

High Pressure Checkball Piston Pumps

PF4000 SERIES
7.3 to 14.0 gpm (27,6 to 53,0 L/min) at 1800 rpm
6 000 to 10 000 psi (420 to 700 bar)

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

Mounting

SAE 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 SAE 14 tooth, 12/24 DP 30° involute spline.

Outlet Port Options

Standard pressure models have SAE 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 Parallel 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 on page 2.

Seal Options

Standard seals are Buna-N (Nitrile) with Disogrin. Options include Fluorocarbon (Viton® or Fluorel®), or EPR outlet seals. Refer to *Typical Model Code* on page 4.

Weight (Mass)

111 lb (50 kg)



Specifications

| Pump Models | Output Flow at 1500 rpm ^① | | Output Flow at 1800 rpm ^① | | Rated Pressure | | Max. Pressure | | Speed rpm ^② | |
|-------------|--------------------------------------|-------|--------------------------------------|-------|----------------|-----|---------------|-----|------------------------|------|
| | U.S. gpm | L/min | U.S. gpm | L/min | psi | bar | psi | bar | Rated | Max. |
| PF4011-30 | 6.4 | 24,2 | 7.7 | 29,1 | 6000 | 420 | 8000 | 560 | 1800 | 2400 |
| PF4016-30 | 9.3 | 35,2 | 11.1 | 42,0 | 6000 | 420 | 8000 | 560 | 1800 | 2400 |
| PF4018-30 | 10.3 | 39,0 | 12.4 | 46,9 | 6000 | 420 | 8000 | 560 | 1800 | 2400 |
| PF4020-30 | 11.7 | 44,3 | 14.0 | 53,0 | 6000 | 420 | 8000 | 560 | 1800 | 2400 |
| PF4011H-30 | 6.1 | 23,1 | 7.3 | 27,6 | 10 000 | 700 | 10 000 | 700 | 1800 | 2400 |
| PF4016H-30 | 8.8 | 33,3 | 10.5 | 39,7 | 10 000 | 700 | 10 000 | 700 | 1800 | 2400 |
| PF4018H-30 | 10.1 | 38,2 | 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.

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

PUMP SELECTION

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

Ordering a PF4000 Series, 30 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 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.

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.

Minimum Inlet Pressure^①

| 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 ^② | 0,7 ^② |
| PF4020 | 0 | 0 | 5 | 0,4 | 10 ^② | 0,7 ^② | 15 ^② | 1,0 ^② |

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.

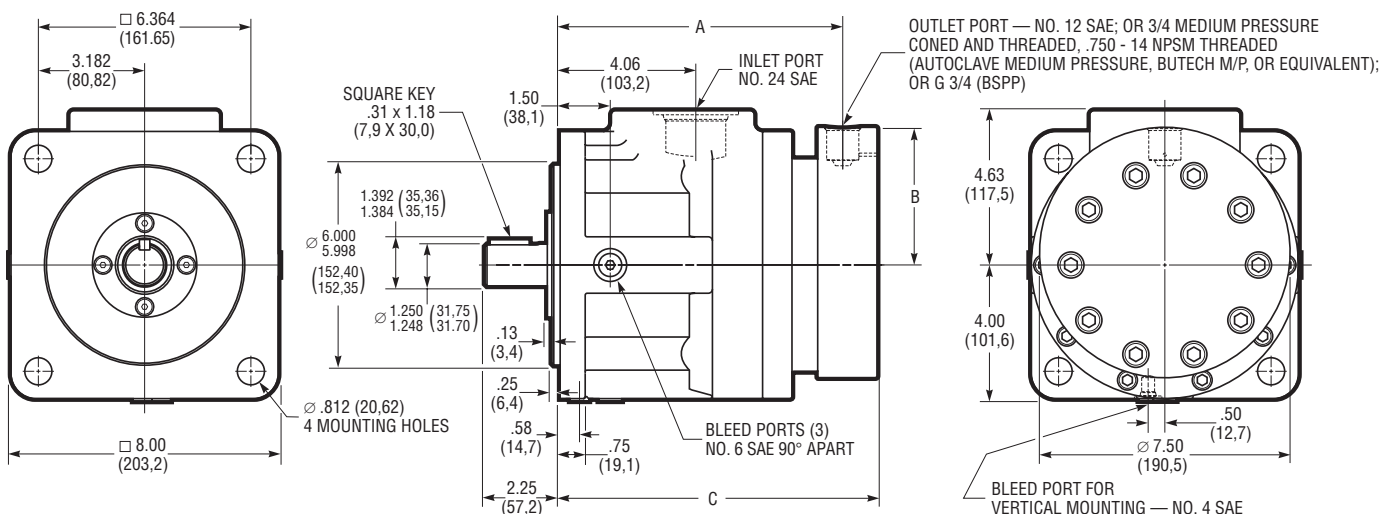
Variable Dimensions

| Variable Dimension | Outlet Port Option | | | |
|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | SAE or BSPP 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) |

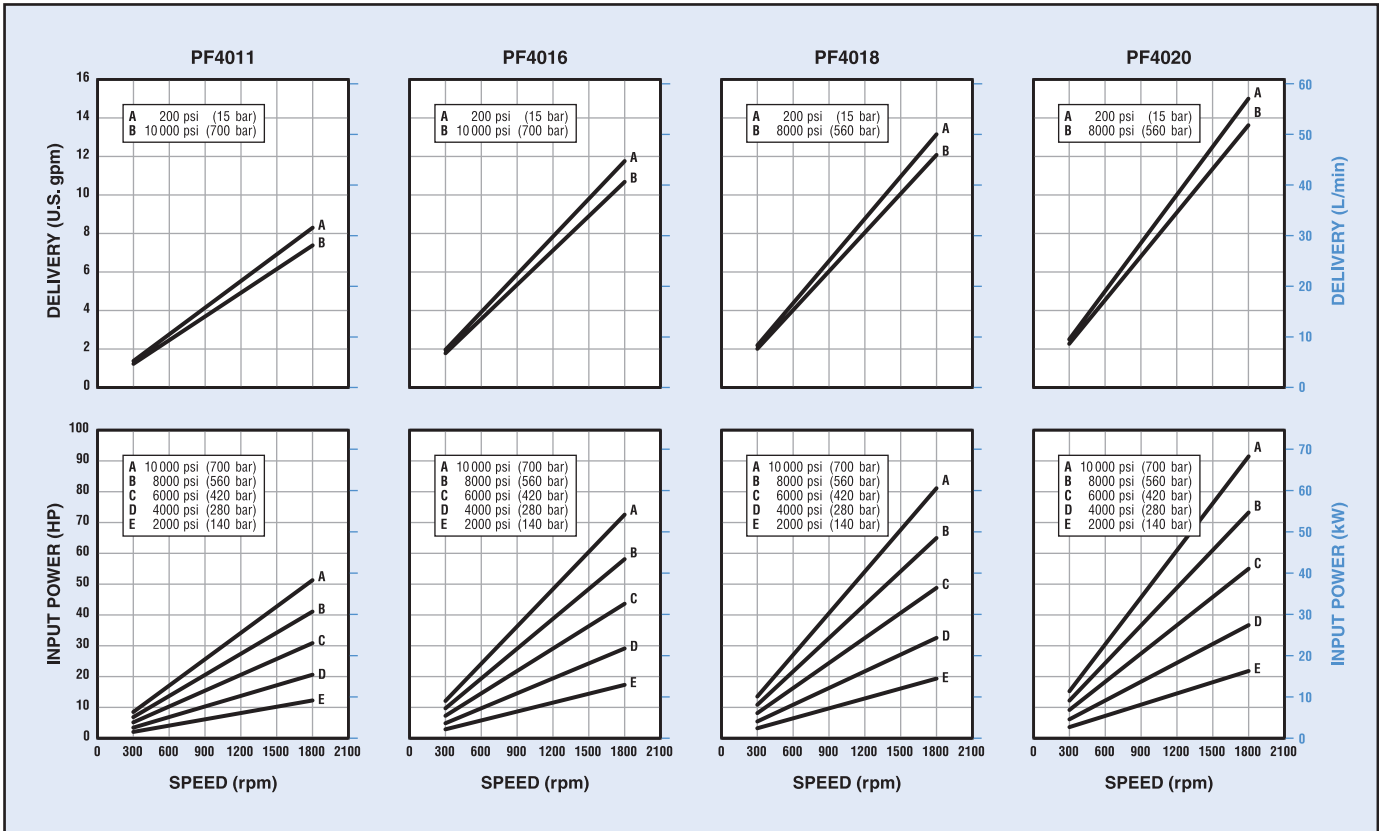
INSTALLATION

All dimensions are shown in inches (millimeters in parentheses) and are nominal. See page 1 for spline shaft data. Refer to [Checkball Pumps Service, Installation, and Operating Instructions](#) 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.



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

PF40

11

H – S XV

A

–

55 – 3

0

| Pump Type | |
|-----------|-----------------------------------|
| PF40 | Fixed Displacement Checkball Pump |

| Output Flow (At 1800 rpm, at Rated Pressure) ^① | |
|---|--|
| 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) |
| ^① 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 ^① |
| ^① Requires “A” or “B” port option. | |

| Drive Shaft | |
|-------------|---------------------------------------|
| No Code | Keyed, 1.250 inch (31,75 mm) diameter |
| S | SAE Spline, 1.250 inch (31,75 mm) |

| Ports | |
|---|--|
| No Code | Inlet No. 24 SAE; Outlet No. 12 SAE ^① |
| A | Inlet No. 24 SAE; Outlet 3/4 Medium Pressure Coned and Threaded, 3/4-14 NPSM Threaded ^② |
| B | Inlet No. 24 SAE; Outlet G 3/4 (BSPP) ^③ |
| ^① Not recommended for operation above 8000 psi (560 bar). Contact the fitting manufacturer for the pressure rating of the fitting. | |
| ^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 (10 Piston Pump) ^① | |
|--|---|
| No Code | Full flow from single outlet |
| Split-Flow [®] Cover Models: | |
| 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 |
| ^① For outlet port sizes, locations and pump cover dimensions, contact the Sales department. | |

| Seals | |
|--|--|
| No Code | All Buna-N (Nitrile) ^① |
| D | Standard: Buna-N (Nitrile) with Disogrin [®] (Polyurethane) o-rings in the cover ^② |
| 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.

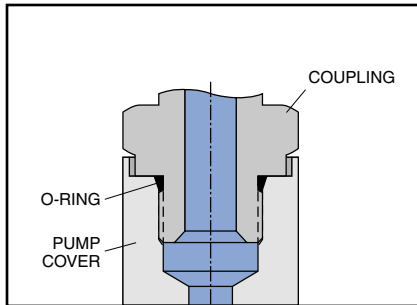
That brochure includes information on mounting, shaft loading, sizing inlet pipe and hose, air bleed procedures and initial start-up. Guidelines for maintenance, repair and trouble-shooting are also included.

OUTLET 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



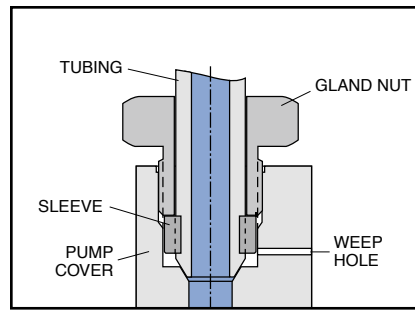
Typical SAE Straight Thread port connection

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



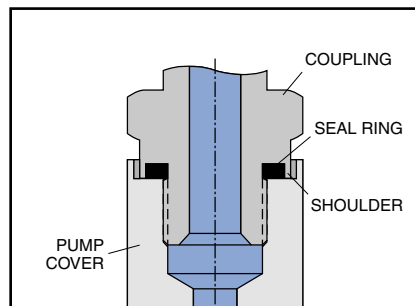
Typical Coned and Threaded port connection

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

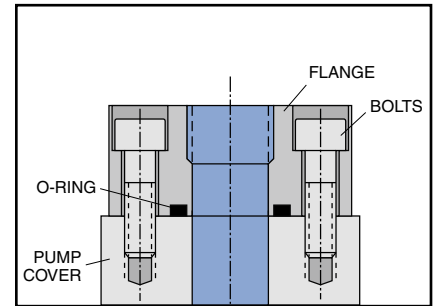
High-pressure pumps are available with flat face ports with British Standard Pipe Parallel (BSPP) threads (BS 2779 or ISO 228), ideal for use on some European applications.

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.