

High Pressure Checkball Piston Pumps

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

MAINTENANCE-FREE DESIGN

The single-fluid checkball design uses the pumped fluid for internal bearing lubrication. This eliminates the potential for fluid cross-contamination possible in other designs with isolated lubrication. It also avoids the cost of a lubrication circuit or separate maintenance of the lubrication fluid.

RELIABLE HIGH PRESSURE

Individual piston check valves provide long service life and greater volumetric efficiency, especially at high pressures and with low-lubricity fluids.

Where as valveplate design pumps are susceptible to wear and scoring damage to the rotating sealing surface – our pump’s design uses check valves instead of a valveplate and eliminates the wear surface entirely.

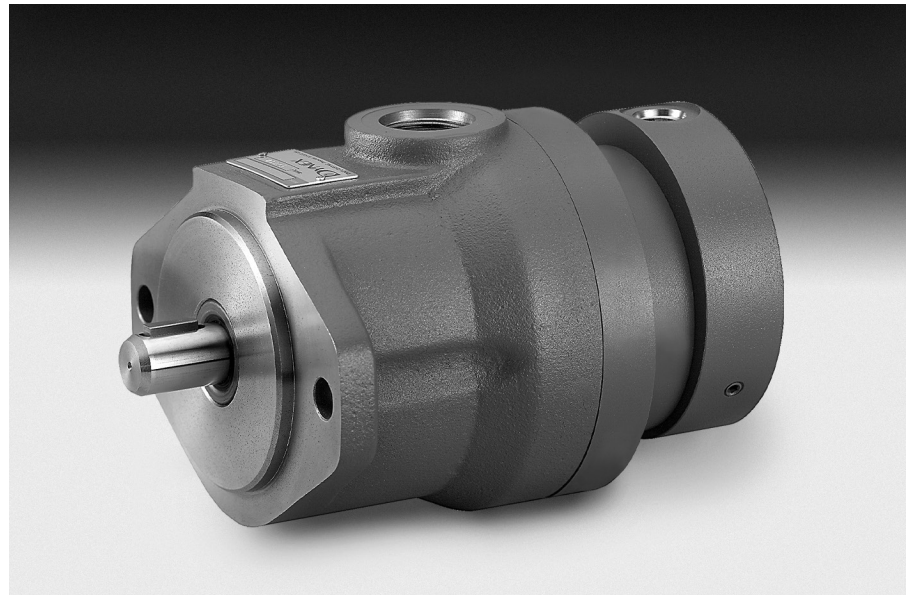
PUMP SELECTION

The specifications table contains standard pressure models, and high pressure “H” option models for maximum pressures to 10 000 psi (700 bar).

NOTE: The “H” option requires high pressure coned and threaded or BSPP outlet ports.

Refer to *Typical Model Code* to specify shaft, seal, and outlet port options.

PF2000 SERIES
3.0 to 8.5 gpm (11,4 to 32,1 L/min) at 1800 rpm
4000 to 10 000 psi (280 to 700 bar)



Specifications

Pump Models	Output Flow at 1500 rpm ^①		Output Flow at 1800 rpm ^①		Rated Pressure		Max. Pressure		Rated Speed	Max. Speed
	U.S. gpm	L/min	U.S. gpm	L/min	psi	bar	psi	bar	rpm	rpm
PF2005-10	2.5	9,5	3.0	11,4	6000	420	6000	420	2000	2800
PF2007-10	3.3	12,5	4.1	15,5	6000	420	6000	420	2000	2800
PF2008-10	4.9	18,5	5.9	22,3	5000	350	6000	420	2000	2400
PF2009-10	5.1	19,3	6.1	23,1	3000	210	4000	280	2000	2800
PF2012-10	7.1	26,9	8.5	32,2	3000	210	4000	280	2000	2400
PF2005H-10 ^②	2.5	9,5	3.0	11,4	6000	420	10 000	700	1800	2800
PF2007H-10 ^②	3.3	12,5	4.1	15,5	6000	420	10 000	700	1800	2800

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

^② The “H” option requires that high pressure coned and threaded “A” or BSPP “B” outlet port option be selected.

INSTALLATION AND OPERATING

All dimensions are shown in inches (millimeters in parentheses) and are nominal.

The diameter of the pump cover and the location of the outlet port varies as shown, dependent on the model. The port location for high-pressure models is shown printed in gray.

Mounting

SAE B 2-bolt pattern with 0.25 inch (6,4 mm) pilot engagement.

Shaft Options

Standard keyed shaft, 0.875 inch (22,22 mm) diameter;

Optional spline shaft, 0.873/0.872 inch (22,17/22,15 mm) diameter standard SAE 13 tooth, 16/32 DP 30° involute spline.

Outlet Port Options

Standard pressure models have SAE ports. High pressure models have either coned and threaded ports (Autoclave Medium Pressure, Butech M/P or equivalent) or BSPP (British Standard Pipe Parallel) ports.

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: Buna-N (Nitrile) with Polyurethane (Disogrin®) o-rings in the cover.

All EPR with High Pressure Shaft Seal (for use with some phosphate ester fluids).

All Fluorocarbon (Viton® or Fluorel®) with High Pressure Shaft Seal.

Minimum Filtration Levels

Pump inlet: 150 micron nominal;
Pressure or return line: 25 micron 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.

Split-Flow® Provides Multiple Outlets

PF2000 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 six-piston pump.

Weight (Mass)

30 lb (14 kg)

Minimum Inlet Pressures^①

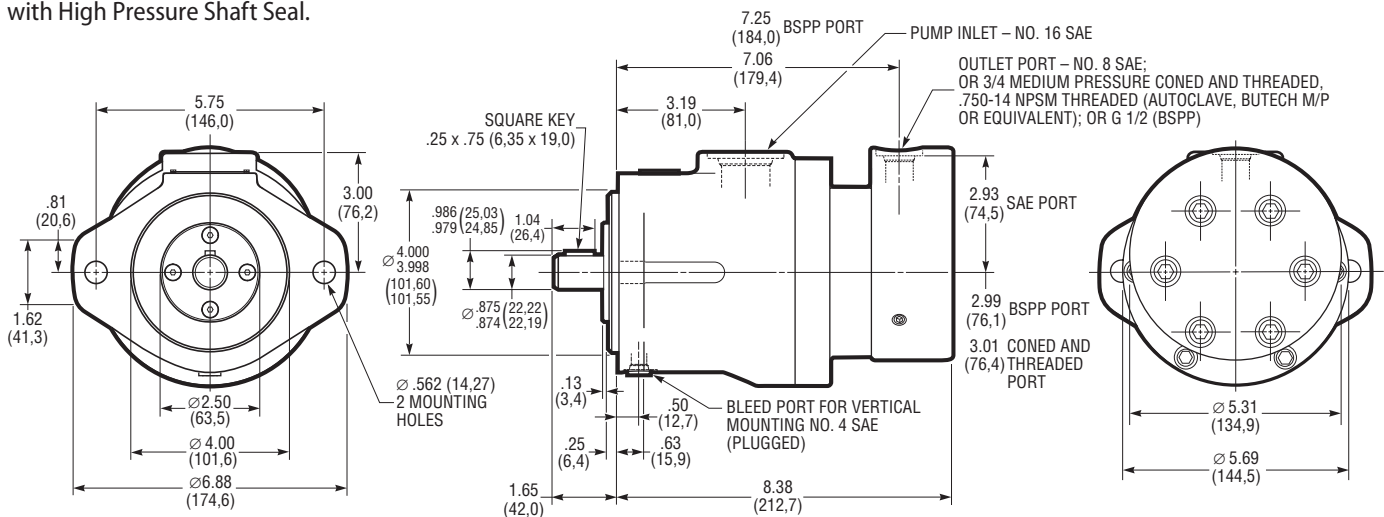
Pump Models	Operating Speed					
	2000 rpm		2400 rpm		2800 rpm	
	psi	bar	psi	bar	psi	bar
PF2005	0	0	3	0,2	5	0,4
PF2007	0	0	3	0,2	5	0,4
PF2008	0	0	5	0,4	–	–
PF2009	0	0	3	0,2	5	0,4
PF2012	0	0	5	0,4	–	–

^① Values shown are based on fluid viscosity of 100 SUS (20 cSt). Inlet pressures higher than 10 psig (0,7 bar) require a high-pressure shaft seal.

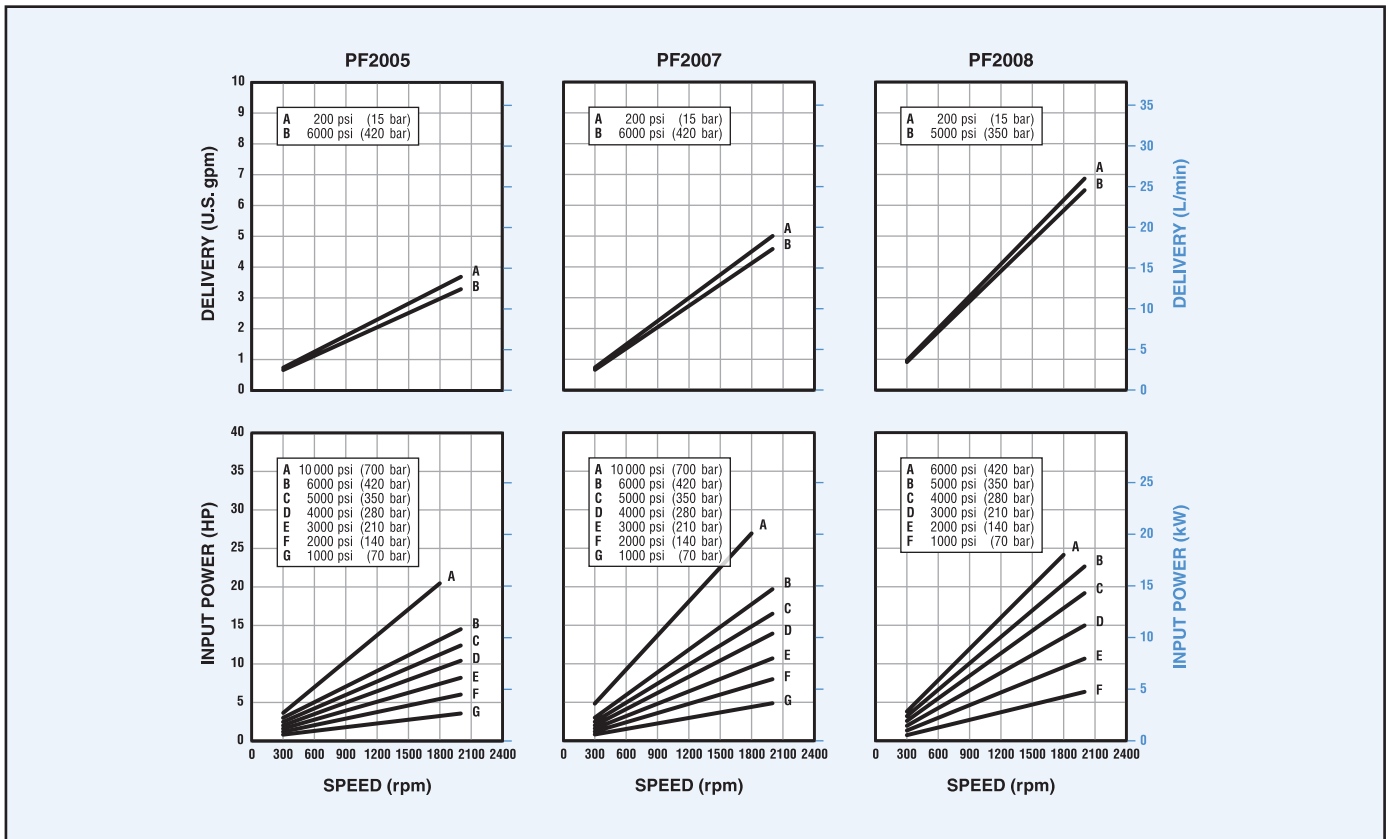
Hydraulic Fluid Viscosity Guidelines^①

Operating					
Minimum		Maximum		Start-up	
SUS	cSt	SUS	cSt	SUS	cSt
59	10	1911	413	1911	413

^① If fluid conditions fall outside of the range shown, contact the Sales department.



Typical Performance Curves



FLUID RECOMMENDATIONS

Special Fluid Operation

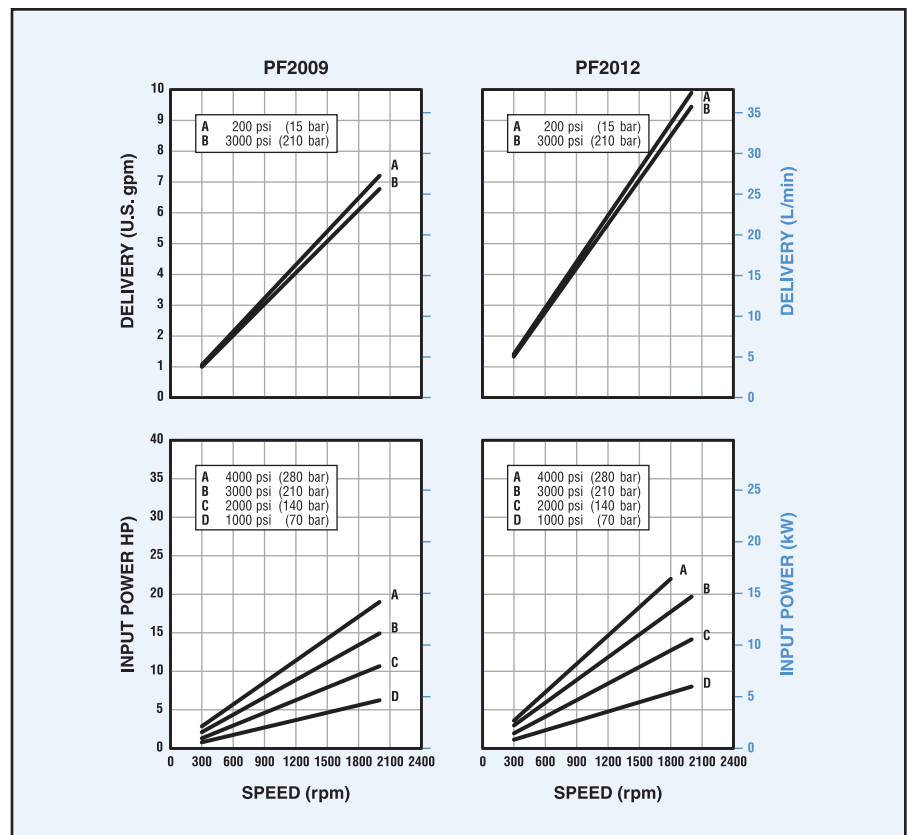
Because of the wide range of fluid characteristics, contact the Sales department for a review of any application using non-petroleum based fluids.

Viscosity Specifications

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

Fluid conditions outside the ranges shown in the table may result in reduced pump output requiring pressurized inlet conditions. For more information, contact the Sales department.

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.

TYPICAL MODEL CODE

PF20

05

H - S XV

A

-

33 - 1

0

Pump Type	
PF20	Fixed Displacement Checkball Pump

Output Flow (At 1800 rpm and Rated Pressure) ^①	
05	3.0 gpm (11,4 L/min)
07	4.1 gpm (15,5 L/min)
08	5.9 gpm (22,3 L/min) ^②
09	6.1 gpm (23,0 L/min) ^②
12	8.5 gpm (32,1 L/min) ^②

① Output flows based on typical performance at rated pressure. Refer to performance curves for flows at lower pressures.
② Not available with high pressure "H" option.

Operating Pressure	
No Code	Standard Pressure
H	High Pressure ^①

① Requires "A" or "B" port option.

Drive Shaft	
No Code	Keyed, 0.875 inch (22,20 mm) diameter
S	SAE 13 Tooth Spline, 0.873/0.872 inch (22,17/22,15 mm)

Ports	
No Code	Inlet No. 16 SAE; Outlet No. 8 SAE ^①
A	Inlet No. 16 SAE; Outlet 9/16 Medium Pressure Coned and Threaded, 0.750-14 NPSM Thread ^②
B	Inlet No. 16 SAE; Outlet G 1/2 (BSPP) ^③

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

Split-Flow [®] Options (6 Piston Pump) ^①	
No Code	Full flow from single outlet
3	Three-piston output + Three inactive pistons

Split-Flow[®] Cover Models:

33	Three-piston output + Three-piston output
3X2	Three ports, each with Two-piston output
42	Four-piston output + Two-piston output
51	Five-piston output + One-piston output
6X	Six ports, each with one-piston output

① For outlet port sizes, locations and pump cover dimensions, contact the Sales department.

Seals	
No Code	Standard: All Buna-N (Nitrile) ^①
D	Buna-N (Nitrile) with Disogrin [®] (Polyurethane) o-rings in the cover ^②
XD	Fluorocarbon (Viton [®] or Fluorel [®]) with Polyurethane (Disogrin [®]) o-rings in the cover and High Pressure Shaft Seal
XE	All EPR with High Pressure Shaft Seal ^①
XV	All Fluorocarbon (Viton [®] or Fluorel [®]) with High Pressure Shaft Seal

① Not available with high pressure "H" option. Contact the Sales department for recommended operating conditions.
② Recommended in high pressure applications.

Design Number

Modification Number

Specifications shown were in effect when printed. Since errors or omissions are possible, contact your Sales representative or the Sales department for the most current specifications before ordering. Dynex reserves the right to discontinue products or change designs at any time without incurring any obligation.

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FLUID RECOMMENDATIONS (All Checkball Pumps)

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.

PF1300 & PF4300 Series pumps are compatible with a variety of water-based fluids. Refer to specific product documentation for specifications for 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.

Refer to separate bulletin: [Water-Based Fluid and Port Specifications](#) for use with water-based 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^①

Pump Models	Operating				Start-up		Optimum	
	Minimum		Maximum		SUS	cSt	SUS	cSt
	SUS	cSt	SUS	cSt				
<i>Fixed Displacement Pumps:</i>								
PF500-20	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
PF1300-11 ^②	–	–	–	–	–	–	–	–
PF2000-10	59	10	1911	413	1911	413	98 to 324	20 to 70
PF2000 ^③	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
PF4300-22 ^②	–	–	–	–	–	–	–	–
PF6000	34	2,3	1911	413	1911	413	98 to 324	20 to 70
<i>Mechanical Variable Delivery Pumps:</i>								
PV4000-11	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 Refer to separate bulletin "[Water-Based Fluid and Port Specifications](#)" for use with water-based fluids.

③ 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 [Checkball Pumps Service, Installation and Operating Instructions](#) for general installation and operating recommendations.

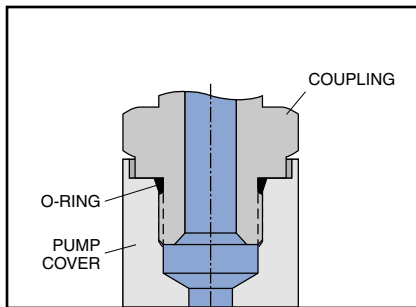
That brochure includes information on mounting, shaft loading, sizing inlet pipe and hose, air bleed procedures and initial start-up. Guidelines for maintenance, repair and trouble-shooting are also included.

OULET PORT CONFIGURATIONS

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.

SAE Straight Thread Ports



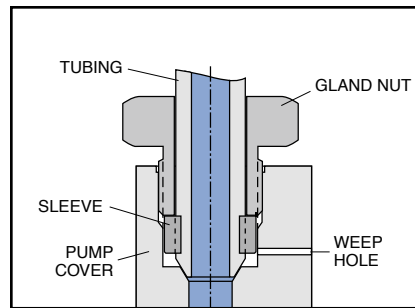
Typical SAE Straight Thread port connection

The Straight Thread connection (SAE J1926/1) is sometimes referred to as an SAE 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.

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

Coned and Threaded Ports



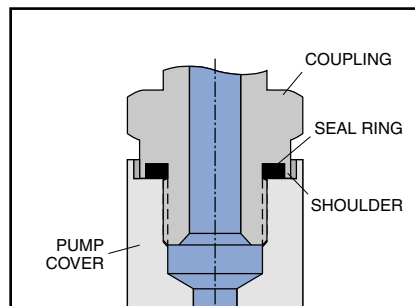
Typical Coned and Threaded port connection

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).

British Standard Pipe Parallel Ports



Typical British Standard Pipe (Parallel) port connection

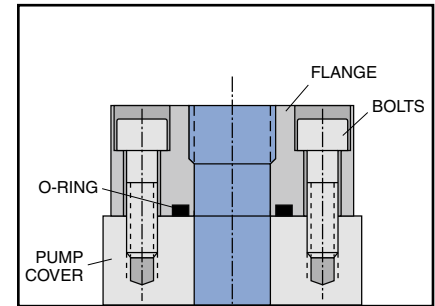
High-pressure pumps are available with flat face ports with British Standard Pipe Parallel (BSPP) threads (BS 2779 or ISO 228), ideal for use on some European applications.

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, "EOlastic" Seal; or equivalent).

BSPP 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.

SAE 4-Bolt Flange Ports



Typical SAE 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 (SAE J518).

A typical fitting consists of a flanged block 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.