



## PUMP DESCRIPTION

Fixed displacement checkball pumps, with bi-directional shaft rotation, provide constant direction of output flow regardless of the direction of drive shaft rotation.

### Mounting

S.A.E. D 4-bolt pattern with 0.25 inch (6,4 mm) pilot engagement.

### Shaft Options

Standard keyed shaft, 1.250 inch (31,75 mm) diameter;

Optional spline shaft, 1.248/1.247 inch diameter standard S.A.E. 14 tooth, 12/24 D.P. 30° involute spline.

### Outlet Port Options

Standard pressure models have S.A.E. ports. High pressure "H" option models require the use of outlet port option "A" (Autoclave Medium Pressure, Butech M/P or equivalent fittings), or outlet port option "B" (British Standard Pipe fittings).

Refer to "Outlet Port Configurations" on page 6 and "Typical Model Code" on page 4 to specify outlet port.

### Inlet Conditions

Pumps may require pressurized inlet conditions at higher speeds. Failure to meet minimum inlet requirements will result in slight flow reduction. Refer to the table.

### Seal Options

Standard seals are Buna-N (Nitrile). Options include Fluorocarbon (Viton® or Fluorel®) or EPR for use with some phosphate ester fluids.

### Weight (Mass)

111 lb (50 kg)

## Specifications

Pump Models	Output Flow at 1500 rpm <sup>①</sup>		Output Flow at 1800 rpm <sup>①</sup>		Rated Pressure		Maximum Intermittent Pressure		Rated Speed rpm <sup>②</sup>	Maximum Speed rpm <sup>②</sup>
	U.S. gpm	L/min	U.S. gpm	L/min	psi	bar	psi	bar		
PF4011-30	6.4	24,2	7.7	29,1	6000	420	8000	560	1800	2400
PF4016-30	9.2	35,0	11.1	42,0	6000	420	8000	560	1800	2400
PF4018-30	10.3	39,1	12.4	46,9	6000	420	8000	560	1800	2400
PF4020-30	11.6	44,1	14.0	53,0	6000	420	8000	560	1800	2400
PF4011H-30	6.0	23,0	7.3	27,6	10 000	700	10 000	700	1800	2400
PF4016H-30	8.7	33,1	10.5	39,7	10 000	700	10 000	700	1800	2400
PF4018H-30	10.0	38,1	12.1	45,8	8000	560	10 000	700	1800	2400
PF4020H-30	11.4	43,2	13.7	51,9	8000	560	10 000	700	1800	2400

① Output flow based on typical performance at rated pressure with pressurized inlet where required, as shown in the table below.

② Contact the sales department for applications requiring operation above rated speed. High speed operation may require a pressurized inlet. Refer to "Inlet Conditions".

## Minimum Inlet Pressure<sup>①</sup>

Pump Models	Operating Speed							
	1200 rpm		1500 rpm		1800 rpm		2400 rpm	
	psi	bar	psi	bar	psi	bar	psi	bar
PF4011	0	0	0	0	0	0	5	0,4
PF4016	0	0	0	0	0	0	5	0,4
PF4018	0	0	0	0	5	0,4	10 <sup>②</sup>	0,7 <sup>②</sup>
PF4020	0	0	5	0,4	10 <sup>②</sup>	0,7 <sup>②</sup>	15 <sup>②</sup>	1,0 <sup>②</sup>

① Values shown are based on fluid viscosity of 100 SUS (20 cSt).

② Inlet pressures higher than 10 psig (0,7 bar) require a high-pressure shaft seal. Refer to "Typical Model Code" on page 4 for seal options.

## PUMP SELECTION

The table shows specifications for standard pressure and high pressure "H" option models.

Ordering a PF4000 Series, 10 Design, pump requires a complete model code specifying shaft, seal and outlet port options. Refer to "Typical Model Code" on page 4.

### Maximum Pressure

Checkball pumps are especially suited for applications susceptible to excessive pressure spikes.

The intermittent pressures listed are the maximum pressures a pump can sustain for occasional, short periods of operation without appreciably reducing life expectancy.

### Fluid Guidelines

See page 5 for "Fluid Recommendations".

Some pump models may require reduced operating pressures when using low-lubricity fluids.

The optional "Low Lubricity Kit" provides an additional internal passage for improved bearing lubrication when using low-lubricity fluids. Refer to "Typical Model Code" on page 4.

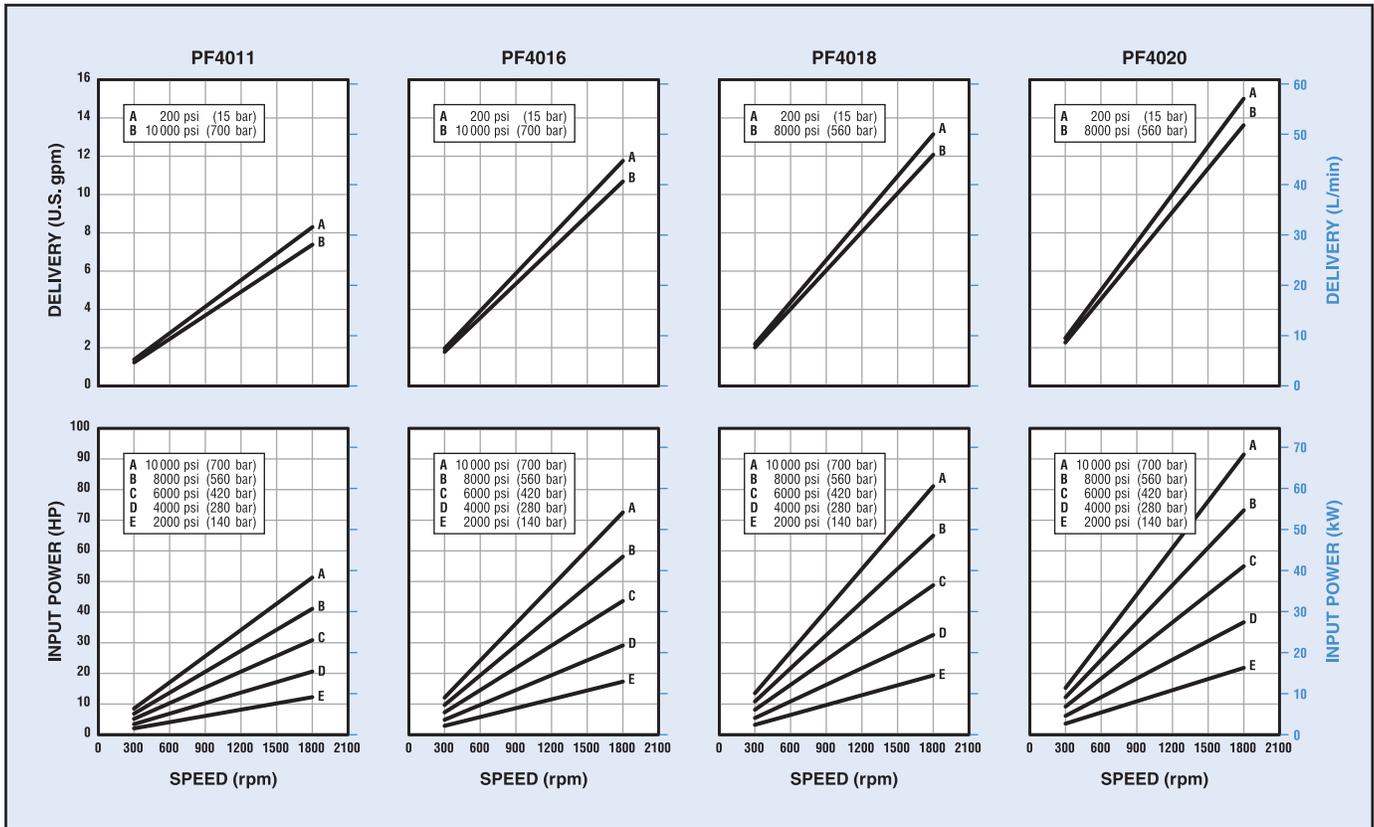
Because of the wide range of fluid characteristics, contact the sales department for a review of any application using non-petroleum based fluids.

### Split-Flow® Provides Multiple Outlets

PF4000 models with split-flow covers efficiently supply flows for multiple function circuits. Piston outputs are grouped together in the cover, with various piston flow splits available in this ten-piston pump. Refer to "Typical Model Code" on page 4 and contact the sales department for availability.

# PF4000 SERIES

## Typical Performance Curves



Typical performance curves are based on 100 SUS (20 cSt) mineral oil with pressurized inlet where required. Refer to the "Minimum Inlet Pressure" table on page 2.

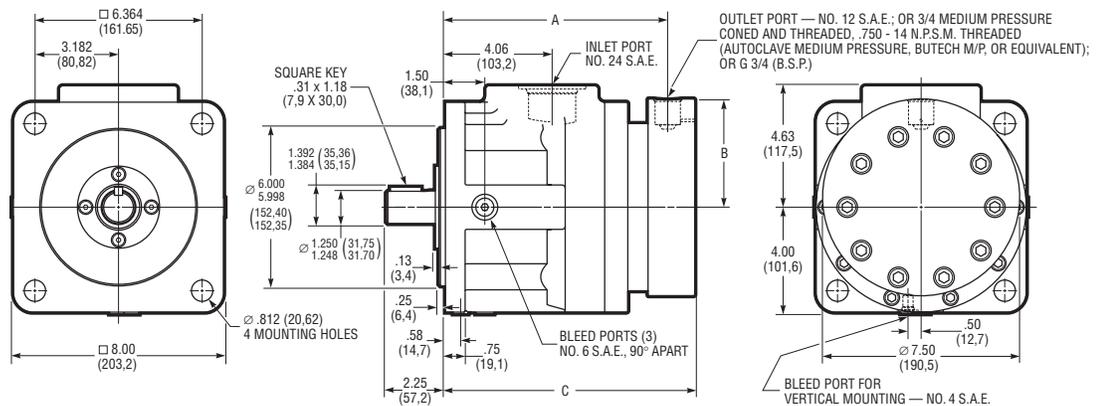
## INSTALLATION

All dimensions are shown in inches (millimeters in parentheses) and are nominal. See page 2 for spline shaft data. Refer to Bulletin PSI.CB for general installation and operating recommendations.

The thickness of the cover and the location of the outlet port varies as shown, dependent on the port option.

## Variable Dimensions

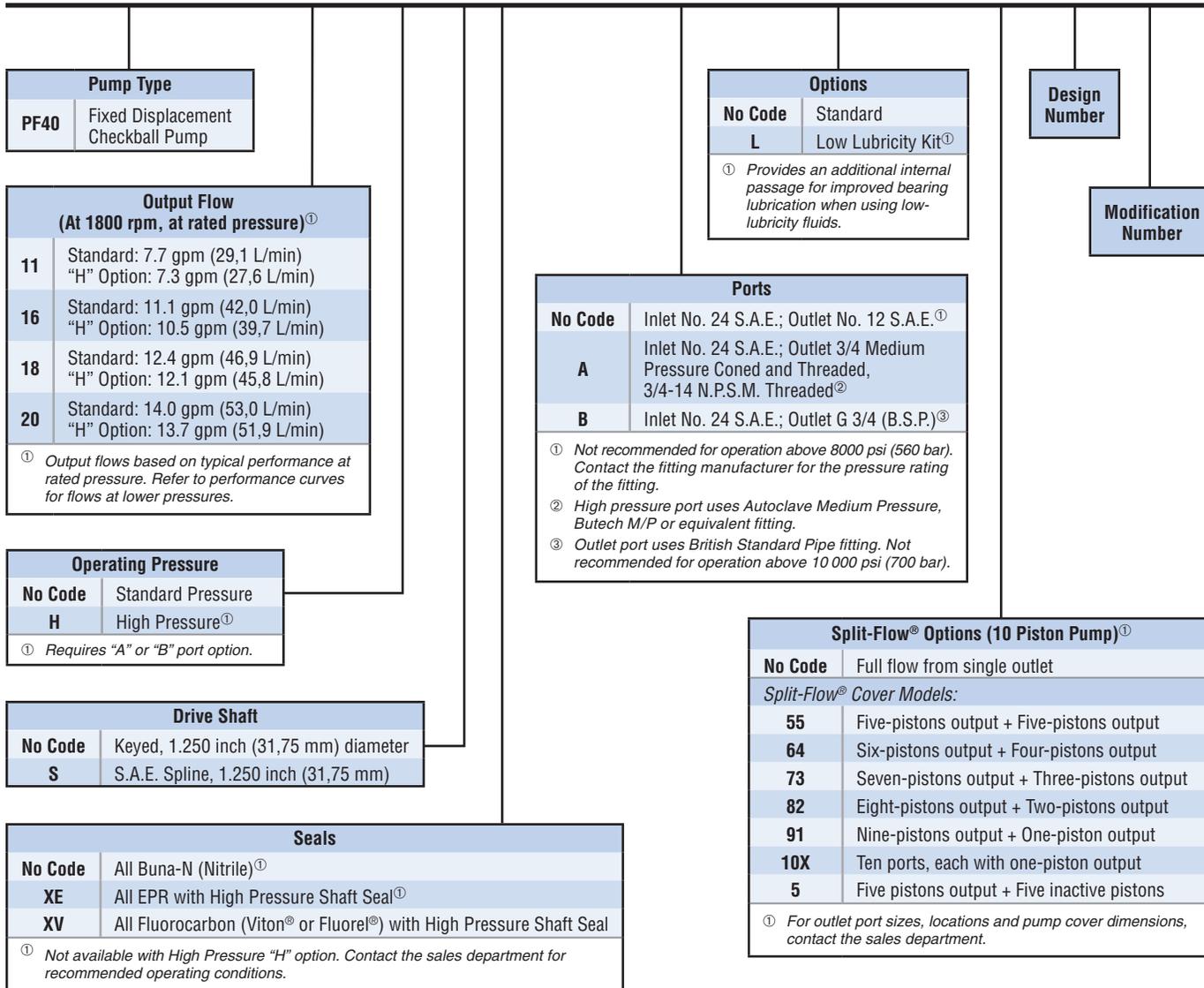
Variable Dimension	Outlet Port Option			
	S.A.E. or B.S.P Port		Coned and Threaded	
	Models PF4011, PF4016	Models PF4018, PF4020	Models PF4011, PF4016	Models PF4018, PF4020
A	8.59 (218,2)	8.66 (220,0)	8.46 (214,9)	8.53 (216,7)
B	3.94 (100,2)	3.94 (100,2)	4.09 (103,8)	4.09 (103,8)
C	9.49 (241,1)	9.56 (242,9)	9.49 (241,1)	9.56 (242,9)



# PF4000 SERIES

## TYPICAL MODEL CODE

PF40 11 H - S XV A L - 55 - 3 0



Pump Type	
PF40	Fixed Displacement Checkball Pump

Output Flow (At 1800 rpm, at rated pressure) <sup>①</sup>	
11	Standard: 7.7 gpm (29,1 L/min) "H" Option: 7.3 gpm (27,6 L/min)
16	Standard: 11.1 gpm (42,0 L/min) "H" Option: 10.5 gpm (39,7 L/min)
18	Standard: 12.4 gpm (46,9 L/min) "H" Option: 12.1 gpm (45,8 L/min)
20	Standard: 14.0 gpm (53,0 L/min) "H" Option: 13.7 gpm (51,9 L/min)

<sup>①</sup> Output flows based on typical performance at rated pressure. Refer to performance curves for flows at lower pressures.

Operating Pressure	
No Code	Standard Pressure
H	High Pressure <sup>①</sup>

<sup>①</sup> Requires "A" or "B" port option.

Drive Shaft	
No Code	Keyed, 1.250 inch (31,75 mm) diameter
S	S.A.E. Spline, 1.250 inch (31,75 mm)

Seals	
No Code	All Buna-N (Nitrile) <sup>①</sup>
XE	All EPR with High Pressure Shaft Seal <sup>①</sup>
XV	All Fluorocarbon (Viton® or Fluorel®) with High Pressure Shaft Seal

<sup>①</sup> Not available with High Pressure "H" option. Contact the sales department for recommended operating conditions.

Options	
No Code	Standard
L	Low Lubricity Kit <sup>①</sup>

<sup>①</sup> Provides an additional internal passage for improved bearing lubrication when using low-lubricity fluids.

Ports	
No Code	Inlet No. 24 S.A.E.; Outlet No. 12 S.A.E. <sup>①</sup>
A	Inlet No. 24 S.A.E.; Outlet 3/4 Medium Pressure Coned and Threaded, 3/4-14 N.P.S.M. Threaded <sup>②</sup>
B	Inlet No. 24 S.A.E.; Outlet G 3/4 (B.S.P.) <sup>③</sup>

<sup>①</sup> Not recommended for operation above 8000 psi (560 bar). Contact the fitting manufacturer for the pressure rating of the fitting.  
<sup>②</sup> High pressure port uses Autoclave Medium Pressure, Butech M/P or equivalent fitting.  
<sup>③</sup> Outlet port uses British Standard Pipe fitting. Not recommended for operation above 10 000 psi (700 bar).

Split-Flow® Options (10 Piston Pump) <sup>①</sup>	
No Code	Full flow from single outlet
<i>Split-Flow® Cover Models:</i>	
55	Five-pistons output + Five-pistons output
64	Six-pistons output + Four-pistons output
73	Seven-pistons output + Three-pistons output
82	Eight-pistons output + Two-pistons output
91	Nine-pistons output + One-piston output
10X	Ten ports, each with one-piston output
5	Five pistons output + Five inactive pistons

<sup>①</sup> For outlet port sizes, locations and pump cover dimensions, contact the sales department.

## FLUID RECOMMENDATIONS

### Mineral Oil

A high-grade premium petroleum-based fluid should be used to assure long component and system life. The fluid should have a combination of anti-wear, demulsibility, rust protection, oxidation-resistant and foam-resistant properties.

### Special Fluids

Various pump models are available for use with water-based fluids, diesel calibration fluids, phosphate ester fluids, machining coolant, brake fluid, various military fluids and other special fluids.

PF4300 Series pumps are compatible with a variety of water-based fluids. These models, which are specifically rated for use with low-lubricity fluids.

Some pump models may require reduced operating pressures when using low-lubricity fluids.

Because of the wide range of fluid characteristics, contact the sales department for a review of any application using non-petroleum based fluids.

### Viscosity Specifications

Using fluid with the correct viscosity range is critical to achieving long component life.

Fluid conditions outside the "Optimum" range shown in the table may result in reduced pump output, requiring pressurized inlet conditions. For more information, contact the sales department.

## Hydraulic Fluid Viscosity<sup>①</sup>

Pump Models	Operating				Start-up <sup>②</sup>		Optimum		
	Minimum		Maximum		SUS	cSt	SUS	cSt	
	SUS	cSt	SUS	cSt					
<i>Fixed Displacement Pumps:</i>									
PF500-10	52	8	1911	413	3706	800	98 to 324	20 to 70	
PF1000-10	59	10	1911	413	3706	800	98 to 324	20 to 70	
PF2000	59	10	1911	413	1911	413	98 to 324	20 to 70	
PF2000 <sup>②</sup>	34	2,3	1911	413	1911	413	98 to 324	20 to 70	
PF3000-10	59	10	1911	413	3706	800	98 to 342	20 to 70	
PF4000-30	34	2,3	1911	413	1911	413	98 to 324	20 to 70	
PF4200-10	34	2,3	1911	413	1911	413	98 to 324	20 to 70	
PF4300-11	31	1,5	927	200	927	200	–	–	
PF6000	34	2,3	1911	413	1911	413	98 to 324	20 to 70	
<i>Mechanical Variable Delivery Pumps:</i>									
PV4000	34	2,3	1911	413	1911	413	98 to 324	20 to 70	
PV6000	34	2,3	1911	413	1911	413	98 to 324	20 to 70	
<i>Hydraulic Variable Delivery Pumps:</i>									
PV6000	34	2,3	1911	413	1911	413	98 to 324	20 to 70	

① Fluid conditions outside the "Optimum" range may result in reduced output, requiring pressurized inlet conditions. Contact the sales department.

② Models with special mounting.

## MINIMUM FILTRATION LEVELS

Pump inlet: 150 μ nominal;

Pressure or return line: 25 μ nominal.

While finer filtration levels than these are desirable and will result in longer component life, restricting flow to the pump inlet should be avoided. Minimum recommended inlet conditions must be maintained.

If a system component fails resulting in fluid contamination, it is important to drain and clean the reservoir, all lines, filter screens and all components. Refill with new fluid.

## INSTALLATION AND OPERATION

Refer to separate Bulletin PSI.CB for general installation and operating recommendations.

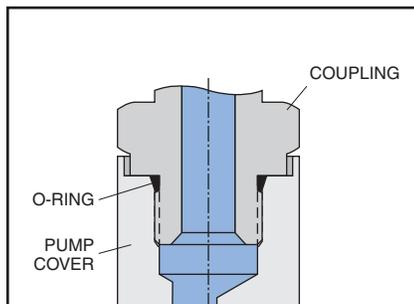
That brochure includes information on mounting, shaft loading, sizing inlet pipe and hose, air bleed procedures and initial start-up. Guidelines for maintenance, repair and trouble-shooting are also included.

## PORT DESCRIPTIONS

Dynex pumps are available with outlet ports suitable for use at various pressure ranges. Refer to the appropriate "Specification Table" or "Typical Model Code" to specify the required port.

Contact the fitting manufacturer to ensure the selected fittings are rated for the maximum pump operating pressure.

### S.A.E. Straight Thread Ports



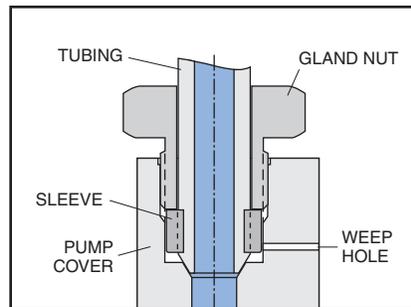
*Typical S.A.E. Straight Thread port connection*

The Straight Thread connection (S.A.E. J1926/1) is sometimes referred to as an S.A.E. O-ring Boss, or ORB. The port consists of a machined spotface surface, a tapered seal cavity and a straight thread port.

The fitting forms a seal by compressing the o-ring in the seal cavity with the underside of the flanged wrench flat. Some adjustable fittings, such as elbows and tees, use a locknut with a captive backup washer for compression.

S.A.E. Straight Thread ports are not recommended for operation above 8000 psi (560 bar). Also, the maximum pressure of pumps with No. 12 S.A.E. outlet ports may be limited by the pressure rating of the available fitting. Contact the fitting manufacturer for ratings.

### Coned and Threaded Ports



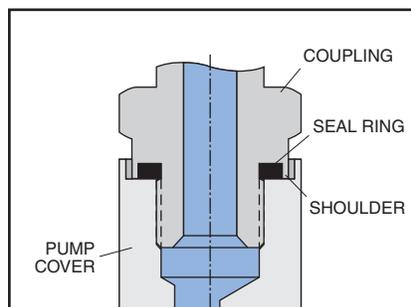
*Typical Coned and Threaded port connection*

High-pressure pumps are available with coned and threaded outlet ports, which use Autoclave Medium Pressure, Butech M/P, or equivalent fittings.

These fittings provide a metal-to-metal seal with an interference fit, not requiring an o-ring. The gland nut holds the sleeve and tubing against the cone surface.

A weep hole, visible on the outside of the pump cover, acts as an indicator of any abnormal leakage caused by system conditions (i.e., excessive pressure). It allows any fluid which does leak past the sealing surfaces to escape, preventing pressure build-up and possible damage.

### British Standard Pipe Ports



*Typical port connection with British Standard Pipe (Parallel) fitting with shoulder*

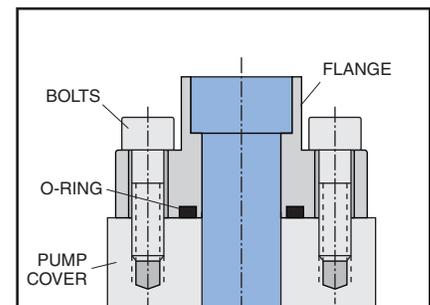
High-pressure pumps are available with flat face ports with British Standard Pipe (B.S.P.) parallel threads (BS 2779 or ISO 228), ideal for use on some European applications.

The fitting forms a seal by compressing a flat elastomer ring on a machined spotface surface. There are several sealing methods for these ports.

The recommended fitting has a recessed seal cavity formed by a shoulder on the underside of the flanged wrench flat (Voss "Peflex", Form B Shoulder Seal; or Parker Type E, "Elastic" Seal; or equivalent).

B.S.P. ports are not recommended for operation above 10 000 psi (700 bar). Contact the fitting manufacturer, to ensure the selected fittings are rated for the maximum pump operating pressure.

### S.A.E. 4-Bolt Flange Ports



*Typical S.A.E. 4-Bolt Flange port connection*

Flange connections are often used for higher flows requiring larger diameter tubing. The port consists of an unthreaded port with four bolt holes in a rectangular pattern on a machined face around the port (S.A.E. J518).

A typical fitting consists of a flanged head with a welded tube and a captive flange with bolt holes. A seal is formed by an o-ring in the groove on the underside mounting surface of the flange head. As the flange bolts are alternately tightened, the o-ring is compressed between the flange head and the machined face on the pump.

To make mounting easier in tight spaces a two-piece split-flange is often used.