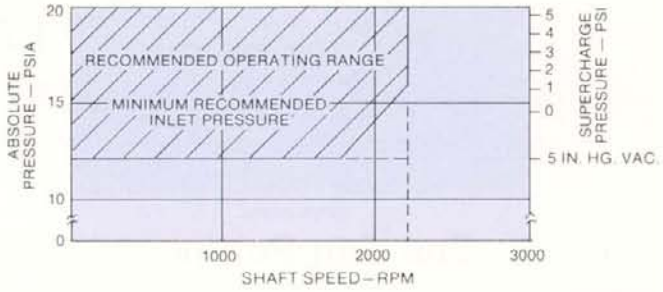


Note: Performance curves based on 120° F oil temperature and ISO VG46 oil, and are representative of this series size.

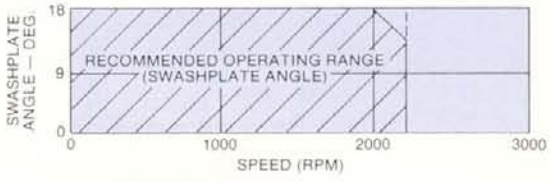
Outlet Flow - GPM



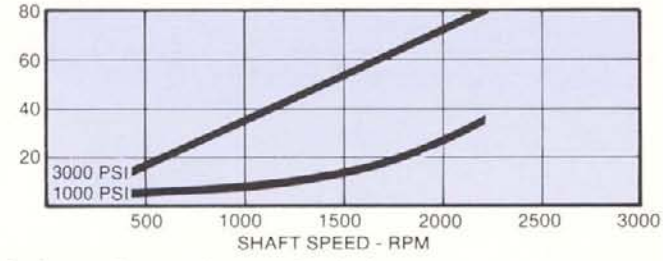
Inlet Pressure vs. Speed



Swashplate Angle vs. Shaft Speed



Input Horsepower



Noise Levels - db(a)

Measured 3.3 ft. (1 m) from pump - 1800 RPM

QUIET L-70

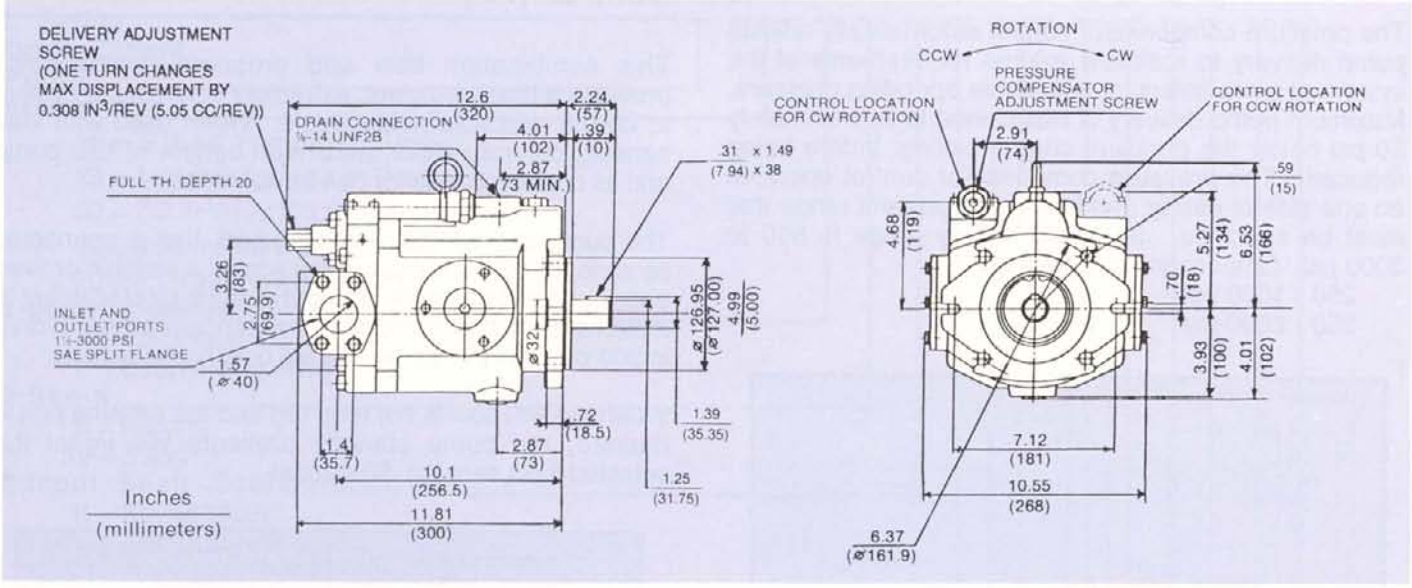
Pressure - PSI	0	500	1000	1500	2000	2500	3000
Full Flow	76	77	77.5	78	79	80.5	82
Dead Head	--	71	72	73	76	78	80

SUPER QUIET L-70

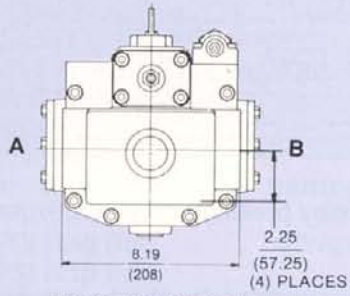
Pressure - PSI	0	500	1000	1500	2000	2500	3000
Full Flow	68.5	71	72	72	73	74	75.5
Dead Head	--	62.5	66	68.5	69.5	71	71.5

NOTE: Noise Data per JIS B-8350-1984 @ 120°F (49° C).

Frame Size 70 - Variable Displacement Pump Installation Drawings

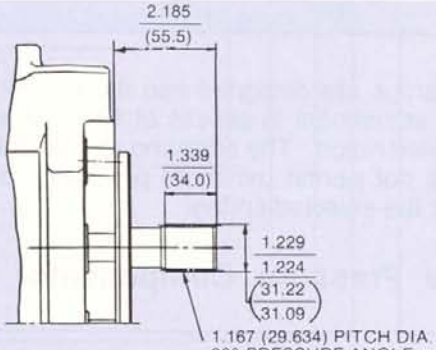


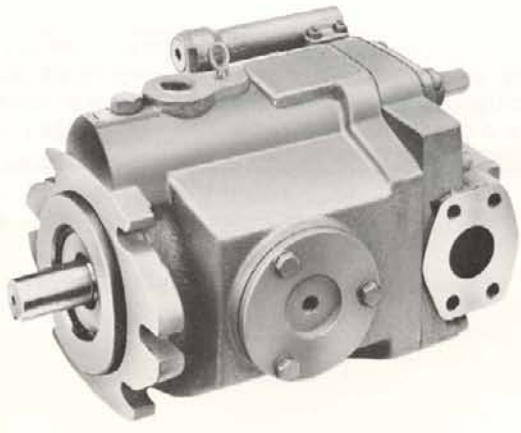
End Cap Porting



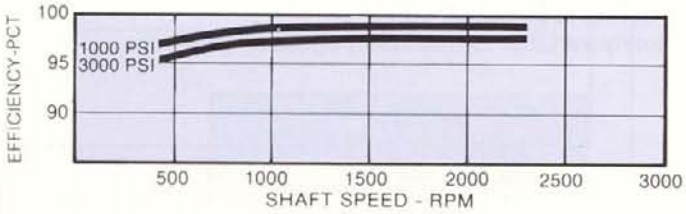
Direction Rotation	Ports	
	Inlet	Outlet
CW	A	B
CCW	B	A

SAE Spline Shaft

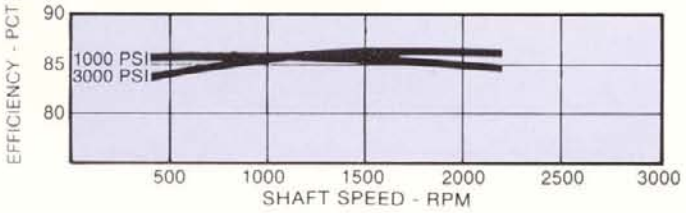




Volumetric Efficiency - Percent



Overall Efficiency - Percent

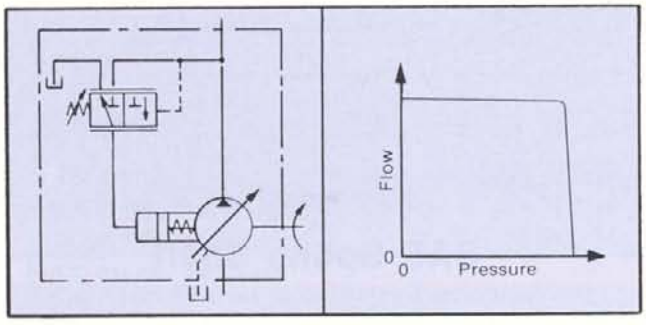


Control Options

Pressure Compensator Control (PC)

The pressure compensator control automatically adjusts pump delivery to maintain volume requirements of the system at a pre-selected, adjustable operating pressure. Maximum pump delivery is maintained to approximately 50 psi below the pressure control setting, before being reduced. The pressure compensator control operates on one side of center and has an adjustment range that must be specified. Standard factory range is 500 to 3000 psi. Other optional ranges are:

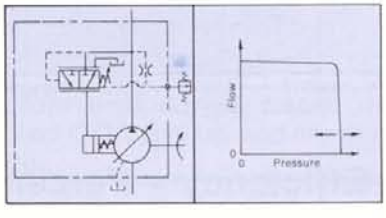
250 - 1000 psi
250 - 2000 psi



Positive stops are designed into the control to prevent pressure adjustment in excess of 125% of maximum of the specified range. The adjusting screw is also retained and does not permit minimum pressures below those stated for the selected spring.

Remote Pressure Compensator Control (RC)

- Remote adjustment of pressure compensator
- Provides versatility in matching pressure compensator setting to duty cycle and function requirements
- Adjusted via an external relief valve
- A port on the control housing is provided for connecting to the relief valve
- Remotely variable to maximum operaing pressure

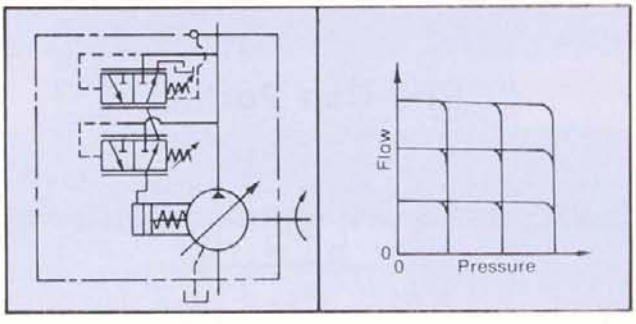


Flow And Pressure Compensator Control (FP)

This combination flow and pressure compensator provides a highly efficient, extremely controllable system at lowest possible noise levels. When used with load sensing control valves, maximum benefit of this pump and its controls capability can be achieved.

The pump control has a sensing port that is connected so as to measure pressure drop across a variable or fixed orifice and automatically adjust the pump displacement to match system flow demand. The standard pressure drop is 200 psi with 100 psi or 300 psi optional selections.

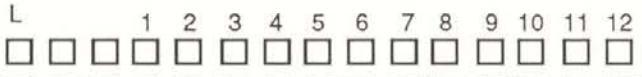
When system flow is not required and the sensing port is drained, the pump standby pressure will equal the selected load sensing differential.



- Low standby pressures prevent excessive heat build-up in the pump
- Eliminates unnecessary horsepower drain when hydraulic functions are idle
- Can be used in multiple function systems to provide within its capacity, the total fluctuation of pressure and gallonage
- Can be used effectively to provide constant flow when shaft input speed varies

Note: As a general system safeguard, a relief valve is required in **all** applications using an open circuit pump(s) to protect the circuit from over pressure. It is also necessary to include a directional control device in the system to enable load flow from the pump to zero.

Variable Displacement Pump



L Series Open Circuit Pump

Frame Size
- 15 = .913 in^3/Rev (15 cc/Rev)
- 23 = 1.41 in^3/Rev (23 cc/Rev)
- 38 = 2.3 in^3/Rev (38 cc/Rev)
- 50 = 3.15 in^3/Rev (50 cc/Rev)
- 70 = 4.26 in^3/Rev (70 cc/Rev)

1:Input Shaft Rotation
- R = Clockwise
- L = Counterclockwise

2:Seals
- B = Buna N
- ΔV = Viton

3:Input Shaft Configuration
- K = Keyed Shaft
- S = Splined Shaft
- ΔN = Non-Standard

4:End Cap System Porting
- X = Side Porting for Inlet & Outlet
- Y = End Porting for Inlet & Outlet

5,6:Control Type
- PC = Pressure Compensator
- FP = Flow & Pressure Compensator
- RC = Remote Pressure Compensator

7:Electrical Input
- X = Not Applicable

8:Compensator High Pressure Setting
- 1 = 1000 PSI (70 Bar)
- 2 = 2000 PSI (140 Bar)
- 3 = 3000 PSI (210 Bar)

9:Flow Compensator Pressure Setting
- A = 100 PSI (7 Bar)
- B = 200 PSI (14 Bar)
- C = 300 PSI (21 Bar)
- D = 400 PSI (28 Bar)
- E = 600 PSI (42 Bar)
- X = Not Applicable

10:Compensator Low Pressure Setting
- 1 = 1000 PSI (70 Bar)
- 2 = 2000 PSI (140 Bar)
- X = Not Applicable

11:Auxiliary Pump Mounting Pads
- A = SAE "A" (For use with Side Ports only, Option 4X)
- ΔB = SAE "B" (L70 Only; For use with Side Ports Only, Option 4X)
- X = Not Applicable

12:Special Design
- K = Super Quiet Version
- X = Quiet Version

Δ = Non-Standard

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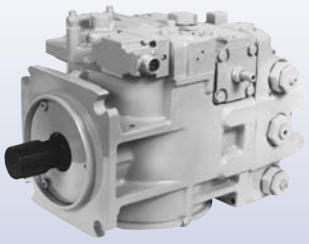
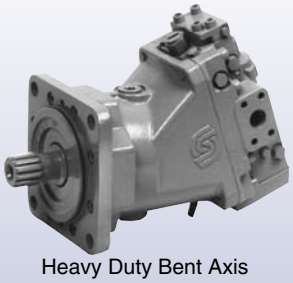
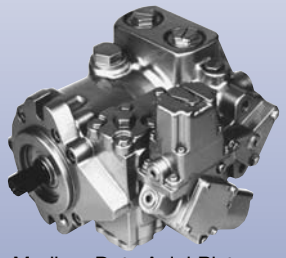


Heavy Duty Axial Piston Pumps and Motors

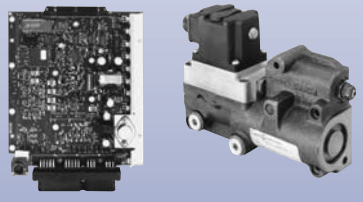


Heavy Duty Bent Axis Variable Motors

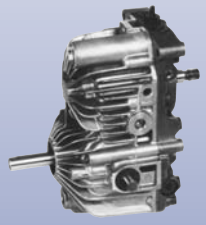
Cartridge Motors/ Compact Wheel Drives



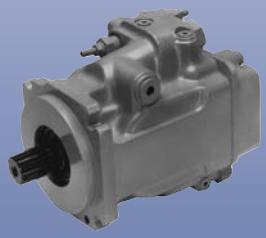
Medium Duty Axial Piston Pumps and Motors



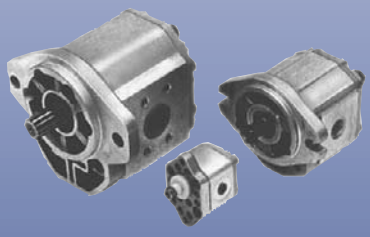
Microcontrollers and Electrohydraulic Controls



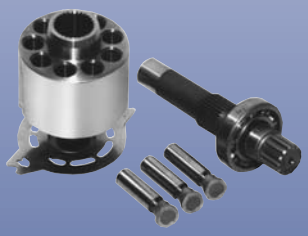
Hydrostatic Transmission Packages



Open Circuit Axial Piston Pumps



Gear Pumps and Motors



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