# Fluid Power Design Data Sheet

**REVISED SHEET 59 - EVOLUTION DESIGN DATA FILE**

**DIMENSIONS OF SAE PORT PADS**

Information on SAE port pads was obtained primarily from SAE J518 specification. For additional dimensions, that source may be consulted.

**Figure 1.** Many hydraulic components, particularly those of large size and those operating at high pressure, are manufactured with SAE 4-bolt port pads with rectangular bolt hole mounting pattern. Advantages of this type of fluid connection are that it can operate at high pressure with no leakage; it can be disconnected and reconnected many times without developing a leak; it forms a union joint for easy disconnection; the mating flange can be attached with tools much smaller than required for pipe threads, straight threads, or a swivel fitting; and the sealing element, an O-ring, can easily be replaced if damaged or changed to another seal compound. Originally, the 4-bolt pad was designed for connections of 1-inch size and larger although it is available in smaller sizes.

There are two series of bolt patterns. One (referred to usually as the 3000 PSI series) is for lower pressures, in the range of 500 to 5000 PSI depending on the size. The other (referred to usually as the high pressure or the 6000 PSI series) has larger bolts, longer and more widely spaced. It is rated for up to 6000 PSI in all sizes. Mounting bolt pattern is different for these two series. Connecting flanges designed for one series will not fit the bolt pattern for the other series. There are several types of connecting flanges which may be used to connect into these port pads.

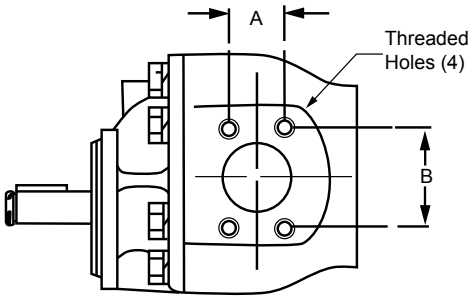



*Figure 1. Many hydraulic componets have 4-bolt port pads with standard SAE rectangular bolt spacing.*

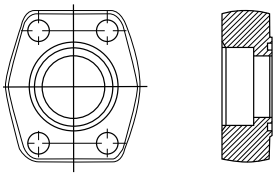


*Figure 2. Typical solid flange with weld socket for connecting pipe to an SAE port pad.*

## PIPE CONNECTIONS TO AN SAE PORT PAD

**Figure 2.** Solid flanges are used for connecting pipe or tubing into an SAE port pad. These flanges are available either with dryseal (NPTF) threads for pipe or with a plain round bore for welding to pipe or tubing. In all cases, the hole diameter through the flange and through the pad is the same as the rated size of the port. The O-ring seal is located in a circular groove on the inside surface of the solid flange and is pressed against the flat surface of the port pad as the bolts are tightened. A mounting kit for a solid flange consists of four high tensile cap screws, four lockwashers, and one O-ring.

## HOSE CONNECTIONS TO AN SAE PORT PAD

**Figure 3.** These port pads are especially desirable for connecting hose to avoid any twist in the hose during assembly. Hoses should have an SAE flange end either straight-thru or angle type. The O-ring is contained in a circular groove on the end surface of the flange. The flange is mounted to the port pad with two hlaf flanges (called a split flange). Hose flange ends are available in straight-thru type or with angles of 22½, 30, 45, 60, 67½, or 90 degrees. Since high pressure hose will not bend in a sharp radius, it is important to carefully plan lengths and angles when ordering hose. The mounting kit for each hose end consists of four high tensile cap screws, four lockwashers, two split flange halves, and one O-ring. Split flange mounting kits can usually be purchased from the hose supplier when ordering hose.

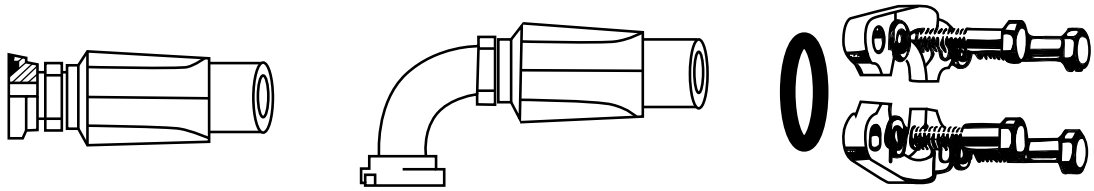



*Figure 3. Hoses may be ordered with an SAE flange fitting. They can be bolted to the port pad with a split flange.*

## NOTES ON SAE FLANGES

a. Solid flanges in the high pressure series are not usually offered with pipe thread connections; only with weld sockets.

b. One disadvantage of SAE pads, especially with split flanges, is the possibility of human error in attachment. When mounting a flange to a port pad, the bolts should be finger tightened to be sure the flange is going on straight. Then, all four screws should be tightened to the same torque, going in rotation and tightening each one a little at a time.

c. SAE flange unions for joining two pieces of pipe or tubing are made to the same bolt spacing as shown in the tables. They use one standard solid flange with clearance holes for mounting bolts and with contained D-ring seal. This is mated to a "companion flange" of similar dimensions which has threaded bolt holes but without the O-ring seal.

d. Some hydraulic components have bolt-on port pads with square mounting hole pattern. This is not an SAE standard; rather, it apparently originated with Vickers many years ago and was adopted by certain other manufacturers. Connection flanges for these ports may be purchased from the component manufacturer.

**LOW PRESSURE SAE 4-BOLT MOUNTING PADS**

**All dimensions are in inches. They refer to Figure 1 on front side of this sheet.**

| Normal Size | PSI Pres. Rating | Bars Pres. Rating | Dim. A, Inches | Dim. B, Inches | Mounting Bolt Size, Inches* | Standard O-Ring Size† |
|---|---|---|---|---|---|---|
| 1/2 | 5000 | 345 | 0.688 | 1.500 | 5/16-18 x 1¼ | 1 x 3/4 |
| 3/4 | 5000 | 345 | 0.875 | 1.875 | 3/8-16 x 1¼ | 1-1/4 x 1 |
| 1 | 5000 | 345 | 1.031 | 2.062 | 3/8-16 x 1¼ | 1-9/16 x 1-5/16 |
| 1¼ | 4000 | 276 | 1.188 | 2.312 | 7/16-14 x 1½ | 1-3/4 x 1-1/2 |
| 1½ | 3000 | 207 | 1.406 | 2.750 | 1/2-13 x 1½ | 2-1/8 x 1-7/8 |
| 2 | 3000 | 207 | 1.688 | 3.062 | 1/2-13 x 1½ | 2-1/2 x 2-1/4 |
| 2½ | 2500 | 172 | 2.000 | 3.500 | 1/2-13 x 1¾ | 3 x 2-3/4 |
| 3 | 2000 | 138 | 2.438 | 4.187 | 5/8-11 x 1¾ | 3-5/8 x 3-3/8 |
| 3½ | 500 | 34 | 2.750 | 4.750 | 5/8-11 x 2 | 4-1/8 x 3-7/8 |
| 4 | 500 | 34 | 3.062 | 5.125 | 5/8-11 x 2 | 4-5/8 x 4-3/8 |
| 5 | 500 | 34 | 3.625 | 6.000 | 5/8-11 x 2¼ | 5-5/8 x 5-3/8 |

## HIGH PRESSURE SAE 4-BOLT MOUNTING PADS

Pressure rating all sizes: 6000 PSI, 414 bar. O-ring sizes are the same as for the low pressure series. For dimensions, refer to **Figure 1** on front side of sheet.

| Rated Size | Dim. A, Inches | Dim. B, Inches | Mounting Bolt Size, Inches* | Weld Socket Diam. |
|---|---|---|---|---|
| 1/2 | 0.718 | 1.594 | 5/16-18 x 1½ | 0.855 |
| 3/4 | 0.937 | 2.000 | 3/8-16 x 1½ | 1.063 |
| 1 | 1.093 | 2.250 | 7/16-14 x 1¾ | 1.328 |
| 1¼ | 1.250 | 2.625 | 1/2-13 x 2¼ | 1.672 |
| 1½ | 1.437 | 3.125 | 5/8-11 x 2¾ | 1.923 |
| 2 | 1.750 | 3.812 | 3/4-10 x 3 | 2.406 |
| 2½ | 2.312 | 4.875 | 7/8-9 x 3½ | 2.906 |
| 3 | 2.812 | 6.000 | 1-7/8-7 x 4½ | 3.547 |

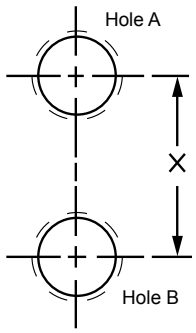
## O-RING COMPATIBILITY

Several types of fittings use an O-ring as the sealing element. These types include the SAE 4-bolt rectangular flange, the SAE and the AND straight thread fittings, and certain proprietary types such as the 4-bolt square flange. The following chart, published by Aeroquip gives the compound material considered best for the listed fluid over the temperature range shown.

| Material | Temperature | Fluids |
|---|---|---|
| Buna-N | -65 to +275°F | Air, gasoline, mineral oil, water, JP-4, J-5, MIL-L-7808C, MIL-L-5606 |
| Butyl | -65 to +250°F | Steam, Pydraul, Skydrol |
| Rubber | -40 to +200°F | Ammonia, hydrochloric acid, methyl alcohol, sodium hydroxide, steam, water |
| Neoprene | -65 to 300°F | Salt water, Freon 12, Freon 22, MIL-L-7808C |
| Silicones | -85 to 550°F | Gases, hot air, high aniline oils |
| Teflon | -100 to 500°F | Acids, alkalies, gases, steam, Pydraul, Skydrol |
| Viton | -40 to +450°F | Air, exhaust gases, MIL-O-8200, MIL-O-8515, MIL-H-7808C, OS45, DC200, JP-4, JP-5 |

## TOOL CLEARANCE

Recommended minimum spacing between holes for tool clearance, pipe thread, or straight thread portholes.




| Hole A Size | Hole B Size | Min. Distance X |
|---|---|---|
| 1" NPT | 1" NPT | 2-3/4" |
| 1" NPT | 3/4 NPT | 2-1/2 |
| 3/4 NPT | 3/4 NPT | 2-1/4 |
| 3/4 NPT | 1/2 NPT | 2-1/8 |
| 1/2 NPT | 1/2 NPT | 2 |
| 1/2 NPT | 3/8 NPT | 1-3/4 |
| 1/2 NPT | 1/4 NPT | 1-5/8 |
| 3/8 NPT | 3/8 NPT | 1-3/4 |
| 3/8 NPT | 1/4 NPT | 1-5/8 |
| 1/4 NPT | 1/4 NPT | 1-3/8 |