

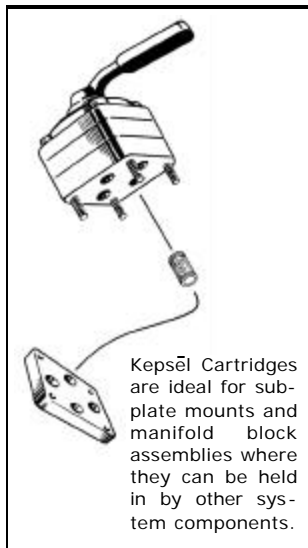


KEPNER PRODUCTS COMPANY

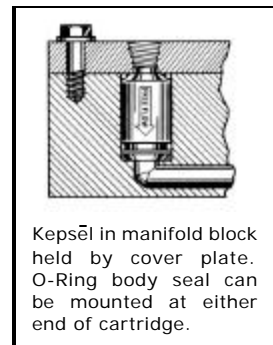
ESTABLISHED IN 1948

TIPS#13

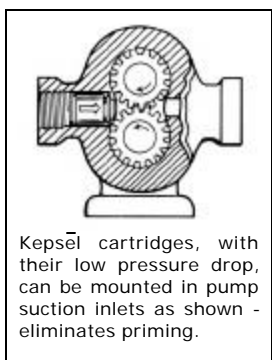
Kepsēl Cartridge Insert Valves - Applications and Installation Page 1 of 3



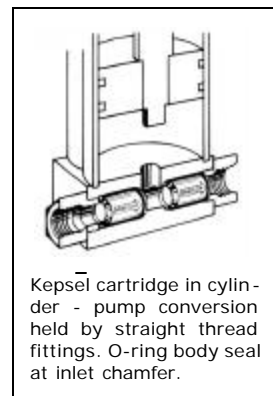
Kepsēl Cartridge Valves are valves without an integral housing, essentially bodiless, because they consist of only the internal moving elements of the valves. They are unsupported until they are installed by insertion into a cavity with appropriate flow passageways, so as to perform the same way as a conventional valve. The cartridge must be held end-for-end in use and should not be allowed to shuttle back and forth in the cavity. The unsupported cartridge valve assembly is not intended for high pressure applications. An interference fit is required except for very low pressure applications. When properly contained, the cartridge valve will perform according to specifications. We have many successful cartridge applications at pressures up to 16,000 PSI which are dependent on the strength of the method of containment.



Our customers are among the best engineers and designers in the world, and they are continually devising new ways to use and adapt our cartridges to their equipment. The Kepsēl Cartridge Insert Valve has gained acceptance because of its performance, reliability, flexibility and ease of use. It offers endless possibilities for design simplification and miniaturization of fluid power circuits.



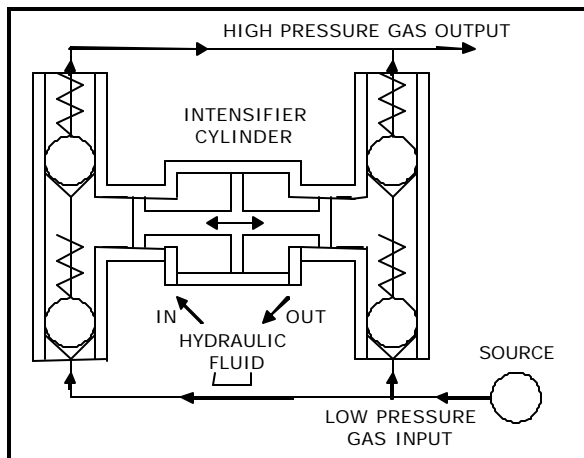
Kepsēl Cartridges are used as check valves, relief checks, orifice checks, shuttle, pilot operated checks and even two-way valves. They are used in control panels, manifolds, sub-plates, valve housings, pump housings, in actuator pistons for cushioning and in actuator cylinders for cushioning, speed control and valving.



The Kepner Kepsēl Cartridge Type Check Valve is designed for simplicity of installation and positive performance. It will eliminate many maintenance problems of the product in which it has been installed. With the Kepsēl there is no need for expensive machining and finishing of fine, close tolerance, metal surfaces. The unique *Flexible Seal Seat™* assures positive valve action with extremely long life. Dirt can't hurt it...The Kepsēl Cartridge is designed and manufactured to the same high quality standards established by the outstanding Kep-O-seal valve line.

KEPSĒL CARTRIDGE INSERT CHECK VALVE APPLICATION

The intensifier converts low pressure gas to high pressure gas. There are two cartridge insert valves used in the inlet ports and two in the outlet ports. A common rod connects the pistons of two cylinders of differing bore sizes. The smaller piston generates a greater force that translates into a higher pressure.



Valve performance is dependent on proper selection, application, installation and maintenance. Consult Factory.



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External sealing of the cartridge in the cavity is accomplished by an O-Ring, and the clearance in the cavity must be within standard static O-Ring tolerances. The cartridge dimensions are such that standard drill and ream sizes, (cavity "Diameter"), in the chart below insure these tolerances are provided.

Recommended Valve Cavity For Cartridge Valves

| Valve Family | Valve Number | Diameter | Dia. Tolerance | Valve Length* |
|-------------------------------|--------------|----------|----------------|---------------|
| Check and Relief Check Valves | 2201 | 0.312 | +0.002 | 0.620 |
| | 2203 | 0.500 | +0.002 | 0.835 |
| | 2206 | 0.656 | +0.002 | 1.215 |
| | 2208 | 0.813 | +0.002 | 1.490 |
| | 2210 | 1.000 | +0.002 | 1.545 |
| | 2212 | 1.219 | +0.002 | 1.930 |
| | 2216 | 1.688 | +0.002 | 2.615 |
| | 2224 | 2.313 | +0.002 | 3.244 |
| Shuttle Valves | 2232 | 3.313 | +0.002 | 4.495 |
| | 2251 | 0.375 | +0.002 | 0.758 |
| | 2253 | 0.500 | +0.002 | 0.873 |
| | 2256 | 0.688 | +0.002 | 1.086 |
| | 2260 | 1.062 | +0.002 | 1.453 |
| Adjustable Relief | 2262 | 1.313 | +0.002 | 1.861 |
| Lock Valves | 1354 | 1.000 | +0.002 | 2.151 |
| | 2741 | 0.375 | +0.002 | 1.192 |
| | 2743 | 0.625 | +0.002 | 1.583 |
| | 2746 | 0.750 | +0.002 | 2.406 |
| | 2750 | 1.189 | +0.002 | 2.967 |
| Lock Valves | 2752 | 1.438 | +0.002 | 3.929 |

*Clamping device must allow for this valve length or longer.

The resulting tolerance between cartridge and bore will be proper to adequately maintain the leak tight seal and retain the external O-Ring against extrusion. With cavity sizes of one (1) inch or less, a drilled hole is satisfactory for pressures under 500 PSI.

The external seal may be used at any one of three positions; at either end on the chamfer or in the body groove. This provides flexibility in installation. The chamfers are often used because of ease of assembly by merely placing the O-Ring in the bottom of the bore and putting the cartridge in behind it.

If service conditions require a non-standard internal seal, the external seal should be made from the same material as the internal seal so the entire installation is compatible with the fluid and temperature.

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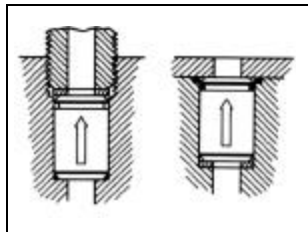
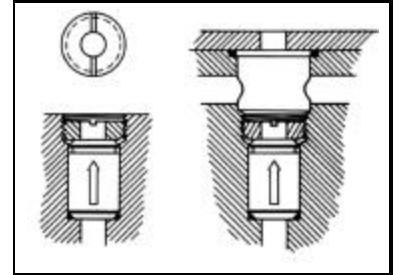
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RETAINING METHODS

(Some suggested methods of retaining the cartridge are shown here.)

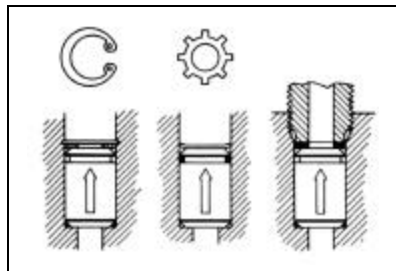
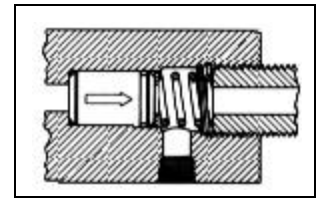
Threaded Washer: A threaded washer, as depicted here, screwed tight against the cartridge, is one of the most effective methods of providing end-for-end holding of the cartridge. The cartridge bore is drilled or reamed and then followed with the tap drill and tap. The washers can be made from rod, threaded stock, pipe plugs, or hex head set screws. A screwdriver slot or spanner wrench holes provides means for tightening. The threaded washer also makes for a very simple cross-hole installation as shown in the sketch.



Shims - With closure by manifold cover plate, shims at top or bottom of cartridge allow exact dimensional adjustment so cover can be pulled tight and end-for-end holding accomplished together. Especially recommended for large sizes and severe operating conditions. Shims may be solid, built up, or of laminated stock peeled to fit.

Malleable Washer - A malleable copper or aluminum washer may be used as a spacer to achieve a firm hold and allow some adjustment for tolerances by squeezing.

Heavy Spring - A very heavy spring or die spring is especially effective in cross-port mounting as shown in the sketch. It is useful anywhere there is room for it, because it allows maximum tolerance on cartridge port depth. The only limitation here is that the spring be located on the downstream or outlet end of the cartridge so that, when the cartridge is checking reverse flow, it will bear against the solid end of the bore.



Special Applications - In this illustration, we show three commonly used methods of cartridge retainment:

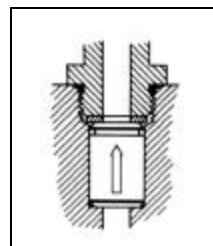
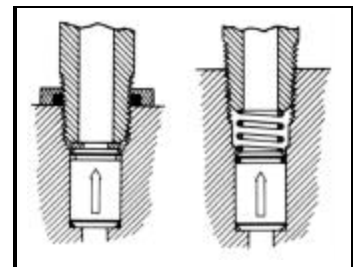
Snap Ring - very strong and permits easy removal, but has the single limitation of requiring accurate positioning of the snap ring groove to provide end-for-end holding.

Friction Ring - the simplest means of retaining in a bore for low or medium pressures. The ring is merely pressed in tightly over the cartridge. The ring, if properly seated, will not loosen and cannot be backed out of the bore.

Teflon Washer - for low pressure applications is a relatively simple and flexible crush washer.

Fitting Closure - It is often convenient to retain the cartridge with a pipe thread, pipe fitting or tube fitting end. This requires some considerations in dimensioning the cartridge bore depth.

Pipe Threads - With pipe threads there is no control dimension to work from since the threads seat by taper interference. In this case a teflon insert lock washer, (such as Tru-Seal), may be used effectively. The hole depth is made such that the fitting contacts the cartridge as the threads begin to lock up. The final sealing is accomplished by tightening the lock washer. The malleable washer shown is necessary only if radial positioning of an elbow or tee fitting is required. Also shown here is the use of a short heavy spring between pipe thread and cartridge.



Straight Thread Port - SAE or AND 10050 - If a straight connector fitting or reducing bushing is used to close the port, the body hex is integral and must be turned in tight to seal the fitting O-Ring into the port. A malleable washer may be used as a spacer to provide for tolerance buildup from the bore depth, the cartridge and the fitting. With an elbow or tee fitting, the locknut on the body threads provides the length adjustment for proper makeup. If it is necessary that the fitting be aimed in a certain direction, a malleable washer used between fitting and cartridge should permit enough turning to properly position the fitting.

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