VEKTEK®

The Productivity Devices Company

PRECISION HYDRAULIC WORKHOLDING DEVICES

800-992-0236

www.vektek.com

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Quick Reference

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Why use VektorFlo®?

Most expensive CNC metalworking machines are purchased without fixtures to hold the workpiece(s). With today's sophisticated machines making tool changes in fractions of a second and cutting at speeds and accuracies we once thought nearly impossible, the speed and quality of part clamping is the next most important opportunity for time savings and productivity improvement. VektorFlo® power clamps provide the "helping hands" to present more parts to the machine spindle with less effort, more consistency, and greater productivity at a cost only modestly more than manual fixtures. Use VektorFlo® because it can increase your productivity.

The selection of any single brand of hydraulic clamp, as any other important decision, must be made from an informed, intelligent point of view. Your choice should be based on many factors influenced by your specific application. Other factors can be used for general comparison and are strong indicators of the overall quality of the brand selected. Before making any decision, we ask that you take time to accurately compare product quality, product and information availability, technical support and service both before and after the sale. When you do, you'll find VektorFlo® "head and shoulders" above the rest! This is why Vektek is Americas leading manufacturer of power workholding products.

Quality Product

When we, at Vektek, made the decision to enter the Hydraulic Clamping market we knew that another "me too" product would not succeed. Professional users expect top quality products backed by knowledgeable technical support. They also expect ready availability of parts when needed. Armed with this knowledge our team of engineers began an extensive product development process. Exhaustive research, design, development and testing yielded a unified product line all of which incorporate the following appropriate features:

- BHC™, Vektek's proprietary black hard coating, makes VektorFlo® bodies extra durable. This high tech surface hardening process virtually eliminates the bore scoring and scratching that is the most common reason for seal failures and leakage in some brands.
- Extensive use of Hardened Chrome components are incorporated to provide improved load bearing areas where it is critical to device life.
- SAE O-Ring Porting . . . Every device is ported using standard SAE porting. Devices commonly use SAE 4, pumps and manifolds typically use SAE 6 porting. O-ring porting normally installs without leaking the first and every time.
- Special seals and wipers help keep leaks from starting by sealing fluid in and contaminants out. Lip seals virtually eliminate external (visible) on single acting devices. Most devices incorporate a wiper to help keep chips from entering the cylinder and damaging the seal. VektorFlo® wipers have been found to be stable in most common coolants.
- Warranty is an indication of a manufacturer's confidence in the ability of the product to run "trouble free" for a specified time. Our hydraulic products are warranted for one year from date of shipment. For details see our printed warranty statement.

Compare the durability and long life of our devices with that of competitors. Prove it to yourself. We welcome any head-to-head run-off.

Availability of Product & Information

We customarily maintain inventory of all items in this catalog. This enables us to respond quickly to help you in a difficult situation. Some VektorFlo® devices are interchangeable with competitive devices to help you out of a tight spot. Please plan adequate lead times into your production schedule when ordering large quantities.

We take pride in the information we share with you, our customer. We have attempted to create a catalog that is easy to read, understand and use. You will find the catalog organized so that you can find specifications, dimensions and product specific features without a lot of useless rhetoric, but with more information than some "parts store" catalogs. Should you need information not contained in this catalog, our Application Engineering Staff would be happy to answer your questions.

Service Before The Sale

Our unique blend of Field Representation, telemarketing, catalog and technical support is there for you when you need us, not when "we're in the neighborhood." Pick up the phone and call us toll free. We'll do our best to answer your questions, solve your problems or just discuss your application at your convenience. There is no charge for this service, we'll even pay for the call.

A typical customer finds that it goes like this:

- After several conversations with a Vektek sales representative, you may uncover an application where hydraulic clamping will pay for itself in a very short time.
- Call us at your convenience and discuss the application with one of our Application Engineers. They may ask you to send information about your current fixture, part, machine and/or processes for them to study and propose a clamping concept.
- At your request, we will develop a custom hydraulic clamping concept based on your part and send drawings to help you in the finalization of your fixture design. We can even include a Bill of Materials, if you request one.
- To aid in your fixture design, CAD files for each product are available to you online at www.vektek.com or by requesting a CD from your sales representative.
- After your design is complete, call us to place your order or place your order online at www.vektek.com. Again, call on your schedule, when you need the components. It's our job to deliver - promptly.
- One more thing to keep in mind . . . You can have all this service at no charge! Call us and see for yourself.

Service After The Sale

Unlike some sales people, we don't and won't disappear after the sale. We want your fixture to work right the first time and keep on working. If it doesn't work **CALL US**, you'll find us ready to help. Remember when you dial

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you talk to us, we can't and won't hide!

We want your business today, tomorrow and next year. We will continue to do what it takes to earn your business and respect. We want to help make your business more profitable.

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Planning Your Power Workholding System . . .

Successful power workholding does not just happen. Like any other manufacturing process, it must be carefully planned. But that does not mean that you need to be a hydraulics engineer to implement a power workholding system. Designing a system involves common-sense application of a few basic workholding concepts and a basic understanding of fixtures.

Applications for power workholding fall into two categories: retrofits to replace and upgrade clamping on existing fixtures; and new fixtures designed from the outset with power workholding. In both cases it is imperative that you keep in mind the forces that can be generated by power workholding devices. A single device, small enough to hold in your hand, can generate five tons of clamping force. If you are replacing existing manual bolt and nut clamping or toggle clamps, make sure that the fixture or machine tool base will withstand the forces. Don't risk damaging a machine bed because you tried to tie a 10,000 pound clamp into a T-slot that would only withstand 5,000 pounds of force.

Using power workholding does not in any way invalidate the principles of sound fixture design. The 3-2-1 concept as it relates to the location of the workpiece in three planes is just as applicable when using power workholding devices as when using manual methods. Workholding devices should be positioned in such a way as to ensure firm contact between the workpiece and locating buttons, pins, or surfaces.

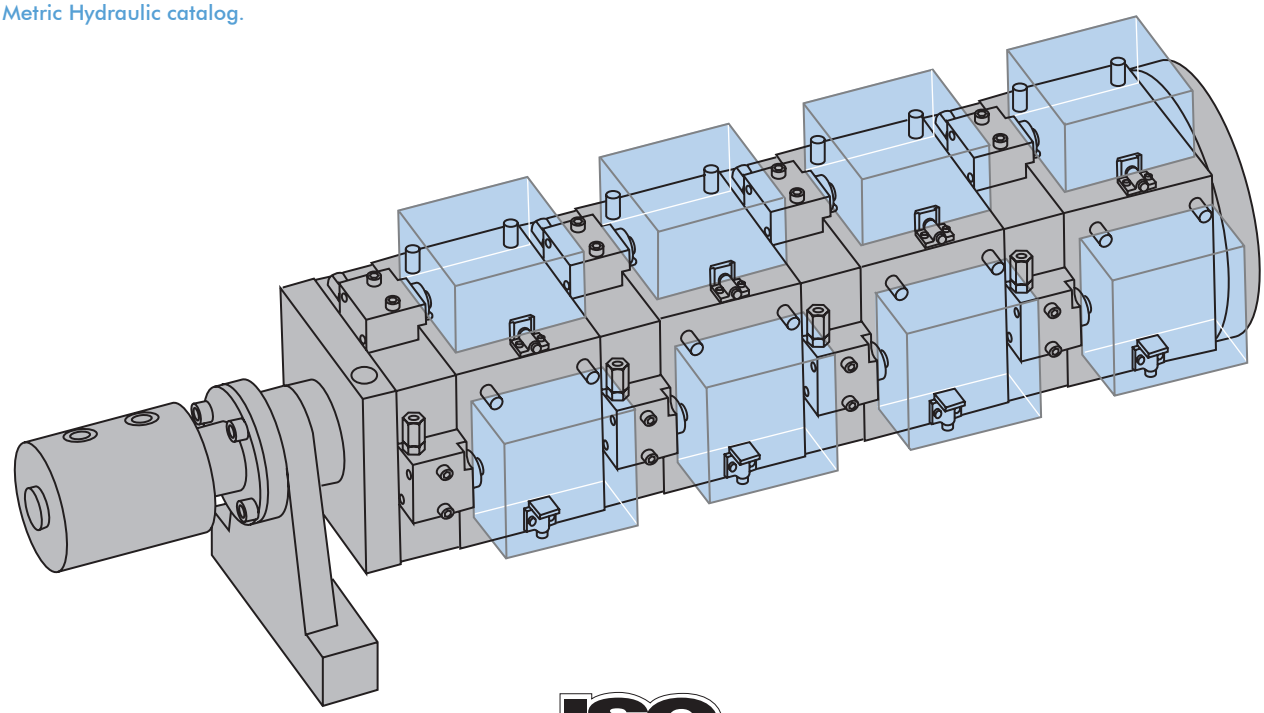
Begin the planning process by asking yourself the following:

* What do you want your system to accomplish?
* What sort of operation will use this system?
* What clamping "speed" is appropriate for the speed at which your production line runs?

You should select "realistic" cycle times . The shorter the cycle time, the larger the power source you will require. For example, a pump with a 1/3-hp electric motor may be satisfactory to reach clamping pressure on a given system in three seconds. However, to accomplish the same task in one second may require a pump with a 1-hp electric motor — at a considerable increase in both initial expense and operating costs. So before you specify "instantaneous" cycling, be sure the increased clamping speed is really worth the higher costs for your particular installation. Ask yourself if you can productively utilize the seconds saved.

With this in mind, let's proceed step-by-step through a plan of attack for designing your system.

For information on workholding product used in Metric applications, call your Vektek Customer Support Specialists and request our Metric Hydraulic catalog.



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Planning

Steps 1-9

Step 1:

First, determine the nature of the operation to be performed, the number of parts to be processed per cycle, and whether operations will be performed on more than one surface of each part. Also determine the time that should be allowed for part loading, unloading, and clamping.

Consult your machine tool file to determine the available work space on the machine table, bed, chuck or other surface, as applicable. Be sure that the space available will accommodate the part or quantity of parts to be processed according to your manufacturing work-flow. If not, revise your plan.

In the initial phases of system planning, include adequate measures and devices to ensure the safety of workers and equipment. For more information, see the safety section on the back inside cover.

Step 2:

Prepare an outline of the sequence of events that will take place during the manufacturing cycle. This will assist you in determining the number of sequence valves that you might need, as well as any external control (such as a tie-in with machine controls) that your application may require.

Step 3:

Determine the cutting forces generated in the machining process and note the direction that these forces tend to act on the workpiece. It is recommended that cutter forces be calculated as a precaution in such a case to ensure that workholding devices are sized and positioned to provide adequate holding. The operation manuals of many machine tools contain tables that list machining forces or simple formulas for calculating these forces. If you are planning a retrofit of a manual clamping system, the torque values of your current application may be helpful in determining how much clamp force you are already using. If you can't find the information, give us a call. We'll be glad to get you started.

Step 4:

Plan your fixture(s) with positive fixed stops to resist the majority of cutting forces and to ensure correct location of the workpiece using the primary part locating features.

Step 5: (Optional)

Thanks to the two-stage design of VektorFlo® hydraulic power sources, the low-pressure high-flow first stage will move clamping devices into position around the workpiece and generate sufficient force to settle the workpiece against fixture stops before high pressure clamping forces are generated. Additionally, in many applications, the nature of the fixture itself will ensure that the part is located closely enough to eliminate the need for positioning devices as a separate fixture element. However, consideration should be given to the need to overcome weight and positioning friction.

Step 6:

After you have determined the machine cutting forces, assess the clamping force required to hold the workpiece on the fixture or machine table.

Step 7:

Determine where clamps should contact the part to hold or support it securely and to avoid interference with machine operations. If clamps cannot be located so as to avoid interference with manufacturing operations, it will be necessary to use an external control device to move the clamps out of the way as the need arises during the manufacturing sequence. This will require additional valves be used to control the offending devices separately.

Step 8:

Determine the type and number of workholding devices you need based on the total clamping force required and clamping positions you've selected.

Step 9:

To help determine the capacity of the power source you'll need, add up the total oil displacement requirements for the devices you have selected. Then choose a power source with equal or greater capacity and determine if it will operate the system within your clamping time constraints by working out the following formulas:

(Device cap.) ÷ (L. P. flow) = Position time

Where . . .

Device cap. is total device oil capacity expressed in cubic inches. L.P. flow is low pressure pump oil volume expressed in cu. in. per minute. Position time is time to position expressed in decimal parts of a minute. (Sequence valves in your circuit will affect this time)

To the result obtained above, add the result of the following calculation to obtain total estimated clamping time.

[(Sys. cap.) ÷ (H.P. flow)] x .01 (Sys. op. press. ÷ 1000) = Pressurize time

Where . . .

H.P. flow is high-pressure pump oil volume expressed in cu. in. per minute. Sys. cap. is total system oil capacity, the workholding device capacity plus the internal volume of any associated tubing, hoses, manifolds, etc. (For small systems, the plumbing volume may be so small as to be negligible. However, for systems with long runs of tubing or hose, their volume may be of such magnitude as to materially affect the time it takes for operating pressure to be reached.)

The expression .01 x (sys. op. press. ÷ 1000) takes into account the slight compressibility of oil and system elasticity which influence the length of time required to pressurize a system. Position time is the total time to reach pressure expressed in decimal parts of a minute.

If total estimated clamping time is not within the cycle time requirements you've targeted but is within device limitations, a larger power source is required — one with greater capacity. Select such a source and repeat the above calculations to ensure that it will provide the clamping cycle times required.

If the total estimated clamping time in the initial calculation is significantly less than the time allowed, your initial power source selection may have been too large. In such a case, select a smaller power source and repeat the above calculations to ensure that it still provides the clamping cycle times you will need.

Additional factors you should consider when selecting a power source include shop floor plan and/or machine layout and your own preference for the type of power source (shop air vs electric).

If desired, large electrical power sources may be used to supply several workholding systems, each operating independently at several machines. In this case, the timing and sequence of operations for each individual system must be calculated as shown above in order to arrive at a size for the power source.

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Step 10:

Select valves and other control components to accomplish the sequence of operations you outlined in Step 2. See the valve sections of this catalog for guidance.

Step 11:

Select appropriate safety control mechanisms. All VektorFlo® electrical power modules have a hydraulic pressure switch as standard equipment to ensure that consistent forces are maintained at all times. However, when a power source is used to power several separate individual systems, each system should also have its own pressure monitor.

Step 12:

Finally, select the plumbing components required to connect the power source to the valves and devices. Simply review your system specifications and layout to determine what you need in terms of fittings, sizes, and lengths.

Step 13:

Call us for help. Our application engineers do not design fixtures. Their job is to help you use hydraulic clamps successfully. Whether you are retrofitting existing fixtures, need an idea (concept) for clamping a new part or want a quick review of your design we stand ready to help VektorFlo® customers with concept assistance.

Call 800-992-0236 Toll Free

for everything you need in workholding. Discover how easy, economical, and efficient power workholding can be — with one toll free call. We'll be glad to answer your questions, provide concepts or advice, and give you a quote.

Please visit us at

www.vektek.com

to download our most current CAD files.

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Clamp Time Calculation

To Calculate the Approximate Clamping Time of a Fixture

1. Fluid capacity per cylinder = _____ ($in.^3$)
2. Total number of cylinders = _____
3. Multiply line 1 by line 2 = _____ ($in.^3$)
4. Repeat steps 1-3 for each different _____ _____

   _____ cylinder size and/or stroke
5. Interpret volume required for flex hose expansion from chart on page I-11 of this catalog _____ ($in.^3$)
6. System capacity = line 3 + line 4 + line 5 = _____ ($in.^3$)
7. System position time = [_____ (line 6 $in.^3$) ÷ _____

   (low pressure pump flow)] X 60 = _____ Seconds (See note 1 below)
8. Time for system to build high pressure = [_____ (line 6 $in.^3$) ÷ _____

   (high pressure pump flow)] X .01 X [_____ (system operating pressure plus note 2 below)

   ÷ 1000] X 60 = _____ Seconds
9. Total position and clamp time = _____ (line 7) + _____

   (line 8) + 1.5 Seconds (correction factor for motor start and stop) = _____ Seconds

NOTES:

1. If sequenced circuits are involved, calculate the position time of these circuits at the high pressure pump flow rate.
2. If using a pallet decoupler, you must add the following correction factor to the total system volume in line 8 above

   .0007 X _____ (system operating pressure) = _____ ($in.^3$)

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Frequently Asked Questions

This list of questions was developed by listening to customers just like you when they asked, "Why didn't I know that?" Before you order devices, build your fixture or even consider your design complete, we suggest you run through this checklist to check for some common problems.

Should I use or at least consider using double acting cylinders?

Double acting cylinders will assure full cylinder retraction on a timely basis even in systems where restrictions such as small orifices or long tubing runs have been introduced. The use of double acting cylinders is especially important if "return" time is critical (as in some CNC systems). We also recommend use of double acting cylinders in systems operating below 800 psi.

Note: Minimum operating pressure for Vektek single acting devices is 750 psi and for double acting devices is 500 psi.

If single acting cylinders must be used: Have I reduced the number of fittings (orifices), length of tubing and restrictions as much as possible? Are all of these properly sized?

Some fittings and hoses which are locally available (not from Vektek) have extremely small orifices which restrict flow. The use of 1/8 or similar size fittings can have this effect on a system. This restriction is even more pronounced when introduced at a main feed line. This can happen with some fittings and many hoses.

Excessive tubing length can create a "column" of oil which is very long. Friction created by moving oil through tubing and hose will slow response times because of the inertia of the column of oil and increased back-pressure of returning oil. If single acting springs are all that is pushing this oil, it is possible that this back-pressure can become sufficient to stall the cylinder.

Proper sizing of fittings for main feed lines and device supply lines will normally be accomplished by using the appropriate VektorFlo® fluid distribution manifold. Device lines are Size-4 (1/4 OD which match to fit SAE 4 ports, and adapt to the occasional use of SAE 2). Main feed lines are Size-6 (3/8 OD, SAE 6). The use of smaller lines Size-2 (1/8) for devices or Size-4 (1/4) for feed lines may cause excessive restrictions. Normally, avoid using an SAE 4 quick disconnect to feed an entire fixture.

How do I tell if my plumbing is free of obstructions and contaminants?

Tubing must always be flushed after cutting. Even if not cut in your shop, it was cut before it came to you. Chips, burrs, dirt and other contaminants have collected inside your tubing and drilled passages. These contaminants can cut device seals, damage valve sealing surfaces, cause erratic operation and reduce service life if not cleaned prior to fixture start up.

The use of improper fittings can also cause obstructions and restrictions. Some people have adapted fittings which they had to use in SAE ports. Yes, the threads are the same on SAE and JIC flare fittings. The body length may be different. In one case the use of JIC fittings in an SAE port made a metal to metal seal at the bottom of the device inlet port. Obviously the "clamps didn't work." Be sure you haven't created obstructions by using non-standard parts.

Is my pump of appropriate size? It is rated for _____gpm, or _____cu. in. per minute. My devices require a total of _____cu. in. of oil to actuate.

For most normal size fixtures, a pump rated in gpm (gallons per minute) is not recommended. If your pump is rated much more than 1 gpm, call us, we'd rather give you sound advice now than have you damage clamps and have to sell you replacements. Be sure that you do not exceed the recommended flow rates for your system. If you aren't sure, ask us.

My pump runs continuously. Is it the right type of pump?

Call us. It can often be made to work. Some modifications will probably be necessary. If you have a VektorFlo® pump which runs continuously, call us immediately (they are not set up to run continuously).

I've been using a dump pump (pump builds to pressure, shuts off and releases pressure automatically). Is this pump suitable for hydraulic workholding components?

It can be. It will work if the circuitry is properly designed. It may require special circuit modifications or a special pallet decoupler to work properly.

I want to make a cut directly against (into) a clamp. Is this possible?

Yes, it is but it will require special design considerations. We encourage that cutter forces always be directed toward a fixed stop. A fixed stop is designed to prevent part movement. A clamp is designed to position and force a part against a fixed stop. In order to machine "into" a clamp, the clamp must be sufficiently sized to resist all cutter and machine forces or the part will tend to shift.

When I use a dial indicator on my part, it bends when it is clamped. Why?

Clamps should be positioned directly opposite a fixed locator, hydraulic support or other supporting element. This element may be a part of the fixture, a solid portion of a rigid part or a properly sized floating locator such as a hydraulic work support. If your clamp is putting force into your part which is not transmitted directly into a solid stop, it may distort the part. Clamping on draft angles or "mushrooming" the part with excessive force can also cause part distortion. Send us a print of your fixture design, we'll be pleased to evaluate it and make suggestions.

I hold all four corners of my part on solid locators. When unclamped, it seems to "spring" back into a different shape. Why?

First, holding all four locating points in exactly the same plane on your fixture is virtually impossible. (See your favorite text on fixture design for an explanation of 3-2-1 fixturing principles.) Second, because your part can't have all four of these points in the same plane, your part is distorting when clamped. Other factors such as stress relief may cause the part to change its "free" shape after machining.

My pump turns on and off approximately every 3-5 seconds. Why?

There could be several causes: A "spool" valve when used with a demand pump will cause it to turn on and off as its internal leakage bleeds off pressure. Use of spool valves voids warranties on VektorFlo® pumps. We suggest the use of "zero leak" poppet or shear seal type valves (see pages N-3 through N-5).

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Frequently Asked Questions

Industrial type double acting cylinders (even high quality ones not designed for clamping) can have significant leakage across their internal seals. This leakage will not normally be externally visible. Internal leaks from one side of the piston to the other will cause pumps to cycle excessively.

NOTE: These cylinders should be avoided in all palletized applications as they may cause pressure loss or backpressure quick disconnects.

All leaks at fittings, seals or other typical leak points will eventually cause a pump to cycle. If your VektorFlo® pump cycles more often than you feel appropriate (more than once per minute without a valve being shifted) call us. We will gladly offer advice.

I want to limit the pressure into a sequenced hydraulic circuit. Which valve do I install first?

We recommend that you avoid putting one special function valve behind another if possible. If you must, put the pressure limiting valve after the sequence valve. This avoids the limiting valve being shut off before the sequenced circuit is fully actuated.

I want several sequenced operations to happen on my fixture. Can I put three or four sequence valves in series?

We do not recommend it. Our sequence valves operate better if run directly from the main hydraulic supply line and set at different pressures. (We recommend at least 500 psi differential for ease of setup.)

My company uses a lot of brass fittings on our product. Can I use these to connect my hydraulic clamps?

No, brass fittings and some aluminum or steel fittings are for low pressures. Be sure that locally sourced fittings are rated for 5,000 psi operation. All of our fittings are rated for at least 5,000 psi. We do not recommend the use of lower pressure fittings. If you have a local source for high pressure O-ring style fittings, by all means feel free to buy these items locally. We want you to know that suitable fittings are available from us.

I need to disconnect my fixture from the pump. I also need double acting clamps. How can I do this?

Vektek has designed several configurations in Automatic and Manual Shutoff Valve Decouplers to fit your application. VektorFlo® automatic valve decouplers work with either single or double acting devices.

Manual decouplers, originally designed for single acting systems, include an auxiliary port that can be used for double acting systems. By adding a second quick disconnect to the auxiliary port of the manual decoupler (we suggest female), connecting a second line and employing appropriate valves you can decouple your fixture from the power supply for machining. (Top plates or manual decouplers with self-closing valves are not designed for use with double acting circuits.)

We use anti-freeze, not hydraulic fluid in our plant. Will this effect your clamps?

Yes, our warranty specifically excludes the use of non-standard hydraulic fluids. While there are some good fluids out there, our approved fluids (or equivalent) are on page J-1. If you must use another fluid and it has good lubricity and corrosion resistance, we can tell you whether it is likely to cause problems or not. Some fluids may provide adequate long term service, we will offer advice upon request. We do not approve of the use of these fluids but may be able to recommend compatible seals.

We run a fixture for 3 months, store it for 6 months, then bring it back on line. How can we keep everything working?

Preventive maintenance. Before you store your fixtures, be sure that they are free of coolants, coolant buildup, clean and dry. A light coating of corrosion protection may help. Be sure to store in a cool, dry, clean environment. We encourage the use of double acting clamps on fixtures which will be stored for extended periods.

Our clamps are used for cast iron grinding. Our coolants also seem to be corrosive (our fixture plates rust). Will your clamps stand up to this?

Better than other brands. Nothing is going to be 100% foolproof. Our extensive use of hard chrome plating, stainless steel and our corrosion resistant BHC™ will give you the best possible resistance to corrosion. Our processes will allow our clamps to run longer with less problems even in this destructive environment.

When I unclamp my single acting clamps, a "squirt" of coolant comes out of the vent port. I am running flood coolant and the clamps are covered during the entire machine cycle. Can I eliminate this problem?

Maybe. We suggest you run a vent line to fresh air from each breather port. This can be done in copper or plastic tubing. If you can't get to fresh air, a trap in the tubing or protected vent inlet area will reduce the amount of coolant entering the cylinders. Keeping the coolant out will reduce the chance of corrosion in the cylinders. It will also keep the cylinders from having to expel the coolant as they return causing sluggish return. Our swing clamps are now available with "bottom" venting to allow them to breathe dry air from protected areas under the fixture.

When I look at my clamps, there are threaded holes in them. What do the labels "P", "ADVANCE", and "RETRACT" mean?

These threaded holes are called "ports". The label "P" or "ADVANCE" ports are normally used to clamp the part, "RETRACT" indicates the port normally used to unclamp or retract the clamp.

My local chemical representative has recommended the use of "water-glycol" hydraulic fluid. What are the benefits of this fluid and should I use it?

Water-glycol is a nontraditional hydraulic fluid. This fluid was developed for use where petroleum based fluids are not allowed. They are commonly used in areas requiring "flameproof" fluid. They often cause problems with device seals, valves and pumps. We do not recommend water-glycol fluids. We may in some cases be able to provide devices with seal compounds acceptable for use in this environment. We cannot recommend or warrant their use in any Vektek pump or directional control valve.

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What about using seals made of Viton®?

Seals made of fluorocarbon, such as Viton®, can be a good answer for high heat applications, up to 350°F, however, fluid type is also important. It may be acceptable in most fluids at lower pressures, but fluorocarbon is not a universal remedy for all fluid problems. There are other acceptable seal compounds for use in water-glycol and other unusual fluids. Our staff can help direct you to a seal that is best suited to perform in your application. Because seals made of fluorocarbon may work in your application, we offer this as an option on many of our cylinders, call for details.

How hot is too hot to run hydraulic fluid?

Anything above 350°F is considered too hot for most hydraulic fluids and seals. Our standard seals are rated to operate at temperatures from 40°F to 160°F. Even seals made of fluorocarbon are not recommended above 350°F. For advice on high heat applications, you may contact Vektek's Engineering Department.

I notice that in your fitting section you have both flareless and 37° flare fittings, why?

We do stock both 37° and flareless fittings. You may also notice that we do not stock the nuts for 37° fittings. We recommend that you connect tubing with flareless fittings. They are proven to work well and be somewhat more forgiving than flared tubing. A good flare tubing connection is very reliable. Should you happen to cut it 1/8" short, it is difficult to stretch. A flareless fitting has some built in forgiveness. We suggest that you use 37° fittings to attach hoses to devices or feed fluid to your fixtures.

I have my cylinder hooked up to a pump. It extended but won't retract. What have I done wrong?

Is there a directional control valve in the circuit? If not, one is required. Is the cylinder single or double acting? Can you provide a schematic or simple hand sketch for us to troubleshoot? We are glad to help.

My cylinder is hooked to the air line and it won't hold the 5,000 pounds your book listed, why?

Is it an air cylinder? We do not manufacture a 5,000 lb. air cylinder. We do manufacture 5,000 psi and 5,000 lb. capacity cylinders. If you have a cylinder with an effective piston area of 1 square inch and you are putting 5,000 psi into it, your effective clamping force will be 5,000 lb. Call us, we would be happy to calculate the force for you.

NOTE: Work supports cannot be adapted to lock on air pressure.

I want to run my clamps on air. I really don't need much force. Since these cylinders are being used to position work pieces, is it OK to use air?

Some of our cylinders (but not work supports) can be run on air, others may be adapted. If air will provide adequate force and you are happy, so are we. In some cases straight line cylinders and work supports have been run successfully using high pressure gas. Swing clamps may not be used on high pressure gas. Please call our factory for information on our pneumatic clamping line, specifically designed for workholding.

I need some type of retractable locator. After my part is loaded, I want it to "disappear." Do you have anything to do this?

Block pull cylinders or any double acting cylinder may be used in this way. If highly precise location is required, please be sure to use a guide bushing to provide more precise location.

When I called in, my salesperson referred to a "breather". What is it and what does it do?

A "breather" is a port designed to let captured air vent to atmosphere when a cylinder is actuated or a work support plunger is moved. This lets the trapped air "breathe" into the room. Breathers will sometimes "inhale" coolant and it is often preferable to plumb them to clean, dry air space rather than allow them to suck coolant. Vektek cylinders are all designed with stainless steel springs to reduce the possibility of corrosion from this coolant contamination. Cylinder malfunction will occur if breathers are plugged.

How do I read my gauge and what does it mean?

First, release all pressure on the system. Check the gauge for proper operation. Check to be sure that the gauge is returning to "zero", pressurize the system and read the gauge. The current psi reading from the gauge indicates the clamped pressure of your system unless there is a pressure limited circuit branch. (The entire system equalizes at this pressure, Δ P is negligible when under static clamp conditions.)

I need a clamp just like your 15-0109-08 except it needs a 6" long rod. Can you help me?

Maybe. We do entertain specials from time to time. Please ask us. We often find that "special" requests coincide with our ongoing new product development. If you have a special need, it is worth asking. We may decide to do your special as a development project. We may not be able to produce it (actually you may not want it) because of cost. It may be something we have done before and will be relatively easy.

The danger involved in using "specials" is that we do not stock replacement on special parts. When your machine crashes (when, not if) and you need a rush spare, special parts have to be made from scratch. You will need to order spares at the time of the original order. The cost of a single replacement on a complicated special can often be 5-10 times the cost paid in the beginning. A little foresight will be very beneficial if you must have a special.

If you have questions you'd like answered, call, write, fax or email us. We would be glad to help you use VektorFlo® products more effectively.

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VektorFlo® Hydraulic Fixture Setup Documentation and Troubleshooting Worksheet

Fixture Designed By: _____

Fixture Built By: _____

Built For: _____

Fixture Serial # _____

1. All pressure gauges reading checked and verified at "0" operating pressure. _____ Yes _____ No
2. Main system operating pressure read from the gauge mounted on the clamping system pump _____ psi or inlet air pressure from air gauge on boosters _____ psi, booster ratio _____:_____.
3. Pump restart pressure checked. Pump restarts at _____ psi.
4. Fixture operating pressure read at fixture gauge _____psi, side A_____psi, side B
5. Pressure limit circuits pressure checked:
   - Side A _____ psi Components & location: _____
   - Side A _____ psi Components & location: _____
   - Side A _____ psi Components & location: _____
   - Side B _____ psi Components & location: _____
   - Side B _____ psi Components & location: _____
   - Side B _____ psi Components & location: _____
6. Sequence operations set to:
   - Side A _____ psi Components & location: _____
   - Side A _____ psi Components & location: _____
   - Side A _____ psi Components & location: _____
   - Side B _____ psi Components & location: _____
   - Side B _____ psi Components & location: _____
   - Side B _____ psi Components & location: _____
7. Fittings checked, secure, no leaks, proper type, not restrictive. _____ Yes _____ No
8. Schematic diagram attached.
9. Bill of materials (hydraulic components) attached.

For troubleshooting assistance contact your Designer/Builder or, complete steps 1-9 above and fax this sheet with all additional pages to 816-364-0471. We are pleased to be of service.

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TuffGrip™ Work Support

When do I need to use TuffGrip™ Double Acting over other work supports?

You will want to use TuffGrip™ work supports whenever your application requires positive retraction of the work support plunger such as in automatic /un-attended applications. The support plunger is retracted when hydraulic pressure retracts the shuttle cylinder, meaning you will not be relying on a mechanical spring to return the plunger to its initial starting position.

You will want to consider TuffGrip™ work supports whenever your application requires extremely tight tolerances. When pressurized, the TuffGrip™ work support sets a new industry standard for minimizing elastic deformation and maximizing uniformity in clamping surface stability.

You will want to use TuffGrip™ work supports if you have an application where the single acting fluid advanced work support may "kick" your part out of position when unclamping the system. The hydraulic pressure on the internal sleeve gripping the plunger is maintained until the double acting positioning piston retracts, opening an internal check valve. This check valve releases the pressure on the sleeve, releasing the plunger after it has been "pulled" back from the piece part. This "shuttle" action prevents "part ejection" that can be experienced in some instances with fluid advanced work supports

I understand that this work support has 2 strokes, a shuttle stroke and a work support stroke. Do these strokes add one upon the other resulting in a total stroke of 0.875 inches?

No, the work support plunger stroke is contained within the advance piston shuttle stroke. The work support plunger is spring advanced resulting in the plunger being extended while the piston shuttle is retracted. When the advance piston strokes forward, the support plunger contacts the part and compresses the spring, and then the internal sleeve locks the plunger in place.

Does the shuttle extend and stroke the full 0.50 inches every time?

Yes, the advance shuttle will travel full stroke every time, stopping on an internal component allowing the internal sequencing to then lock the work support plunger.

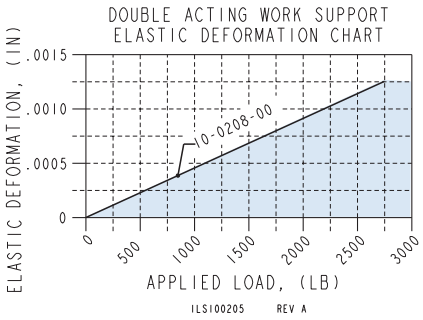
Where do I position my part so it is in the work support plunger "working zone"?

Position the part in the middle of the work support plunger stroke. The catalog chart lists a dimension that represents the fully extended length. For best performance, position your part at the fully extended stroke minus ½ the plunger stroke.

I thought it was wrong to clamp over a column of fluid? How can I clamp over a work support that is inside a cylinder supported by hydraulic fluid?

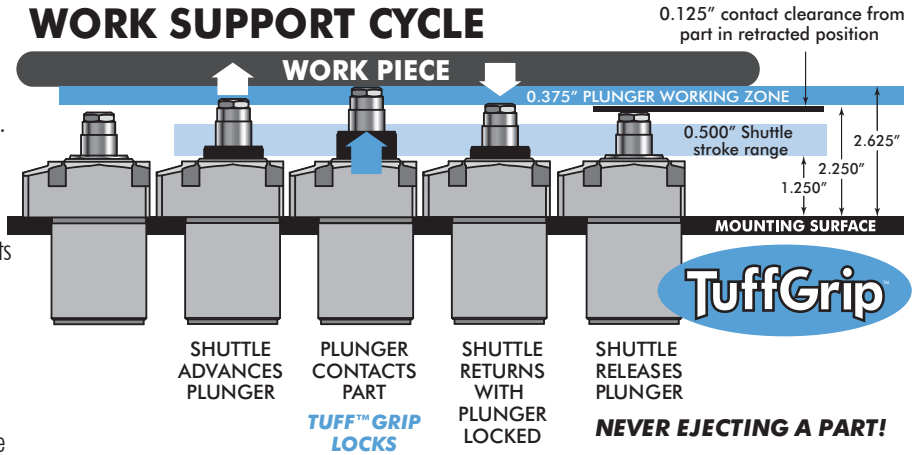
While it is not always the best option to clamp over a column of fluid, neither is it always wrong. Certain considerations must be addressed and adhered to when this is done. In this application, the work support is supported by the advance cylinder which is held firmly against a shoulder inside the body. This positioning is maintained by a 3:1 ratio of seating force verses the support force of the work support plunger. This advance /support ratio has shown to be the most stable combination, and has the least elastic deformation compared to other units on the market today.

Patent Pending



Elastic deformation is the amount that the work support compresses under an applied load, at an input pressure of 5,000 psi, when measured from the mounting flange to the contact bolt. This value returns to zero when the load is removed.

DOUBLE ACTING WORK SUPPORT CYCLE



NEVER EJECTING A PART!

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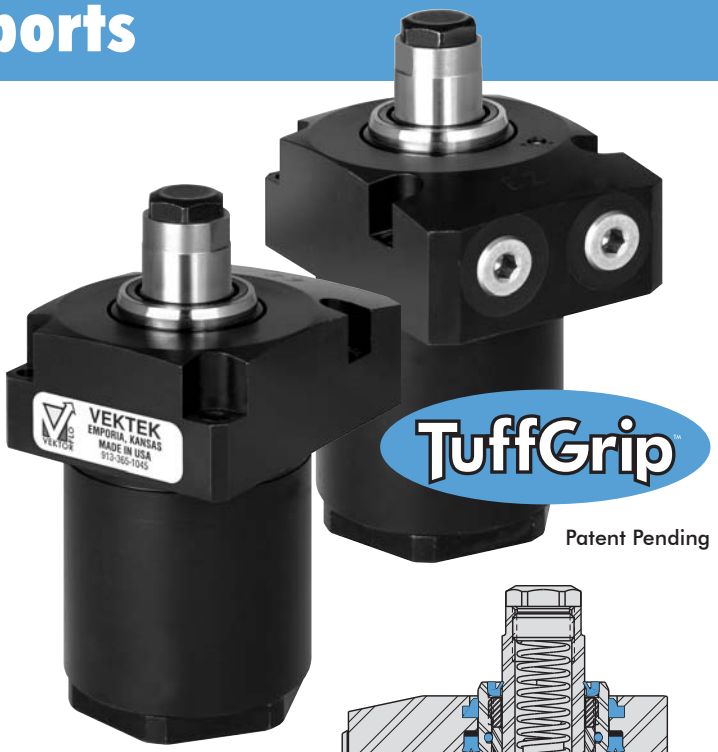
TuffGrip™ Work Supports

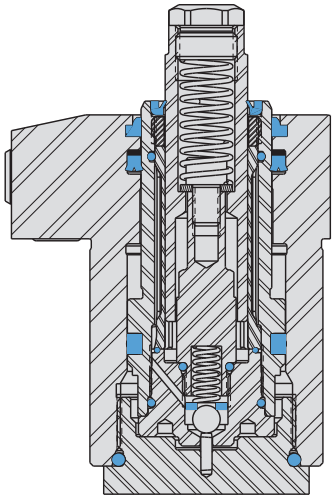
Work Support

Double Acting Work Support

- TuffGrip™ is currently available in a 2750 lb capacity at 5,000 psi.
- Innovative design featuring a spring advanced work support within a double acting shuttle cylinder.
- TuffGrip™ sleeve design is 2.5 times thicker than other work support models on the market. This sleeve efficiently closes and uniformly grips the plunger making it superior in precision applications.
- Eliminates part ejection of any work piece.
- Top flange body style allows for hydraulic connection through face sealed o-rings or through SAE ports.
- Sealed design and dual wipers keep chips and debris out so unit operates smoothly.
- BHC™ (Black Hard Coat) body, hard chrome plated shuttle piston and stainless steel plunger promote long life in harsh machining environments.



Patent Pending



Device Operation

Advance: Hydraulic pressure extends the shuttle cylinder to the full stroke position, moving the work support plunger out to the part. The spring advanced plunger will contact the part during the shuttle extension applying only spring force. Internal sequencing occurs after the shuttle is fully extended and allows hydraulic pressure to lock the plunger inside the sleeve.

Retract: The sleeve maintains its locked condition while hydraulic pressure retracts the shuttle. On reaching the full retracted position the sleeve unclamps and the plunger returns to its spring advance state at least 0.125 inches below the part but may be separated from the part by as much as 0.50 inches.

Model No.	Support Capacity (lb.)*	Contact Force (lb)	Work Support Stroke (in.)	Shuttle Stroke (in)	Body Diameter	Piston Area (sq. in.)		Oil Capacity (cu. in.)**		Optional Flow Control Model No.
						Extend	Retract	Extend	Retract	
Double Acting (D/A) Cylinders, actuated hydraulically both directions.										
10-0208-00	2750	4-7	0.375	0.50	2.12	1.62	0.52	0.81	0.26	70-2037-71

* Support capacities are listed at 5,000 psi maximum operating pressure. Support capacities for other pressures must be determined by consulting the graph on page B-3.

** Restrict flow rate to a maximum of 70 cu in/min.

Dimensions

Model No.	Capacity	A	B*	C**	D	E	F	G	H	J	K	L	M	N	P
Double Acting (D/A)															
10-0208-00	2750	2.63	0.38	0.50	2.32	1.13	1.75	2.12	1.19	0.75	2.90	1.13	2.25	1.13	0.94

* Plunger stroke "B" is the available work zone of the plunger. The work piece must be positioned inside this window to prevent part ejection.

** Shuttle Stroke "C" is the stroke the shuttle travels to position the work support plunger relative to the work piece.

The difference between "C" and "B" (C-B) equals the minimum distance the plunger is below the work piece in the retracted position.

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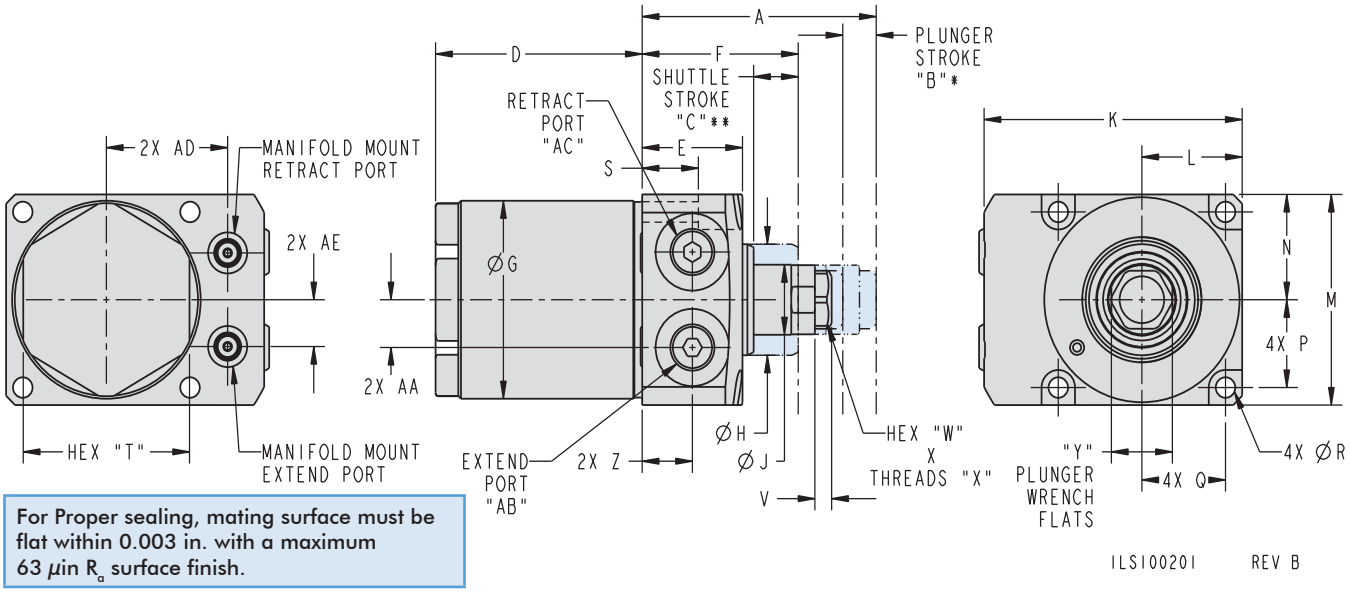
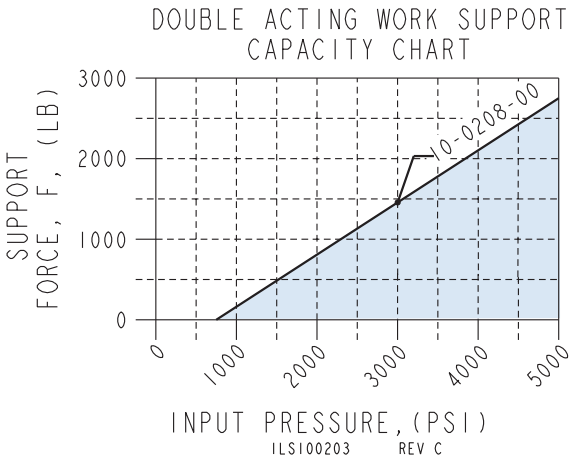
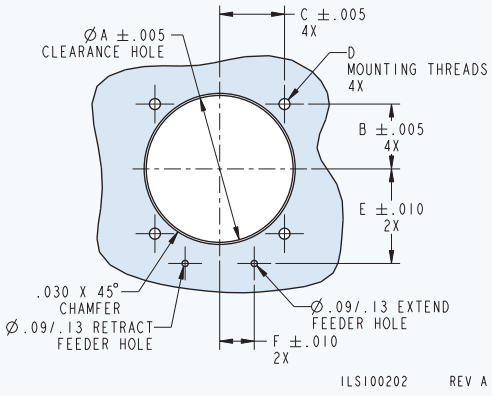


For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.

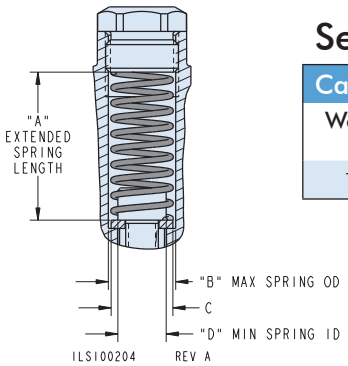




Manifold Port/Bolt Mounting Dimensions

Cavity Dimensions							
Model No.	Capacity	A	B	C	D	E	F
10-0208-00	2750	2.13	0.938	0.938	10 - 32 UNF	1.36	0.50

Q	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD	AE	Model No.
Cylinders, actuated hydraulically both directions.														
0.94	0.22	0.63	1.88	0.19	0.63	9/16 - 18 X 0.31	0.69	0.56	0.51	SAE 4	SAE 4	1.36	0.50	10-0208-00



Self-produced Contact Spring

Cavity Dimensions						Standard Spring			
Work Support Series	Capacity	A	B	C	D	OD	WIRE Ø	Free Length	Rate (lb/in)
10-0208-00	2750	1.13	0.51	0.46	0.38	0.48	0.045	1.50	9.4

NOTE: Vektek recommends only 17-7 stainless steel springs. Too light of custom spring force may not actuate the plunger, especially if a custom contact bolt is used. Too heavy of a custom spring may cause damage to the device's internal components. Vektek cannot guarantee that custom springs will provide proper plunger actuation.

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Work Supports

Frequently Asked Questions

Frequently Asked Questions

Why do I need to use work supports?

The basics of 3-2-1 fixturing require that three points define one plane of part location. When machining, a part may requires additional support for more than the three basic locators, a floating location support (work support) is an easy solution. You can use a work support anywhere a "screw jack" can be used. It adjusts faster, dependence on the operator's "feel."

A work support will provide solid adjustable support for parts ranging from fragile circuit boards to massive airplane wing spars. They provide "automatic" adjustment and lock up giving repeatable, predictable results without the risk of "forgetting" a clamp or the time of manually adjusted alternatives.

What is required to use work supports?

Work supports will work in most applications where part distortion, chatter, ringing or poor surface finish results are present. They can eliminate or decrease most of these problems when they are caused by part movement during machining. All you need to use them is an application, space to insert the support, power supply and plumbing. They can work wonders to improve part quality and reduce scrap and rework. Work supports are often used on fixtures where parts are manually clamped but require additional support.

After the plunger is advanced, hydraulic pressure is used to "squeeze" the sleeve against the plunger, "locking" it securely against the part. It then becomes a solid support holding the part with the capacity indicated on the appropriate chart (page B-5).

Can I use work supports without other hydraulic clamps?

Yes, work supports are often used when manual clamps are used. They reduce the dependence on "operator feel," speed operations by locking multiples with a single adjustment and speed load time dramatically even when used with manual clamps to secure the part. In fact, one of Vektek's most effective applications was one where the part was bolted in place over a tower equipped with several work supports. They supported the inside of a case while the outside was being machined. Our work supports reduced the part loading time from over five hours to just under one hour in this application.

Explain the difference in the three advance types and why I might want to use one over the other.

Spring advance is typically used when the part is heavy enough to depress the spring loaded plungers. This can be used on most applications.

Air advance is normally used when a part is very light, fragile or heavy contamination is present. Light weight parts may require clamping before the supports can be advanced. Air advance supports can be "fine tuned" to lightly touch the part without distorting or unseating it before lockup. When heavy contamination (fines, heavy flood coolant or corrosives) is present, use of a full time "air spring" continuously purges the sleeve/plunger contact area to keep it clear.

Fluid advance is recommended to avoid the introduction of a second power medium or when the plunger must be retracted to allow for part loading. This is significant when palletizing fixtures where quick connectors must be connected to add an air control circuit to the fixture. Fluid advance supports should not be used if advance force control is required.

What is the "breather port" and can I plug it or use it for my hydraulic connection?

All spring advance work supports require the exchange of air and will work consistently when allowed to exchange air to and from atmosphere. Air advance work supports have no breather, but use a continuous air advance to advance the plunger into position. Fluid advance work supports can come in either a vented 4,000 lb (ventless by request) or ventless style 1,000 lb and 2,500 lb models. The ventless configuration avoids the exchange of dirty fluid through a vent which can then become plugged and restrict movement.

What type of part will typically need work supports? Are there any I should avoid?

Parts with thin webs, unusual shapes or unsupported structures that must be held within a plane are likely candidates for work supports. There are no parts to be avoided. Cast iron and aluminum parts produce large quantities of fines that can infiltrate cavities and reduce work support life (air advance should be considered for both).

What about deflection?

Deflection is a difficult topic to discuss relative to work supports. Let's start with a support measured in its free state with "no load, not locked." This will establish a "no load, no lock zero" point. When a support is pressurized, there is a small amount of growth. As it is loaded the support "deflects" back closer to the "no load, no lock zero." As the support approaches full capacity it may deflect below the "no load, no lock zero" slightly. Other factors which may be more important include: the surface finish of the part where it is contacted, the shape and contact area of the end effector, the actual cutter or load force applied to the part, and the repeatability from part to part or lot to lot. For this reason, Vektek has chosen to publish only repeatability data on our work supports.

Can I lay my work support on its side?

Normally, yes. As long as you are not using a heavy end effector or unusually side loading your support, the physical orientation should not affect performance. If you have a question about a specific application, please give us a call.

I have an interrupted cut that is going to take place over the top of a work support. The forces involved are transmitted directly down on the support. The cutter is a large milling cutter and the cut is interrupted because I am sawing through webs on a cast part. How do I size the work support for this application?

You are correct that the impact of the re-entry of the teeth on the cutter to the next web of your part will create an interruption and mill may cause an impact beyond the normal "horsepower, depth of cut and tooth loading formulae." In this case, you should plan to allow no less than 2X the calculated. Impact loading from interrupted cuts can require increasing capacity beyond this safety measure, hence up to 5:1 times calculated force in the event of interrupted cuts may be appropriate. Keep in mind that if you are tapping with a ball peen hammer the upsizing is less than if you are impact loading with a full striking blow, but often both create forces well beyond the size of the hammer.

Do I need to use a torque wrench and socket when installing cartridge work supports?

Yes, a torque wrench and a 6 point socket is required. If you use an open end, adjustable or box end wrench you increase the chances of damaging the hex, roundness of the support sleeve or damaging the seals causing leakage between the sleeve and body. Please use an appropriate socket, torque wrench and care when installing cartridge work supports.

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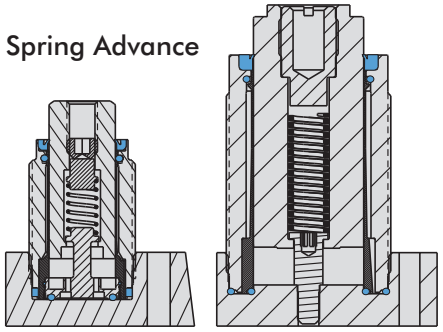
Standard Features

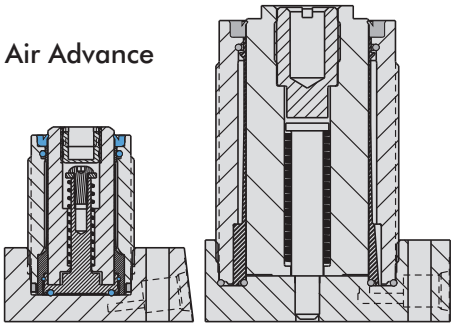
- Highly repeatable, repeats position plus or minus 0.0002 inches.
- May be bolted up or down to mount directly on fixture plates. May also be installed through a hole and locked in place using retaining collars for easy adjustment.
- Standard SAE porting is located in the base of the support for easy access to both the clamp and vent ports (bronze filter installed before shipping).
- Design features insure VektorFlo® work supports last longer, stand up to harsh environments and abuse better than other models without these features.
- Proprietary wiper and seal designs reduce contamination and drag for longer lasting, better performing work supports.
- Special corrosion resistant plungers and sleeves reduce the tendency to stick.
- Special large diameter plungers and sleeves provide greater rigidity.
- Cartridge mount work supports available in all styles for installation into customer machined cavities.

Spring Advance



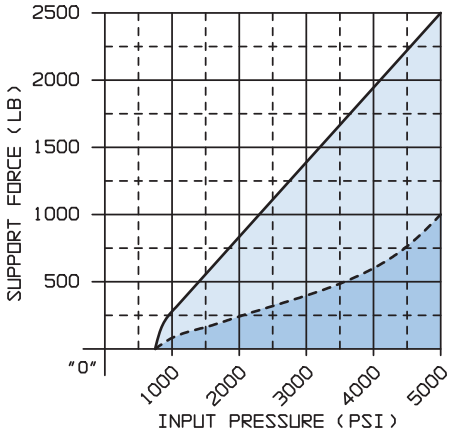
ILS100500 REV H

Air Advance



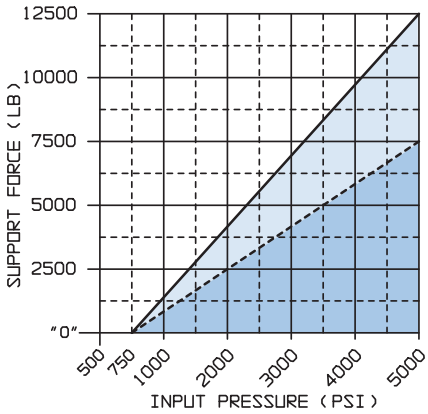
ILS100600 REV J

Capacity Charts For Specific Work Support Models



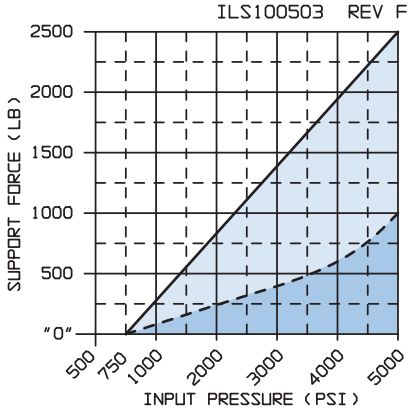
10-0509-06	10-0506-10
10-0509-07	10-0506-11
10-0509-08	10-0506-12
10-0609-06	10-0606-10
10-0609-07	10-0606-11
10-0609-08	10-0606-12

ILS100503 REV F



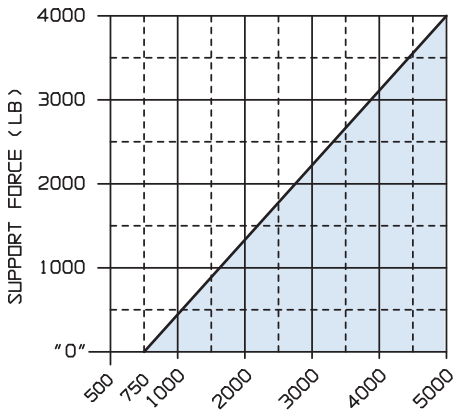
10-0520-07	10-0515-06
10-0620-07	10-0615-06

ILS100603 REV D



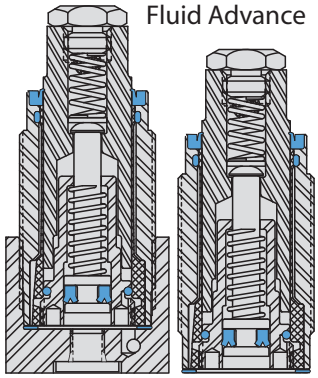
10-0708-07	10-0706-04
10-0808-07	10-0806-05

ILS100703 REV E



10-0715-06 & 10-0815-06
ILS100704 REV D

Fluid Advance



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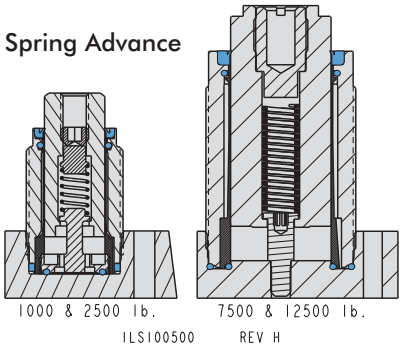
Work Supports

Spring Advance



For Supporting Most Parts

- Available in four capacities from 1,000 to 12,500 lb., adapt to support fragile parts, heavy parts or "hog out" applications.
- When using the 3-2-1 locating principles, you often need additional support for a 4th, 5th or even more areas on your part. A work support will give you "floating" locators which won't interfere with your 3, 2 or 1 locators. Clamp over your locators then lock the supports.
- Spring extended plungers maintain contact with the part during loading exerting only spring force against the part; then hydraulically "freezes" the plunger without exerting any additional force on the part.

Proprietary wiper and seal designs reduce contamination and drag for longer lasting, better performing work supports.

Stainless steel plunger and sleeve assemblies help guard against corrosion in most machining environments.

Precision fit plunger/sleeve assemblies allow VektorFlo® work supports to begin to lock at lower pressures and build support faster.

If spring advance supports are be used in flood coolant environments (consider air advance) attach tubing to the vent port and route to clean, dry air to keep coolant from being drawn in and becoming sticky on internal surfaces.

Standard SAE porting and alternate o-ring manifold face seal is located in the base of the support for bolt down installation. The base can be removed for direct cartridge mounting.

Model No.	Support Capacity* (lb)	Mounting Style **	Contact Force (lb.)	Stroke (in.)	Base Dimensions (in.)	Extended Height (in.)	Oil Capacity (cu. in.)
Spring Advance Work Supports, spring lifts plunger, part weight depresses plunger, hydraulic pressure locks in place.							
10-0506-10	1000	Cartridge	1-2	0.25	N/A	1.87	0.05
10-0506-11		SAE-ported			0.85 X 1.25 X 1.75	2.18	0.12
10-0506-12		Manifold			0.90 X 1.31 X 1.75	2.24	0.13
10-0509-06	2500	Cartridge	2-6	0.38	N/A	2.44	0.08
10-0509-07		SAE-ported			0.91 X 1.50 X 2.31	2.78	0.13
10-0509-08		Manifold			0.91 X 1.50 X 2.31	2.78	0.10
10-0515-06	7500	SAE-ported	9-18	0.50	1.00 X 2.50 X 3.00	4.38	0.81
10-0520-07	12500	SAE-ported	11-16	0.75	1.25 X 3.50 X 3.81	5.25	1.79

* Support capacities are listed at 5,000 psi maximum operating pressure. Support capacities for other pressures must be determined by consulting the graph on page B-5.

** For cartridge mount models, see cavity dimensions on pages B-12.

Dimensions

Model No.	Capacity	A	B	C	D	E	F	G	H	J	K	L	M	N
Spring Advance Work Supports, spring lifts plunger, part weight depresses plunger, hydraulic pressure locks in place.														
10-0506-11 10-0506-12	1000	1-16	2.18 2.24	0.25	1.06	0.85 0.90	0.21	0.87	0.63	5/16-18 X 0.27	1.25 1.31	0.63 0.66	0.90	0.45
10-0509-07 10-0509-08	2500	1 5/16-16	2.78	0.38	1.39	0.91	0.25	1.12	0.81	3/8-16 X 0.46	1.50	0.75	1.06	0.53
10-0515-06	7500	2 1/4-16	4.38	0.50	2.67	1.00	0.50	1.99	1.50	1/2-13 X 0.63	2.50	1.25	2.06	1.03
10-0520-07	12500	3-16	5.25	0.75	2.96	1.25	0.53	2.74	2.00	5/8-11 X 0.63	3.50	1.75	2.87	1.44

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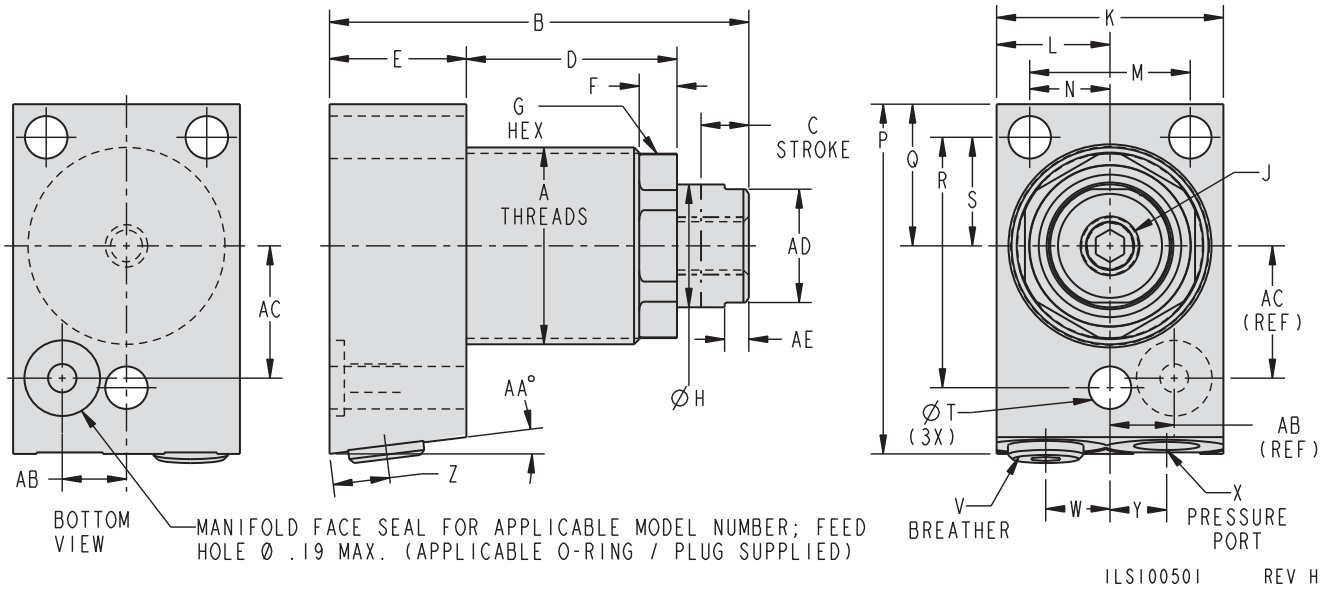
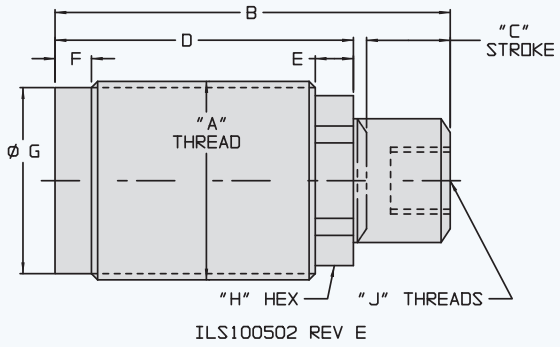
Spring Advance



For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 µin R_a surface finish.



Cartridge Dimensions

Model No.	Capacity	A	B	C	D	E	F	G	H	J
Work Support, Spring Rise, Cartridge										
10-0506-10	1000	1-16	1.87	0.25	1.59	0.21	0.27	0.95	0.87	5/16-18 X 0.27
10-0509-06	2500	1 5/16-16	2.43	0.38	1.96	0.25	0.34	1.22	1.12	3/8-16 X 0.46

P	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD	AE	Model No.
Spring Advance Work Supports, spring lifts plunger, part weight depresses plunger, hydraulic pressure.															
1.75	0.69	1.20	0.51	0.22	SAE 2	0.33	SAE 2 N/A	0.33 N/A	0.37	7°	N/A 0.38	N/A 0.69	N/A	N/A	10-0506-11 10-0506-12
2.31	0.94	1.66	0.72	0.28	SAE 4	0.43	SAE 4 N/A	0.43 N/A	0.38	7°	N/A 0.43	N/A 0.88	N/A	N/A	10-0509-07 10-0509-08
3.00	1.25	2.41	1.03	0.28	SAE 4	0.63	SAE 4	0.63	0.38	N/A	N/A	N/A	1.13	0.16	10-0515-06
3.81	1.75	3.22	1.44	0.34	SAE 4	0.94	SAE 4	0.94	0.38	N/A	N/A	N/A	1.63	0.16	10-0520-07

All dimensions are in inches

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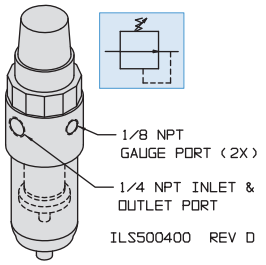
Work Supports

Air Advance



Air Filter Regulator

Model No	PSI Output
50-0440-01	0-25 psi
50-0440-02	0-125 psi

Ask us about air valves to control your work supports either manually or electrically.

For Supporting Fragile Parts Or Use In Harsh Environments

- Available in four capacities from 1,000 to 12,500 lb., adapt to support fragile parts, heavy parts or "hog out" applications.
- For harsh environments (where contaminants such as aluminum or cast iron fines and corrosive or tacky coolants are present) we suggest running a constant "air sprong" to keep the plunger extended and the problem contaminants out.
- Normally retracted plungers provide additional clearance for part loading. Advance them with air pressure, exerting ONLY the force needed to "kiss" the part, then "freeze" the plunger in place hydraulically.
- Heavier end effectors may be used with air advance supports because of their additional air powered lifting/contact force.

Special large diameter plungers and sleeves provide greater rigidity.

Stainless steel plunger and sleeve assemblies help guard against corrosion in most machining environments.

Continuous flow of air, can serve as an "air spring" and be left connected during machining. This "air spring" effect helps keep harsh contaminants from getting between the plunger and sleeve. This is an excellent support choice when using double acting cylinders. (You should observe air bubbles escaping around the plunger when used in this manner.)

Standard SAE porting and alternate o-ring manifold face seal is located in the base of the support for bolt down installation. The base can be removed for direct cartridge mounting.

Model No.	Support Capacity* (lb)	Mounting Style ***	Hydraulic Connection	Contact Force** (lb.)	Stroke (in.)	Base Dimensions (in.)	Retracted Height (in.)	Oil Capacity (cu. in.)
Air Advance Work Supports, air pressure lifts plunger against part; hydraulic pressure locks in place, spring retracts plunger.								
10-0606-10	1000	Cartridge	Cavity	4	0.25	N/A	1.62	0.05
10-0606-11		SAE-ported	SAE Ports			0.85 X 1.25 X 1.75	1.93	0.12
10-0606-12		Manifold	Face Seal			0.90 X 1.31 X 1.75	1.99	0.13
10-0609-06	2500	Cartridge	Cavity	8	0.38	N/A	2.06	0.08
10-0609-07		SAE-ported	SAE Ports			0.91 X 1.50 X 2.31	2.40	0.13
10-0609-08		Manifold	Face Seal			0.91 X 1.50 X 2.31	2.40	0.10
10-0615-06	7500	SAE-ported	SAE Ports	20	0.50	1.00 X 2.50 X 3.00	3.87	0.81
10-0620-07	12500	SAE-ported	SAE Ports	57	0.75	1.25 X 3.50 X 3.81	4.50	1.79

* Support capacities are listed at 5,000 psi maximum operating pressure. Support capacities for other pressures must be determined by consulting the graph on page B-5.

** The maximum air pressure for advancing the plunger is 25 psi. Order air regulator Model No. 50-0440-01(0 to 25 psi) to more precisely control plunger advance force.

*** For cartridge mount models, see cavity dimensions on pages B-12.

Dimensions

Model No.	Capacity	A	B	C	D	E	F	G	H	J	K	L	M	N
Air Advance Work Supports, air pressure lifts plunger against part, hydraulic pressure locks part in place, spring retracts plunger.														
10-0606-11	1000	1-16	1.93	0.25	1.06	0.85	0.21	0.87	0.63	5/16-18 X 0.29	1.25	0.63	0.90	0.45
10-0606-12			1.99			0.90					1.31	0.66		
10-0609-07	2500	1 5/16-16	2.40	0.38	1.39	0.91	0.25	1.13	0.81	3/8-16 X 0.24	1.50	0.75	1.06	0.53
10-0609-08														
10-0615-06	7500	2 1/4-16	3.87	0.50	2.67	1.00	0.50	1.99	1.50	1/2-13 X 0.63	2.50	1.25	2.06	1.03
10-0620-07	12500	3-16	4.50	0.75	2.96	1.25	0.53	2.74	2.00	5/8-11 X 0.63	3.50	1.75	2.87	1.44

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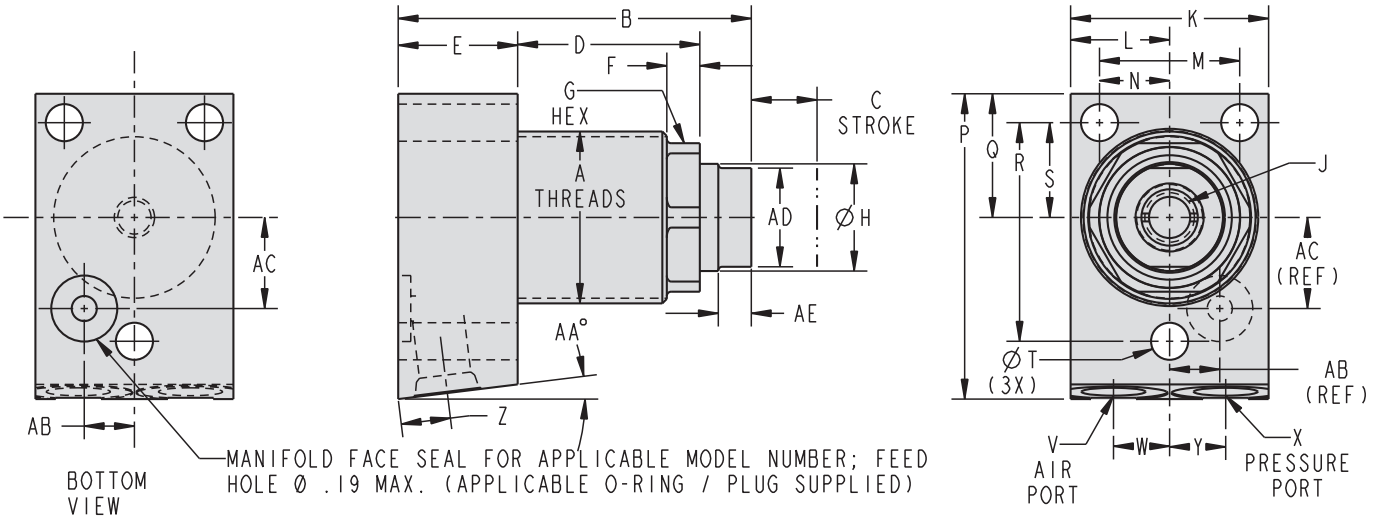
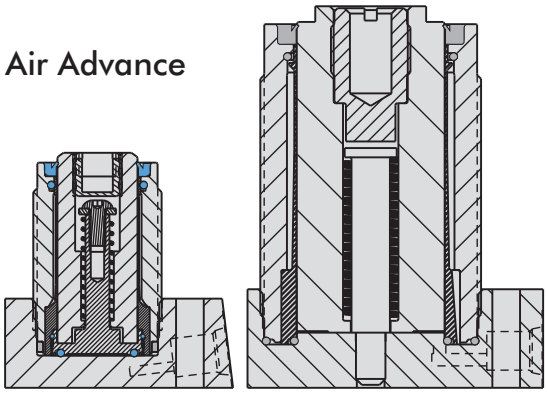


ILS100601 REV G

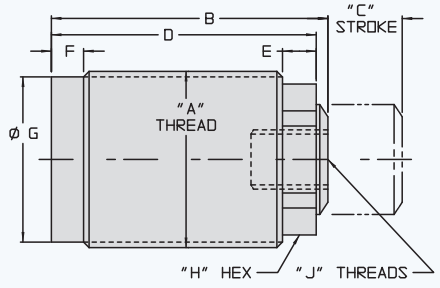
Air Advance



1000 & 2500 lb. 7500 & 12500 lb.

ILS100600 REV J

For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.



ILS100602 REV E

Cartridge Dimensions

Model No.	Capacity	A	B	C	D	E
Work Support, Air Rise Cartridge						
10-0606-10	1000	1-16	1.62	0.25	1.59	0.21
10-0609-06	2500	1 5/16-16	2.06	0.38	1.96	0.25

Model No.	Capacity	F	G	H	J
Work Support, Air Rise Cartridge					
10-0606-10	1000	0.95	1.62	0.87	5/16-18 X 0.29
10-0609-06	2500	1.22	2.06	1.12	3/8-16 X 0.24

P	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD	AE	Model No.
Air Advance Work Supports, air pressure lifts plunger against part, hydraulic pressure locks part in place, spring retracts plunger.															
1.75	0.69	1.20	0.51	0.22	SAE 2	0.33	SAE 2 N/A	0.33 N/A	0.37	7°	N/A 0.38	N/A 0.69	N/A	N/A	10-0606-11 10-0606-12
2.31	0.94	1.66	0.72	0.28	SAE 4	0.43	SAE 4 N/A	0.43 N/A	0.38	7°	N/A 0.43	N/A 0.88	N/A	N/A	10-0609-07 10-0609-08
3.00	1.25	2.41	1.03	0.28	SAE 4	0.63	SAE 4	0.63	0.38	N/A	N/A	N/A	1.13	0.16	10-0615-06
3.81	1.75	3.22	1.44	0.34	SAE 4	0.94	SAE 4	0.94	0.38	N/A	N/A	N/A	1.63	0.16	10-0620-07

All dimensions are in inches.

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Work Supports

Fluid Advance

For Retracted Plunger Applications

- Available in three capacities 1,000, 2,500 and 4,000 lb.
- Normally retracted plungers do not interfere with part loading. Advance them with hydraulic pressure, exerting only spring force to bring the plunger into contact with your part (this force is not adjustable by adjusting hydraulic pressure). Hydraulic pressure then automatically sequences, "freezing" the plunger properly against the part. All this accomplished with a single hydraulic line.
- Ventless configuration and built in wiper keeps chips and debris out, reducing the chance of plunger/sleeve sticking or binding.

U. S. Patent No. 5,957,443

Internally vented plunger gives air trapped between the hydraulic advance piston and the support plunger a place to escape, even when you install a custom contact point. Heavy end effectors/contact points are not recommended.

Stainless steel plunger and sleeve assemblies help guard against corrosion in most machining environments.

Standard SAE porting and alternate o-ring manifold face seal is located in the base of the support for bolt down installation. The base can be removed for direct cartridge mounting.

Feeder caps (page B-10) and retaining collars (page L-1) are available as mounting options.

Model No.	Support Capacity* (lb)	Mounting Style ***	Contact Force** (lb.)	Stroke (in.)	Base Dimensions (in.)	Retracted Height (in.)	Oil Capacity (cu. in.)
Fluid Advance Work Supports, hydraulic pressure lifts spring which lifts plunger, hydraulic pressure locks.							
10-0706-04	1000	Cartridge	1-6	0.25	N/A	2.09	0.08
10-0806-05		SAE/Manifold			0.90 X 1.31 X 1.75	2.48	0.16
10-0708-07	2500	Cartridge	3-10	0.25	N/A	2.85	0.12
10-0808-07		SAE/Manifold			1.25 X 1.50 X 2.31	3.25	0.19
10-0715-06	4000	Cartridge	6-12	0.50	N/A	2.85	0.59
10-0815-06		SAE/Manifold			0.99 X 2.88 X 3.19	3.25	0.65

* Support capacities are listed at 5,000 psi maximum operating pressure. Support capacities for other pressures must be determined by consulting the graph on page B-5.

** Restrict flow rate to a maximum of 130 cu. in./minute.

*** For cartridge mount models, see dimensions on pages B-12 and B-13

NOTE: The maximum system back-pressure a fluid advance work support can overcome is 10 psi. Returning back-pressure greater than 10 psi may cause slow or failed retraction.

Dimensions

Model No.	Capacity	A	B	C	D	E	F	G	H	J	K	L	M	N	P
Fluid Advance Work Supports, hydraulic pressure lifts spring which lifts plunger, hydraulic pressure locks.															
10-0806-05	1000	1-16	2.48	0.25	1.14	0.90	0.21	0.88	0.62	0.14	1.31	0.66	0.90	0.45	1.75
10-0808-07	2500	1 1/4-16	3.25	0.25	1.35	1.25	0.36	1.13	0.81	0.19	1.50	0.75	1.06	0.53	2.31
10-0815-06	4000	2 1/4-16	3.25	0.50	1.57	0.99	0.50	2.00	1.50	0.19	2.88	1.44	2.06	1.03	3.19

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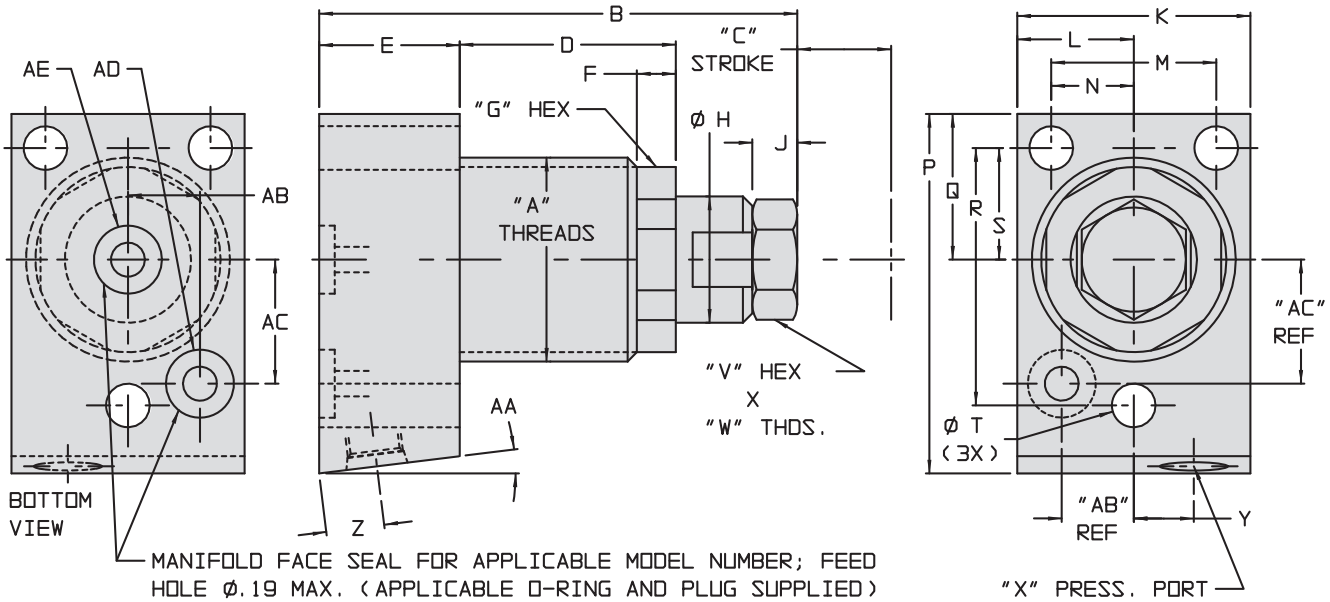
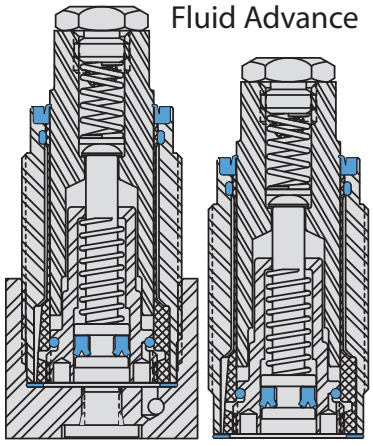
Fluid Advance



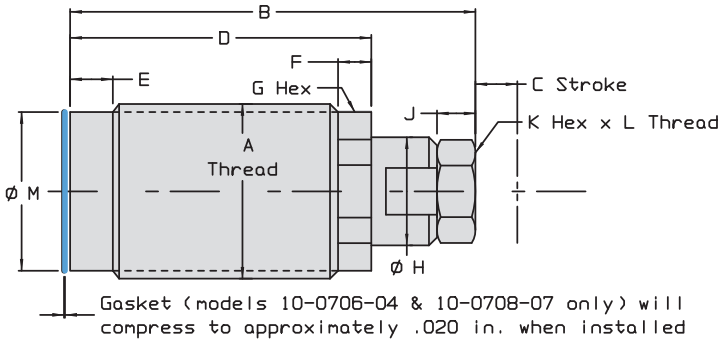
ILS100701 REV J

Fluid Advance



ILS100700 REV. H

For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.



ILS100702 REV H

Cartridge Dimensions

Model No.	Capacity	A	B	C	D	E	F	G	H	J	K	L	M
Work Support, Oil Rise, Cartridge													
10-0706-04	1000	1-16	2.09	0.25	1.66	0.24	0.21	0.88	0.62	0.14	0.50	5/16-18 X 0.19	0.92
10-0708-07	2500	1 1/4-16	2.85	0.25	2.16	0.31	0.36	1.13	0.81	0.19	0.63	7/16-14 X 0.25	1.17
10-0715-06	4000	2 1/4-16	2.85	0.50	2.16	0.19	0.50	2.00	1.50	0.19	0.75	1/2-13 X 0.25	2.16

Q	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD	AE	Model No.
Fluid Advance Work Supports, hydraulic pressure lifts spring which lifts plunger, hydraulic pressure locks.														
0.69	1.20	0.51	0.22	0.50	5/16-18 X 0.19	SAE 2	0.33	0.38	7°	0.38	0.69	YES	N/A	10-0806-05
0.94	1.66	0.72	0.28	0.63	7/16-14 X 0.25	SAE 4	0.43	0.38	N/A	N/A	N/A	N/A	YES	10-0808-07
1.44	2.41	1.03	0.28	0.75	1/2-13 X 0.25	SAE 4	0.63	0.38	N/A	N/A	N/A	N/A	YES	10-0815-06

All dimensions are in inches

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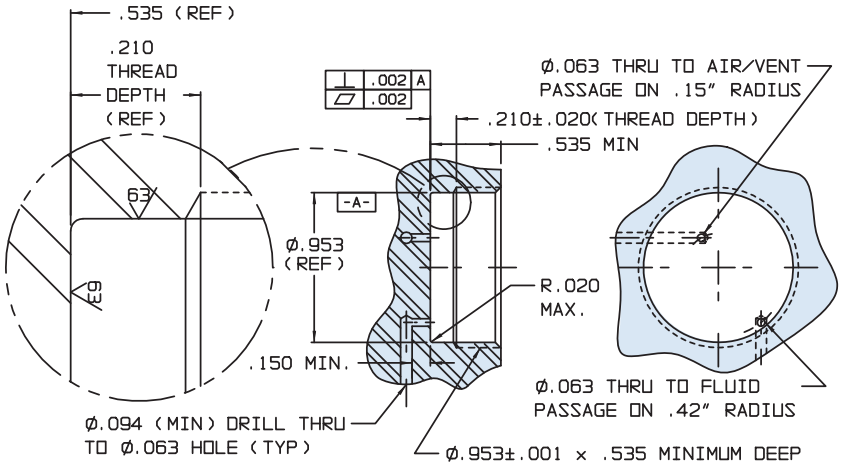
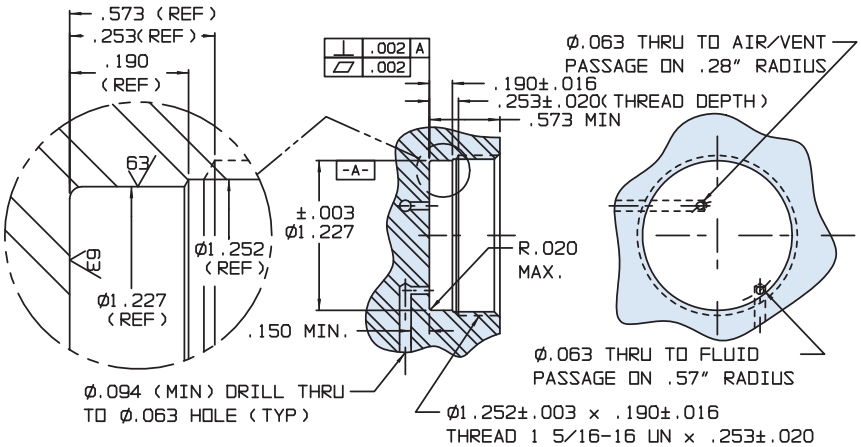
Work Supports

Cartridge Mount Cavity Dimensions



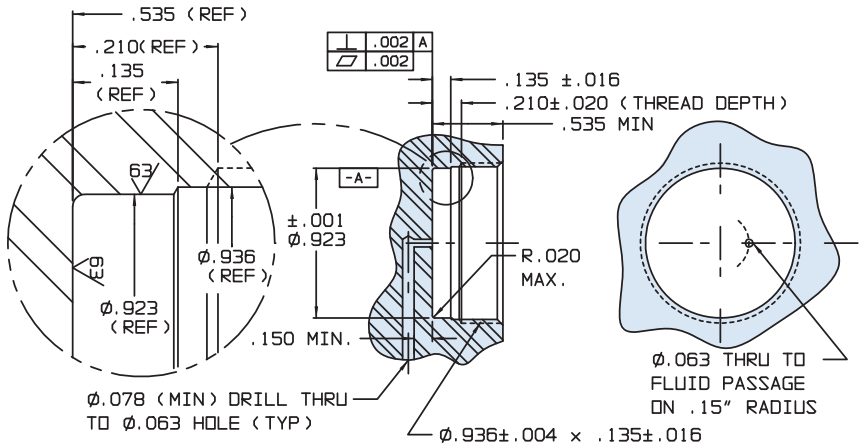
WORK SUPPORT CAVITY DIMENSIONS:
#1000 SPRING RISE 10-0506-10
#1000 AIR RISE 10-0606-10
(TORQUE TO 30 Ft.Lbs.)

ILS100504 REV F



WORK SUPPORT CAVITY DIMENSIONS:
#2500 SPRING RISE 10-0509-06
#2500 AIR RISE 10-0609-06
(TORQUE TO 30 Ft.Lbs.)

ILS100505 REV D



WORK SUPPORT CAVITY DIMENSIONS:
#1000 OIL RISE 10-0706-04
(TORQUE TO 30 Ft.Lbs.)

ILS100705 REV D

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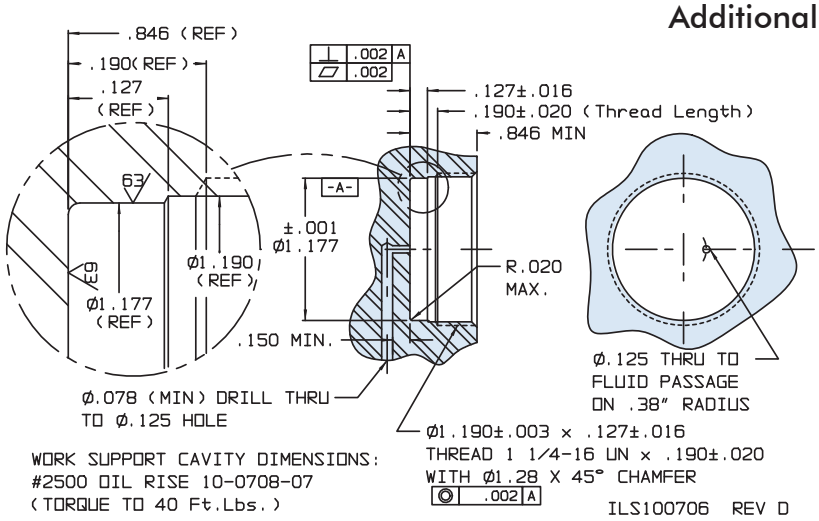
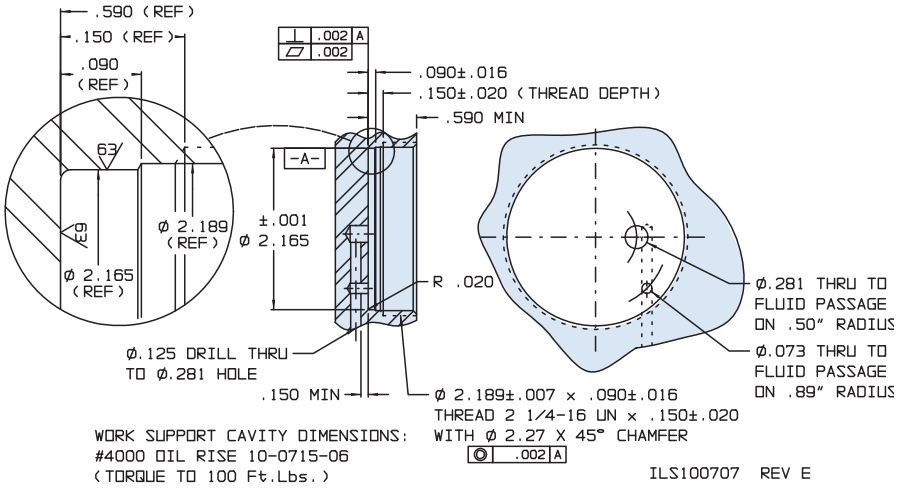
Additional Dimensions, Feeder Caps, Shield



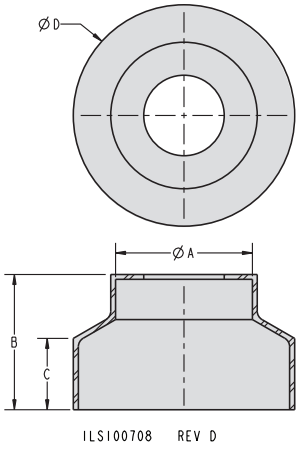


Work Support Accessories

Fluid Advance Work Support Shields

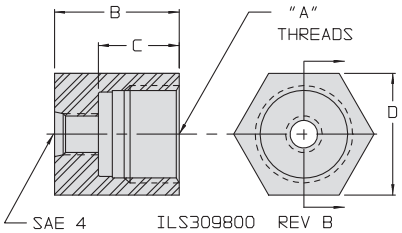
Model No.	Fits Model No.	A	B	C	D
81-0707-01	10-0706-04 10-0806-05	0.63	0.50	0.30	1.04
81-0708-01	10-0708-07 10-0808-07	0.81	0.84	0.43	1.38
81-0715-01	10-0715-06 10-0815-06	0.88	1.00	0.58	2.36

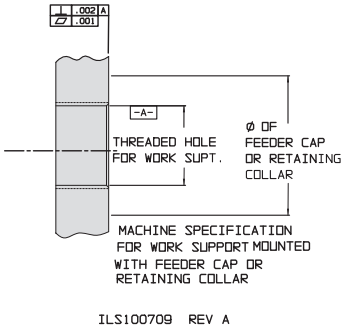
For use with fluid advance work supports only



Feeder Caps

Model No.	A	B	C	D
For use with fluid advance work supports only				
30-9872-40	1 - 16	1.00	0.53	1.25
30-9872-43	1 1/4 - 16	1.38	0.85	1.50
30-9872-48	2 1/4 - 16	0.99	0.59	2.50





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TuffCam™ High-Speed Swing Clamps

Frequently Asked Questions

Frequently Asked Questions

When do you recommend the use of TuffCam™ Swing Clamps over the standard product?

Sometimes there are applications where speed is essential, massive arms are required, or position sensing and feedback are necessary. These applications may result in premature failure not due to defects in standard clamps, but from excesses in speed, mass or other requirements.

When speed is essential, standard swing clamps (which last millions of cycles in ordinary applications) may not live up to life cycle expectations. When a standard swing clamp is damaged early in its life due to speed abuse, replacement with a TuffCam™ High-Speed Swing Clamp may be a way to maintain speed requirements and lengthen device life in the application.

Where arm mass damages the swing mechanism of standard swing clamps, the tri-cam uni-directional design of the TuffCam™ High-Speed Swing Clamp strengthens the ball and cam link. The beefier design, capacity and reinforced rotation mechanism of the TuffCam™ High-Speed Swing Clamp could be your best solution.

Can I run the TuffCam™ High-Speed Swing Clamp at any speed I want?

No, there are restrictions. TuffCam High-Speed Swing Clamps are capable of approximately two times the speed of standard swing clamps in prolonged use without damage. In the event that you need faster speeds or larger arms, please understand that the life of even TuffCam™ High-Speed Swing Clamps is reduced. Consult the **Clamp Time and Flow Rate** chart on page C-2 to determine the speed for your application.

What makes the cam follower ball seat so special in these units?

The three uni-directional cams and three cam balls guide the rotation of the plunger and provide greater guide, support and directional stability. The patented cam follower design is unique in the industry and uses solid carbide balls and composite ball seats. The ball seat design assures that the ball rolls in the cam rather than jamming and scraping resulting in wear on both the cam track and ball.

The demands on my fixture have changed and I am considering your TuffCam™ High-Speed Swing Clamps. Can I switch out High-Speed for your standard product?

Yes, the TuffCam™ High-Speed Swing Clamps have the same mounting envelope as standard swing clamp counterpart. However, if you are using our standard Bottom Flange 2600 lb capacity unit with the optional in-port flow control valve, you will be unable to use the valve in the TuffCam™ version of this Swing Clamp.

I want to use work supports with TuffCam™ High-Speed Swing Clamps. Will the work supports cycle fast enough to keep up with the part change outs?

There will be some lag between the unclamp of swing clamps and the full release of pressure in any work support circuit. This is critical with fluid advance supports, as the circuit must have time to evacuate under low pressure to allow the plungers to retract for reloading the fixture. If speed is the issue in support retraction to coordinate with TuffCam™ High-Speed Swing Clamps, an air advance support must be used with the air circuit released prior to hydraulic circuit release. When the hydraulic circuit is released, the support will begin to immediately retract pushing only the air from the line rather than the higher viscosity hydraulic fluid.

I'm using a high volume pump and it is "blowing out" my swing clamps. Will TuffCam™ High-Speed Swing Clamps take care of this problem?

High volume pumps often incorporate high volume accumulators. An accumulator will yield excessive flow, approaching instantaneous infinite flow, and is intended for dynamic loads. Hydraulic clamps are used to hold static loads. Excessive flow may continue to damage clamps, even TuffCam™ clamps, and we recommend changing to a pump designed for clamping applications or appropriate flow restriction.

It is important to hit my part in the exact place every time in my application, should I use your TuffCam™ Swing Clamps?

TuffCam™ High-Speed Swing Clamps will be more precise in their point of contact. Keep in mind that any draft angle or side forces will ultimately damage the cam tracks of any swing clamp and result in loss of precision. In the case of precision positioning, guide pins are recommended and may be implemented with a single-ended or double-ended arm.

What defines a TuffCam™ High-Speed Swing Clamp? How can I measure the clamp speed?

The maximum speed of a swing clamp is applicable to both clamp and unclamp function, as the momentum on the cam track and cam follower apply to both movements. To approximate the speed of your application:

* Look down the centerline of the swing clamp, perpendicular to the arm.
* Actuate your clamping system while watching the arm "swing" into position.
* The eye can track speed of movement at roughly 1/16 second. If while looking directly into the end of the swing clamp, you can observe the arm move through it's swing, the positioning time should be somewhere around ½ second or longer. See flow rates and clamping time in the front of the TuffCam™ High-Speed Swing Clamp section of our catalog.
* If, while looking directly into the end of the swing clamp, you can cannot observe the arm move, or it is unclamped and the next thing you can see is that it in the clamped position, the positioning time is something substantially less than 1/2 second. Your standard model clamp is at risk of premature failure However, the TuffCam™ High-Speed Swing Clamps can actuate at a faster speed. See flow rates and clamping time in the front of the TuffCam™ High-Speed Swing Clamp section of our catalog.
* It is possible to approximate the clamp time by adding the total active volume of devices in the specific control branch of your system, and dividing that volume (cubic inches) by your pump's output volume (cubic inches per minute) and then multiplying that number by 60 (60 seconds per minute). This will give you the theoretical calculated time to move a device through its stroke, but does not account for flow loss due to flow restrictions in the system.

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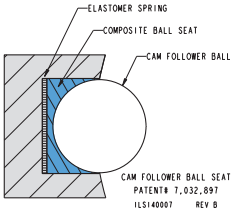
TuffCam™ High-Speed Swing Clamps

TuffCam™ High-Speed Swing Clamp

TuffCam™ High-Speed Swing Clamps were developed to meet your demand for high-speed, precise positioning and/or heavy arm applications. These tri-cam design clamps can position and clamp in less than one second and handle larger arms than standard swing clamps. One of the keys to this innovation is the patented Cam Follower Ball Seat that was developed to improve strength and wear. Using the patented Vektek V-Groove, a composite ball seat, and an elastomer spring, these clamps have reduced static friction for improved clamp breakaway and reduced dynamic friction for improved life.

U. S. Patent Nos.
7,032,897
5,820,118

- Available in these body styles:
  - Threaded Body
  - Top Flange
  - Bottom Flange
  - Cartridge Mount
  - Rod Position Sensing
  - Magnetic Position Sensing
- Single and double acting (position sensing are double acting only).
- Three cams for more accurate arm positioning, smoother rotation. and lower per cam surface contact pressure.
- Patented ball seat for improved rotary function, cam follower contact, and reduced dynamic and static friction.
- Vektek again changes the "state of the art" in ball and cam swing clamps making them work better at reasonable prices.
- BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.
- Standard fluorocarbon wipers for improved coolant compatibility.
- Arm clocking feature uses standard Vektek arms.
- Same mounting envelope as Standard VektorFlo® Swing Clamps.

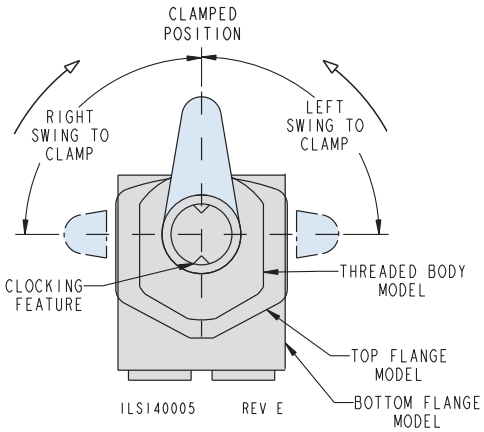


Clamp Time and Fluid Flow Rates for TuffCam™ High-Speed Swing Clamps

Swing Clamp Capacity (lb)	Standard Arm		Extended Arm	
	Fastest Allowable Clamp Time (sec.)	Maximum Permissible Flow Rate (cm^3/min)	Fastest Allowable Clamp Time (sec.)	Maximum Permissible Flow Rate (cm^3/min)
450	0.2	14	0.5	7
1100	0.3	45	0.7	20
2600	0.4	126	0.8	57

ILS150108 REV C

- For upreach and double arms, use extended arm flows and times.
- When using custom arms the extended arm flows and times are to be considered the limiting factor.
- The actual time to position the clamp will vary by custom arm configuration and may require customer testing in specific application to establish limits.



TuffCam™ Arm Clocking Feature
Drill points shown in the clamped position. Second Clocking feature 180 from the first clocking feature.

NOTE: Arm Length and Pressure Limitation Graphs on page O-3

*TuffCam™ is a trademark of Vektek, Inc.

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TuffCam™ High-Speed Swing Clamps

TuffCam™ High-Speed, Threaded Body Swing Clamp

Single And Double Acting

- Available in three capacities 450, 1100 and 2,600 lb. with standard arm at 5,000 psi.
- Three cams for accurate arm positioning, smoother rotation and lower per cam surface contact pressure.
- Patented ball seat for improved rotary function , cam follower contact, and reduced dynamic and static friction.
- Fluorocarbon wipers are standard for improved coolant compatibility.
- Tungsten-Carbide cam followers for strength and wear.
- Same mounting envelope as standard VektorFlo® Swing Clamps.
- High-Speed clocking feature (page C-2) uses standard Vektek arm.
- Arms sold separately – see section O.

U. S. Patent Nos.
7,032,897
5,820,118

Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Body Thread	Standard Arm Length **	Effective Piston Area (sq. in.) Retract	Oil Capacity (cu. in.)**** Extend	Oil Capacity (cu. in.)**** Retract
Single Acting (S/A)							**Cylinders, actuated hydraulically 1 direction, spring returned.**		
14-0105-01-R 14-0105-01-L	Right Left	450	0.22	0.57	1 1/16-16	1.06	0.098	N/A	0.056
14-0109-01-R 14-0109-01-L	Right Left	1100	0.31	0.79	1 1/2-16	1.50	0.295	N/A	0.233
14-0113-01-R 14-0113-01-L	Right Left	2600	0.50	1.16	1 7/8-16	2.00	0.626	N/A	0.726
Double Acting (D/A							**Cylinders, actuated hydraulically both directions.**		
14-0205-01-R 14-0205-01-L	Right Left	450	0.22	0.57	1 1/16-16	1.06	0.098	0.142	0.056
14-0209-01-R 14-0209-01-L	Right Left	1100	0.31	0.79	1 1/2-16	1.50	0.295	0.475	0.233
14-0213-01-R 14-0213-01-L	Right Left	2600	0.50	1.16	1 7/8-16	2.00	0.626	1.423	0.726

WARNING! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above by 5,000, and multiply the Resultant Number X Your System Operating Pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

*** To allow for piece part height variations, it is recommended that the vertical travel be set at about 50% of the vertical stroke.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-2.

Dimensions

Model No. Left Swing	Capacity	A	B	C	D	E	F	G	H	J	K	L
Single Acting (S/A)												
14-0105-01-L	450	1 1/16-16	4.28	4.02	0.75	2.02	0.27	1.94	0.94	0.15	0.437	0.19
14-0109-01-L	1100	1 1/2-16	5.68	5.32	1.09	2.54	0.38	2.40	1.27	0.15	0.625	0.16
14-0113-01-L	2600	1 7/8-16	7.33	6.81	1.06	3.35	0.36	3.21	1.30	0.15	0.875	0.16
Double Acting (D/A)												
14-0205-01-L	450	1 1/16-16	4.28	4.02	0.75	2.02	0.27	1.94	0.94	0.15	0.437	0.19
14-0209-01-L	1100	1 1/2-16	5.68	5.32	1.09	2.54	0.38	2.40	1.27	0.15	0.625	0.16
14-0213-01-L	2600	1 7/8-16	7.33	6.81	1.06	3.35	0.36	3.21	1.30	0.15	0.875	0.16

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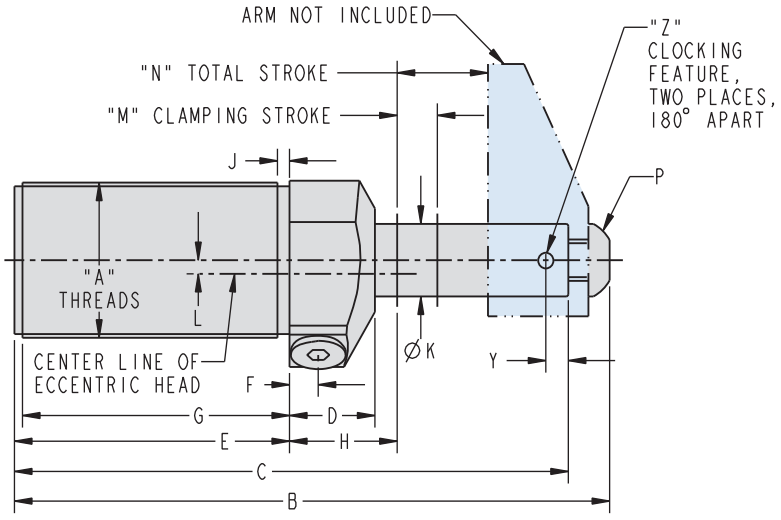
TuffCam™ High-Speed Swing Clamps

TuffCam™ High-Speed, Threaded Body Swing Clamp



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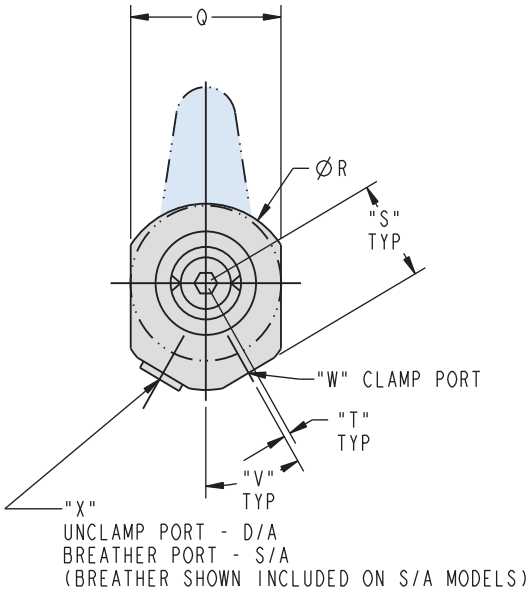

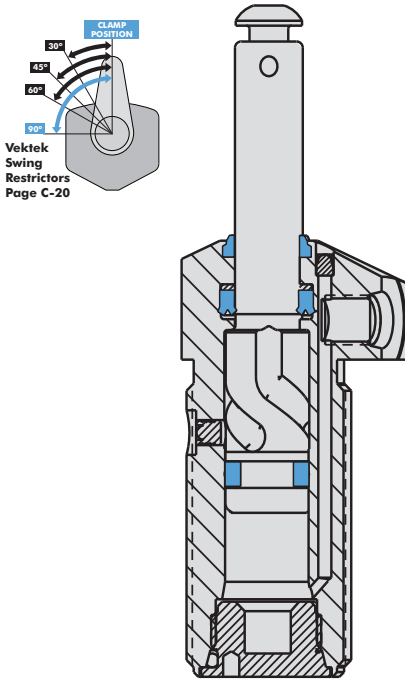

Vektek Swing Restrictors Page C-20

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Features

BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.

SAE porting is all on the top of the cylinder body for easy access (bottom unclamp porting is available).

Vent port with bronze filter gives single acting swing clamps a place to "breathe" and helps keep out contamination.

M	N	P	Q	R	S	T	V	W	X	Y±0.005	Z	Model No. Right Swing
Cylinders, actuated hydraulically 1 direction, spring returned.												
0.22	0.57	1/4-28 X 0.38	1.13	1.50	0.81	N/A	25°	SAE 2	SAE 2	0.156	Ø 0.13 x 90°	14-0105-01-R
0.31	0.79	3/8-24 X 0.63	1.50	1.88	1.03	0.09	35°	SAE 4	SAE 4	0.156	Ø 0.19 x 90°	14-0109-01-R
0.50	1.16	1/2-20 X 0.75	1.88	2.25	1.20	0.08	30°	SAE 4	SAE 4	0.156	Ø 0.19 x 90°	14-0113-01-R
Cylinders, actuated hydraulically both directions.												
0.22	0.57	1/4-28 X 0.38	1.13	1.50	0.81	N/A	25°	SAE 2	SAE 2	0.156	Ø 0.13 x 90°	14-0205-01-R
0.31	0.79	3/8-24 X 0.63	1.50	1.88	1.03	0.09	35°	SAE 4	SAE 4	0.156	Ø 0.19 x 90°	14-0209-01-R
0.50	1.16	1/2-20 X 0.75	1.88	2.25	1.20	0.08	30°	SAE 4	SAE 4	0.156	Ø 0.19 x 90°	14-0213-01-R

Order arms separately

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TuffCam™ High-Speed Swing Clamp

TuffCam™ High-Speed, Top Flange Swing Clamp

U. S. Patent Nos.
7,032,897
5,820,118

Single And Double Acting

- Available in three capacities 450, 1,100 and 2,600 lb. with standard arm at 5,000 psi.
- Three cams for accurate arm positioning, smoother rotation and lower per cam surface contact pressure.
- Patented ball seat for improved rotary function, cam follower contact, and reduced dynamic and static friction.
- Fluorocarbon wipers are standard for improved coolant compatibility.
- Tungsten-Carbide cam followers for strength and wear.
- Same mounting envelope as standard VektorFlo® Swing Clamps.
- Fitting 30-8711-20, adapter assembly, included and shipped with the clamp, drawing on page H-5. Plugs are also included and shipped.
- High-Speed clocking feature (page C-2) uses standard Vektek arm.
- Arms sold separately – see section O.
- Can be either manifold mounted or standard plumbed using standard SAE fittings.

Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Body Diameter	Standard Arm Length **	Effective Piston Area (sq. in.) Retract	Oil Capacity (cu. in.)**** Extend	Oil Capacity (cu. in.)**** Retract	Optional Flow Control Model No.
Single Acting (S/A)										**Cylinders, actuated hydraulically 1 direction, spring returned.**
14-6105-01-R 14-6105-01-L	Right Left	450	0.22	0.57	1.00	1.06	0.098	N/A	0.056	70-2037-70
14-6109-01-R 14-6109-01-L	Right Left	1100	0.31	0.79	1.44	1.50	0.295	N/A	0.233	70-2037-71
14-6113-01-R 14-6113-01-L	Right Left	2600	0.50	1.16	1.75	2.00	0.626	N/A	0.726	70-2037-71
Double Acting (D/A)										**Cylinders, actuated hydraulically both directions.**
14-6205-01-R 14-6205-01-L	Right Left	450	0.22	0.57	1.00	1.06	0.098	0.142	0.056	70-2037-70
14-6209-01-R 14-6209-01-L	Right Left	1100	0.31	0.79	1.44	1.50	0.295	0.475	0.233	70-2037-71
14-6213-01-R 14-6213-01-L	Right Left	2600	0.50	1.16	1.75	2.00	0.626	1.423	0.726	70-2037-71

Warning! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above by 5,000, and multiply the resultant number X your system operating pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

*** To allow for work piece height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-2.

Dimensions

Model No. Left Swing	Capacity	A	B	C	D	E	F	G	H	J	K	L	M	N
Single Acting (S/A)														
14-6105-01-L	450	0.99	4.28	4.02	2.02	0.94	0.75	0.31	0.437	1/4 - 28 x 0.38	0.22	0.31	0.22	0.57
14-6109-01-L	1100	1.43	5.68	5.32	2.60	1.21	1.03	0.38	0.625	3/8 - 24 x 0.63	0.28	0.50	0.31	0.79
14-6113-01-L	2600	1.74	7.34	6.82	3.35	1.30	1.06	0.41	0.875	1/2 - 20 x 0.75	0.34	0.41	0.50	1.16
Double Acting (D/A)														
14-6205-01-L	450	0.99	4.28	4.02	2.02	0.94	0.75	0.31	0.437	1/4 - 28 x 0.38	0.22	0.31	0.22	0.57
14-6209-01-L	1100	1.43	5.68	5.32	2.60	1.21	1.03	0.38	0.625	3/8 - 24 x 0.63	0.28	0.50	0.31	0.79
14-6213-01-L	2600	1.74	7.34	6.82	3.35	1.30	1.06	0.41	0.875	1/2 - 20 x 0.75	0.34	0.41	0.50	1.16

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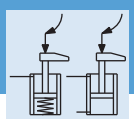
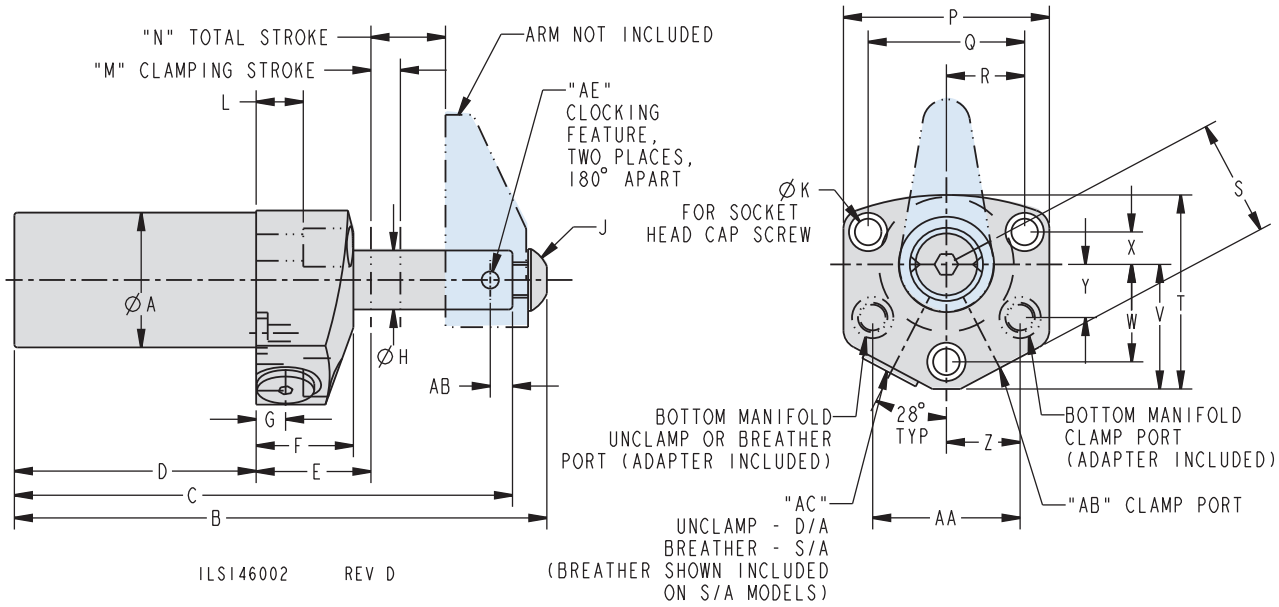
TuffCam™ High-Speed Swing Clamp



TuffCam™ High-Speed, Top Flange Swing Clamp



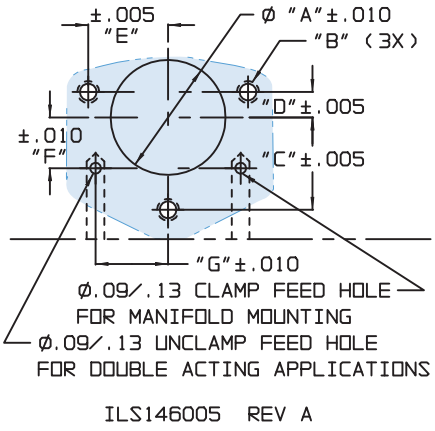
C-6

Features

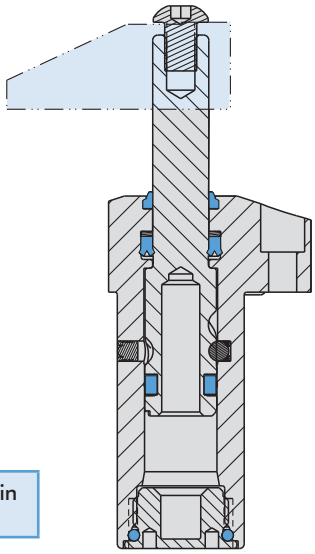
BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.

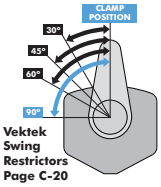
SAE porting is all on the top of the cylinder body for easy access, no need to modify fixtures or reroute tubing to access cylinder end to unclamp. (Optional bottom porting available)

Vent port with bronze filter gives single acting swing clamps a place to "breathe" and helps keep contamination from entering breather port.



For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 µin R_a surface finish.





Vektek Swing Restrictors Page C-20

Mounting Dimensions

Model No.	Capacity	A	B	C	D	E	F	G
14-6X05-01-L/R	450	1.015	10-32	0.795	0.219	0.687	0.438	0.625
14-6X09-01-L/R	1100	1.453	1/4-20	1.032	0.344	0.875	0.562	0.844
14-6X13-01-L/R	2600	1.765	5/16-18	1.250	0.438	1.000	0.531	1.047

	P	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD±0.005	AE	Model No. Right Swing
Cylinders, actuated hydraulically 1 direction, spring returned.																
	1.88	1.38	0.69	0.96	1.58	1.02	0.80	0.22	0.44	0.63	1.25	SAE 2	SAE 2	0.156	Ø.13 X 90°	14-6105-01-R
	2.31	1.75	0.88	1.24	2.06	1.32	1.03	0.34	0.56	0.84	1.69	SAE 4	SAE 4	0.156	Ø.19 X 90°	14-6109-01-R
	2.69	2.00	1.00	1.53	2.53	1.63	1.25	0.44	0.53	1.05	2.09	SAE 4	SAE 4	0.156	Ø.19 X 90°	14-6113-01-R
Cylinders, actuated hydraulically both directions.																
	1.88	1.38	0.69	0.96	1.58	1.02	0.80	0.22	0.44	0.63	1.25	SAE 2	SAE 2	0.156	Ø.13 X 90°	14-6205-01-R
	2.31	1.75	0.88	1.24	2.06	1.32	1.03	0.34	0.56	0.84	1.69	SAE 4	SAE 4	0.156	Ø.19 X 90°	14-6209-01-R
	2.69	2.00	1.00	1.53	2.53	1.63	1.25	0.44	0.53	1.05	2.09	SAE 4	SAE 4	0.156	Ø.19 X 90°	14-6213-01-R

Order arms separately

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TuffCam™ High-Speed Swing Clamp

TuffCam™ High-Speed, Bottom Flange Swing Clamp

Single And Double Acting

- Three cams for accurate arm positioning, smoother rotation and lower per cam surface contact pressure.
- Patented ball seat for improved rotary function, cam follower contact, and reduced dynamic and static friction.
- Fluorocarbon wipers are standard for improved coolant compatibility.
- Tungsten-Carbide cam followers for strength and wear.
- Same mounting envelope as standard VektorFlo® Swing Clamps.
- High-Speed clocking feature (page C-2) uses standard Vektek arm.
- Arms sold separately – see section O.

BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.

SAE porting from three directions on larger models gives you five alternatives for plumbing. You can use standard fittings in any of the three sets of ports or manifold by bolting up or down.

Vent port with bronze filter gives single acting swing clamps a place to "breathe" and helps keep contamination from entering breather port.

U. S. Patent Nos.
7,032,897
5,820,118

Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Standard Arm Length	Effective Piston Area (sq. in.) Retract	Oil Capacity (cu. in.)**** Extend	Oil Capacity (cu. in.)**** Retract	Optional Flow Control Model No.
Single Acting (S/A)									**Cylinders, actuated hydraulically 1 direction, spring returned.**
14-2105-01-R 14-2105-01-L	Right Left	450	0.22	0.57	1.06	0.098	N/A	0.056	70-2037-71
14-2109-01-R 14-2109-01-L	Right Left	1100	0.31	0.79	1.50	0.295	N/A	0.233	70-2037-73
14-2113-01-R 14-2113-01-L	Right Left	2600	0.50	1.16	2.00	0.626	N/A	0.726	N/A
Double Acting (D/A)									**Cylinders, actuated hydraulically both directions.**
14-2205-01-R 14-2205-01-L	Right Left	450	0.22	0.57	1.06	0.098	0.142	0.056	70-2037-71
14-2209-01-R 14-2209-01-L	Right Left	1100	0.31	0.79	1.50	0.295	0.475	0.233	70-2037-73
14-2213-01-R 14-2213-01-L	Right Left	2600	0.50	1.16	2.00	0.626	1.423	0.726	N/A

Warning! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide cylinder capacity shown above by 5,000, and multiply the resultant number X your system operating pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

*** To allow for work piece height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-2.

Dimensions

Model No. Left Swing	Capacity	A	B	C	D	E	F	G	H	J	K	L	M	N
Single Acting (S/A)														
14-2105-01-L	450	1.05	4.32	4.06	2.80	1.00	SAE 4	0.438	0.38	0.66	SAE 4	0.22	0.57	2.99
14-2109-01-L	1100	1.49	5.70	5.33	3.65	1.25	SAE 4	0.625	0.56	0.63	SAE 4	0.31	0.79	3.83
14-2113-01-L	2600	1.79	7.35	6.83	4.43	1.25	SAE 4	0.875	0.75	0.63	SAE 4	0.50	1.16	4.67
Double Acting (D/A)														
14-2205-01-L	450	1.05	4.32	4.06	2.80	1.00	SAE 4	0.438	0.38	0.66	SAE 4	0.22	0.57	2.99
14-2209-01-L	1100	1.49	5.70	5.33	3.65	1.25	SAE 4	0.625	0.56	0.63	SAE 4	0.31	0.79	3.83
14-2213-01-L	2600	1.79	7.35	6.83	4.43	1.25	SAE 4	0.875	0.75	0.63	SAE 4	0.50	1.16	4.67

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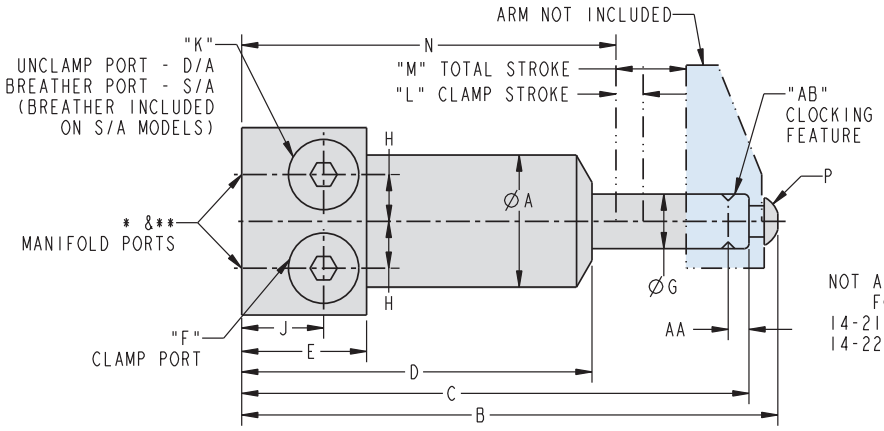
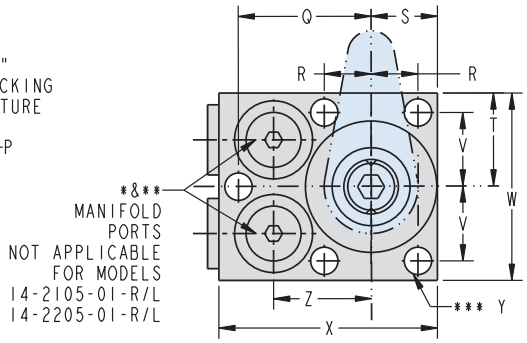
TuffCam™ High-Speed Swing Clamp

TuffCam™ High-Speed, Bottom Flange Swing Clamp





ILS142002 REV E

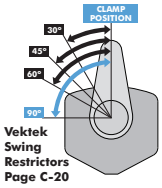
For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.

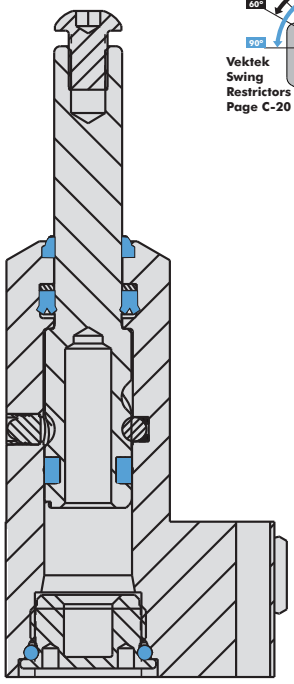
DRAWING NOTES:

* All ports (except breather) are shipped with removable steel plugs installed.

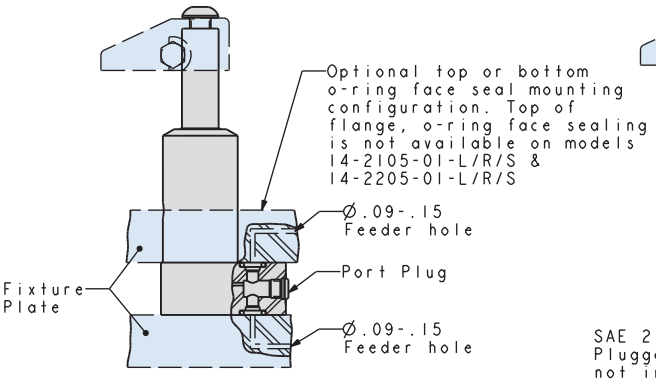
** Counter bores for 5/8" diameter o-ring face seals provided. (SAE 2 ports)

*** When used as manifold mounted, all 5 mounting bolts must be used to assure proper O-ring face sealing.

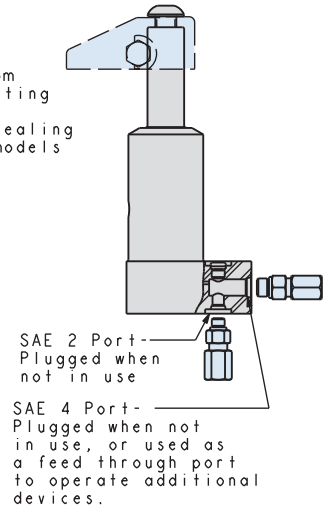




ILS142001 REV H



ILS142005 REV A



Order arms separately

	P	Q	R	S	T	V	W	X	Y	Z	AA±0.005	AB	Model No. Right Swing
Cylinders, actuated hydraulically 1 direction, spring returned.													
	1/4-28 X 0.38	1.06	0.38	0.53	0.75	0.59	1.50	1.75	0.22	0.78	0.156	Ø 0.13 X 90°	14-2105-01-R
	3/8-24 X 0.63	0.99	0.56	0.75	1.00	0.81	2.00	2.50	0.28	1.13	0.156	Ø 0.19 X 90°	14-2109-01-R
	1/2-20 X 0.75	1.21	0.69	0.94	1.25	1.00	2.50	3.00	0.34	1.25	0.156	Ø 0.19 X 90°	14-2113-01-R
Cylinders, actuated hydraulically both directions.													
	1/4-28 X 0.38	1.06	0.38	0.53	0.75	0.59	1.50	1.75	0.22	0.78	0.156	Ø 0.13 X 90°	14-2205-01-R
	3/8-24 X 0.63	0.99	0.56	0.75	1.00	0.81	2.00	2.50	0.28	1.13	0.156	Ø 0.19 X 90°	14-2209-01-R
	1/2-20 X 0.75	1.21	0.69	0.94	1.25	1.00	2.50	3.00	0.34	1.25	0.156	Ø 0.19 X 90°	14-2213-01-R

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TuffCam™ High-Speed Swing Clamp

TuffCam™ High-Speed Cartridge Mount

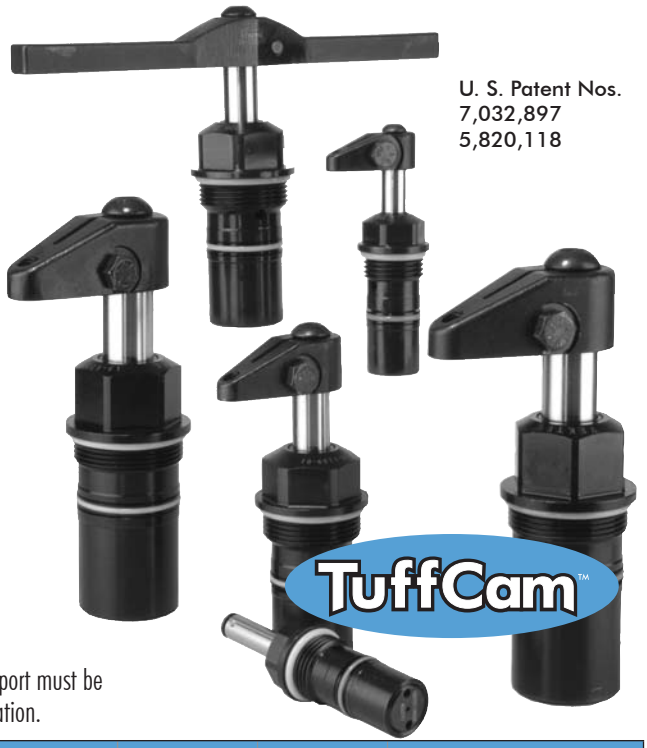
Single And Double Acting

- Three cams for accurate arm positioning, smoother rotation and lower per cam surface contact pressure.
- Patented ball seat for improved rotary function , cam follower contact, and reduced dynamic and static friction.
- Fluorocarbon wipers are standard for improved coolant compatibility.
- Tungsten-Carbide cam followers for strength and wear.
- Same mounting envelope as standard VektorFlo® Swing Clamps.
- High-Speed clocking feature (page C-2) uses standard Vektek arm.
- Arms sold separately – see section O.

BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.

Simplified pocket design with O-ring face seal on top allows use of some standard port tooling.

Only one O-ring must pass cross porting during installation, and only one (not two) port must be passed (but should not touch), reducing the chance of O-ring damage during installation.



U. S. Patent Nos.
7,032,897
5,820,118

Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Body Thread	Standard Arm Length	Effective Piston Area (sq. in.) Retract	Oil Capacity (cu. in.)**** Extend	Oil Capacity (cu. in.)**** Retract
Single Acting (S/A)							Cylinders, actuated hydraulically 1 direction, spring returned.		
14-1105-01-R 14-1105-01-L	Right Left	450	0.22	0.57	1 1/16-12	1.06	0.098	N/A	0.056
14-1109-01-R 14-1109-01-L	Right Left	1100	0.31	0.79	1 5/8-12	1.50	0.295	N/A	0.233
14-1113-01-R 14-1113-01-L	Right Left	2600	0.50	1.16	1 7/8-12	2.00	0.626	N/A	0.726
Double Acting (D/A)							Cylinders, actuated hydraulically both directions.		
14-1205-01-R 14-1205-01-L	Right Left	450	0.22	0.57	1 1/16-12	1.06	0.098	0.142	0.056
14-1209-01-R 14-1209-01-L	Right Left	1100	0.31	0.79	1 5/8-12	1.50	0.295	0.475	0.233
14-1213-01-R 14-1213-01-L	Righ Left	2600	0.50	1.16	1 7/8-12	2.00	0.626	1.423	0.726

WARNING! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application divide the cylinder capacity shown above by 5,000, and multiply the resultant number X your system operating pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

*** To allow for piece part height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-2.

Dimensions

Model No. Left Swing	Capacity	A	B	C	D	E	F	G	H	J	K
Single Acting (S/A)											
14-1105-01-L	450	2.13	2.13	1.32	1.88	0.13	0.63	0.49	0.83	0.438	0.92
14-1109-01-L	1100	2.70	2.98	1.50	2.63	0.13	0.94	0.65	1.13	0.625	1.34
14-1113-01-L	2600	3.17	4.17	1.50	3.65	0.16	1.25	0.55	1.49	0.875	1.72
Double Acting (D/A)											
14-1205-01-L	450	2.13	2.13	1.32	1.88	0.13	0.63	0.49	0.83	0.438	0.92
14-1209-01-L	1100	2.70	2.98	1.50	2.63	0.13	0.94	0.65	1.13	0.625	1.34
14-1213-01-L	2600	3.17	4.17	1.50	3.65	0.16	1.25	0.55	1.49	0.875	1.72

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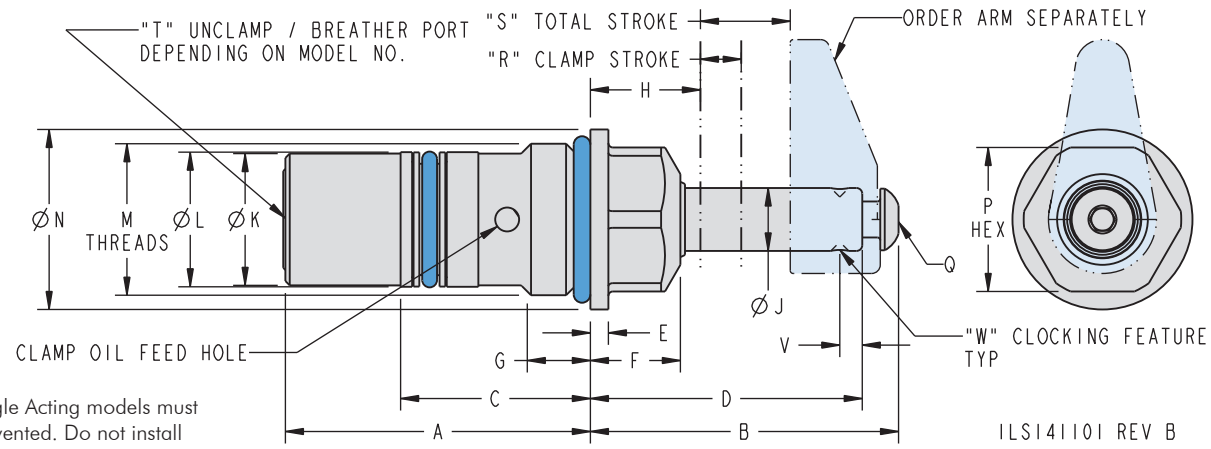
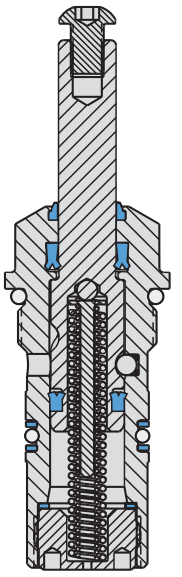
TuffCam™ High-Speed Swing Clamp

TuffCam™ High-Speed Cartridge Mount

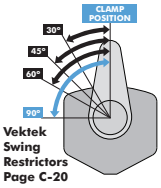


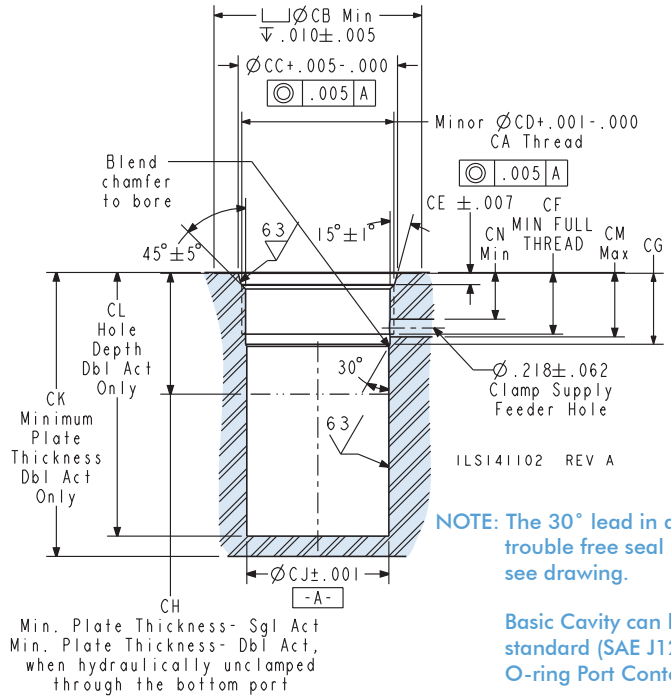
* Single Acting models must be vented. Do not install in a blind hole.

ILSI41101 REV B



ILSI41100 REV A





ILSI41102 REV A

NOTE: The 30° lead in angle is to ensure trouble free seal installation, see drawing.

Basic Cavity can be formed with a standard (SAE J126/1 Port Detail) O-ring Port Contour Cutter

Cavity Dimensions

Model No.	CA	CB	CC	CD	CE	CF	CG MIN	CG MAX	CH	CJ	CK	CL	CM	CN
Single Acting (S/A)												Cylinders, actuated, actuated hydraulically 1 direction, spring returned.		
14-1105-01-X	1 1/16-12	1.38	1.148	0.979	0.137	0.50	0.750	0.906	1.25	0.938	N/A	N/A	0.750	0.417
14-1109-01-X	1 5/8-12	2.00	1.713	1.541	0.139	0.68	0.815	0.906	1.50	1.376	N/A	N/A	0.815	0.525
14-1113-01-X	1 7/8-12	2.25	1.962	1.792	0.139	0.62	0.875	0.906	1.50	1.751	N/A	N/A	0.875	0.403
Double Acting (D/A)												Cylinders, actuated hydraulically both directions.		
14-1205-01-X	1 1/16-12	1.38	1.148	0.979	0.137	0.50	0.750	0.906	N/A	0.938	2.75	2.25	0.750	0.417
14-1209-01-X	1 5/8-12	2.00	1.713	1.541	0.139	0.68	0.815	0.906	N/A	1.376	3.25	2.75	0.815	0.525
14-1213-01-X	1 7/8-12	2.25	1.962	1.792	0.139	0.62	0.875	0.906	N/A	1.751	3.75	3.25	0.875	0.403

	L	M	N	P	Q	R	S	T	V±0.005	W	Model No. Right wing
									Cylinders, actuated hydraulically 1 direction, spring returned.		
	0.935	1 1/16-12	1.25	1.00	1/4-28 X 3/8	0.22	0.57	Breather	0.156	Ø 0.13 x 90°	14-1105-01-R
	1.372	1 5/8-12	1.88	1.50	3/8-24 X 5/8	0.31	0.79	Breather	0.156	Ø 0.19 x 90°	14-1109-01-R
	1.747	1 7/8-12	2.13	1.63	1/2-20 X 3/4	0.50	1.16	Breather	0.156	Ø 0.19 x 90°	14-1113-01-R
									Cylinders, actuated hydraulically both directions.		
	0.935	1 1/16-12	1.25	1.00	1/4-28 X 3/8	0.22	0.57	SAE 2	0.156	Ø 0.13 x 90°	14-1205-01-R
	1.372	1 5/8-12	1.88	1.50	3/8-24 X 5/8	0.31	0.79	SAE 4	0.156	Ø 0.19 x 90°	14-1209-01-R
	1.747	1 7/8-12	2.13	1.63	1/2-20 X 3/4	0.50	1.16	SAE 4	0.156	Ø 0.19 x 90°	14-1213-01-R

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TuffCam™ High-Speed Swing Clamp

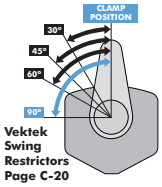
TuffCam™ Position Sensing High-Speed Swing Clamps

Rod Position Sensing Swing Clamps

- For use with Double Acting clamps only.
- Available for use on TuffCam™ High-Speed Swing Clamp with capacities of 1,100 lbs. and 2,600 lbs.
- Actuator Rod Position System can be used with a mechanical switch or air logic system to detect when clamp is in position.
- Actuator rod is concentric to plunger shaft.
- Actuator rod moves with the same rotary and linear motion as the plunger.
- All TuffCam™ high-speed features apply to these units.
- TuffCam™ High-Speed Clocking feature (page C-2) uses standard Vektek arm.

BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.

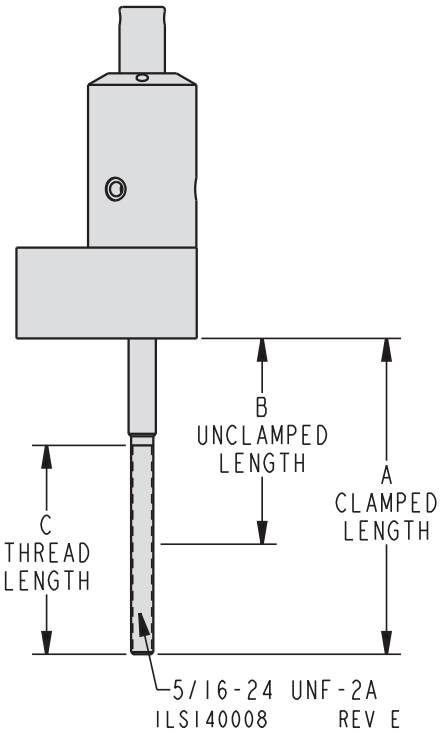
All TuffCam™ features apply to these units.



U. S. Patent Nos.
7,032,897
5,820,118

Rod Position Sensing System

Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)	A (in.)	B (in)	C (in)	Optional Flow Control Model No.
TuffCam Threaded Body (D/A) clamps, hydraulic retract and extend.						
14-0209-01-R-PR	Right	1100	3.97	3.18	2.88	N/A
14-0209-01-L-PR	Left					
14-0213-01-R-PR	Right	2600	5.10	3.94	3.63	N/A
14-0213-01-L-PR	Left					
TuffCam Top Flange (D/A) clamps, hydraulic retract and extend.						
14-6209-01-R-PR	Right	1100	3.97	3.18	2.88	70-2037-71
14-6209-01-L-PR	Left					
14-6213-01-R-PR	Right	2600	5.10	3.94	3.63	70-2037-71
14-6213-01-L-PR	Left					
TuffCam Bottom Flange (D/A) clamps, hydraulic retract and extend.						
14-2209-01-R-PR	Right	1100	3.92	3.13	2.88	70-2037-71
14-2209-01-L-PR	Left					
14-2213-01-R-PR	Right	2600	5.04	3.88	3.63	N/A
14-2213-01-L-PR	Left					



These systems available as Double Acting TuffCam™ Swing Clamps only.

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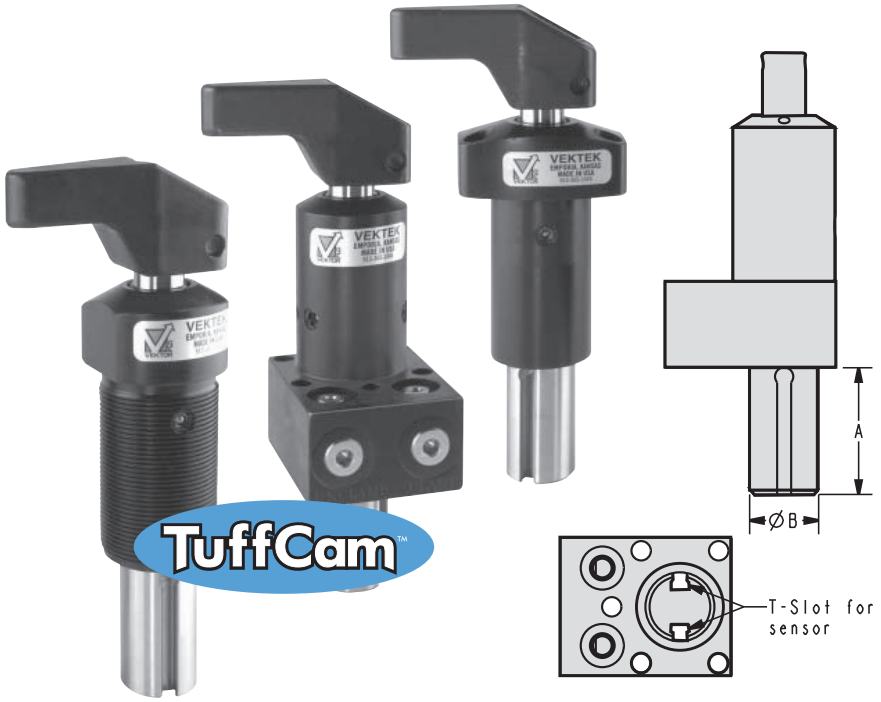
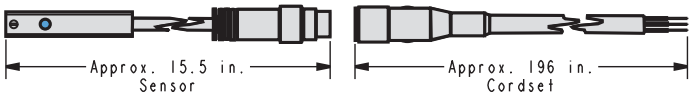
TuffCam™ High-Speed Swing Clamp

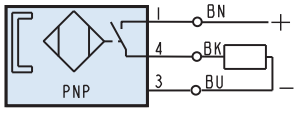
Magnetic Position Sensing Swing Clamps

- Sensors sold separately.
- Sensor mounting housing is concentric to plunger shaft.
- For use with Double Acting clamps only.
- Available for TuffCam High-Speed Swing Clamps only.
- TuffCam™ Clocking feature uses standard Vektek arm (page C-2).

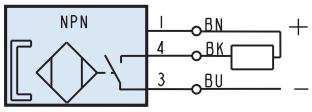
BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.







Model No. 62-2970-00
Schematic



Model No. 62-2970-01
Schematic

Sensor Kits Ordered Separately

62-2970-00 PNP Position Sensing Kit includes:

a 29-7001-00 Sensor and a 27-6424-00 Cordset

62-2970-01 NPN Position Sensing Kit includes:

a 29-7001-01 Sensor and a 27-6424-00 Cordset

The use of NPN or PNP is determined by the device to which the sensor is connected. One Sensor is required for each sensing position.

ILS140009 REV G

U. S. Patent Nos.
7,032,897
5,820,118

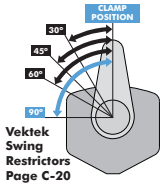
Magnetic Position Sensing System

Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)	A (in.)	B (in)	Optional Flow Control Model No.
TuffCam™ Threaded Body (D/A) clamps, hydraulic retract and extend.					
14-0205-01-R-PS 14-0205-01-L-PS	Right Left	450	1.72	1.00	N/A
14-0209-01-R-PS 14-0209-01-L-PS	Right Left	1100	1.89	1.00	N/A
14-0213-01-R-PS 14-0213-01-L-PS	Right Left	2600	2.27	1.00	N/A
TuffCam™ Top Flange (D/A) clamps, hydraulic retract and extend.					
14-6205-01-R-PS 14-6205-01-L-PS	Right Left	450	1.72	1.00	70-2037-70
14-6209-01-R-PS 14-6209-01-L-PS	Right Left	1100	1.89	1.00	70-2037-71
14-6213-01-R-PS 14-6213-01-L-PS	Right Left	2600	2.27	1.00	70-2037-71
TuffCam™ Bottom Flange (D/A) clamps, hydraulic retract and extend.					
14-2205-01-R-PS 14-2205-01-L-PS	Right Left	450	1.66	1.00	70-2037-71
14-2209-01-R-PS 14-2209-01-L-PS	Right Left	1100	1.84	1.00	70-2037-73
14-2213-01-R-PS 14-2213-01-L-PS	Right Left	2600	2.21	1.00	N/A

These systems available for Double Acting TuffCam™ Swing Clamps only.

Sensor Feature:

- Normally Open Contact
- LED Indicator Light
- 10 to 30 VDC operating range
- 3 Watt Maximum Contact Rating
- ≤ 0.8 ms Switch-off time
- ≤ 1.0 ms Switch-on time



Vektek Swing Restrictors Page C-20

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1-800-992-0236

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Swing Clamps

Frequently Asked Questions

Where and when should I use swing clamps?

Swing clamps are a logical choice where loading of the part is hampered by other styles of clamp. Swing clamps (as their names indicate) move out of the way for easy access to the load/unload area. They may be easily visualized by tool designers and the action emulates that of manual strap clamps which have been used for years.

Are there some applications where I need to avoid using swing clamps?

Yes, swing clamps should not be used when there are no fixed stops or hard locators into which the cutter force is transmitted. If swing clamps are oriented to hold vertically, horizontal cutter forces should be transmitted into solid stops that can easily absorb their energy. If forces are transmitted to swing clamps at 90° to the clamp action, all of the force is transmitted into the rotating mechanism. This may result in premature wear and early failure.

How do I size swing clamps?

First, calculate the cutter forces to be resisted. Then examine the direction of these forces. Determine how much of these forces will have to be held by the clamp. Size your clamp based on the estimated working pressure of your fixture. (We recommend using 3,000-4,000 psi at this point to give you some additional capacity if required when your fixture is complete or processes change.)

I want the fastest possible action from my swing clamps. How do I do that and how fast can I get?

Look at the appropriate catalog page to determine flow rates. If you are unable to determine flow rates, use the time limitations indicated under the same footnote. A good rule of thumb, "If you see the clamp open, then see it closed, but don't see it move between, it moved in less than 1/16th second. That is always too fast." Finally, ask yourself; "To what good use will the operator put that extra fraction of a second?" If the answer is none, slow the clamp down. You may want to consider TuffCam™ Swing Clamps when speed is critical to your process

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Frequently Asked Questions

I am planning to exceed the flow rating of your clamps, but I will be using low pressure (750 psi). That's OK isn't it?

No. Excessive speed is excessive speed, regardless of pressure. Swinging an arm against a cam faster than intended is not recommended. It will shorten clamp life even at low pressures. We recommend not exceeding maximum flow rates. Some alternate components to consider are the Flow Control Swing Clamps on page C-19, In-port Flow Controls found on page M-2 (if available for your clamp type) or you may be want to consider TuffCam™ Swing Clamps.

My swing clamps don't all contact the part at the same time. Why?

Flow restrictions, excess fittings, long tubing runs and different springs can all cause swing clamps to swing at different times. Despite the appearance, they actually build to pressure at approximately the same time. Because some customers (often the machine operators) are sensitive to the timing of their swing clamps we created the flow control swing clamp (C-19). Look to this clamp as a solution to the timing sensitive problem or add an in-port flow control valve at each swing clamp. See page M-2.

NOTE: Do not use this as a sequence valve.

I want to run my swing clamp on air; is this easily done?

We have designed pneumatic swing clamps, please see pneumatic catalog. It can be done for the three larger sizes of double acting hydraulic swing clamps (excludes Low Profile models). The smallest swing clamp may not be changed to air. It is extremely difficult to control air flow into or out of a pressure vessel this small. We do not recommend that the smallest clamp be converted to air, nor will we warrant its use in this application. Please call us for specific ordering details.

My application calls for an arm about the size of a baseball bat. It only weighs 14 lb. How fast can I swing it?

VERY SLOWLY! Weight, like flow, can damage a swing clamp. If you must use an arm exceeding the weight of our standard or extended arm, slow it down. Heavy arms should be used on double acting clamps only, and swing speed must be restricted in both directions. Remember the length and pressure limitations from the charts provided.

I want to use a 450 lb. swing clamp but need a 5,000 lb. swing clamp arm for length. How do I fit this arm onto the clamp? What are my flow and pressure restrictions?

You will have to add to an extended arm or make a custom. We cannot supply an arm modified to these specifications. A reach of this distance is not recommended. If you must reach beyond the limits charted, please consult Vektek's engineers.

I need to clamp over a work support. Are there any special precautions that I should take?

Yes, you will want to be sure that the clamp is sequenced to swing only after the support has built sufficient pressure to hold the force it is capable of generating and that they are properly sized. Sequencing is recommended only above 2,000 psi using a Vektek sequence valve (other brands will not work).

My part won't take 5,000 psi. How do I make your clamps work?

Your part doesn't have to take 5,000 psi. The force exerted on your part is determined by the pressure (in psi) times the piston area (in sq. in.). The force exerted by VektorFlo® swing clamps ranges from 450 to 5,000 lbs. at 5,000 psi input pressure. If you adjust the pressure down to 2,500 psi, your force will range from 225 to 2,500 lbs. depending on the model selected. You can generally adjust your pressure from 750 to 5,000 psi and get just the force you need to hold your part properly.

How do you decide between a standard and high speed swing clamp?

TuffCam High-Speed Swing Clamps must always be used when the required clamp actuation time is 1/2 second or less. The TuffCam rotation mechanism is more durable than the standard clamp, but they have the capability to swing in only one direction, as ordered. Standard swing clamps can be used when clamp speed is not critical (greater than 1/2 second is allowed) or the direction may need to be changed to swing left, right or straight. This is ideal where direction is not yet determined or you want to reduce the requirement for maintenance stock (1 clamp or 3 as shelf spares).

Features, Patented Design and Air Ordering

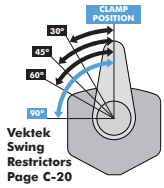
Standard Features

- Large ball and cam rotational mechanism assures the swing action.
- Standard models swing 90°, swing angles of less than 90° readily available for a small additional charge, swings of more than 90° are special order products.
- The original "duck billed," cross bolt locking, top cap screw arm design, as originated by Vektek, is highly recommended due to its low mass, versatility, and ease of modification, see Page O-2.
- Special wipers and swept-line cylinder top helps keep chips from packing and coolant contaminants from entering the operation.
- Vent port with bronze filter gives the cylinder a place to "breathe" and helps keep chips and coolants from sucking past wipers (Unclamp port on double-acting models).
- Exclusive BHC™ (Black Hard Coating) on the cylinder bodies and rod bearing surface helps prevent leaks caused by scoring and scratching especially in the event of high side or "kick" loads which promote excessive scoring in many other brands. BHC™ gives a Rockwell 60C skin hardness.
- Hardened Chrome alloy steel plungers run longer with less wear and drag than other brands.
- Proprietary seal designs reduce leakage and increase seal life for longer lasting, more dependable operations.

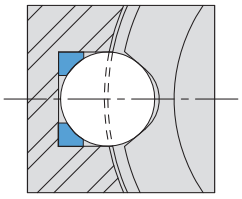
U.S. Patent Nos.
5,820,118
6,886,820

Patented V-groove Cam Design

- V shaped design provides a tougher mechanism. The ball runs deep in the track eliminating cam to ball edge loading.
- Resists flow related damage better (Please follow recommended flow rates for longest swing clamp life.).
- Lasts longer and will withstand operator induced "crashes" from improperly loaded parts with less damage.
- Provides planar rather than edge contact with the cam follower.
- Will withstand swing interference better than other cam designs.
- External cam swing clamp models (pages C-15 to C-26) have hardened V-cam tracks that resist damage and give you a built in extra cam (opposite swing direction) or straight line option should you accidentally damage one.
- Internal cam swing clamps (pages C-27 to C-32) have double V-cams providing extra strength, but must be ordered in the required swing direction. Low profile 5,000 and 7,500 lb. swing clamps do not have built in multiple direction cams.
- Vektek changes the "state of the art" in ball and cam swing clamps making them work better at reasonable prices.



Vektek Swing Restrictors Page C-20



SWING CLAMP "V" GROOVE
ILS150103 REV B

Clamp Time and Fluid Flow Rates for Standard Swing Clamps

Swing Clamp Capacity (lb)	Standard Arm		Extended Arm	
	Fastest Allowable Clamp Time (sec.)	Maximum Permissable Flow Rate (cm^3/min)	Fastest Allowable Clamp Time (sec.)	Maximum Permissable Flow Rate (cm^3/min)
450	0.4	8	0.9	4
1100	0.6	25	1.2	11
2600	0.6	70	1.4	32
5000	0.7	180	1.4	81
7500	0.7	180	1.6	81

ILS150108 REV C

- For upreach and double arms, use extended arm flows and times.
- When using custom arms the extended arm flows and times are to be considered the limiting factor.
- The actual time to position the clamp will vary by custom arm configuration and may require customer testing in specific application to establish limits.

NOTE: Arm Length and Pressure Limitation Graphs on page O-3

Air Ordering Information

Vektek offers the VektorAir™ line of pneumatic clamping devices and accessories, rated to run up to 250 psi. The product line includes an intensifier to boost standard shop air up to 250 psi. Call for a catalog. If you currently use our hydraulic models adapted for air, you may continue to do so, contact our sales office for air ordering information.

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Standard Swing Clamp

Threaded Body

Single and Double Acting

- Available in four capacities from 450 to 5,000 lb. with standard arm at 5,000 psi.
- Special concentric design models available to replace competitive product.
- Standard models swing 90°, swing angles of less than 90° readily available for a small additional charge, swings of more than 90° are special order products.
- To avoid cylinder damage and preserve warranty, see page C-14 regarding flow rate limits and time calculations to be observed.
- Clocking feature (page C-20) uses standard Vektek arm.

U.S. Patent Nos.
5,820,118
6,886,820

SAE porting is all on the top of the cylinder body for easy access (bottom unclamp porting is available), no need to modify fixtures or reroute tubing to access cylinder end to unclamp.

Vent port with bronze filter gives the cylinder a place to "breathe" and helps keep chips from sucking past wipers.

Hardened V-cam tracks resist damage and give you a built in extra cam or straight line option should you accidentally damage one. Specify left, right or straight cam, we will preset the swing when you order.

Model No. Add -L, -R or -S for Swing Direction	Cylinder Capacity (lb)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Body Thread	Standard Arm Length	Effective Piston Area (sq. in.) Retract	Oil Capacity (cu. in.)**** Extend	Oil Capacity (cu. in.)**** Retract
Single Acting (S/A)					Cylinders, actuated hydraulically 1 direction, spring returned.			
15-0105-00	450	0.22	0.57	1 1/16-16	1.06	0.098	N/A	0.056
15-0109-08	1100	0.31	0.79	1 1/2-16	1.50	0.295	N/A	0.233
15-0113-11	2600	0.50	1.16	1 7/8-16	2.00	0.626	N/A	0.726
15-0113-12	2600	0.50	1.16	1 7/8-16	2.00	0.626	N/A	0.726
15-0118-00	5000	0.63	1.66	2 1/2-16	2.50	1.178	N/A	1.955
Double Acting (D/A)					Cylinders, actuated hydraulically both directions.			
15-0205-00	450	0.22	0.57	1 1/16-16	1.06	0.098	0.142	0 .056
15-0209-08	1100	0.31	0.79	1 1/2-16	1.50	0.295	0.475	0.233
15-0213-11	2600	0.50	1.16	1 7/8-16	2.00	0.626	1.423	0.726
15-0218-00	5000	0.63	1.66	2 1/2-16	2.50	1.178	3.992	1.955

WARNING! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above by 5,000, and multiply the Resultant Number X Your System Operating Pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

*** To allow for piece part height variations, it is recommended that the vertical travel be set at about 50% of the vertical stroke.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-14.

Dimensions

Model No. Left Swing	Model No. Right Swing	Capacity	A	B	C	D	E	F	G	H	J	K	L
Single Acting (S/A)													
15-0105-00-L	15-0105-00-R	450	1 1/16-16	4.28	4.02	0.75	2.02	0.27	1.94	0.94	0.15	0.437	0.19
15-0109-08-L	15-0109-08-R	1100	1 1/2-16	5.68	5.32	1.09	2.54	0.38	2.40	1.27	0.15	0.625	0.16
15-0113-11-L	15-0113-11-R	2600	1 7/8-16	7.33	6.81	1.06	3.35	0.36	3.21	1.30	0.15	0.875	0.16
15-0118-00-L	15-0118-00-R	5000	2 1/2-16	9.96	9.31	1.19	4.71	0.39	4.59	1.52	0.15	1.250	0.10
Double Acting (D/A)													
15-0205-00-L	15-0205-00-R	450	1 1/16-16	4.28	4.02	0.75	2.02	0.27	1.94	0.94	0.15	0.437	0.19
15-0209-08-L	15-0209-08-R	1100	1 1/2-16	5.68	5.32	1.09	2.54	0.38	2.40	1.27	0.15	0.625	0.16
15-0213-11-L	15-0213-11-R	2600	1 7/8-16	7.33	6.81	1.06	3.35	0.36	3.21	1.30	0.15	0.875	0.16
15-0218-00-L	15-0218-00-R	5000	2 1/2-16	9.96	9.31	1.19	4.71	0.39	4.59	1.52	0.15	1.250	0.10

Order arms separately

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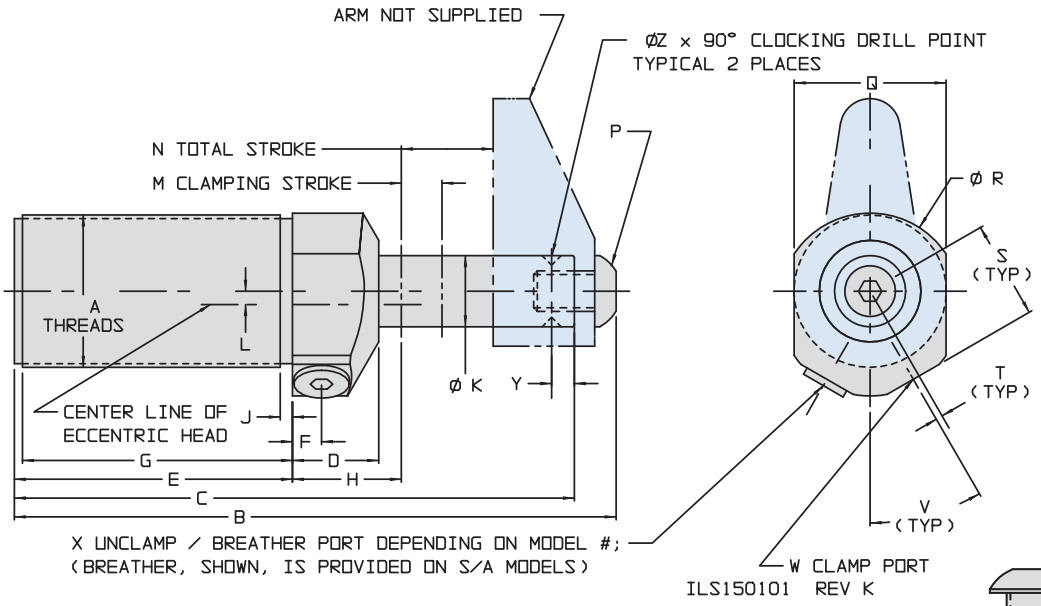
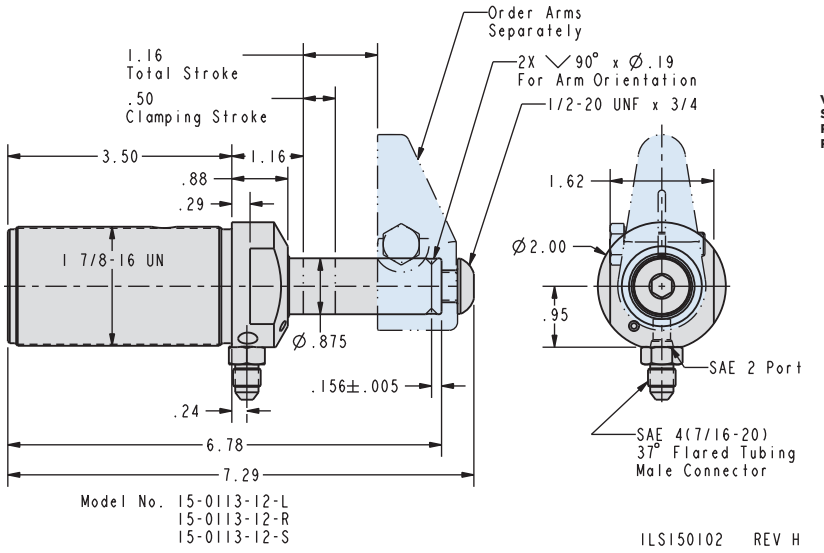
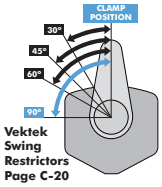
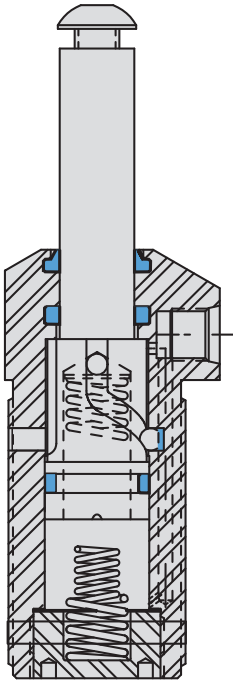
Standard Swing Clamp

Threaded Body









All dimensions are in inches. For mounting hardware details, see section L.

M	N	P	Q	R	S	T	V	W	X	Y±0.005	Z	Model No. Straight Swing
Cylinders, actuated hydraulically 1 direction, spring returned.												
0.22	0.57	1/4-28 X 3/8	1.13	1.50	0.81	N/A	25°	SAE 2	BREATHER	0.156	0.13	15-0105-00-S
0.31	0.79	3/8-24 X 5/8	1.50	1.88	1.03	0.09	35°	SAE 4	BREATHER	0.156	0.19	15-0109-08-S
0.50	1.16	1/2-20 X 3/4	1.88	2.25	1.20	0.08	30°	SAE 4	BREATHER	0.156	0.19	15-0113-11-S
0.63	1.66	5/8-18 X 1	2.50	2.75	1.42	0.05	30°	SAE 4	BREATHER	0.156	0.19	15-0118-00-S
Cylinders, actuated hydraulically both directions.												
0.22	0.57	1/4-28 X 3/8	1.13	1.50	0.81	N/A	25°	SAE 2	SAE 2	0.156	0.13	15-0205-00-S
0.31	0.79	3/8-24 X 5/8	1.50	1.88	1.03	0.09	35°	SAE 4	SAE 4	0.156	0.19	15-0209-08-S
0.50	1.16	1/2-20 X 3/4	1.88	2.25	1.20	0.08	30°	SAE 4	SAE 4	0.156	0.19	15-0213-11-S
0.63	1.66	5/8-18 X 1	2.50	2.75	1.42	0.05	30°	SAE 4	SAE 4	0.156	0.19	15-0218-00-S

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Standard Swing Clamp

Threaded Body, Long Stroke

Double Acting

- Available in 1,100 and 2,600 capacity.
- Can be pressure limited to yield force matching smaller models, yet retains full straight line clamping stroke.
- To avoid cylinder damage and preserve warranty, see page C-14 regarding flow rate limits and time calculations to be observed.
- Clocking feature (page C-20) uses standard Vektek arm.

Threaded plunger end with cap screw provides secure attachment of standard or custom built arms.

SAE 4 porting is all on the top of the cylinder body for easy access, no need to modify fixtures to access cylinder end to unclamp.

Hardened V-cam tracks resist damage and give you a built in extra cam (opposite swing direction) or straight line option should you accidentally damage one.

BHC™ (Black Hard Coating) on the cylinder bodies helps prevent leaks caused by scoring and scratching, especially in the event of high side or "kick" loads which promote excessive scoring in many other brands.

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5,820,118
6,886,820

Model No. Add -L, -R or -S for Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Body Thread	Standard Arm Length**	Effective Piston Area (sq. in.)	Oil Capacity (cu. in.)****	
						Retract	Extend	Retract
Double Acting (D/A)						Cylinders, actuated hydraulically both directions.		
15-0209-10	1100	0.75	1.21	1 1/2-16	1.50	0.295	0.73	0.36
15-0209-12*	1100	0.75	1.21	1 1/2-16	1.50	0.295	0.73	0.36
15-0213-20	2600	1.35	2.00	1 7/8-16	2.00	0.626	2.45	1.25
15-0213-22*	2600	1.35	2.00	1 7/8-16	2.00	0.626	2.45	1.25

* Includes optional unclamp porting through the bottom of the swing clamp

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting and 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above by 5,000, and multiply the resultant number by your system operating pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss, and seal drag.)

*** To allow for piece part height variations, it is recommended that the vertical travel be set at about 50% of the vertical stroke

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-14.

Dimensions

Model No. Left Swing	Model No. Right Swing	Capacity	A	B	C	D	E	F	G	H	J
Double Acting (D/A)											
15-0209-10-L	15-0209-10-R	1100	1 1/2-16	6.94	6.58	1.09	3.38	0.38	3.28	1.28	0.15
15-0213-20-L	15-0213-20-R	2600	1 7/8-16	9.80	9.28	1.06	4.98	0.36	4.88	1.30	0.15

* For bottom unclamp porting, order either 15-0209-12 or 15-0213-22 (R, L, S).

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Order arms separately

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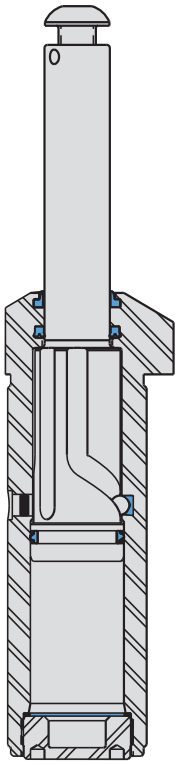
Standard Swing Clamp

Threaded Body, Long Stroke



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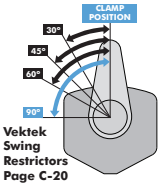

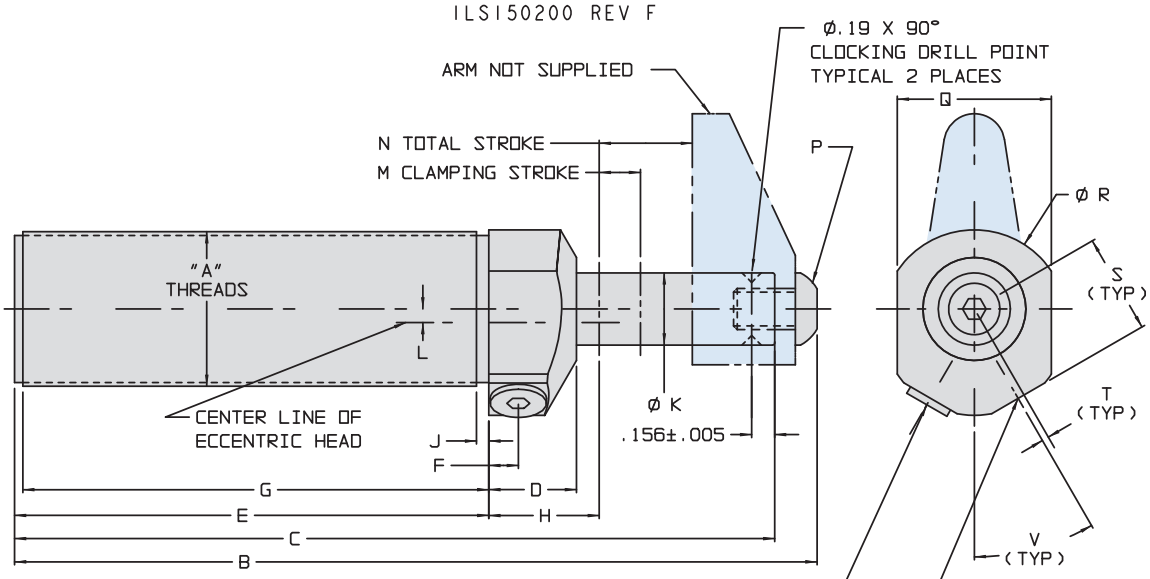

ILS150201 REV J

ØK	L	M	N	P	Q	ØR	S	T	V	W	X	Model No. Straight Swing
Cylinders, actuated hydraulically both directions.												
0.62	0.16	0.75	1.21	3/8-24 X 5/8	1.49	1.87	1.03	0.10	35	SAE 4	SAE 4	15-0209-10-S
0.87	0.16	1.35	2.00	1/2-20 X 3/4	1.87	2.25	1.20	0.08	30	SAE 4	SAE 4	15-0213-20-S

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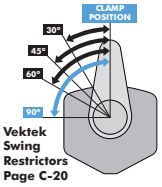
Standard Swing Clamp

Threaded Body, Flow Control

Double Acting

- Available in our very popular 1,100 lb. capacity model.
- Integral flow control needle valve regulates the speed in both directions.
- Created for applications where multiple clamps must be timed to contact the part at similar times.
- Needle valve is built into the clamp head, no need to add external flow controls or give up space on your fixture for additional plumbing.
- Clocking feature (page C-20) uses standard Vektek arm.
- Arms sold separately – see section O.



Special limiting capability prevents the total blockage of the flow path.

U.S. Patent Nos.
5,820,118
6,886,820

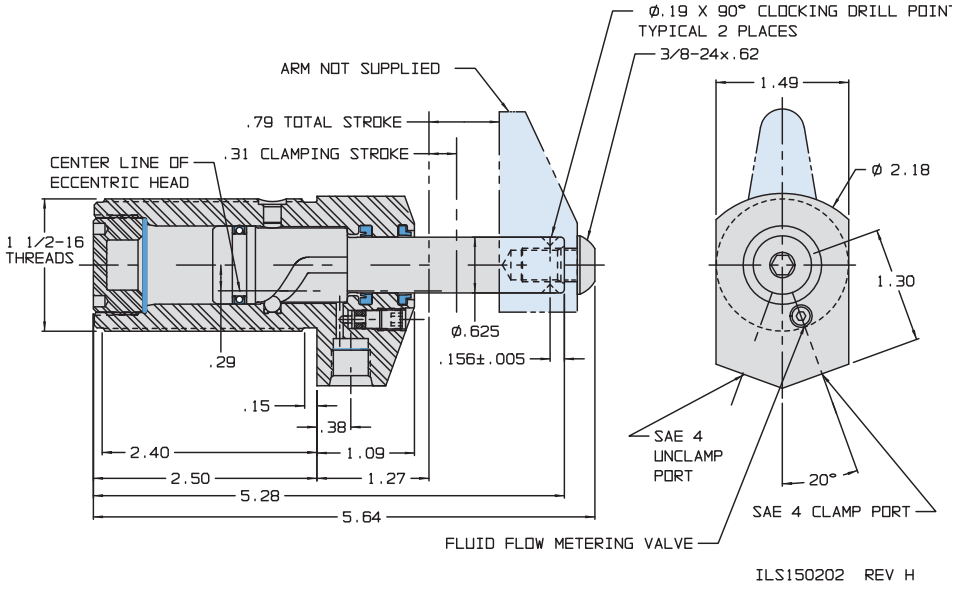
NOTE: Do not modify the needle valve or seat, excessive pressures may result.

Hardened V-cam tracks resist damage and give you a built in extra cam (opposite swing direction) or straight-line option should you accidentally damage one. Specify right, left or straight cam, we will preset the swing when you order.

Mounting hardware is available or you may tap your fixture and use a retaining collar to lock in place.

Standard SAE 4 O-ring porting makes plumbing simpler and leak-free.

Available only as a double-acting unit, springs cannot be used in this design.



Model No.	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Body Thread	Standard Arm Length**	Effective Piston Area (sq. in.) Retract	Oil Capacity (cu. in.)**** Extend	Oil Capacity (cu. in.)**** Retract
Double Acting (D/A)					**Cylinders, actuated hydraulically both directions.**			
15-0209-09-L 15-0209-09-R 15-0209-09-S	1100	0.31	0.79	1 1/2-16	1.50	0.295	0.475	0.233

WARNING: Never allow swing arm to contact workpiece or fixturing during rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above by 5,000, and multiply the resultant number X to your System Operating Pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss, and seal drag.)

*** To allow for piece part height variations, it is recommended that the vertical travel be set at no more than 50% of travel.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-14.

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Order arms separately

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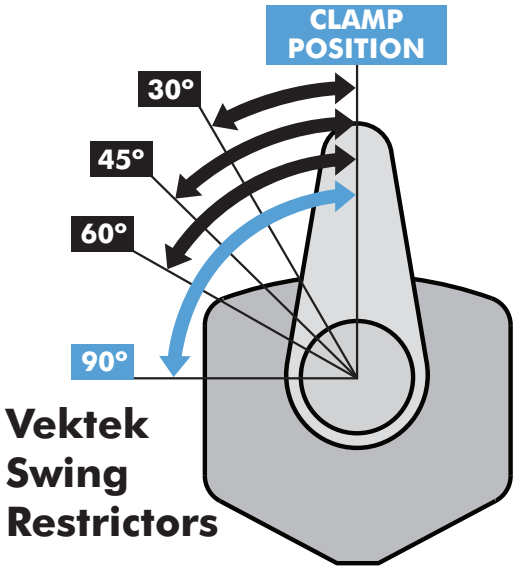
Swing Clamp Restrictors

Swing Restrictors add just one more element of flexibility when using Vektek Swing Clamps. Normally shipped with the swing angle set to 90°, you can have swing restrictors added to your clamps to limit the the arm swing to 30°, 45° or 60° of rotation. Restrictors that are factory installed on new clamps will have the clamp specially marked to avoid intermingling clamps with varying swing angles in your shop. Contact your Vektek Customer Service specialist should you need swing angles greater than 90°.



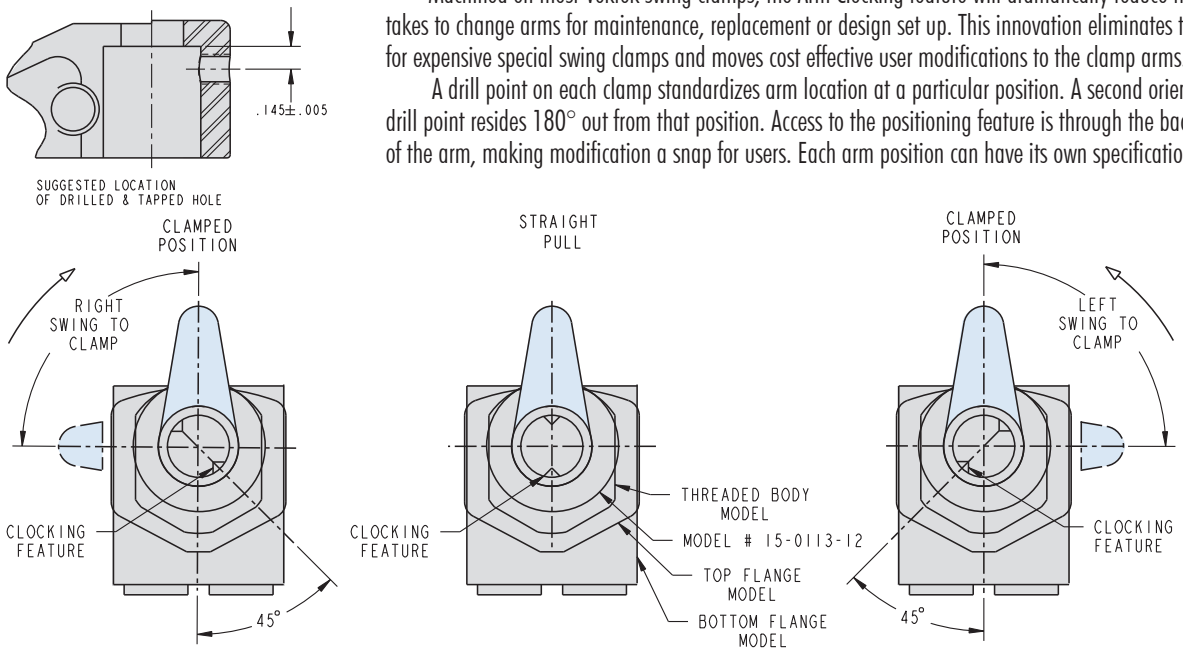
Swing Clamp Swing Restrictors

Model No	Clamp Capacity	Swing Restriction
81-5505-30	450/2kN	30°
81-5505-45	450/2kN	45°
81-5505-60	450/2kN	60°
81-5509-30	1100/4.9kN	30°
81-5509-45	1100/4.9kN	45°
81-5509-60	1100/4.9kN	60°
81-5513-30	2600/11.6kN	30°
81-5513-45	2600/11,6kN	45°
81-5513-60	2600/11.6kN	60°
81-5518-30	5000/22kN	30°
81-5518-31	LP SC 5000/22kN	30°
81-5518-45	5000/22kN	45°
81-5518-46	LP SC, 5000/22kN	45°
81-5518-60	5000/22kN	60°
81-5518-61	LP SC, 5000/22kN	60°
81-5521-30	LP SC 7500/33kN	30°
81-5521-45	LP SC 7500/33kN	45°
81-5521-60	LP SC 7500/33kN	60°

Clocking

Machined on most Vektek swing clamps, the Arm Clocking feature will dramatically reduce the time it takes to change arms for maintenance, replacement or design set up. This innovation eliminates the need for expensive special swing clamps and moves cost effective user modifications to the clamp arms.

A drill point on each clamp standardizes arm location at a particular position. A second orientation drill point resides 180° out from that position. Access to the positioning feature is through the back or side of the arm, making modification a snap for users. Each arm position can have its own specification.



Swing Clamp Arm Clocking Feature

Drill points shown in the clamped position.
Second Clocking feature 180 from the first clocking feature.

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Standard Swing Clamp

Top Flange/Manifold Mount

Single And Double Acting

- Easy to use, just bolt in place and plumb or use the easy to make manifold pattern to eliminate external plumbing.
- Available in four capacities from 450 to 5,000 lb.
- Can be either manifold mounted or standard plumbed using standard SAE fittings.
- Single piece body and mounting give a rigid installation, no threads to rock around or additional mounting hardware to buy.
- Fitting 30-8711-20, adapter assembly, included and shipped with the clamp, drawing on page H-5. Plugs are also included and shipped.
- Clocking feature (page C-20) uses standard Vektek arm.

Hardened V-cam tracks resist damage and gives you a built-in extra cam (opposite swing direction) or straight-line option should you accidentally damage one. Specify right, left or straight cam, we will preset the swing when you order.

Low installed clamping height can be fine tuned to fit your part with easy to make spacers (page L-2).

U.S. Patent Nos.
5,820,118
6,886,820

Model No. Add -L, -R or -S to indicate desired Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Standard Arm Length	Body Dia.	Effective Piston Area (sq. in.)	Oil Capacity (cu. in.)****		Optional Flow Control Model No.
						Retract	Extend	Retract	
Single Acting (S/A)									**Cylinders, actuated hydraulically 1 direction, spring returned.**
15-0505-00	450	0.22	0.57	1.06	1.00	0.098	N/A	0.056	70-2037-70
15-0509-08	1100	0.31	0.79	1.50	1.44	0.295	N/A	0.233	70-2037-71
15-0513-11	2600	0.50	1.16	2.00	1.75	0.626	N/A	0.726	70-2037-71
15-0518-00	5000	0.63	1.66	2.50	2.38	1.178	N/A	1.955	70-2037-72
Double Acting (D/A)									**Cylinders, actuated hydraulically both directions.**
15-0605-00	450	0.22	0.57	1.06	1.00	0.098	0.142	0.056	70-2037-70
15-0609-08	1100	0.31	0.79	1.50	1.44	0.295	0.475	0.233	70-2037-71
15-0613-11	2600	0.50	1.16	2.00	1.75	0.626	1.423	0.726	70-2037-71
15-0618-00	5000	0.63	1.66	2.50	2.38	1.178	3.992	1.955	70-2037-72

WARNING! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above by 5,000, and multiply the Resultant Number X Your System Operating Pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

*** To allow for piece part height variations, it is recommended that the vertical travel be set at about 50% of the vertical stroke.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-14.

Dimensions

Model No. Left Swing	Model No. Right Swing	Capacity	A	B	C	D	E	F	G	H	J	K	L	M
Single Acting (S/A)														
15-0505-00-L	15-0505-00-R	450	0.99	4.28	4.02	2.02	0.94	0.75	0.31	0.437	1/4 - 28 x 0.38	0.22	0.31	0.22
15-0509-08-L	15-0509-08-R	1100	1.43	5.68	5.32	2.60	1.21	1.03	0.38	0.625	3/8 - 24 x 0.62	0.28	0.50	0.31
15-0513-11-L	15-0513-11-R	2600	1.74	7.34	6.82	3.35	1.30	1.06	0.41	0.875	1/2 - 20 x 0.75	0.34	0.41	0.50
15-0518-00-L	15-0518-00-R	5000	2.37	9.96	9.31	4.43	1.80	1.47	0.54	1.250	5/8 - 18 x 1.00	0.41	0.75	0.63
Double Acting (D/A)														
15-0605-00-L	15-0605-00-R	450	0.99	4.28	4.02	2.02	0.94	0.75	0.31	0.437	1/4 - 28 x 0.38	0.22	0.31	0.22
15-0609-08-L	15-0609-08-R	1100	1.43	5.68	5.32	2.60	1.21	1.03	0.38	0.625	3/8 - 24 x 0.62	0.28	0.50	0.31
15-0613-11-L	15-0613-11-R	2600	1.74	7.34	6.82	3.35	1.30	1.06	0.41	0.875	1/2 - 20 x 0.75	0.34	0.41	0.50
15-0618-00-L	15-0618-00-R	5000	2.37	9.96	9.31	4.43	1.80	1.47	0.54	1.250	5/8 - 18 x 1.00	0.41	0.75	0.63

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Order arms separately

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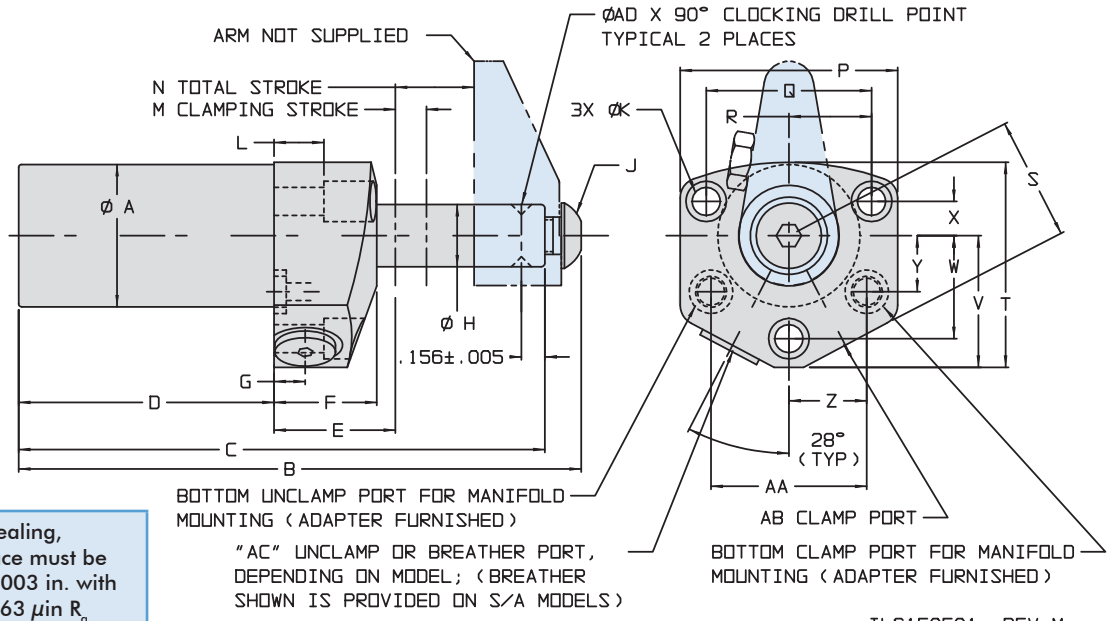
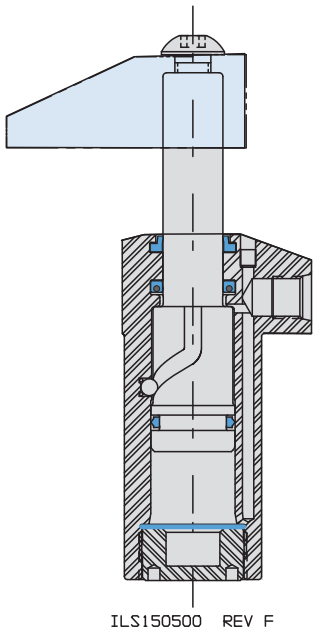
Standard Swing Clamp

Top Flange/Manifold Mount



ILS150501 REV M

For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.



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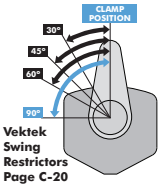

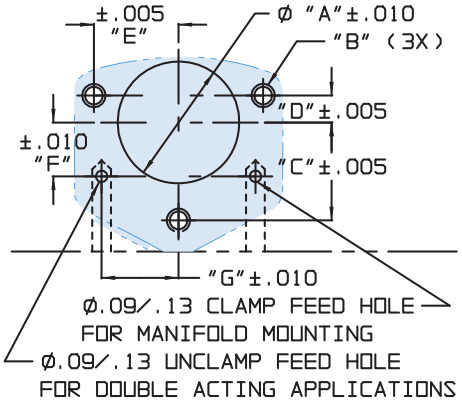

ILS150502 REV E

Mounting Dimensions

Model No.	Capacity	A	B	C	D	E	F	G
15-0X05-00-X	450	1.015	10-32	0.795	0.219	0.687	0.438	0.625
15-0X09-08-X	1100	1.453	1/4-20	1.032	0.344	0.875	0.562	0.844
15-0X13-11-X	2600	1.765	5/16-18	1.250	0.438	1.000	0.531	1.047
15-0X18-00-X	5000	2.390	3/8-16	1.719	0.601	1.367	0.750	1.406

N	P	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD	Model No. Straight Swing
Cylinders, actuated hydraulically 1 direction, spring returned.															
0.57	1.88	1.38	0.69	0.96	1.58	1.02	0.80	0.22	0.44	0.63	1.25	SAE 2	SAE 2	0.13	15-0505-00-S
0.79	2.31	1.75	0.88	1.24	2.06	1.32	1.03	0.34	0.56	0.84	1.69	SAE 4	SAE 4	0.19	15-0509-08-S
1.16	2.69	2.00	1.00	1.53	2.53	1.63	1.25	0.44	0.53	1.05	2.09	SAE 4	SAE 4	0.19	15-0513-11-S
1.66	3.61	2.73	1.37	2.05	3.34	2.13	1.72	0.60	0.75	1.41	2.81	SAE 4	SAE 4	0.19	15-0518-00-S
Cylinders, actuated hydraulically both directions.															
0.57	1.88	1.38	0.69	0.96	1.58	1.02	0.80	0.22	0.44	0.63	1.25	SAE 2	SAE 2	0.13	15-0605-00-S
0.79	2.31	1.75	0.88	1.24	2.06	1.32	1.03	0.34	0.56	0.84	1.69	SAE 4	SAE 4	0.19	15-0609-08-S
1.16	2.69	2.00	1.00	1.53	2.53	1.63	1.25	0.44	0.53	1.05	2.09	SAE 4	SAE 4	0.19	15-0613-11-S
1.66	3.61	2.73	1.37	2.05	3.34	2.13	1.72	0.60	0.75	1.41	2.81	SAE 4	SAE 4	0.19	15-0618-00-S

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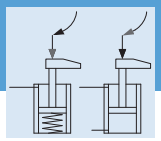

Standard Swing Clamp

Manifold/Bottom Flange Mount Specifications

Single And Double Acting

- Simply the easiest to use manifold mount design on the market today. No precision installation holes, no precisely located ports, no special mounting hardware, only our special patented design gives you all that.
- Available in three sizes 450 to 2,600 lb. capacity at 5,000 psi.
- Unique, bolt up, bolt down or standard ported "foot" design allows you the maximum flexibility in fixture design.
- Can be manifold face sealed or fittings may be used in the top and bottom ports (SAE 2).
- Clocking feature (page C-20) uses standard Vektek arm.

Hardened V-cam tracks resist damage and give you a built in extra cam (opposite swing direction) or straight line option should you accidentally damage one. Specify left, right or straight cam, we will preset the swing when you order.

SAE porting from three directions on larger models gives you five alternatives for plumbing. You can use standard fittings in any of the three sets of ports or manifold by bolting up or down.

U.S. Patent Nos.
5,192,158
5,820,118

Easily installed using standard cap screws. The large base and one piece mounting give this clamp excellent rigidity.

Model No. Add -L, -R or -S to indicate desired Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Standard Arm Length **	Effective Piston Area (sq. in.) Retract	Oil Capacity (cu. in.)**** Extend	Oil Capacity (cu. in.)**** Retract	Optional Flow Control Model No.
Single Acting (S/A)					**Cylinders, actuated hydraulically 1 direction, spring returned.**			
15-2105-01	450	0.22	0.57	1.06	0.098	N/A	0.056	70-2037-71
15-2109-01	1100	0.31	0.79	1.50	0.295	N/A	0.233	70-2037-73
15-2113-01	2600	0.50	1.16	2.00	0.626	N/A	0.726	70-2037-73
Double Acting (D/A)					**Cylinders, actuated hydraulically both directions.**			
15-2205-01	450	0.22	0.57	1.06	0.098	0.142	0.056	70-2037-71
15-2209-01	1100	0.31	0.79	1.50	0.295	0.475	0.233	70-2037-73
15-2213-01	2600	0.50	1.16	2.00	0.626	1.423	0.726	70-2037-73

WARNING! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above by 5,000, and multiply the Resultant Number X Your System Operating Pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

*** To allow for piece part height variations, it is recommended that the vertical travel be set at about 50% of the vertical stroke.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-14.

Dimensions

Model No. Left Swing	Model No. Right Swing	Capacity	A	B	C	D	E	F	G	H	J	K	L
Single Acting (S/A)													
15-2105-01-L*	15-2105-01-R *	450	1.05	4.32	4.06	2.80	1.00	SAE 4	0.438	0.38	0.66	SAE 4	0.22
15-2109-01-L	15-2109-01-R	1100	1.49	5.70	5.33	3.65	1.25	SAE 4	0.625	0.56	0.63	SAE 4	0.31
15-2113-01-L	15-2113-01-R	2600	1.79	7.35	6.83	4.43	1.25	SAE 4	0.875	0.75	0.63	SAE 4	0.50
Double Acting (D/A)													
15-2205-01-L *	15-2205-01-R *	450	1.05	4.32	4.06	2.80	1.00	SAE 4	0.438	0.38	0.66	SAE 4	0.22
15-2209-01-L	15-2209-01-R	1100	1.49	5.70	5.33	3.65	1.25	SAE 4	0.625	0.56	0.63	SAE 4	0.31
15-2213-01-L	15-2213-01-R	2600	1.79	7.35	6.83	4.43	1.25	SAE 4	0.875	0.75	0.63	SAE 4	0.50

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1-800-992-0236

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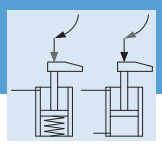
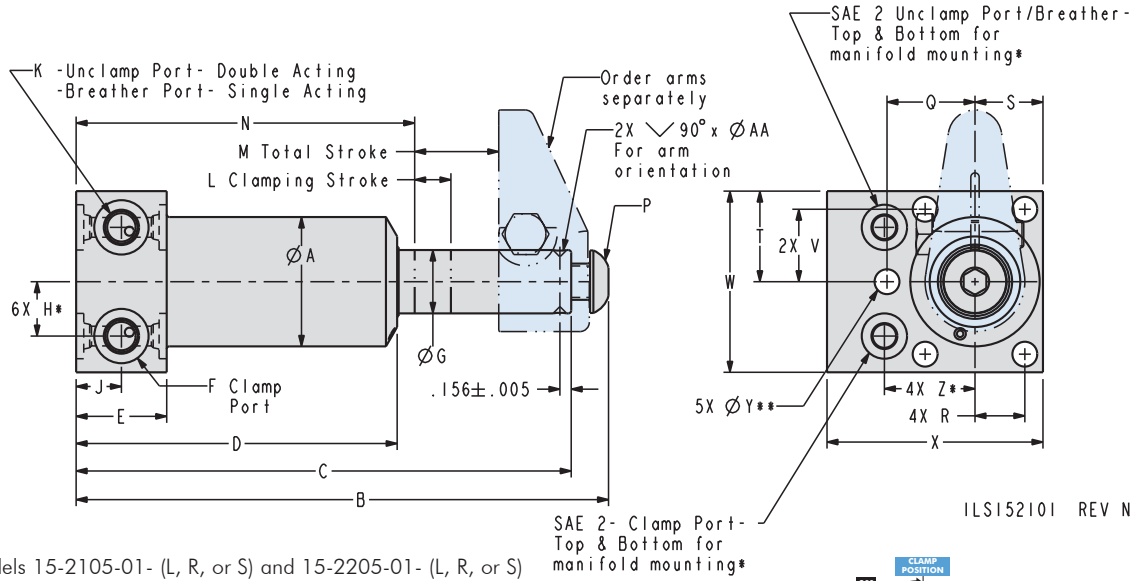
Standard Swing Clamp

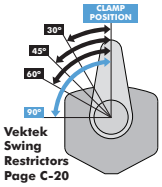


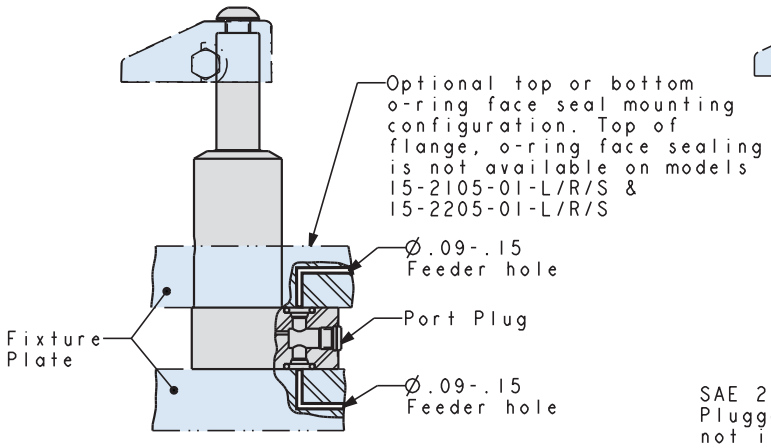
Manifold/Bottom Flange Mount



* Models 15-2105-01- (L, R, or S) and 15-2205-01- (L, R, or S) do not include the option for manifold mounting on the top surface, all other models are shipped with the plugs and o-rings necessary for manifold mounting.

** All five mounting screws must be used when manifold mounting to assure a leak free o-ring seal.





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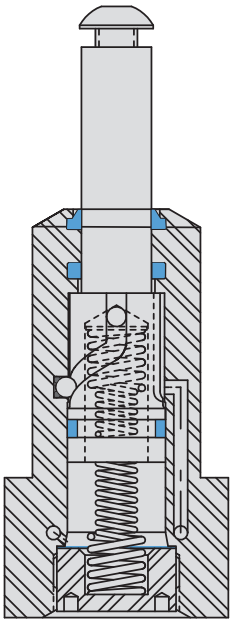

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U.S. Patent Nos.
5,192,158
5,820,118

For Proper sealing, mating surface should be flat within 0.003 in. with a maximum 63 μin R_a surface finish.

M	N	P BHCS	Q	R	S	T	V	W	X	Y	Z	ØAA	Model No. Straight Swing
Cylinders, actuated hydraulically 1 direction, spring returned.													
0.57	2.99	1/4-28 X 3/8	1.06	0.38	0.53	0.75	0.59	1.50	1.75	0.22	0.78	0.13	15-2105-01-S *
0.79	3.83	3/8-24 X 5/8	0.99	0.56	0.75	1.00	0.81	2.00	2.50	0.28	1.13	0.19	15-2109-01-S
1.16	4.67	1/2-20 X 3/4	1.21	0.69	0.94	1.25	1.00	2.50	3.00	0.34	1.25	0.19	15-2113-01-S
Cylinders, actuated hydraulically both directions.													
0.57	2.99	1/4-28 X 3/8	1.06	0.38	0.53	0.75	0.59	1.50	1.75	0.22	0.78	0.13	15-2205-01-S *
0.79	3.83	3/8-24 X 5/8	0.99	0.56	0.75	1.00	0.81	2.00	2.50	0.28	1.13	0.19	15-2209-01-S
1.16	4.67	1/2-20 X 3/4	1.21	0.69	0.94	1.25	1.00	2.50	3.00	0.34	1.25	0.19	15-2213-01-S

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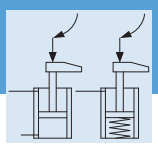

Standard Swing Clamp

Cartridge Mount

Single And Double Acting

- Simplified cavity design makes machining of pocket and installation easier.
- Eliminates the need for exposed plumbing, installs nicely in custom designed chip shedding fixtures.
- Uses SAE O-ring mounting configuration
- Bury deeply in fixtures to reduce overall installed height and simplify design.

Simplified pocket design with O-ring face seal on top allows use of some standard port tooling.

Only one O-ring must pass cross porting during installation, and only one (not two) ports must be passed (but should not touch), reducing the chance of O-ring damage during installation.

Hardened V-cam tracks resist damage and give you a built in extra cam (opposite swing direction) or straight line option should you accidentally damage one. Specify left, right or straight cam and we will preset the swing when you order.

U.S. Patent Nos.
5,820,118

Model No. Add -L, -R or -S to indicate desired Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	SAE Body Thread	Standard Arm Length **	Effective Piston Area (sq. in.) Retract	Oil Capacity (cu. in.)**** Extend	Oil Capacity (cu. in.)**** Retract
Single Acting (S/A)						Cylinders, actuated hydraulically 1 direction, spring returned.		
15-1105-01	450	0.22	0.57	1 1/16-12	1.06	0.098	N/A	0.056
15-1109-01	1100	0.31	0.79	1 5/8-12	1.50	0.295	N/A	0.233
15-1113-01	2600	0.50	1.16	1 7/8-12	2.00	0.626	N/A	0.726
Double Acting (D/A)						Cylinders, actuated hydraulically both directions.		
15-1205-01	450	0.22	0.57	1 1/16-12	1.06	0.098	0.142	0.056
15-1209-01	1100	0.31	0.79	1 5/8-12	1.50	0.295	0.475	0.233
15-1213-01	2600	0.50	1.16	1 7/8-12	2.00	0.626	1.423	0.726

WARNING! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above, by 5000, and multiply the Resultant Number X Your System Operating Pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, frictional loss and/or return springs.)

*** To allow for piece part height variations, it is recommended that the vertical travel be set at about 50% of the vertical stroke.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-14.

NOTE: The clocking feature does exist on this product but you will be unable to predict its position due to body thread.

Dimensions

Model No. Left Swing	Model No. Right Swing	Capacity	A	B	C	D	E	F	G	H
Single Acting (S/A)										
15-1105-01-L	15-1105-01-R	450	2.13	2.13	1.32	1.88	0.13	0.63	0.49	0.83
15-1109-01-L	15-1109-01-R	1100	2.70	2.98	1.50	2.63	0.13	0.94	0.65	1.13
15-1113-01-L	15-1113-01-R	2600	3.17	4.17	1.50	3.65	0.16	1.25	0.55	1.49
Double Acting (D/A)										
15-1205-01-L	15-1205-01-R	450	2.13	2.13	1.32	1.88	0.13	0.63	0.49	0.83
15-1209-01-L	15-1209-01-R	1100	2.70	2.98	1.50	2.63	0.13	0.94	0.65	1.13
15-1213-01-L	15-1213-01-R	2600	3.17	4.17	1.50	3.65	0.16	1.25	0.55	1.49

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Order arms separately

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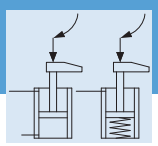
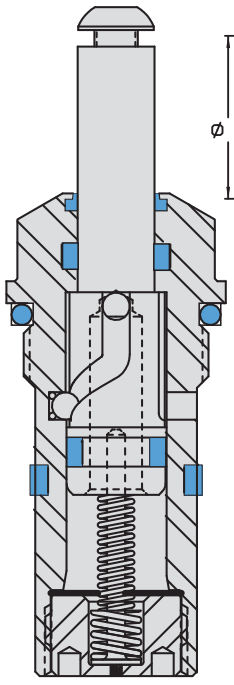
Standard Swing Clamp

Cartridge Mount





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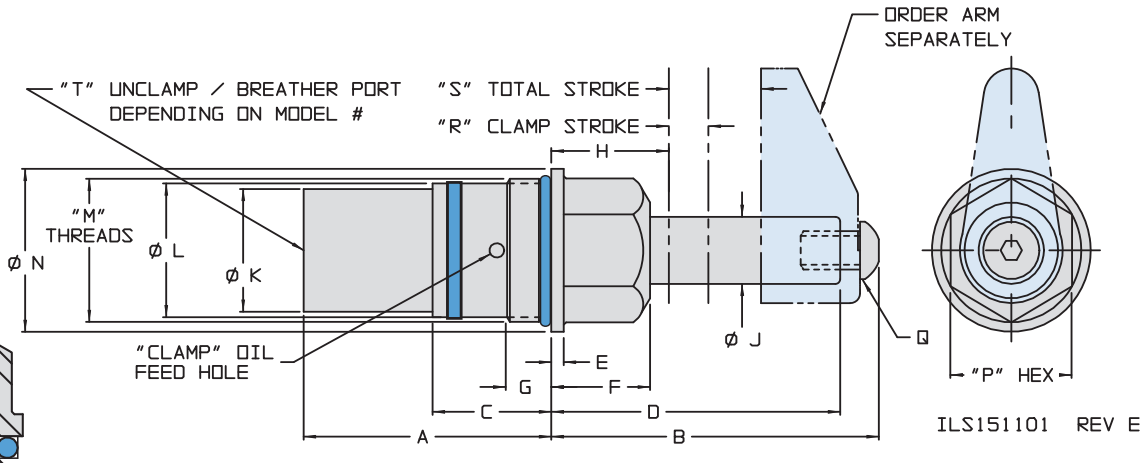
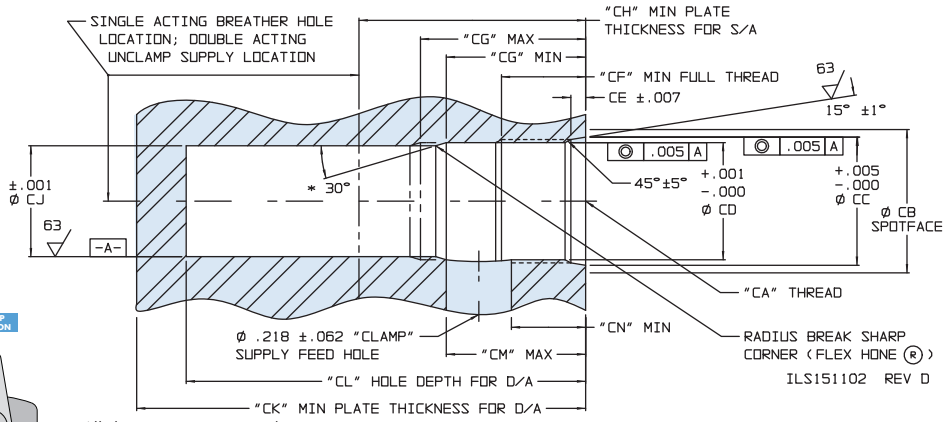


ILS151101 REV E



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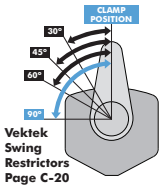

Vektek Swing Restrictors Page C-20

All dimensions are in inches.

* The 30° lead in angle is to ensure trouble free seal installation, see drawing.

NOTE: Flexible honing of cavity is strongly recommended. Flex-Hone™ is a registered trademark of Brush Research Manufacturing Co. Inc., Los Angeles, CA, 323-261-2193. Please contact Brush Research for additional information.

Cavity Dimensions

Model No.	CA	CB	CC	CD	CE	CF	CG MIN	CG MAX	CH	CJ	CK	CL	CM	CN
Single Acting (S/A)												Cylinders, actuated hydraulically 1 direction, spring returned.		
15-1105-01	1 1/16-12	1.38	1.148	0.979	0.137	0.50	0.750	0.906	1.25	0.938	N/A	N/A	0.750	0.417
15-1109-01	1 5/8-12	2.00	1.713	1.541	0.139	0.68	0.815	0.906	1.50	1.376	N/A	N/A	0.815	0.525
15-1113-01	1 7/8-12	2.25	1.962	1.792	0.139	0.62	0.875	0.906	1.50	1.751	N/A	N/A	0.875	0.403
Double Acting (D/A)												Cylinders, actuated hydraulically both directions.		
15-1205-01	1 1/16-12	1.38	1.148	0.979	0.137	0.50	0.750	0.906	N/A	0.938	2.75	2.25	0.750	0.417
15-1209-01	1 5/8-12	2.00	1.713	1.541	0.139	0.68	0.815	0.906	N/A	1.376	3.25	2.75	0.815	0.525
15-1213-01	1 7/8-12	2.25	1.962	1.792	0.139	0.62	0.875	0.906	N/A	1.751	3.75	3.25	0.875	0.403

* Single Acting models must be vented, do not install in blind holes

J	K	L	M	N	P	Q	R	S	T	Model No. Straight Swing
										Cylinders, actuated hydraulically 1 direction, spring returned.
0.438	0.92	0.935	1 1/16-12	1.25	1.00	1/4-28 X 3/8	0.22	0.57	Breather	15-1105-01-S
0.625	1.34	1.372	1 5/8-12	1.88	1.50	3/8-24 X 5/8	0.31	0.79	Breather	15-1109-01-S
0.875	1.72	1.747	1 7/8-12	2.13	1.63	1/2-20 X 3/4	0.50	1.16	Breather	15-1113-01-S
										Cylinders, actuated hydraulically both directions.
0.438	0.92	0.935	1 1/16-12	1.25	1.00	1/4-28 X 3/8	0.22	0.57	SAE 2	15-1205-01-S
0.625	1.34	1.372	1 5/8-12	1.88	1.50	3/8-24 X 5/8	0.31	0.79	SAE 4	15-1209-01-S
0.875	1.72	1.747	1 7/8-12	2.13	1.63	1/2-20 X 3/4	0.50	1.16	SAE 4	15-1213-01-S

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High Capacity, Low Profile Swing Clamps

Threaded, High Capacity, Low Profile

Single And Double Acting

High Capacity

- Arm style secured in two directions with single cross bolt.
- Low profile swing clamp arm dimensions are found on pages 0-8 and 0-9. Order Arms Separately.
- One piece body construction reduces potential leak paths and improves rigidity.
- High clamp force capacity in compact package.
- To avoid cylinder damage and preserve warranty, see page C-14 regarding flow rate limits and time calculations to be observed.

Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Standard Arm Length	Effective Piston Area (sq. in.) Extend	Effective Piston Area (sq. in.) Retract	Oil Capacity (cu. in.)****	Oil Capacity (cu. in.)**** Retract
Single Acting (S/A)							**Cylinders, actuated hydraulically 1 direction, spring returned.**		
15-0121-00	Right	7500	0.62	1.18	3.25	N/A	1.773	N/A	2.092
15-0121-01	Left		0.62						
15-0121-02	Straight		1.18						
Double Acting (D/A)							**Cylinders, actuated hydraulically both directions.**		
15-0221-02	Right	7500	0.62	1.18	3.25	3.54	1.773	4.177	2.092
15-0221-03	Left		0.62						
15-0221-04	Straight		1.18						

Warning! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above by 5,000, and multiply the resultant number X your system operating pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

*** To allow for piece part height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-14.

Dimensions

Model No. Left Swing	Clamp Swing Direction	Capacity	A	B	C	D	E*	F	G	H	J
Single Acting (S/A)											
15-0121-00	Right	7500	3 1/8 –16	8.52	4.49	0.99	SAE 4	1.500	0.51	0.51	Breather
15-0121-01	Left										
15-0121-02	Straight										
Double Acting (D/A)											
15-0221-02	Right	7500	3 1/8 –16	7.74	4.49	0.99	SAE 4	1.500	0.51	0.51	SAE 4
15-0221-03	Left										
15-0221-04	Straight										

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Order arms separately

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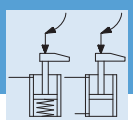
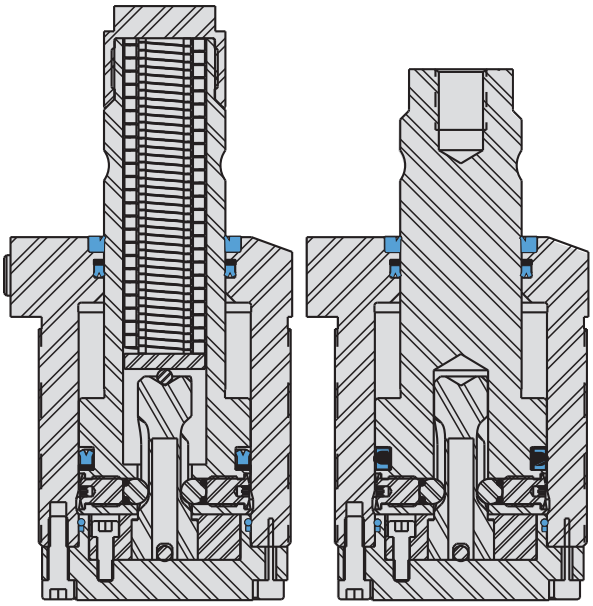
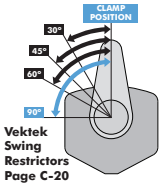
High Capacity, Low Profile Swing Clamps



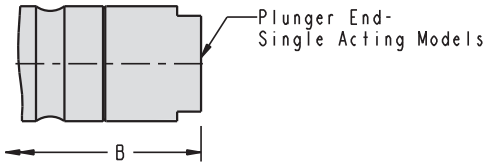
Threaded, High Capacity, Low Profile

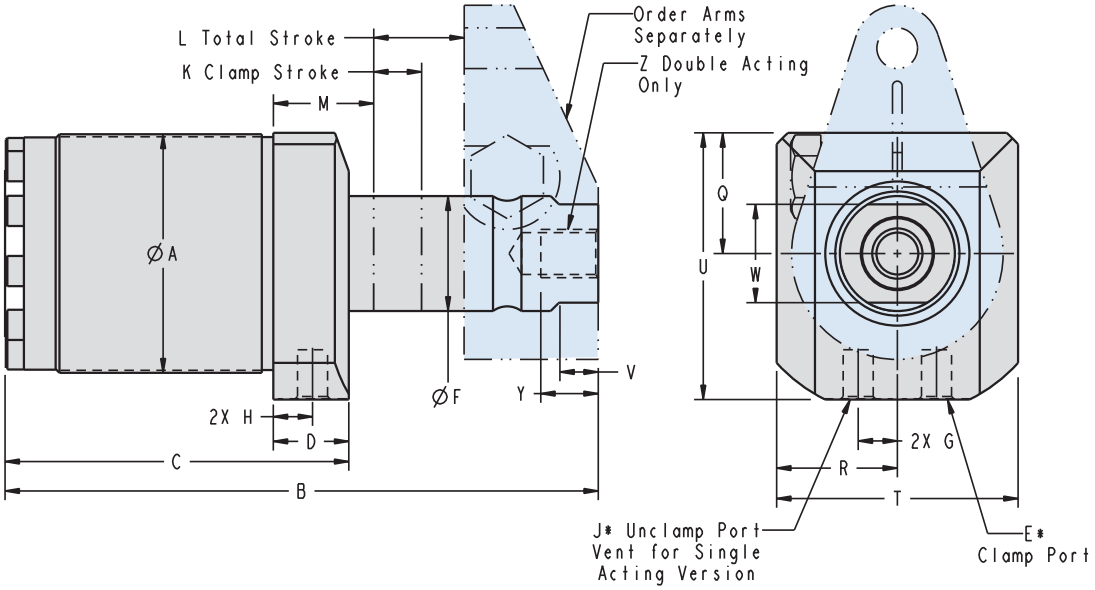


ILS150107 REV D



Vektek Swing Restrictors Page C-20





ILS150106 REV F

	ØK	L	M	Q	R	T	U	V	W	Y	Z
Cylinders, actuated hydraulically 1 direction, spring returned.											
	0.62	1.18	1.31	1.58	1.58	3.15	3.48	-----	-----	-----	-----
Cylinders, actuated hydraulically both directions.											
	0.62	1.18	1.31	1.58	1.58	3.15	3.48	0.50	1.31	0.75	M16 x 2.0

* All ports (except breather), are shipped with removable steel plugs installed.

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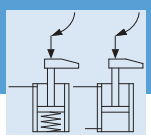

High Capacity, Low Profile Swing Clamps

Manifold/Top Flange, High Capacity, Low Profile

Single And Double Acting

High Capacity

- High clamp force capacity in compact package.
- Manifold mounting capability as well as SAE porting.
- Low profile swing clamp arm dimensions are found on pages 0-8 and 0-9.
- One piece body construction reduces potential leak paths and improves rigidity.
- Flange and bore from one piece, provides extra rigid design.

Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Standard Arm Length **	Effective Piston Area (sq. in.)		Oil Capacity (cu. in.)****		Optional Flow Control Model No.
						Extend	Retract	Extend	Retract	
Single Acting (S/A)										**Cylinders, actuated hydraulically 1 direction, spring returned.**
15-0521-00	Right		0.62							
15-0521-01	Left	7500	0.62	1.18	3.25	N/A	1.773	N/A	2.092	70-2037-72
15-0521-02	Straight		1.18							
Double Acting (D/A)										**Cylinders, actuated hydraulically both directions.**
15-0621-00	Right		0.62							
15-0621-01	Left	7500	0.62	1.18	3.25	3.540	1.773	4.177	2.092	70-2037-72
15-0621-02	Straight		1.18							
Double Acting (D/A) Long Stroke										**Cylinders, actuated hydraulically both directions.**
15-0621-03	Right		1.25							
15-0621-04	Left	7500	1.25	1.81	3.25	3.540	1.773	6.407	3.209	70-2037-72
15-0621-05	Straight		1.81							

Warning! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above by 5,000, and multiply the resultant number x your system operating pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

*** To allow for piece part height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-14.

Dimensions

Model No. Left Swing	Clamp Swing Direction	Capacity	A	B	C	D	E*	F	G	H	J	K	L	M
Single Acting (S/A)														
15-0521-00	Right													
15-0521-01	Left	7500	3.03	8.52	4.49	0.99	SAE 4	1.500	0.51	0.51	Breather	0.62	1.18	1.31
15-0521-02	Straight													
Double Acting (D/A)														
15-0621-00	Right													
15-0621-01	Left	7500	3.03	7.74	4.49	0.99	SAE 4	1.500	0.51	0.51	SAE 4	0.62	1.18	1.31
15-0621-02	Straight													
Double Acting (D/A) Long Stroke														
15-0621-03	Right													
15-0621-04	Left	7500	3.03	8.99	5.11	0.99	SAE 4	1.500	0.51	0.51	SAE 4	1.25	1.81	1.31
15-0621-05	Straight													

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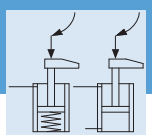
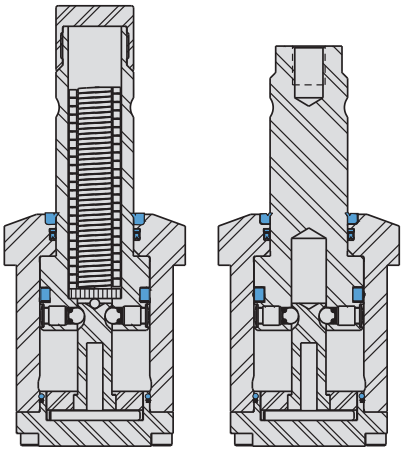
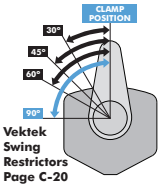
High Capacity, Low Profile Swing Clamps



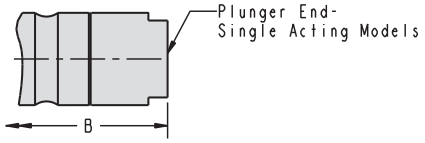
Manifold/Top Flange, High Capacity, Low Profile

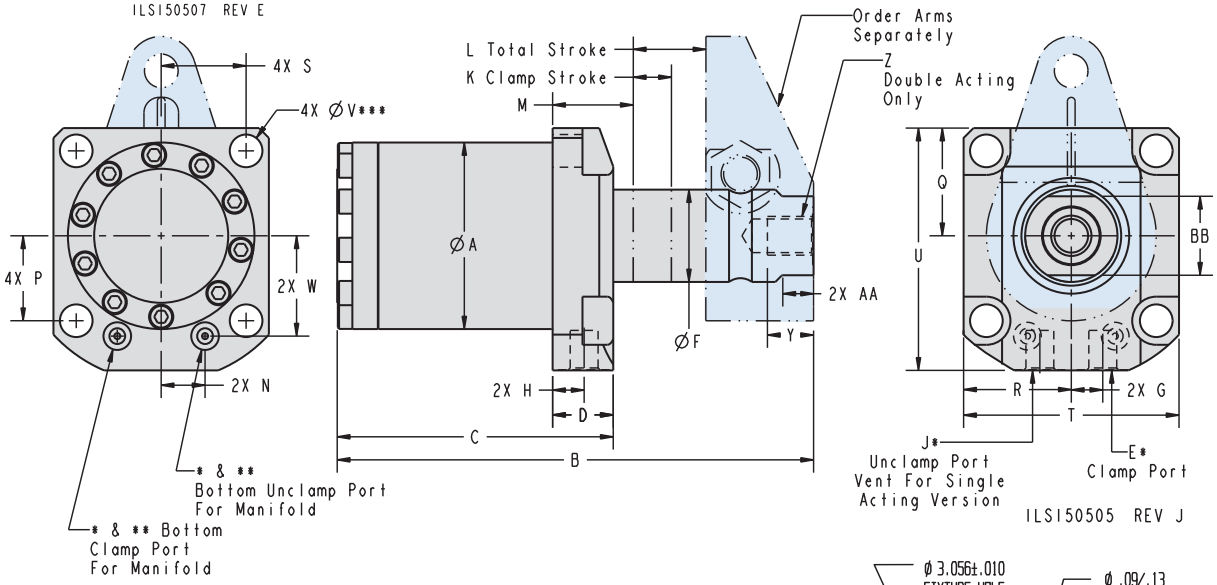


ILS150507 REV E



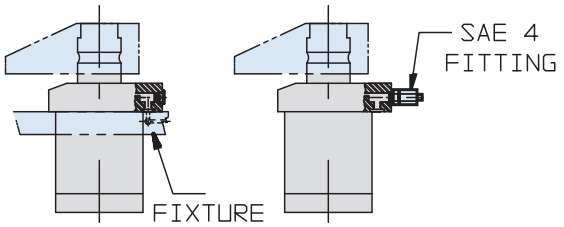
For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 µin R_a surface finish.



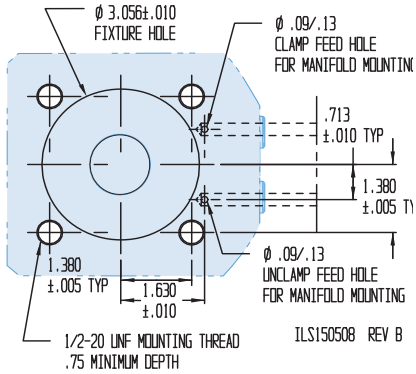


ILS150505 REV J

* All ports (except breather), are shipped with removable steel plugs installed.
** Counter bores for Ø 7/16 x 1/16 (2-011) o-ring face seals provided.
*** When used as manifold mounted, all (4) mounting bolts must be used to assure proper o-ring face sealing. Recommended fastener sizes are listed in column CC.



ILS150506 REV B



ILS150508 REV B

	N	P	Q	R	S	T	U	V***	W	Y	Z	AA	BB	CC
Cylinders, actuated hydraulically 1 direction, spring returned.														
	0.71	1.38	1.75	1.75	1.38	3.50	3.94	0.53	1.63	-----	-----	-----	-----	1/2 - 20
Cylinders, actuated hydraulically both directions.														
	0.71	1.38	1.75	1.75	1.38	3.50	3.94	0.53	1.63	0.75	M16 x 2.0	0.50	1.31	1/2 - 20
Cylinders, actuated hydraulically both directions.														
	0.71	1.38	1.75	1.75	1.38	3.50	3.94	0.53	1.63	0.75	M16 x 2.0	0.50	1.31	1/2 - 20

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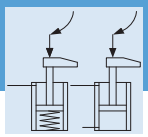

High Capacity, Low Profile Swing Clamps

Manifold/Bottom Flange Mount, High Capacity, Low Profile

Single And Double Acting

High Capacity

- Two piece body construction.
- Low profile swing clamp arm dimensions are found on pages 0-8 and 0-9.
- High clamp force capacity in compact package.
- Manifold mounting capability as well as SAE porting.

C-31

Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Standard Arm Length	Effective Piston Area (sq. in.)		Oil Capacity (cu. in.)****		Optional Flow Control Model No.
						Extend	Retract	Extend	Retract	
Single Acting (S/A)										**Cylinders, actuated hydraulically 1 direction, spring returned.**
15-2718-00	Right	5000	0.56	1.10	2.50	N/A	1.175	N/A	1.295	70-2037-72
15-2718-01	Left		0.56							
15-2718-02	Straight		1.10							
15-2121-00	Right	7500	0.62	1.18	2.69	N/A	1.773	N/A	2.092	70-2037-72
15-2121-01	Left		0.62							
15-2121-02	Straight		1.18							
Double Acting (D/A)										**Cylinders, actuated hydraulically both directions.**
15-2818-00	Right	5000	0.56	1.10	2.50	2.402	1.175	2.647	1.295	70-2037-72
15-2818-01	Left		0.56							
15-2818-02	Straight		1.10							
15-2221-00	Right	7500	0.62	1.18	2.69	3.540	1.773	4.177	2.092	70-2037-72
15-2221-01	Left		0.62							
15-2221-02	Straight		1.18							

WARNING! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application divide the cylinder capacity shown above by 5,000, and multiply the resultant number X your system operating pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

*** To allow for piece part height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-14.

Dimensions

Model No. Left Swing	Clamp Swing Direction	Capacity	A	B	C	D	E*	F	G	H	J	K	L	M
Single Acting (S/A)														
15-2718-00	Right	5000	2.47	8.04	4.41	0.98	SAE 4	1.250	0.51	0.49	BREATHER	0.56	1.10	4.76
15-2718-01	Left													
15-2718-02	Straight													
15-2121-00	Right	7500	3.11	8.85	4.78	0.99	SAE 4	1.500	0.51	0.51	BREATHER	0.62	1.18	5.14
15-2121-01	Left													
15-2121-02	Straight													
Double Acting (D/A)														
15-2818-00	Right	5000	2.47	7.63	4.41	0.98	SAE 4	1.250	0.51	0.49	SAE 4	0.56	1.10	4.76
15-2818-01	Left													
15-2818-02	Straight													
15-2221-00	Right	7500	3.11	8.07	4.78	0.99	SAE 4	1.500	0.51	0.51	SAE 4	0.62	1.18	5.14
15-2221-01	Left													
15-2221-02	Straight													

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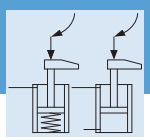
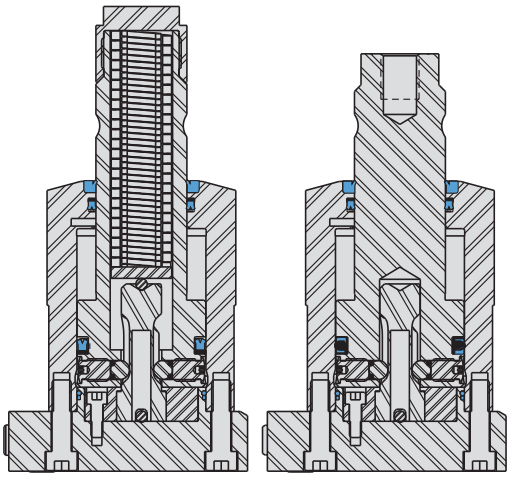
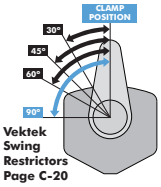
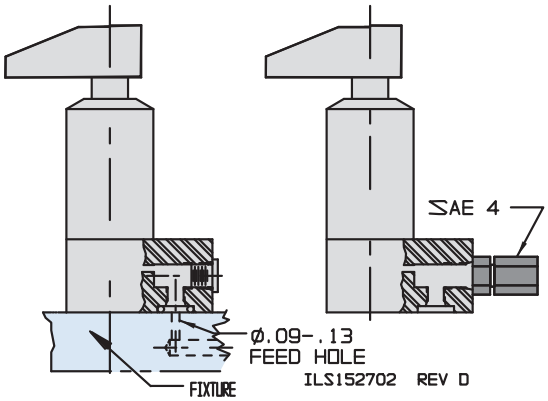
High Capacity, Low Profile Swing Clamps

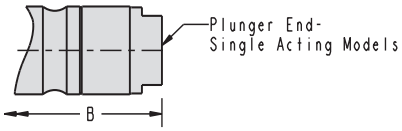


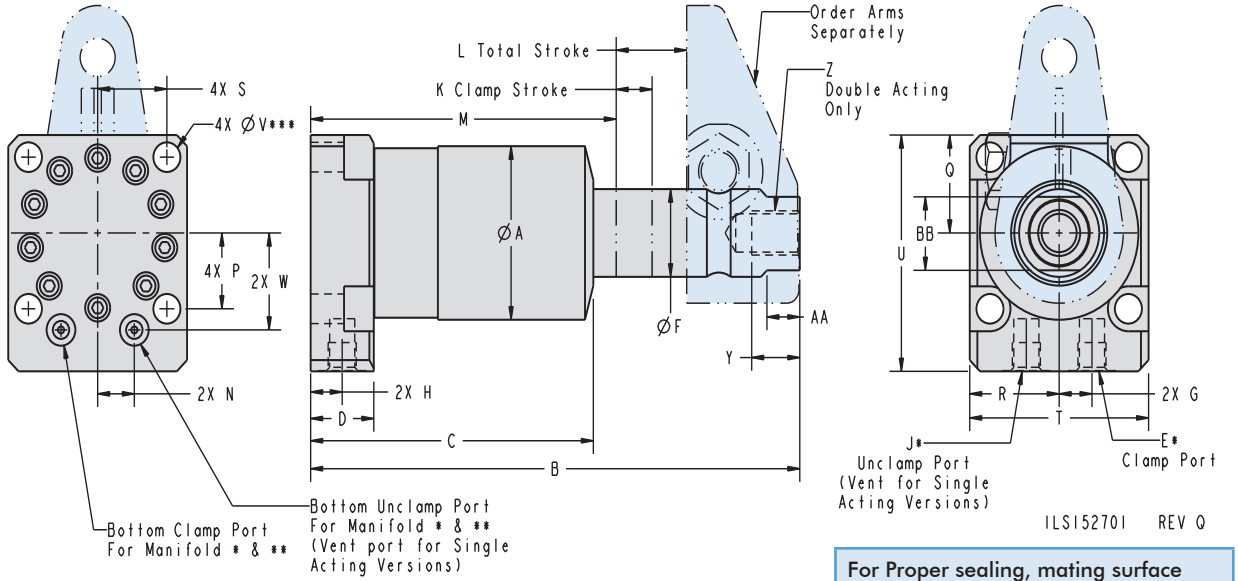
Manifold/Bottom Flange Mount, High Capacity, Low Profile











For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 µin R_a surface finish.

* All ports (except breather), are shipped with removable steel plugs installed.
** Counter bores for 7/16 diameter x 1/16 (2-011) O-ring face seals provided.
*** When used as manifold mounted, all (4)mounting bolts must be used to assure proper o-ring face sealing. Recommended fastener sizes are listed in column CC.

Order arms separately

	N	P	Q	R	S	T	U	V***	W	Y	Z	AA	BB	CC
Cylinders, actuated hydraulically 1 direction, spring returned.														
	0.57	1.08	1.39	1.39	1.08	2.79	3.37	0.42	1.38	-----	-----	-----	-----	3/8-24
	0.68	1.38	1.75	1.75	1.38	3.50	3.94	0.53	1.64	-----	-----	----	-----	1/2-20
Cylinders, actuated hydraulically both directions.														
	0.57	1.08	1.39	1.39	1.08	2.79	3.37	0.42	1.38	0.75	M16 x 2,0	0.50	1.06	3/8-24
	0.68	1.38	1.75	1.75	1.38	3.50	3.94	0.53	1.64	0.75	M16 x 2,0	0.50	1.31	1/2-20

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Frequently Asked Questions

The link clamp arm pivots up and out of the way to accommodate hard-to-reach or hard-to-hit clamping points. Link clamps contain the beam mechanism often preferred by fixture builders. This self-contained beam eliminates the need to build or design a clamp mechanism as part of the fixture. Vektek 's unique single piece body and pivot design provides the least side-to-side axial deflection and the most rigid product on the market today.

When should I use a link clamp?

A link clamp is often preferred when you must reach over, not swing over or around a height obstacle. Reaching down into a die casting, between two mounting lugs, or a direct overhead vertical load are good examples where these devices are required. Keep in mind that the vertical clearance must be greater when you are bringing a part into position, but direct drop in loading is easily accomplished by an operator or robot.

What is the vertical stroke of a link clamp?

The maximum part variation is included in the vertical stroke, when outside the specification, the force generated by the clamp will be reduced and may result in reduced clamp life.

When using a high flow pump, which is better, a swing clamp or a link clamp?

Avoid the high flow pump. The link clamp positions with less mechanical resistance, but mass, acceleration, and sudden stops affect all clamps adversely. Make your decision based on your acceptance of the shortened life cycle.

Is the link clamp more accurate than swing clamps?

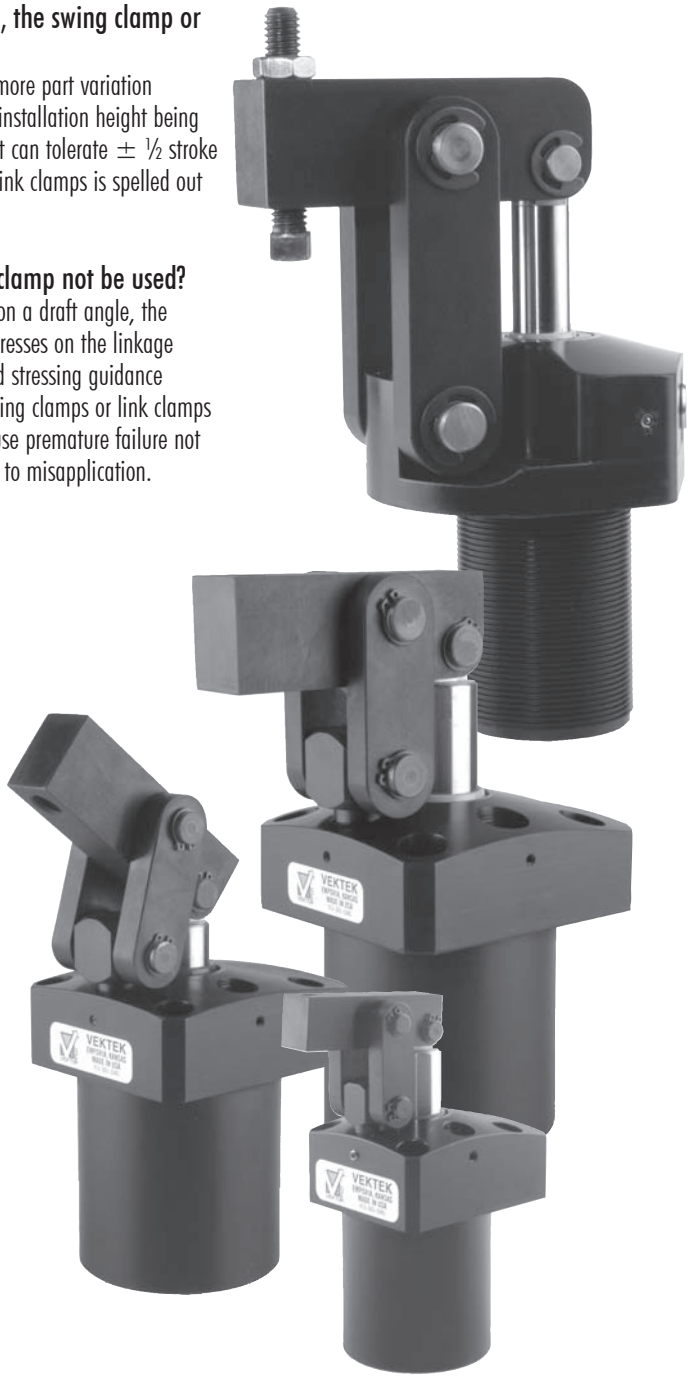
In some cases it may be preferred, its link mechanism still has a limited amount of play and may not be as precise as you desire. This type of decision is application dependent.

The part thickness varies on my application. Which component will work best for my situation, the swing clamp or the link clamp?

Swing clamps have more part variation tolerance, with nominal installation height being at ½ of straight stroke, it can tolerate ± ½ stroke variations. The limit on link clamps is spelled out on the catalog page.

When should a link clamp not be used?

If you are clamping on a draft angle, the angle will exert undue stresses on the linkage mechanism. Please avoid stressing guidance mechanisms of either swing clamps or link clamps as these stresses will cause premature failure not covered by warranty due to misapplication.



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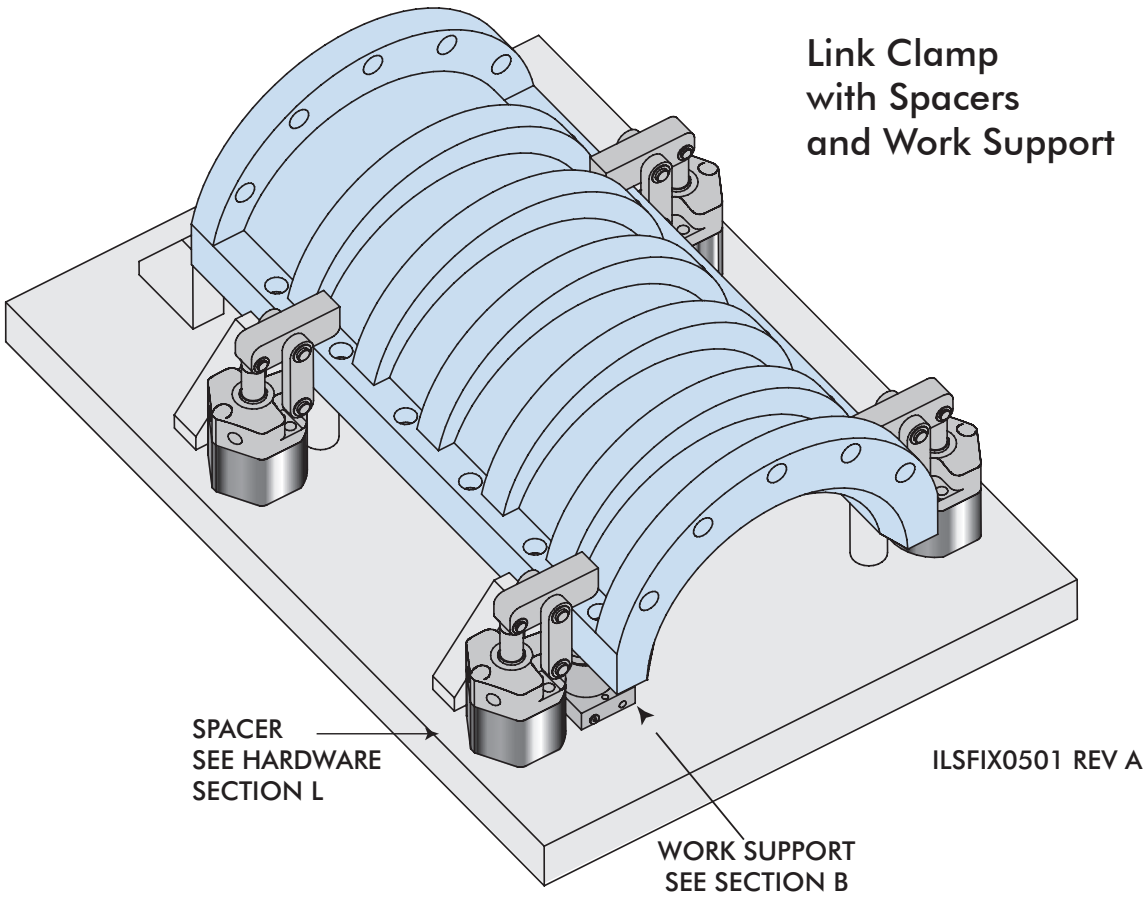
Link Clamp

Link Clamp with Spacers and Work Support



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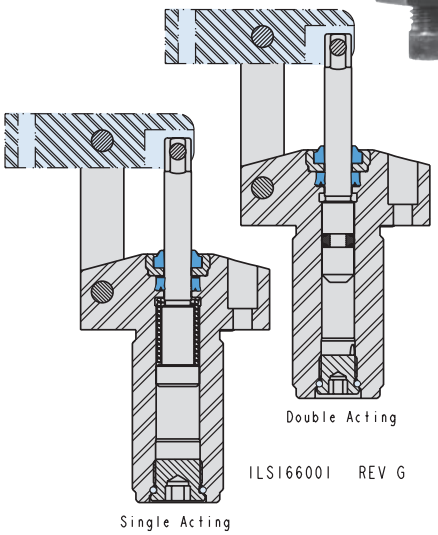
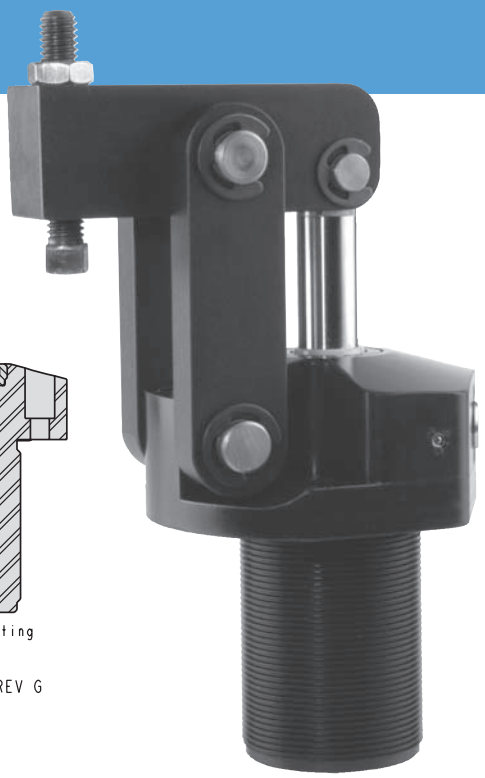
Link Clamps

Link Clamp

Single and Double Acting

- Excellent alternative to swing clamps when swing space is limited.
- Available in five sizes 350 lb to 6,800 lb capacities at 5,000 psi.
- Single piece body/pivot design for accuracy and long life.
- Link clamps clear large obstructions better than other types of clamps.
- Top Flange or threaded body mount from same body.
- Standard fluorocarbon seals.
- Flexible plumbing options accommodate either standard or manifold mounting using SAE fittings (face seal 39-0510-25 included).
- User manufactured levers may reduce linkage life.





Model No.	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)****	Body Thread	Standard Lever Length	Effective Piston Area (sq. in.) Extend	Oil Capacity (cu. in.) Extend	Oil Capacity (cu. in.) Retract	Maximum Flow Rate*** (cu. in./min)	Optional Flow Control Model No.
Single Acting (S/A)								**Cylinders, actuated hydraulically 1 direction, spring returned.**	
16-6104-00	350	0.09	1-1/16 - 16 UN	0.88	0.076	0.103	N/A	12	70-2037-70
16-6106-00	700	0.12	1-1/2 - 16 UN	1.13	0.150	0.287	N/A	34	70-2037-71
16-6109-00	1300	0.14	1-7/8 - 16 UN	1.38	0.307	0.821	N/A	98	70-2037-71
16-6114-00	3000	0.18	2-1/2 - 16 UN	1.75	0.785	2.148	N/A	258	70-2037-71
16-6116-00	5000	0.22	3-1/8 - 16 UN	2.13	1.227	3.755	N/A	450	70-2037-72
Double Acting (D/A								**Cylinders, actuated hydraulically both directions.**	
16-6204-00	450	0.09	1-1/16 - 16 UN	0.88	0.110	0.103	0.032	12	70-2037-70
16-6206-00	1100	0.12	1-1/2 - 16 UN	1.13	0.248	0.287	0.113	34	70-2037-71
16-6209-00	2600	0.14	1-7/8 - 16 UN	1.38	0.601	0.821	0.405	98	70-2037-71
16-6214-00	5000	0.18	2-1/2 - 16 UN	1.75	1.227	2.148	0.773	258	70-2037-71
16-6216-00	6800	0.22	3-1/8 - 16 UN	2.13	1.767	3.755	1.147	450	70-2037-72

** Clamp capacities are listed at 5,000 psi maximum operating pressure with a standard length link clamp lever installed. Minimum operating pressure is 750 psi for single acting and 500 psi for double acting devices. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the clamp capacity shown above by 5,000 and multiply the resultant number by your system operating pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to mechanical inefficiencies and friction.)

*** To insure maximum service life and trouble-free operation, restrict fluid flow to the above flow ratings when clamping. If you are unable to measure flow rates, the devices should be positioned in no less than 1/2 second. These recommendations apply when using the standard lever. When using the optional long lever or your custom lever, please restrict the flow rates to position the lever in no less than 1 second.

**** Equal to +/- 3° with standard lever.

Dimensions

Model No.	Capacity (lb)	A	B	C	D	E	F	G	H	J	K	L	M	N
Single Acting (S/A)														
16-6104-00	350	1-1/16 - 16 UN	2.00	0.87	0.44	1.06	1.13	1.94	0.50	2.51	2.00	1.88	SAE 2	N/A
16-6106-00	700	1-1/2 - 16 UN	2.25	1.31	0.62	1.31	1.50	2.50	0.63	3.38	2.50	2.50	SAE 4	N/A
16-6109-00	1300	1-7/8 - 16 UN	2.50	1.62	0.87	1.63	1.88	3.25	1.00	4.31	3.13	3.06	SAE 4	N/A
16-6114-00	3000	2-1/2 - 16 UN	3.00	1.87	0.87	2.13	2.38	4.13	1.25	5.50	4.00	3.75	SAE 4	N/A
16-6116-00	5000	3-1/8 - 16 UN	3.50	2.25	1.00	2.56	2.88	5.13	1.50	6.50	4.88	4.50	SAE 4	N/A
Double Acting (D/A)														
16-6204-00	450	1-1/16 - 16 UN	2.00	0.87	0.44	1.06	1.13	1.94	0.50	2.51	2.00	1.88	SAE 2	SAE 2
16-6206-00	1100	1-1/2 - 16 UN	2.25	1.31	0.62	1.31	1.50	2.50	0.63	3.38	2.50	2.50	SAE 4	SAE 4
16-6209-00	2600	1-7/8 - 16 UN	2.50	1.62	0.87	1.63	1.88	3.25	1.00	4.31	3.13	3.06	SAE 4	SAE 4
16-6214-00	5000	2-1/2 - 16 UN	3.00	1.87	0.87	2.13	2.38	4.13	1.25	5.50	4.00	3.75	SAE 4	SAE 4
16-6216-00	6800	3-1/8 - 16 UN	3.50	2.25	1.00	2.56	2.88	5.13	1.50	6.50	4.88	4.50	SAE 4	SAE 4

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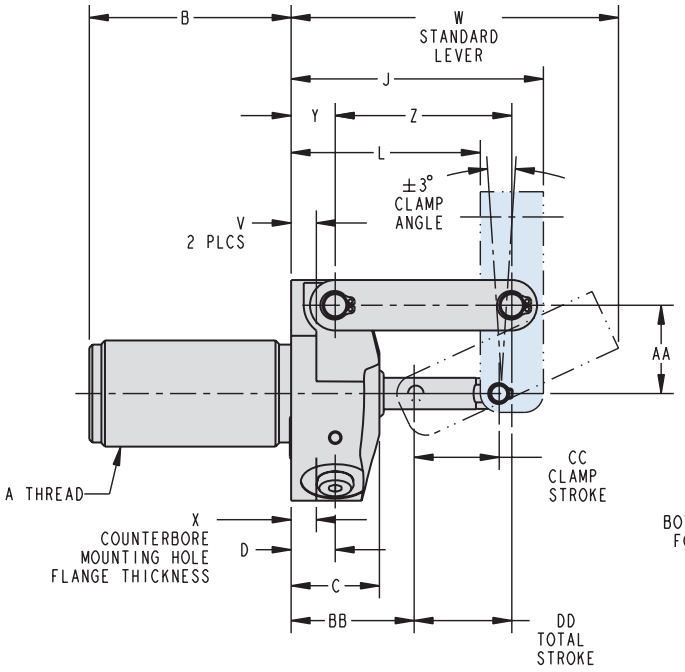
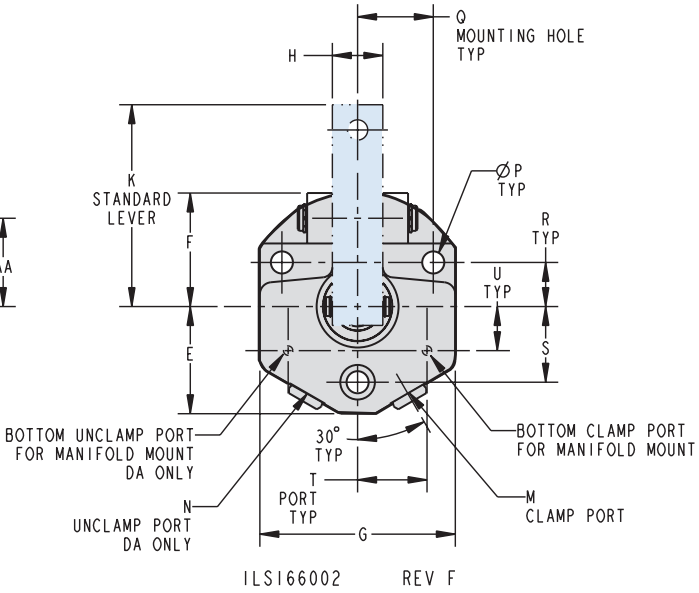
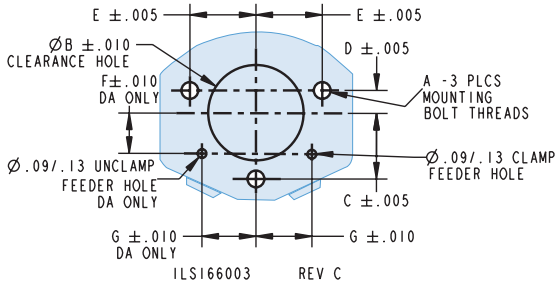
Link Clamp

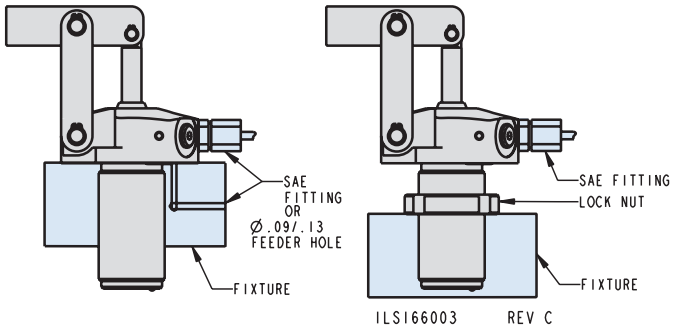




Levers are to be adjusted to within +/- 3° of nominal clamp angle to prevent premature failure.



For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.



Mounting Dimensions

Model No.	Capacity (lb)	A	B	C	D	E	F	G
16-6X04-00	350/450	10 - 32 UNF	1.125	0.750	0.437	0.750	0.437	0.688
16-6X06-00	700/1100	1/4 - 20 UNC	1.562	1.000	0.500	1.000	0.375	0.969
16-6X09-00	1300/2600	3/8 - 16 UNC	1.937	1.250	0.625	1.312	0.437	1.250
16-6X14-00	3000/5000	1/2 - 13 UNC	2.562	1.625	0.750	1.687	0.625	1.625
16-6X16-00	5000/6800	5/8 - 11 UNC	3.187	2.000	1.000	2.000	0.750	2.000

	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD
Cylinders, actuated hydraulically 1 direction, spring returned.															
	0.22	0.750	0.437	0.750	N/A	0.437	0.25	3.25	0.25	0.44	1.75	0.88	1.22	0.84	0.94
	0.28	1.000	0.500	1.000	N/A	0.375	0.50	4.25	0.50	0.75	2.13	1.13	1.72	1.03	1.13
	0.41	1.312	0.625	1.250	N/A	0.437	0.50	5.37	0.50	0.88	2.75	1.37	2.19	1.25	1.34
	0.53	1.687	0.750	1.625	N/A	0.625	0.75	6.75	0.75	1.13	3.38	1.75	2.63	1.63	1.75
	0.66	2.000	1.000	2.000	N/A	0.750	0.88	8.12	0.87	1.31	4.06	2.13	3.12	2.00	2.13
Cylinders, actuated hydraulically both directions.															
	0.22	0.750	0.437	0.750	0.688	0.437	0.25	3.25	0.25	0.44	1.75	0.88	1.22	0.84	0.94
	0.28	1.000	0.500	1.000	0.969	0.375	0.50	4.25	0.50	0.75	2.13	1.13	1.72	1.03	1.13
	0.41	1.312	0.625	1.250	1.250	0.437	0.50	5.37	0.50	0.88	2.75	1.37	2.19	1.25	1.34
	0.53	1.687	0.750	1.625	1.625	0.625	0.75	6.75	0.75	1.13	3.38	1.75	2.63	1.63	1.75
	0.66	2.000	1.000	2.000	2.000	0.750	0.88	8.12	0.87	1.31	4.06	2.13	3.12	2.00	2.13

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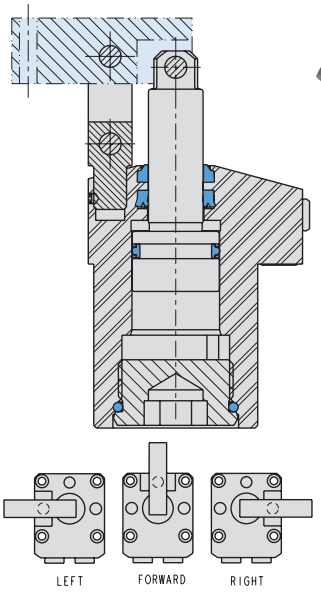
Link Clamps

Low Pressure Link Clamp Specifications

Double Acting

- Excellent alternative to swing clamps when swing space is limited.
- Available in three sizes 550 lb. to 2,200 lb. capacities at 1,000 psi.
- Left, forward, or right lever position from the same body.
- Link clamps clear large obstructions better than other types of clamps.
- Top Flange body mount.
- Standard fluorocarbon seals.
- Flexible plumbing options accommodate either manifold mounting or SAE (face seal 39-0510-25 included).
- User manufactured arms may reduce linkage life.



Model No.	Lever Position	Cylinder Capacity (lb.)*	Vertical Clamping Stroke (in.)****	Standard Lever Length **	Effective Piston Area (sq. in.)	Oil Capacity (cu. in.)		Maximum Flow Rate*** (cu. in./ min)	Optional Flow Control Model No.
					Extend	Extend	Retract		
Double Acting (D/A)						Cylinders, actuated hydraulically both directions..			
16-6211-00 16-6211-01 16-6211-02	Forward Right Left	550	0.09	1.875	0.785	0.712	0.433	85.43	70-2037-70
16-6215-00 16-6215-01 16-6215-02	Forward Right Left	1100	0.125	2.625	1.767	1.988	1.491	238.60	70-2037-71
16-6221-00 16-6221-01 16-6221-02	Forward Right Left	2200	0.125	3.094	3.546	4.514	4.111	541.89	70-2037-71

* Clamp capacities are listed at 1,000 psi maximum operating pressure with a standard length link clamp lever installed.

** Use of extended length levers will result in a reduction of clamp capacity. See graphs of lever output curves for clamping force of various lever lengths. Minimum operating pressure is 150 psi for double acting devices. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the clamp capacity shown above by 1,000 and multiply the resultant number by your system operating pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to mechanical inefficiencies and friction.)

*** To insure maximum service life and trouble-free operation , restrict fluid flow to the above flow ratings when clamping. If you are unable to measure flow rates, the devices should be positioned in no less than 1/2 second. These recommendations apply when using the standard lever. When using the optional long lever or your custom lever, please restrict the flow rates to position the arm in no less than 1 second.

**** Equal to +/- 3° with standard lever.

Levers sold separately (page O-12)

Dimensions

Model No.	Lever Position	Capacity (lb)	A	B	C	D	E	F	G	H	J	K	L	M
Double Acting (D/A)														
16-6211-00 16-6211-01 16-6211-02	Forward Right Left	550	1.88	1.88	1.13	0.56	2.45	1.00	2.00	0.50	2.81	1.69	2.06	SAE 2
16-6215-00 16-6215-01 16-6215-02	Forward Right Left	1100	2.53	2.50	1.19	0.59	3.19	1.38	2.75	0.75	3.44	2.25	2.44	SAE 4
16-6221-00 16-6221-01 16-6221-02	Forward Right Left	2200	2.94	2.75	1.44	0.63	3.72	1.67	3.34	0.88	4.13	2.69	2.88	SAE 4

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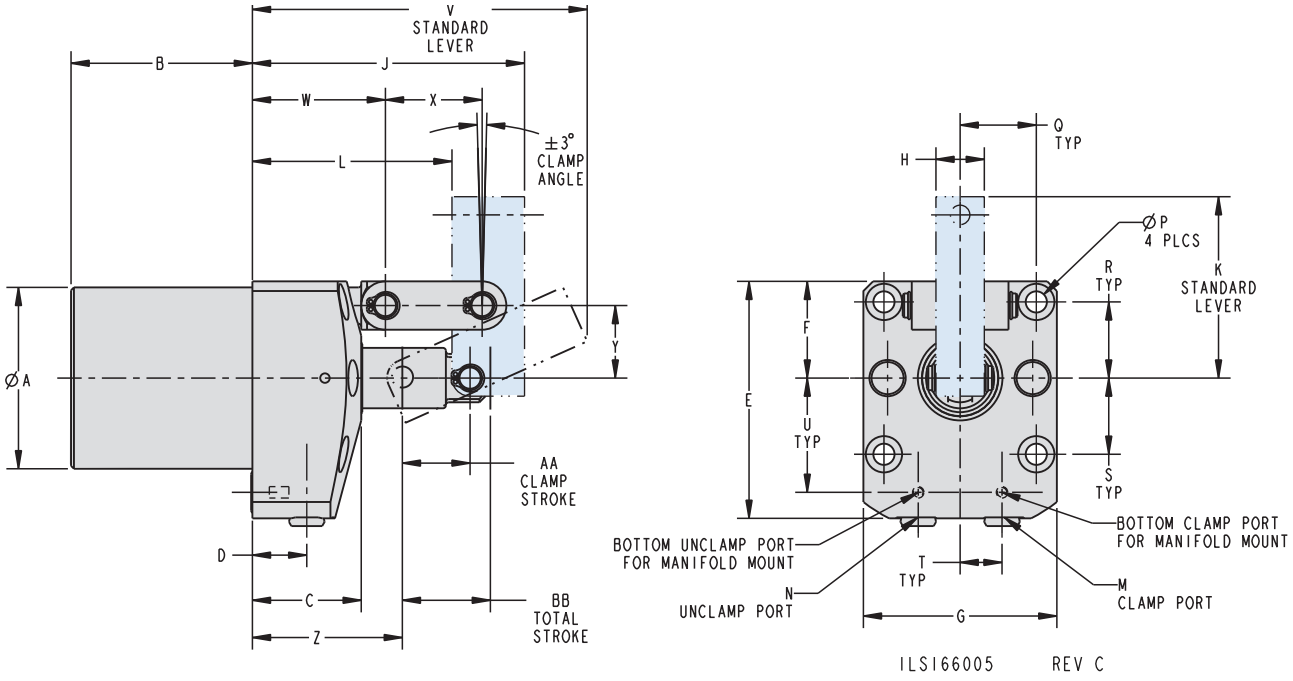
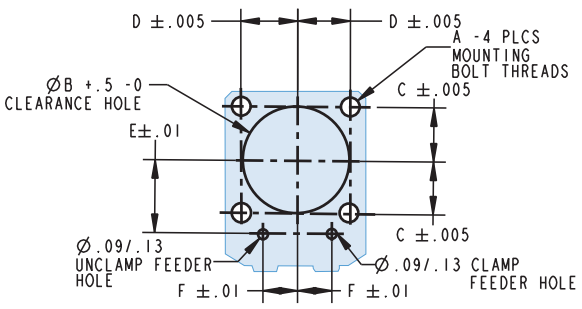
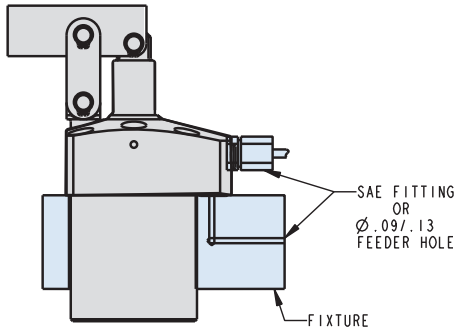
Low Pressure Link Clamp Dimensions







For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μ in. R_a surface finish.

Manifold Port/Bolt Mounting Dimensions

Model No.	Capacity (lb)	A	B	C	D	E	F
16-6211-0X	550	10-32 UNF	1.890	0.788	0.788	1.181	0.433
16-6215-0X	1100	1/4-20 UNC	2.560	1.083	1.083	1.555	0.591
16-6221-0X	2200	5/16-18 UNC	2.950	1.240	1.240	1.772	0.630

	N	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB
Cylinders, actuated hydraulically both directions.														
	SAE 2	0.219	0.788	0.788	0.7875	0.433	1.181	3.36	1.38	1.00	0.75	1.47	0.78	0.91
	SAE 4	0.281	1.083	1.083	1.083	0.591	1.555	4.42	1.56	1.50	1.00	1.75	1.00	1.13
	SAE 4	0.344	1.240	1.240	1.240	0.630	1.772	5.23	1.88	1.75	1.19	2.06	1.19	1.32

Levers are to be adjusted to within +/- 3° of nominal clamp angle to prevent premature failure.

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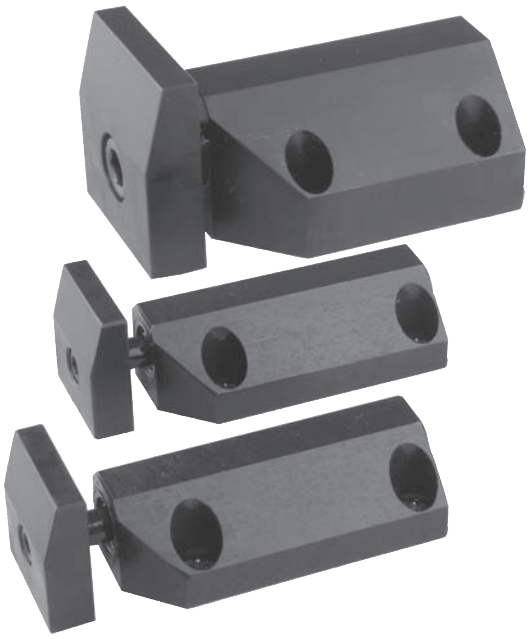
Special Use Clamps

Spring/Hydraulic Part Crowder

Single Acting

- Use fewer components to secure parts.
- Crowding and clamping pressure applied at the exact same point on parts.
- Spring contact force.
- Hydraulic holding force.
- Select from 3 cylinder capacities; 550 lbs, 980 lbs, and 2200 lbs.
- Flexible plumbing options accommodate either manifold mounting or SAE.
- BHC™ (Black Hard Coat) finish.

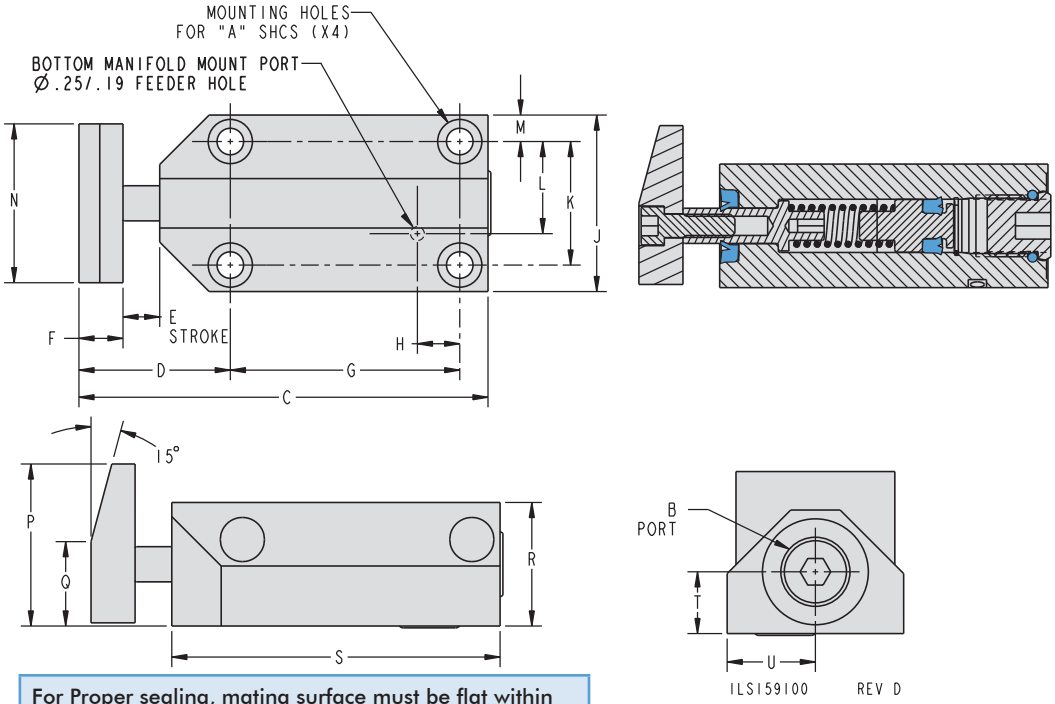


Model No.*	Spring Loaded Contact Force (lb)	Hydraulic Assist Cylinder Capacity** (lb)	Piston Area (sq. in.)	Oil Capacity (cu. in.)
15-9104-00	5.5 -11	550	0.110	0.108
15-9105-00	14 - 20	980	0.196	0.194
15-9108-00	21 -2 7	2200	0.442	0.350

E-1

* Add an "F" to the end of the model number to order fluorocarbon seals.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying the hydraulic system pressure. To determine approximate output force for your application, multiply the Piston Area X Your System Operating Pressure. (Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.)



For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.

Dimensions

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U
Single Acting (S/A)															Cylinders, actuated hydraulically 1 direction, spring returned.				
15-9104-00	#8	SAE 4	2.90	1.07	0.25	0.31	1.625	0.300	1.25	0.875	0.653	0.19	1.13	1.15	0.60	0.88	2.33	0.44	0 .63
15-9105-00	#10	SAE 6	3.14	1.26	0.25	0.38	1.625	0.280	1.50	1.063	0.782	0.22	1.25	1.27	0.70	0.98	2.50	0.49	0 .75
15-9108-00	1/4"	SAE 4	3.50	1.50	0.25	0.50	1.625	0.188	2.25	1.688	1.157	0.28	2.00	2.02	1.15	1.63	2.75	0.81	1.13

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Edge Clamp Specifications

Single Acting Standard And Manifold Mount

- Low profile allows you to slab mill over the clamp on most parts.
- Downward clamping angle of the blade yields both horizontal and vertical force pushing your part firmly against locators and the work surface.
- Three way porting makes plumbing multiple clamps easy without Tees or additional manifolds.
- Manifold mount design uses O-ring face seal for simple bolt down installation.
- Unique center hole mounting and thrust bushing make this device ideal for quick set-up T-slot mounting.

U.S. Patent No. 5,690,546

Hardened Chrome alloy steel blade grips the part while the unique design angle provides both horizontal and vertical clamp force.

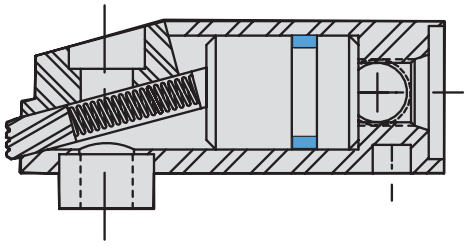
Three SAE 4 fluid ports on standard model, O-ring bolt down face seal on the manifold model simplify leak free installation.

BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.

Specially designed springs run longer, require less maintenance.

Pivot locator/thrust bushing provided.

Proprietary seal designs reduce leakage for long lasting cylinders.



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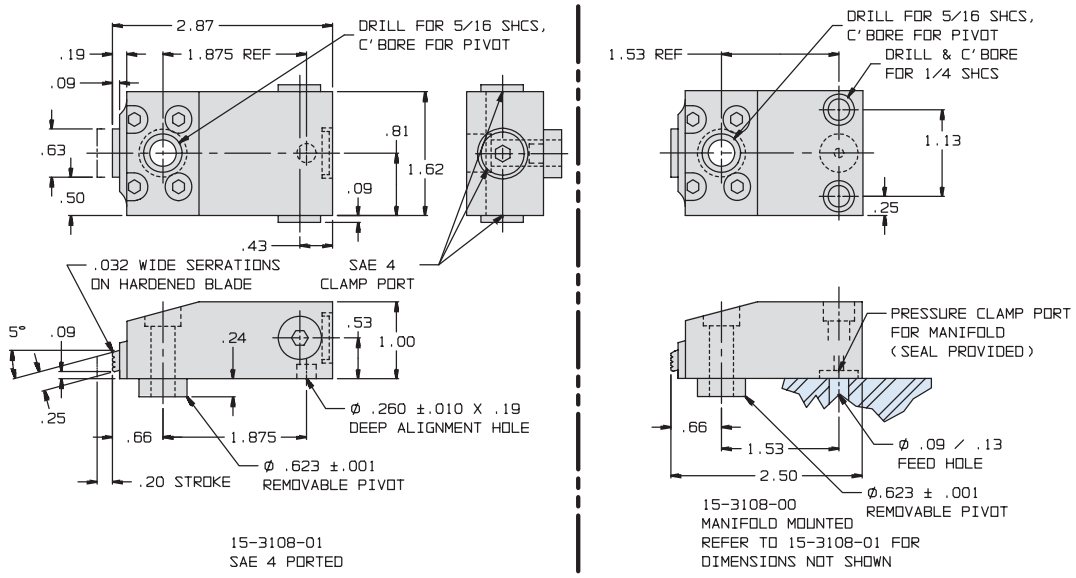
For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.

Model No.	Plumbing Style	Clamp Force (lb.)*		Effective Horizontal Stroke	Vertical Blade Movement	Body Size	Piston Area (sq. in.)	Oil Capacity (cu. in.)	Approximate Pressure to Extend
		Horizontal	Vertical						
Single Acting (S/A)						**Cylinders, actuated hydraulically 1 direction, spring returned.**			
15-3108-01	SAE Ported	2000	500	0.20	0.06	1.62 x 2.88	0.442	0.09	200 psi
15-3108-00	Manifold	2000	500	0.20	0.06	1.62 x 2.50	0.442	0.09	200 psi

* Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying hydraulic system pressure. (Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.)



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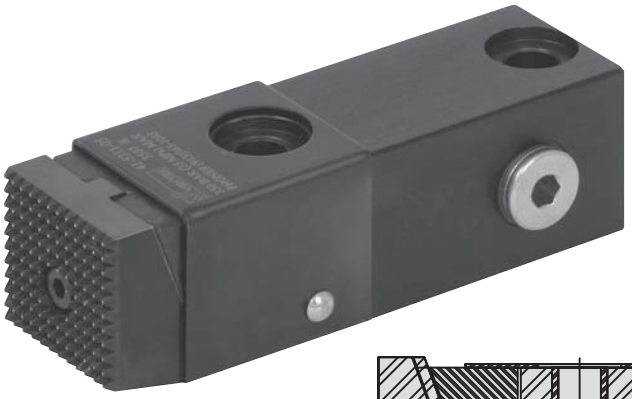
Special Use Clamps

Pull-Down Clamp

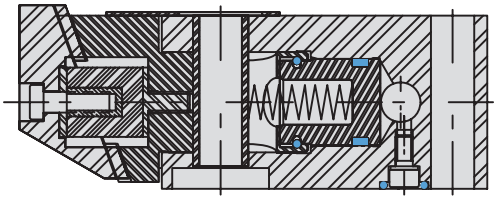


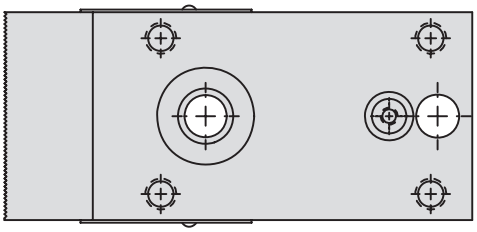
Single Acting

- Three capacities available 870, 3900 or 6300 lbs.
- Use when lateral clamping is desired.
- Generates straight clamping motion and force along with pull-down clamping force.
- Pull-down force is approximately 1/3 of the straight clamping force.
- This clamp is shipped with the jaw shown. The interchangeable jaws found on page E-6 can be purchased for use with this clamp.
- Counter hold devices to pull the work piece down when straight clamping force is applied, see page E-5.

NOTE: Available with both manifold mounting and SAE porting.

The straight and pull-down movements are independent of each other.





ILS153103 REV E

Model No.	Plumbing Style	Lateral Clamp Force (lb.)*	Pull Down Clamp Force (lb.)*	Effective Horizontal Stroke	Oil Capacity (cu. in.)	Piston Area (sq. in.)	Recommended Mounting Bolts (not supplied)	Mounting Bolts Max. Torque (ft.-lb.)
Single Acting (S/A)				Cylinders, actuated hydraulically 1 direction, spring returned.				
15-3105-00	Manifold and SAE Ported	870	290	0.20	0.03	0.175	5/16	18
15-3110-00	Manifold and SAE Ported	3900	1300	0.31	0.24	0.761	7/16	63
15-3112-00	Manifold and SAE Ported	6300	2100	0.39	0.49	1.247	5/8	150

* Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying the hydraulic system pressure. (Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.)

Dimensions

Model No.	A	B	C	D	E±.02	F	G	H	J	K	L	M
Single Acting (S/A)												
15-3105-00	3.94	1.18	1.18	1.50	1.54	0.08	SAE 2	0.33	0.12	2.09	2.32	0.43
15-3110-00	5.31	1.97	1.97	2.24	2.28	0.12	SAE 4	0.49	0.55	2.64	2.91	0.71
15-3112-00	5.89	2.56	2.56	2.46	2.50	0.12	SAE 4	0.65	0.67	2.83	3.27	0.93

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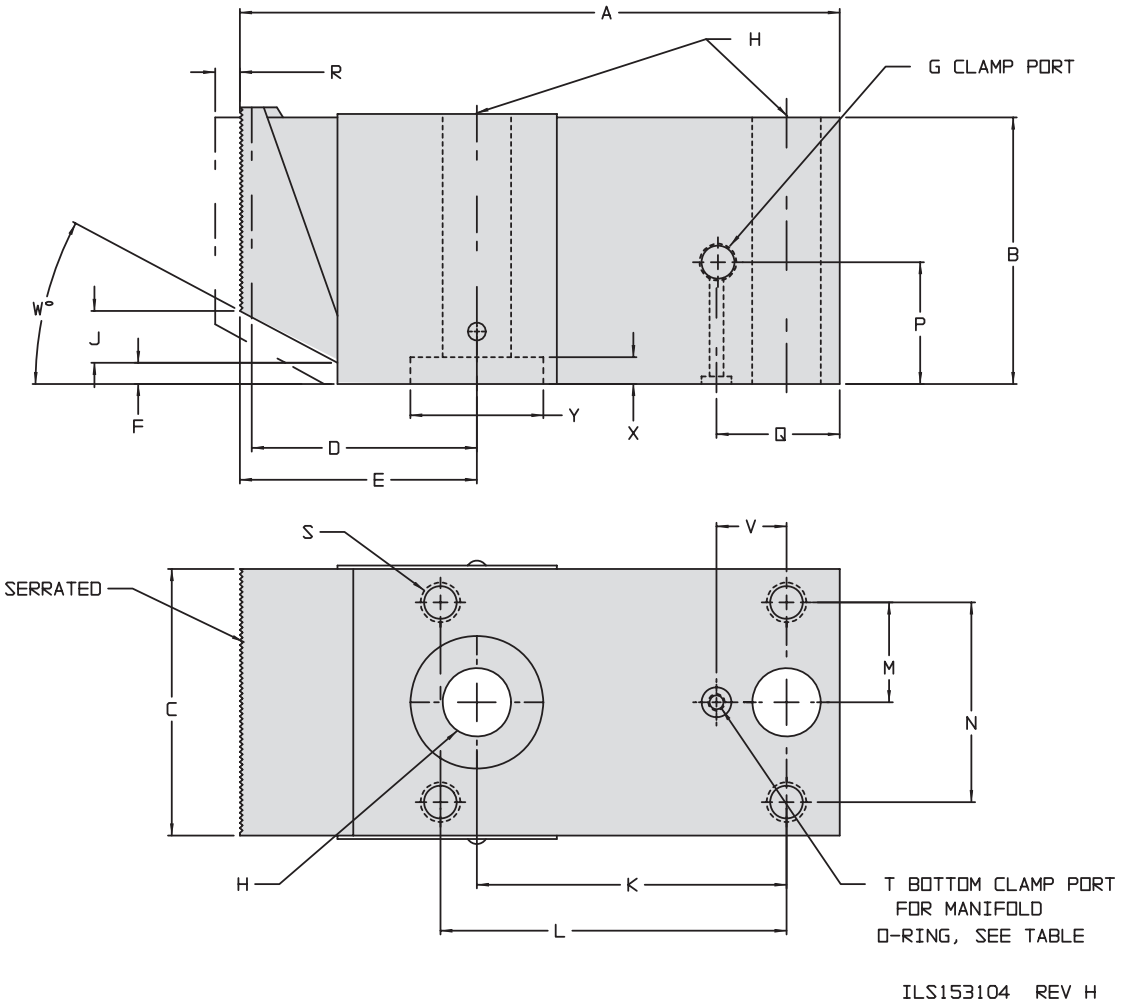
Pull-Down Clamp



NOTE: The vertical travel of stroke "F" can not be exceeded.

For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.

N	P	Lateral Clamping Force (lb)	Pull Down Force (lb)	Q	R	S	T	V	W	X	Y
Cylinders, actuated hydraulically 1 direction, spring returned.											
0.87	0.59	870	290	0.75	0.20	M5 x 0.24 DP	N/A	0.51	15	N/A	N/A
1.42	0.98	3900	1300	0.98	0.31	M8 x 0.47 DP	M5	0.55	30	0.229	1.103
1.85	1.19	6300	2100	1.19	0.39	M10 x 0.63 DP	M5	0.69	30	0.225	1.263

O-Rings for Manifold Mounting

Part No.	Description
39-0510-43	O-ring for 15-3105-00
39-0510-44	O-ring for 15-3110-00, 15-3112-00
(one each supplied)	

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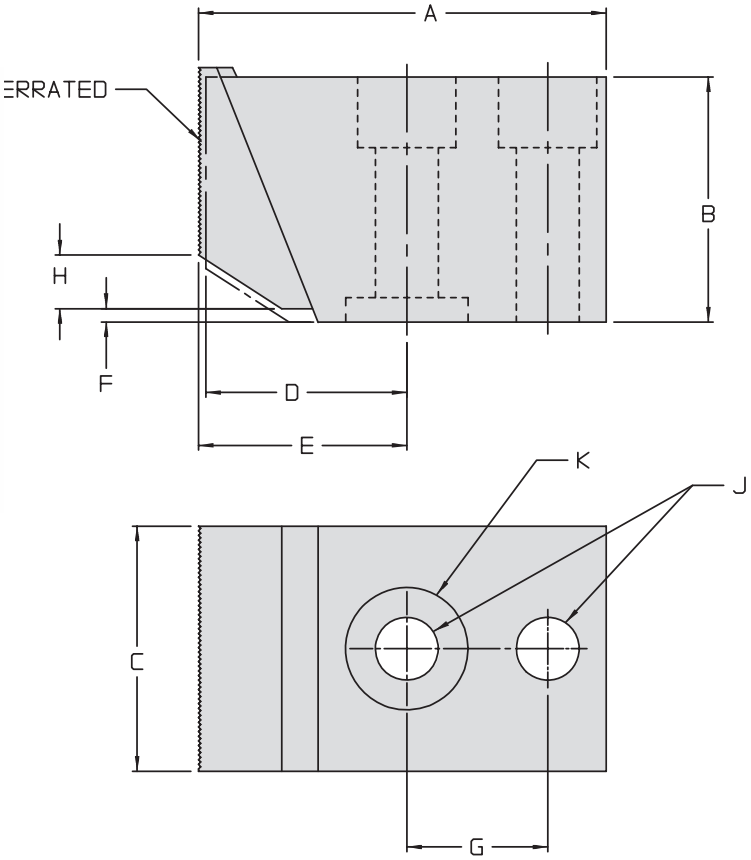
Special Use Clamps

Pull-Down Counter-Hold



ILS153105 REV E

Pull-Down Counter-Hold

- Complements the pull-down clamp (page E-3) by pulling the workpiece down when straight clamping force is applied.
- Clamping bolt is behind the jaw, keeps clamping jaw from raising.

NOTE: The maximum pull-down stroke of the jaw must not exceed Dimension F.

Model No.	Description	Pull Down Force (lb)	Recommended Mounting Bolts (not supplied)
15-3105-02	Mechanical counter hold for 15-3105-00	290	5/16
15-3110-02	Mechanical counter hold for 15-3110-00	1300	7/16
15-3112-02	Mechanical counter hold for 15-3112-00	2100	5/8

Dimensions

Model No.	A	B	C	D	E	F	G	H	J	K
15-3105-02	3.11	1.18	1.18	1.61	1.65	0.08	1.02	0.12	0.33 thru 0.55 C'bore x 0.31 deep	N/A
15-3110-02	4.02	1.97	1.97	2.32	2.36	0.12	1.18	0.55	0.49 thru 0.78 C'bore x 0.51 deep	1.10 C'bore x 0.24 deep
15-3112-02	4.49	2.56	2.56	2.40	2.44	0.12	1.46	0.67	0.65 thru 1.00 C'bore x 0.71 deep	1.26 C'bore x 0.24 deep

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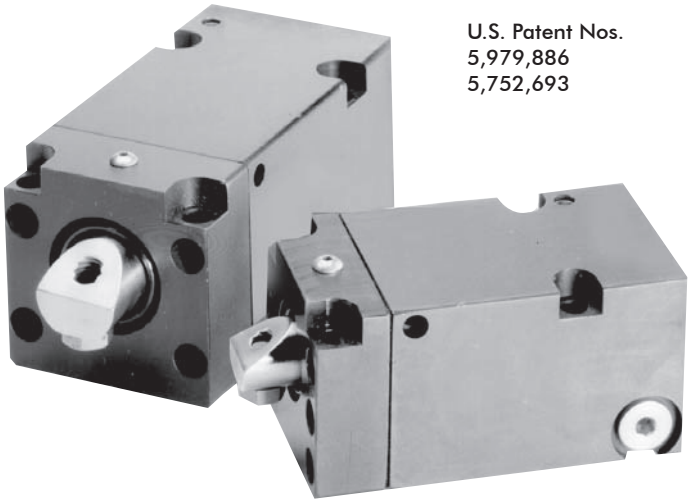
Special Use Clamps

Retract Clamp

Single Acting

- Available in two capacities, 1,700 and 3,300 lb.
- Extends straight forward, then down to contact your part.
- Replaceable spherical contact point (furnished) provides point contact for true vertical clamp force.
- Lifts vertically, then retracts, not like others which can draw the part when unclamping.



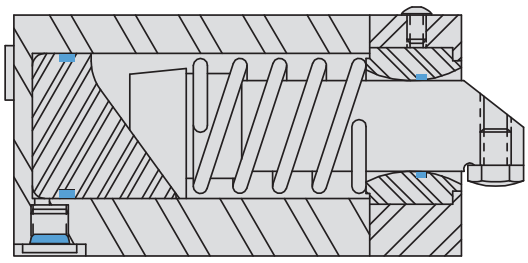
U.S. Patent Nos.
5,979,886
5,752,693

Patented design overcomes the shortcomings of other models.

Integral wiper helps keep chips and contaminants out of the mechanism.

Manifold mounting port is built into each unit, making selection easy, no special models to order.

Rear and side porting are included for ease of plumbing in your application.



ILS154100 REV D

Model No.	Clamping Force (lb.)**	Horizontal Stroke (in.)	Clamping Travel (in.)	Oil Capacity Extend (cu. in.)
Single Acting (S/A)	Cylinders, actuated hydraulically 1 direction, spring returned.			
15-4108-01	1700	0.67	0.12	1.1
15-4108-03	3300	0.88	0.16	2.1

** Clamping force is rated at 5,000 psi Maximum Operating Pressure and the Maximum Back Pressure to assure return is 10 psi.

Dimensions

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P
Single Acting (S/A)														
15-4108-01	4.01	4.56	0.74	0.12	0.41	0.32	60°	SAE 2	0.35	1.89	1.99	0.95	0.37	0.21
15-4108-03	5.14	5.78	0.88	0.16	0.53	0.36	60°	SAE 2	0.53	1.91	2.43	0.85	0.47	0.21

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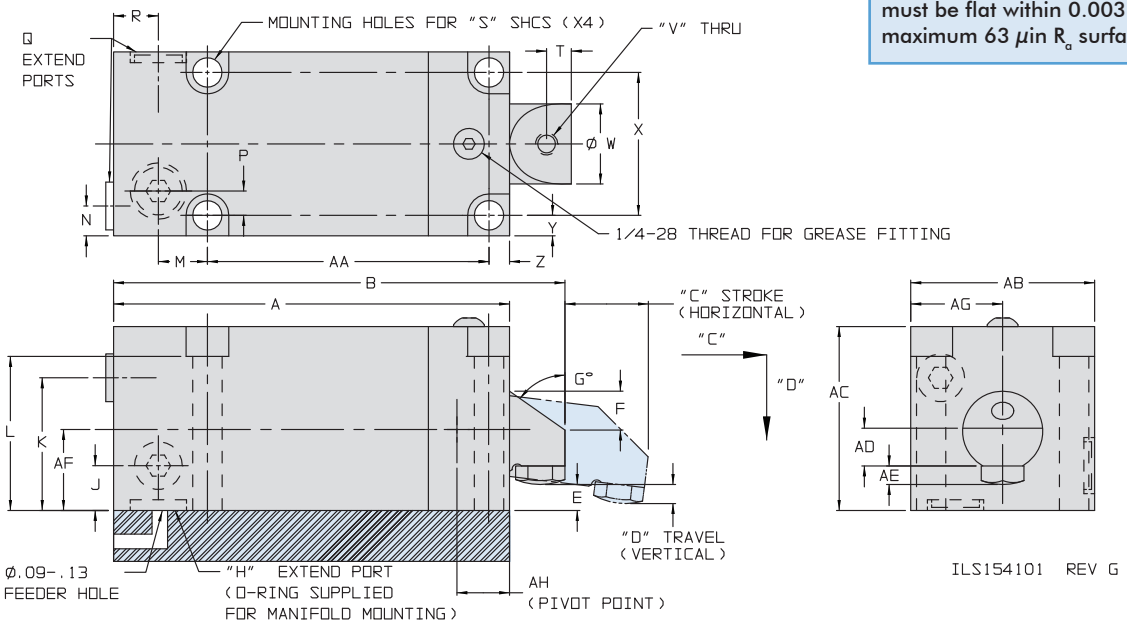
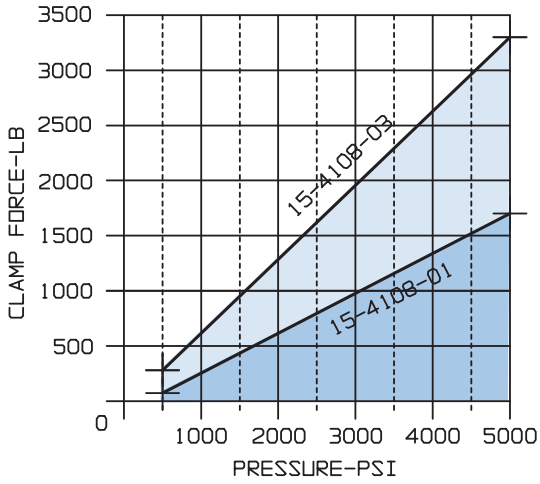
Retract Clamp

For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.





ILS154102 REV B

	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
Cylinders, actuated hydraulically 1 direction, spring returned.																	
	SAE 4	0.44	1/4"	0.26	1/4-20	0.687	1.70	0.27	0.24	2.36	2.25	2.25	0.30	0.20	0.90	1.13	0.371
	SAE 4	0.44	5/16"	0.29	5/16-18	0.938	2.02	0.37	0.24	3.30	2.75	2.75	0.52	0.22	1.15	1.38	0.465

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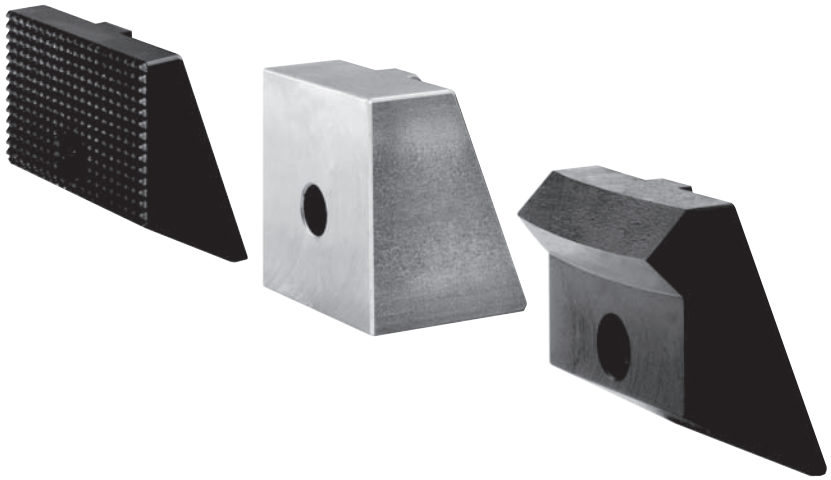
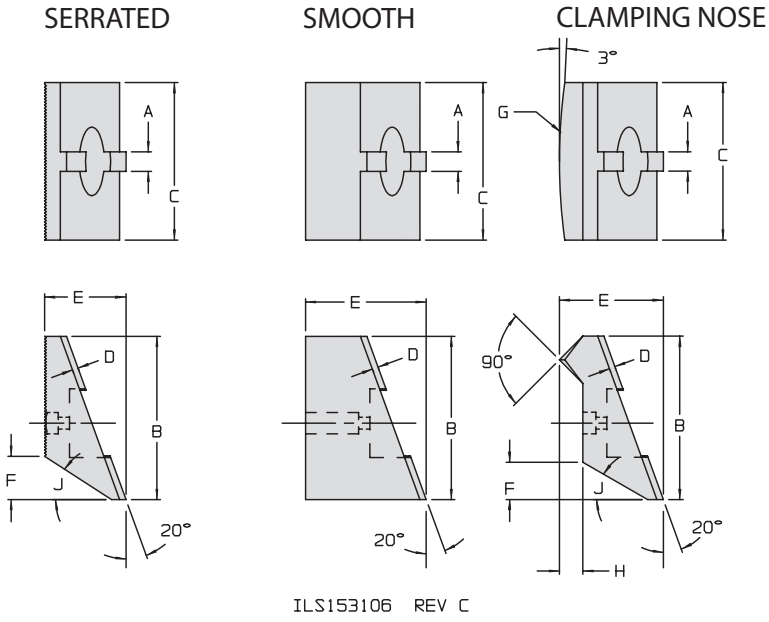


Pull-Down Clamping Jaws

- Three styles of clamping jaws are available.
- Serrated, for holding normal surfaces.
- Smooth, not hardened to facilitate shaping into any clamping form or ground flush for sensitive work.
- Clamping nose, for holding hard or uneven workpieces.

Model No	Description
15-3105-03	Serrated clamp jaw for 15-3105-00
15-3105-04	Smooth clamp jaw for 15-3105-00*
15-3105-05	Clamping nose clamp jaw for 15-3105-00
15-3110-03	Serrated clamp jaw for 15-3110-00
15-3110-04	Smooth clamp jaw for 15-3110-00*
15-3110-05	Clamping nose clamp jaw for 15-3110-00
15-3112-03	Serrated clamp jaw for 15-3112-00
15-3112-04	Smooth clamp jaw for 15-3112-00*
15-3112-05	Clamping nose clamp jaw for 15-3112-00

* Smooth jaw is not hardened or treated.



Dimensions

Model No.	A	B	C	D	E	F	G	H	J
15-3105-03	0.24	1.16	1.16	0.10	0.87	0.12	N/A	N/A	15°
15-3105-04				0.11	1.26	N/A	N/A	N/A	N/A
15-3105-05					1.06	0.16	12 RAD	0.20	15°
15-3110-03	0.39	1.97	1.97	0.12	1.24	0.55	N/A	N/A	30°
15-3110-04					1.63	N/A	N/A	N/A	N/A
15-3110-05					1.48	0.55	8 RAD	0.32	30°
15-3112-03	0.39	2.56	2.56	0.12	1.46	0.69	N/A	N/A	30°
15-3112-04					2.05	N/A	N/A	N/A	N/A
15-3112-05					1.85	0.67	12 RAD	0.39	30°

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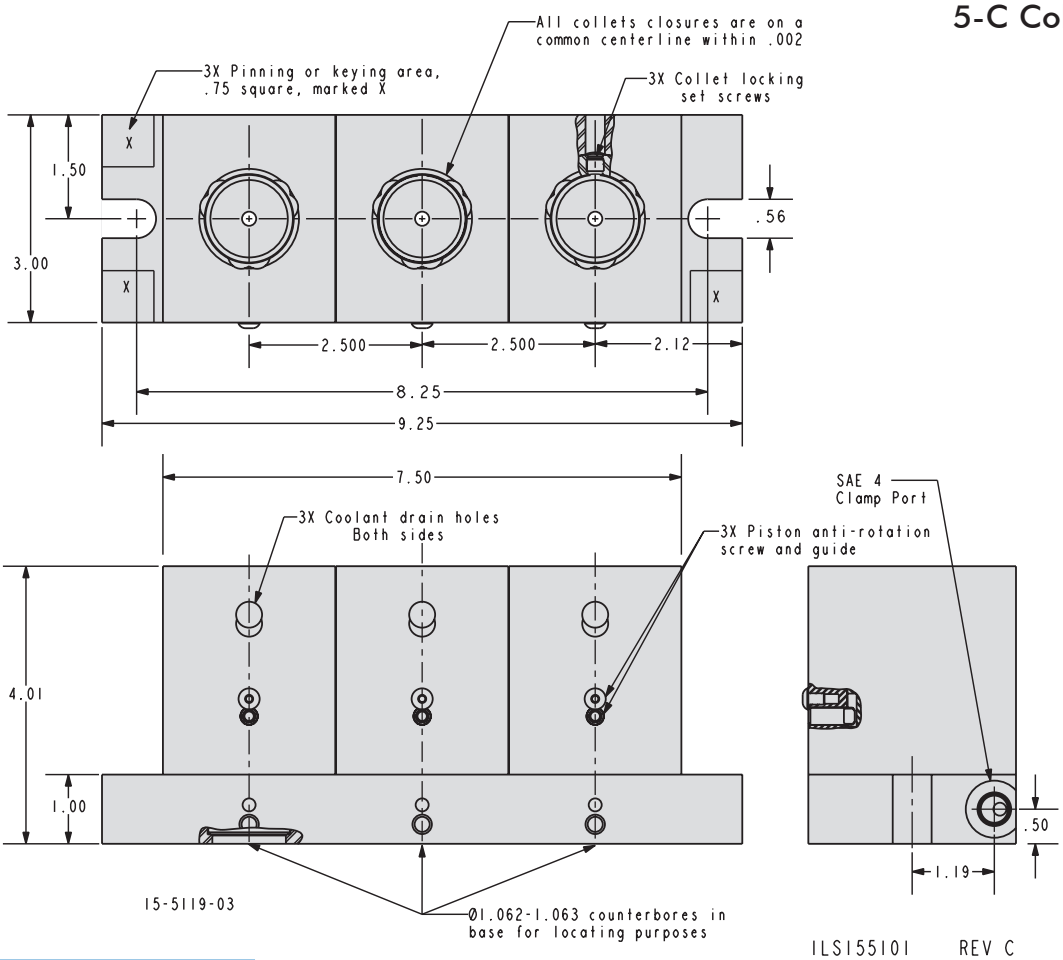
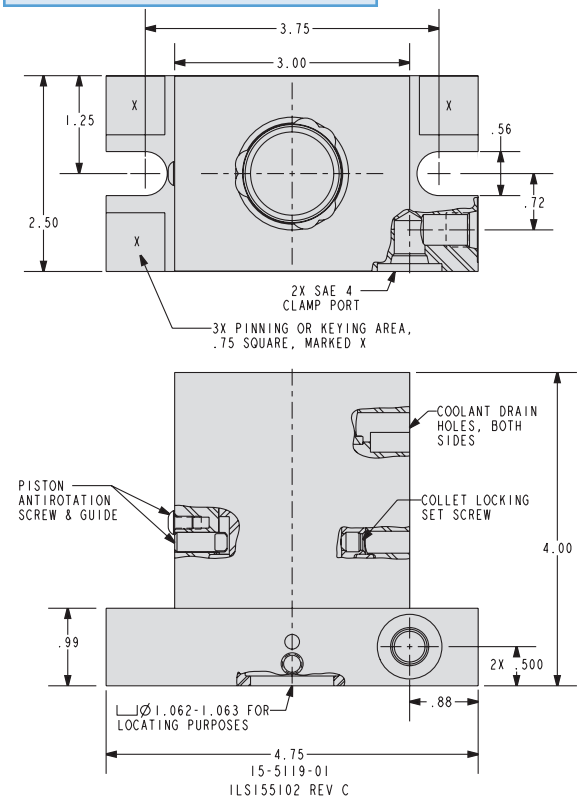
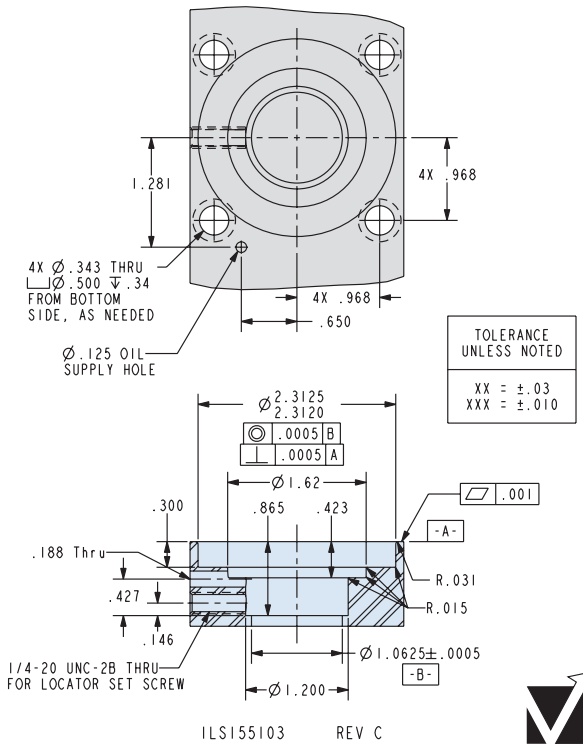
5-C Collet Vise



For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.





Dimensions for customer produced base.

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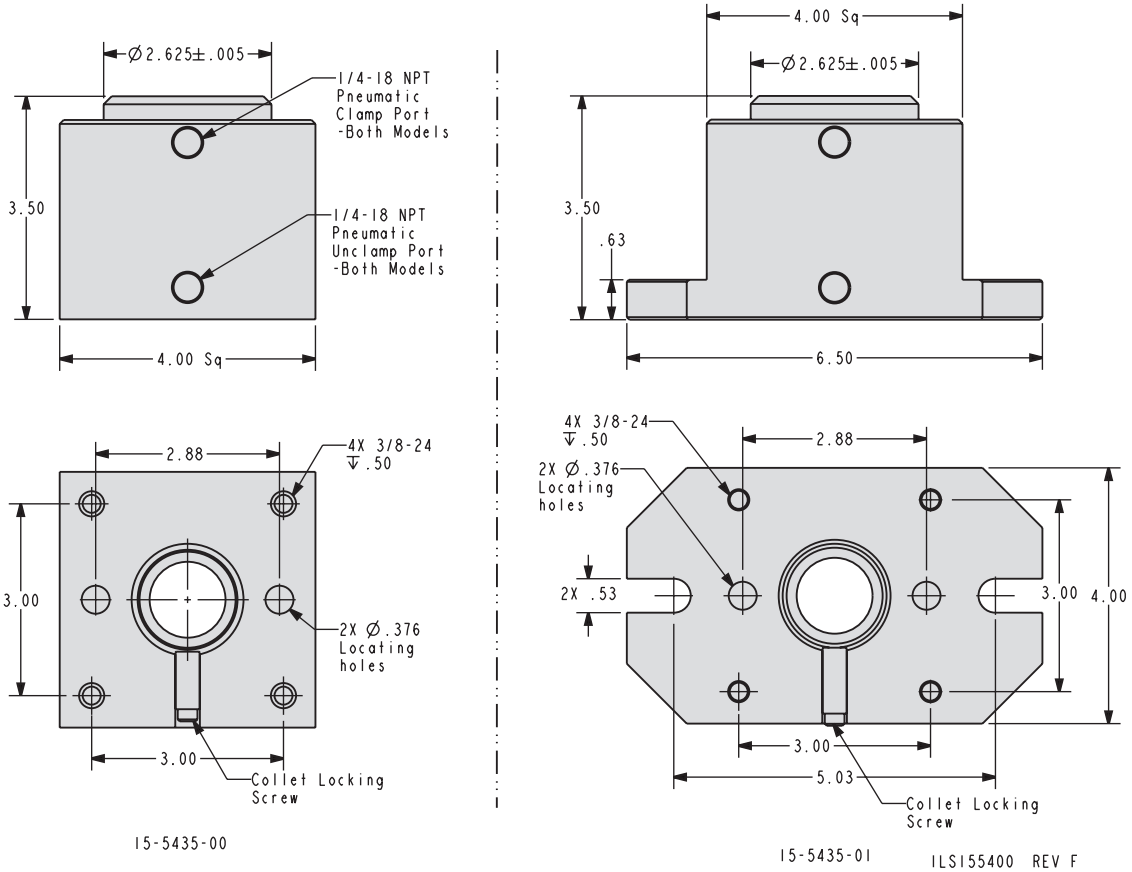
Special Use Clamps

Air Powered Collet Vise

Double Acting Single Collet Styles Only

- Compact design yields 750 lb. collet closing force at 100 psi air line pressure.
- Concentric piston pulls the standard 5-C collet on centerline.
- Available with or without mounting flange for easy fastening from either top or bottom.
- Through hole design allows you to feed bar stock (1.062" maximum diameter) from the bottom of the collet for high production applications.
- Light weight, only 5 lbs.



Model No.	Base Style	Approximate Radial Clamp Force Per Station (lb)*	Approximate Downward Clamp Force Per Station (lb)*	Weight
Double Acting (D/A) Collet Closer, actuated pneumatically both directions.				
15-5435-00	Square	115 in lbs.	750 lbs.	4.5 lbs.
15-5435-01	Flange Mount	115 in lbs.	750 lbs.	5.0 lbs.

* At 100 psi air pressure with a Ø 0.500 collet

NOTE: Do not exceed 150 psi maximum inlet pressure

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Frequently Asked Questions

Why use them?

They are the most common and least costly form of hydraulic clamping available. They can be sized adequately to allow you to clamp across or against cutter forces. However, we always recommend that cutter forces be transmitted into fixed stops.

Why are these cylinders more expensive than "standard industrial grade"?

Standard industrial grade cylinders are typically made with cylinders and rods cut to length and made from many parts. Clamping cylinders typically use a one piece piston and one piece body. The grade of materials, seals and finishes are higher due to the long life and frequency of use required. We strive to produce the finest quality cylinders for the specialty clamping industry. We welcome any head to head run-off. Compare for yourself and see the difference in quality.

What are the intended applications of cylinders? What should I avoid?

Clamping cylinders are intended for pushing up against a part and holding it in place. They are not intended for use in power cylinder applications where punching, bending or forming are performed. The special seals used in clamps are not designed to lubricate well in power applications, nor are the cylinders cushioned against "break through" forces. Questions about your application? Call us.

I need a custom end effector. What do I need to be aware of in designing it?

Most of the required dimensional information is located in the dimensions table for each individual product. Be aware that single acting cylinders are not designed to carry or retract heavy weights. Their threads are primarily intended for installation of contact points. Double acting cylinders ensure retraction of properly designed special end effectors. If you must use single acting, contact us in the design phases to be sure your cylinder will return.

How does plumbing affect flow on my fixture?

A good example to help you understand this is to compare it with a freeway system with 25 on-ramps. Now put a continuous flow of traffic on the ramps and freeway. Finally, block all but one outlet lane. Just as all the vehicles must compete for that lane, all cylinders are competing for the single outlet on your fixture. Divide your circuit into branches, feed each from a manifold, be sure that your main return line is adequately sized, increase flow as much as possible, by reducing restrictions. If a series of tees and elbows is used to feed an entire fixture, expect flow problems. Finally, be sure that your fixture is properly bled of all air. To achieve predictable clamp and unclamp times, we recommend double acting clamps.

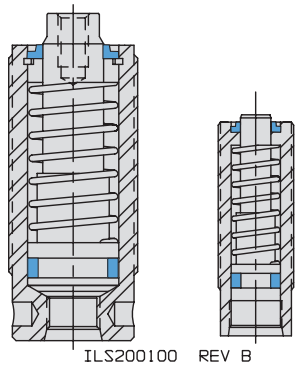
How do I use my hollow cylinder to draw a bolt that runs my mechanism?

This will involve mounting your hollow cylinder on the side of your fixture plate opposite where it is to draw the bolt. Using the bottom mounting holes draw it back against the fixture. Run the bolt through the fixture and cylinder. When the cylinder extends, it will draw the bolt.

NOTE: For maximum spring life, do not regularly run single acting cylinders to the end of the stroke.

Standard Features

- Most common and least expensive form of hydraulic clamping.
- Adjustable force ranging from "minimal" to maximum cylinder capacity, by adjusting the input pressure.
- Designed for long life in high production applications. Don't gamble with "cheap" cylinders which wear out prematurely.



BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching. After years of use, cylinder removal is easier because BHC™'s corrosion resistance is better than black oxide or hardened chrome plating.

Proprietary seal designs reduce leakage and increase seal life for longer lasting, dependable cylinders.

Threaded models use positionable, SAE 4 fluid ports.

Manifold models supplied with gasket to seal against the cavity bottom.

Hardened chrome alloy steel pistons won't "mushroom" even when used without grippers.

Special wipers keep chips and contaminants out.

Positive piston stop shoulder keeps the spring from "bottoming out" guarding against premature spring failure which can plague other cylinder brands.

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Single Acting

- Easy to use, basic hydraulic cylinders in SAE ported styles.
- Adjustable force ranging from "minimal" to maximum cylinder capacity, by adjusting the input pressure.
- Designed for long life in high production applications. Don't gamble with "cheap" cylinders which wear out prematurely.
- Reduce or eliminate part distortion by providing accurate repeatable clamping force.

Special tough wipers help keep chips and contaminants out on all cylinder sizes.

Positive piston stop shoulder keeps the spring from "bottoming out" guarding against premature spring failure which can plague other cylinder brands.

Available in three stroke lengths for each capacity, up to 1 1/4" stroke.

Model No.	Cylinder Capacity (lb.)** Extend	Stroke (in.)	Body Thread	Minimum Length (in.)	Effective Piston Area (sq. in.) Extend	Oil Capacity (cu. in.)** Extend
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.						
20-0104-02		0.25		1.97		0.028
20-0104-07	550	0.75	5/8-18	2.60	0.110	0.083
20-0104-12		1.25		3.22		0.138
20-0105-03		0.38		2.00		0.074
20-0105-07	980	0.75	3/4-16	2.63	0.196	0.147
20-0105-12		1.25		3.30		0.245
20-0108-02		0.25		2.19		0.111
20-0108-07	2200	0.75	1 1/16-16	2.70	0.442	0.332
20-0108-12		1.25		3.39		0.553

** Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying the hydraulic system pressure. To determine approximate output force for your application, multiply the Piston Area times Your System Operating Pressure. (Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.)

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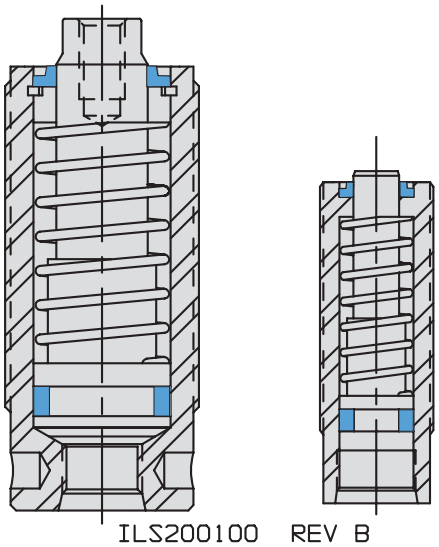
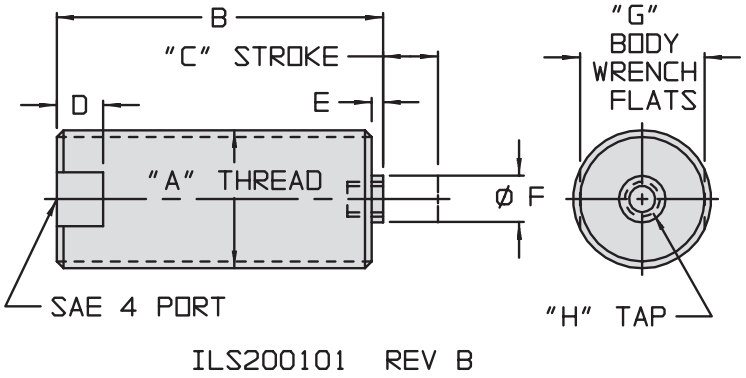


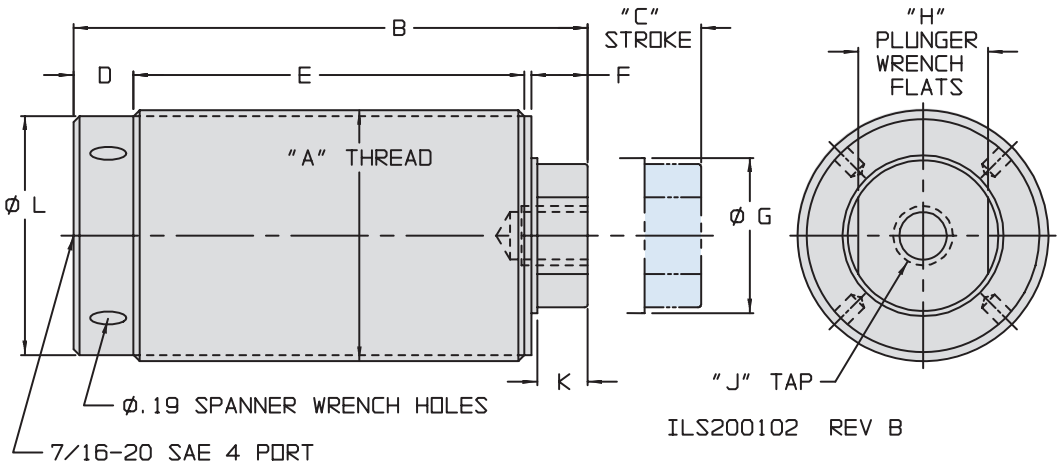
ILS200100 REV B



ILS200101 REV B

Dimensions 550 lb and 980 lb Capacities

Model No.	Capacity (lb)	A	B	C	D	E	F	G	H
Single Acting (S/A)					Cylinders, actuated hydraulically 1 direction, spring returned.				
20-0104-02	550	5/8-18	1.97	0.25	0.25	0.10	0.25	0.56	8-32 x 0.25
20-0104-07			2.60	0.75					
20-0104-12			3.22	1.25					
20-0105-03	980	3/4-16	2.00	0.38	0.25	0.06	0.25	0.68	8-32 x 0.25
20-0105-07			2.63	0.75					
20-0105-12			3.30	1.25					



ILS200102 REV B

Dimensions 2200 lb Capacity

Model No.	Capacity (lb)	A	B	C	D	E	F	G	H	J	K	L
Single Acting (S/A)						Cylinders, actuated hydraulically 1 direction, spring returned						
20-0108-02	2200	1 1/16-16	2.19	0.25	0.50	1.40	0.26	0.50	0.43	1/4-20 X 0.44	0.19	0.97
20-0108-07			2.70	0.75		1.90	0.26					
20-0108-12			3.39	1.25		2.63	0.21					

All dimensions are in inches. For mounting hardware details, see page L-1.

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Cylinders

Threaded

Single and Double Acting

- Easy to use, basic hydraulic cylinders in SAE 4 ported designs.
- Designed for long life in high production applications.
- Reduce or eliminate part distortion by providing accurate, repeatable clamping force.
- Double Acting cylinders assure complete powered retraction for CNC controlled operations (where time is critical) or when using heavy end effectors. Single acting cylinders should be used with small end effectors only and where retraction speed is not critical.
- Coaxial spring design adds long life to Single Acting units.

Hardened chrome alloy steel pistons won't "mushroom" even when used without grippers.

Springs are designed to return the cylinder and contact points, not intended to pull mechanisms.

Model No.	Cylinder Capacity (lb.)**		Stroke (in.)	Body Thread	Miniumum Length	Effective Piston Area (sq. in.)		Oil Capacity (cu. in.)	
	Extend	Retract				Extend	Retract	Extend	Retract
Single Acting (S/A)								**Cylinders, actuated hydraulically 1 direction, spring returned.**	
20-0110-00	3900	N/A	0.50	1 5/16-16	2.68	0.785	N/A	0.393	N/A
20-0110-01			1.00		3.18			0.785	
20-0110-04			1.50		3.80			1.177	
20-0110-02			2.00		4.30			1.570	
20-0115-00	8800	N/A	0.50	1 7/8-16	2.75	1.767	N/A	0.884	N/A
20-0115-01			1.00		3.25			1.767	
20-0115-04			1.50		3.75			2.650	
20-0115-02			2.00		4.26			3.534	
Double Acting (D/A)								**Cylinders, actuated hydraulically both directions.**	
20-0210-00	3900	1300	0.50	1 7/8-16	2.68	0.785	0.267	0.393	0.134
20-0210-01			1.00		3.18			0.785	0.267
20-0210-04			1.50		3.80			1.177	0.400
20-0210-02			2.00		4.30			1.570	0.534
20-0215-00	8800	3800	0.50	2 1/2-16	2.75	1.767	0.773	0.884	0.386
20-0215-01			1.00		3.25			1.767	0.773
20-0215-04			1.50		3.75			2.650	1.160
20-0215-02			2.00		4.26			3.534	1.546

** Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying hydraulic system pressure. To determine approximate output force for your application, multiply the Piston Area X Your System Operating Pressure. (Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.)

Dimensions at 3900 lb Capacity, Extended

Model No.	Extend Capacity (lb)	A	B	C	D	E	F	G	H	J	K	L	M	N
Single Acting (S/A)														
20-0110-00	3900	1 5/16-16	2.68	0.50	0.50	1.56	0.32	0.81	0.68	5/16-18 X 0.44	0.28	1.22	N/A	N/A
20-0110-01			3.18	1.00		2.06								
20-0110-04			3.80	1.50		2.56								
20-0110-02			4.30	2.00		3.18								
Double Acting (D/A)														
20-0210-00	3900	1 7/8-16	2.68	0.50	0.50	1.56	0.32	0.81	0.68	5/16-18 X 0.44	0.28	1.76	0.56	0.56
20-0210-01			3.18	1.00		2.06								
20-0210-04			3.80	1.50		2.56								
20-0210-02			4.30	2.00		3.18								

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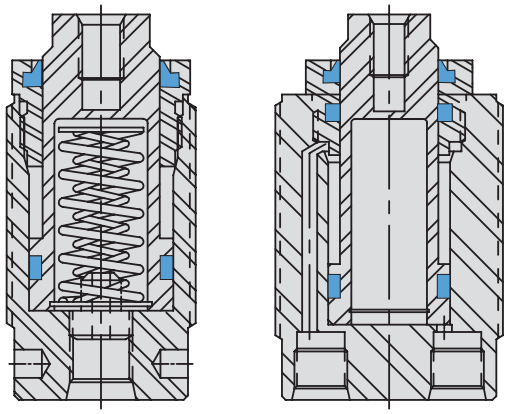
Threaded



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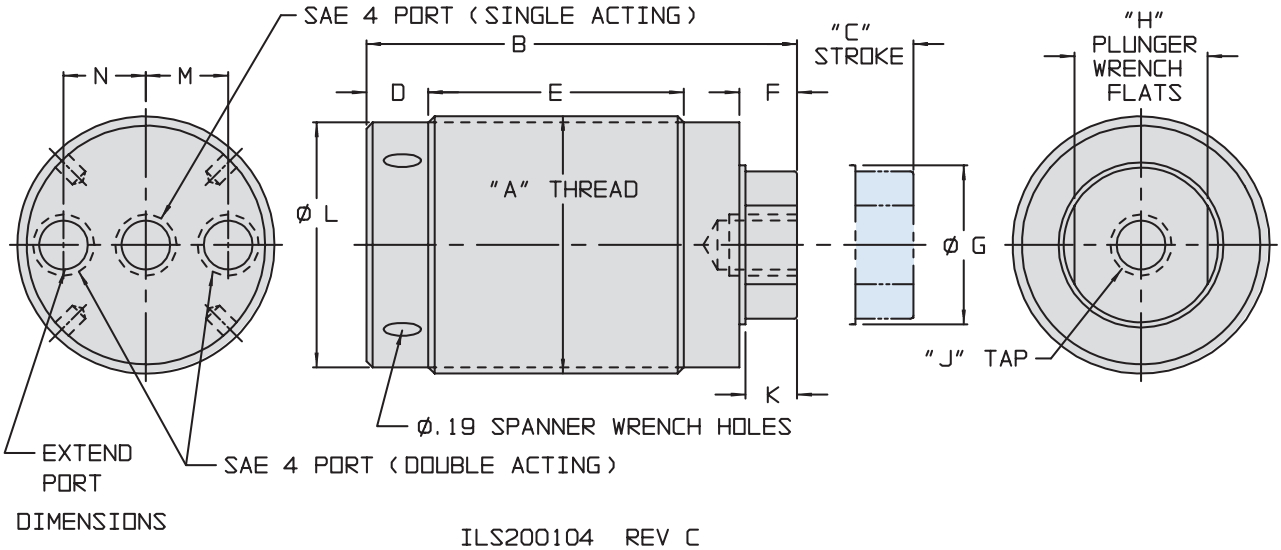

DIMENSIONS

ILS200104 REV C

Dimensions at 8800 lb Capacity, Extended

Model No.	Extend Capacity (lb)	A	B	C	D	E	F	G	H	J	K	L	M	N
Cylinders, actuated hydraulically 1 direction, spring returned.														
20-0115-00	8800	1 7/8-16	2.75	0.50	0.50	1.56	0.40	1.13	1.00	1/2-13 X 0.51	0.36	1.78	N/A	N/A
20-0115-01			3.25	1.00		2.06								
20-0115-04			3.75	1.50		2.56								
20-0115-02			4.26	2.00		3.18								
Cylinders, actuated hydraulically both directions.														
20-0215-00	8800	2 1/2-16	2.75	0.50	0.50	1.56	0.40	1.13	1.00	1/2-13 X 0.51	0.36	2.39	0.81	0.44
20-0215-01			3.25	1.00		2.06								
20-0215-04			3.75	1.50		2.56								
20-0215-02			4.26	2.00		3.18								

All dimensions are in inches. For mounting hardware details, see page L-1.

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Cylinders

Block Specifications

Single and Double Acting

- No special mounting hardware required, just bolt down these easy to use devices.
- Dual position mounting, either parallel or perpendicular to piston travel on every model.
- Adjustable force ranging from "negligible" to maximum cylinder capacity, simply adjust the input pressure.
- Advance porting is provided on both bottom and side of most models for easy plumbing access.

Threaded piston ends allow the use of custom end attachments (Double Acting recommended for attachments or mechanisms).

Vent port with bronze filter (Single Acting) gives the cylinder a place to "breathe" and helps keep chips and other contaminants from sucking past wipers.

Springs are designed to return the cylinder and contact points, not intended to pull mechanisms.

Model No.	Cylinder Capacity (lb.)**		Stroke (in.)	Body Size	Minimum Length (in)	Piston Area (sq. in.)		Oil Capacity (cu. in.)	
	Extend	Retract				Extend	Retract	Extend	Retract
Single Acting (S/A)				**Cylinders, actuated hydraulically 1 direction, spring returned.**					
20-1108-00	2200	N/A	0.25	1.13 x 2.00	2.37	0.442	N/A	0.110	N/A
20-1108-01			0.75		3.12			0.330	
20-1110-00	3900	N/A	0.50	1.75 x 2.00	2.80	0.785	N/A	0.393	N/A
20-1110-01			1.00		3.30			0.785	
20-1110-04			1.50		3.93			1.177	
20-1110-02			2.00		4.43			1.570	
20-1115-00	8800	N/A	0.50	2.00 x 2.50	2.88	1.767	N/A	0.884	N/A
20-1115-01			1.00		3.38			1.767	
20-1115-04			1.50		3.88			2.650	
20-1115-02			2.00		4.38			3.534	
Double Acting (D/A)				**Cylinders, actuated hydraulically both directions.**					
20-1208-00	2200	1200	0.25	1.13 X 2.00	2.37	0.442	0.246	0.110	0.061
20-1208-01			0.75		3.12			0.330	0.183
20-1210-00	3900	1300	0.50	1.75 X 2.00	2.80	0.785	0.267	0.393	0.134
20-1210-01			1.00		3.30			0.785	0.268
20-1210-04			1.50		3.93			1.177	0.400
20-1210-02			2.00		4.43			1.570	0.536
20-1215-00	8800	3800	0.50	2.00 X 2.50	2.88	1.767	0.773	0.884	0.387
20-1215-01			1.00		3.38			1.767	0.774
20-1215-04			1.50		3.88			2.650	1.160
20-1215-02			2.00		4.38			3.534	1.548

** Cylinder capacities are at 5,000 psi maximum operating pressure. The output force is adjustable by varying hydraulic system pressure. To determine the approximate output force for your application, multiply the Piston Area times Your System Operating Pressure. (Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.)

Dimensions

Model No.	Capacity	A	B	C	D	E	F	G	H	J	K	L	M
Single Acting (S/A)													
20-1108-00	2200	2.37	0.25	1.84	0.29	0.28	0.92	N/A	0.50	1.31	0.22	2.00	1.31
20-1108-01		3.12	0.75	2.59									
20-1110-00	3900	2.80	0.50	2.25	0.32	0.34	1.06	N/A	0.81	1.50	0.28	2.00	1.50
20-1110-01		3.30	1.00	2.75				N/A					
20-1110-04		3.93	1.50	3.38				1.13					
20-1110-02		4.43	2.00	3.87				1.62					
20-1115-00	8800	2.88	0.50	2.25	0.40	0.34	1.06	N/A	1.13	2.00	0.34	2.50	1.90
20-1115-01		3.38	1.00	2.75				N/A					
20-1115-04		3.88	1.50	3.25				1.00					
20-1115-02		4.38	2.00	3.75				1.63					
Double Acting (D/A)													
20-1208-00	2200	2.37	0.25	1.84	0.29	0.28	0.92	N/A	0.50	1.31	0.22	2.00	1.31
20-1208-01		3.12	0.75	2.59									
20-1210-00	3900	2.80	0.50	2.25	0.32	0.34	1.06	N/A	0.81	1.50	0.28	2.00	1.50
20-1210-01		3.30	1.00	2.75				N/A					
20-1210-04		3.93	1.50	3.38				1.13					
20-1210-02		4.43	2.00	3.87				1.62					
20-1215-00	8800	2.88	0.50	2.25	0.40	0.34	1.06	N/A	1.13	2.00	0.34	2.50	1.90
20-1215-01		3.38	1.00	2.75				N/A					
20-1215-04		3.88	1.50	3.25				1.00					
20-1215-02		4.38	2.00	3.75				1.63					

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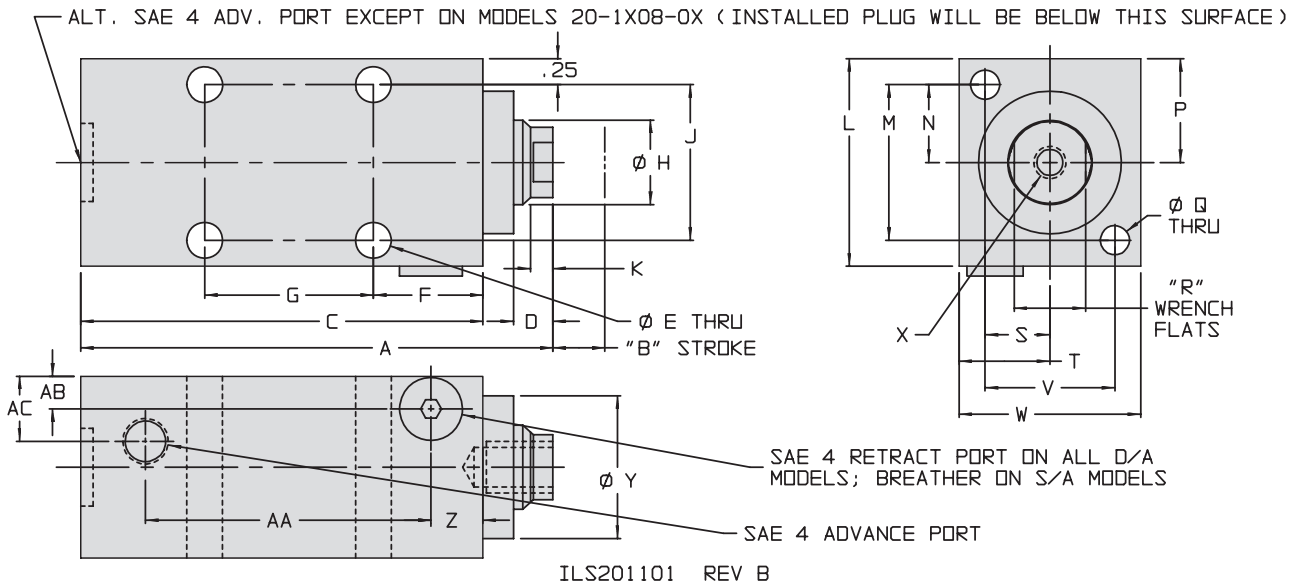
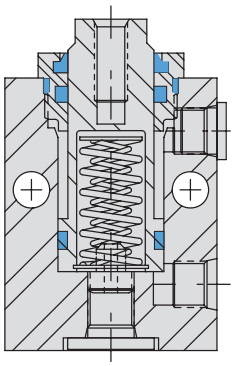
Block Dimensions



ILS201101 REV B



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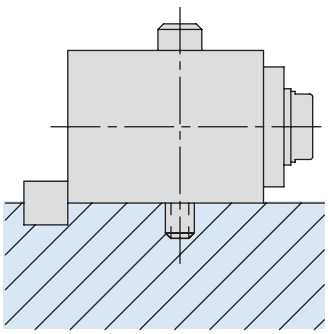

ILS201102 REV B

NOTE: When mounting block cylinders on high force installations, provide cylinder back-up using square key in fixture or similar means as shown in illustration at left. When clamping force is applied, the back-up element resists the sliding tendency of the block and eliminates shear loads on mounting bolts.

All dimensions are in inches.

	N	P	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC
Cylinders, actuated hydraulically 1 direction, spring returned.														
	0.66	0.91	0.28	0.43	0.31	0.56	0.62	1.13	1/4-20 X 0.44	1.06	0.38	1.10 1.85	0.38	0.38
	0.75	1.00	0.28	0.68	0.62	0.87	1.25	1.75	5/16-18 X 0.44	1.38	0.50	1.12 1.62 2.25 2.75	0.31	0.88
	0.95	1.25	0.34	1.00	0.70	1.00	1.40	2.00	1/2-13 X 0.51	1.75	0.50	1.12 1.62 2.12 2.66	0.31	1.00
Cylinders, actuated hydraulically both directions.														
	0.66	0.91	0.28	0.43	0.31	0.56	0.62	1.13	1/4-20 X 0.44	1.06	0.38	1.10 1.85	0.38	0.38
	0.75	1.00	0.28	0.68	0.62	0.87	1.25	1.75	5/16-18 X 0.44	1.38	0.50	1.12 1.62 2.25 2.75	0.31	0.88
	0.95	1.25	0.34	1.00	0.70	1.00	1.40	2.00	1/2-13 X 0.51	1.75	.50	1.12 1.62 2.12 2.66	0.31	1.00

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Cylinders

Manifold Mount Block Cylinders

Single and Double Acting

- No external ports or external plumbing to collect chips.
- Reduced installation labor.
- Available in the same popular sizes as our other block cylinders.

Model No.	Cylinder Capacity (lb.)**		Stroke (in.)	Body Size	Minimum Length (in)	Effective Piston Area (sq. in.)		Oil Capacity (cu. in.)****	
	Extend	Retract				Extend	Retract	Extend	Retract
Single Acting (S/A)				**Cylinders, actuated hydraulically 1 direction, spring returned.**					
21-1108-00	2200	N/A	0.25	1.13 x 2.00	2.40	0.442	N/A	0.110	N/A
21-1108-01			0.75		3.15			0.330	N/A
21-1110-05	3900	N/A	0.50	2.00 x 2.00	2.75	0.785	N/A	0.393	N/A
21-1110-01			1.00		3.25			0.785	N/A
21-1110-04			1.50		3.88			1.177	N/A
21-1110-02			2.00		4.38			1.570	N/A
21-1115-00	8800	N/A	0.50	2.00 x 2.50	2.83	1.767	N/A	0.884	N/A
21-1115-01			1.00		3.33			1.767	N/A
21-1115-04			1.50		3.83			2.650	N/A
21-1115-02			2.00		4.33			3.534	N/A
Double Acting (D/A)				**Cylinders, actuated hydraulically both directions.**					
21-1208-00	2200	1200	0.25	1.13 x 2.00	2.40	0.442	0.246	0.110	0.061
21-1208-01			0.75		3.15			0.330	0.183
21-1210-00	3900	1300	0.50	2.00 x 2.00	2.75	0.785	0.267	0.393	0.134
21-1210-01			1.00		3.25			0.785	0.268
21-1210-04			1.50		3.88			1.177	0.400
21-1210-02			2.00		4.38			1.570	0.536
21-1215-05	8800	3800	0.50	2.00 x 2.50	2.83	1.767	0.773	0.884	0.387
21-1215-01			1.00		3.33			1.767	0.774
21-1215-04			1.50		3.83			2.650	1.160
21-1215-02			2.00		4.33			3.534	1.548

** Cylinder capacities are listed at 5,000 psi maximum operating pressure. Cylinder force can be adjusted by varying the hydraulic system pressure. To calculate the approximate output force for an application, multiply the predetermined operating pressure by the Effective Piston Area. The actual output force will vary slightly due to frictional losses within the assembly and/or return spring forces.

Dimensions

Model No.	Capacity	A	B	C	D	ØE	F	G	H
Single Acting (S/A)									
21-1108-00	2200	2.40	0.25	1.88	0.29	0.28	0.75	0.88	0.50
21-1108-01		3.15	0.75	2.63				1.63	
21-1110-05	3900	2.69	0.50	2.13	0.32	0.34	0.75	1.00	0.81
21-1110-01		3.19	1.00	2.63				1.50	
21-1110-04		3.81	1.50	3.13	0.45			2.00	
21-1110-02		4.31	2.00	3.63				2.50	
21-1115-00	8800	2.77	0.50	2.14	0.40	0.34	0.75	1.00	1.13
21-1115-01		3.27	1.00	2.64				1.50	
21-1115-04		3.77	1.50	3.14				2.00	
21-1115-02		4.27	2.00	3.64				2.50	
Double Acting (D/A)									
21-1208-00	2200	2.40	0.25	1.88	0.29	0.28	0.75	0.88	0.50
21-1208-01		3.15	0.75	2.63				1.63	
21-1210-00	3900	2.69	0.50	2.13	0.32	0.34	0.75	1.00	0.81
21-1210-01		3.19	1.00	2.63				1.50	
21-1210-04		3.81	1.50	3.13	0.45			2.00	
21-1210-02		4.31	2.00	3.63				2.50	
21-1215-05	8800	2.77	0.50	2.14	0.40	0.34	0.75	1.00	1.13
21-1215-01		3.27	1.00	2.64				1.50	
21-1215-04		3.77	1.50	3.14				2.00	
21-1215-02		4.27	2.00	3.64				2.50	

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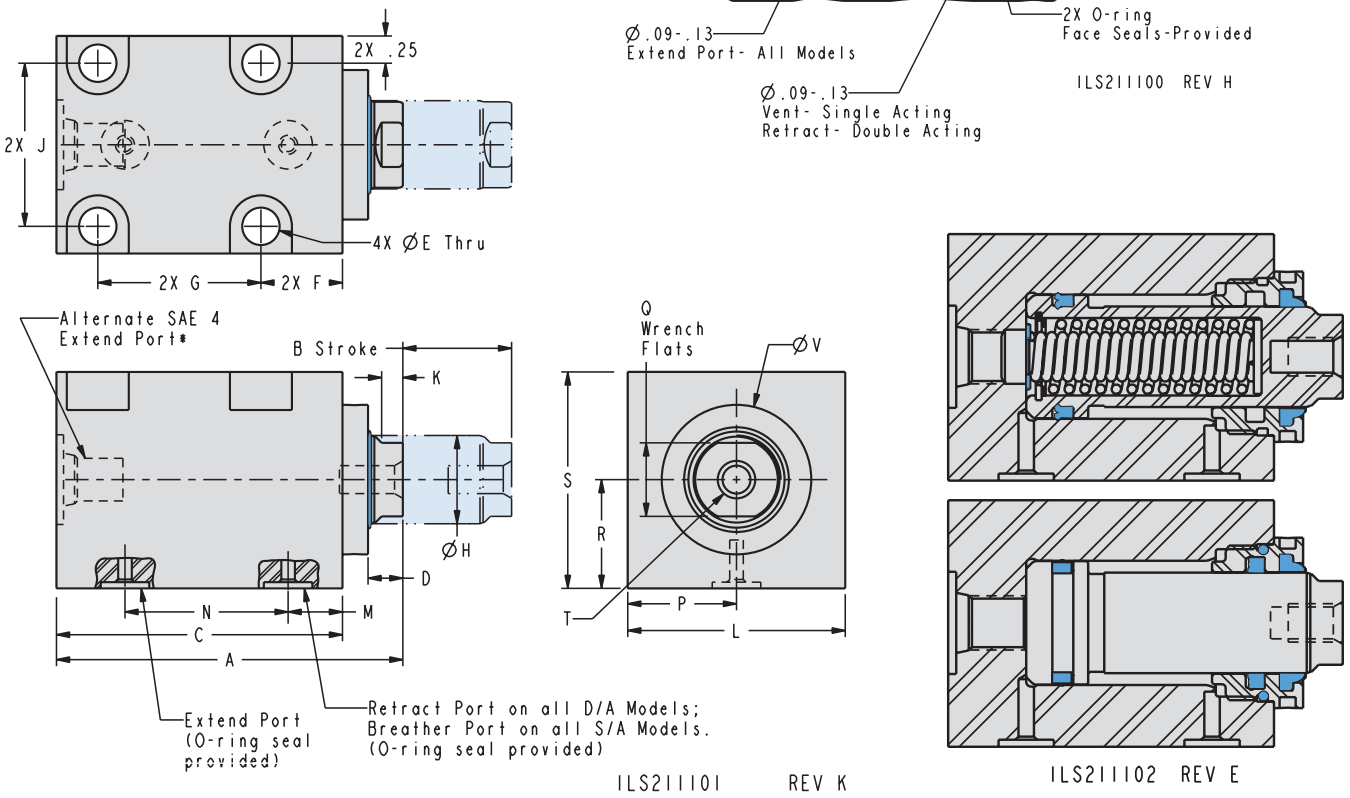
Manifold Mount Block Cylinders

For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.



J	K	L	M	N	P	Q	R	S	T	ØV
Cylinders, actuated hydraulically 1 direction, spring returned.										
1.50	0.22	2.00	0.50	0.88 1.63	1.00	0.43	0.55	1.12	1/4-20 x 0.44	1.06
1.50	0.26	2.00	0.50	1.00 1.50 2.00 2.50	1.00	0.68	0.99	1.99	5/16-18 x 0.44	1.38
2.00	0.36	2.50	0.50	1.00 1.50 2.00 2.50	1.25	1.00	0.99	1.99	1/2-13 x 0.51	1.75
Cylinders, actuated hydraulically both directions.										
1.50	0.22	2.00	0.50	0.88 1.63	1.00	0.43	0.55	1.12	1/4-20 x 0.44	1.06
1.50	0.26	2.00	0.50	1.00 1.50 2.00 2.50	1.00	0.68	0.99	1.99	5/16-18 x 0.44	1.38
2.00	0.36	2.50	0.50	1.00 1.50 2.00 2.50	1.25	1.00	0.99	1.99	1/2-13 x 0.51	1.75

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Cylinders

Hollow Rod (Through hole, center pull)

Single And Double Acting

- Three capacities from 4,600 lb. to 11,700 lb. clamp force at rated pressure.
- Also called "Power Nuts," hollow cylinders will draw or tighten an appropriately sized bolt to clamp or actuate remote mechanisms.
- Keyhole shaped bodies make maximum use of space, sized to piston diameter with additional bulk added for the ports only, not the entire body.
- Easily used to add hydraulics to existing strap clamps or pull against "C" washers.
- Double acting models push and pull with equal force because both sides of the piston have identical areas.

Bolt size threads in piston ends allow the use of standard bolts or threaded rods for remote actuators.

Vent port with bronze filter gives the cylinder a place to "breathe" and helps keep chips and coolants from drawing past wipers (Double acting unclamp port or for single acting breather line installation).

Pistons are retained by a specially designed end cap which reduces spring stresses allowing them to run longer and require less maintenance.

Model No.	Cylinder Capacity (lb.)**	Stroke (in.)	Body Size	Minimum Length (in)	Piston Area (sq. in.)	Oil Capacity (cu. in.)
Single Acting (S/A)				**Cylinders, actuated hydraulically 1 direction, spring returned.**		
20-2113-03	4600	0.25	1.63 x 2.16	2.00	0.920	0.230
20-2115-04	6600	0.38	1.95 x 2.44	2.50	1.325	0.500
20-2120-05	11700	0.50	2.54 x 2.99	3.00	2.356	1.178
Double Acting (D/A)				**Cylinders, actuated hydraulically both directions.**		
20-2213-03	4600	0.25	1.63 x 2.16	2.00	0.920	0.230
20-2215-04	6600	0.38	1.95 x 2.44	2.50	1.325	0.500
20-2220-05	11700	0.50	2.54 x 2.99	3.00	2.356	1.178

** Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying hydraulic pressure. To determine approximate output force, use the following formula: Effective Piston Area times Input Pressure = Clamping Force (Actual force may vary slightly due to friction and/or return springs.)

Dimensions

Model No.	Capacity	A	B	C	D	E	F	G
Single Acting (S/A)								
20-2113-03	4600	2.00	0.25	0.25	1.72	1.63	1.25	2.16
20-2115-04	6600	2.50	0.38	0.25	2.22	1.95	1.44	2.44
20-2120-05	11700	3.00	0.50	0.38	2.59	2.54	2.00	2.99
Double Acting (D/A)								
20-2213-03	4600	2.00	0.25	0.25	1.72	1.63	1.25	2.16
20-2215-04	6600	2.50	0.38	0.25	2.22	1.95	1.44	2.44
20-2220-05	11700	3.00	0.50	0.38	2.59	2.54	2.00	2.99

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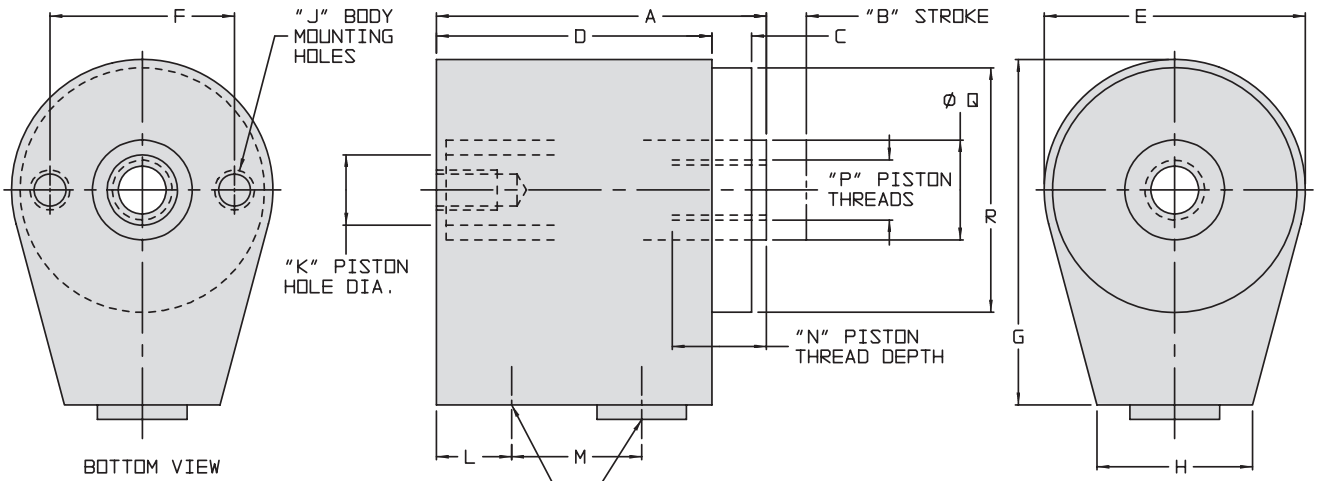
Hollow Rod Dimensions (Through hole, center pull)



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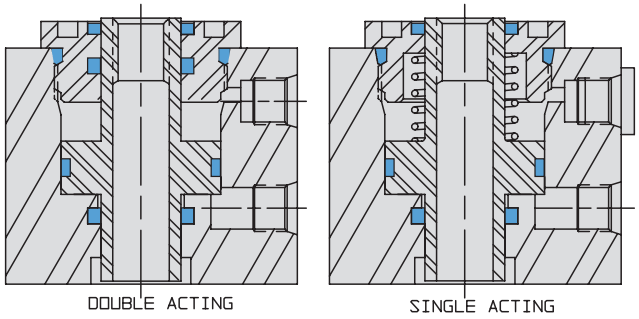

ILS202100 REV C

H	J	K	L	M	N	P	Q	R
Cylinders, actuated hydraulically 1 direction, spring returned.								
0.97	1/4-20 X 0.25	0.41	0.47	0.81	0.59	3/8-16	0.63	1.56
0.94	5/16-18 X 0.31	0.53	0.72	1.00	0.59	1/2-13	0.75	1.88
1.13	3/8-16 X 0.50	0.66	0.91	1.19	0.72	5/8-11	1.00	2.50
Cylinders, actuated hydraulically both directions.								
0.97	1/4-20 X 0.25	0.41	0.47	0.81	0.59	3/8-16	0.63	1.56
0.94	5/16-18 X 0.31	0.53	0.72	1.00	0.59	1/2-13	0.75	1.88
1.13	3/8-16 X 0.50	0.66	0.91	1.19	0.72	5/8-11	1.00	2.50

All dimensions are in inches.

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Cylinders

Cartridge Mount Mini-Cylinders

Single Acting

- Easy to use, basic hydraulic cylinders in four capacities of manifold mount styles.
- Adjustable force ranging from minimal to maximum cylinder capacity, by adjusting the input pressure.
- Reduce or eliminate part distortion by providing accurate clamping force.
- Manifold mounting eliminates exposed tubing for clean, compact, clutter free fixtures.

Special tough wipers help keep chips and contaminants out on all cylinder sizes.

Positive piston stop shoulder keeps the spring from "bottoming out", guarding against premature spring failure which can plague other cylinder brands.

BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching. After years of use, cylinder removal is easier because of BHC's corrosion resistance.

Cartridge models use a gasket to seal against the cavity bottom.

Model No.	Cylinder Capacity (lb.)**	Stroke (in.)	Body Thread	Minimum Length (in.)	Piston Area (sq. in.)	Oil Capacity (cu. in.)
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.						
21-0102-00*	125	0.12	3/8-24	1.16	0.028	0.004
21-0104-02	550	0.19	5/8-18	1.14	0.110	0.021
21-0105-03	980	0.25	3/4-16	1.48	0.196	0.049
21-0105-04				1.44		
21-0108-04	2200	0.38	1 1/16-16	1.36	0.442	0.166
21-0108-05				1.32		
21-0108-08		0.75		2.43		0.332
21-0110-04	3900	0.31	1 5/16-16	1.47	0.785	0.243

* All cylinder pistons are chrome plated, hardened alloy steel with the exception of Model# 21-0102-00 which has a piston made of unhardened stainless steel.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying the hydraulic system pressure. To determine approximate output force for your application, multiply the piston area by the operating pressure. Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.

Dimensions

Model No.	Capacity	A	B	C	D	E	F	G	H	J	K	L
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.												
21-0102-00*	125	3/8-24	1.16	0.12	0.125	0.86	0.04	0.11	0.31	N/A	N/A	0.313
21-0104-02	550	5/8-18	1.14	0.19	0.203	0.69	0.06	0.18	0.50	N/A	0.25	0.539
21-0105-03	980	3/4-16	1.48	0.25	0.203	0.98	0.06	0.25	0.63	N/A	0.25	0.656
21-0105-04			1.44				0.03			8-32 X 0.25	N/A	
21-0108-04	2200	1 1/16-16	1.36	0.38	0.312	0.61	0.06	0.50	0.87	N/A	0.75	0.916
21-0108-05			1.32				0.03			1/4-20 X 0.38	N/A	
21-0108-08			2.43	0.75		1.69	0.06			1/4-20 X 0.44		
21-0110-04	3900	1 5/16-16	1.47	0.31	0.312	0.72	0.09	0.63	1.00	1/4-20 X 0.50	N/A	1.222

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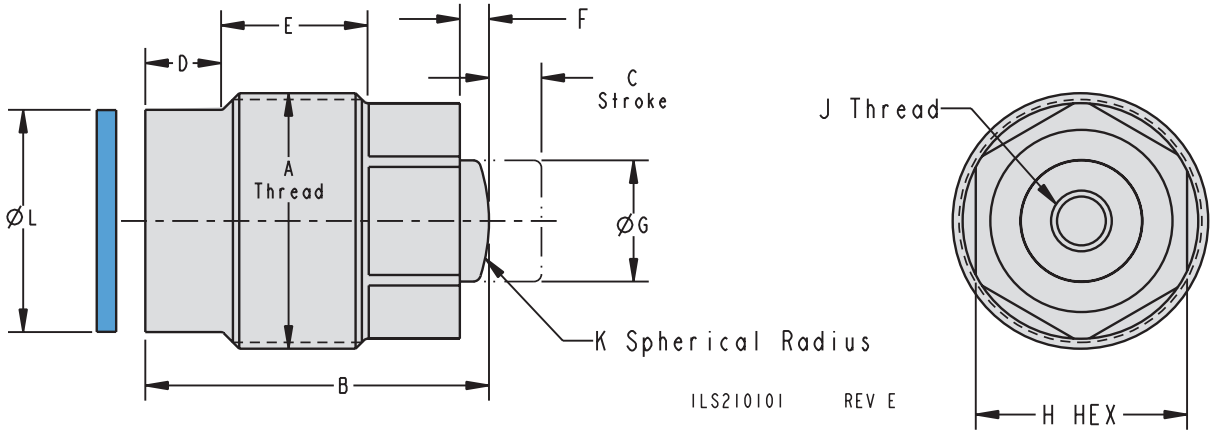

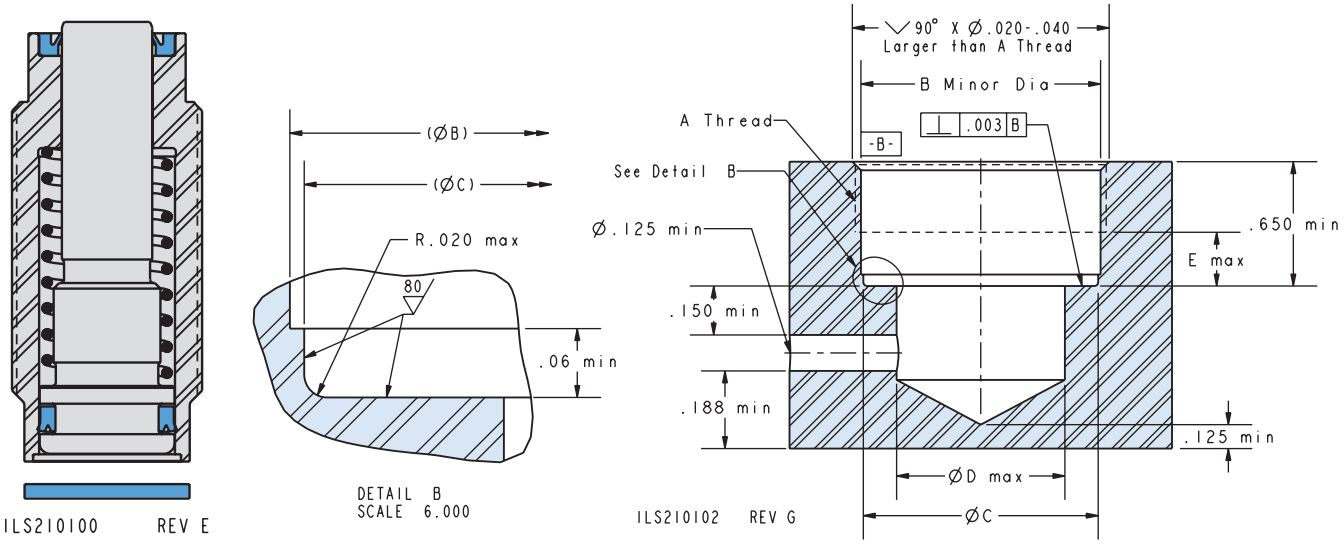

Cavity Dimensions

A	Metal Gasket Torque	Composite Gasket Torque	ØB	ØC	D	E
Cylinders, actuated hydraulically 1 direction, spring returned.						
3/8-24 UNF-2B	10 FT-LB	N/A	0.335± 0.003	0.325± 0.005	0.13	0.100
5/8-18 UNF-2B	30 FT-LB	15 FT-LB	0.572± 0.003	0.545± 0.005	0.31	0.156
3/4-16 UNF-2B	40 FT-LB	20 FT-LB	0.690± 0.003	0.662± 0.005	0.38	0.156
1 1/16-16 UNF-2B	50 FT-LB	25 FT-LB	1.002± 0.003	0.923± 0.005	0.63	0.281
1 5/16-16 UNF-2B	N/A	35 FT-LB	1.253± 0.003	1.228± 0.005	0.88	0.281

Both metal and composite gaskets are supplied. Use only one gasket of your choice.

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Push/Pull Cylinders

Frequently Asked Questions

Frequently Asked Questions

What is the intended application of these devices?

They are intended for use actuating remote mechanisms, pulling on clamp plates, or often with removable "C" washers as a manual assembly, automatically activated pull clamp.

I want a non-rotating model, how do I get a guided pull cylinder?

See the swing clamp pages (section C), order the required swing clamp size assembled in the straight line guided track. This will get you the intended pull cylinder with a guided straight line pull, or you may add an external guide to many applications.

I need to draw a wedge but I have had problems unlocking hydraulic wedge mechanisms. How do I solve this problem?

The best solution is to draw the wedge using a double acting push/pull cylinder. This will give you a push capacity of approximately 2:1 providing adequate force to overcome the mechanical advantage involved in the wedging action.

I want to make my part locators disappear. How can I do this?

You can mount them on either single or double acting push/pull cylinders. Always use double acting if there will be a guide bushing or other frictional mechanism, or if positive extension is required in a short time. When extended, your locators are in place to help position your part. After location you just need to actuate your pull cylinders and draw the locator out of the way.

I need to crowd a part against the fixed stops on my fixture then retract the spring plungers. Do you have anything to do this?

Yes, you may use single acting pull cylinders as stock crowders to hold your part in place, then draw them away for machining. This can often be done with a single hydraulic clamping circuit making your controls very simple. Be sure to use a hardened contact point on your pull cylinder when using it as a stock crowder.

I notice that you don't have a double acting block pull cylinder. Why not?

Double acting block pull cylinders are the same as double acting block cylinders. Please order a simple double acting block cylinder for this function. Other models may be readily available in their exact configuration under different numbers.

I need to manually index a swing clamp. The rotation required to clear the part varies from part to part, I can use a little extra stroke also. Can you help?

Maybe. If the contact point location on the part is not critical, you can use a single acting pull cylinder as a manually indexed swing clamp. Remember that the arm is not guided as it travels down. The extra stroke comes from your operator swinging the cylinder "flat" in the unclamp position, it then has the full cylinder stroke to pull the arm against the workpiece. Please avoid using double acting cylinders as they are difficult to swing when pressurized in the up position.

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Standard Features

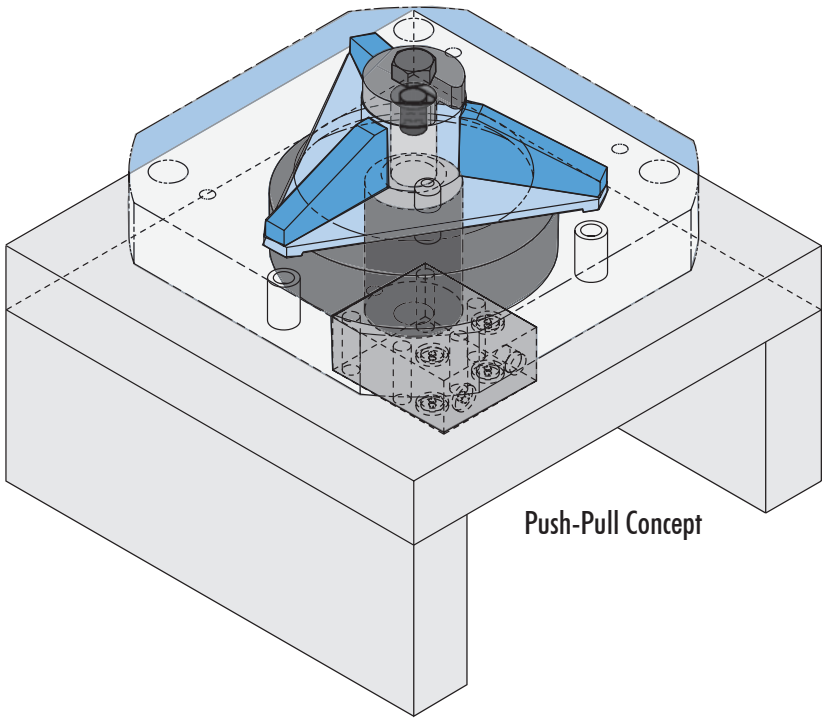
Special wipers keep chips and contaminants out.

Hardened chrome alloy steel plungers run longer with less wear and drag than other brands.

Vent port with bronze filter gives the cylinder a place to "breathe" and helps keep chips from drawing past wipers (Can be used for a breather line. Used as the double acting unclamp port).

BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching, especially in the event of high side or "kick" loads which promote excessive scoring in many other brands.

Proprietary seal designs reduce leakage and increase seal life for longer lasting, more dependable cylinders.



Push-Pull Concept

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Push/Pull Cylinders

Threaded Body

Single And Double Acting

- Available in pull capacities of 470 lbs, 1400 lbs, 3100 lbs and 5600 lbs.
- Single acting plunger is spring extended, hydraulically retracted.
- Also available in a straight line guided model, order as a Swing Clamp.
- Special concentric design model available to replace competitive products that fail.

Hardened chrome alloy steel plungers run longer with less wear and drag than other brands.

SAE porting is standard for leak free plumbing connection.

Vent port with bronze filter gives the cylinder a place to "breathe" and helps keep chips from drawing past wipers (Can be used for a remote breather line. Used as the double acting unclamp port).

Proprietary seal designs reduce leakage and increase seal life for longer lasting, more dependable cylinders.

Threaded plunger ends allow the attachment of arms, mechanisms or remote actuators.

Push/Pull cylinders are not shipped with cap screws.

Model No.	Cylinder Capacity (lb.)**		Stroke (in.)	Extended Height (in.)	Effective Piston Area (sq. in.)		Oil Capacity (cu. in.)	
	Extend	Retract			Extend	Retract	Extend	Retract
Single Acting (S/A)					**Cylinders, actuated hydraulically 1 direction, spring returned.**			
25-0105-00	N/A	470	0.57	4.00	N/A	0.098	N/A	0.056
25-0109-08	N/A	1400	0.79	5.28	N/A	0.295	N/A	0.233
25-0113-11	N/A	3100	1.16	6.78	N/A	0.626	N/A	0.726
25-0118-00	N/A	5600	1.66	9.29	N/A	1.178	N/A	1.955
Double Acting (D/A)					**Cylinders, actuated hydraulically both directions.**			
25-0205-00	1200	470	0.57	4.00	0.249	0.098	0.142	0.056
25-0209-08	3000	1400	0.79	5.28	0.601	0.295	0.475	0.233
25-0213-11	6100	3100	1.16	6.78	1.227	0.626	1.423	0.726
25-0218-00	12000	5600	1.66	9.29	2.405	1.178	3.992	1.955

** Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying the hydraulic system pressure. To determine approximate output force for your application, multiply the Piston Area times Your System Operating Pressure. (Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.)

Dimensions

Model No.	Capacity Extend	Capacity Retract	A	B	C	D	E	F	G
Single Acting (S/A)									
25-0105-00	N/A	470	1 1/16 - 16	4.02	0.75	2.02	0.27	1.94	0.15
25-0109-08	N/A	1400	1 1/2 - 16	5.32	1.09	2.54	0.38	2.40	0.15
25-0113-11	N/A	3100	1 7/8 - 16	6.81	1.06	3.35	0.36	3.21	0.15
25-0118-00	N/A	5600	2 1/2 - 16	9.31	1.19	4.71	0.39	4.59	0.15
Double Acting (D/A)									
25-0205-00	1200	470	1 1/16 - 16	4.02	0.75	2.02	0.27	1.94	0.15
25-0209-08	3000	1400	1 1/2 - 16	5.32	1.09	2.54	0.38	2.40	0.15
25-0213-11	6100	3100	1 7/8 - 16	6.81	1.06	3.35	0.36	3.21	0.15
25-0218-00	12000	5600	2 1/2 - 16	9.31	1.19	4.71	0.39	4.59	0.15

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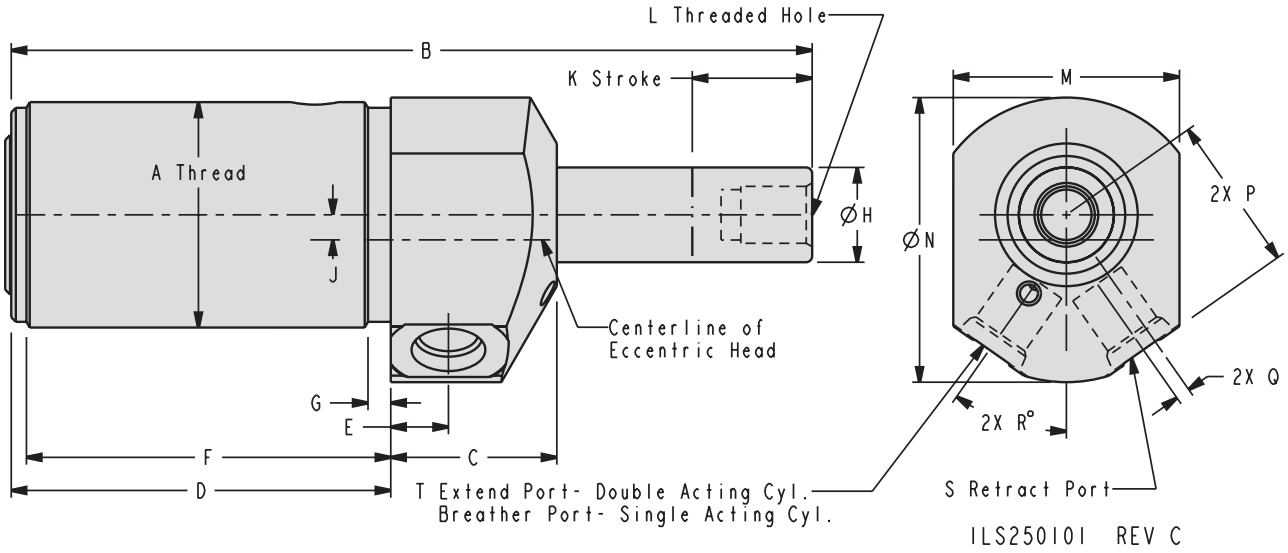

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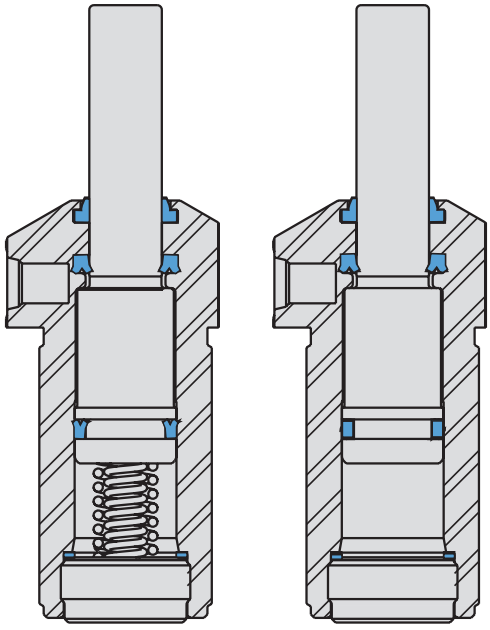

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	ØH	J	ØK	L	M	ØN	P	Q	R	S	T
Cylinders, actuated hydraulically 1 direction, spring returned.											
	0.437	0.19	0.57	1/4 - 28 X 0.28	1.13	1.50	0.81	N/A	25°	SAE 2	Breather
	0.625	0.16	0.79	3/8 - 24 X 0.47	1.50	1.88	1.03	0.09	35°	SAE 4	Breather
	0.875	0.16	1.16	1/2 - 20 X 0.52	1.88	2.25	1.20	0.08	30°	SAE 4	Breather
	1.250	0.10	1.66	5/8 - 18 X 0.75	2.50	2.75	1.42	0.05	30°	SAE 4	Breather
Cylinders, actuated hydraulically both directions.											
	0.437	0.19	0.57	1/4 - 28 X 0.28	1.13	1.50	0.81	N/A	25°	SAE 2	SAE 2
	0.625	0.16	0.79	3/8 - 24 X 0.47	1.50	1.88	1.03	0.09	35°	SAE 4	SAE 4
	0.875	0.16	1.16	1/2 - 20 X 0.52	1.88	2.25	1.20	0.08	30°	SAE 4	SAE 4
	1.250	0.10	1.66	5/8 - 18 X 0.75	2.50	2.75	1.42	0.05	30°	SAE 4	SAE 4

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Push/Pull Cylinders

Manifold/Top Flange

Single And Double Acting

- Our tapered top flange is designed to keep chips and coolants away from the internal working cylinder parts.
- Bolt into place and plumb, or to eliminate the external plumbing, follow the easy-to-make manifold pattern.
- Use standard SAE fittings to plumb.
- Single piece body and mounting give a rigid installation, no additional mounting hardware to purchase or install.
- Fitting 30-8711-20, adapter assembly, and plugs are included and shipped with the clamp, drawing on page G-6.
- Also available in a straight line guided model, order as swing clamp.

Low install clamping height can be adjusted to fit your part with easy-to-make risers.

Standard SAE and manifold plumbing options are built into each unit.

Push/Pull cylinders are not shipped with cap screws.

Model No.	Cylinder Capacity (lb.)**		Stroke (in.)	Extended Height	Effective Piston Area (sq. in.)		Oil Capacity (cu. in.)		Optional Flow Control Model No.
	Extend	Retract			Extend	Retract	Extend	Retract	
Single Acting (S/A)						Cylinders, actuated hydraulically 1 direction, spring returned.			
25-0505-00	N/A	470	0.57	4.00	N/A	0.098	N/A	0.056	70-2037-70
25-0509-08	N/A	1400	0.79	5.28	N/A	0.295	N/A	0.233	70-2037-71
25-0513-11	N/A	3100	1.16	6.78	N/A	0.626	N/A	0.726	70-2037-71
25-0518-00	N/A	5600	1.66	9.29	N/A	1.178	N/A	1.955	70-2037-72
Double Acting (D/A)						Cylinders, actuated hydraulically both directions.			
25-0605-00	1200	470	0.57	4.00	0.249	0.098	0.142	0.056	70-2037-70
25-0609-08	3000	1400	0.79	5.28	0.601	0.295	0.475	0.233	70-2037-71
25-0613-11	6100	3100	1.16	6.78	1.227	0.626	1.423	0.726	70-2037-71
25-0618-00	12000	5600	1.66	9.29	2.405	1.178	3.992	1.955	70-2037-72

** Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying the hydraulic system pressure. To determine approximate output force for your application, multiply the Piston Area times Your System Operating Pressure. (Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.)

Dimensions

Model No.	Capacity Extend	Capacity Retract	ØA	B	C	D	E	ØH	K	L	ØM	N
Single Acting (S/A)												
25-0505-00	N/A	470	0.99	4.02	0.75	2.02	0.31	0.437	0.57	1/4 - 28 X 0.28	0.22	0.31
25-0509-08	N/A	1400	1.43	5.32	1.03	2.60	0.38	0.625	0.79	3/8 - 24 X 0.47	0.28	0.50
25-0513-11	N/A	3100	1.74	6.82	1.06	3.35	0.41	0.875	1.16	1/2 - 20 X 0.52	0.34	0.41
25-0518-00	N/A	5600	2.37	9.31	1.47	4.43	0.54	1.250	1.66	5/8 - 18 X 0.75	0.41	0.75
Double Acting (D/A)												
25-0605-00	1200	470	0.99	4.02	0.75	2.02	0.31	0.437	0.57	1/4 - 28 X 0.28	0.22	0.31
25-0609-08	3000	1400	1.43	5.32	1.03	2.60	0.38	0.625	0.79	3/8 - 24 X 0.47	0.28	0.50
25-0613-11	6100	3100	1.74	6.82	1.06	3.35	0.41	0.875	1.16	1/2 - 20 X 0.52	0.34	0.41
25-0618-00	12000	5600	2.37	9.31	1.47	4.43	0.54	1.250	1.66	5/8 - 18 X 0.75	0.41	0.75

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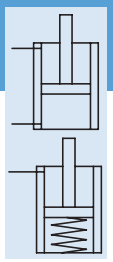
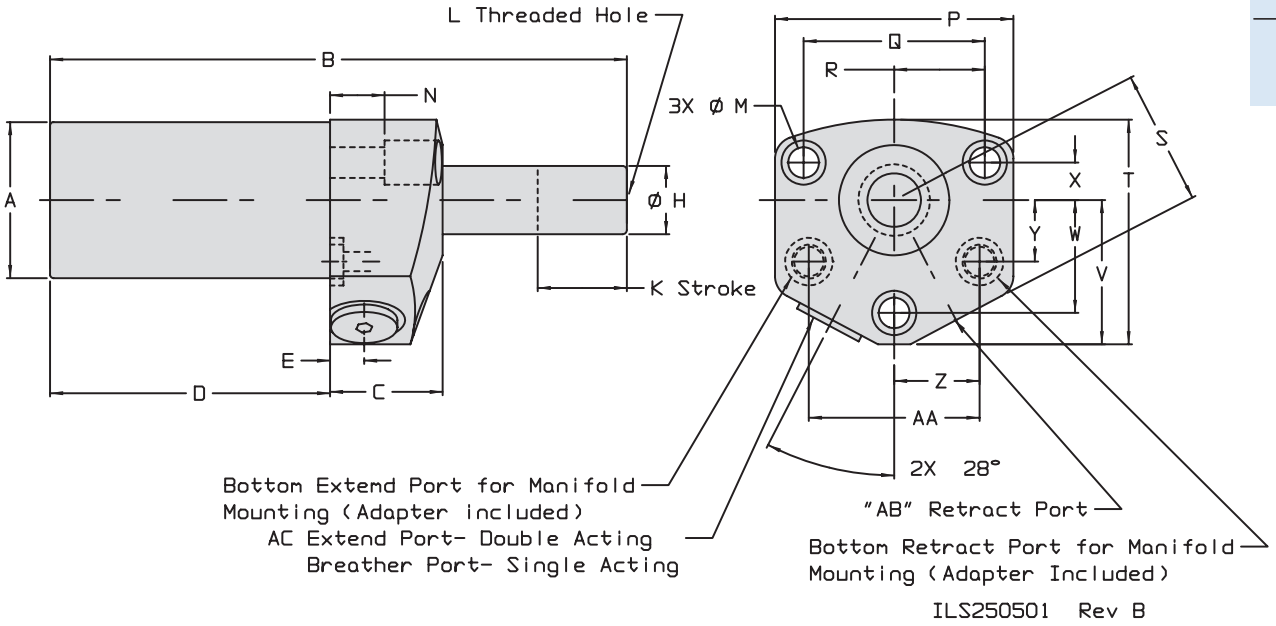
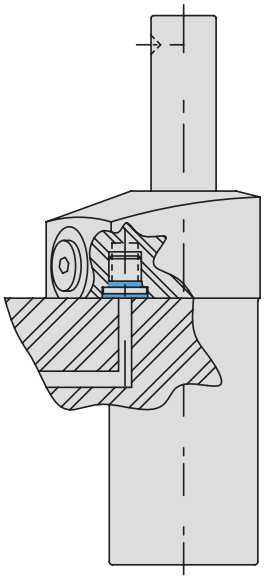
Manifold/Top Flange





ILS250501 Rev B

For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.



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P	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC
Cylinders, actuated hydraulically 1 direction, spring returned.												
1.88	1.38	0.69	0.96	1.58	1.02	0.80	0.22	0.44	0.63	1.25	SAE 2	SAE 2
2.31	1.75	0.88	1.24	2.06	1.32	1.03	0.34	0.56	0.84	1.69	SAE 4	SAE 4
2.69	2.00	1.00	1.53	2.53	1.63	1.25	0.44	0.53	1.05	2.09	SAE 4	SAE 4
3.61	2.73	1.37	2.05	3.34	2.13	1.72	0.60	0.75	1.41	2.81	SAE 4	SAE 4
Cylinders, actuated hydraulically both directions.												
1.88	1.38	0.69	0.96	1.58	1.02	0.80	0.22	0.44	0.63	1.25	SAE 2	SAE 2
2.31	1.75	0.88	1.24	2.06	1.32	1.03	0.34	0.56	0.84	1.69	SAE 4	SAE 4
2.69	2.00	1.00	1.53	2.53	1.63	1.25	0.44	0.53	1.05	2.09	SAE 4	SAE 4
3.61	2.73	1.37	2.05	3.34	2.13	1.72	0.60	0.75	1.41	2.81	SAE 4	SAE 4

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Push/Pull Cylinders

Manifold/Bottom Flange

Single And Double Acting

- Single acting are available in three capacities, with retracts from 470 to 3,100 lb. force at rated pressure.
- Double acting have an extend capacity of 1,200 to 6,100 lb., with their retract capacities the same as the single acting at the same operating pressure.
- Mounting versatility allows the unit to be bolted up, bolted down, or to be traditionally mounted.
- Single piece body and mounting give a rigid installation without additional mounting hardware to buy, saving time and money.
- Also available in a straight line guided model, order as swing clamp.

BHC™ (Black Hard Coating) on the cylinder bodies and rod bearing surface helps prevent scoring and scratching especially in the event of high side kick loads which promote excessive scoring in many other brands.

SAE porting from three directions gives you five alternatives. You can use standard fittings in any of the three sets of ports or manifold by bolting up or down.

Hardened chrome alloy steel plungers run longer with less wear and drag than other brands.

Push/Pull cylinders are not shipped with cap screws.

Model No.	Cylinder Capacity (lb.)**		Stroke (in)	Extended Height (in)	Effective Piston Area (sq. in.)		Oil Capacity (cu. in.)		Optional Flow Control Model No.
	Extend	Retract			Extend	Retract	Extend	Retract	
Single Acting (S/A)									**Cylinders, actuated hydraulically 1 direction, spring returned.**
25-2105-01	N/A	470	0.57	4.06	N/A	0.098	N/A	0.056	70-2037-71
25-2109-01	N/A	1400	0.79	5.33	N/A	0.295	N/A	0.233	70-2037-73
25-2113-01	N/A	3100	1.16	6.83	N/A	0.626	N/A	0.726	70-2037-73
Double Acting (D/A)									**Cylinders, actuated hydraulically both directions.**
25-2205-01	1200	470	0.57	4.06	0.249	0.098	0.142	0.056	70-2037-71
25-2209-01	3000	1400	0.79	5.33	0.601	0.295	0.475	0.233	70-2037-73
25-2213-01	6100	3100	1.16	6.83	1.227	0.626	1.423	0.726	70-2037-73

** Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying the hydraulic system pressure. To determine approximate output force for your application, multiply the Piston Area times Your System Operating Pressure. (Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.)

Dimensions

Model No.	Capacity Extend	Capacity Retract	ØA	C	D	E	F	ØG	H	J	K
Single Acting (S/A)											
25-2105-01*	N/A	470	1.05	4.06	2.80	1.00	SAE 4	0.438	0.38	0.66	Breather
25-2109-01	N/A	1400	1.49	5.33	3.65	1.25	SAE 4	0.625	0.56	0.63	Breather
25-2113-01	N/A	3100	1.87	6.83	4.43	1.25	SAE 4	0.875	0.75	0.63	Breather
Double Acting (D/A)											
25-2205-01*	1200	470	1.05	4.06	2.80	1.00	SAE 4	0.438	0.38	0.66	SAE 4
25-2209-01	3000	1400	1.49	5.33	3.65	1.25	SAE 4	0.625	0.56	0.63	SAE 4
25-2213-01	6100	3100	1.87	6.83	4.43	1.25	SAE 4	0.875	0.75	0.63	SAE 4

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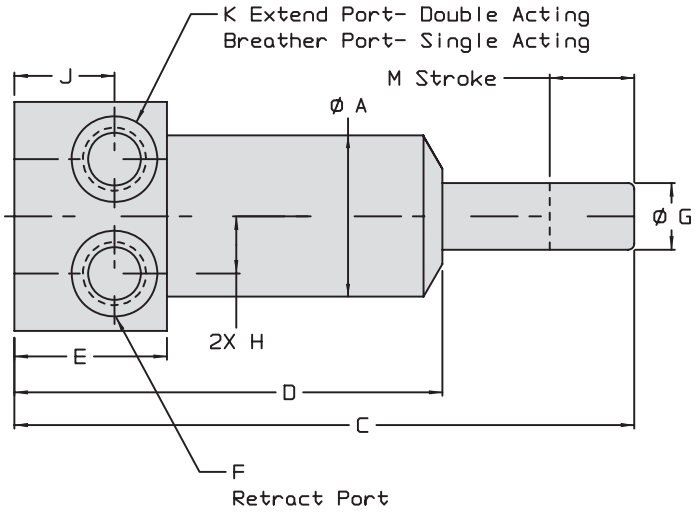
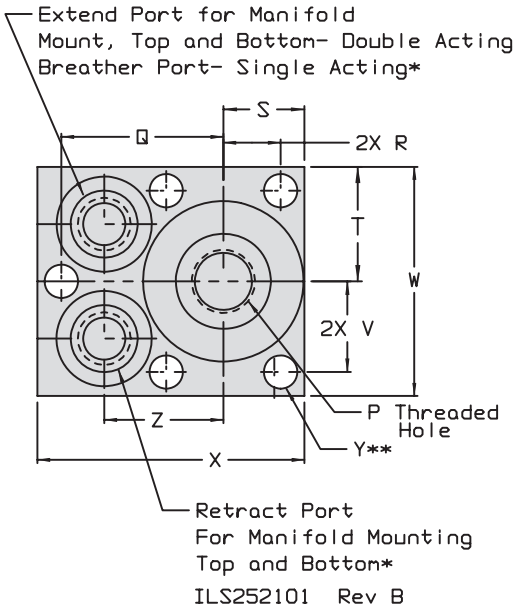
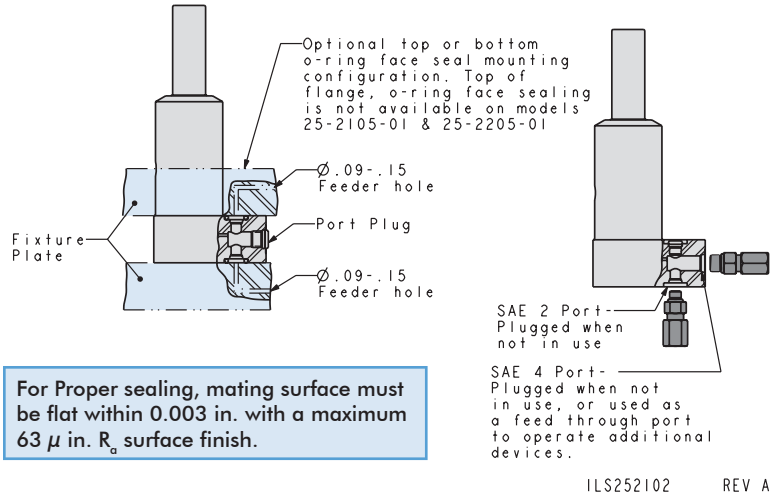
Manifold/Bottom Flange



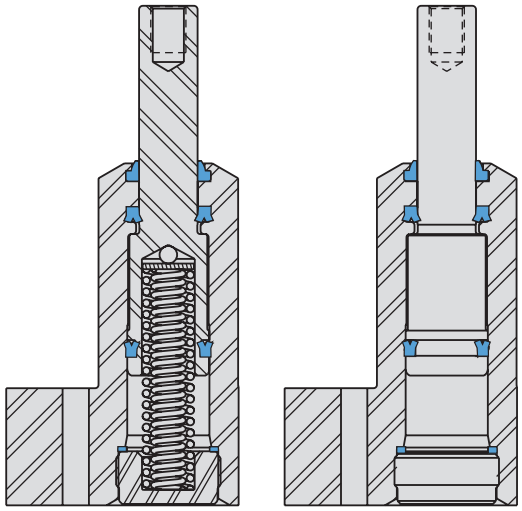


* Models 25-2105-01 and 25-2205-01 can be manifold mounted from the bottom surface only. All other models are shipped with the necessary plugs and O-rings for manifold mounting.

** All five mounting screws must be used when manifold mounting to assure a leak free O-ring seal.



For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μ in. R_a surface finish.



	M	P	Q	R	S	T	V	W	X	ØY	Z
Cylinders, actuated hydraulically 1 direction, spring returned.											
	0.57	1/4 - 28 x 0.28	1.06	0.38	0.53	0.75	0.59	1.50	1.75	0.22	0.78
	0.79	3/8 - 24 x 0.47	0.99	0.56	0.75	1.00	0.81	2.00	2.50	0.28	1.13
	1.16	1/2 - 20 x 0.52	1.21	0.69	0.94	1.25	1.00	2.50	3.00	0.34	1.25
Cylinders, actuated hydraulically both directions.											
	0.57	1/4 - 28 x 0.28	1.06	0.38	0.53	0.75	0.59	1.50	1.75	0.22	0.78
	0.79	3/8 - 24 x 0.47	0.99	0.56	0.75	1.00	0.81	2.00	2.50	0.28	1.13
	1.16	1/2 - 20 x 0.52	1.21	0.69	0.94	1.25	1.00	2.50	3.00	0.34	1.25

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Push/Pull Cylinders

Cartridge Mount

Single And Double Acting

- Cylinders are used when rotational swing arms are not beneficial.
- Single acting are available in three retract capacities from 470 to 3,100 lb. force.
- Double acting have an extend capacity of 1,200 to 6,100 lb., with their retract capacities the same as the single acting at the same operating pressure.
- Threaded plunger ends allow the attachment of arms or other mechanisms.
- Also available in a straight line guided model, order as a swing clamp.

Provides a long stroke in a compact body design. Can be mounted into fixture to reduce height.

Hardened chrome alloy steel plungers run longer with less wear and drag than other brands.

Vent port with bronze filter gives the cylinder a place to "breathe" and helps keep chips from drawing past wipers (unclamp port on double acting models).

Push/Pull cylinders are not shipped with cap screws.

Model No.	Cylinder Capacity (lb.)**		Stroke (in.)	Body Thread	Effective Piston Area (sq. in.)		Oil Capacity (cu. in.)	
	Extend	Retract			Extend	Retract	Extend	Retract
Single Acting (S/A)						Cylinders, actuated hydraulically 1 direction, spring returned.		
25-1105-01	N/A	470	0.57	1 1/16-12	N/A	0.098	N/A	0.056
25-1109-09	N/A	1400	0.79	1 5/8-12	N/A	0.295	N/A	0.233
25-1113-12	N/A	3100	1.16	1 7/8-12	N/A	0.626	N/A	0.726
Double Acting (D/A)						Cylinders, actuated hydraulically both directions.		
25-1205-01	1200	470	0.57	1 1/16-12	0.249	0.098	0.142	0.056
25-1209-09	3000	1400	0.79	1 5/8-12	0.601	0.295	0.475	0.233
25-1213-12	6100	3100	1.16	1 7/8-12	1.227	0.626	1.423	0.726

** Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying the hydraulic system pressure. To determine approximate output force for your application, multiply the Piston Area times Your System Operating Pressure. (Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.)

Dimensions

Model No.	Capacity Extend	Capacity Retract	A	C	D	E	F	G
Single Acting (S/A)								
25-1105-01	N/A	470	2.13	1.32	1.88	0.13	0.63	0.49
25-1109-09	N/A	1400	2.70	1.50	2.63	0.13	0.94	0.65
25-1113-12	N/A	3100	3.17	1.50	3.65	0.16	1.25	0.55
Double Acting (D/A)								
25-1205-01	1200	470	2.13	1.32	1.88	0.13	0.63	0.49
25-1209-09	3000	1400	2.70	1.50	2.63	0.13	0.94	0.65
25-1213-12	6100	3100	3.17	1.50	3.65	0.16	1.25	0.55

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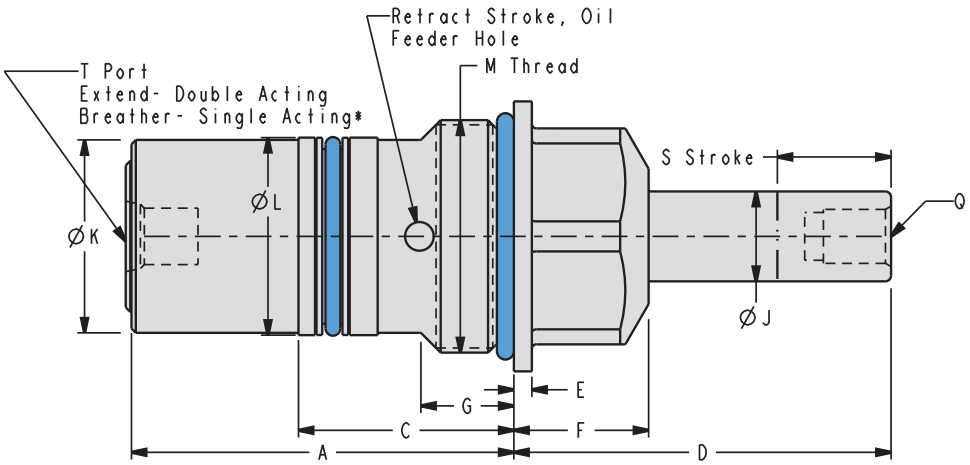
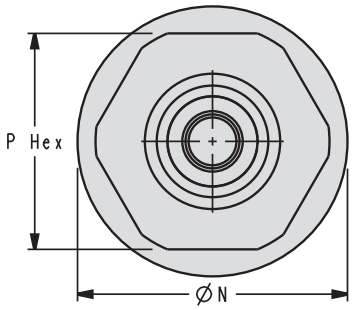
Push/Pull Cylinders

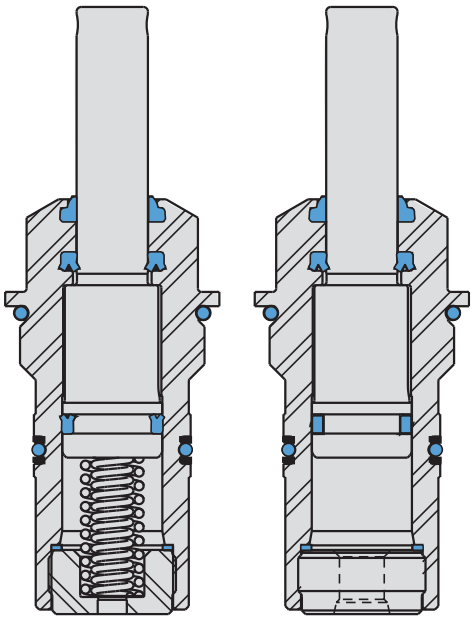
Cartridge Mount





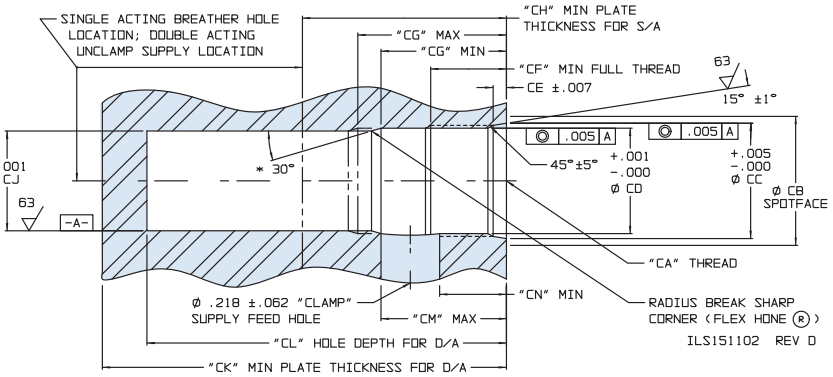
ILS251103 REV C

* Single Acting models must be vented. Do not install in blind holes.



Pull Cylinder Push/Pull Cylinder

ILS251102 REV D



ILS151102 REV D

All dimensions are in inches.

* The 30° lead in angle is to ensure trouble free seal installation, see drawing.

NOTE: Flexible honing of cavity is strongly recommended. Flex-Hone™ is a registered trademark of Brush Research Manufacturing Co. Inc., Los Angeles, CA, 323-261-2193. Please contact Brush Research for additional information.

SEE PAGE C-26 FOR CAVITY DIMENSIONS

	ØJ	ØK	ØL	M	ØN	P	Q	R	S	T
Cylinders, actuated hydraulically 1 direction, spring returned.										
	0.438	0.92	0.935	1 1/16 - 12	1.25	1.00	1/4 - 28 X 0.28	0.22	0.57	Breather
	0.625	1.34	1.372	1 5/8 - 12	1.88	1.50	3/8 - 24 X 0.47	0.31	0.79	Breather
	0.875	1.72	1.747	1 7/8 - 12	2.13	1.63	1/2 - 20 X 0.52	0.50	1.16	Breather
Cylinders, actuated hydraulically both directions.										
	0.438	0.92	0.935	1 1/16 - 12	1.25	1.00	1/4 - 28 X 0.28	0.22	0.57	SAE 2
	0.625	1.34	1.372	1 5/8 - 12	1.88	1.50	3/8 - 24 X 0.47	0.31	0.79	SAE 4
	0.875	1.72	1.747	1 7/8 - 12	2.13	1.63	1/2 - 20 X 0.52	0.50	1.16	SAE 4

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Push/Pull Cylinders

Block Pull

Single Acting

- No mounting hardware required, just bolt in place to secure these "draw" action cylinders.
- Adjustable force ranging from "negligible" to maximum cylinder capacity, just adjust the input pressure.
- Normally extended piston provides a simple device for actuating clamping mechanisms, device manipulation or disappearing spring crowders.

Threaded plunger ends allow the attachment of custom end treatments or the use of bolts to pull "C" washers.

Hardened chrome alloy steel pistons won't "mushroom" or wear unevenly.

Vent port with bronze filter gives the cylinder a place to "breathe" and helps keep chips from drawing past wipers.

Specially designed springs run longer, require less maintenance.

Model No.	Cylinder Capacity (lb.)** Retract	Stroke (in.)	Body Size	Extended Height (in.)	Piston Area (sq. in.)	Oil Capacity (cu. in.)
Single Acting (S/A)				Cylinders, actuated hydraulically 1 direction, spring returned.		
25-1110-11	1300	1.00	1.75 x 2.00	4.30	0.267	0.268
25-1110-12		2.00		6.43		0.536
25-1115-11	3800	1.00	2.00 x 2.50	4.38	0.773	0.774
25-1115-12		2.00		6.51		1.548

** Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying hydraulic pressure. To determine approximate output force, use the following formula: Effective Piston Area X Input Pressure = Clamping Force (Actual force may vary slightly due to friction and/or return springs.)

Dimensions

Model No.	Capacity	A	B	C	D	E	F	G	H	J	K	L
Single Acting (S/A)												
25-1110-11	1300	4.30	1.00	2.75	1.32	0.34	1.06	N/A	0.81	1.50	0.28	2.00
25-1110-12		6.43	2.00	3.87	2.32			1.62				
25-1115-11	3800	4.38	1.00	2.75	1.40	0.34	1.06	N/A	1.13	2.00	0.34	2.50
25-1115-12		6.51	2.00	3.87	2.40			1.62				

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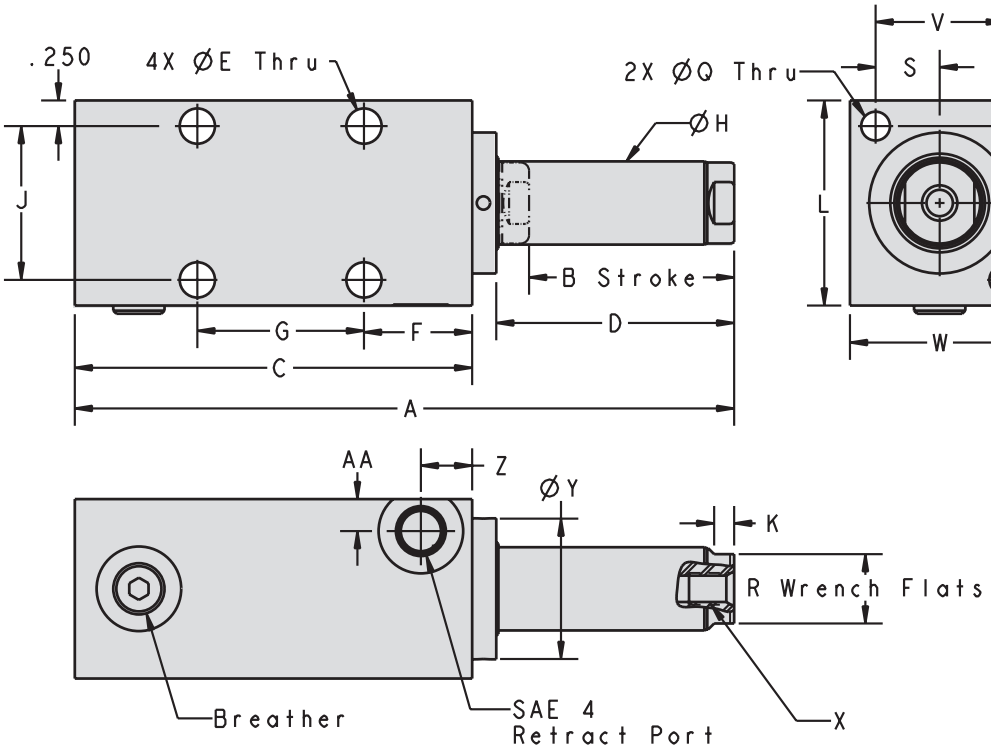
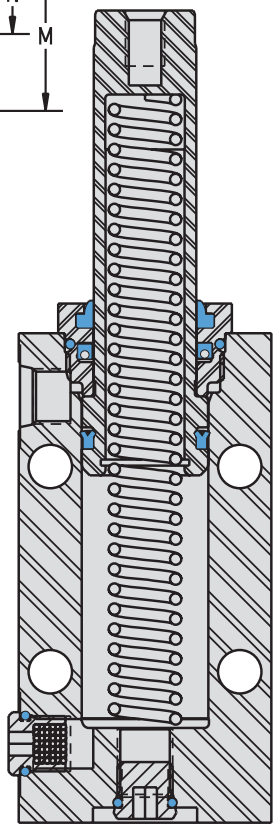


ILS251101 REV C



ILS251100 REV D

	M	N	P	Q	R	S	T	V	W	X	Y	Z	AA
Cylinders, actuated hydraulically 1 direction, spring returned.													
	1.50	0.75	1.00	0.28	0.68	0.62	0.87	1.25	1.75	5/16-18 X 0.44	1.38	0.50	0.31
	1.90	0.95	1.25	0.34	1.00	0.70	1.00	1.40	2.00	1/2-13 X 0.51	1.75	0.50	0.31

All dimensions are in inches.

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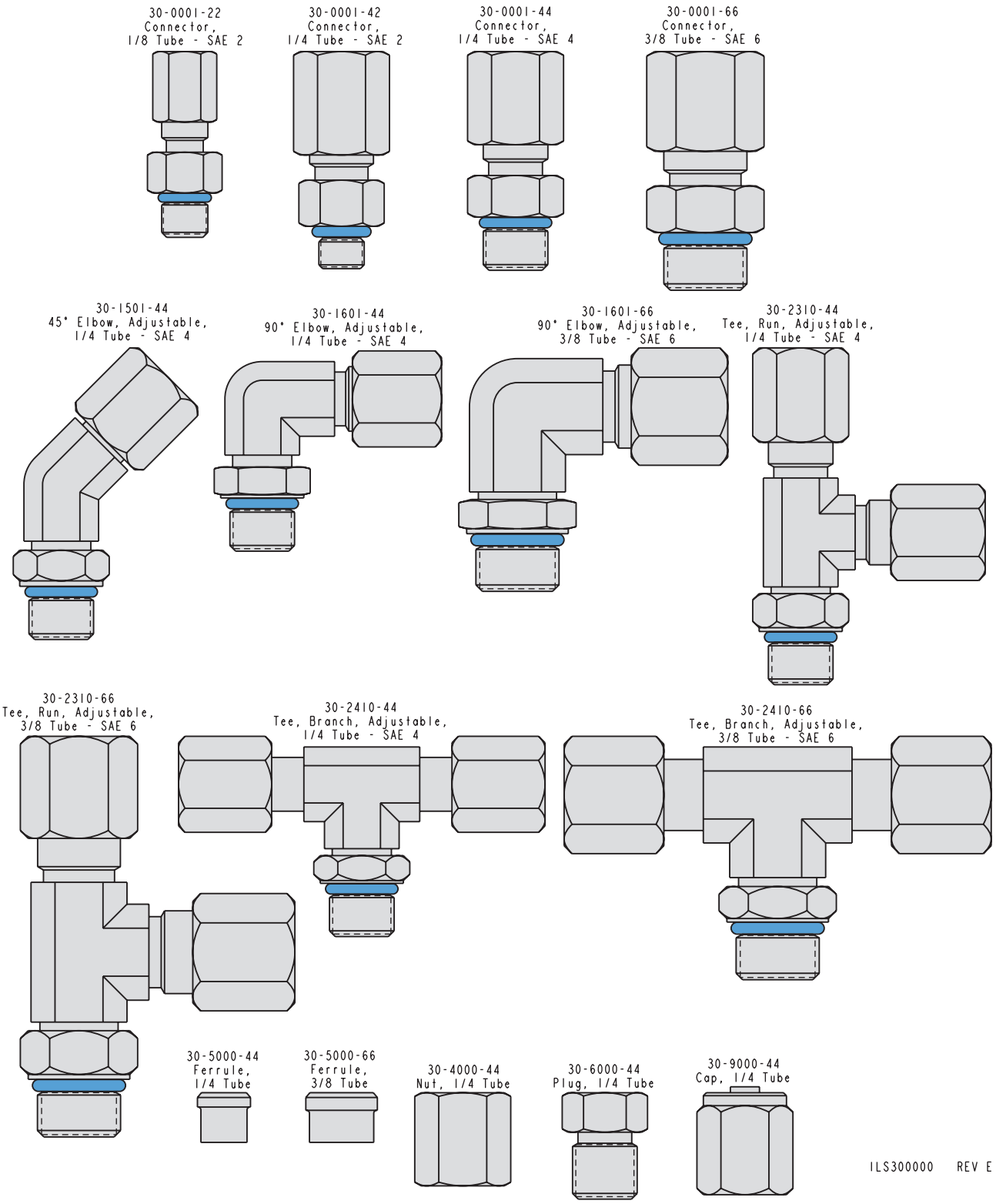
Connectors, Elbows and Tees

SAE Connectors, Elbows, Tees and Plugs



ILS300000 REV E

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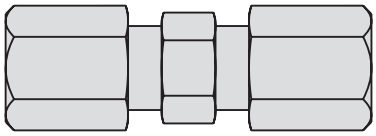
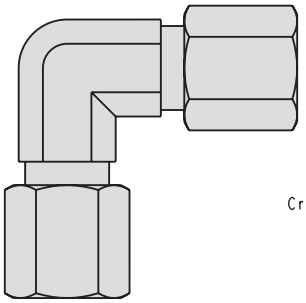
Flareless Tube and Straight Thread Fittings

SAE J514, Flareless Tube Fittings

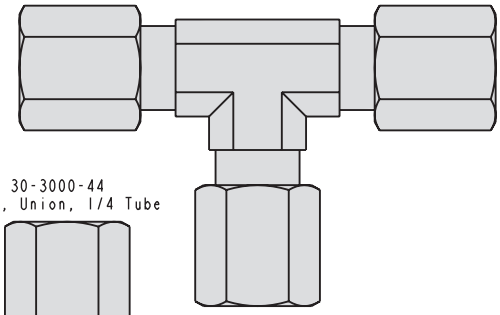
30-0000-44
Union, Straight, 1/4 Tube



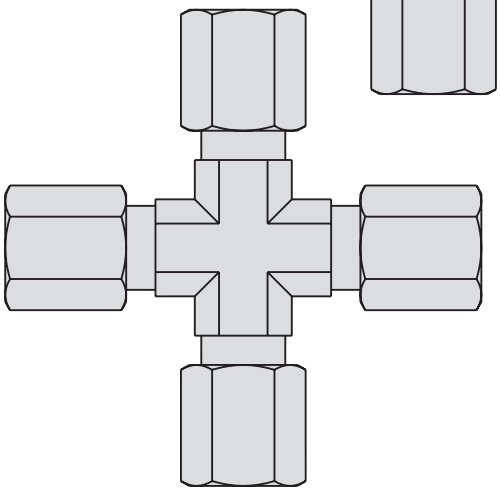
30-1600-44
90° Elbow, Union, 1/4 Tube



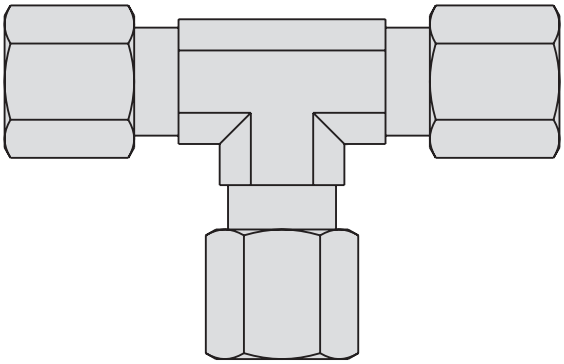
30-2000-44
Tee, Union, 1/4 Tube



30-3000-44
Cross, Union, 1/4 Tube

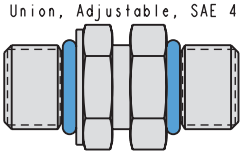


30-2000-66
Tee, Union, 3/8 Tube

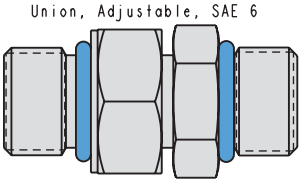


SAE Straight Thread

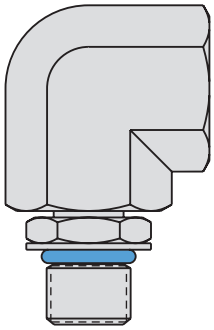
30-0011-44
Union, Adjustable, SAE 4



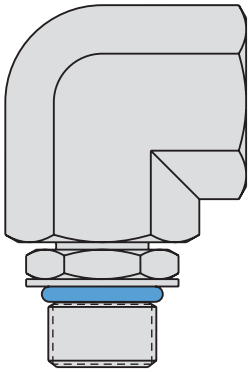
30-0011-66
Union, Adjustable, SAE 6



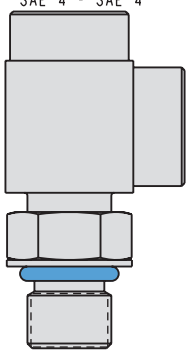
30-1621-44
90° Elbow, Adjustable,
SAE 4 - SAE 4



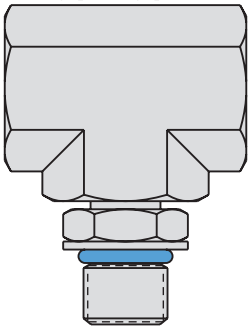
30-1621-66
90° Elbow, Adjustable,
SAE 6 - SAE 6



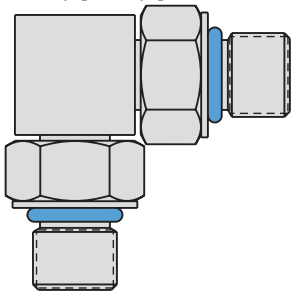
30-2312-44
Tee, Run, Adjustable
SAE 4 - SAE 4



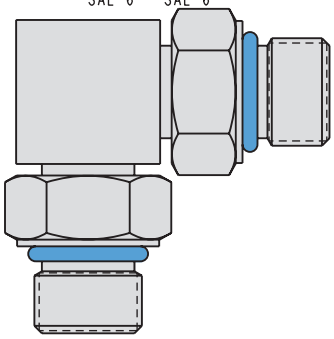
30-2412-44
Tee, Branch, Adjustable,
SAE 4 - SAE 4



30-1611-44
90° Elbow, Union, Adjustable
SAE 4 - SAE 4



30-1611-66
90° Elbow, Union, Adjustable,
SAE 6 - SAE 6



ILS300001 REV C

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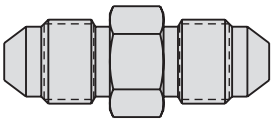
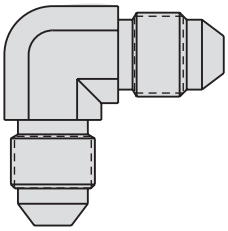
Flared Tube Fittings

SAE J514 Flared Tube Fittings 37°

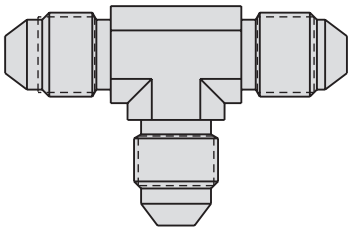
30-0055-44
Union,
1/4 37° Flared Tube



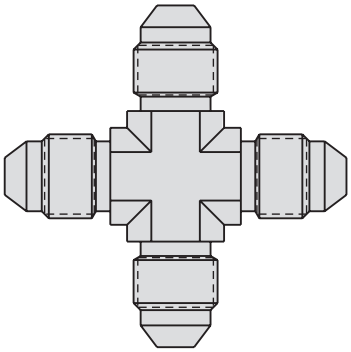
30-1655-44
90° Elbow, Union,
1/4 37° Flared Tube



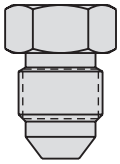
30-2055-44
Tee, Union, 1/4 37°
Flared Tube



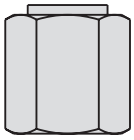
30-3055-44
Cross, Union, 1/4 37°
Flared Tube



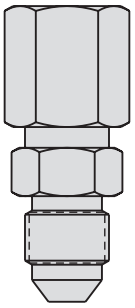
30-6055-44
Plug, 1/4 37°
Flared Tube



30-9066-44
Cap, 1/4 37°
Flared Tube



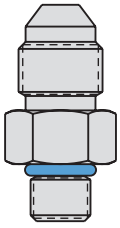
30-0005-44
Adapter, Union,
1/4 Flareless Tube -
1/4 37° Flared Tube



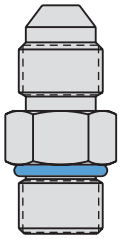
H-3

SAE J514 Flared Tube 37° - SAE Straight Thread

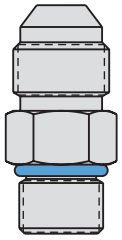
30-0015-42
Connector, 1/4 37°
Flared Tube - SAE 2



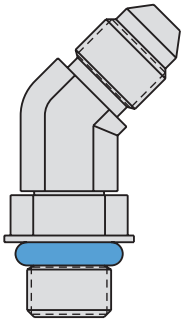
30-0015-44
Connector, 1/4 37°
Flared Tube - SAE 4



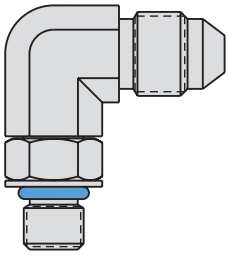
30-0015-45
Connector, 5/16 37°
Flared Tube - SAE 4



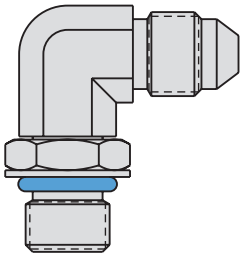
30-1515-44
45° Elbow, Adjustable,
1/4 37° Flared
Tube - SAE 4



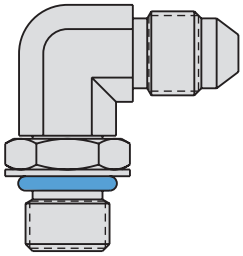
30-1615-42
90° Elbow, Adjustable
1/4 37° Flared
Tube - SAE 2



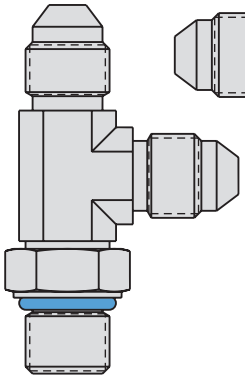
30-1615-44
90° Elbow, Adjustable
1/4 37° Flared
Tube - SAE 4



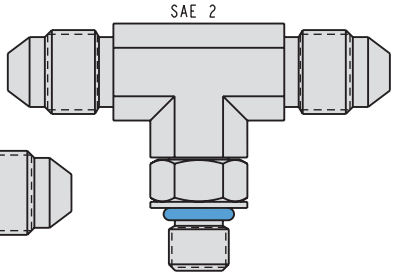
30-1615-45
90° Elbow, Adjustable,
5/16 37° Flared
Tube - SAE 4



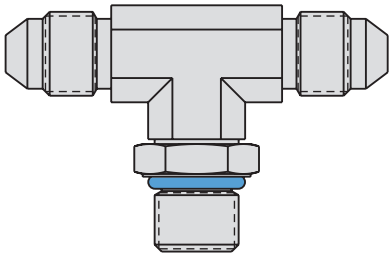
30-2315-44
Tee, Run, Adjustable,
1/4 37° Flared
Tube - SAE 4



30-2415-42
Tee, Branch, Adjustable,
1/4 37° Flared Tube -
SAE 2



30-2415-44
Tee, Branch, Adjustable
1/4 37° Flared Tube -
SAE 4



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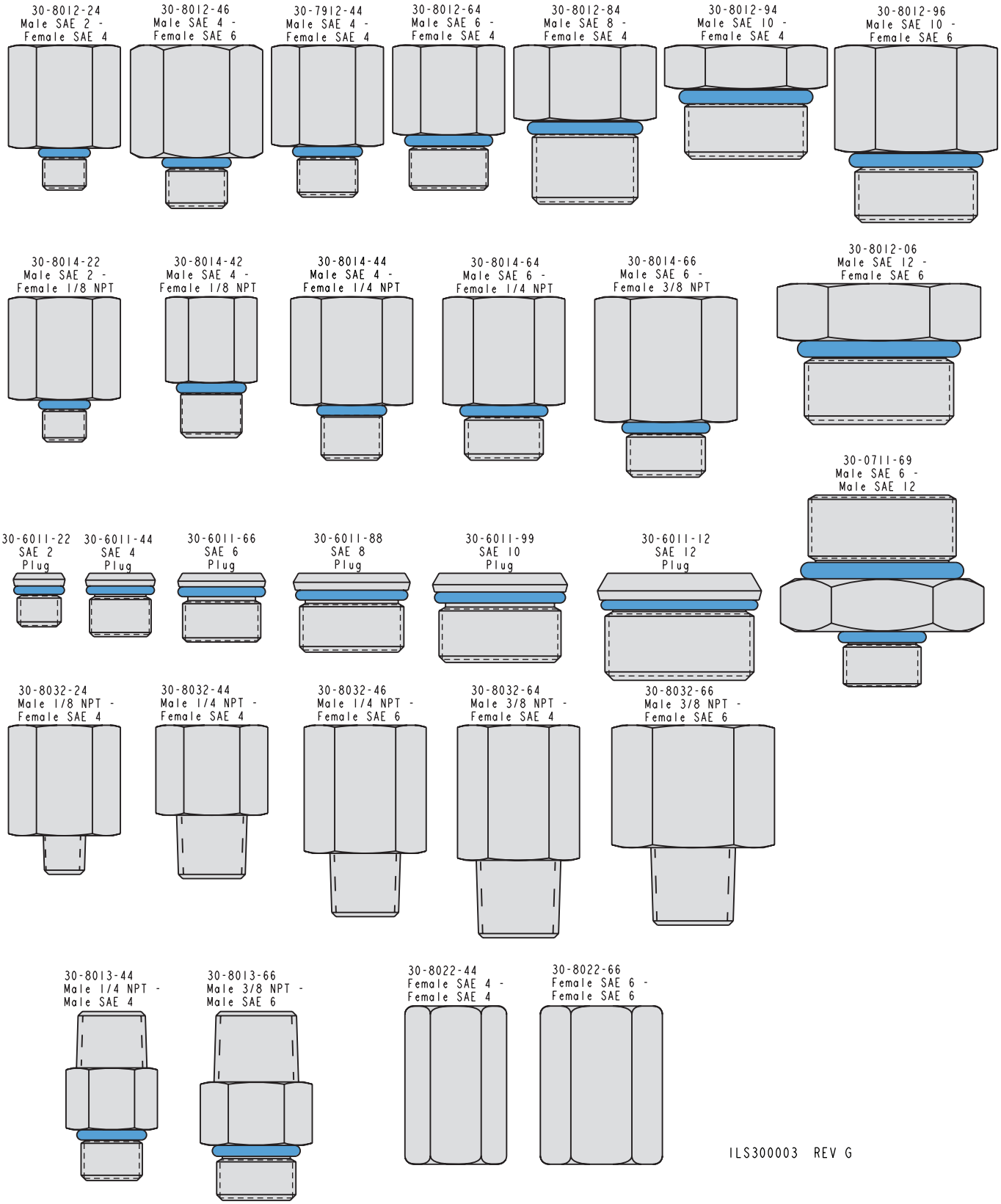

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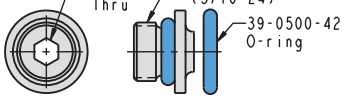
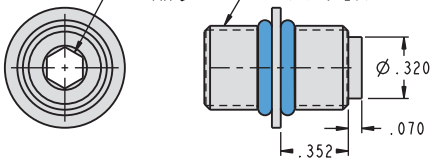
Special Use Adapters

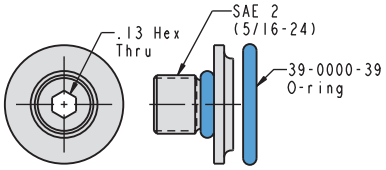
Part No. 30-8711-20
For Manifold Mounting
Top Flange Swing Clamps and
Top Flange Push/Pull Cylinders



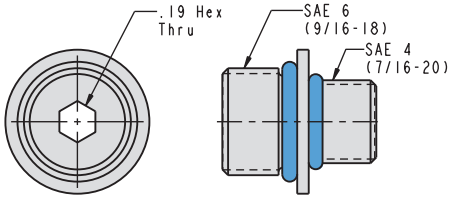
Part No. 30-8711-44



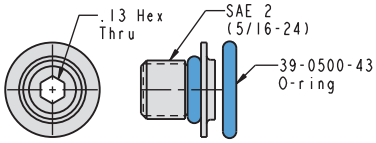
Part No. 30-8711-21



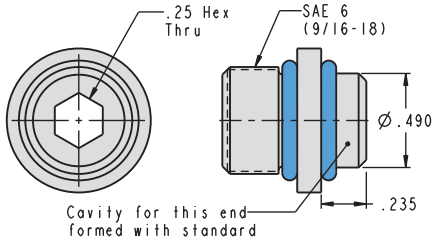
Part No. 30-8711-46



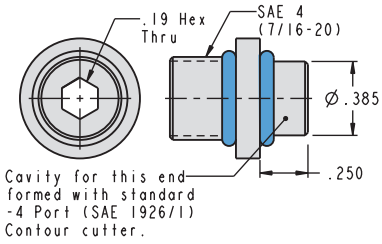
Part No. 30-8711-23
For Manifold Mounting
32-1241-00 & 32-1261-01 Single Path,
32-2242-00 & 32-2262-00 Dual Path and
32-4244-00 & 32-4264-00 Quad Path
Rotary Unions



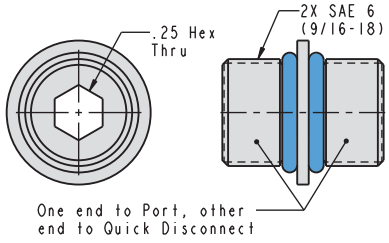
Part No. 30-8711-60
For Manifold Porting
32-1261-01 (SAE 6 Single
Path) Rotary Unions



Part No. 30-8711-40
For Manifold Porting
32-1241-00 (SAE 4 Single
Path) Rotary Unions



Part No. 30-8711-66
Adapter for Quick Disconnect
30-7827-66, 30-7727-66
30-7827-60, 30-7727-60



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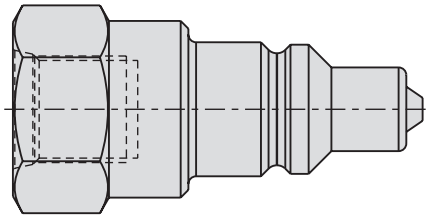
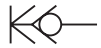
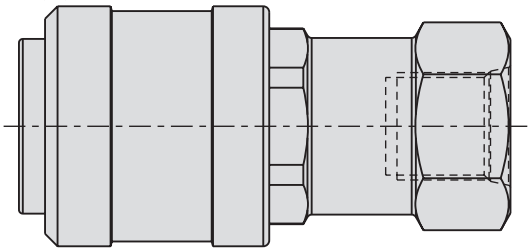
Quick Connects

30-7727-66
Male Half, Quick Disconnect.
SAE 6 (9/16-18) Port.
Recommended for use on
main supply hydraulic lines

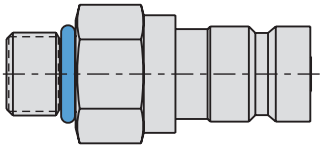


30-7827-66
Female Half, Quick Disconnect.
SAE 6 (9/16-18) Port
Recommended for use on
main supply hydraulic lines.

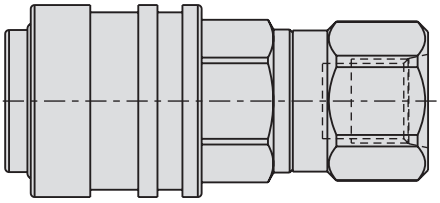




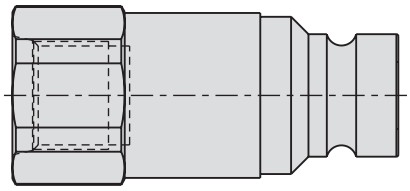
30-7717-44
Male Half, Quick Disconnect
SAE 4 (7/16-20) Stud End
Recommended for use where
the total volume of oil is
less than two (2) cubic inches.



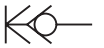
30-7827-44
Female Half, Quick Disconnect
SAE 4 (7/16-20) Port
Recommended for use where
the total fluid volume is less
than two (2) cubic inches.

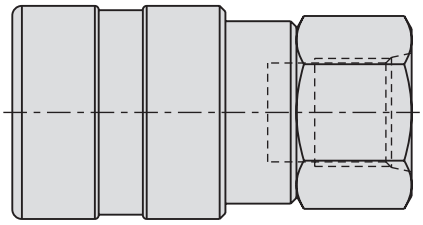


30-7727-60
Male Half, Flat Face
Quick Disconnect.
SAE 6 (9/16-18) Port

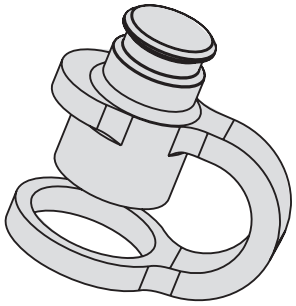


30-7827-60
Female Half, Flat Face
Quick Disconnect.
SAE 6 (9/16-18) Port

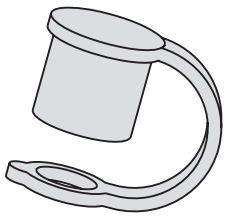




30-7197-06
Dust Cover: For Use
on 30-7727-66 or
30-7827-66



30-7197-04
Dust Cover: For Use
on 30-7717-44



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Miscellaneous Plumbing

Hydraulic System Manifolds

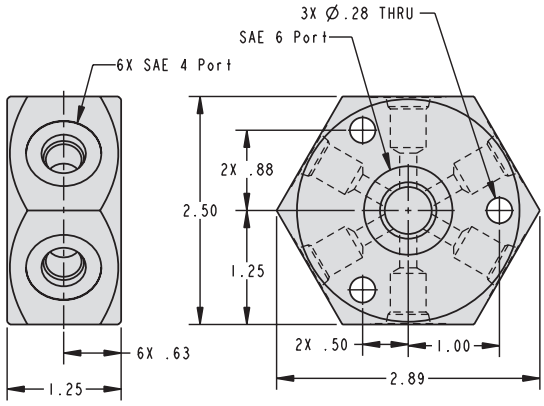
- Four different styles to suit the needs of your particular system.
- SAE straight thread O-ring ports used exclusively to provide drip free hydraulic connections.
- High strength steel, careful attention to detail in design, and extensive testing ensure reliability at working pressures up to 5,000 psi.

Order plugs separately. 30-6011-66 for SAE 6 and 30-6011-44 for SAE 4.

Hexagonal Manifold
Model No. 31-2266-24

I-1

- Centralized connection point for multiple hydraulic lines.
- Widely used on multi-sided fixtures.
- Controlled depth counter bore on SAE 6 center port accepts standard O-ring (included) to allow manifold stacking and permit, 12, 18 or 24 circuits to share one common feed (minor customer modification required).



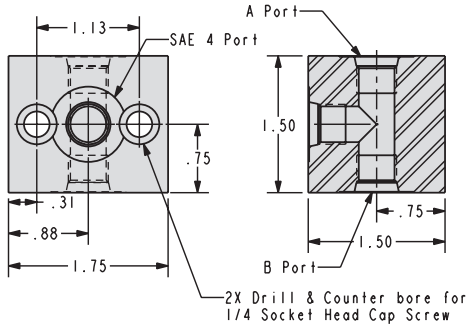
(Plugs Sold Separately)
(30-6011-44 SAE 4) (30-6011-66 SAE 6)

31-2266-24 Manifold

ILS312200 REV C

Hydraulic Junction Manifolds

- Available in two block sizes with a choice of five porting configuration between them.
- Convenient, cost effective connection point for mounting quick connect fittings on fixtures and pallets.
- Provide secure interface when connecting between rigid steel tubing and flexible hose.

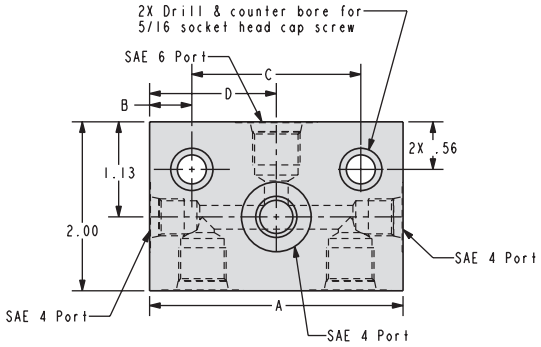


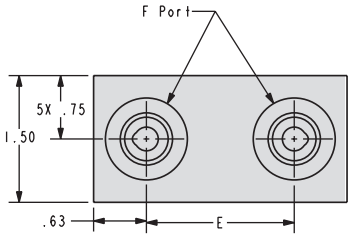
(Plugs Sold Separately)
(30-6011-44 SAE 4) (30-6011-66 SAE 6)

ILS311200 REV C

Dimensions

Model No.	A	B
31-1241-24	SAE 4	SAE 4
31-1261-24	SAE 6	SAE 4
31-1261-26	SAE 6	SAE 6





(Plugs Sold Separately)
(30-6011-44 SAE 4) (30-6011-66 SAE 6)

ILS311201 REV C

Dimensions

Model No.	A	B	C	D	E	F
31-1264-24	2.50	0.38	1.75	1.25	1.25	SAE 4
31-1264-46	3.00	0.50	2.00	1.50	1.75	SAE 6

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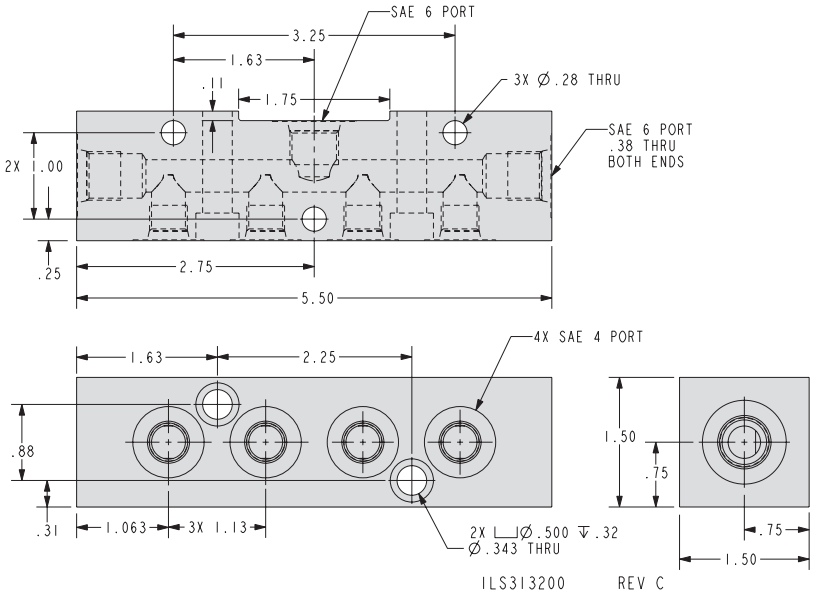
Hydraulic System Manifolds

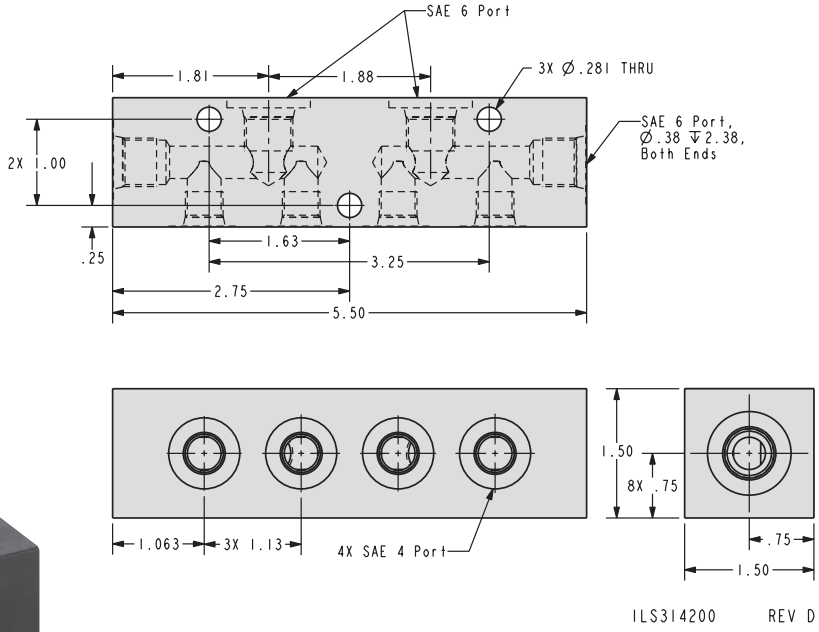
Single Path Rectangular Manifold
Model No. 31-3264-01

- Wide spacing between ports allows use with elbow and tee tube fittings.
- SAE 6 back port recessed to accept internal hex plug and permit flush mounting.
- 5/16″ and 1/4″ mounting holes added to provide greater mounting flexibility.
- Plugs sold separately:
  SAE 4 - Model No. 30-6011-44
  SAE 6 - Model No. 30-6011-66



Dual Path Rectangular Manifold
Model No. 31-4264-24

- Two separate flow paths in single manifold simplifies hydraulic connections and reduces the number of components required in double acting systems.
- Wide spacing between ports allows use with elbow and tee tube fittings.
- Plugs sold separately:
  SAE 4 - Model No. 30-6011-44
  SAE 6 - Model No. 30-6011-66



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Standard Features Single, Dual, Quad, 6, 8 and 12 Flow Path Models

Rotating unions are a rotary connection, feeding pressure to fixtures while allowing full 360° rotation of the fixture with or without pressure. A machine or independent indexer may do this indexing. Rotating unions allow "live" hydraulic power to be supplied to fixtures on machines during the machining cycle.

- Single, dual, quad, 6, 8, and 12 path models are available to fit your application.
- SAE 6 models are required for major fluid distribution and all remote valve systems. SAE 4 models may be used on double acting systems and small single acting systems where speed of retraction is not critical.
- Most units may be either manifold mounted or used with standard fittings.

A cableway or similar anti-rotation device is required to resist the starting torque of the rotary union.

The leak free design eliminates the need for a drain or vent line required by standard industrial models. This feature also reduces the demand for pressure present in industrial models that can cause pump cycling.

All units include internal bearings to increase life under loaded applications.

Quad path models are often installed in machine doors to feed two independent dual path models on fixtures, making VektorFlo® the choice for all of your machine clamping needs.

Integral mounting holes and multiple plumbing options make VektorFlo® designs easier to use than specialized larger industrial model.

Maximum RPM at Various Pressures with Petroleum Based Fluids

Model No.	Configuration	500 psi	1000 psi	2000 psi	3000 psi	4000 psi	5000 psi
32-1261-00	Single Path	915	460	230	150	115	90
32-1241-00 32-1261-01	Single Path	460	230	115	75	60	50
32-2242-00 32-2262-00 32-2242-01 32-2262-01	Dual Path	380	190	95	65	50	40
32-4244-00 32-4264-00	Quad Path	380	190	95	65	50	40
32-1461-41	Single Path	380	190	95	65	50	40
32-6246-00 32-6246-01	6 Path	100	50	35	25	20	20
32-8248-00 32-8248-01	8 Path	100	50	35	25	20	20
32-1224-12 32-1224-13	12 Path	100	50	35	25	20	20

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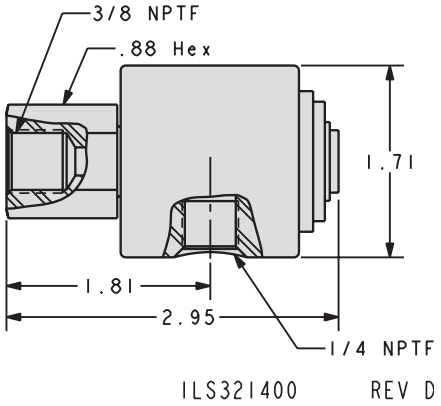
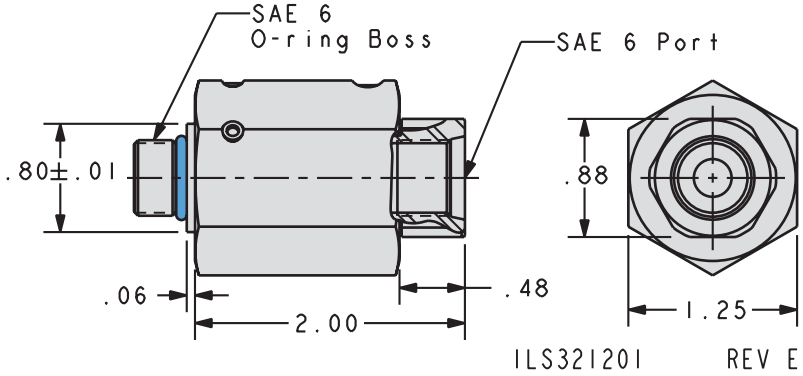
Single Path Rotating Union
NPT Ports
Model No. 32-1461-41

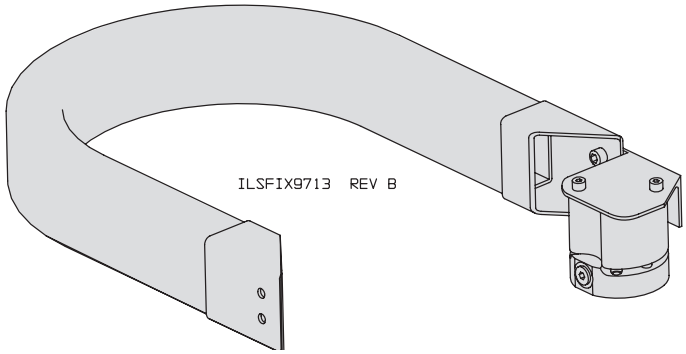


Operating Parameter Guidelines
- Max Pressure: 5,000 psi
- Max. RPM: 380
- Max Temperature: 40-160°F

Single Path Rotating Union
SAE Inline
Model No. 32-1261-00



Operating Parameter Guidelines
- Max Pressure: 5,000 psi
- Max. RPM: 380
- Max Temperature: 40-160°F



A cableway or similar anti-rotation device is required for all rotating union applications.

NOTE: Hoses alone should never be used to control the movement of a rotating union.

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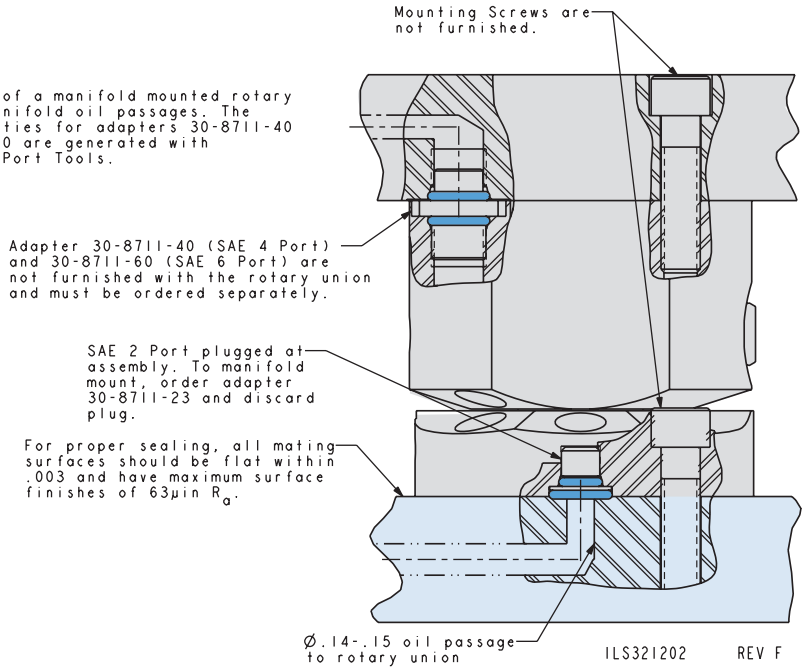
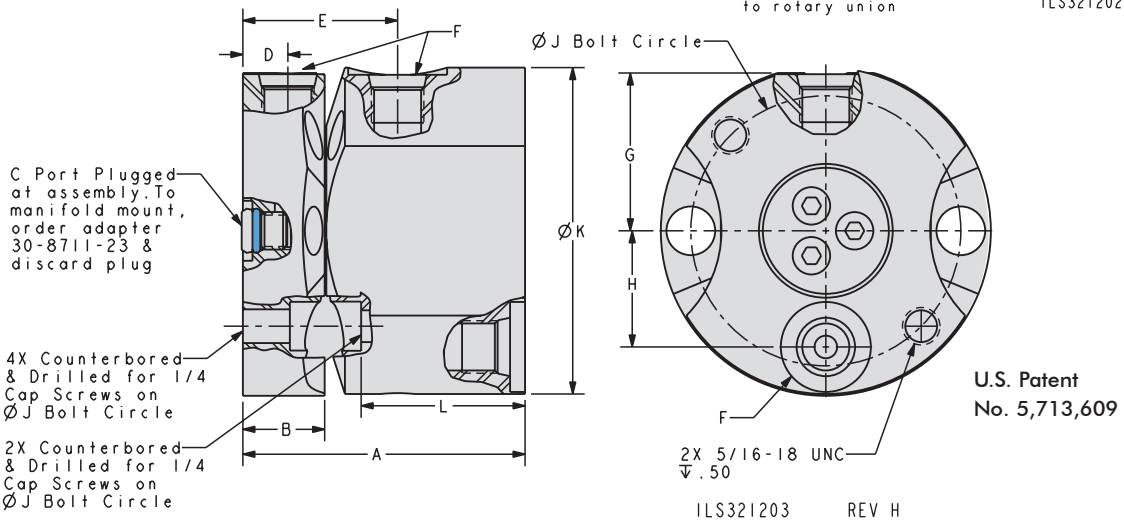
Miscellaneous Plumbing

Single Path Rotating Union





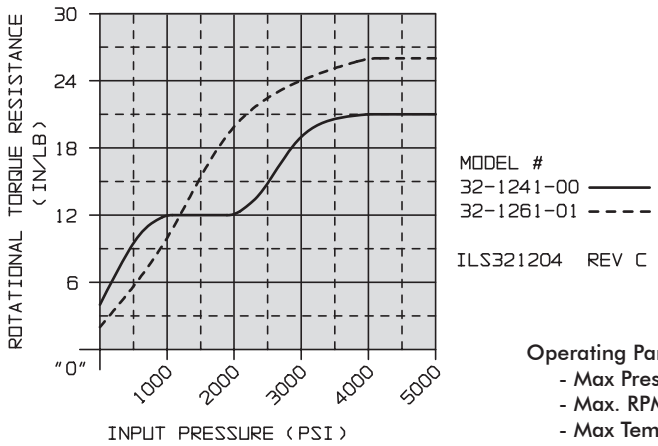
U.S. Patent No. 5,713,609

Dimensions

Model No.	A	B	C	D	E	F	G	H	J	K	L
32-1241-00	2.36	0.69	SAE 2	0.38	1.30	SAE 4	1.30	0.97	2.25	2.75	1.37
32-1261-01	2.60	0.97	SAE 2	0.50	1.58	SAE 6	1.44	1.03	2.38	3.00	1.35

NOTE: Model No. 30-8711-23 adapter is needed for manifold mounting. Order separately.

For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 µin R_a surface finish.



Operating Parameter Guidelines
- Max Pressure: 5,000 psi
- Max. RPM: 380
- Max Temperature: 40-160°F

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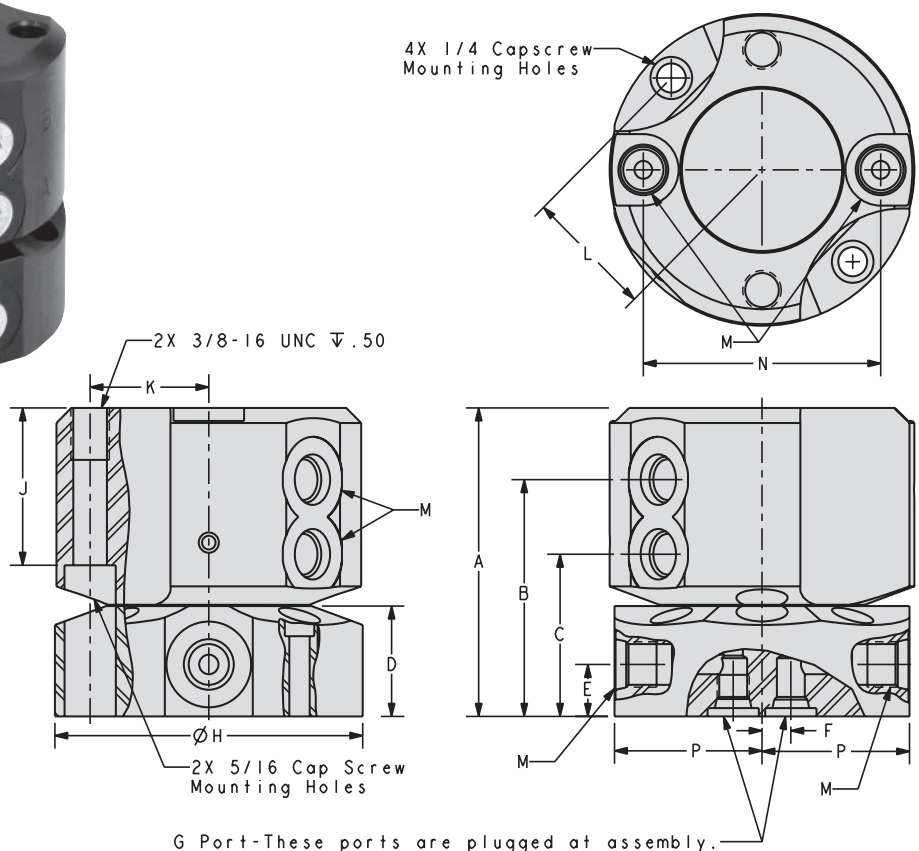
Dual Path Rotating Union

U.S. Patent
No. 5,713,609

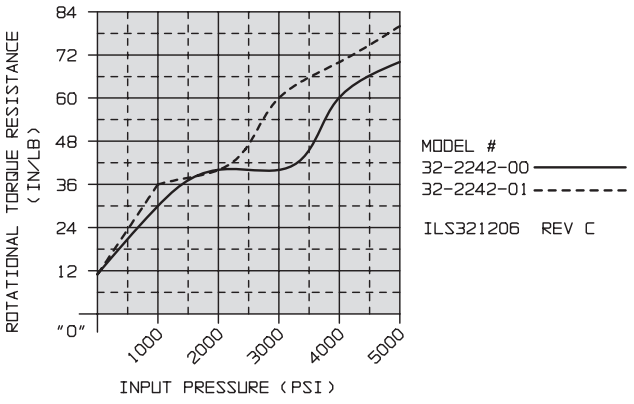


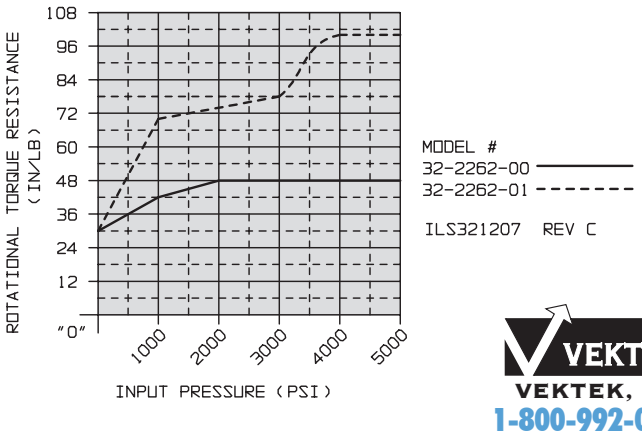
For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.

Dimensions

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P
32-2242-00	2.97	2.28	1.56	1.06	0.50	0.28	SAE 2	3.00	1.51	1.156	1.250	SAE 4	2.312	1.46
32-2262-00	3.34	2.56	1.73	1.13	0.63	0.38	SAE 2	3.47	1.82	1.375	1.500	SAE 6	2.750	1.68
Models 32-2242-01 and 32-2262-01 are not adaptable for manifold mounting.														
32-2242-01*	3.06	2.38	1.66	1.16	0.60	0.39	SAE 4	3.00	1.51	1.156	1.250	SAE 4	2.312	1.46
32-2262-01*	3.34	2.56	1.73	1.13	0.63	0.47	SAE 6	3.47	1.82	1.375	1.500	SAE 6	2.750	1.68

NOTE: Model No. 30-8711-23 adapter is needed for manifold mounting. Order separately.





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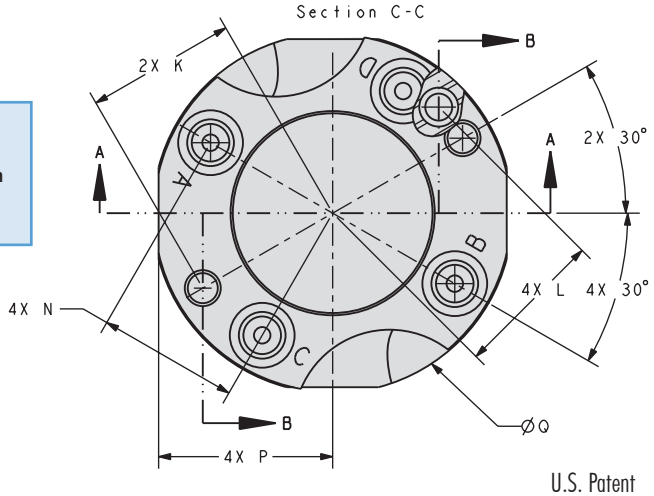
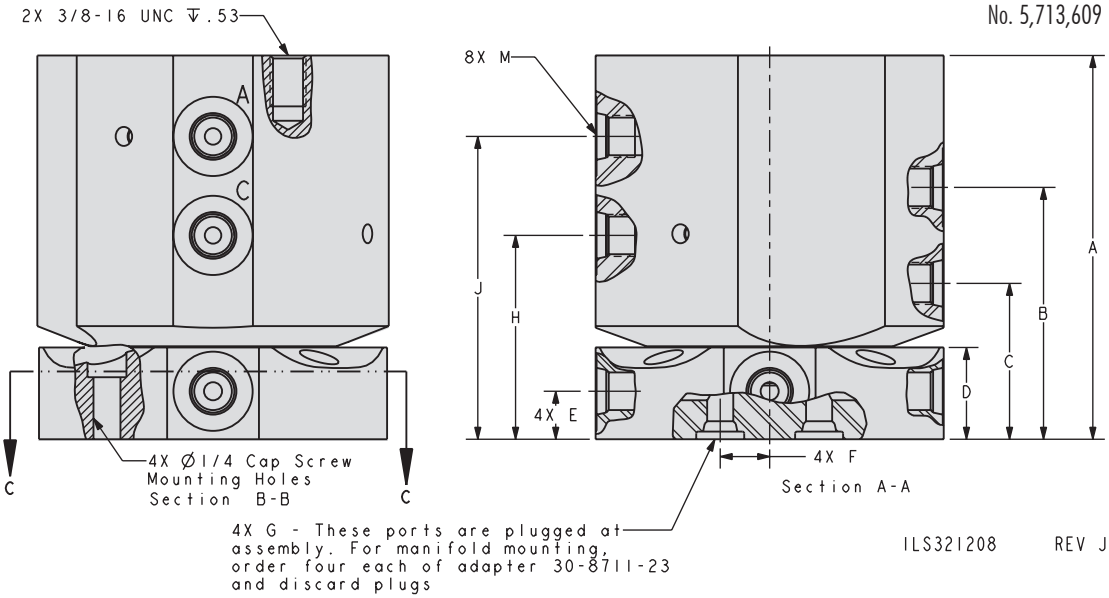
Quad Path Rotating Union

For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.



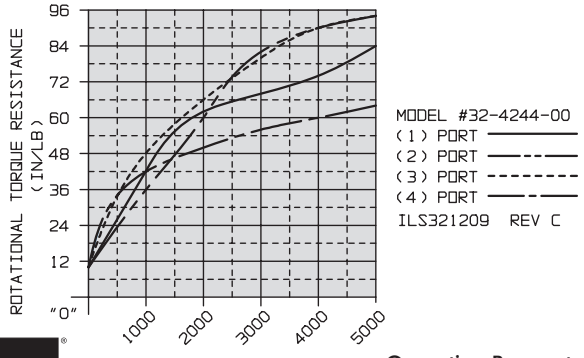
U.S. Patent No. 5,713,609

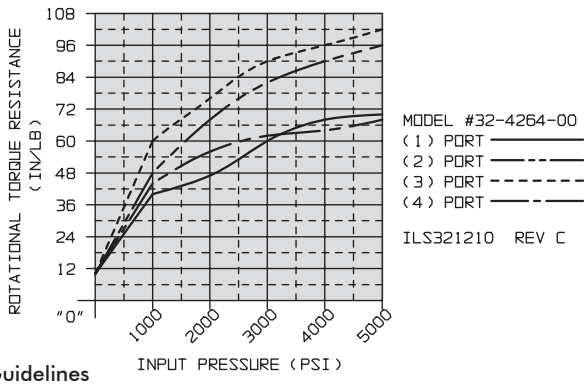


Dimensions

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
32-4244-00	4.00	2.63	1.63	0.96	0.50	0.52	SAE 2	2.13	3.16	1.56	1.56	SAE 4	1.47	1.81	3.75
32-4264-00	4.50	3.00	1.80	1.08	0.56	0.52	SAE 2	2.40	3.60	1.69	1.75	SAE 6	1.52	1.94	4.00

NOTE: Model No. 30-8711-23 adapter is needed for manifold mounting. Order separately.





Operating Parameter Guidelines
- Max Pressure: 5,000 psi
- Max. RPM: 380
- Max Temperature: 40-160° F

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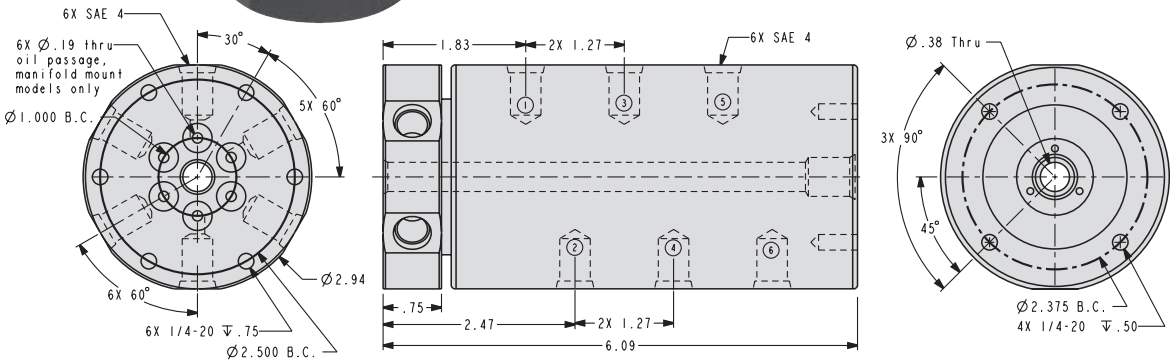
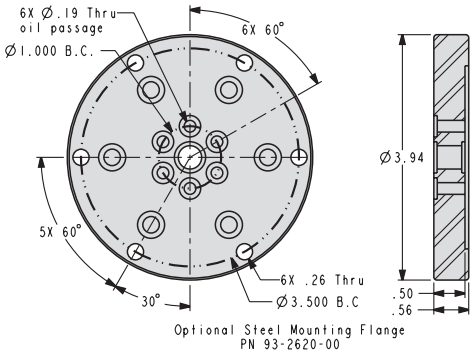
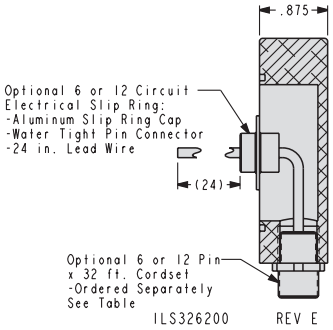
6 Path Rotary Unions

6 Path Rotating Unions

- Available with electrical slip ring option.
- Nitrile O-rings for water tight connections.
- External porting and manifold mountable on the bottom surface.







Operating Parameter Guidelines
- Max Pressure: 5,000 psi
- Max Vacuum: 30 Hg
- Max. RPM: 100 with Slip Ring 300 RPM without
- Max Temperature: 350° F

I-8

For Proper sealing, mating surface should be flat to 0.003 in. with a maximum 32 μin. R_a surface finish.

6 Path Rotary Unions

Model No.	Hydraulic Input Connection	Electrical Slip Ring Option	Maximum Current/ Circuit	Maximum Volts/Circuit	Lead Wire Length	Optional Cordset***	Optional Steel Mounting Flange Model No.**
32-6246-00	SAE 4	N/A	N/A	N/A	N/A	N.A	93-2620-00
32-6246-00-ES6A	SAE 4	6 Circuit	2 Amp	60 AC/75 DC	24"	27-6424-01	
32-6246-00-ES12A	SAE 4	12 Circuit	2 Amp	60 AC/75 DC	24"	27-6424-02	
32-6246-01	O-ring Face Seals	N.A	N/A	N/A	N/A	N/A	
32-6246-01-ES6A	O-ring Face Seals	6 Circuit	2 Amp	60 AC/75 DC	24"	27-6424-01	
32-6246-01-ES12A	O-ring Face Seals	12 Cirtcuit	2 Amp	60 AC/75 DC	24"	27-6424-02	

* O-rings furnished: -010, 70A, NBR Part No. 55-2500-01

** Optional Mounting Flange includes:
- 6 SHCS 1/4-20 x 1/2 Part No. 21-4100-63
- 6 O-rings -010, 70A NBR Part No. 55-2500-01
- 1 O-rings -012, 70A NBR Part No. 39-0020-09
- 1 O-rings -013, 70A NBR Part No. 39-0000-72

*** Order Cordset Separately

Installation instructions available. Request IS3205

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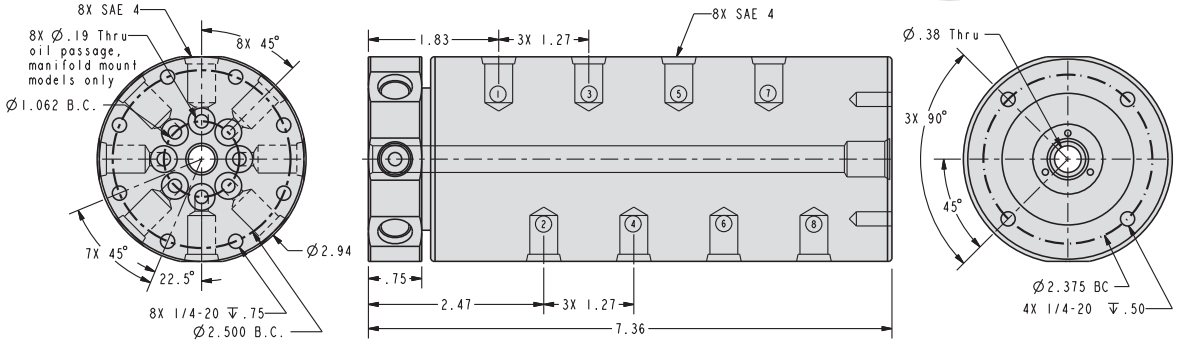
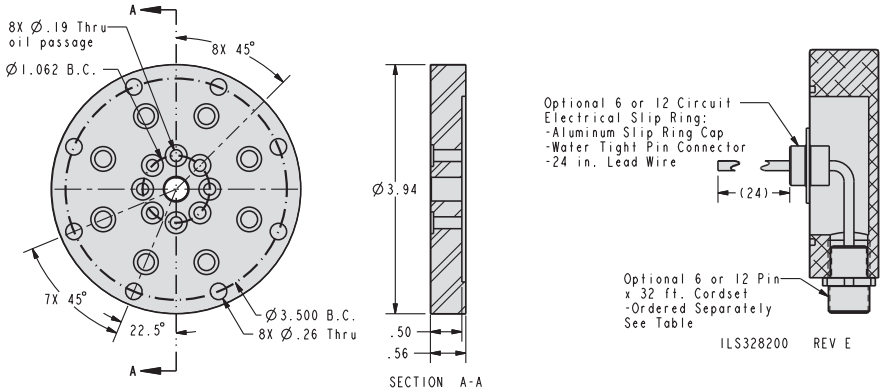
Miscellaneous Plumbing

8 Path Rotary Unions

8 Path Rotating Unions

- Available with electrical slip ring option.
- Nitrile O-rings for water tight connections.
- External porting and manifold mountable on the bottom surface.





Operating Parameter Guidelines
- Max Pressure: 5,000 psi
- Max Vacuum: 30 Hg
- Max. RPM: 100 with Slip Ring 300 RPM without
- Max Temperature: 350° F

For Proper sealing, mating surface should be flat to 0.003 in. with a maximum 32 μin. R_a surface finish.

8 Path Rotary Unions

32-8248-00	SAE 4	N/A	N/A	N/A	N/A	N.A	93-2820-00
32-8248-00-ES6A	SAE 4	6 Circuit	2 Amp	60 AC/75 DC	24"	27-6424-01	
32-8248-00-ES12A	SAE 4	12 Circuit	2 Amp	60 AC/75 DC	24"	27-6424-02	
32-8248-01	O-ring Face Seal	N.A	N/A	N/A	N/A	N/A	
32-8248-01-ES6A	O-ring Face Seal	6 Circuit	2 Amp	60 AC/75 DC	24"	27-6424-01	
32-8248-01-ES12A	O-ring Face Seal	12 Cirtcuit	2 Amp	60 AC/75 DC	24"	27-6424-02	

* O-rings furnished: -010, 70A, NBR Part No. 55-2500-01
** Optional Mounting Flange includes:
- 8 SHCS 1/4-20 x 1/2 Part No. 21-4100-63
- 8 O-rings -010, 70A NBR Part No. 55-2500-01
- 2 O-rings -012, 70A NBR Part No. 39-0020-09

*** Order Cordset Separately

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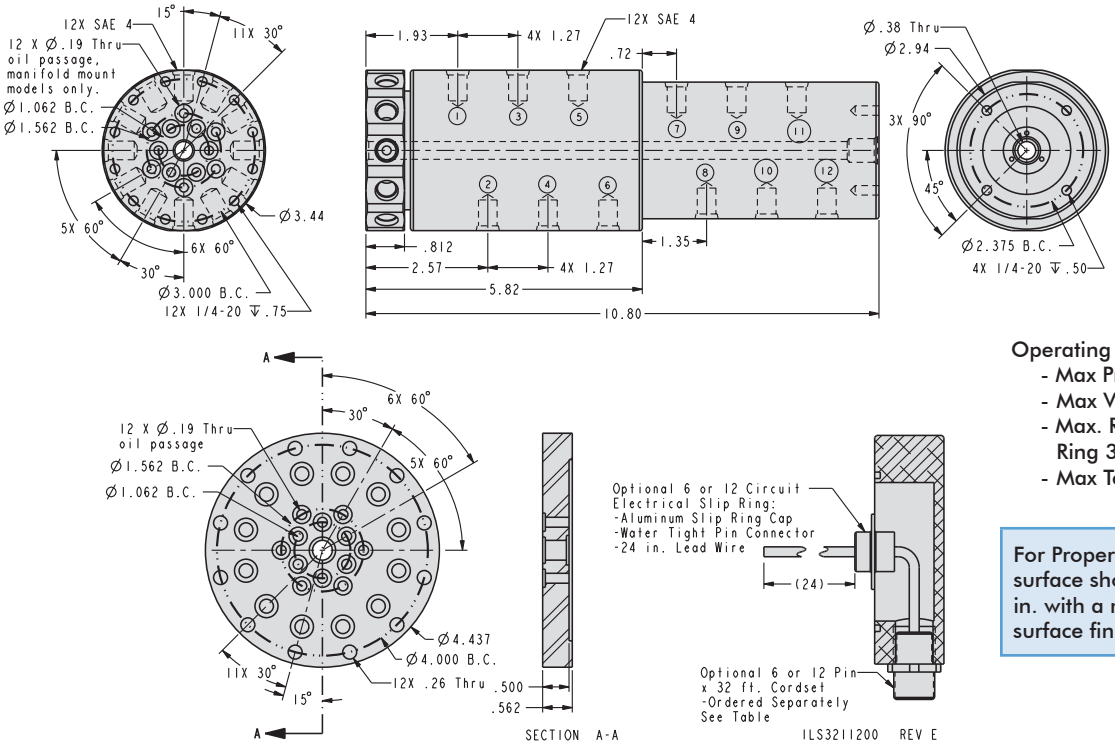
12 Path Rotating Unions

- Available with electrical slip ring option.
- Nitrile O-rings for water tight connections.
- External porting and manifold mountable on the bottom surface.



Operating Parameter Guidelines
- Max Pressure: 5,000 psi
- Max Vacuum: 30 Hg
- Max. RPM: 100 with Slip Ring 300 RPM without
- Max Temperature: 350° F

For Proper sealing, mating surface should be flat to 0.003 in. with a maximum 32 μin. R_a surface finish.

12 Path Rotary Unions

32-1224-12	SAE 4	N/A	N/A	N/A	N/A	N.A	93-2120-00
32-1224-12-ES6A	SAE 4	6 Circuit	2 Amp	60 AC/75 DC	24"	27-6424-01	
32-1224-12-ES12A	SAE 4	12 Circuit	2 Amp	60 AC/75 DC	24"	27-6424-02	
32-1224-13	O-ring Face Seal	N.A	N/A	N/A	N/A	N/A	
32-1224-13-ES6A	O-ring Face Seal	6 Circuit	2 Amp	60 AC/75 DC	24"	27-6424-01	
32-1224-13-ES12A	O-ring Face Seal	12 Cirtcuit	2 Amp	60 AC/75 DC	24"	27-6424-02	

* O-rings furnished: -010, 70A, NBR Part No. 55-2500-01
** Optional Mounting Flange includes:
- 12 SHCS 1/4-20 x 1/2 Part No. 21-4100-63
- 12 O-rings -010, 70A NBR Part No. 55-2500-01
- 2 O-rings -012, 70A NBR Part No. 39-0020-09

*** Order Cordset Separately

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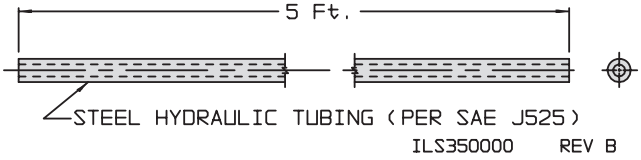
Miscellaneous Plumbing

Hoses & Tubing

Hoses

- All VektorFlo® hoses are intended to operate up to 5,000 psi working pressure.
- End fittings have the largest possible orifice to reduce restrictions and allow devices to work better.
- Large hoses are typically used to feed entire fixtures, medium size hoses are for feeding small fixtures or single devices.
- Small hoses are to be used to feed single devices ONLY and are to be connected directly back to a manifold unless used on double acting clamps.

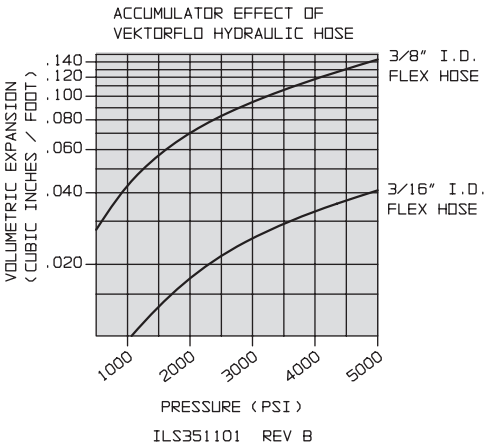
NOTE: Use of standard rubber hoses and end fittings can hamper the action of many devices due to excessive end fitting restrictions. If you choose to purchase hoses from another supplier, be sure that hose diameters and end fittings are not causing excessive restrictions.

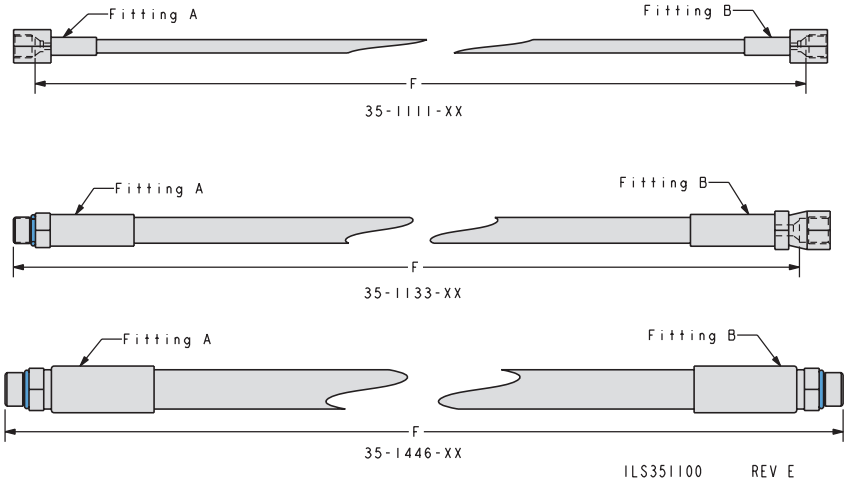


Tubing

Part No.	Description
35-0002-05	1/4 (0.250") O.D. x 0.049 Thick Wall
35-0003-05	3/8 (0.375") O.D. x 0.065 Thick Wall

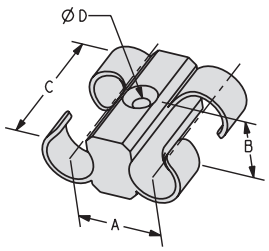
Suggested Center Line Radius 1/4" =0.56 and 3/8" =0.94





Hoses

Part No.	Minimum Bend Radius (in.)	Hose I. D.	Hose O. D.	Fitting A	Fitting B	F
35-1111-08	0.75	0.08	0.22	7/16-20 Female JIC 37° Swivel	7/16-20 Female JIC 37° Swivel	8 in.
35-1111-12						12 in.
35-1111-18						18 in.
35-1111-24						24 in.
35-1111-30						30 in.
35-1133-02	1.50	0.19	0.43	7/16-20 Male Straight Thread SAE 4 O-ring Boss	7/16-20 Female JIC 37° Swivel	24 in.
35-1133-03						36 in.
35-1133-05						60 in.
35-1446-03	2.50	0.38	0.67	9/16-18 Male Straight Thread SAE 6 O-ring Boss	9/16-18 Male Straight Thread SAE 6 O-ring Boss	36 in.
35-1446-05						60 in.
35-1446-10						120 in.



Hose Mounting Clip
ILS352000 REV E

Hose Mounting Clip

Model No.	Hose ID	A	B	C	D
35-2001-00	0.08	0.48	0.36	0.80	0.13
35-2003-00	0.19	0.74	0.57	1.10	0.16
35-2006-00	0.38	1.04	0.80	1.61	0.22

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Frequently Asked Questions

I have a pump on my machine. Can I use it to drive my clamps too?

Yes, you may use a machine pump to drive your clamping system if it has the following characteristics:

1) It operates in an appropriate pressure range.
2) It has an appropriate flow rate or it is restricted to an acceptable flow.
3) It uses acceptable hydraulic oil (see insert).
4) It has adequate capacity to handle both tasks.

What size pump do I need to drive my system?

It depends. First, add up the total oil capacity of all of your system devices. To this, add the estimated volume of the plumbing (especially hoses, which expand under pressure) included in your system. This total should not exceed 75% of the capacity of your power supply (if it does you may encounter problems bleeding the system). If your system is only work supports, you may be able to get by with just a screw pump. If it is simple, you may be able to use an air/hydraulic booster. If it is a complex system or palletized fixture, you will need a more conventional power supply, a large pump may be required. Please feel free to call if we can help estimate pump size or clamp times.

How do I adjust the pressure to my system?

Vektek air/hydraulic power supplies are adjusted by changing the inlet air pressure via the attached air regulator. Electric pump pressures are adjusted by changing the pressure switch setting. **ALL** Vektek pumps run on demand and should not be made to continuously pump. If your pump cycles more than once every 30 seconds, contact the factory immediately for assistance.

My pump kicks on and off frequently (every 3-5 seconds), what should do?

You have a leak. It may be internal to a clamp, valve or an industrial cylinder. It is important to determine the source of the leak and eliminate it. This may involve replacing components and extensive troubleshooting. We will try to help. Please gather information for us before you call. You should fill out the Fixture Documentation Sheet (found on page A-8) and have a schematic and bill of materials ready when you call us. We want to help, but need adequate information about your system to diagnose the problem.

Hydraulic Oil

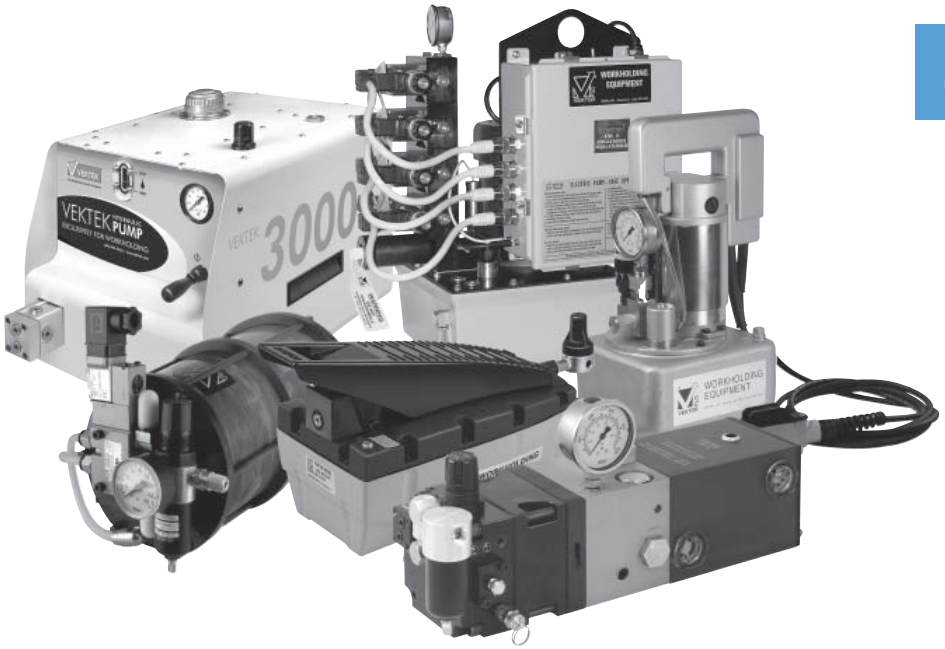
Cat. No. 65-0010-01, 1 Gal

VektorFlo® hydraulic oil is a premium grade petroleum base fluid with detergent and anti-wear additives. It also includes additives to inhibit corrosion, rust, oxidation and foaming. VektorFlo® hydraulic oil has the following additional characteristics:

Pour Point: -35°F
Flash Point: 421°F
Viscosity (SUS) 100°F: 165
210°F : 44.0
ISO Viscosity Grade: 32

If you are presently using one of the following products, or an **equivalent,** it may be substituted for our oil, although we recommend completely draining existing oil before refilling the reservoir:

BP - Energol HLP 32
Conoco - Super Hydraulic Oil 15
Exxon - NUTO H 32
Mobil - DTE 24
Shell Oil Co. - Premium 32
Sun Oil Co. - SunvisWR 816 WR
Texaco - Rando HD32



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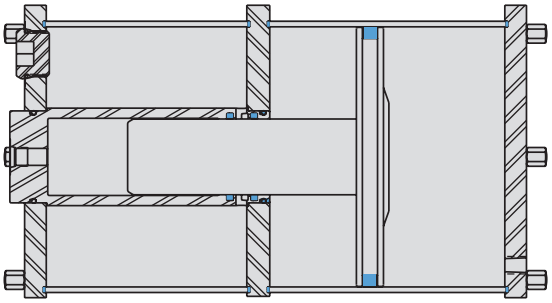
Power Supplies

Compact Air/Hydraulic Boosters

For Single Acting Systems

- Multiplies your shop air line pressure to power simple hydraulic systems without electricity.
- Intensification ratios ranging from 11:1 to 54:1.
- Output capacities from 2.4 to 11.1 cu. inches.
- Manual or electric control packages available.

Air/hydraulic boosters are an inexpensive way to power single acting systems. Whether this is your first system or you want a compact "ride-along" power supply for a system, these boosters are an efficient choice. Solid end and intermediate plates capture a reinforced epoxy case which acts as the air cylinder and fluid reservoir. The hydraulic piston runs in a steel cylinder immersed in the fluid reservoir. The double acting air piston design assures you of full fluid capacity on each actuation of the booster.



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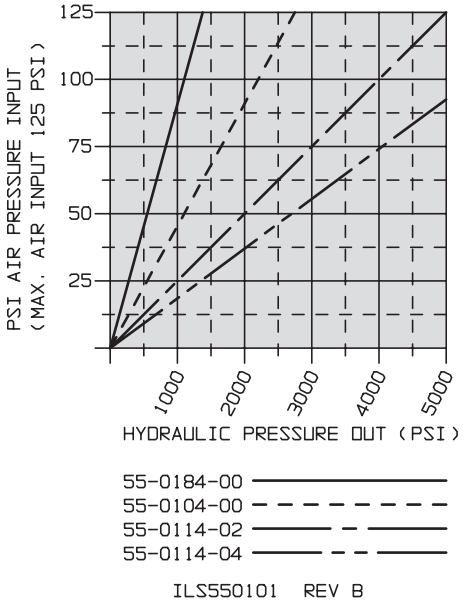
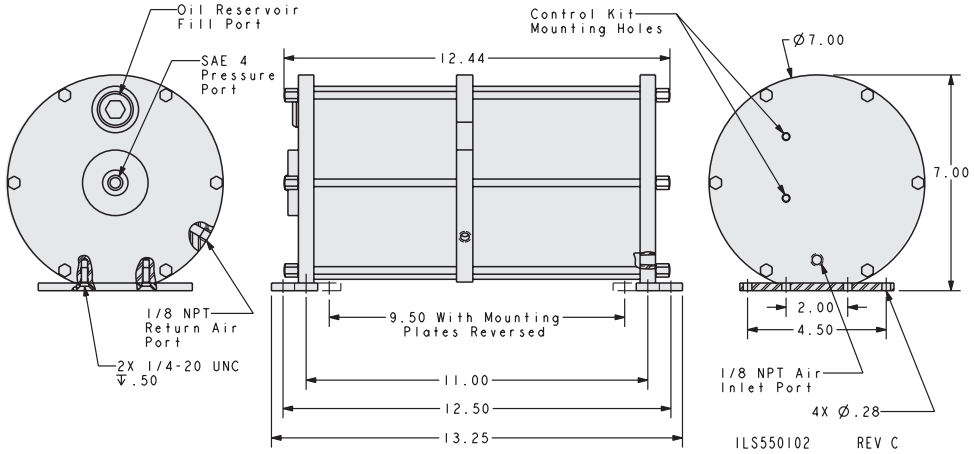


ILS550101 REV B

J-2

Model No.	Intensification Ratio	Useable Oil Volume	Maximum Air Input
Air over Hydraulic Pressure Intensifiers			
55-0184-00	1:11	11.1 cu. in.	125 psi
55-0104-00	1:22	5.7 cu. in.	
55-0114-02	1:40	3.2 cu. in.	
55-0114-04	1:54	2.4 cu. in.	

NOTE: One booster can be used to operate one single acting system. Boosters are not intended for use with single acting palletized (disconnected) systems. Boosters may be mounted horizontally or vertically. If mounted vertically, the oil discharge end must point up for proper operation.



ILS550102 REV C

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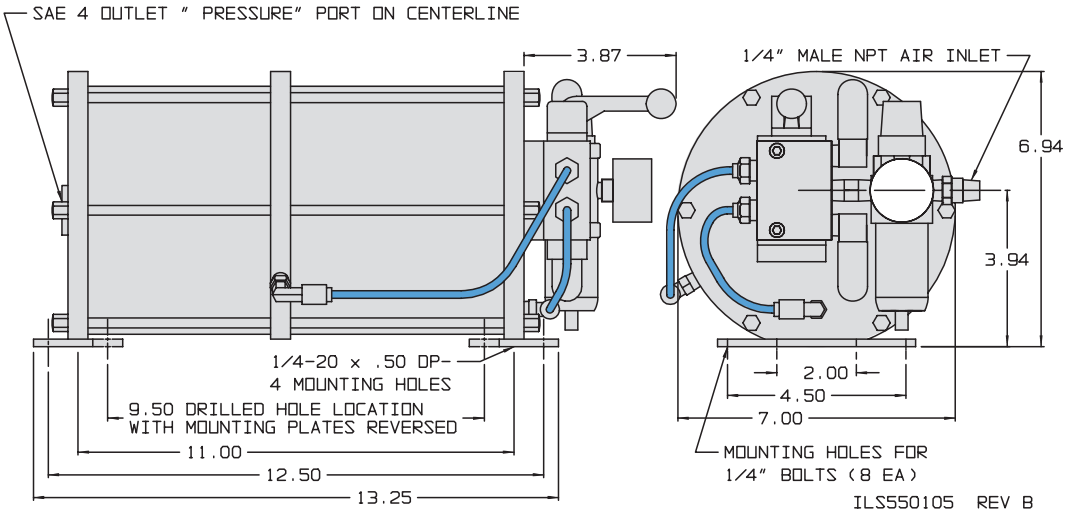
Booster with Control Package

- Complete package includes everything you need to use a VektorFlo® booster, including hardware.
- Includes filter/regulator with automatic drain, gauge, pneumatic check valve, control valve, mufflers and all of the fittings and tubing, ready to hook up! (Customer supplies air quick connector.)
- Available in manual, 115 VAC (6.8 W) or 24 VDC (6.0 W) models.
- Includes air inlet check valve to prevent loss of clamping force in the event of an air line break.

Model No.	Intensification Ratio
Air over Hydraulic Pressure Intensifiers	
55-0184-00	11:1 Booster Without Control
55-0284-16	11:1 Booster With Manual Control
55-0284-17	11:1 Booster With 115 VAC Control
55-0284-18	11:1 Booster With 24 VDC Control
55-0104-00	22:1 Booster Without Control
55-0204-16	22:1 Booster With Manual Control
55-0204-17	22:1 Booster With 115 VAC Control
55-0204-18	22:1 Booster With 24 VDC Control
55-0114-02	40:1 Booster Without Control
55-0214-16	40:1 Booster With Manual Control
55-0214-17	40:1 Booster With 115 VAC Control
55-0214-18	40:1 Booster With 24 VDC Control
55-0114-04	54:1 Booster Without Control
55-0224-16	54:1 Booster With Manual Control
55-0224-17	54:1 Booster With 115 VAC Control
55-0224-18	54:1 Booster With 24 VDC Control

ILS550103 REV B

Boosters With Control Packages Dimensions



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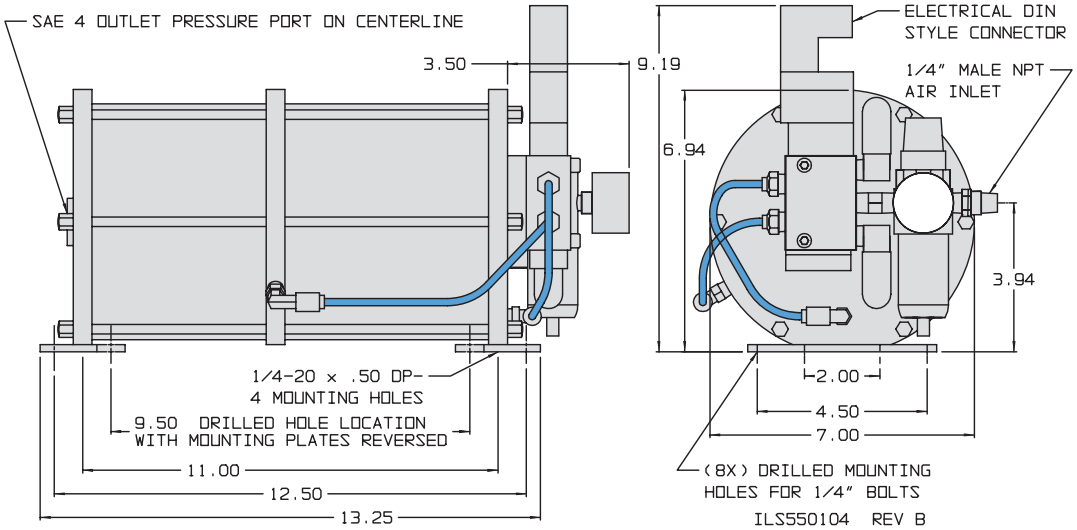

ILS550104 REV B

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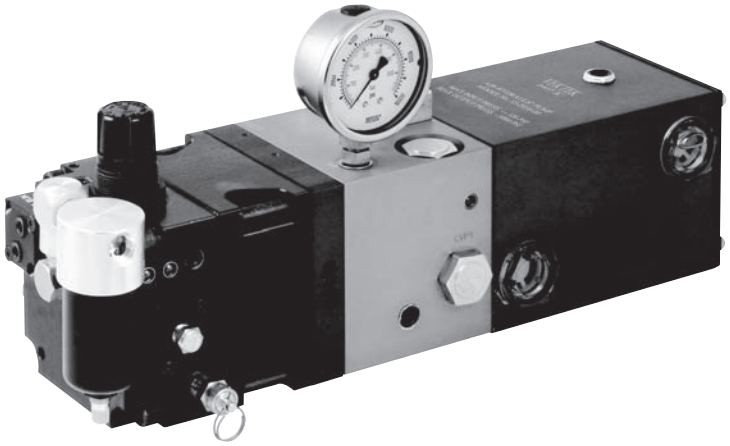
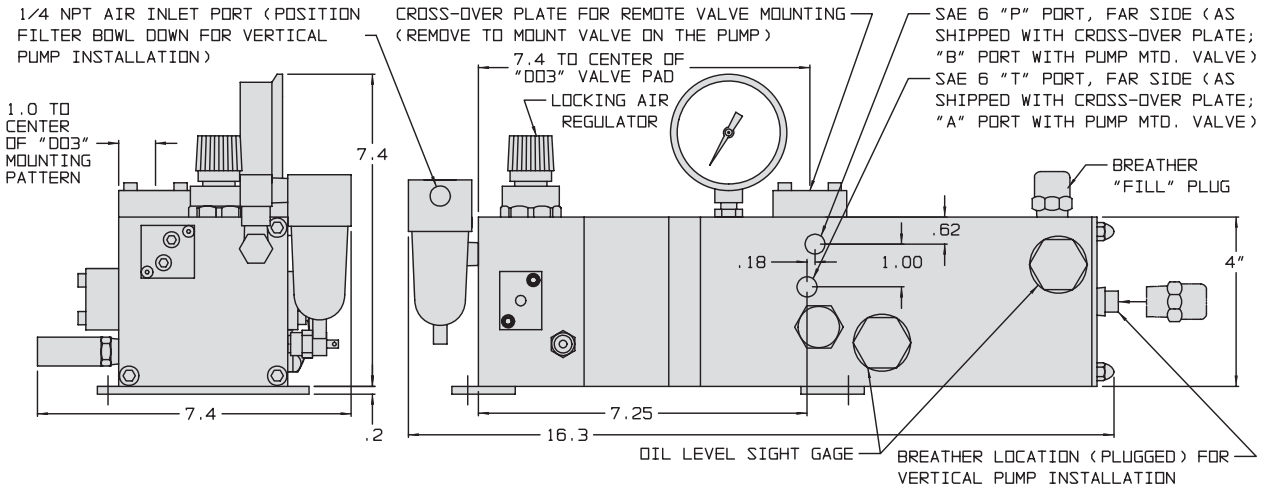
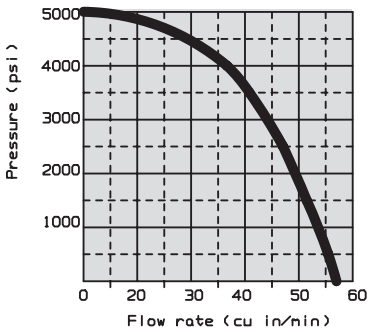
Compact Air/Hydraulic Pump

- Suitable for most single fixtures and small pallet systems.
- Powers either single or double acting cylinders.
- Any one of our D03 valves can be mounted directly on the pump, no external sub-plate is necessary on most systems, or remotely by external plumbing.
- Flow rates up to 90 cu. in. per minute. Position devices quickly then pressure builds to preset operating range.
- Built in air regulator adjusts to determine hydraulic output pressure from 1,200 to 5,000 psi.
- Mounting hardware is included.
- Noise level, 80 Db at 4 feet.







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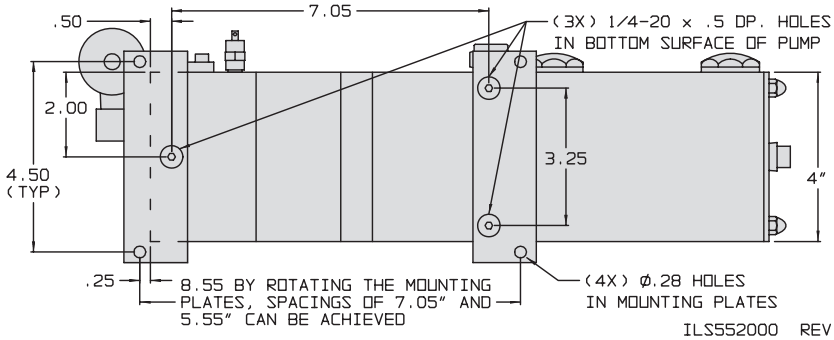

ILS552000 REV D

BOTTOM VIEW MODEL# 55-2056-00

Model No.	Reservoir Capacity	Maximum Air Input	Pressure Range	Mounting Options	Weight
55-2056-00	Horizontal 68 cu. in.	120 psi	1200 to 5000 psi	Horizontal (as shown)	19 lbs
55-2056-00	Vertical 80 cu. in.	120 psi	1200 to 5000 psi	Vertical (Reservoir up, filter bowl down)	19 lbs

WARNING! The use of spool valves invalidates the warranty on VektorFlo® pumps.

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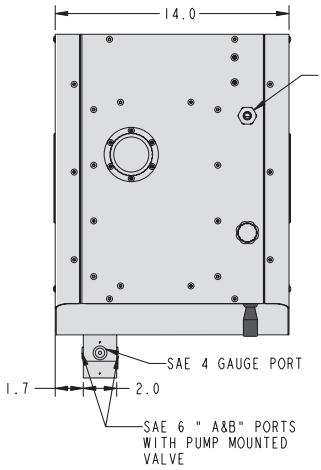
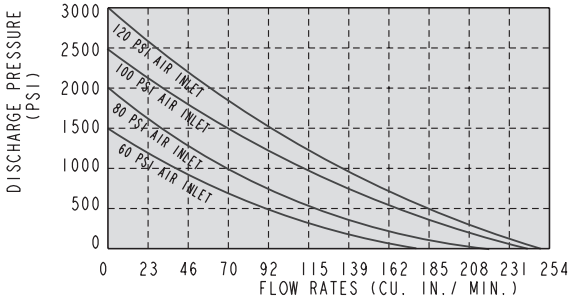
Designed Exclusively for Workholding

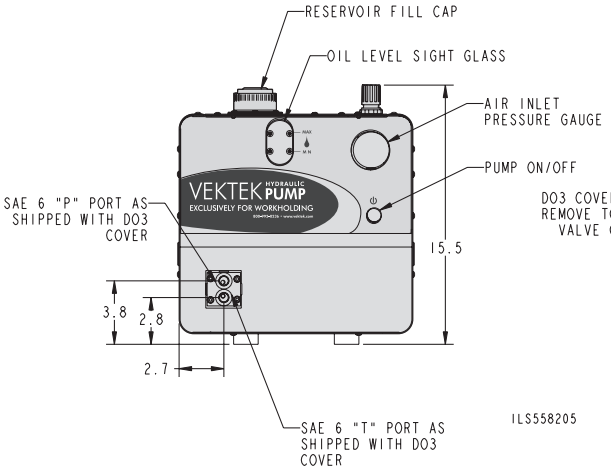
Model No. 55-2201-00

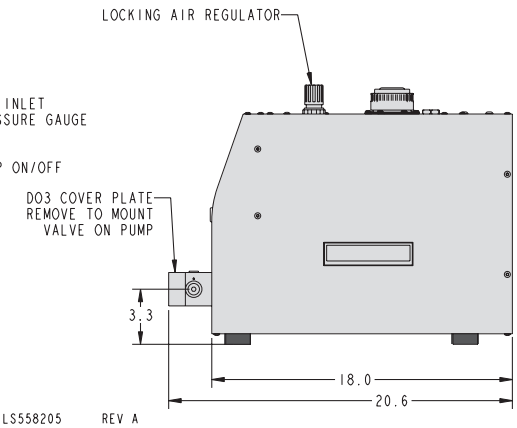
- Powers either single or double acting systems.
- Internal cartridge hydraulic return line filter included.
- Pump is self-priming.
- Any one of our D03 valves can be mounted directly on the pump, no external sub-plate is necessary on most systems.
- Flow rates up to 1.0 GPM.
- Built-in locking air regulator adjusts to determine hydraulic output pressure from 500 to 3000 psi.
- Hydraulic Gauge sold separately.
- SAE 4 Extender, Model No. 30-7912-44, required to install the gauge. Order Separately.
- Filter, Model No. 31-0500-14 provided. Order additional filters separately.
- Suitable for fixtures or pallet systems.
- Use ISO 32 grade hydraulic fluid sold separately (not included).

Model No.	Reservoir Capacity	Maximum Air Input	Pressure Range
55-2201-00	231 cu. in. (1 gal)	120 psi	500 to 3000 psi









ILS558205 REV A

J-5

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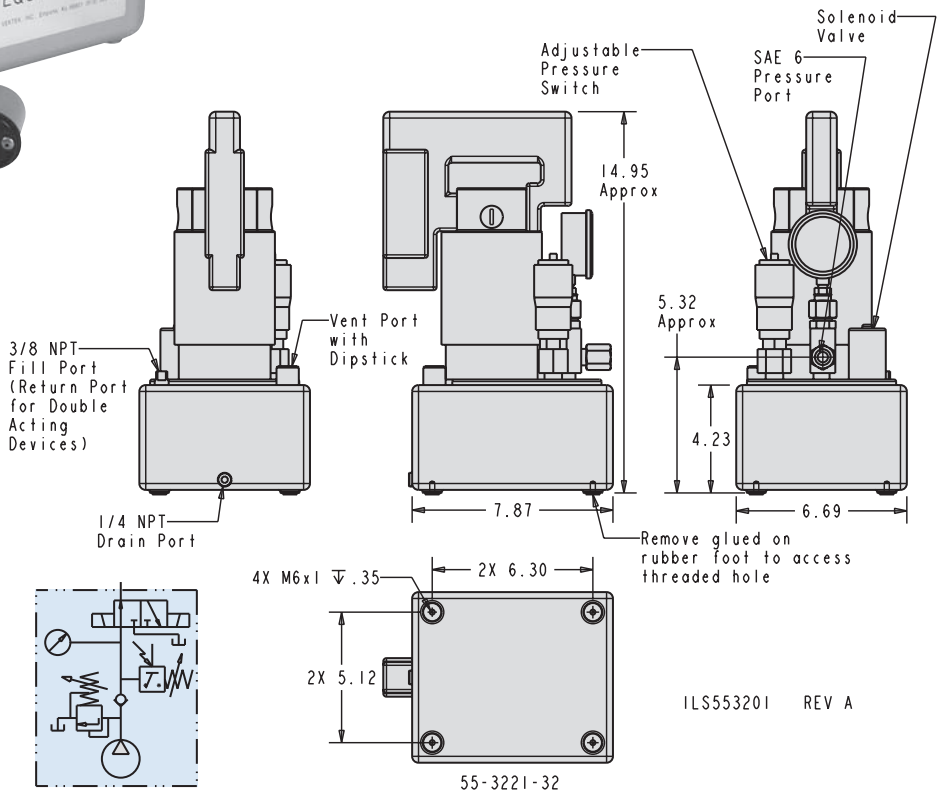
Power Supplies

1/3 HP Portable Electric/Hydraulic Pump

Portable Electric/Hydraulic Pump

- New enclosed motor housing eliminates entry of motor damaging environmental debris.
- New beefier motor extends life and runs quieter than the previous model.
- Builds to preset pressure, maintains continuous pressure until switched off and will not release until electrically signaled.
- Fully self-contained, yet easily portable, weighs only 32 lb. with oil.
- Hydraulic pressure switch externally adjustable from 700 to 5,000 psi.
- Two-stage pump flows 120 cu. in. per minute at low pressure; 12 cu. in. per minute at maximum pressure.
- Integral safety overload valve, factory set at 5,000 psi.
- Reservoir usable oil capacity: 108 cu. in.
- Equipped with single-phase 115V 1/3 hp motor.

Extreme portability and easy pressure adjustment make this a versatile pump that can be fitted with quick connectors to serve as the power source for fixtures used in various plant locations. To ensure long, trouble-free service, VektorFlo® power supplies have been specially engineered to operate at 5,000 psi, optimum pressure for power workholding. The pump automatically holds the pressure set on the pressure switch and automatically restarts should a pressure drop occur. The compact motor draws only 7 amps at full pressure. Nothing is needed other than a hose to put this self-contained unit to work.



Model No.	Cylinder Use	Valve Type*	Cylinder Operating	Motor	Pump Flow/Minute		Reservoir Capacity	
					100 psi	5000 psi	Gross	Useable
55-3221-32	Single Acting or Double Acting*	2 Way 3 Port Electric	Advance, hold, Release	1/3 hp, 115V/7amp 1 ph, 50/60 Hz	120 cu. in.	12 cu. in.	122 cu. in.	108 cu. in.

WARNING! The use of spool valves invalidates the warranty on VektorFlo® pumps.

* Double acting systems require the use of a remote valve and return line. Valve information in section N. Available with SAE 6 outlet port.

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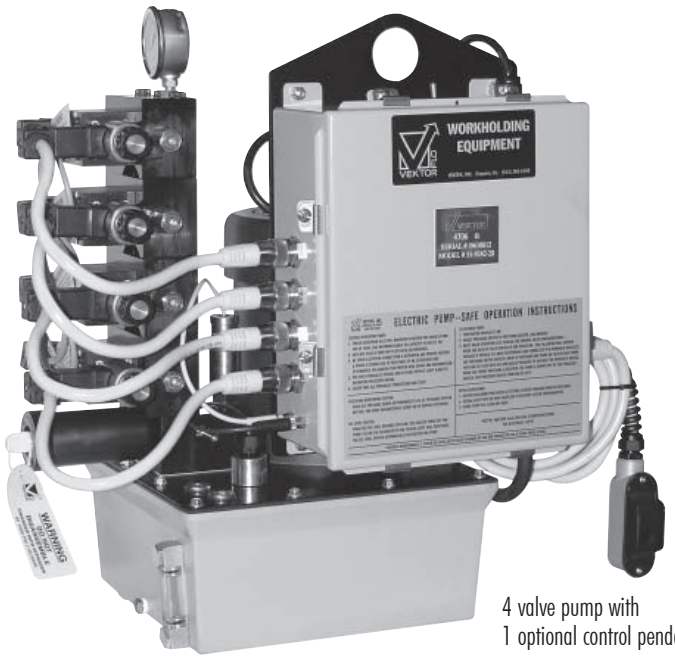
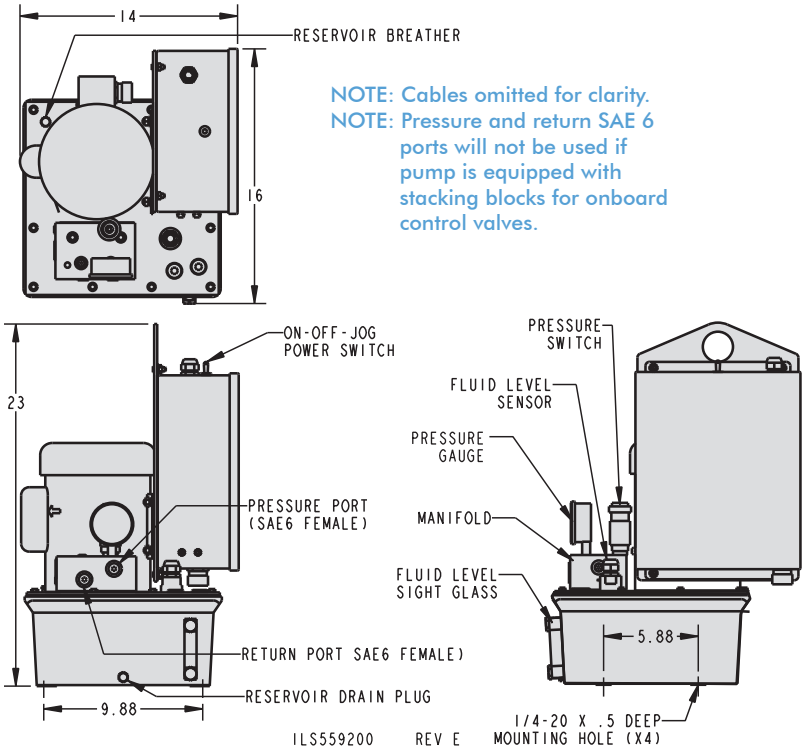


4 valve pump with
1 optional control pendants

Medium Capacity, 2 Stage Electric/Hydraulic Pump Intermittent Duty Cycle (50%) 3 Cycles Per Minute Maximum

115 VAC 1 Phase and 230/460 VAC 3 Phase Models

- Two stage pump, designed for power clamping, is medium weight (a fully equipped 2-Port pump weighs approximately 130 lbs) and energy efficient. Includes over pressure relief, full time pressure monitoring, in-tank fluid level sensor and full flow filtration.
- First stage pump flow is 350 cu. in. per minute up to 650 psi to move clamps into position quickly. The second stage maintains pressure with a flow rate between 40 and 50 cu. in/.min at 5,000 psi.
- Exclusive stacking manifold feature accommodates all VektorFlo® DO3 valves. Stacking of multiple manifolds allows you to select a pump to meet your circuit needs using inexpensive standard components



In operation, the pump turns on, builds to the preset pressure, then turns off. In the event of pressure decay, a pressure switch automatically restarts the pump to replenish system clamping pressure." The on-demand operation of the pump reduces electrical consumption and prevents overheating of oil which can occur in continuously running pumps.

The fluid level sensor prevents the pump from running without fluid. Should oil levels run low, the pump shuts down preventing potential damage.

Small size and high performance allow this pump to compete favorably with many single stage pumps requiring up to 2 hp motors.

See section N for valve information.

* Dump pump configuration drops all pressure after reaching its setting.

Note: Maximum system flow rate is 1.5 gpm (346.5 cu. in./minute) for all VektorFlo® special function valves.

Excess flow voids warranty.

Motor	Pump Flow/ Minute 5,000 psi	Reservoir Capacity Gross	Reservoir Capacity Usable	Pressure Switch Adjustment Range	Pressure Gauge	Application
3/4 hp, 115 VAC 1 phase, 60 Hz, 3450 rpm	40 cu. in	500 cu. in. (2.2 gal)	400 cu. in. (1.7 gal)	800-5000 psi	0-10,000 psi silicone or glycerin filled	Single and/or Double Acting Depending on Valve Selection
1 hp, 230/460 VAC 3 phase, 60 Hz, 3450 rpm	50 cu. in.					

Warning: The use of spool valves invalidates the warranty on VektorFlo® pumps.

NOTE: See pump model matrix on J-8 for specific pump number.

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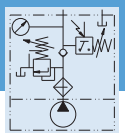

Power Supplies

Medium Capacity Pump Systems Fully Configured

Pump Model Matrix

VALVE CONFIGURATION	No. of Valves	115 VAC 1 Phase 3/4 hp	230 VAC 3 Phase 1 hp	460 VAC 3 Phase 1 hp
Manifold Only Pumps				
Manifold Only Used as a central or remote power supply with remote control valves configured with a "P" (pressure out) and "T" (tank return flow) port only. Typically mounted behind a machine or between two machines with valves mounted on the machine closer to the application and often machine controlled. A shear seal or poppet style zero leak valve must be used.	0	55-9242-32	55-9272-32	55-9292-32
D03 Valve Manifold Only Used to direct mount a valve to the pump, controlling the direction of 2 outlet ports. A shear seal or poppet style zero leak valve must be used.	0	55-9242-63	55-9272-63	55-9292-63
Decoupled System Pumps				
24VDC 2-Position 3-Port Normally Closed Single Acting Only Decoupled System Valve installed with a control pendant to power systems using the Self-closing Decoupler and Tombstone Top Plates. Commonly referred as a dump pump and uses a momentary contact pendant switch. When preset pressure is reached the control valve automatically shifts and dumps pressure back to tank. Operator interface is by remote pendant or can be wired into a machine controller.	1	55-9242-35	55-9272-35	55-9292-35
24VDC 3-Position 4-Port P-Blocked Center with A & B Ports Pressure Regulated Engineered to reduce pressure to either the clamp or unclamp side of a circuit. This model is ideal for use with either 1 or 2 handed Auto-Shutoff Pallet Decouplers. Uses a P-Blocked center valve to drop pressure in both lines to decouple and re-couple the hydraulic hoses. Operator interface is by remote pendant or can be wired into a machine controller. This configuration can also be used to operate two individual single acting systems at different pressures.	1	55-9242-65	55-9272-65	55-9292-65
24VDC 3-Position 4-Port P-Blocked Engineered to be used with either 1 or 2 handed Auto-Shutoff Pallet Decouplers. Uses a P-Blocked center valve to drop pressure in both lines to decouple and re-couple the hydraulic hoses. Operator interface is by remote pendant or can be wired into a machine controller.	1 2 3 4	55-9242-09 55-9242-18 55-9242-24 55-9242-30	55-9272-09 55-9272-18 55-9272-24 55-9272-30	55-9292-09 55-9292-18 55-9292-24 55-9292-30
Live or Decoupled Systems				
24VDC 2-Position 3-Port Normally Closed Single Acting Systems Used with Single Acting Coupled systems and Manual Pallet Decouplers, Tombstone Top Plates and the Self-Closing (single hose) Decoupler. Operator interface is by remote pendant or can be wired into machine controller. **NOTE: All valves used in the decoupled condition are de-energized when not in use to avoid heat build-up between cycles.**	1 2 3 4	55-9242-33 55-9242-36 55-9242-37 55-9242-38	55-9272-33 55-9272-36 55-9272-37 55-9272-38	55-9292-33 55-9292-36 55-9292-37 55-9292-38
Manual 2-Position 3-Port To control a Single Acting system either coupled or decoupled. (May not be used with 2 hose Auto-Shutoff Decouplers.) Operator interface is by shifting a manual valve handle, requiring pump to be located with in operators reach.	1 2 3 4	55-9242-01 55-9242-48 55-9242-11 55-9242-49	55-9272-01 55-9272-48 55-9272-11 55-9272-49	55-9292-01 55-9292-48 55-9292-11 55-9292-49
Manual 3-Position 4-Port P-Blocked Controls double acting systems, either coupled or decoupled, when the fluid flow from the clamp and unclamp hoses needs to return to tank the valve is actuated to the "center" position. Recommended for control of Auto-Shutoff Pallet Decoupler (2 hose) systems. Operator interface is by shifting a manual valve handle, requiring pump to be located with in operators reach. This is an ideal configuration for running double acting coupled or decoupled systems. Best selection for fixture testing of all system types.	1 2 3 4	55-9242-05 55-9242-17 55-9242-23 55-9242-29	55-9272-05 55-9272-17 55-9272-23 55-9272-29	55-9292-05 55-9292-17 55-9292-23 55-9292-29
Manual 3-Position 4-Port Closed Center Used to run a continuously connected system. Not well suited for use with most decoupled systems. Operator interface is by shifting a manual valve handle.	1 2 3 4	55-9242-04 55-9242-45 55-9242-46 55-9242-47	55-9272-04 55-9272-45 55-9272-46 55-9272-47	55-9292-04 55-9292-45 55-9292-46 55-9292-47
24VDC 2-Position 3-Port Normally Open To run a single acting system usually coupled. (May not be used with Auto-Shutoff Decouplers.) Operator interface is by remote pendant or can be wired into a machine controller. If used to power a decoupled system, valves will run hot while decoupled.	1 2 3 4	55-9242-03 55-9242-14 55-9242-20 55-9242-26	55-9272-03 55-9272-14 55-9272-20 55-9272-26	55-9292-03 55-9292-14 55-9292-20 55-9292-26
24VDC 3-Position 4-Port Closed Center To run a continuously connected system. Difficult to use with most decoupled systems. Operator interface is by remote pendant or can be wired into a machine controller. Center position allows no movement of clamps when valve is de-energized.	1 2 3 4	55-9242-07 55-9242-16 55-9242-22 55-9242-28	55-9272-07 55-9272-16 55-9272-22 55-9272-28	55-9292-07 55-9292-16 55-9292-22 55-9292-28

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Medium Capacity Pump Pendants and Optional Return Line Filter

Features of
Medium Capacity Electric/Hydraulic Pump Intermittent Duty Cycle With Valves And Control

- "On demand" pump.
- Internal pressure relief valve directs excess flow back to tank preventing motor stalls when flow is fully restricted. This valve serves the dual purpose of lubricating the internal parts.
- Sight gauge to monitor hydraulic fluid level.
- An oil level sensor, mounted in the tank, turns the motor off to protect your pump from burning up in low oil conditions.
- Pressure line filtration of 25 microns helps protect the components on your application. (An optional return line filter is now available)
- All pumps come completely configured, assembled and ready to connect to the machine controller. When connecting solenoid valves to a machine controller order wiring kit Model No. 95-5342-28 (cable is 19.7 ft. long) per valve.

Warning: The use of spool valves invalidates the warranty on VektorFlo® pumps.

NOTE: Contact factory for custom pump configurations.

NOTE: Voltages listed are input to control box for pump motor. All solenoid valves use 24 VDC control voltage supplied by the transformer internal to the pump control box. Wiring of control valves supplied with pump is not required.

NOTE: Solenoid valves configurations are supplied with one valve control pendant with a 6 ft. cable. For additional pendants order from the chart at the right.

NOTE: See pump manual to calculate the required electrical service for your specific application.

- Directional Control Valves Section N
- Configurations that include integrally mounted solenoid valves incorporate an accumulator in the "P" port on the front of its manifold block. This helps compensate for pressure loss during the valve shift and as a means to "cushion" the motor over-run on small circuits.
- One control pendant is supplied with each pump. (Additional pendants and controller interface wiring are ordered separately. See pendant chart.)
- Each valve circuit in a multiple valve configuration incorporates a pressure line "P" check valve to prevent pressure loss in an already pressurized circuit when subsequent circuits are actuated.
- One price, you select the function from page J-8 and buy from a price list, no custom charges or price mystery.

Pendant Model No.	Corresponding Valve Configuration
70-7407-76	3/4 closed or P-blocked center (on-off-on)
70-7407-77	2/3 Normally open (on-off)
70-7407-79	2/3 Normally closed (off-MOM)
70-7407-80	2/3 Normally closed (off-on)

Optional Vektek Return Line Filter for Medium Capacity Pump

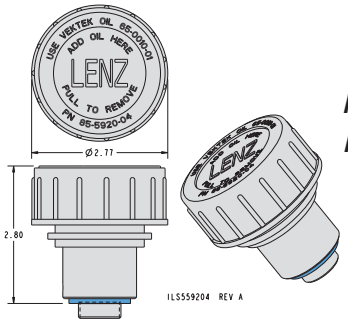
- Superior filtration over screen filters; 25 Micron nominal filter rating.
- Vektek spin-on element is easily serviced.
- Filter service indicator gauge is included.
- Compatible with pumps using a 0 to 4 valve stack.
- Factory installation on new pumps or field installation on existing models.

Filter Kit Model No.	Pump Valve Manifolds	Replacement Filter
62-5592-00	0	31-0500-14*
62-5592-01	1**	
62-5592-02	2	
62-5592-03	3	
62-5592-04	4	

* Use Vektek replacement filter only.

** D03 manifold only pump has one valve manifold but no valve included. Order Return Line Filter Model No. 62-5592-01 for pump Model Nos. 55-9242-63, 55-9272-63, and 55-9292-63.

Get a Clean Start



Oil Filler/Breather Kit
for
Medium Capacity Pump
Model No. 62-5592-05

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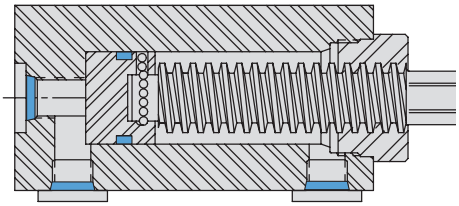
Threaded Body and Block Body Style Screw Pump

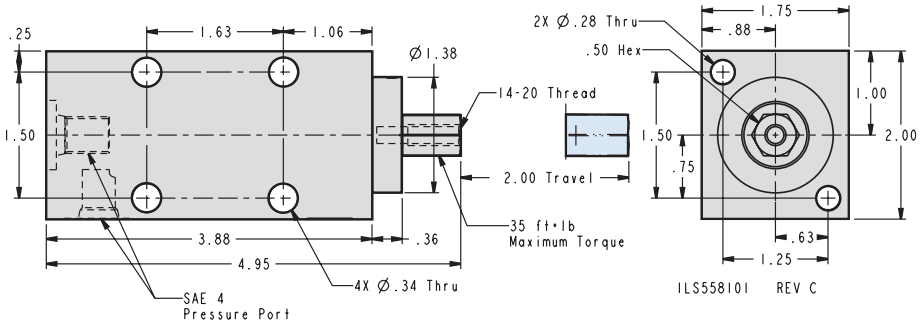
Threaded Body Screw Pump Model No. 55-8190-01
Block Body Screw Pump Model No. 55-8190-00

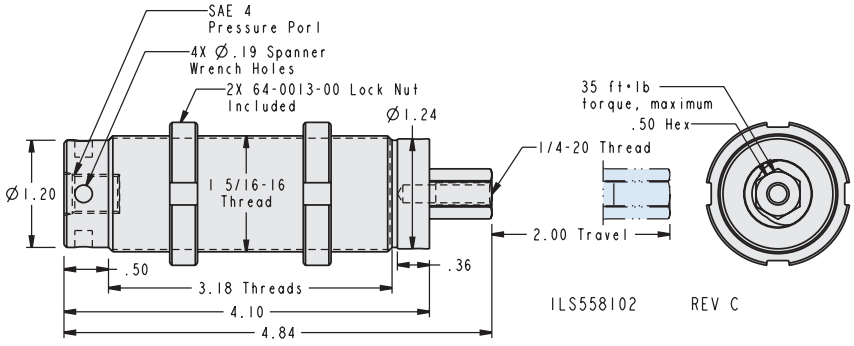
- Simple, inexpensive power supply for small systems.
- Ideally suited to powering work supports when used on manual clamping fixtures.
- Heavy duty threaded screw can be driven by a precision "nut runner" for fast and precise actuation (maximum RPM = 500).
- Block style bolts down, threaded body can be mounted through a bulkhead with the two retaining collars provided.

Max. Working Pressure	5,000 psi
Capacity	1.57 cu. in.
Volume per Revolution	0.13 cu. in.
Body	BHC™ heat treated alloy steel
Screw	Hardened acme (6 tpi) threads

NOTE: Accumulator effect of Vektek hose is required for use with the Vektek Screw Pump. We recommend hoses on all screw pump installations.







Applied Torque Produces Approximate Output Pressure

Torque	Pressure
10 Ft. Lb.	1,000 psi
20 Ft. Lb.	2,000 psi
25 Ft. Lb.	3,000 psi
30 Ft. Lb.	4,000 psi
35 Ft. Lb.	5,000 psi
Screw Pump capacity 1.57 cu. in.	
7/8 & 1 1/16 Hex adapters are supplied with each screw pump.	

ILS558103 REV B

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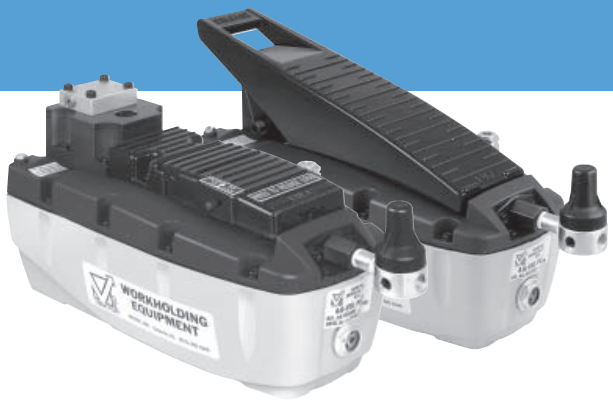
Compact Air/Hydraulic Pump



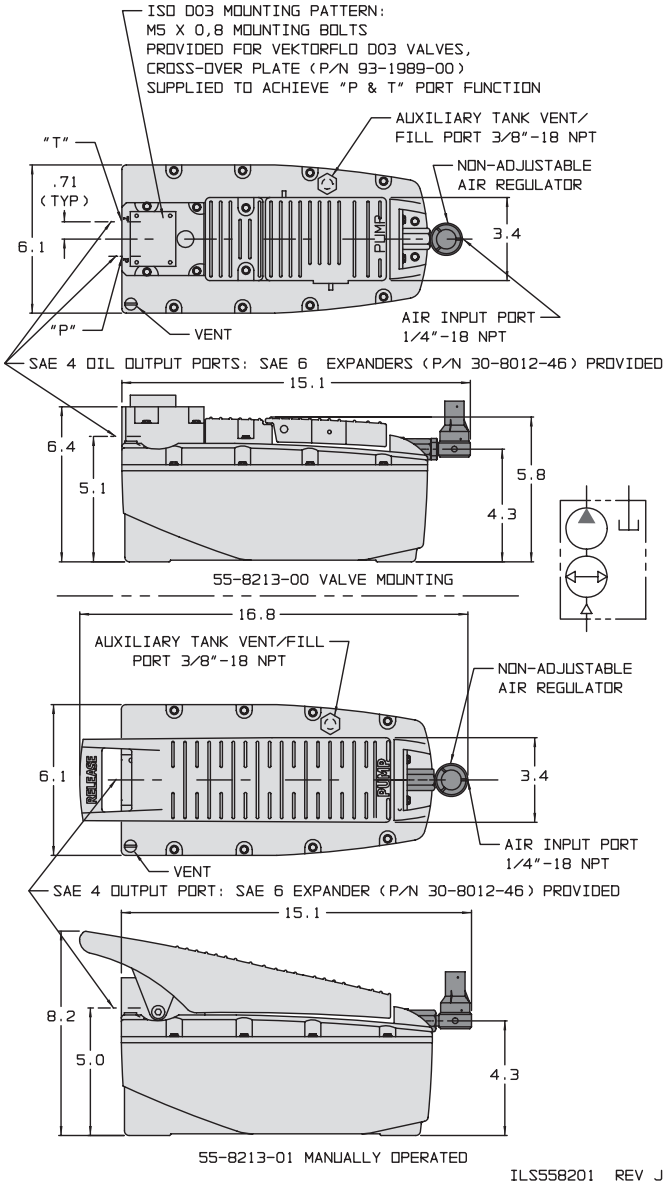
- Suitable for most single fixtures and small pallet systems.
- Noise level, 75 Db. at four feet.
- Long life, shown to perform over three times longer than comparable equipment.

Model No. 55-8213-00

- Suitable for operating either single or double acting systems.
- Valves can be mounted directly on the pump or remotely, no external sub-plate is necessary.
- A D03 valve (see pages N-3 through N-5) or cross over plate, part 93-1989-00 is required for use with this pump, crossover plate is provided.

Model No. 55-8213-01

- For Single Acting Systems only.
- Control valve built-in, no external valves are required or recommended.
- Mounting hardware included.
- Easily operated by hand or foot; press to pump, press to release. Pump does not run unless treadle is pressed to activate function.



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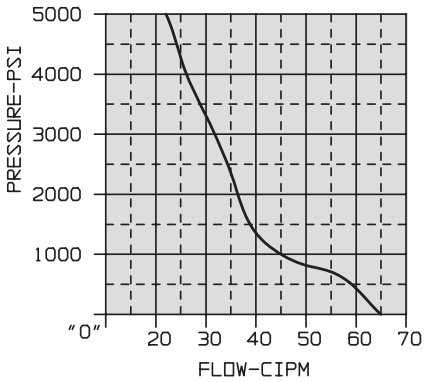

MODEL #55-8213-00 = 85 PSI AIR MAX
MODEL #55-8213-01 = 85 PSI AIR MAX
MINIMUM AIR PRESSURE = 40 PSI

ILS558203 REV C

Model No.	Resevoir Capacity Gross	Resevoir Capacity Useable	Air Input Pressure Min.	Air Input Pressure Max.	Hydraulic Pressure Range	Mounting Options	Weight
55-8213-00	Horiz. 146.5 cu. in.	Horiz. 128.15 cu. in.	40 psi	85 psi	2,000-5,000 psi	Horizontal (as shown)	16.3 lbs
55-8213-00	Vertical 134.25 cu. in.	Vertical 91.54 cu. in.				Vertical (air inlet face up)	
55-8213-01	Horiz. 146.5 cu. in.	Horiz. 128.15 cu. in.	40 psi	85 psi	2,000-5,000 psi	Horizontal (as shown)	16.3 lbs
55-8213-01	Vertical 134.25 cu. in.	Vertical 91.54 cu. in.				Vertical (air inlet face up)	

WARNING! Use of spool valves invalidates the warranty on VektorFlo® pumps

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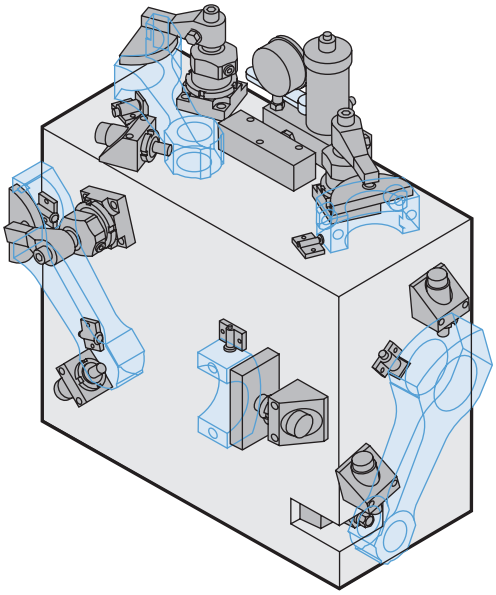
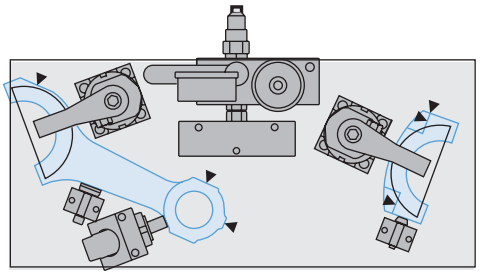
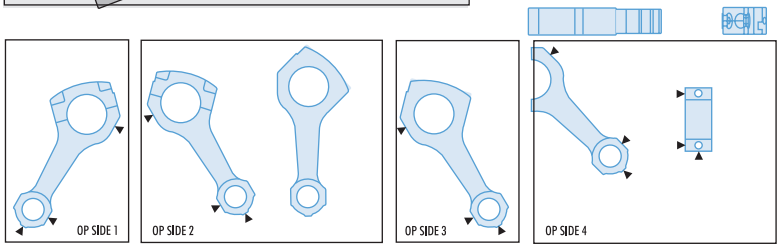
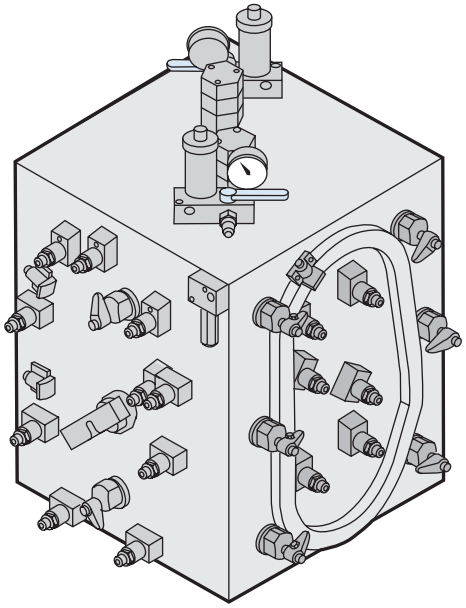
Palletized Fixture Accessories

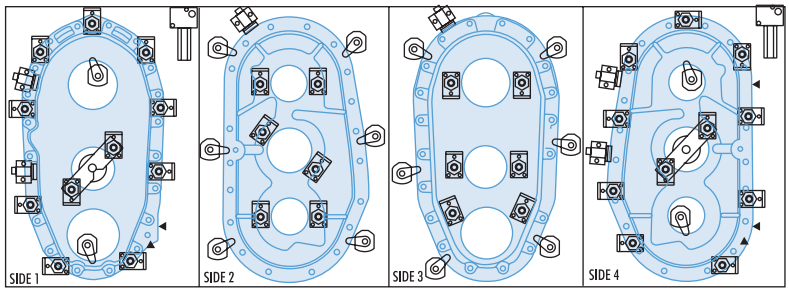
Layout Examples

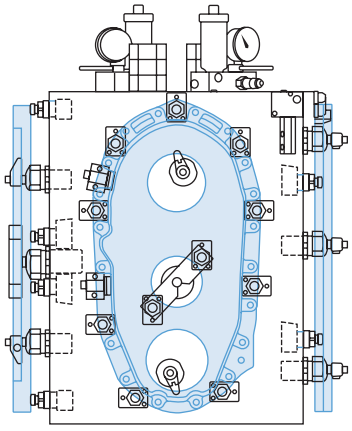












K-1

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Frequently Asked Questions

We are frequently asked questions which are common to both novice and experienced users about pallet and tombstone fixture clamping systems. The answers to the following questions may help users better understand palletized hydraulic systems. Contact Vektek for assistance in determining if you should use a decoupled fixture or leave the fixture connected to the pump.

What is a pallet decoupler and what is its purpose within a clamping system?

A pallet decoupler is a device which serves as the interface between the stationary pump and the moving pallet, and is the point where the hose(s) from the pump is connected and disconnected from the pallet. The decoupler "rides along" on the pallet and is the regulator of pressurized hydraulic fluid for the clamping circuit while it is disconnected from the pump.

A decoupler must contain a shutoff valve to trap pressurized fluid from the pump within the clamping circuit and allow the hose(s) to be disconnected from the pallet. A decoupler must also contain;

* A coupler(s) for connecting the hose(s).
* Filter screens to minimize the amount of contamination that enters the pallet hydraulic circuit.
* An accumulator to store pressurized hydraulic fluid for pressure maintenance to the clamping circuit while the pallet is disconnected from the pump..
* Ports for connection of the pallet hydraulic circuit.
* May include a pressure gauge and an over-pressure relief valve.

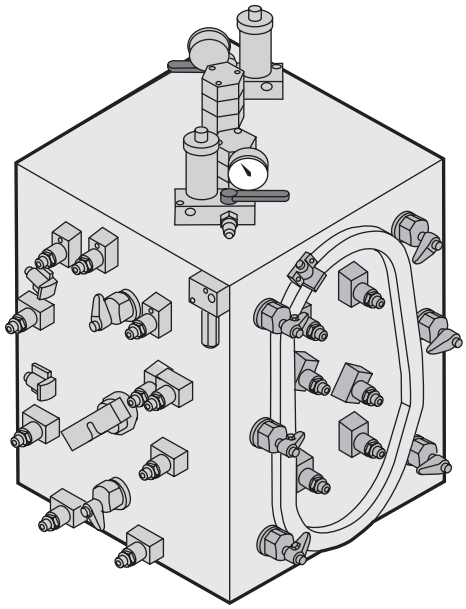
What are the basic types of pallet decouplers?

We divide pallet decouplers into two basic types based on whether the shutoff valve operates automatically or manually. In Manual Shutoff Valve Decouplers the operator manually closes the shutoff valve to trap pressure on the pallet (to keep the parts clamped) and manually opens it to release pressure from the pallet (unclamp the parts). With a Manual Shutoff Valve Decoupler the operator must also control the pump to pressurize the pallet and release pressure from the hose(s) for disconnection. For ease of operation, most Manual Shutoff Valve Decouplers are used with single acting clamp systems or circuits.

In an Automatic Shutoff Valve Decoupler the shutoff valve is actuated by Clamp and Unclamp pressures from the pump and the operator needs to control only the pump. Automatic Shutoff Valve Decouplers are used with both single and double acting circuits with equal ease.

What is the difference between a pallet decoupler and a Tombstone Top Plate?

A Tombstone Top Plate is an expanded type of Manual Shutoff Valve Decoupler. A decoupler has one shutoff valve to control one pallet circuit. A tombstone top plate has multiple shutoff valves to provide separate control of each single acting circuit (face) and a common accumulator to keep all circuits pressurized when the tombstone is disconnected from the pump. Tombstones that require double acting clamping circuits must use one Automatic Shutoff Valve Decoupler per face or circuit.



If I don't have enough space for decoupler (or top plate) with its accumulator, can I use just a shutoff valve and a disconnect coupler?

Absolutely not, every hydraulic clamping pallet and tombstone must have an accumulator to be safe! We offer decouplers with integral accumulators to minimize their size, and decouplers and top plates that allow the accumulator to be located to a place on the pallet or tombstone that has more space. In addition, we can provide all the individual components required to implement a distributed decoupling system to safely conform to your space limits.

What type of pump do I need to operate decouplers and Tombstone Top Plates?

Manual Shutoff Valve Decouplers and Tombstone Top Plates require an on-demand pump that includes a 2-Position 3-Port directional control valve and a mating coupler with suitable hose.

Automatic Shut off Valve Decouplers require an on-demand pump that includes a 3-Position 4-Port pressure blocked center directional control valve and a decoupler Operating Handle with suitable hoses.

Pumps for palletized fixtures must be configured to de-pressurize the hose(s) for connection and disconnection. See Basic Pump recommendations for each type of decoupler on the following pages. Pumps can also be configured to operate any combination of Manual Shutoff and Automatic Shutoff Valve Decouplers and Top Plates.

Most users prefer pendant controlled, pump mounted, and electric control valves for decoupling operations. However, pumps can be configured for remote mounted electric and manual control valves, and with valves for integration into the machine control or machining cell PLC (Programmable Logic Control). Pumps can be set-up with an automatic Pressure Monitoring System to assure that the pallet and tombstone fixture are properly pressurized before entering the machine. Pump operations can be set to deliver a different operating pressure to each pallet and tombstone and to deliver different pressures to the Clamp/Unclamp side of double acting circuits. Contact Vektek for technical assistance.

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Palletized Fixture Accessories

One-Handed Operating Handle - Automatic Shutoff Valve Decouplers

Automatic Shutoff Valve Decouplers for Single and Double Acting Systems

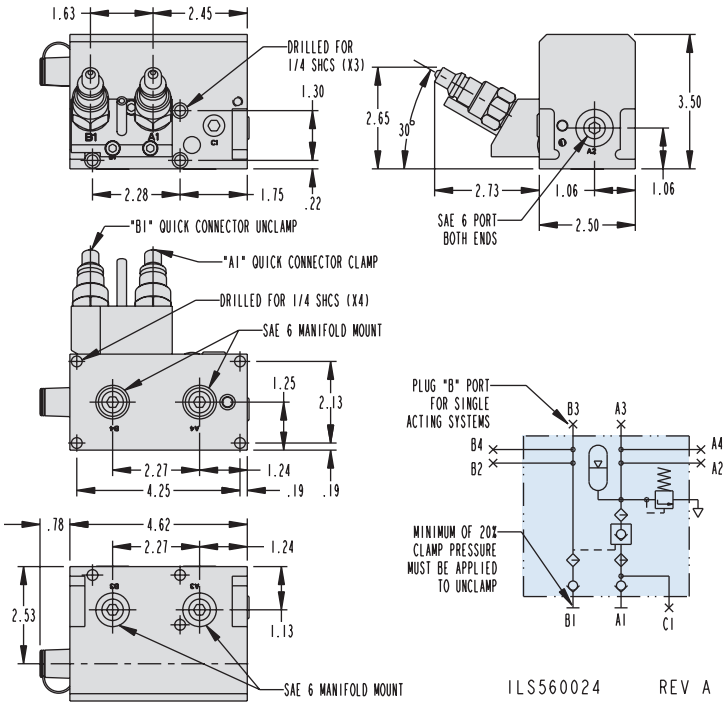
- Decouplers are a convenient, self-contained package that includes quick connect couplings, filters, pilot operated check valve, over pressure relief valve.
- Robust pilot operated check valve with a 1:5 pilot to check ratio for proven long term reliability.
- Internal 25 micron filters for added protection of the pilot operated check valve.
- Integral accumulator available in two operating pressure ranges.
- SAE female external ports and manifold mounting (bottom and rear) connections.
- Single acting pallet circuits require 2 hoses to the Operating Handle for pressure release. For single hose systems see the Manual Shutoff Valve Decoupler, page K-10.

Decouplers with Integral Accumulator

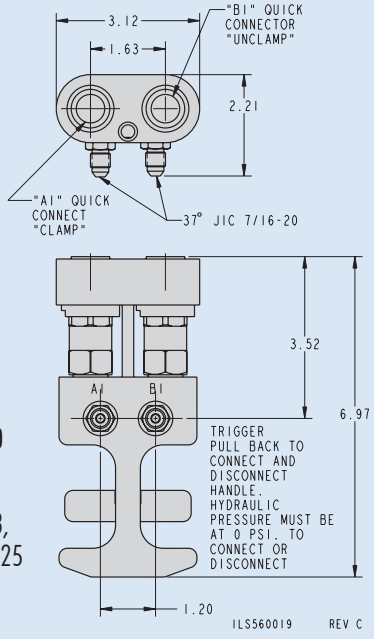
Model No.	Pressure Range	Accumulator Capacity
56-0005-23	1,000-3,000 psi	3.6 cu. in.
56-0005-24	2,000-5,000 psi	3.2 cu. in.

For use with Operating Handle Model No. 56-0008-00

NOTE: Field repair requires a special Check Valve Installation Tool. Please order Model No. 65-6000-00



For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.



Model No. 56-0008-00

For use with Decoupler

Model Nos. 56-0005-23, 56-0005-24, 56-0005-25 or 56-0005-26

Double Acting One-Handed Operating Handle

- Provides a fast, positive connection to the Decoupler.
- Ergonomic design reduces operator fatigue.

NOTE: These Automatic Shutoff Valve Decouplers and Operating Handle must be used with a suitable pump (see page K-4) which includes a 3-position/4-port, P-blocked center ("A" & "B" connected to "Tank") directional control valve for operation of single or double acting systems. One Automatic Shutoff Decoupler can be used to operate only one double acting or one single acting circuit. For operation of a single acting circuit, plug the Decoupler port "B" (as shown in the schematic).

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One-Handed Operating Handle - Automatic Shutoff Valve Decouplers

Automatic Shutoff Valve Decouplers for Single and Double Acting Systems

- Decouplers are a convenient, self-contained package that includes quick connect couplings, filters, pilot operated check valve, accumulator and over pressure relief valve.
- Robust pilot operated check valve with a 1:5 pilot to check ratio for proven long term reliability.
- Internal 25 micron filters for added protection of the pilot operated check valve.
- External accumulator available in two operating pressure ranges.
- Single acting pallet circuits require 2 hoses to the Operating Handle for pressure release. For single hose systems see the Manual Shutoff Valve Decoupler, page K-10.

Decouplers with External Accumulator

Model No.	Pressure Range	Accumulator Capacity
56-0005-25	1,000-3,000 psi	3.6 cu. in.
56-0005-26	2,000-5,000 psi	3.2 cu. in.

For use with Operating Handle Model No. 56-0008-00.

Pumps for Automatic Shutoff Valve Decouplers

A. Basic Automatic Shutoff Valve Decoupler Pump: Medium Capacity pump with one 3-position/4-port, P-blocked center directional control valve and 3-position pendant switch providing "Clamp-Disconnect-UnClamp" control (all detented) of the palletized circuit. See page J-7 for standard features of all Medium capacity pumps.

115 VAC, 1 Phase Model No. 55-9242-09

230 VAC, 3 Phase Model No. 55-9272-09

460 VAC, 3 Phase Model No. 55-9292-09

B. Medium capacity pump with an adjustable clamp and unclamp pressure regulator used with a 3-position/4-port P-blocked center valve. The valve is pendant controlled. Pendant switch must be held in either clamp or unclamp condition to fully cycle devices. Devices will stop when the pendant is released.

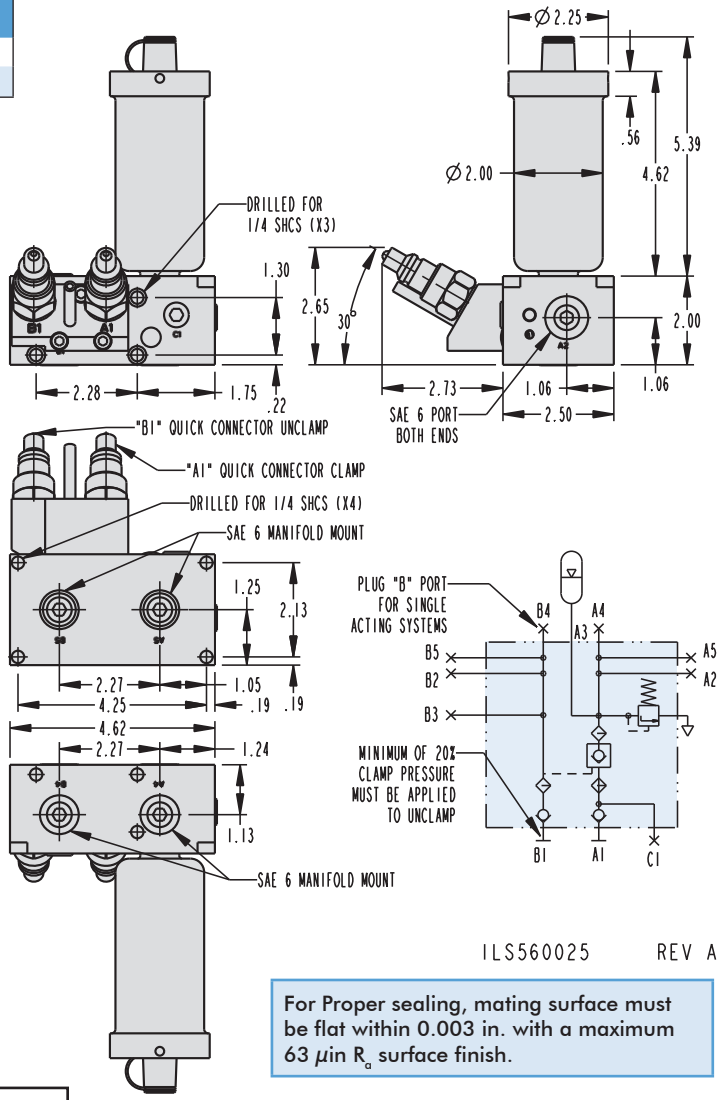
115 VAC, 1 Phase Model No. 55-9242-65

230 VAC, 3 Phase Model No. 55-9272-65

460 VAC, 3 Phase Model No. 55-9292-65

C. Other Automatic Shutoff Valve Decoupler Pumps: Vektek offers a matrix of pumps with a wide range of electric and hydraulic control features for use with the Automatic Decouplers. Contact Vektek with your specific needs for technical support on other suitable pump configurations.

NOTE: These automatic Shutoff Valve Decouplers and Operating Handle must be used with a suitable pump (see chart above) which includes a 3-position/4-port, P-blocked center ("A" & "B" connected to "Tank") directional control valve for operation of single or double acting systems. One Automatic Shutoff Valve Decoupler can be used to operate only one double acting or one single acting circuit. For operation of a single acting circuit, plug the Decoupler port "B" (as shown in the schematic).



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For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.

NOTE: Field repair requires a special Check Valve Installation Tool. Please order Model No. 65-6000-00

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Palletized Fixture Accessories

Two-Handed Operating Handle - Automatic Shutoff Valve Decouplers

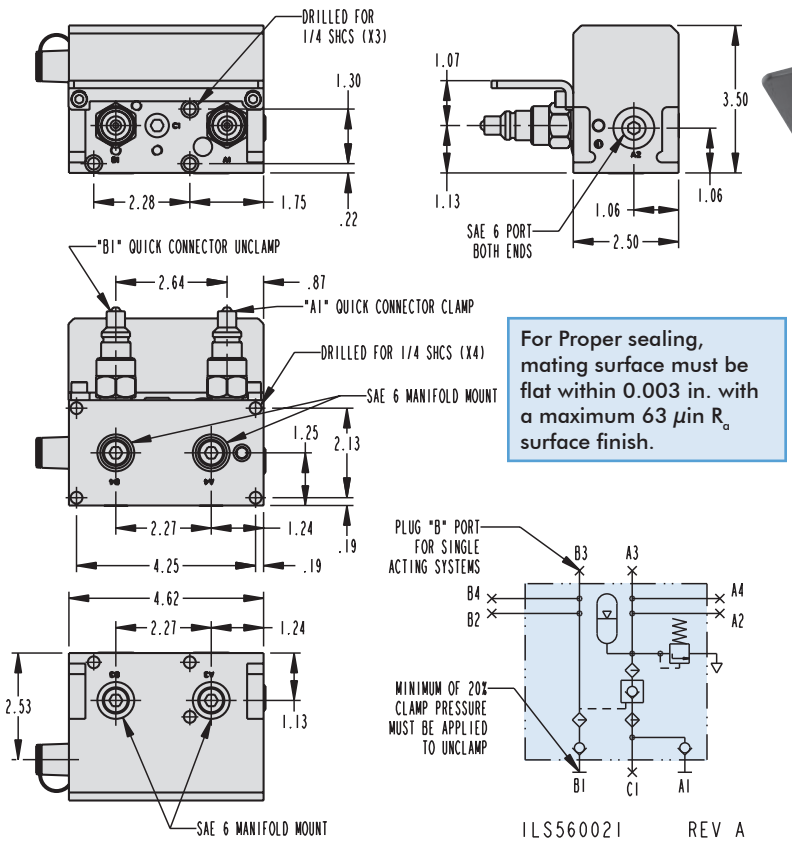
Automatic Shutoff Valve Decouplers for Single and Double Acting Systems

- Decouplers are a convenient, self-contained package that includes quick connect couplings, filters, pilot operated check valve, over pressure relief valve.
- Robust pilot operated check valve with a 1:5 pilot to check ratio for proven long term reliability.
- Internal 25 micron filters for added protection of the pilot operated check.
- Integral accumulator available in two operating pressure ranges.
- SAE female external ports and manifold mounting (bottom and rear) connections on all models.
- Single acting pallet circuits require 2 hoses to the Operating Handle for pressure release. For single hose systems see the Manual Shutoff Valve Decoupler,page K-10.

Decouplers with Integral Accumulator

Model No.	Pressure Range	Accumulator Capacity
56-0005-17	1,000 - 3,000 psi	3.6 cu. in.
56-0005-18	2,000 - 5,000 psi	3.2 cu. in.

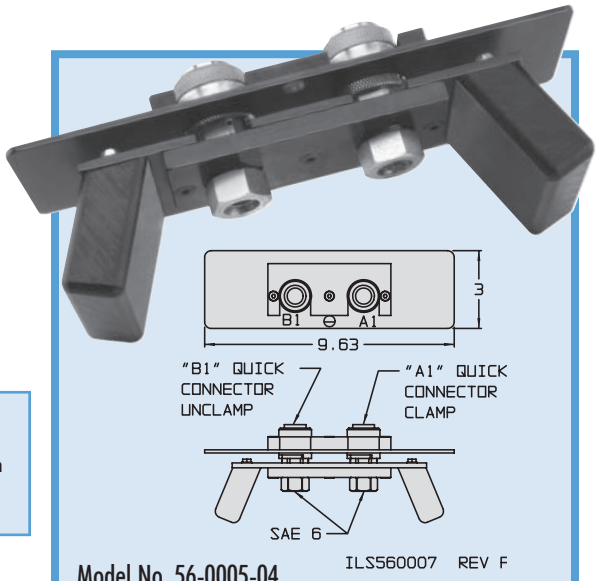
For use with Operating Handle **Model No. 56-0005-04**



For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.

NOTE: Field repair requires a special Check Valve Installation Tool. Please order Model No. 65-6000-00

NOTE: These automatic Shutoff Valve Decouplers and Operating Handle must be used with a suitable pump (see page K-6) which includes a 3-position/4-port, P-blocked center ("A" & "B" connected to "Tank") directional control valve for operation of single or double acting systems. One Automatic Shutoff Decoupler can be used to operate only one double acting or one single acting circuit. For operation of a single acting circuit, plug the Decoupler port "B" (as shown in the schematic).



Model No. 56-0005-04

For use with Decoupler Models 56-0005-17, 56-0005-18, 56-0005-19 or 56-0005-20

Two-Handed Operating Handle

- Provides fast, positive connection to the Decoupler.
- The Two-Handed Handle may be used with the optional Safety Interlock Storage Module (page K-8) to assure that the hoses are disconnected from the pallet before it is shuttled into the machine.
- Vektek Pumps for Automatic Shutoff Valve Decouplers inset on page K-6, bullet "A", are recommended for use with this handle.

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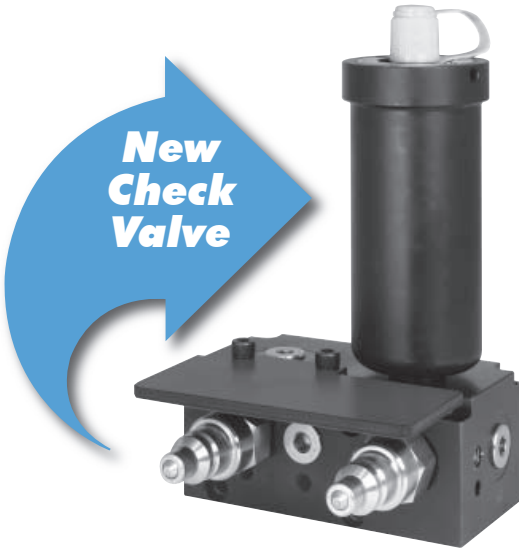
Automatic Shutoff Valve Decouplers for Single and Double Acting Systems

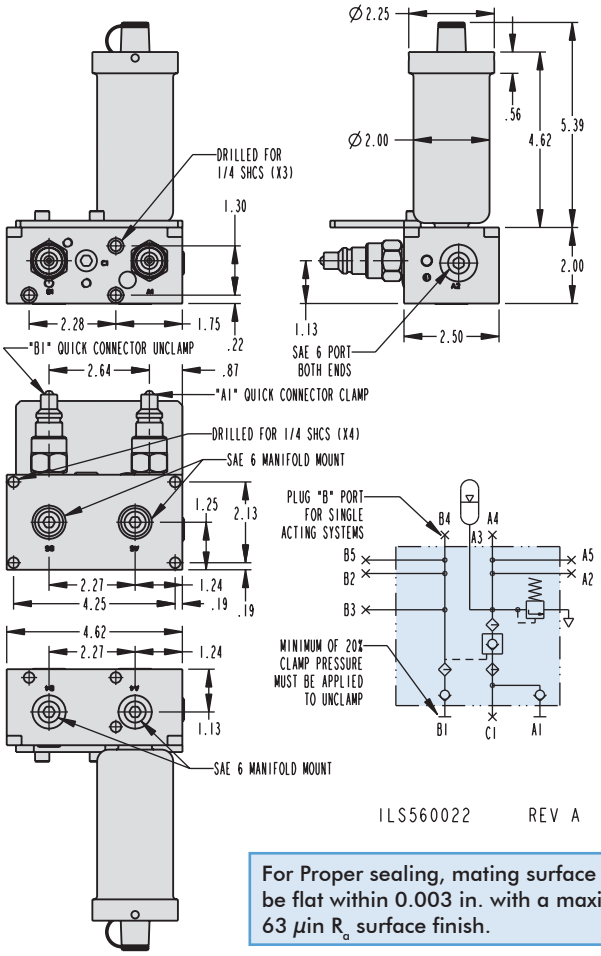
- Decouplers are a convenient, self-contained package that includes quick connect couplings, filters, pilot operated check valve, accumulator and over pressure relief valve.
- Robust pilot operated check valve with a 1:5 pilot to check ratio for proven long term reliability.
- Internal 25 micron filters for added protection of the pilot operated check valve.
- External accumulator available in two operating pressure ranges.
- SAE female external ports and manifold mounting (bottom and rear) connections.
- Single acting pallet circuits require 2 hoses to the Operating Handle for pressure release. For single hose systems see the Manual Shutoff Valve Decoupler, page K-10.



Decouplers with External Accumulator

Model No.	Pressure Range	Accumulator Capacity
56-0005-19	1,000-3,000 psi	3.6 cu. in.
56-0005-20	2,000-5,000 psi	3.2 cu. in.

For use with Operating Handle Model No. 56-0005-04.



For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.

NOTE: Field repair requires a special Check Valve Installation Tool. Please order Model No. 65-6000-00

Pumps for Automatic Shutoff Valve Decouplers

A. Basic Automatic Shutoff Valve Decoupler Pump: Medium Capacity pump with one 3-position/4-port, P-blocked center directional control valve and 3-position pendant switch providing "Clamp-Disconnect-UnClamp" control (all detented) of the palletized circuit. See page J-7 for standard features of all Medium capacity pumps.

115 VAC, 1 Phase Model No. 55-9242-09

230 VAC, 3 Phase Model No. 55-9272-09

460 VAC, 3 Phase Model No. 55-9292-09

B. Medium capacity pump with an adjustable clamp and unclamp pressure regulator used with a 3-position/4-port p-blocked center valve. The valve is pendant controlled. Pendant switch must be held in either clamp or unclamp condition to fully cycle devices. Devices will stop when the pendant is released.

115 VAC, 1 Phase Model No. 55-9242-65

230 VAC, 3 Phase Model No. 55-9272-65

460 VAC, 3 Phase Model No. 55-9292-65

C. Other Automatic Shutoff Valve Decoupler Pumps: Vektek offers a matrix of pumps with a wide range of electric and hydraulic control features for use with the Automatic Decouplers. Contact Vektek with your specific needs for technical support on other suitable pump configurations.

NOTE: These automatic Shutoff Valve Decouplers and Operating Handle must be used with a suitable pump (see page K-4) which includes a 3-position/4-port, P-blocked center ("A" & "B" connected to "Tank") directional control valve for operation of single or double acting systems. One Automatic Shutoff Decoupler can be used to operate only one double acting or one single acting circuit. For operation of a single acting circuit, plug the Decoupler port "B" (as shown in the schematic).

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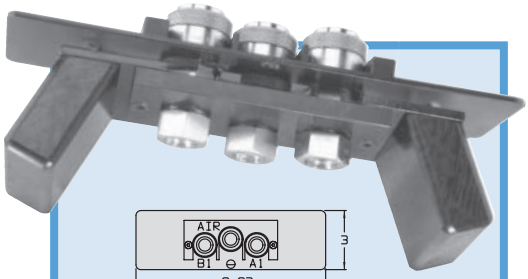
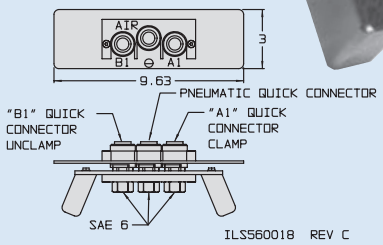
Palletized Fixture Accessories

Two-Handed Handle with Air - Automatic Shutoff Valve Decoupler with Air

Automatic Shutoff Valve Decouplers for Single and Double Acting Systems

- Decouplers are a convenient, self-contained package that includes quick connect couplings, filters, pilot operated check valve, accumulator and over pressure relief valve and separate path for compressed air.
- Robust pilot operated check valve with a 1:5 pilot to check ratio for proven long term reliability.
- Internal 25 micron filters for added protection of the pilot operated check valve.
- SAE female external ports and manifold mounting (bottom and rear) connections.
- Single acting pallet circuits require 2 hoses to the Operating Handle for pressure release. For single hose systems see the Manual Shutoff Valve Decoupler, page K-10.





Two-Handed Operating Handle with Air

Model No. 56-0007-01

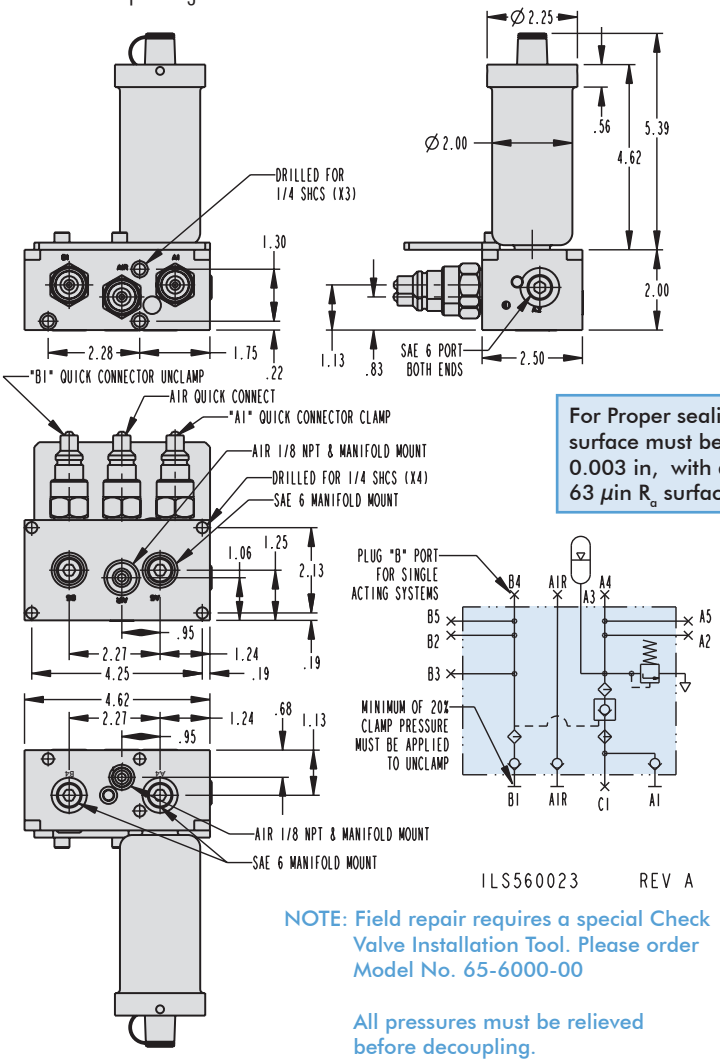
For use with Automatic Shutoff Valve Decoupler with Air: Models 56-0005-21 and 56-0005-22

Pneumatic Specifications:
250 psig Maximum Pressure
15 SCFM Maximum Flow

Decouplers with Air and External Accumulator

Model No.	Pressure Range	Accumulator Capacity
56-0005-21	1,000-3,000 psi	3.6 cu. in.
56-0005-22	2,000-5,000 psi	3.2 cu. in.

For use with Operating Handle Model No. 56-0007-01



For Proper sealing, mating surface must be flat within 0.003 in, with a maximum 63 μin R_a surface finish.

NOTE: Field repair requires a special Check Valve Installation Tool. Please order Model No. 65-6000-00

All pressures must be relieved before decoupling.

NOTE: This Automatic Shutoff Valve Decoupler and Operating Handle must be used with a suitable pump (see blue inset on K-6) which includes a 3-position/4-port, P-blocked center ("A" & "B" connected to "Tank") directional control valve for operation of single or double acting systems. One Automatic Shutoff Decoupler can be used to operate only one double acting or one single acting circuit. For operation of a single acting circuit, plug the Decoupler port "B" (as shown in the schematic).

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Handle Docking Module

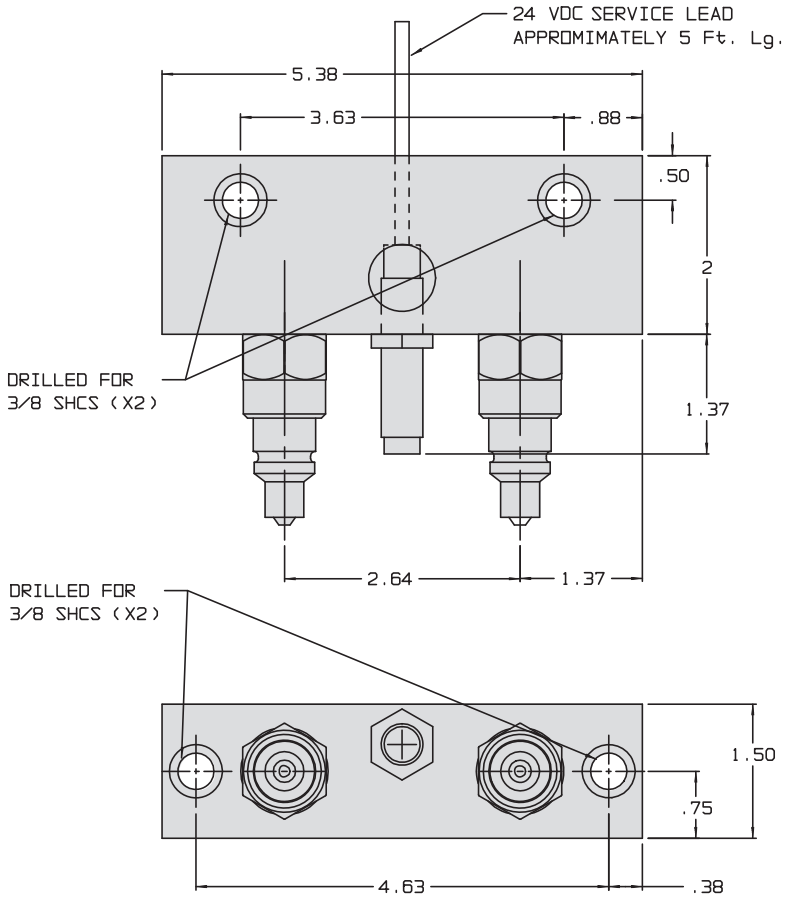
with controller interface feature

The Docking Module is designed for use with the 2-Handed Automatic Shutoff Pallet Decoupler handle. This docking unit stores your handle while your parts are machined and is equipped with a proximity switch to wire into your controller. Your process simply will not start until the decoupler handle is seated for detection by the proximity switch.

- Use of the optional Docking Module confirms that the Two-Handed Pallet Decoupler Handle and hoses are disconnected from the pallet before it is shuttled into the machine.
- Included dummy couplers to connect the Two-Handed Handle, and a proximity switch that senses the Handle is connected to the Module.

Docking Module Model No. 56-0005-05

For use with Operating Handle Model No. 56-0005-04



56-0005-05 TWO HANDED STORAGE MODULE WITH SAFETY PROXIMITY SWITCH
PROVISION FOR TWO HANDED HANDLE MODEL No. 56-0005-04

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Palletized Fixture Accessories

Accumulators-External

Accumulators*

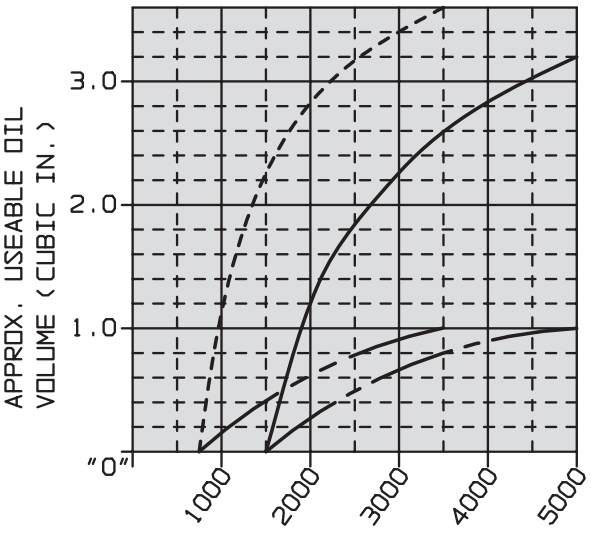
- Maintains circuit pressure while the pallet or tombstone fixture is disconnected from the pump using a decoupler or tombstone Top Plate.
- Piston-type, inert gas precharged accumulators compensate for pallet pressure changes during machining.
- Available in two operating ranges provide up to 3.6 cu. in. of pressure fluid reserve.

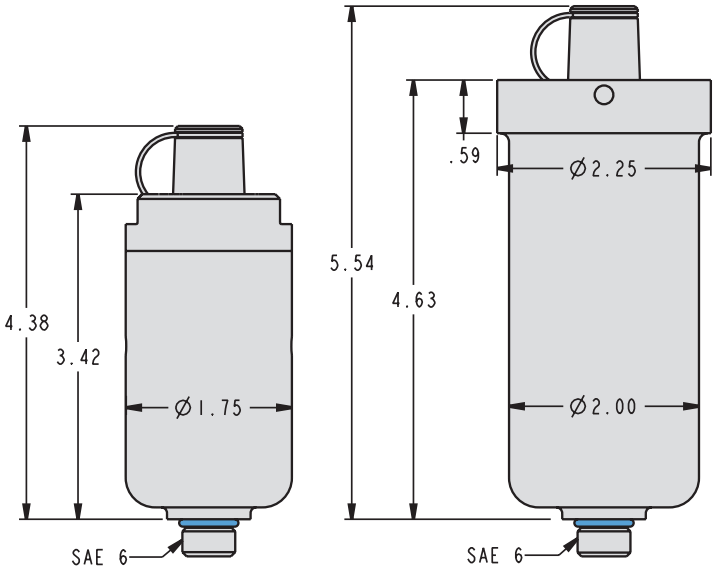
Hydraulic fluid compresses the precharged inert gas across the piston during circuit pressurization. The pressurized gas provides additional fluid to the circuit to reduce pressure changes in the event of small seeps, or thermal expansion/ contraction while the pallet or fixture is in the machine. The 2,000-5,000 psi operating pressure model has gas precharged to 1,500 psi. The 1,000-3,500 psi operating pressure model has gas precharged to 750 psi. Perform annual maintenance in accordance with the instructions provided with each accumulator. Contact Vektek for additional copies of the annual maintenance instructions or to arrange for factory performed annual maintenance.

Strictly observe all safety precautions provided with each accumulator.

Small System Accumulators

- Same functions as the larger accumulators above, except for smaller total volume circuits.
- For system operating pressures of 2,000-5,000 psi unit will provide up to 1 cu. in. of pressurized fluid reserve.





Accumulator Model No.	System Operating Pressure Range	Approximate Useable Volume At Maximum System Pressure
10-1014-01	2,000 - 5,000 psi	1.0 Cubic Inch
10-1014-02	1,000 - 3,500 psi	1.0 Cubic Inch
10-1016-01	2,000 - 5,000 psi	3.2 Cubic Inch
10-1016-02	1,000 - 3,500 psi	3.6 Cubic Inch

*NOTE: Accumulator's gas precharge must be checked annually. Consult Vektek for technical assistance.

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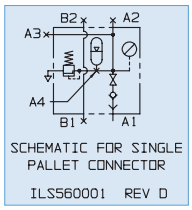
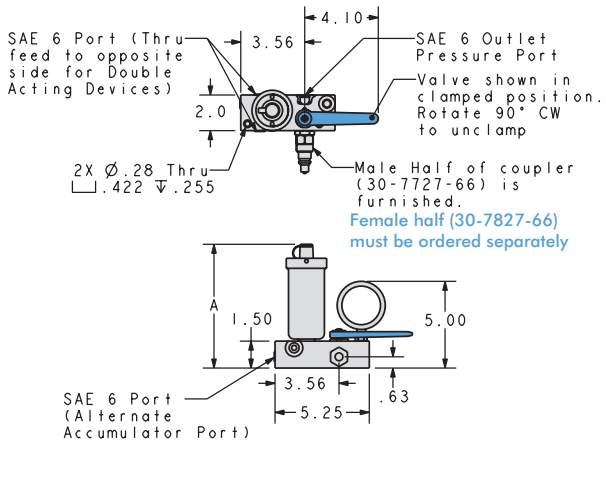
Manual Shutoff Valve Decoupler for Single Acting Systems

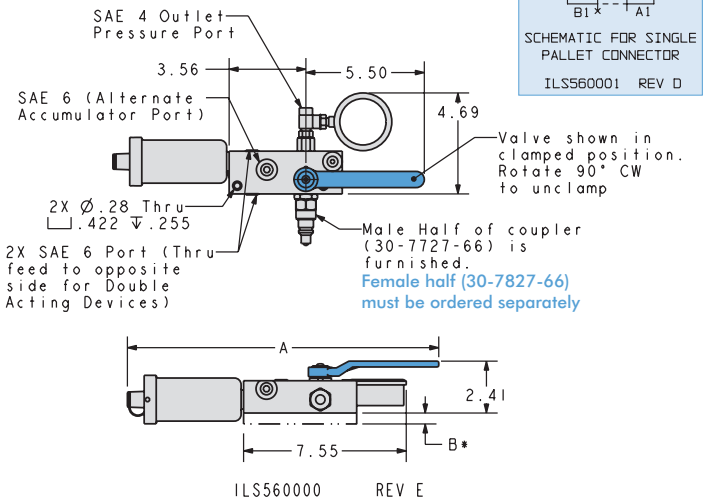
- This Decoupler is a convenient, self-contained package that includes a quick connect coupling, manual shutoff valve, accumulator (choose from horizontal or vertical arrangement), filter screen, pressure gauge, and over-pressure relief valve.
- Models available for circuits operating at 2,000-5,000 psi and 1,000-3,500 psi with standard and small accumulators.
- Includes auxiliary ports that can be used for double acting pallet circuits or compressed air.

Decoupler with External Accumulator

For operation with Female Quick Connect Coupling Model No. 30-7827-66 (page H-6)







Vertical Accumulator Manual Shutoff Valve Decoupler

Model No.	Pressure Range (psi.)	Accumulator Capacity (cu. in.)	A
56-0001-01	2000-5000	3.2	7.04
56-0001-02	1000-3500	3.6	7.04
56-0001-03	2000-5000	1.0	5.88

Horizontal Accumulator Manual Shutoff Valve Decoupler

Model No.	Pressure Range (psi.)	Accumulator Capacity (cu. in.)	A	B Min.
56-0002-01	2000-5000	3.2	14.1	0.50
56-0002-02	1000-3500	3.6	14.1	0.50
56-0002-03	2000-5000	1.0	12.9	0.25

* Depending on where the Decoupler is mounted, a spacer (not furnished) may be needed to offset the overhang of the accumulator.

Pumps for Manual Shutoff Valve Decouplers

A. Basic Manual Shutoff Valve Decoupler Pump: Medium Capacity pump with one 2-position/3-port, normally closed directional control valve and 2-position pendant switch providing "Clamp-Unclamp/Disconnect" control (both detented) of the palletized single acting circuit. See page J-7 for standard features of all 3/4 HP pumps.

115 VAC, 1 Phase Model No. 55-9242-33

230 VAC, 3 Phase Model No. 55-9272-33

460 VAC, 3 Phase Model No. 55-9292-33

B. Other Manual Shutoff Valve Decoupler Pumps: Vektek offers a matrix of pumps with a wide range of electric and hydraulic control features for use with the Manual Shutoff Decouplers to control both single and double acting circuits. Contact Vektek with your specific needs for technical support on other suitable pump configurations.

NOTE: This Manual Shutoff Valve Decoupler must be used with a suitable pump (see chart at left) which includes a 2-position/3-port, directional control valve for operation of one single acting circuit. Contact Vektek for considerations in the use of this Manual Shutoff Decoupler to control double acting circuits. Also see the Automatic Shutoff Valve Decouplers on pages K-3 through K-7.

For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.

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Palletized Fixture Accessories

Manual Shutoff Valve Decouplers, Self-Closing Valve

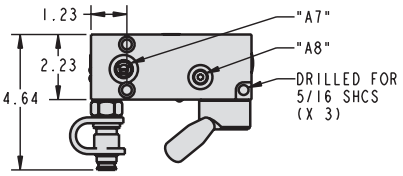
Manual Release Shutoff Valve Decoupler with Self-Closing Valve for Single Acting Systems

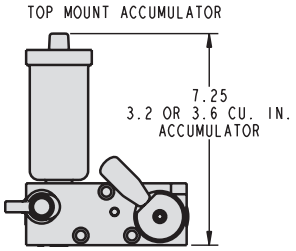
Decoupler with External Accumulator

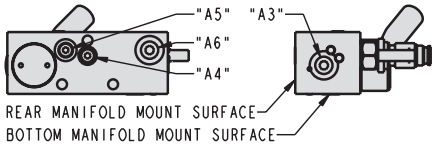
For operation with Female Quick Connect Coupling Model No. 30-7827-66.

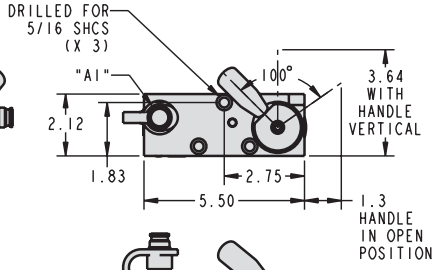
- This Decoupler is a convenient, self-contained package that includes a male quick disconnect with dust cover, accumulator, filter screens on both sides of system, and an over-pressure relief valve. (Pressure gauge sold separately see page M-11) .
- Manual shutoff valve automatically closes on system pressurization. Valve is manually opened to release system pressure back to the pump.
- External accumulator can be repositioned into your decoupler mounting and pallet layout.
- Manifold mountable from the bottom or the rear surface.

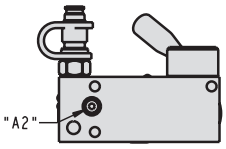
A1 - SAE 6 QUICK CONNECT
A2 - SAE 4 MAINFOLD MOUNT PRESSURE PORT
A3 - SAE 6 PRESSURE PORT
A4 - SAE 4 MANIFOLD MOUNT PRESSURE PORT
A5 - SAE 4 PRESSURE PORT
A6 - SAE 6 PRESSURE PORT
A7 - SAE 6 PRESSURE PORT
A8 - SAE 4 PRESSURE PORT

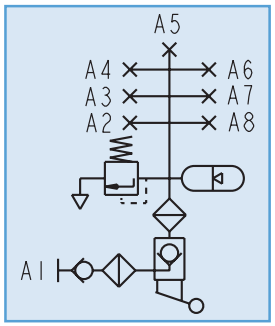








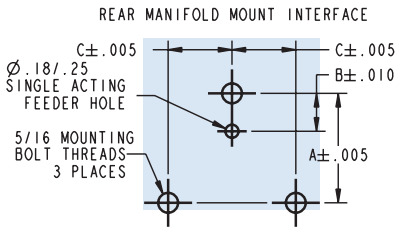


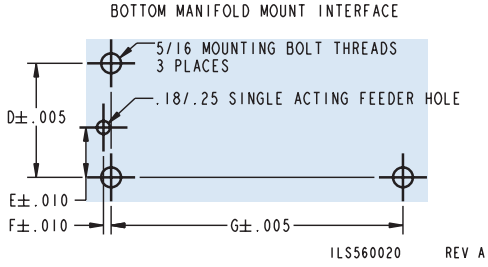


Assembly Elements

Model No.	System Operating Pressure		Accumulator Model No.	Quick Connect Part No.
	Min.	Max		
56-0006-03	2,000 psi	5,000 psi	10-1016-01	30-7727-66
56-0006-04	1,000 psi	3,500 psi	10-1016-02	30-7727-66

For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.





Manifold Mount Dimensions

Model No.	A	B	C	D	E	F	G
56-0006-03	1.500	0.520	0.875	1.563	0.683	0.105	4.0
56-0006-04							

NOTE: This Automatic Shutoff Valve Decoupler must be used with a suitable pump which includes a 2-position/3-port, directional control valve for operation of one single acting circuit.

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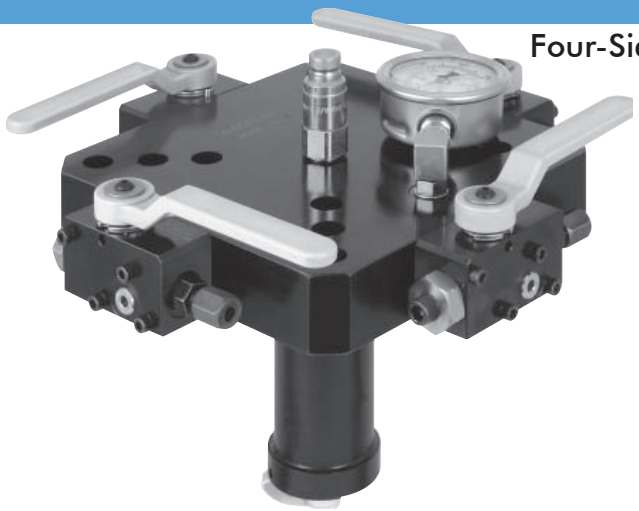
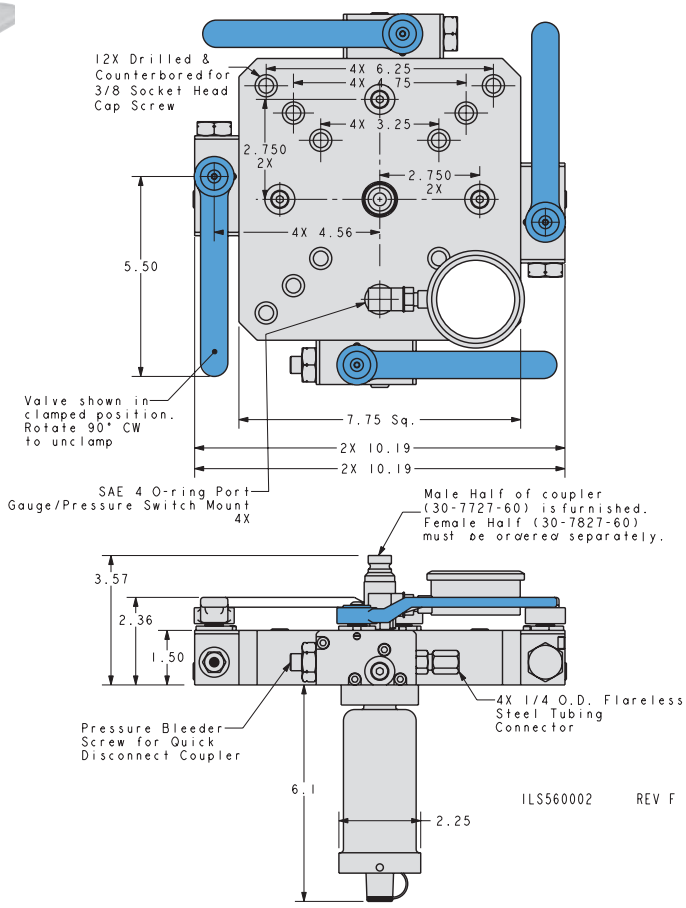
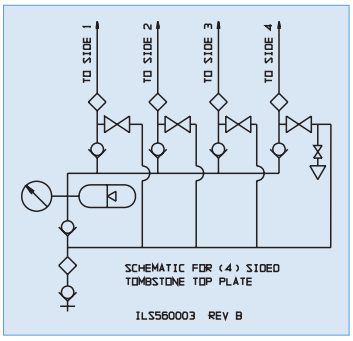
Four-Sided Tombstone Top Plate - Manual Shutoff Valves





Manual Shutoff Tombstone Top Plate for Single Acting Systems

- Provides separate unclamp control of up to four faces of a tombstone or multi-circuit pallet for independent loading and unloading.
- Tombstone Top Plates are convenient, self-contained packages that include a quick connect coupling, manual shutoff valves, accumulator, filter screens, check valves, pressure gauge(s), and a manual pressure bleed port.
- The Four-sided Tombstone Top Plate is provided with one common pressure gauge and auxiliary ports for optional pressure gauges at each shutoff valve.
- Models available for circuits operating at 2,000-5,000 psi and 1,000-3,500 psi pressures.



Four-Sided Tombstone Top Plate

Model No.	Range
56-0003-01	2,000 - 5,000 psi
56-0003-02	1,000 - 3,000 psi
For Operation with Female Quick Connect Coupling Model No, 30-7827-60 (page H-6)	

A. Basic Manual Shutoff Valve Top Plate Pump: Medium Capacity pump with one 2-position/3-port, normally closed directional control valve and 2-position pendant switch providing "Clamp-Unclamp/Disconnect" control (momentary-detent) of the column single acting circuits. These pumps RUN only when the pendant switch is held in the "Clamp" position. See page J-7 for standard features of all Medium Capacity pumps.

115 VAC, 1 Phase Model No. 55-9242-35

230 VAC, 3 Phase Model No. 55-9272-35

460 VAC, 3 Phase Model No. 55-9292-35

B. Other Manual Shutoff Valve Decoupler Pumps: Vektek offers a matrix of pumps with a wide range of electric and hydraulic control features for use with the Manual Shutoff Valve Top Plates. Contact Vektek with your specific needs for technical support on other suitable pump configurations.

NOTE: These Manual Shutoff Valve Top Plates must be used with a suitable pump (see chart) which includes a 2-position/3-port, directional control valve for operation of single acting circuits only. Each valve on a Manual Top Plate can be used to operate only one single acting circuit. For operation of double acting circuits, see the Automatic Shutoff Valve Decouplers on pages K-3 through K-7.

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Palletized Fixture Accessories

Two-Sided Tombstone Top Plate - Manual Shutoff Valves

Manual Shutoff Valve Tombstone Top Plates for Single Acting Systems

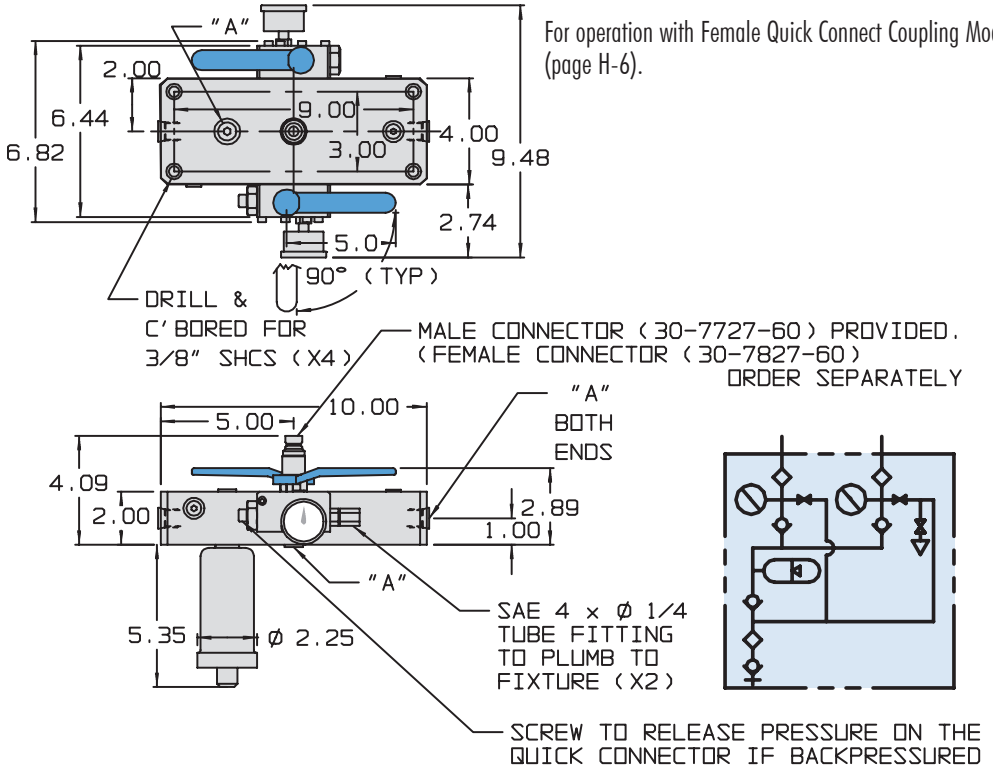
- Provides separate unclamp control of up to two faces of a tombstone or multi-circuit pallet for independent loading and unloading.
- Tombstone Top Plates are convenient, self-contained packages that include a quick connect coupling, manual shutoff valves, accumulator, filter screens, check valves, pressure gauge, and a manual pressure bleed port.
- The Two-sided Top Plate is provided with a gauge at each shutoff valve.
- Models available for circuits operating at 1,000-5,000 psi and 1,000-3,500 psi.

Two-Sided Tombstone Top Plate

Model No. 56-0004-01, Top Plate for circuits operating at 2,000-5,000 psi.

Model No. 56-0004-02, Top Plate for circuits operating at 1,000-3,500 psi.

For operation with Female Quick Connect Coupling Model No. 30-7827-60 (page H-6).



NOTE: These Manual Shutoff Valve Top Plates must be used with a suitable pump (see page K-12) which includes a 2-position/3-port, directional control valve for operation of single acting circuits only. Each valve on a Manual Top Plate can be used to operate only one single acting circuit. For operation of double acting circuits, see the Automatic Shutoff Valve Decouplers on pages K-3 through K-7.

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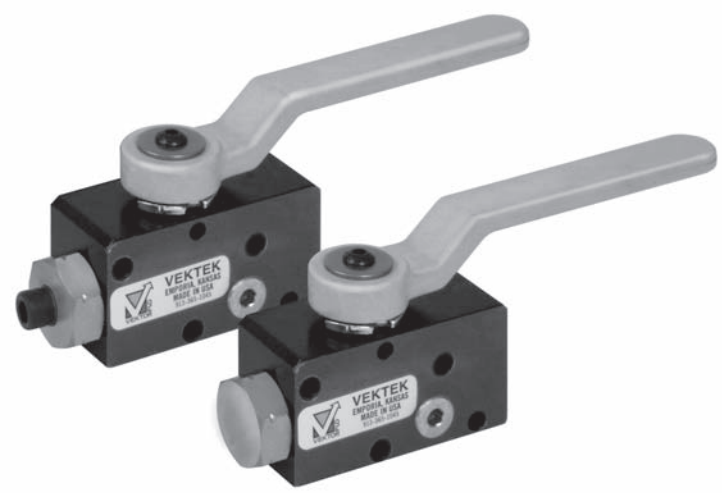


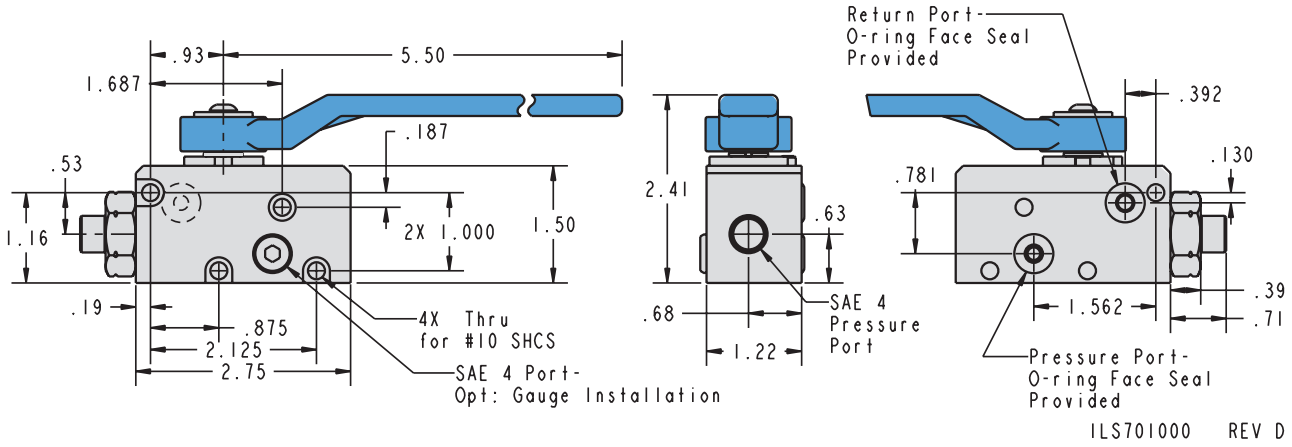
Manual Unload Valves -Tombstone

- Manual Dump Valves are compact packages that include a manual shutoff valve, check valve, filter screen, auxiliary gauge port and manifold mounting ports. Available with optional manual pressure bleed port.
- These valves provide separate control of a tombstone face or pallet circuit when integrated into the complete Tombstone Top Plate system shown in the schematic.

Manual Dump Valves

Model No. 70-1017-00 Manual Unload Valve (face mounted).

Model No. 70-1017-03 Manual Unload Valve with bleed port.



For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.

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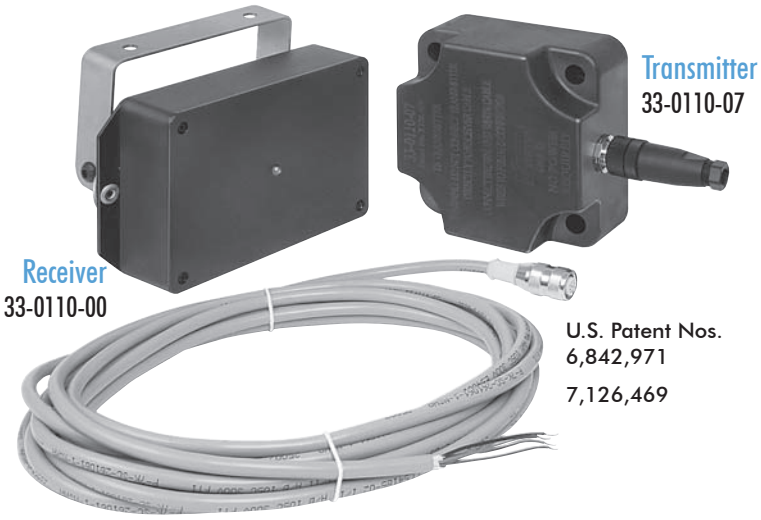
Palletized Fixture Accessories

Pallet Pressure Monitor System

Frequently Asked Questions



Description	Measure
Operating Distance	Up to 8 inches
Nominal Regulated Supply Voltage	24 Volts DC
Supply Voltage Range	14 to 28 Volts
Supply Current with Relay OFF	43 ma
Supply Current with Relay ON	58 ma
Input Power Polarity Reversal Protection	Yes
Input Transient Protection	Up to 35 Volts
Output Relay Current Rating	3 amps
Led Indicator	Green
Weight of Receiver Unit 33-0110-00	1.2 pounds
Weight of Transmitter Unit 33-0110-07	0.9 pounds
Weight of Cable 27-6222-02	0.4 pounds
Protection	IEC IP 67

What is a "Pallet Pressure Monitor"?

The Pallet Pressure Monitor is a patented wireless device designed to confirm the presence of a preset minimum hydraulic pressure on your system. This allows you to hold a part on a fixture hydraulically and have pressure confirmed as the pallet passes into, out of, or during the machining cycle. The necessary pressure can be specific to each individual pallet on an appropriately equipped machine.

Do I need power to operate the monitor and if not why?

You do need 24VDC to power the stationary receiver. No power is necessary on the moving function/pressure monitor transmitter module.

Do I need equal numbers of transmitters and receivers?

No. You may use as many transmitters with a single receiver as you wish. The confirmation of pressure will address any transmitter within range. If you are monitoring more than one transmitter it is recommended that you have the others greater than 11 inches from the receiver to avoid a stray confirmation signal. Receivers must be a minimum of 4 feet apart.

Will the monitor interfere with the machine controller?

No, there are no instances of machine control interference.

Do the monitor components require line-of-sight positioning to operate?

We have monitored through plastic, metal and other materials without interference or ill effects. Direct line-of-sight or partial line-of-sight is preferred, for optimum range, you may test the confirmation ability in your application for alternate methods. Not all situations and materials have been tested, please test and confirm suitability for yourself.

Can one receiver monitor more than one pressure setting?

Yes. A receiver will confirm that the pressure adjustment of any transmitter within range is confirmed as adjusted.

What is the range of the monitor?

As configured and properly installed, the wireless pressure monitor will have a transmission range of up to 8 inches. It is strongly recommended that you pass the transmitter and receiver within less than the maximum distance, as long as they do not touch and are less than 8 inches apart, they should address each other properly.

Do I have to use the nylon cap screws provided by Vektek?

Yes, metal cap screws may interfere with the range and operation of the pressure monitor transmitter.

Will this pallet pressure monitor operate in a coolant environment?

Both the transmitter and receiver are sealed units and are designed to be run in the machining environment. The pallet transmitter is suitable for use under flood coolant, the receiver is sealed, but the connector and cable should not be submerged.

Can the monitor be used with other than Vektek pressure switches?

Yes, the monitoring and adjusting capability of other switches is determined by their manufacturers. The Vektek hydraulic pressure switch is appropriate to the task being performed, suitability of other switches is neither prohibited nor endorsed by Vektek. Any switch you choose to use is to be deemed suitable by you or your qualified integrator.

Can I operate the monitor on 115 volts?

The monitor can be set up with a transformer to supply the necessary 24VDC to drive the receiver. It can also be used to drive a relay controlling the supply of 115VAC to another function. The monitor cannot be run on 115 volts AC.

Will the chips from my machining operation interfere with the signal?

No. Chips will not interfere with signals. It is recommended that the transmitter be mounted where chips will not build up.

Will the "electrical noise" around my machine and in the plant interfere with the signal?

No. The transmitter and receiver will not be affected by "electrical noise".

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Pallet Pressure Monitor System

Pallet Pressure Monitor

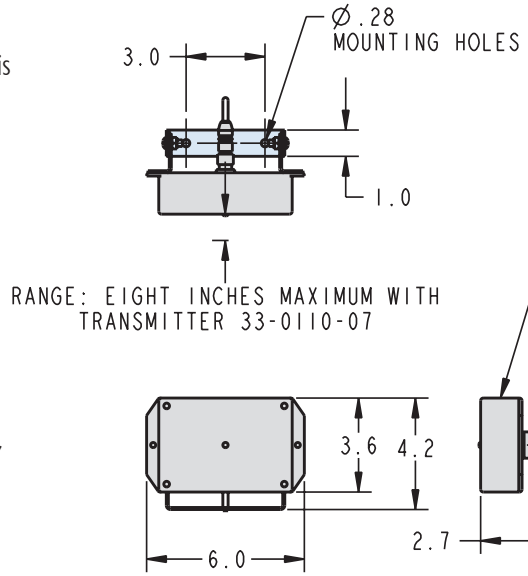
The Pallet Pressure Monitor will verify system pressure is at or above user defined minimum acceptable pressure prior to or during machine cycle.

- Wireless communication between transmitter and receiver.
- No electrical power required on pallet.
- Up to 8" Range.
- Pallets may be loaded days or hours prior to machine entry and confirmed before machining.
- Use with Pressure Switch Model No. 70-7500-75, ordered separately.
- Receiver may be used with multiple transmitters set at various pressure levels.
- No more than one transmitter may be within the receiver range at any time.
- Capable of continuous or sample monitoring.
- Receiver may be mounted inside machine enclosure for continuous monitoring during machining.

Transmitter

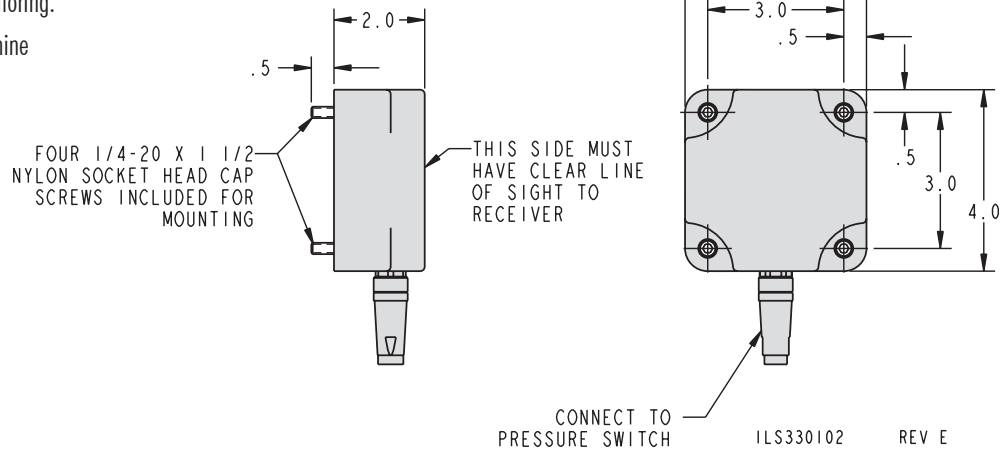
Model No. 33-0110-07

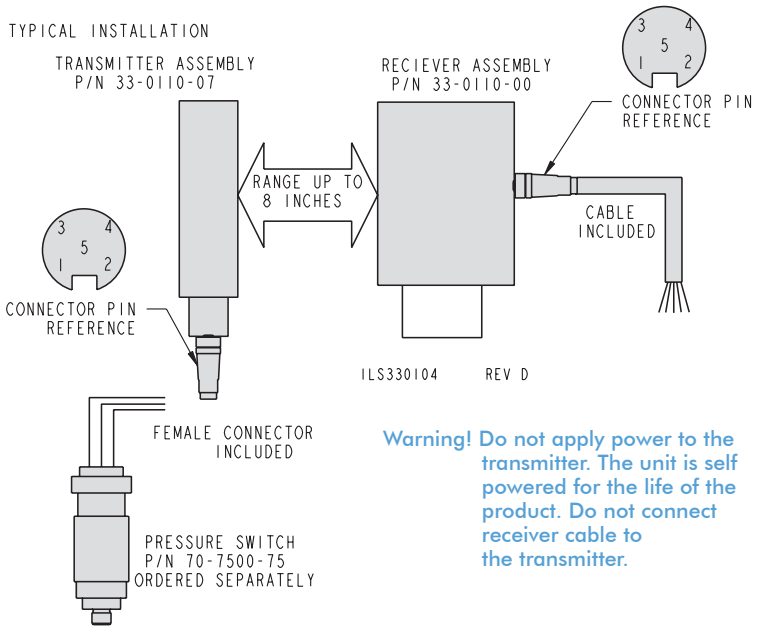
- No power source required, unit is self-powered for the life of the product.
- Use with pressure switch Model No. 70-7500-75.
- Simple wiring, connect the transmitter to the pressure switch with the provided connectors,



Receiver

Model No. 33-0110-00





Warning! Do not apply power to the transmitter. The unit is self powered for the life of the product. Do not connect receiver cable to the transmitter.

Receiver Cable Wiring

Wire Color	Function	Connector Pin No.
Brown	Relay Normally Closed	1
White	Relay Common	2
Blue	Relay Normally Open	3
Black	+24VDC	4
Gray	-24VDC	5

Transmitter Wiring Options

Function	Connector Pin Number (Yellow Jacket Cable)	Models Shipped before March 2008 (Gray Jacket Cable)
Normally Open	1. Brown Wire (Normally Open) 2. Blue Wire (Common)	1. White Wire (Normally Open) 2. Black Wire (Common)
Normally Closed	1. Black Wire (Normally Closed) 2. Blue Wire (Common)	1. Red Wire (Normally Closed) 2. Black Wire (Common)
Note: Pins 3, 4, & 5 are not used		

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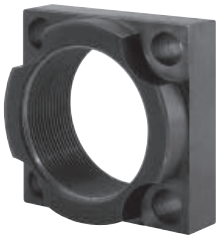
Hardware

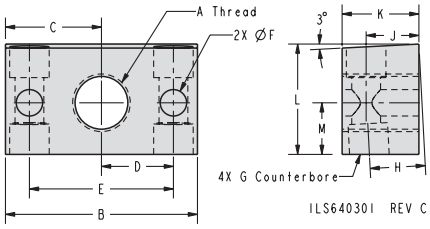
Mounting

Mounting Block

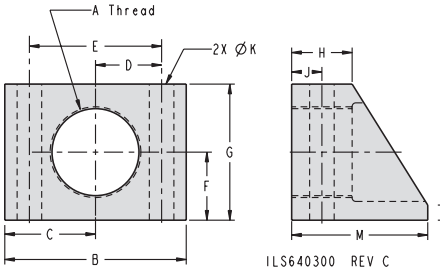
Mounting Bracket



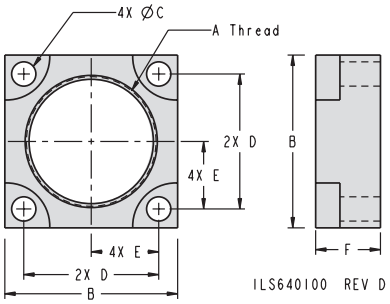
Mounting Flange



ILS640301 REV C



ILS640300 REV C



ILS640100 REV D

Mounting Block

Model No.	A	B	C	D	E	F	G	H	J	K	L	M
64-0306-00	5/8-18	2.25	1.13	0.81	1.62	0.34	5/16 SHCS	0.72	0.68	1.00	1.22	0.56
64-0307-00	3/4-16	2.50	1.25	0.94	1.88	0.34	5/16 SHCS	0.72	0.68	1.00	1.44	0 .67

Mounting Bracket

Model No.	A	B	C	D	E	F	G	H	J	K	L	M
64-0310-00	1 1/16-16	2.25	1.12	0.81	1.62	0.87	1.75	0 .75	0.50	0.34	0.25	2.00
64-0313-00	1 5/16-16	2.50	1.25	0.94	1.88	1.00	2.00	0 .75	0.44	0.41	0.25	2.00
64-0315-00	1 1/2-16	3.00	1.50	1.09	2.18	1.12	2.25	1.00	0.50	0.41	0.25	2.25
64-0318-00	1 7/8-16	3.38	1.69	1.28	2.56	1.25	2.50	1.00	0.62	0.53	0.25	2.50
64-0325-00	2 1/2-16	4.00	2.00	1.59	3.18	1.75	3.50	1.25	0.62	0.53	0.32	3.00

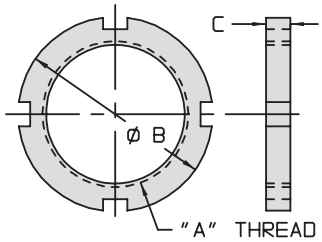
Mounting Flange

Model No.	A	B	C	D	E	F
64-0110-00	1 1/16-16	1.50	0.22	1.12	0.56	0.37
64-0112-00	1 1/4-16	2.25	0.34	1.56	0.78	0.75
64-0113-00	1 5/16-16	1.88	0.28	1.44	0.72	0.75
64-0115-00	1 1/2-16	2.00	0.28	1.56	0.78	0.75
64-0118-00	1 7/8-16	2.50	0.41	1.88	0.94	1.00
64-0125-00	2 1/2-16	3.25	0.53	2.44	1.22	1.25

L-1

Retaining Collar

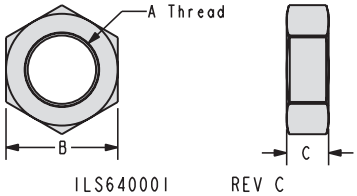
Model No.	A	B	C
64-0010-00	1 1/16-16	1.50	0.31
64-0012-00	1 1/4-16	1.63	0.31
64-0013-00	1 5/16-16	1.63	0.31
64-0015-00	1 1/2-16	2.00	0.31
64-0016-00	1 5/8-16	2.13	0.31
64-0018-00	1 7/8-16	2.44	0.31
64-0022-00	2 1/4-16	2.88	0.31
64-0023-00	2 5/16-16	2.88	0.31
64-0025-00	2 1/2-16	3.25	0.31
64-0027-00	2 3/4-16	3.25	0.31
64-0031-00	3 1/8-16	4.00	0.50
64-0032-00	3 1/4-16	3.75	0.31



ILS640000 REV D

Retaining Collar

Retaining Nut



ILS640001 REV C

Retaining Nut

Model No.	A	B	C
64-0006-00	5/8-18	0.94	0.38
64-0007-00	3/4-16	1.12	0.42

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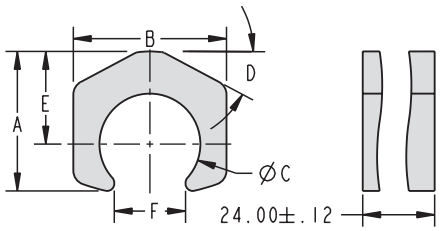
Swing Clamp and Link Clamp Spacers

Top Flange Swing Clamp Spacers

Model No.	Swing Clamp Model No.	High-Speed Swing Clamp Model No.	A	B	ØC	D	E	F
64-0409-01	15-XX05-00	14-6X05-01-L/R	1.45	1.88	1.02	28°	1.02	0.75
64-0414-01	15-XX09-08	14-6X09-01-L/R	1.97	2.31	1.45	28°	1.32	1.25
64-0417-01	15-XX13-11	14-6X13-01-L/R	2.45	2.69	1.77	28°	1.63	1.25

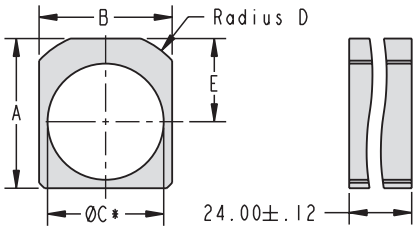
Top Flange Swing Clamp Spacer



Top Flange, Low Profile Swing Clamp Spacers

Model No.	Swing Clamp Model No.	Top Flange Clamp Capacity	A	B	ØC	D	E
64-0431-02	15-XX21-XX	7500	3.94	3.50	2.98	2.38	2.19
Note: This spacer must be machined to fit the clamp							

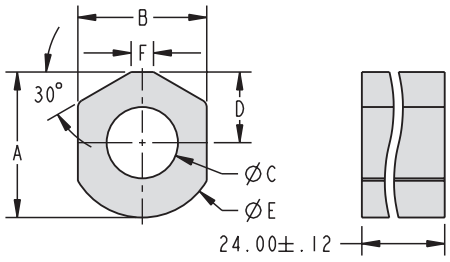
Low Profile
Top Flange Swing Clamp Spacer



Link Clamp Spacers

Model No.	Link Clamp Model No.	Link Clamp Capacity	A	B	ØC	D	ØE	F
64-0410-01	16-6X04-00	450	2.19	1.94	1.07	1.06	2.25	0.34
64-0415-01	16-6X06-00	1100	2.81	2.50	1.51	1.31	3.00	0.55
64-0418-01	16-6X09-00	2600	3.50	3.25	1.89	1.63	3.75	0.22
64-0425-01	16-X214-00	5000	4.50	4.13	2.51	2.13	4.75	0.23
64-0431-01	16-X216-00	6800	5.44	5.13	3.14	2.56	5.75	0.36

Link Clamp Spacer



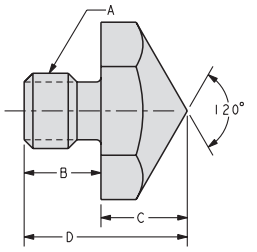
ILS640400 REV G

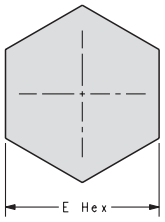
NOTE:
1. Customer will be required to cut spacer to the appropriate length, drill mounting and oil feed holes to the correct size for the applicable clamp.
2. Material is extruded aluminum alloy.

End Effectors

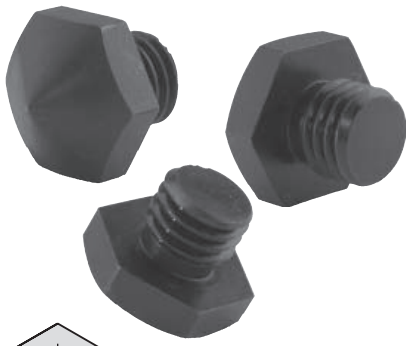
Conical Contact Points

Part No.	A	B	C	D	E
64-2004-10	1/4-20 UNC	0.25	0.28	0.53	0.50
64-2005-10	5/16-18 UNC	0.25	0.38	0.63	0.75
64-2006-10	3/8-16 UNC	0.25	0.44	0.69	0.75
64-2007-10	7/16-14 UNC	0.25	0.38	0.63	0.63
64-2008-10	1/2-13 UNC	0.38	0.50	0.88	0.88
64-2009-10	5/8-11 UNC	0.50	0.56	1.06	1.00





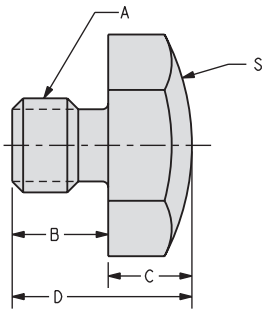
ILS642000 REV E

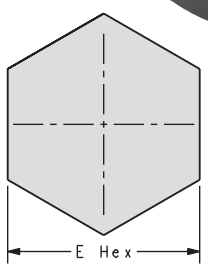


Contact points have been carburized RC 37-42

Spherical Radius Contact Points

Part No.	A	B	C	D	E	F
64-2104-10	1/4-20 UNC	0.25	0.22	0.47	0.50	0.63
64-2105-10	5/16-18 UNC	0.25	0.19	0.44	0.75	1.25
64-2106-10	3/8-16 UNC	0.31	0.25	0.56	0.75	1.25
64-2107-10	7/16-14 UNC	0.25	0.25	0.50	0.63	0.75
64-2108-10	1/2-13 UNC	0.38	0.31	0.69	0.88	1.50
64-2109-10	5/8-11 UNC	0.50	0.38	0.88	1.00	2.00





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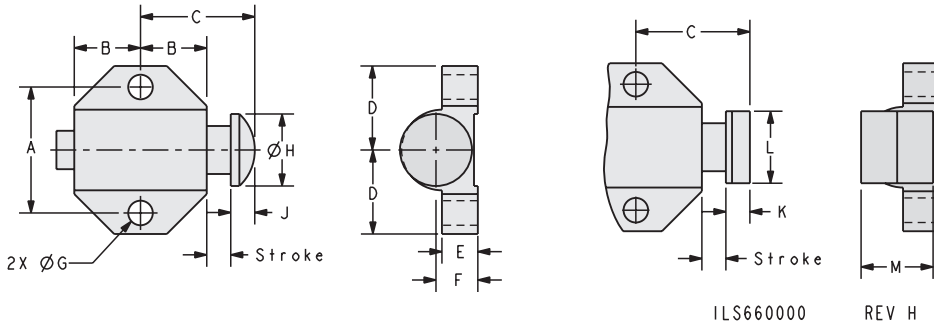
Tooling Components



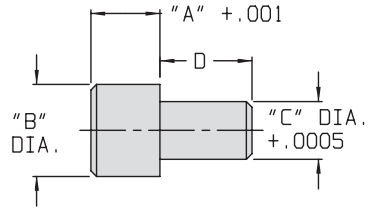
ILS660000 REV H

Aluminum Body Spring Stop Dimensions

Model No.	Nose Shape	Force** (lb)	Stroke	A	B	C	D	E	F	G	H	J	K	L	M
66-0010-00	Round	10	0.13	0.66	0.34	0.59	0.44	0.19	0.22	0.13	0.38	0.13	N/A	N/A	N/A
66-0014-00	Round	14	0.19	1.13	0.50	0.94	0.75	0.25	0.31	0.19	0.56	0.19	N/A	N/A	N/A
66-0032-00	Round	32	0.25	1.50	0.69	1.25	1.00	0.31	0.56	0.26	0.81	0.25	N/A	N/A	N/A
66-0010-01	Square	10	0.13	0.66	0.34	0.59	0.44	0.19	0.22	0.13	N/A	N/A	0.13	0.38	0.38
66-0014-01	Square	14	0.19	1.13	0.50	0.94	0.75	0.25	0.31	0.19	N/A	N/A	0.19	0.62	0.62
66-0032-01	Square	32	0.25	1.50	0.69	1.25	1.00	0.31	0.56	0.26	N/A	N/A	0.31	0.78	0.75

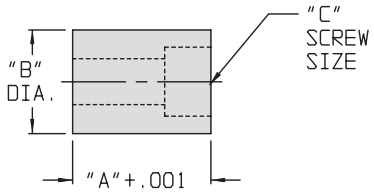
** At midtroke

NOTE: Actual Dimensions may differ slightly from listed nominal dimensions.



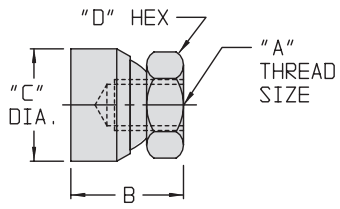
Press Fit Rest Buttons

Model No.	A	B	C	D
66-0438-01	0.375	0.38	0.1880	0.38
66-0462-02	0.500	0.62	0.3755	0.62



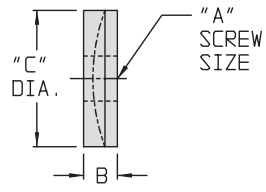
Screw On Buttons

Model No.	A	B	C
66-0562-01	0.375	0.62	1/4 S.H.C.S.
66-0562-02	0.500		
66-0562-04	0.750		
66-0562-05	1.000		



Toggle Pads

Model No.	A	B	C	D
66-0625-00	1/4 - 20 X .41	0.62	0.62	0.50
66-0632-00	5/16 - 18 X .42	0.75	0.68	0.56
66-0638-00	3/8 - 16 X .50	0.81	0.75	0.62
66-0650-00	1/2 - 13 X .53	0.94	0.88	0.75
66-0662-00	5/8 - 11 X .56	1.00	1.00	0.88



ILS660400 REV C

Spherical Washers

Model No.	A	B	C
66-0862-00	5/8	0.32	1.38

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Frequently Asked Questions

What is the difference between your accessory valves and others I already use?

Vektek accessory valves are sized for the normal flows and conditions present in hydraulic clamping systems. They are not intended for use in general industrial equipment as they are specifically intended for clamping. Maximum intended flow rate on any Vektek accessory valve is 1.5 gpm. Excessive flows may cause damage or erratic behavior. General industrial products are intended for use in large flow applications (typically 2 gpm +). These general industrial products do not normally work well in clamping systems.

What is the function of a pressure limiting valve? Relative to a pressure relief valve?

Pressure limiting valves limit the pressure that can pass through the valve. When they reach their preset pressure, they close off to prevent further increase in downstream pressure.

Pressure relief valves are intended to guard against excess pressure. When a circuit builds beyond the setting of a pressure relief valve, it opens and excess pressure is relieved from the system. If a relief valve is set below the pressure switch adjustment of a pump, the pump will kick on and off frequently. Incorrect adjustment of a pressure relief valve can cause expensive damage to your pump.

Explain why you don't want me to put a group of sequence valves in series.

When a group of sequence valves is put in series they have to work harder than if they are fed parallel from a single main feed line (see chart on page M-6). Vektek sequence valves modulate as fluid passes through them, trying to maintain upstream pressure. The interruption of fluid flow through one valve will adversely effect the modulation of the next valve in line, resulting in erratic performance. You may put as many sequence valves in parallel as you wish. We recommend approximately 500 psi difference in their settings for ease of installation.

What is the difference between your ball valve and the "screw down" valves I can buy locally?

Our shutoff ball valves close a circuit and maintain that seal until rotated and pressure is released later. They are intended for applications that will not allow for leakage or are repetitive. They change from closed to full open with 1/4 turn of the handle.

Explain why I might select one filter over another.

Vektek offers three styles of filter. The first type is In-line Filter (available in 10 or 25 micron filtration), designed and sized to be used in-line where fine filtration is desired to help protect devices (restricted to a maximum flow rate of 3 gpm) making this unit particularly flexible in meeting your design criteria. You can also mount these filters directly into the device ports of sensitive valves and components to guard against contamination.

The second style is the Basic Filter which is also available in 10 and 25-micron filter ratings. These filters catch small debris and are intended for high contamination systems. The larger filtering surface allows this unit to accept up to 7 gpm and handle larger quantities of chip contamination before maintenance. The frequency of maintenance is determined by the amount of contamination present in your system. Simple flushing will often improve the flow through these filters when performance becomes obviously limited.

Our third type of filter element is an In-line Screen Mesh. This filter is intended to catch the big chips (180 micron rating). At fixture assembly, it is easy to forget to clean the I.D. of the tubing before introducing oil to the plumbing. Tubing and manifold passages may contain chips, dirt, cobwebs, tape or paper. These contaminants will break loose and lodge in a valve resulting in valve failure. By using these "chip catchers" you can reduce expense and can make your system more dependable.

Standard Features

Common Features: Sequence, Pressure Relief, Pressure Limiting Valves and Pressure Reducing

- Material: All cartridge components are steel, operating parts are hardened.
- Operating Media: Conventional, petroleum based, premium quality hydraulic fluid such as VektorFlo® Model No. 65-0010-01, see page J-1.
- Recommended Filtration: 25 Micron (NOM) / 40 Micron (ABS) (minimum).
- Adjustments: Turning adjustment screw clockwise (when viewed from adjustment end of cartridge) increases pressure setting on all three valve styles.

NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves.

Excess flow voids warranty.

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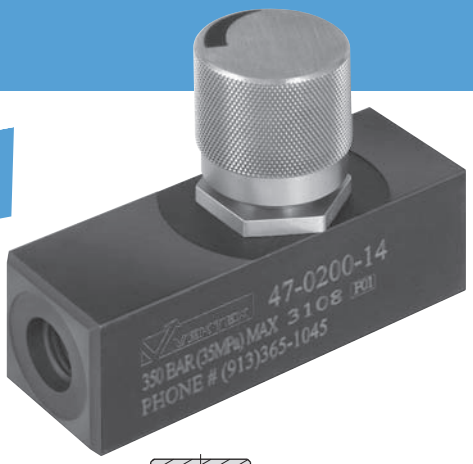
Accessory Valves

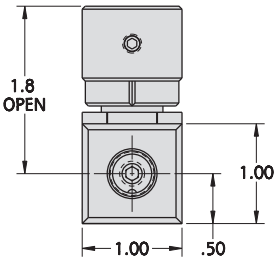
Flow Control, Shut-Off

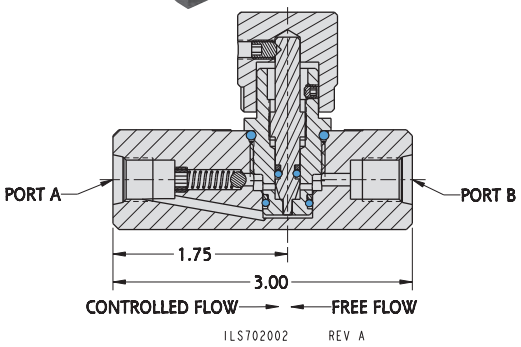
Precision Flow Control

NEW



- Micro metering adjustment of master system with 1/64 inch pitch needle valve.
- Protect sensitive components from excessive flow.
- For single component or system control.
- Flows up to 3 gal/min at 5,000 psi maximum pressure.
- Check valve for reverse free flow.
- Available in SAE 4 or SAE 6 port sizes.
- Stainless steel inner valve construction.
- Fluorocarbon seals are standard.



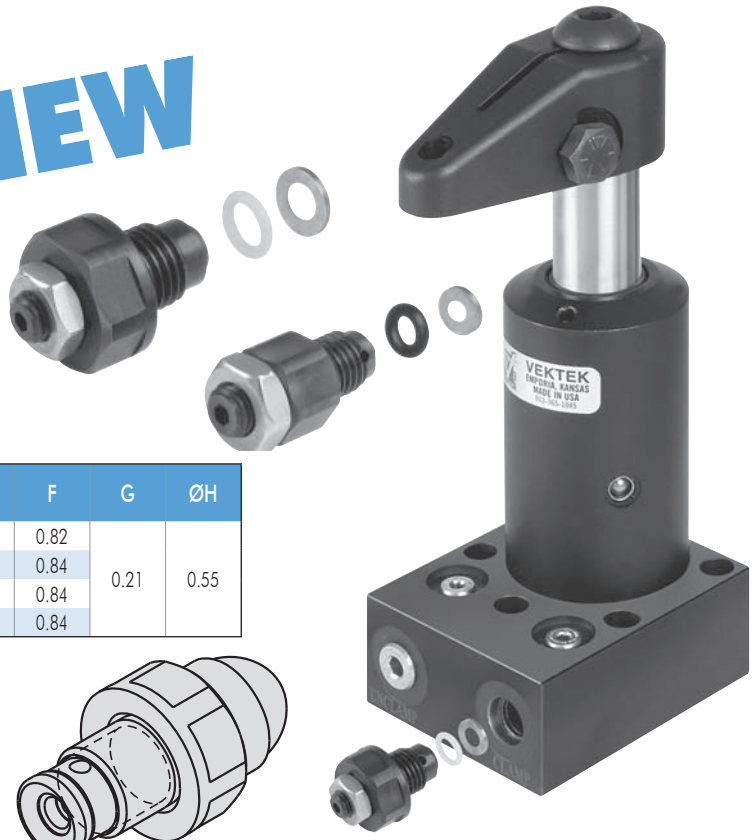


In-line Flow Control

Model No.	A Port	B Port
70-2000-05	SAE 4	SAE 4
70-2001-11	SAE 6	SAE 6

Precision In-port Flow Control

NEW

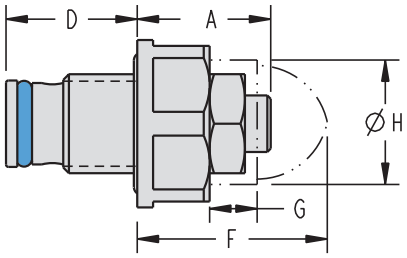


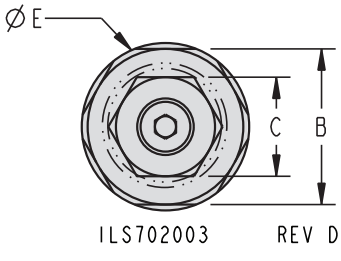
- Regulate speed of clamping.
- Reverse free flow check valve.
- Smallest high-pressure flow control valve on the market.
- Prevent component cam damage from unexpected or accidental surges in flow rate.
- Available in US Customary and Metric measures.

In-Port Flow Control

Model No.	Port Size	A Max	B Hex	C Hex	D	ØE	F	G	ØH
70-2037-70	SAE 2	0.50	7/16	7/16	0.470	0.480	0.82	0.21	0.55
70-2037-71	SAE 4	0.50	11/16	7/16	0.580	0.740	0.84		
70-2037-72	SAE 4	0.50	11/16	7/16	0.750	0.740	0.84		
70-2037-73	SAE 4	0.50	11/16	7/16	1.000	0.740	0.84		

Consult the swing clamp specifications page for the valve that is appropriate for your application.





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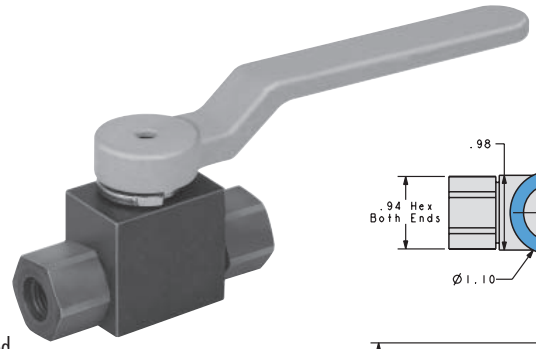
Shutoff Valve

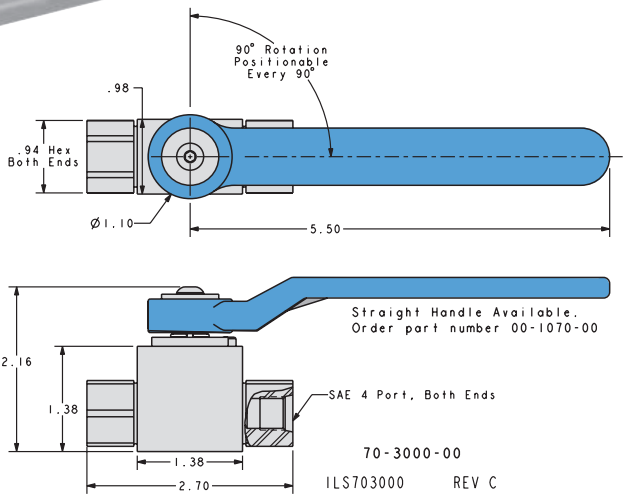
Model No. 70-3000-00

- Ball valve designed for positive shut-off operation.
- Handle is easily moved, even under maximum pressure.
- Straight handle available order Part No. 00-1070-00.



Precision, steel components and molded spherical seats provide a positive seal to isolate your fixture. Use with hydraulic junction manifolds on page I-1 and I-2 for secure fixture mounting.

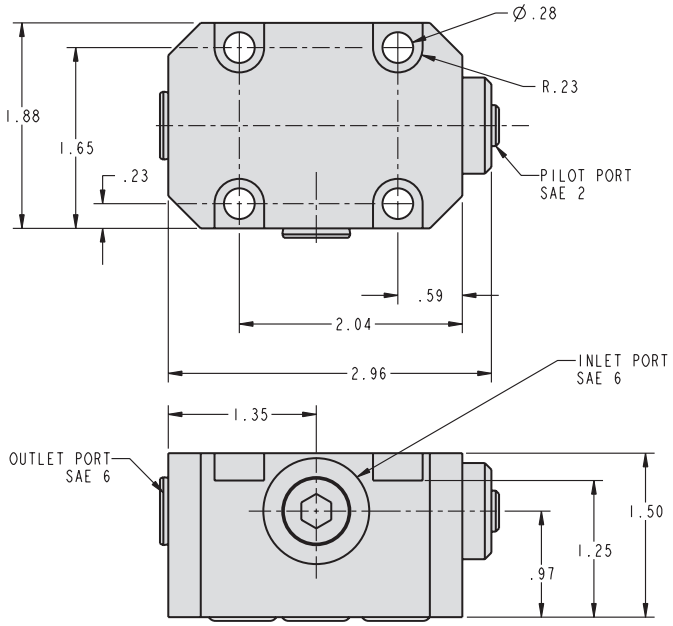
NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves.
Excess flow voids warranty.



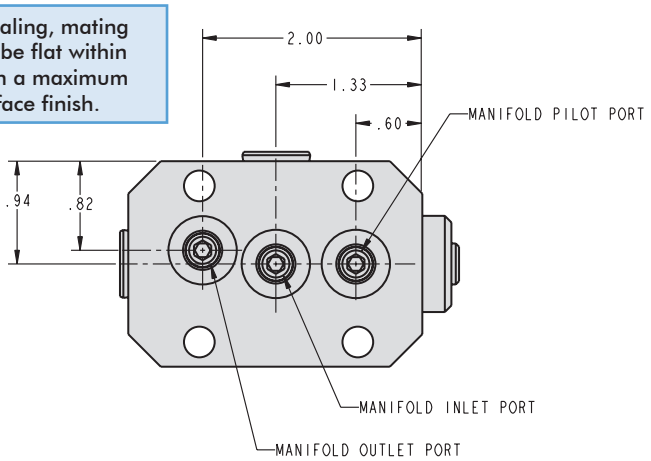
"A" Pilot Operated Check Valve

Model No. 70-3311-11

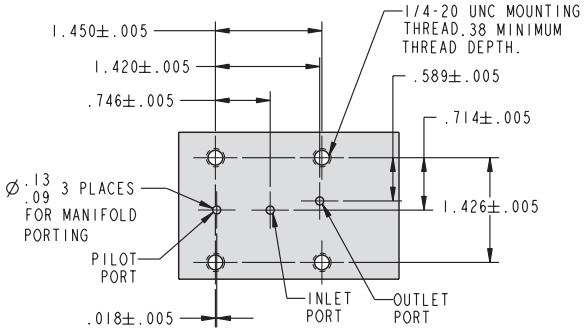
- Sealed pilot piston eliminates cross circuit leakage.
- 5:1 Ratio of Pilot to Check pressure for release.
- Manifold Mounted.
- Filters on each port location.
- Unclamp device sequencer, provides a way to sequence single circuit unclamp timing.
- Requires "B" pilot line to open "A" line check valve (requires a double acting control valve to operate single acting systems).
- Maximum operating pressure 5,000 psi.



For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.



PILOT OPERATED CHECK VALVE MODEL NO. 70-3311-11
ILS703300 REV B



MOUNTING DIMENSIONS FOR PILOT CHECK MODEL NUMBER 70-3311-11
ILS703303 REV A

NOTE: Field repair requires a special Check Valve Installation Tool. Please order Model No. 65-6000-00

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Accessory Valves

Check Valves

"A-B" Check Valve

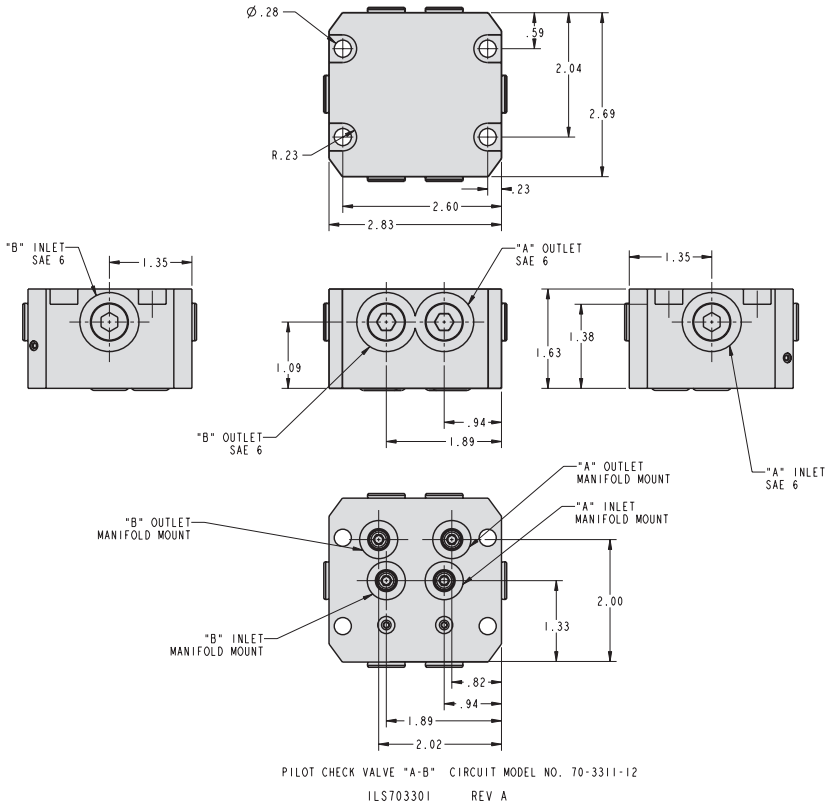
Model No. 70-3311-12

- Sealed pilot piston eliminates cross circuit leakage.
- 5:1 Ratio of Pilot to Check pressure for release.
- Filters on each port location.
- Manifold mounted.
- BHC™ body and stainless steel internal components for corrosion protection.

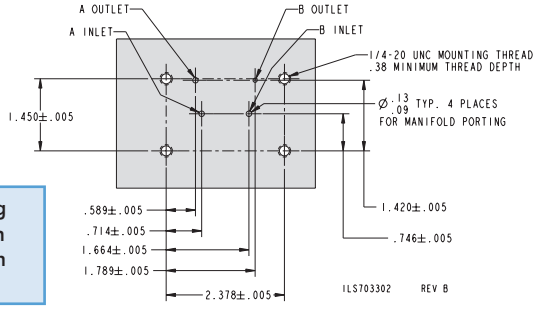
NOTE: Pressure applied to the "A" inlet port flows to the "A" outlet port and unlocks check on the "B" side allowing pressure on "B" to return to tank. Pressure applied to "B" inlet flows to "B" outlet and unlocks check on "A" side allowing pressure on "A" to return to tank.

5,000 psi maximum operating pressure

NOTE: Field repair requires a special Check Valve Installation Tool. Please order Model No. 65-6000-00



PILOT CHECK VALVE "A-B" CIRCUIT MODEL NO. 70-3311-12
ILS703301 REV A



ILS703302 REV B

MOUNTING DIMENSIONS FOR A-B CHECK MODEL NUMBER 70-3311-12

For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μin R_a surface finish.

M-4

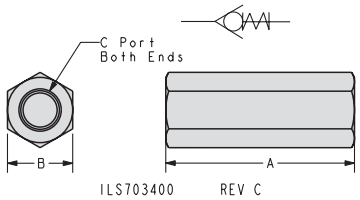
Check Valves

Model No. 70-3400-01 SAE 4
Model No. 70-3400-06 SAE 6
Model No. 70-3425-00 "P" Check Stack

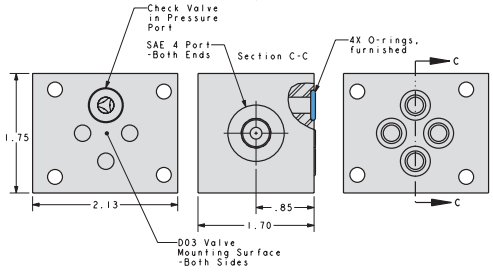
Permits flow in one direction only. Can not be adjusted for reverse flow.

NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves.

Excess flow voids warranty.



ILS703400 REV C



70-3425-00 "P" Check D03 Stack Block
ILS703406 REV C

Check Valve Dimensions

Model No.	A	B	C
70-3400-01	2.17	0.75	SAE 4
70-3400-06	2.60	1.00	SAE 6

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Accessory Valves

Sequence Valve

Sequence Valve

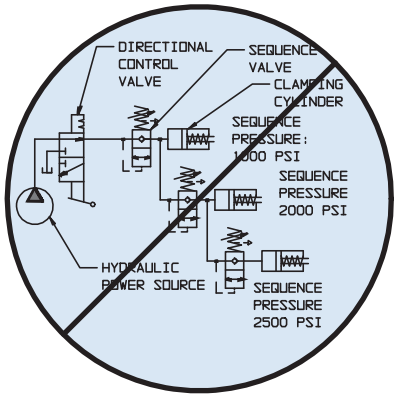
Model No. 70-4400-02 Assembly.

Model No. 70-4430-02 Cartridge.

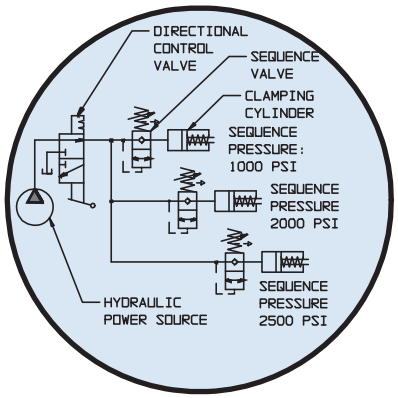
- Specialized construction resists corrosion which can cause other styles to "misfire".
- Direct acting poppet style construction.
- Manifold mountable.
- Cartridge may be installed directly into your manifold.
- Pressure adjustment range: 750 psi - 5,000 psi.
- Two-port design eliminates need for third fluid line to drain bypass flow (internal leakage) back to system reservoir.
- True sequence design allows full system pressure downstream of valve after opening.

Operation: The VektorFlo® sequence valve operates as a pressure sensitive, normally closed element in a clamping system. When fluid first enters the system at low pressure, the valve is closed, blocking the flow of fluid to devices down stream. After devices in the other branches of the system have moved into position, the pressure begins to increase. The increasing pressure overcomes the spring force holding the valve closed, forcing the poppet off its seat, and allowing fluid flow through the valve. After all devices have positioned and clamped, the downstream pressure increases to equal upstream pressure. Pressure throughout the system will increase to the maximum setting on the hydraulic power supply. When unclamping, as pressure falls, force from the adjustment spring pushes the poppet back onto its seat. Fluid trapped in the downstream circuit flows back through the check seat to return to the power unit reservoir.

DON'T



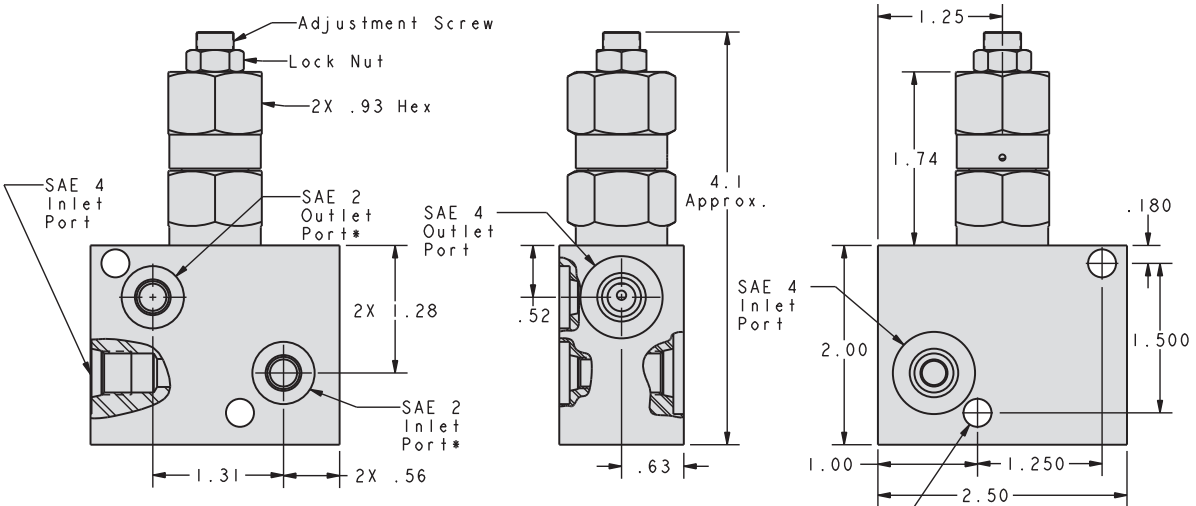
DO



ILSSCHAA REV B

NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves.

Excess flow voids warranty.



*SAE 2 Ports are counterbored for o-rings that are used in manifold mounting applications.

Ø.09/ .15 FEED HOLES

70-4400-02 Sequence Valve Assembly

ILS704400 REV J

For Proper sealing, mating surface must be flat to 0.003 in. with a maximum 63 μ in. R_a surface finish.

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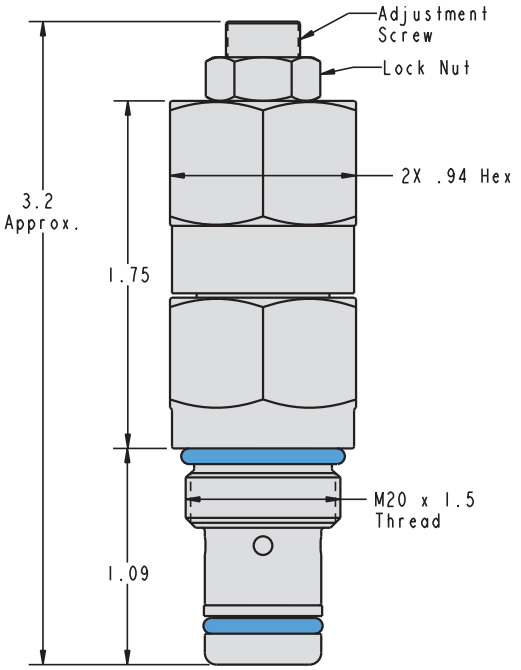
Sequence Valve

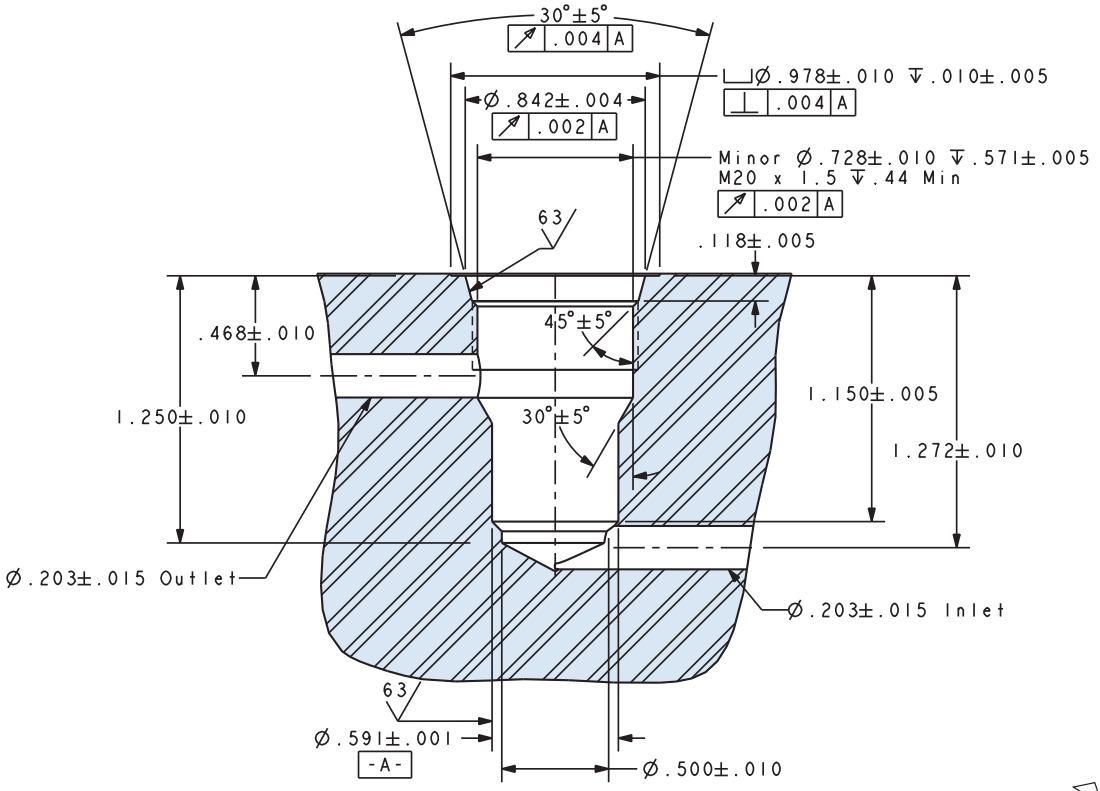
Model No. 70-4430-02 Cartridge Only.



Model No. 70-4430-02 Sequence Valve Cartridge

ILS704401 REV D

Sequence Valve Cartridge Cavity



ILS704402 REV C

NOTE: For Cavity tooling (multistep reamer and M20 x 1.5 tap), Order kit Model No. 62-7040-00

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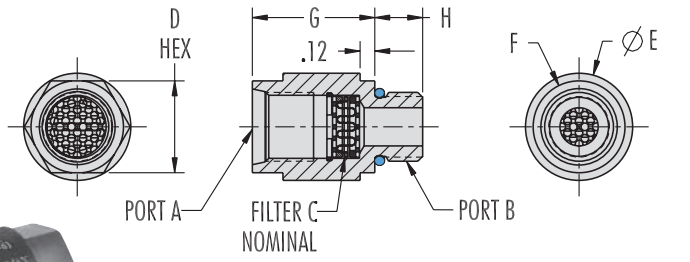
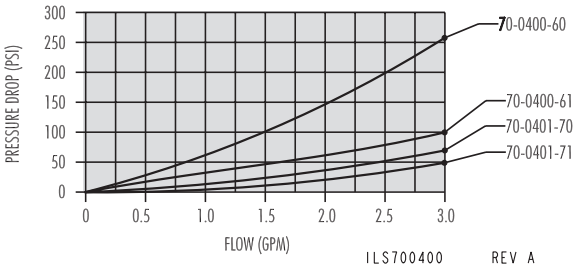
In-line Filter

- Available in two port sizes and two filter ratings.
- Filters at 5,000 psi in either direction.
- Compact in-line design for maximum flexibility.
- Protects sensitive valves and devices from contamination.
- Serviceable for cleaning or filter replacement.
- Maximum flow 3 gpm.
- Maximum ambient temperature of 200° F.
- Can also be used for in-line application.

In-line Filters, Basic Filters and Filter Screens





Screen replacement kits available.
Call factory for details

In-line Filter Dimensions

Model No.	A	B	C	D	E	F	G	H
70-0400-60	SAE 4	SAE 4	10 Micron	0.63	0.75	0.63	0.88	0.35
70-0400-61	SAE 4	SAE 4	25 Micron	0.63	0.75	0.63	0.88	0.35
70-0401-70	SAE 6	SAE 6	10 Micron	0.75	0.88	0.75	1.00	0.39
70-0401-71	SAE 6	SAE 6	25 Micron	0.75	0.88	0.75	1.00	0.39

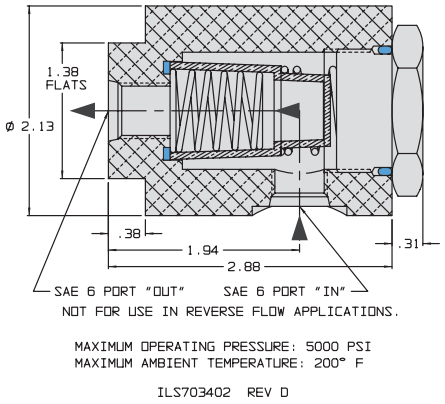
Basic Filter

10 Micron Model No. 70-3401-15
25 Micron Model No. 70-3401-12

- Keeps chips and debris from reaching valves or other sensitive devices.
- Traps contaminants which may have been missed when cleaning tubing or blind holes prior to fixture startup.
- Easily cleaned or changed filter should be checked when devices become sluggish.

Basic Filter Pressure Drop

Gal/Min	25 Micron	10 Micron
1	2	2.2
2	7	7.7
3	10	11.0
4	15	16.5
5	20	22.0
6	26	28.6
7	33	36.3

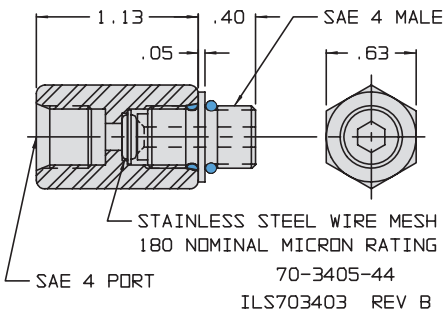


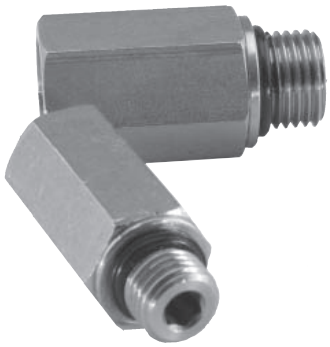
Screen replacement kits available.
Call factory for details

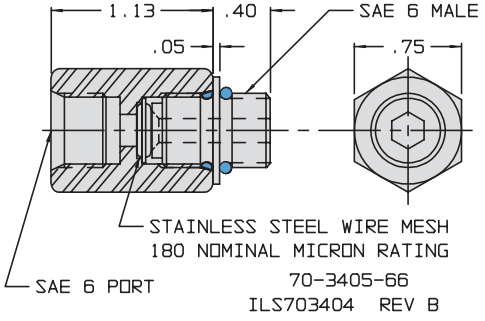
In-line Filter Screens

SAE 4 Filter Screen
Model No. 70-3405-44

- Protects valves and devices installed at pump.
- Catches damage causing chips.
- Can be used in in-port applications.







SAE 6 Filter Screen
Model No. 70-3405-66

- Protects devices and individual valves.
- Catches damage causing chips.
- Can be used in in-port applications.

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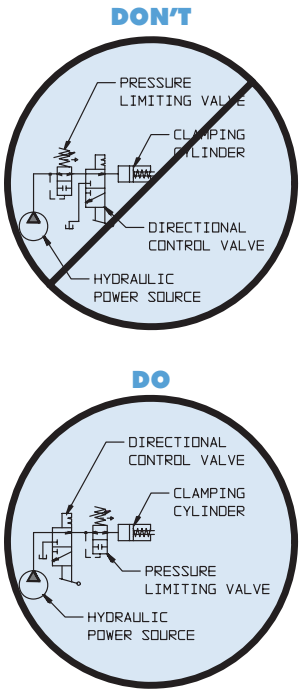
Accessory Valves

Pressure Limiting Valve



ILSSCHAB REV B

Operation: The Pressure Limiting Valve (PLV) is a Normally Open (N/O) pressure control device. The valve remains open and fluid flows freely to downstream devices (from the valve to devices) until the pressure in the valve reaches the pressure (adjustable) set-point. At the set-point pressure the valve closes, blocking further flow and pressure rise to the downstream devices. The internal valve seal prevents fluid flow through the valve in either direction until the inlet pressure (power source to the valve) is reduced to near zero. The PLV is best suited for use in single-acting systems.

Once the PLV closes, it will remain closed until the inlet pressure is again reduced to zero.

NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves.

Excess flow voids warranty.

For Proper sealing, mating surface must be flat to 0.003 with a maximum 63 μ in. R_a surface finish.

Pressure Limiting Valve

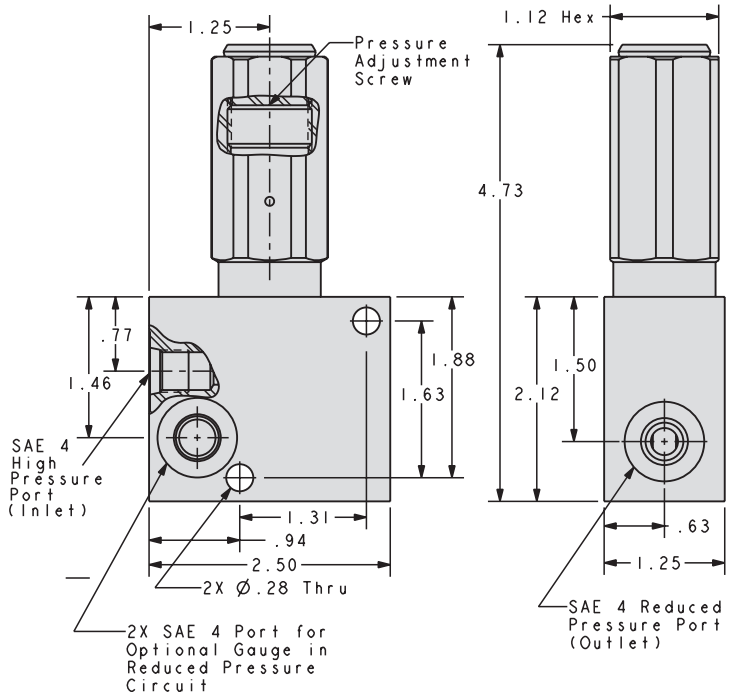
- Recommended for use in single acting systems only.
- Direct acting, poppet style, adjustable, cartridge type construction.
- Cartridge may be installed directly into your manifold.
- All pressure limiting valve configurations are designed to operate with up to 5,000 psi on the inlet (P) port.
- Seal Material: Internal seals are nylon.
- Internal adjustment discourages tampering with pressure adjustment setting.

NOTE: When adjusting the Pressure Limiting Valve, once the valve has closed in operation, changes in adjustment setting will not be reflected by a change in downstream pressure until inlet pressure falls allowing valve to reset to open.

- Two-port design eliminates need for third fluid line to drain bypass flow (internal leakage) back to system reservoir.

Pressure Adjustment Ranges

Assembly Model No.	Range	Factory Preset	Cartridge Model
70-5400-08	750 psi - 2,500 psi	1,000 psi	70-5430-08
70-5400-07	1,000 psi - 3,500 psi	1,500 psi	70-5430-07
70-5400-06	1,500 psi - 5,000 psi	2,000 psi	70-5430-06



Pressure Limiting Valve Assembly
70-5400-06, 70-5400-07, & 70-5400-08

ILS705400 REV D

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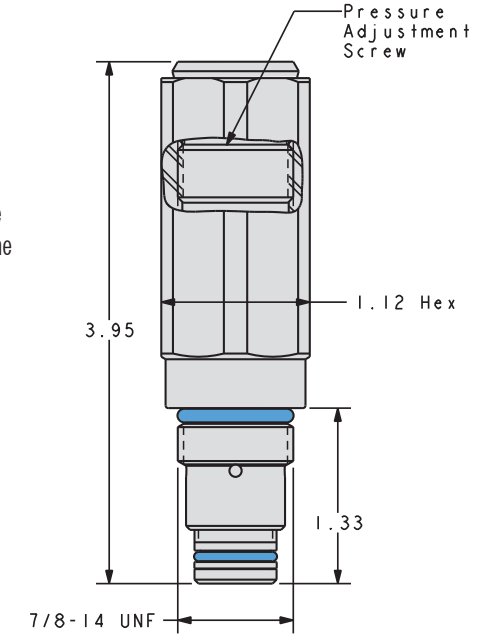
Pressure Limiting Valve Cartridge

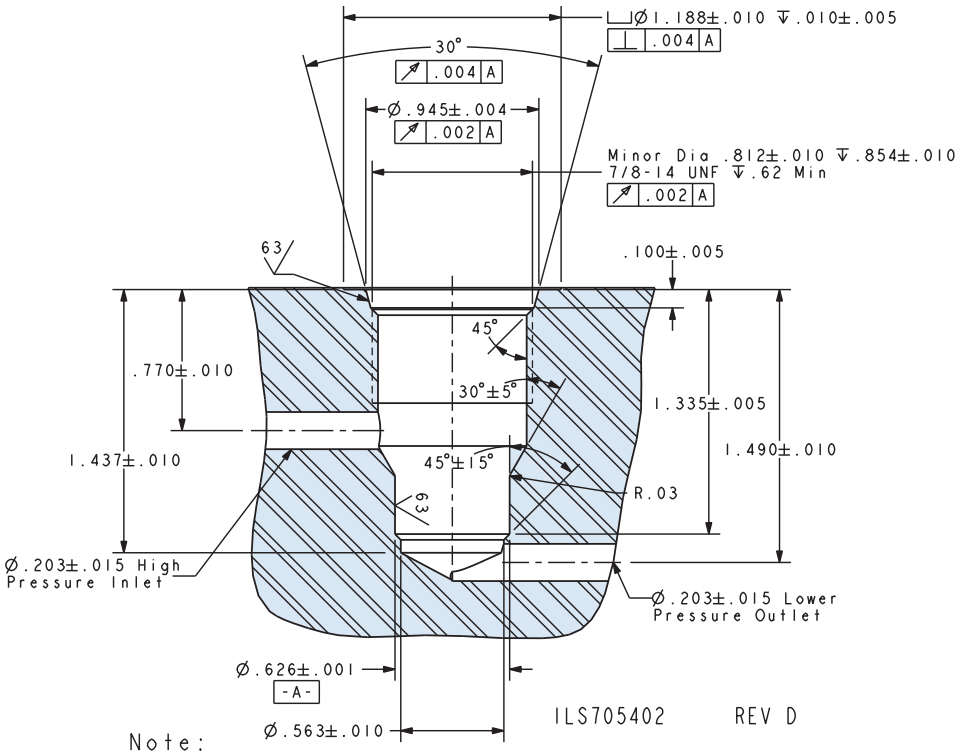
Model No. 70-5430-06
Model No. 70-5430-07
Model No. 70-5430-08

- Pressure Limiting Cartridge is interchangeable with the Pressure Reducing Cartridge using the same mounting cavity.



Pressure Limiting Valve Cartridge
70-5430-06, 70-5430-07, & 70-5430-08
ILS705401 REV C

Pressure Limiting Valve and Pressure Reducing Valve Cartridge Cavity



ILS705402 REV D

Note:
There is no standard porting tool available for this cavity

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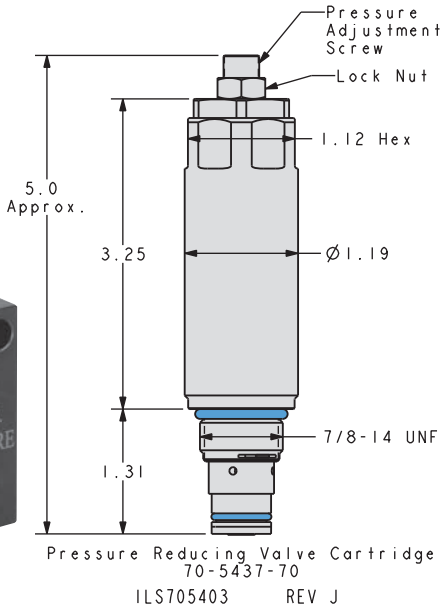
Accessory Valves

Pressure Reducing Valve



Pressure Reducing Valve Cartridge
70-5437-70
ILS705403 REV J

Pressure Reducing Valve

Model No. 70-5410-10 Assembly.

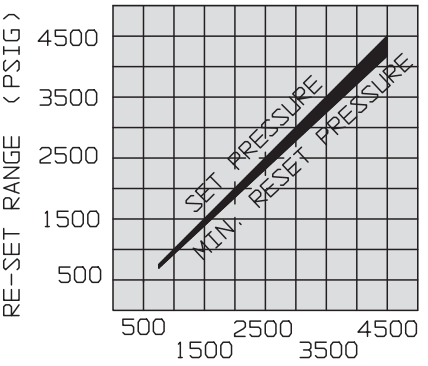
Model No. 70-5437-70 Cartridge Only.

- For use in double or single acting systems.
- Direct acting, poppet style, adjustable, cartridge construction.
- Cartridge may be installed directly into your manifold.
- Set the Range from 750 psi to 4,500 psi (Recommended).
- Repeatability is +/- 7% of set pressure.
- Maximum inlet pressure 5,000 psi.
- Pressure Reducing Cartridge is interchangeable with the Pressure Limiting Cartridge in the same mounting cavity.
- Two-port design eliminates need for third fluid line to drain bypass flow (internal leakage) back to system reservoir.

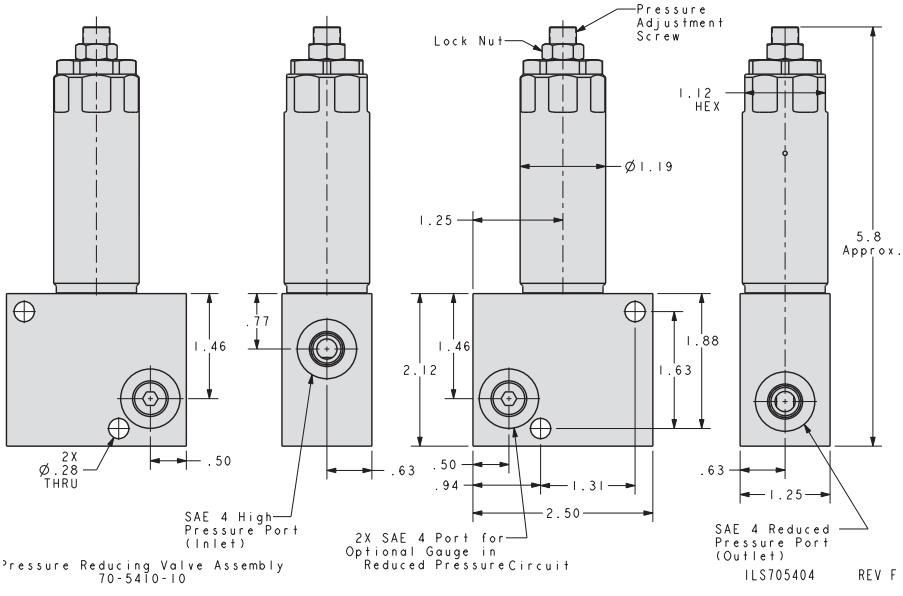
Operation: The Pressure Reducing Valve (PRV) is a Normally Open (N/O) pressure control device. The valve remains open and fluid flows freely to downstream devices (from the valve to devices) until the pressure in the valve reaches the pressure (adjustable) set-point. At the set-point pressure, the valve closes blocking further flow and pressure rise to the downstream devices. If there is a sufficient down stream pressure loss (from the valve to devices), the PRV will re-open, allowing flow to pass through the valve until the pressure again reaches the valve set-point. The PRV is designed for use in both single and double-acting systems.

Once the PRV closes, it will re-open in the event of a downstream pressure loss, allowing the pressure to again build to the intended system set-point.

U. S. Patent No. 5,931,182
See page M-9 for cartridge cavity dimensions.

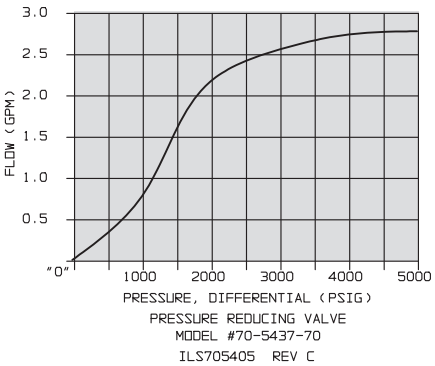


SET PRESSURE (PSIG)
ILS705406 REV B



Pressure Reducing Valve Assembly
70-5410-10

ILS705404 REV F



ILS705405 REV C

For Proper sealing, mating surface must be flat to 0.003 in.with a maximum 63 μ in. R_a surface finish.

NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves.

Excess flow voids warranty.

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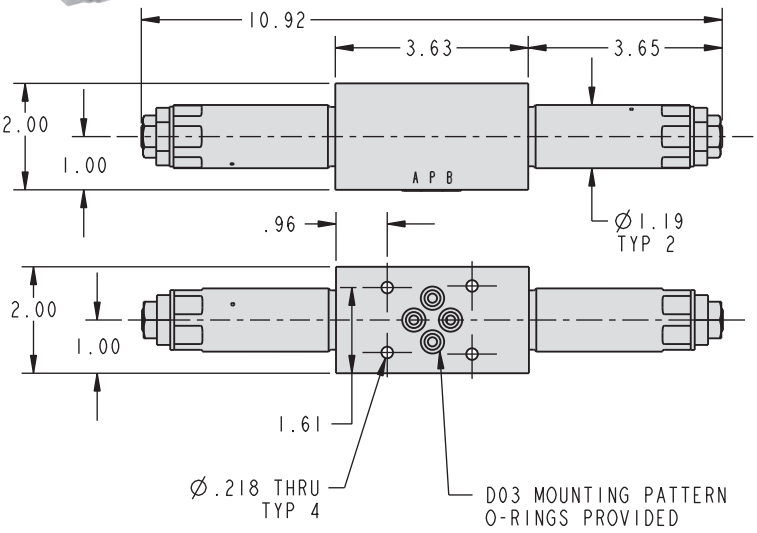
Pressure Reducing Valve Control Block, Over Pressure Relief Cartridge



DOUBLE PRV CONTROL BLOCK ASSEMBLY

70-8425-50 D03 MOUNTING

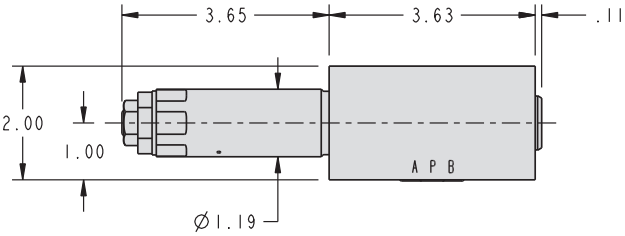
ILS708401 REV B

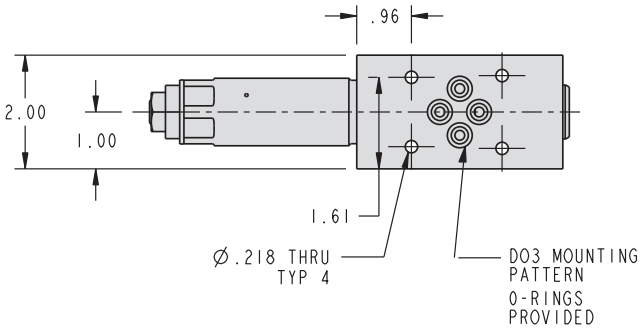
PRV Control Block

Model No. 70-8425-50 Dual PRV Assembly

Model No. 70-8425-51 Single PRV Assembly

- Control pressure independently on both the clamp and unclamp side of the fixture regardless of pump pressure setting.
- Eliminate the wait for full system pressure to finish cycling workholding components.
- For use in double or single acting systems.
- D03 Mounting to use on pump stack or as a remote mounted valve.
- Set the Range from 750 psi to 4,500 psi (Recommended).





SINGLE PRV CONTROL BLOCK ASSEMBLY
70-8425-51 D03 MOUNTING

ILS708402 REV A

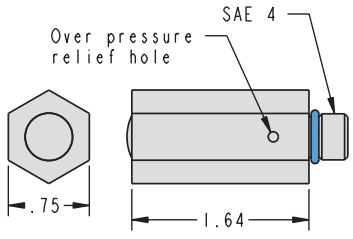
NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves.

Excess flow voids warranty.

Over-Pressure Relief Cartridge

Model No. 70-6336-70

- Cartridge will open to bleed off excess pressure in the event of over-pressurization (above 5,000 psi).
- Screw in cartridge adds an extra element of confidence in your self-designed systems.
- SAE 4 male connection.



70-6336-70 Over Pressure Relief Valve

ILS706300 REV C

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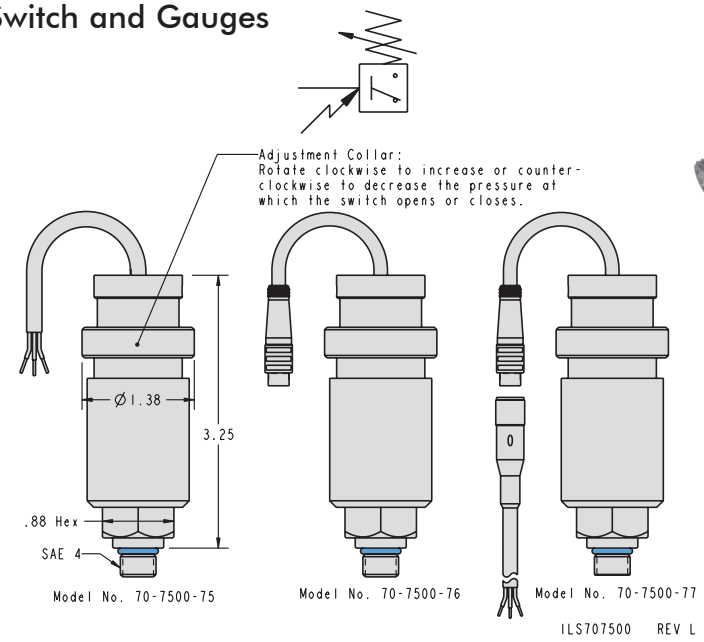
Accessory Valves

Pressure Switch and Gauges



Model 70-7500-76

Pressure Switch

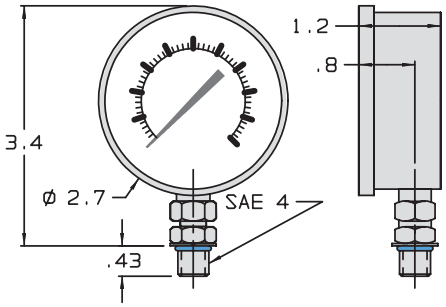
Electrical Rating

- 1 amp @ 28VDC resistive
- 5 amp @ 125/250 VAC

Reset deadband : approximately 5% of the set pressure.

Sealed Switch for operation in high moisture environments.

Model No.	Pressure Range	Electrical Connection	Wiring Instructions
70-7500-75	800-5000 psi	36 in. Lead Wire before Ends	Brown ... N/O Black ... N/C Blue ... Common
70-7500-76	800-5000 psi	14 in. Lead Wire with M8 3 Pin Connector	N/A
70-7500-77	800-5000 psi	10.5 in. Lead wire with M8, 3 Pin Connector and Part No. 27-6424-00 Cordset, 16.4 ft long Female M8 Connector and Bore Ends	Brown ... N/O Black ... N/C Blue ... Common



Standard Pressure Gauges

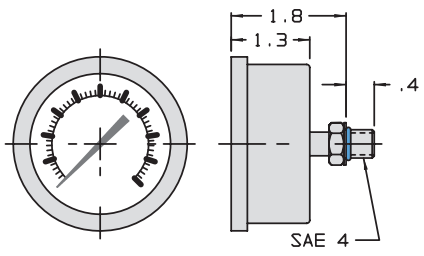
Model No. 72-2121-37 - 0 to 1,000 psi
Model No. 72-2121-46 - 0 to 3,000 psi
Model No. 72-2121-52 - 0 to 5,000 psi
Model No. 72-2121-62 - 0 to 10,000 psi

- Liquid filled gauges up to 10,000 psi analog readouts.
- Conform to ANSI standard B40.1 Grade B.
- SAE 4 male connection.
- Safety Glass Window.

Back Mount Pressure Gauges

Model No. 72-1221-55 - 0 to 6,000 psi - Ø 1.73"
Model No. 72-2121-55 - 0 to 5,000 psi - Ø 2.70"
Model No. 72-2121-65 - 0 to 10,000 psi - Ø 2.70"

- Liquid filled gauges up to 10,000 psi analog readouts.
- Conform to ANSI standard B40.1 Grade B.
- SAE 4 male connection.
- Safety Glass Window.



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Frequently Asked Questions

What is the function of a directional control valve?

A directional control valve is the extend and retract control for your hydraulic cylinders. It provides a flow path from the pump to the cylinders and a return path from the cylinders to the fluid reservoir.

What is the flow pattern for a double acting system?

A four port valve is normally required for double acting systems. Let's look at the two control positions first. In the advance position pressure flows from the pump through the valve from "P" to "A", "B" flows back to "T". In the retract position "P" is flowing to "B", "A" is returned to "T". You need to be aware that when shifting between positions, there is a transitional state. During this transition, there is some "cross-talk" between ports allowing pressure to drop in the pressurized circuit and return to tank. The importance of this information is that you cannot pressurize a system and shift back to the closed center position to hold it clamped. Using the center position to hold is inappropriate because it removes the pump from the circuit and defeats the purpose of a live hydraulic system.

What is the purpose of the center position?

The center position on 3-position 4-port solenoid valves is the resting position with both solenoids de-energized. On manual valves the center position is transitional and is often unused.

Closed center solenoid valves are used to assure that no movement takes place upon power failure (though a small amount of pressure will be lost in transition). The closed center manual valve makes no change in circuit direction in the center position.

"P" blocked center in either a manual or solenoid valve is commonly used for decoupling of palletized double acting systems. This allows the pressure to be dropped from both the "A" and "B" hoses for disconnect and reconnect under no pressure. In the center position of this valve "P" is blocked, "A", "B" and "T" are connected.

What is the flow pattern for a single acting system?

Single acting systems typically have only two valve positions. In the advance position "P" is connected to "A." In the retract position, "A" is connected to "T" and "P" is blocked, allowing the cylinder springs to push the fluid back to tank.

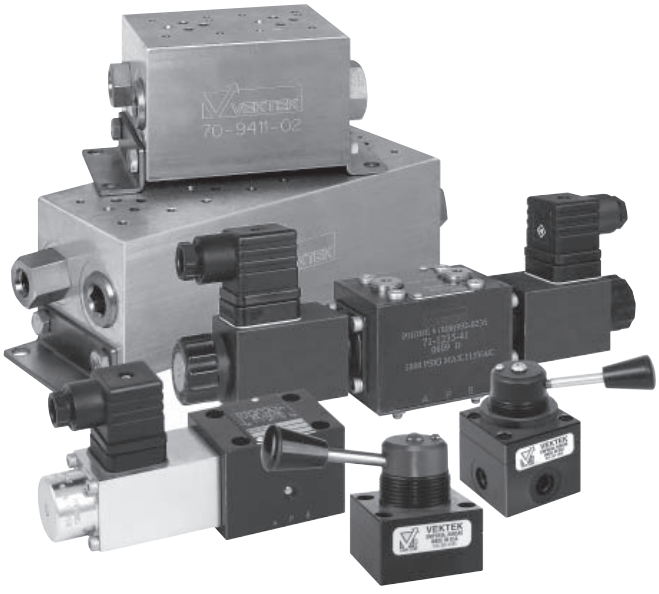
What do I need to watch for when I'm plumbing a system?

You should watch for proper flow paths among other things. Remember that hydraulic fluid, like water, will take the path of least resistance. Plan your fluid distribution manifolds and fittings to provide for the smoothest possible flow to and from your cylinders. The best schematically designed control system can be ruined by poor plumbing implementation.

I can get a spool valve locally for a lot less money than your valve. Will it work?

You are responsible for the appropriate use of all devices. The use of spool valves invalidates the warranty on any VektorFlo® pump. If you are using a suitable industrial pump and valve, they may work. The use of a pump with excess flow invalidates the warranty on any VektorFlo® item. If you choose to use non-Vektek pumps and valves, you assume the responsibility for selecting appropriate sizes.

The use of spool valves invalidates the warranty on any VektorFlo® Pump.



All VektorFlo® directional control valves are rated at 5,000 psi working pressure. They typically incorporate international standard mounting and fluid flow patterns (NFPA D03/ISO 44011). This allows one valve sub-plate to serve as the mounting platform for any of these valves. Plumbing lines are connected to ports on the sides of the sub-plate while four hold-down screws secure the top valve.

Removal and replacement is easily accomplished without disturbing system plumbing; greatly reducing chances of system contamination. Valve changeovers can be accomplished in minutes, not hours: a tremendous advantage as production downtime costs mount up.

Standardized mounting patterns also mean that valve operation can easily be upgraded from manual to electric, again without having to change system plumbing. Our electric solenoid valves are direct bolt-on replacements for our manually operated versions.

VektorFlo® D03 style valves may be positioned in either of two ways:

1. Mounted away from the power source on one of our remote valve sub-plates (perhaps mounted directly on your fixture or machine tool).
2. Mounted directly on our large capacity power supply using a direct mount sub-plate. This further simplifies plumbing and eliminates the need for each individual fixture to have its own valves.

NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves. Excess flow voids warranty.

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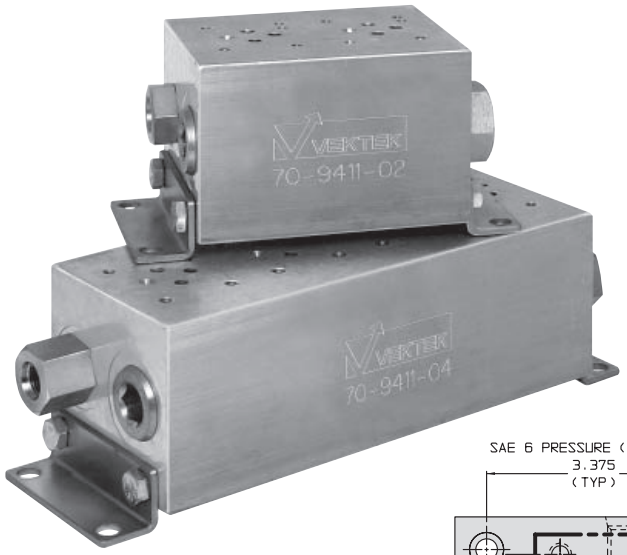
Directional Control Valves

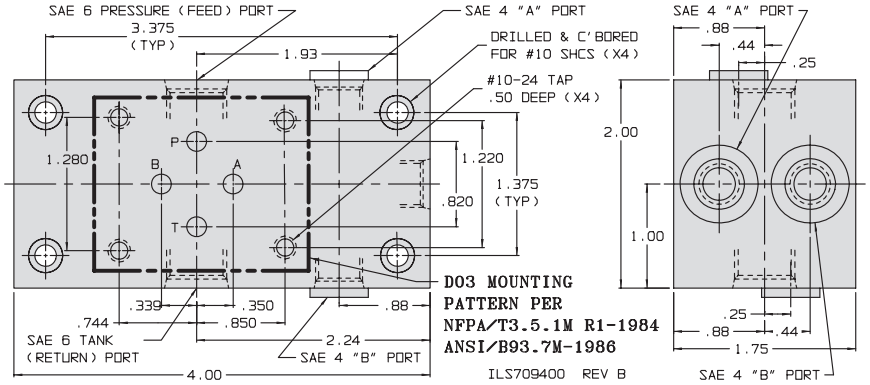
Valve Sub-plates

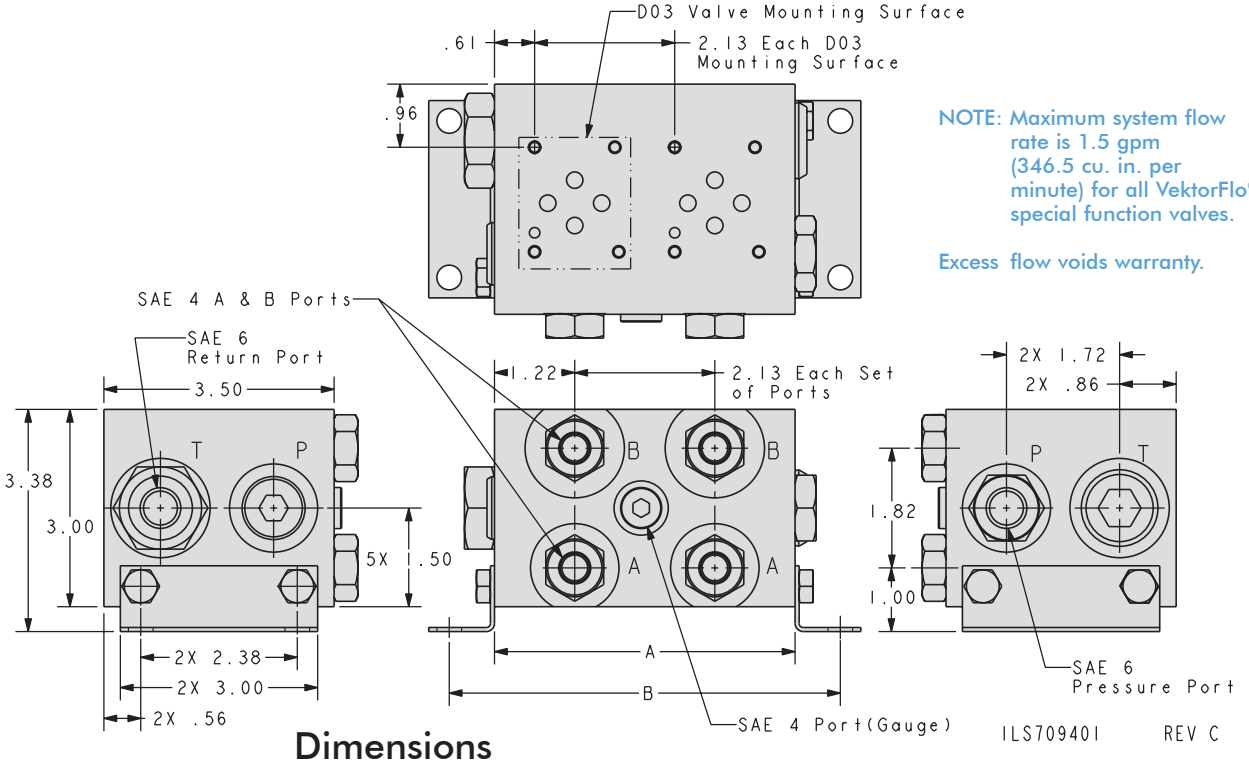


NFPA D-03 Standard

- Contains all plumbing connections for "P", "T", "A", and "B" connections.
- Simplifies "at the fixture" valve mounting for 1, 2 or 4 valve plumbing.
- Makes valve changes simple, just remove four cap screws to change valves.
- All VektorFlo® valves fit the D03 pattern except panel mount model.

Remote Single Valve Sub-plate
Model No. 70-9411-00





NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves.

Excess flow voids warranty.

Dimensions

Model No.	Description	A	B
70-9411-02	Two Valve Manifold	4.57	5.95
70-9411-04	Four Valve Manifold	8.83	10.21
93-1989-00	Crossover Plate		
93-1989-01	Blanking Plate		

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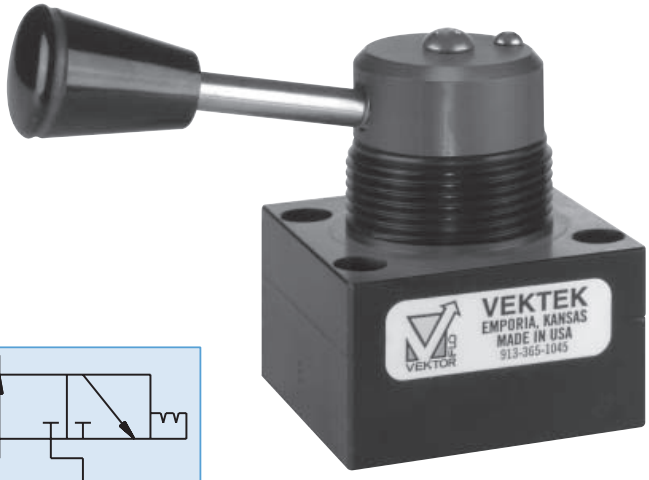


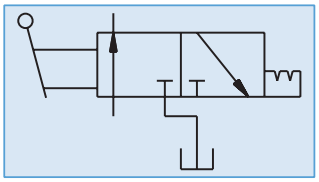
Control Valves: 2-Position, 3-Port

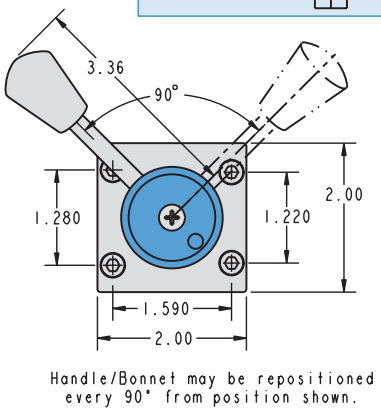
Manual Model No. 71-1422-02

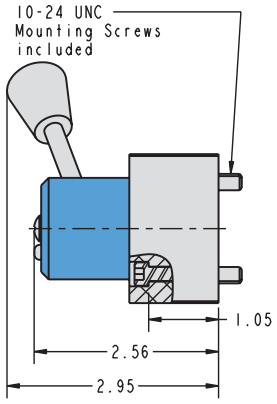
- Available as either manual or solenoid operator.
- Efficient control solutions for single-acting systems.
- 2-position 3-port manual valve is equipped with colored bonnet to differentiate it from the 3-position 4-port.
- Shear style valve design features hardened steel poppets in an aluminum body.
- Low restriction design generates a pressure drop of less than 2 psi with a 2 gpm flow.

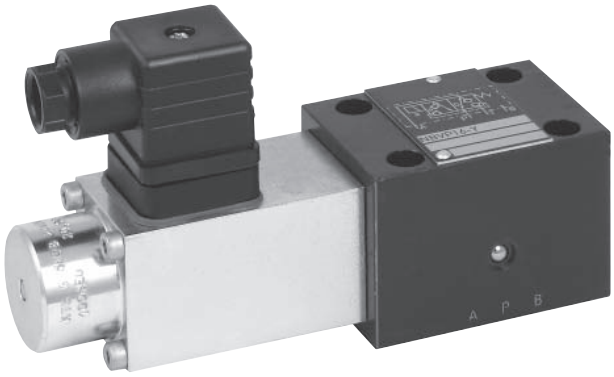
NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special valves.

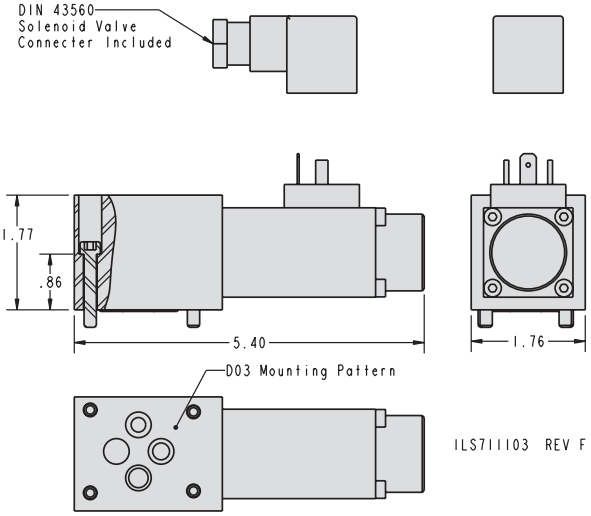
Excess flow voids warranty.



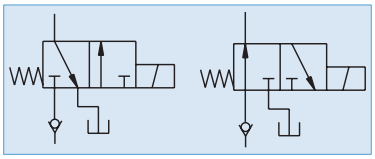








Model No.	Function	Valve Connector Part No.	Solenoid Voltage	Power Consumption (Watts)	Duty Rating
71-1122-54	Normally Open	85-5342-91	24VDC	27.6	100%
71-1122-13	Normally Open*	87-1123-00	115VAC	28.6	
71-1150-03	Normally Closed	85-5342-91	24VDC	27.6	
71-1150-05	Normally Closed*	87-1123-00	115VAC	28.6	



* Supplied with rectified connectors that must be used to insure proper valve function and warranty. Use of any other connector will void the valve warranty.

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Directional Control Valves

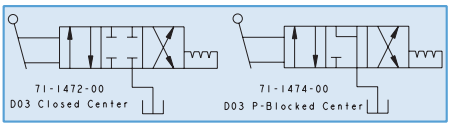
3 Position, 4-Port Manually Operated

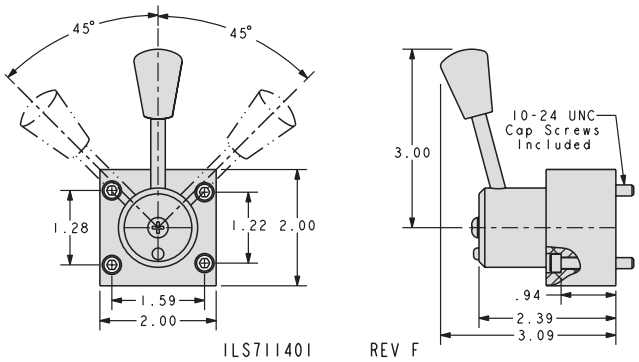
Control Valves: 3-Position, 4-Port

- These valves offer the features required to efficiently control a double acting workholding system (They may also be used to control single acting systems working in opposition).
- Valves incorporate extremely low leakage (4 drops per minute per seal) pressure balanced shear type seals and poppet designs.
- Heat treated rotor and poppets are spring and pressure loaded against each other to provide positive fluid control for hundreds of thousands of cycles.
- Operates with rotary handle motion. Detented internal rotor snaps into position ensuring accurate alignment of internal flow passages.
- Use of an of anti-friction rotary bearing allows for low effort handle rotation even when operating at 5,000 psi.
- All valves incorporate lightweight aluminum alloy bodies and are furnished with required standard length mounting bolts.

D03 Mount

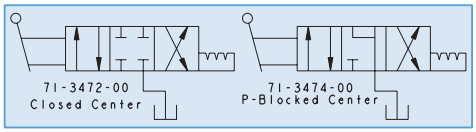
Model No. 71-1472-00 D03 Closed Center
Model No. 71-1474-00 P-Blocked Center

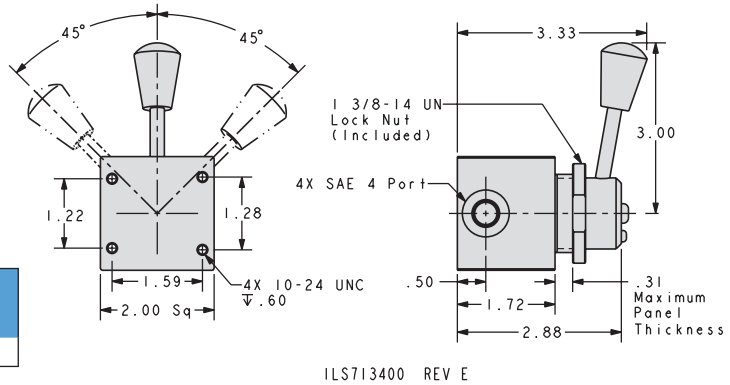




Panel Mount

Model No. 71-3472-00 Closed Center
Model No. 71-3474-00 P-Blocked Center





Seals	Fluid Temp. Maximum	Fluid Flow Maximum	Tank Port Pressure
Buna N Teflon*	158° F	3 gpm	250 psi max

NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves.

Excess flow voids warranty.

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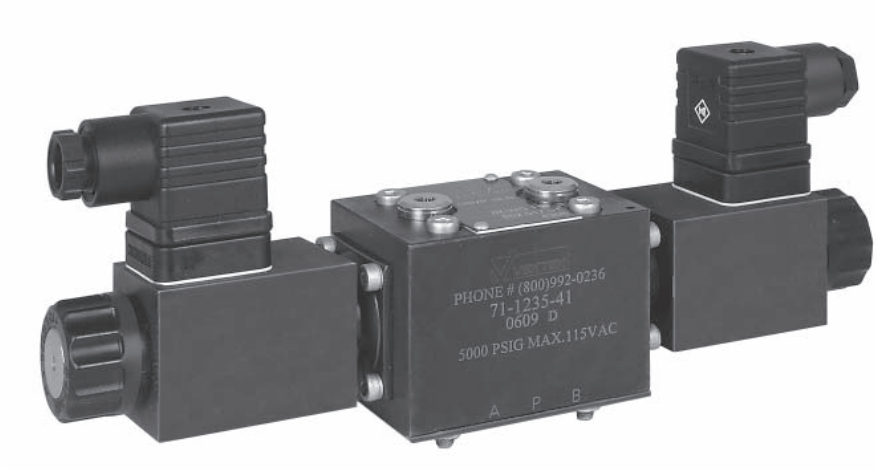
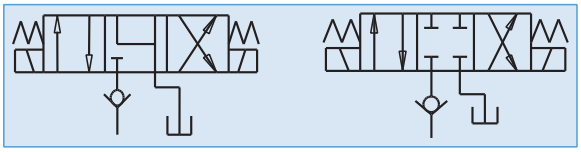
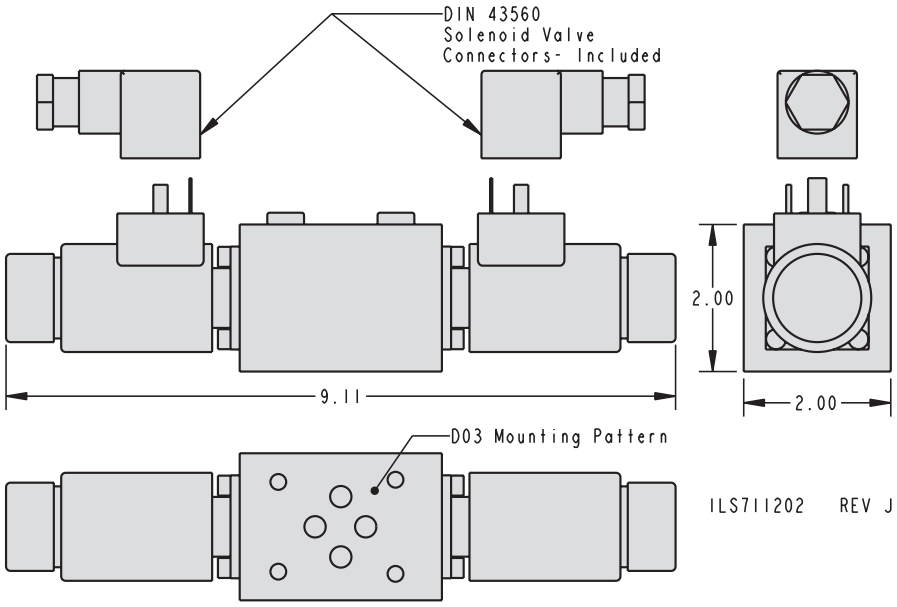


Control Valves
3-Position, 4 Port

- Provide improved control of clamping circuits with true poppet design.
- Multiple coil voltages available.
- Internal design promotes improved service life.
- Narrow width allows mounting of multiple valves on standard D03 manifolds.
- All valves have built-in P-Block check for fail safe multi-valve operation.
- Coils can be easily replaced.





Model No.	Function	Valve Connector Part No.	Solenoid Voltage	Power Usage (watts)	Duty Rating
71-1235-21	Closed Center	85-5342-91	24VDC	27.6	100%
71-1235-22	Closed Center*	87-1123-00	115VAC	28.6	
71-1235-40	P-Blocked Center	85-5342-91	24VDC	27.6	
71-1235-41	P-Blocked Center*	87-1123-00	115VAC	28.6	

* Supplied with rectified connectors that must be used to insure proper valve function and warranty. Use of any other connector will void the valve warranty.

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Swing Clamp Arms

Frequently Asked Questions

Frequently Asked Questions

I need to make my own arms, what information do I need?

The information that you need is detailed on page 0-7. We strongly encourage you to copy our connection to the swing clamp rod. The combination of the top cap screw and side bolt squeezing action is the most secure connection on the market today. You should be sure to put the 0.02" step, slot and relieve the underside of your custom arms for best results.

Can I modify the arms I buy from you?

Yes, you can. Our arms are made of a cast alloy steel that you can easily weld or machine to fit your needs.

Do I really need to put the step in the top of the arm like you do?

Yes, you should. The step in top of the arm relieves stress on the cap screw and the piston rod. If you make custom arms and leave this off, you will probably experience premature failures if your clamps are run near maximum capacity.

I want to use the cap screw only to hold my arm in place. Will this work?

It is unlikely that you can use the cap screw to hold arm orientation adequately. We have had customers modify clamps to include flats, pins, serrations or use setscrews to hold orientation. These methods may work in specific instances. We still recommend our method of attachment, cap screw and cross bolt for a secure, dependable, universal attachment. Other methods may complicate the replacement of clamps when they are damaged by a machine crash or other problems.

Why should I buy your arm rather than have my toolmaker make one?

Our arm is designed to hold orientation when properly installed. It has a relief to keep from over-stressing the cap screw. It will probably cost you less than the total cost of making your own. You can rest assured that our arm is made to our specifications and will withstand the forces our clamps generate, when used as recommended.

I need an arm slightly different from those you make. How do I make my own?

Our first recommendation is to investigate the possibility of modifying our existing arms. All VektorFlo® arms are machinable and weldable. You should be able to easily modify any standard arm you purchase. We recommend this because our original design for the cross bolt orientation mechanism is the most secure, dependable and versatile orientation method available. Many customers and competitors have tried to copy it, some with limited success. We welcome you to use our method also. Please be sure to put in the 00.02" step for the cap screw and relieve the cut in the arm so that the bolt will squeeze the plunger shaft. If you do not take these two steps, your custom arm may not work suitably.

Can I pin the arm to hold orientation?

Yes, it is possible to add a setscrew or pin to the arm and plunger end to assure orientation is retained. We do not recommend it because it limits the future replacement of clamps and arms with standard product when (not if) there is a machine crash. Our arms, when installed properly, will hold orientation in normal use. They will hold even when crashed repeatedly. Customer designed arms sometimes require pins but often are very expensive compared to our "off the shelf" models.

I am using a double ended arm. Is the capacity of your 2,600 lb. swing clamp still the same?

No. First of all, the 2,600 lb. rating is with a standard arm installed and includes the frictional loss inherent in all cantilevered designs. The true capacity rating for this clamp is 3,100 lbs. If you are pulling in the center of the arm and both points are being contacted at the same time, divide the force by 2 (1,550 per part at 5,000 psi).

I want to clamp two parts with each double ended swing clamp arm. Do I need a fixed or pivoting arm?

If your parts will not vary in size (clamped height) you can probably get by with a fixed clamp arm. If your parts vary by as little as 0.01", you may get significant variations in clamp force with a fixed arm (higher force on the taller part, lighter force on the shorter one). If your parts vary or the clamp force is crucial, we recommend a pivoting arm so that the force is equalized on both parts. (Remember that if the length varies, the resulting forces may change also, be sure that both ends are equal length.)

I have a variety of parts to clamp with my swing clamp fixture. Do you have a way to "quick change" the clamp arms?

You will need to make a custom attachment. The first option is to set your swing clamp to be able to clamp the tallest part with the standard arm. The height or width can then be adjusted by attaching a contact device to the arm.

The second option would be to use our standard rocker arm attachment assembly with a heeled custom arm. The arm could be made "quick change" by using a pull pin or clevis pin substituted for our supplied pivot pin. This is an ideal option when the arm style must change dramatically from part to part.

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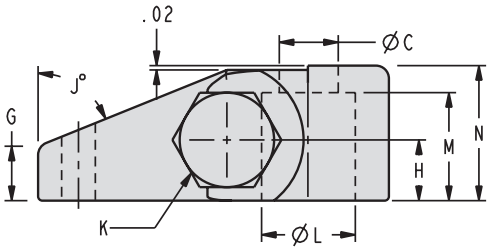
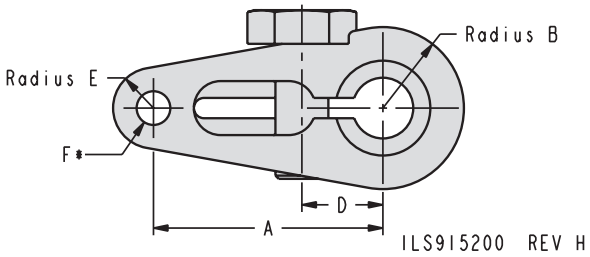
Swing Clamp Arms

Standard Length and Upreach





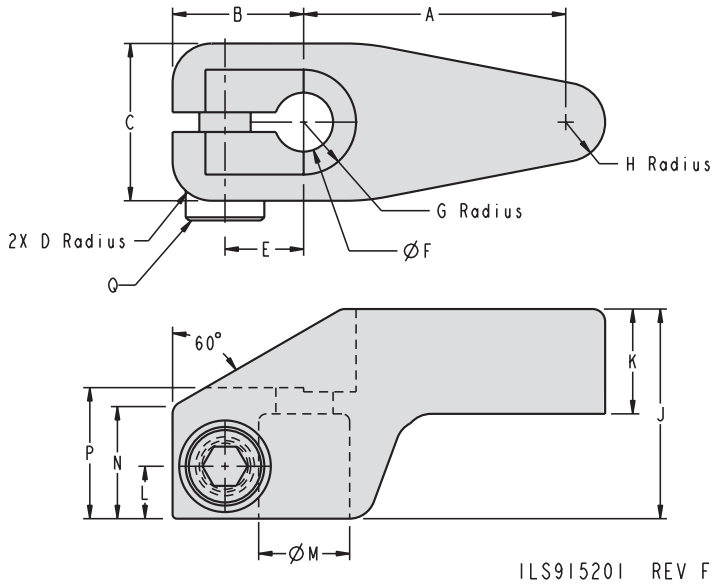
ILS915200 REV H

Standard Arm Dimensions

Model No.	Cylinder Capacity	A	B	ØC	D	E	F*	G	H	J°	K	ØL	M	N
91-5205-01	450	1.06	0.38	0.28	0.38	0.19	10-24	0.25	0.28	68°	1/4-28	0.4380/0.4400	0.50	0.63
91-5209-01	1100	1.50	0.50	0.41	0.50	0.25	5/16-18	0.29	0.31	65°	5/16-24	0.6255/0.6275	0.71	0.88
91-5213-01	2600	2.00	0.69	0.53	0.66	0.37	3/8-16	0.47	0.37	65°	3/8-24	0.8755/0.8775	1.00	1.25
91-5218-01	5000	2.50	1.00	0.66	0.97	0.56	5/8-11	0.63	0.50	65°	5/8-18	1.2500/1.2520	1.44	1.75

* For arms without threaded holes, order Model Nop. 91-52XX-00

NOTE: See catalog page C-20 for suggested location of drilled and tapped hole for Clocking.



ILS915201 REV F

Upreach Arm Dimensions

Model No.	Cylinder Capacity	A	B	C	D	E	ØF	G	H	J	K	L	ØM	N	P	Q
91-5205-06	450	1.25	0.63	0.75	0.19	0.38	0.28	0.25	0.19	1.00	0.50	0.25	0.4380/0.4400	0.54	0.63	1/4-28
91-5209-06	1100	1.75	0.75	1.00	0.25	0.50	0.41	0.34	0.25	1.38	0.66	0.32	0.6255/0.6275	0.79	0.88	5/16-24
91-5213-06	2600	2.50	1.03	1.38	0.38	0.66	0.53	0.50	0.38	2.00	1.00	0.44	0.8755/0.8775	1.18	1.25	3/8-24
91-5218-06	5000	3.00	1.50	2.00	0.56	0.97	0.66	0.63	0.56	2.75	1.31	0.53	1.2500/1.2520	1.61	1.75	5/8-18

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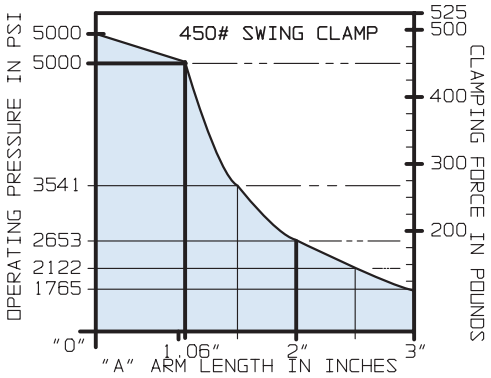
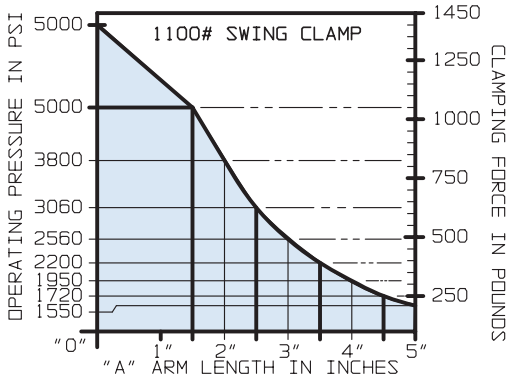
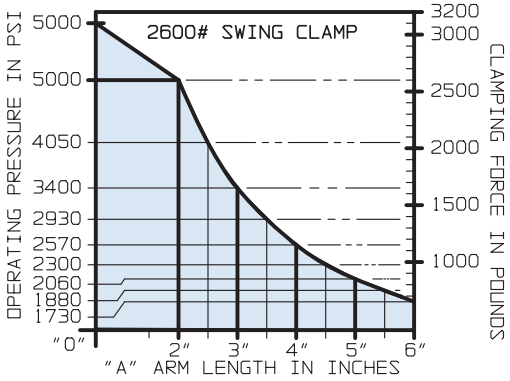
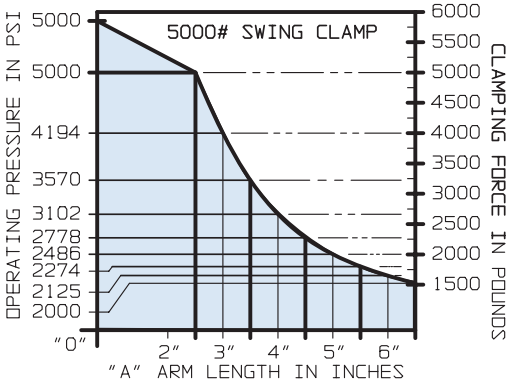
Swing Clamp Arms

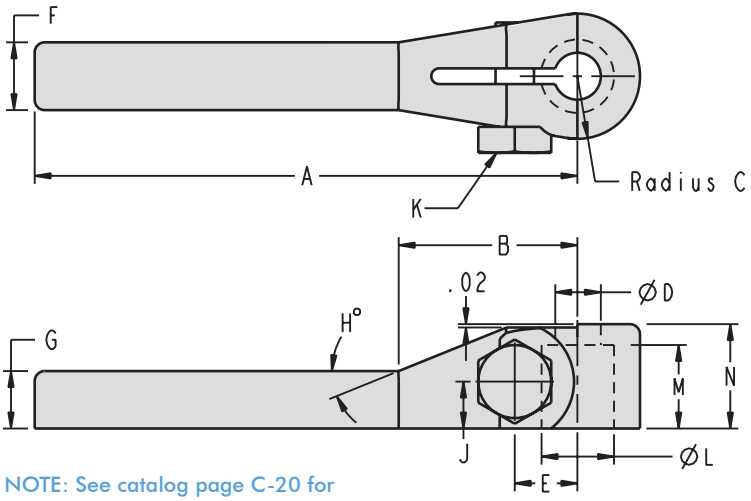
Arm Length Pressure Limitations





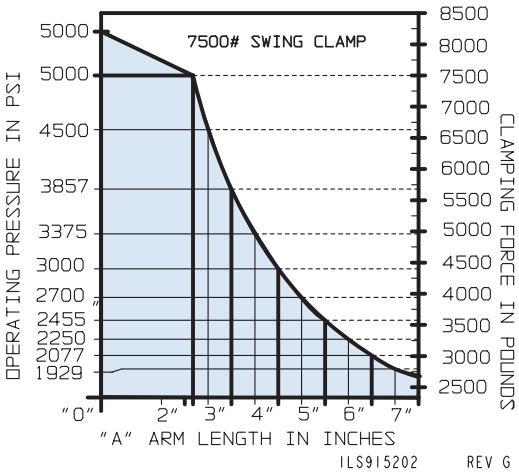






NOTE: See catalog page C-20 for suggested location of drilled and tapped hole for Clocking.

ILS915202 REV G



Arm lengths and pressures operating at or below the curves shown are in the safe operating zones for the clamp model indicated.

NOTE: Please reference Clamp Times and Flow Rate charts on page C-2 for TuffCam™ or C-14 for Standard Swing Clamps.

Extended Arm Dimensions

Model No.	Cylinder Capacity	A	B	C	ØD	E	F	G	H°	J	K	ØL	M	N
91-5205-02	450	3.25	1.07	0.38	0.28	0.38	0.41	0.34	22°	0.28	1/4-28	0.4380/0.4400	0.50	0.63
91-5209-02	1100	5.37	1.32	0.50	0.41	0.50	0.56	0.50	25°	0.31	5/16-24	0.6255/0.6275	0.71	0.88
91-5213-02	2600	6.37	2.03	0.69	0.53	0.66	0.75	0.63	25°	0.37	3/8-24	0.8755/0.8775	1.00	1.25
91-5218-02	5000	6.50	2.80	1.00	0.66	0.97	1.13	0.75	25°	0.50	5/8-18	1.2500/1.2520	1.44	1.75

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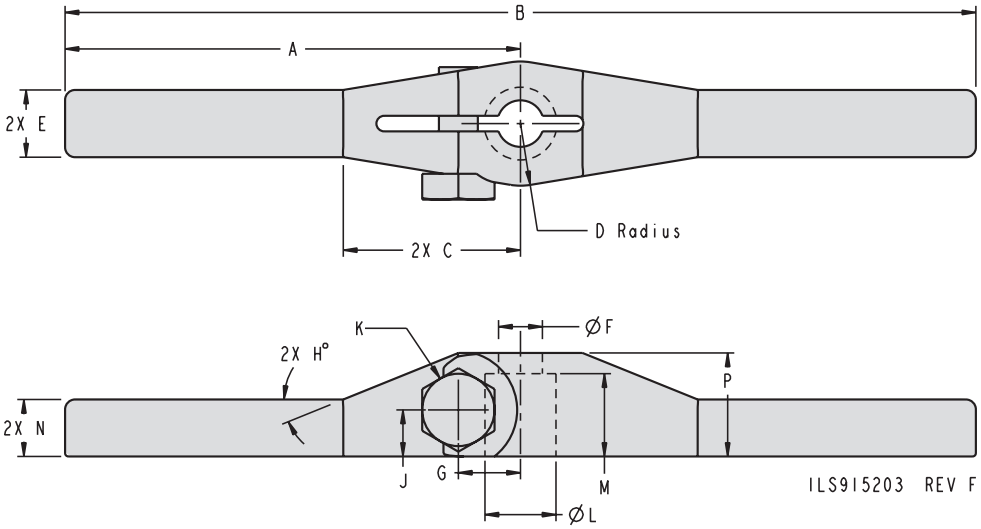
Double Ended



Double Ended Dimensions

Model No.	Cylinder Capacity	A	B	C	D	E	ØF	G	H°	J	K	ØL	M	N	P
91-5205-07	450	2.75	5.50	1.07	0.38	0.41	0.28	0.38	22°	0.28	1/4-28	0.4380/0.4400	0.50	0.34	0.63
91-5209-07	1100	4.37	8.75	1.32	0.50	0.56	0.41	0.50	25°	0.31	5/16-24	0.6255/0.6275	0.71	0.50	0.88
91-5213-07	2600	5.37	10.75	2.03	0.69	0.75	0.53	0.66	25°	0.37	3/8-24	0.8755/0.8775	1.00	0.63	1.25
91-5218-07	5000	5.50	11.00	2.80	1.00	1.13	0.66	0.97	25°	0.50	5/8-18	1.2500/1.2520	1.44	0.75	1.75

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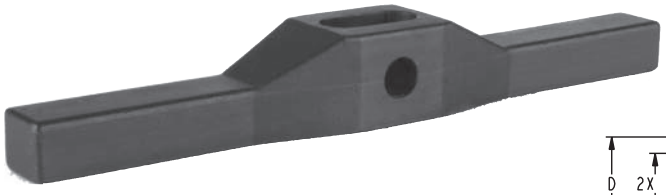
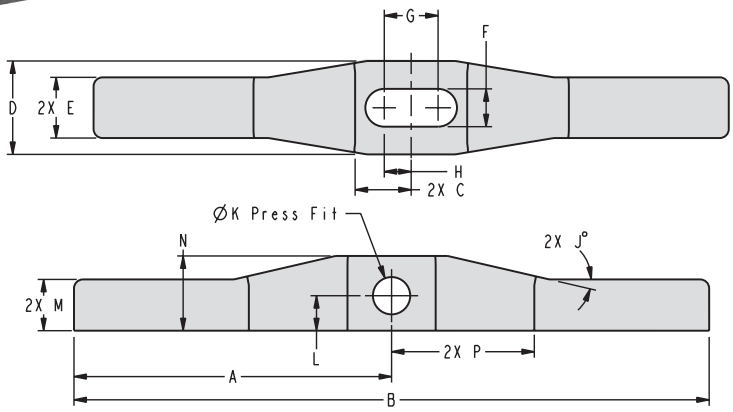
Swing Clamp Arms

Doubled Ended Rocker

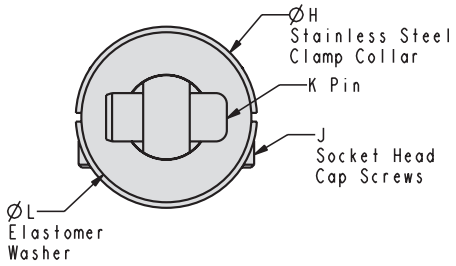


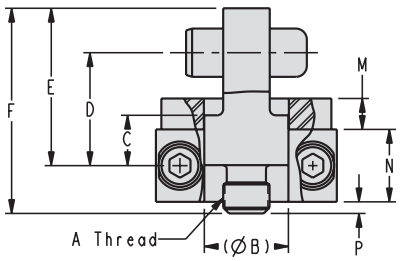


ILS915205 REV E

Double Ended Rocker Arm Dimensions

Model No.	Cylinder Capacity	A	B	C	D	E	F	G	H	J°	ØK	L	M	N	P
91-5205-09	450	2.13	4.25	0.38	0.63	0.41	0.25	0.36	0.18	13°	0.250	0.23	0.34	0.46	0.96
91-5209-09	1100	3.00	6.00	0.48	0.88	0.56	0.38	0.50	0.25	18°	0.312	0.38	0.50	0.75	1.27
91-5213-09	2600	4.25	8.50	0.73	1.25	0.75	0.53	0.70	0.35	25°	0.437	0.55	0.63	1.10	1.78
91-5218-09	5000	5.50	11.00	0.98	2.00	1.12	0.78	1.00	0.50	30°	0.624	0.87	0.75	1.75	2.86





ILS915206 REV E

Rocker Arm Attachment Assembly Dimensions

Model No.	Cylinder Capacity	A	ØB	C	D	E	F	G	ØH	J	K	ØL	M	N	P
91-5205-08	450	1/4-28	0.437	0.26	0.58	0.81	1.06	0.243	0.94	6-32	Ø.250 X 0.63	0.88	0.16	0.38	0.06
91-5209-08	1100	3/8-24	0.625	0.33	0.76	1.14	1.58	0.370	1.31	10-32	Ø.313 X 0.88	1.25	0.19	0.44	0.22
91-5213-08	2600	1/2-20	0.875	0.30	1.05	1.59	2.09	0.524	1.63	1/4-28	Ø.438 X 1.25	1.63	0.25	0.50	0.25
91-5218-08	5000	5/8-18	1.250	0.40	1.43	2.24	2.88	0.780	2.06	1/4-28	Ø.625 X 2.00	2.00	0.25	0.50	0.37

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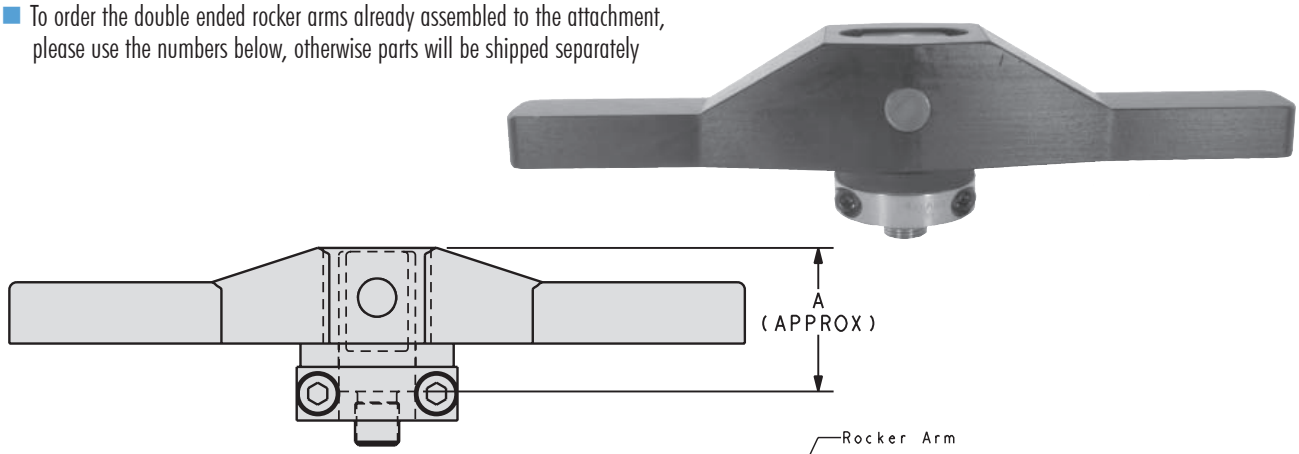
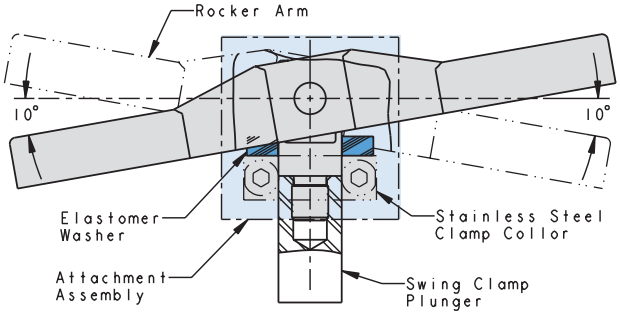
Double Ended Rocker Arm Assembly

■ To order the double ended rocker arms already assembled to the attachment, please use the numbers below, otherwise parts will be shipped separately



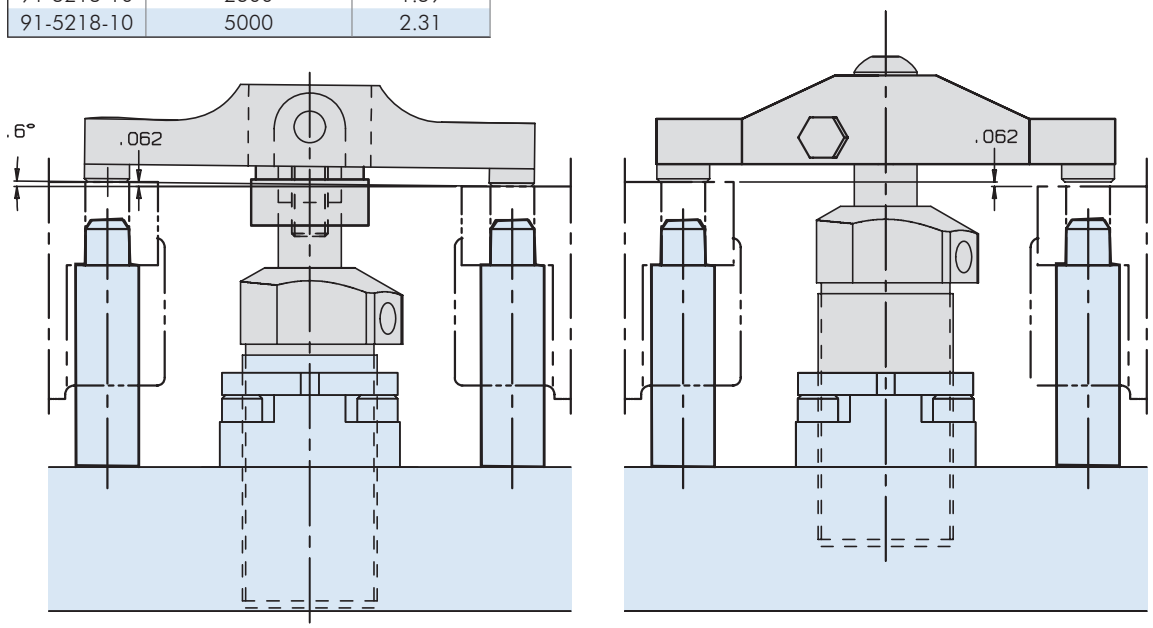
ILS915208 REV E



ILS915204 REV C

Double Ended Rocker Arm Assembly Dimensions

Model No.	Cylinder Capacity	A
91-5205-10	450	0.81
91-5209-10	1100	1.14
91-5213-10	2600	1.59
91-5218-10	5000	2.31



ILSFIX9712 REV B

The double ended rocker arm illustrated on the left will provide equal clamping force at both ends.

The fixed double ended arm on the right will transmit more force on the taller part.

Specifications on O-5

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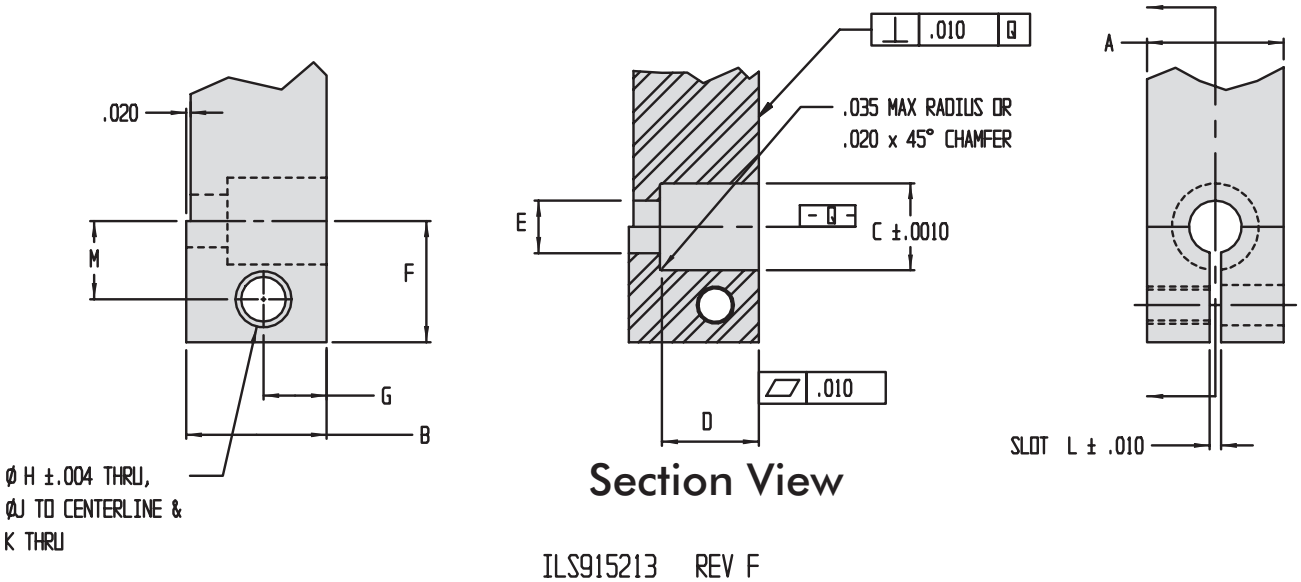
Swing Clamp Arms

Customer-Produced Arm



Section View

ILS915213 REV F

Self-produced Arm Dimensions for Standard and High-Speed Cylinders

Arm Series	Cylinder Capacity	A	B	ØC	D	ØE	F	G	ØH	ØJ	K	L	M
Recommended Machining Dimensions for Self-produced Clamp Arms													
91-5205-01 91-5205-02 91-5205-06 91-5205-07	450	0.75	0.63	0.439	0.50	0.28	0.63	0.28	0.219	0.281	1/4-28 UNF 28	0.095	0.38
91-5209-01 91-5209-02 91-5209-06 91-5209-07	1100	1.00	.88	0.626	0.71	0.41	0.75	0.31	0.272	0.332	5/16-24 UNF 28	0.114	0.50
91-5313-01 91-5213-02 91-5213-06 91-5213-07	2600	1.38	1.25	0.876	1.00	0.53	1.03	0.37	0.332	0.391	3/8-24 UNF 28	0.114	0.66
91-5218-01 91-5218-02 91-5218-06 91-5218-07	5000	2.00	1.75	1.251	1.44	0.66	1.50	0.56	0.578	0.641	5/8-18 UNF 28	0.114	0.97

NOTE: Please reference Clamp Times and Flow Rate charts on page C-2 for TuffCam™ or C-14 for Standard Swing Clamps.

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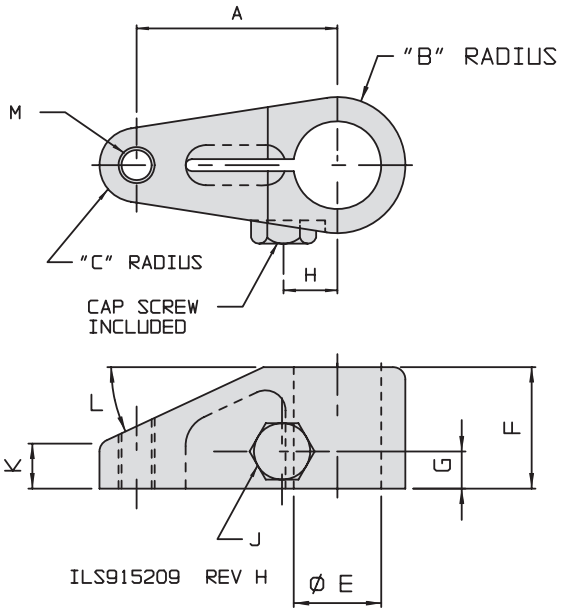
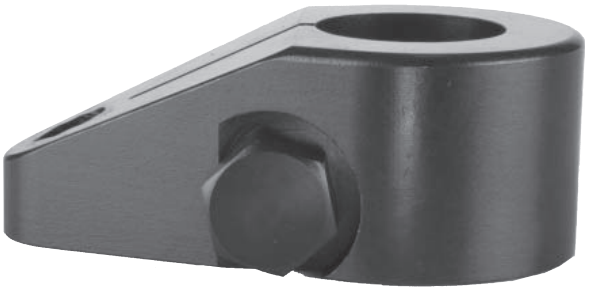
Low Profile Swing Clamp Arms





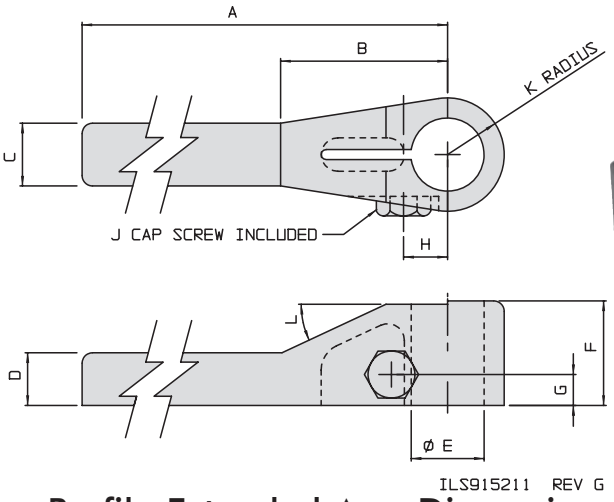
Low Profile Standard Arm Dimensions

Model No.	Cylinder Capacity	A	B	C	E	F	G	H	J	K	L	M
91-5218-12*	5000	2.50	1.00	0.56	1.2500/1.2520	1.75	0.50	0.884	M16 x 1,50	0.63	25°	5/8-11
91-5221-11**	7500	2.68	1.37	0.56	1.5005/1.5025	1.75	0.56	1.009	M16 x 1,50	0.65	25°	5/8-11

* For use with the low profile swing clamps, models 15-2718-XX and 15-2818-XX only. For arm without tapped hole order model number 91-5218-11.

** For use with low profile swing clamps model 15-0121-XX, 15-0221-XX, 15-0521-XX, 15-0621-XX, 15-2121-XX and 15-2221-XX only. For arm without tapped hole order model number 91-5221-06.

NOTE: Replacement Bolt for 91-5218-XX is model number 21-5000-24.
Replacement Bolt for 91-5221-XX is model number 21-5000-28.



NOTE: Please reference Clamp Times and Flow Rate charts on page C-14 for Standard Swing Clamps.

Low Profile Extended Arm Dimensions

Model No.	Cylinder Capacity	A	B	C	D	E	F	G	H	J	K	L
91-5218-13*	5000	6.50	2.80	1.13	0.75	1.2500/1.2520	1.75	0.50	0.884	M16 X 1,50	0.63	25°
91-5221-07**	7500	7.10	2.69	1.19	1.33	1.5005/1.5025	1.75	0.56	1.009	M16 x 1,50	0.65	25°

* For use with the low profile swing clamps, models 15-2718-XX and 15-2818-XX only.

** For use with the low profile swing clamps, models 15-0121-XX, 15-0221-XX, 15-0521-XX, 15-0621-XX, 15-2121-XX and 15-2221-XX only.

NOTE: Replacement Bolt for 91-5218-13 is model number 21-5000-24.
Replacement Bolt for 91-5221-07 is model number 21-5000-28.

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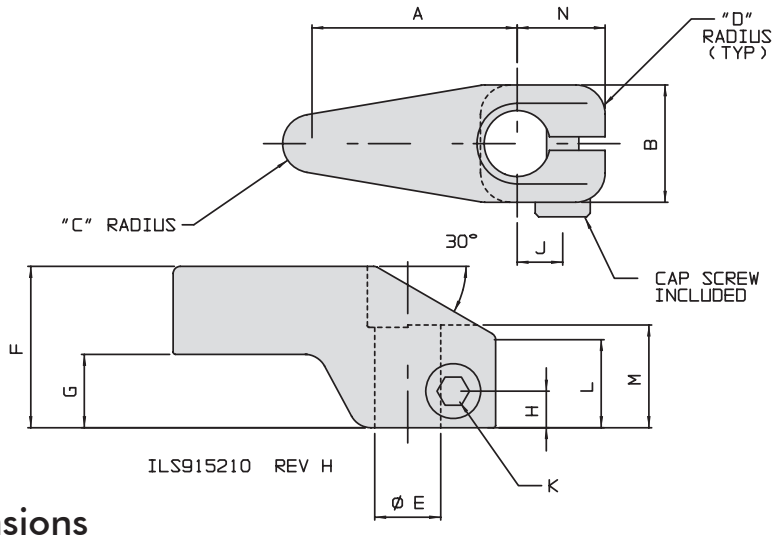
Swing Clamp Arms

Low Profile Swing Clamp Arms



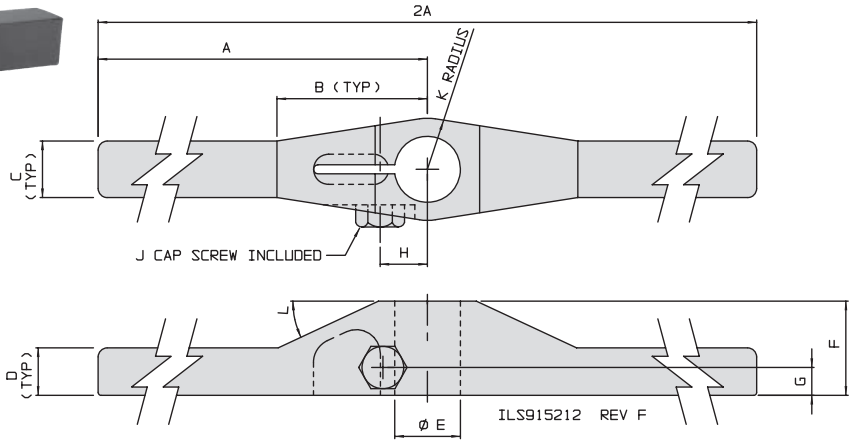
Low Profile Upreach Arm Dimensions

Model No.	Cylinder Capacity	A	B	C	D	E	F	G	H	J	K	L	M	N
91-5218-15*	5000	3.00	2.00	0.56	0.56	1.2500/1.2520	2.75	1.44	0.53	0.884	M16 x 1,50	1.61	1.75	1.50
91-5221-09**	7500	3.19	2.75	0.56	0.56	1.5005/1.5025	3.00	1.56	0.53	1.009	M16 x 1,50	1.77	1.75	1.62

* For use with the low profile swing clamps, models 15-2718-XX and 15-2818-XX only.
** For use with the low profile swing clamps, models 15-0121-XX, 15-0221-XX, 15-0521-XX, 15-0621-XX, 2121-XX and 15-2221-XX only.

All dimensions are in inches.

NOTE: Replacement Bolt for Model No. 91-5218-15 and Model No. 91-5221-09 is Model No. 21-5000-25.



Low Profile Double Ended Arm Dimensions

Model No.	Cylinder Capacity	A	2A	B	C	D	E	F	G	H	J	K	L
91-5218-14*	5000	6.50	11.00	2.80	1.13	0.75	1.2500/1.2520	1.75	0.50	0.884	M16 X 1,50	0.63	25°
91-5221-08**	7500	7.10	14.20	2.69	1.19	1.33	1.5005/1.5025	1.75	0.56	1.009	M16 X 1,50	0.65	25°

* For use with the low profile swing clamps, models 15-2718-XX and 15-2818-XX only.
** For use with the low profile swing clamps, models 15-0121-XX, 15-0221-XX, 15-0521-XX, 15-0621-XX, 2121-XX and 15-2221-XX only.

NOTE: Replacement Bolt for 91-5218-14 is model number 21-5000-24.
Replacement Bolt for 91-5221-08 is model number 21-5000-28.

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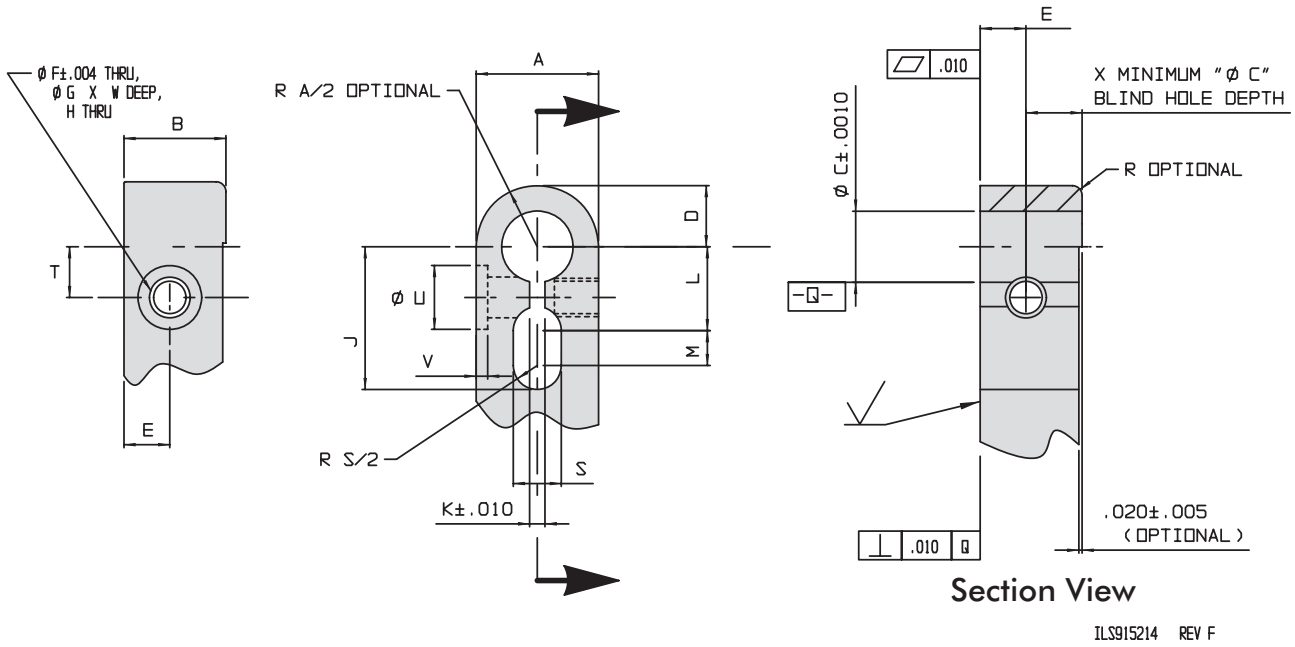
Recommended Machine Dimensions for Customer-produced Low Profile Swing Clamps



Self-produced Low Profile Arm Dimensions

Arm Series	Cylinder Capacity	A	B	ØC	D	E	ØF	ØG	H	J
Recommended Machining Dimensions for Self-produced Clamp Arm										
91-5218-12 91-5218-13 91-5218-15	5000	2.00	1.75	1.251	1.00	0.50	0.57	0.65	M16 x 1,50-6H	2.06
91-5221-07 91-5221-09 91-5221-11	7500	2.75	1.75	1.5015	1.38	0.56	0.57	0.65	M16 x 1,50-6H	2.25

Arm Series	Cylinder Capacity	K	L	M	S	T	U	V	W	X S/A	X D/A
Recommended Machining Dimensions for Self-produced Clamp Arm											
91-5218-12 91-5218-13 91-5218-15	5000	0.11	1.00	0.80	0.51	0.88	1.38	0.25	1.01	1.70	1.29
91-5221-07 91-5221-09 91-5221-11	7500	0.12	1.12	0.57	0.56	1.00	1.38	0.38	1.00	2.00	1.22

NOTE: Please reference Clamp Times and Flow Rate charts on page C-14 for Standard Swing Clamps.

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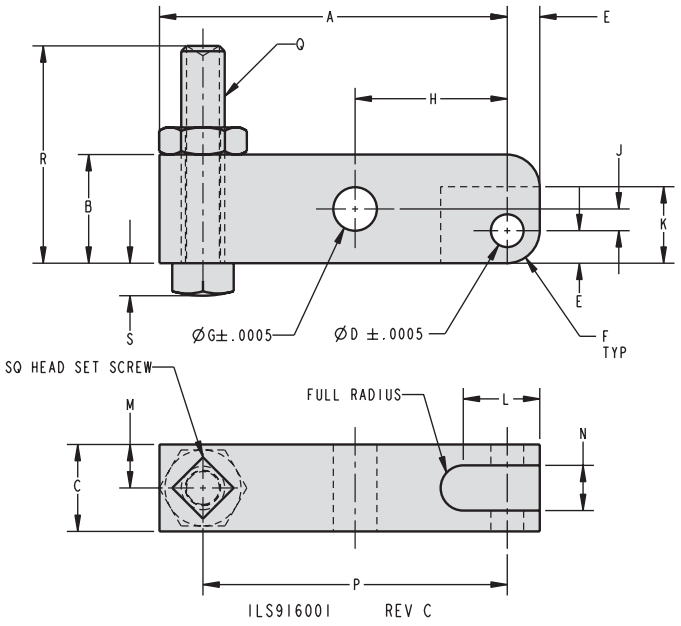
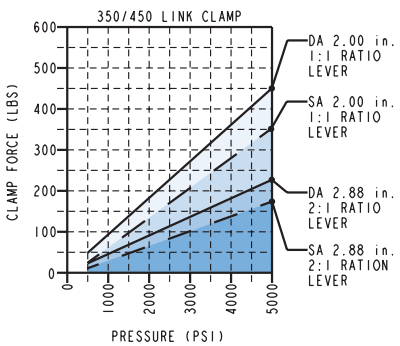
Link Clamp Levers

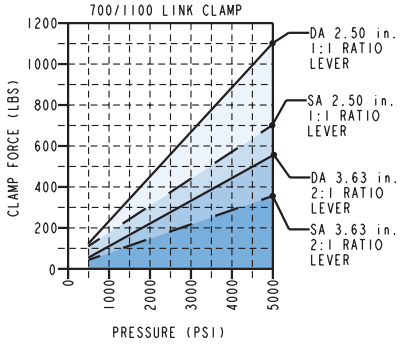
Link Clamp Lever

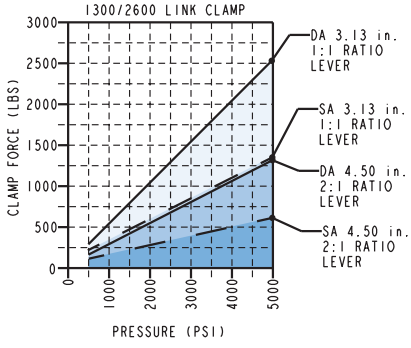


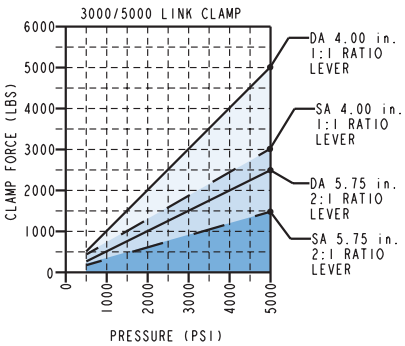
Dimensions

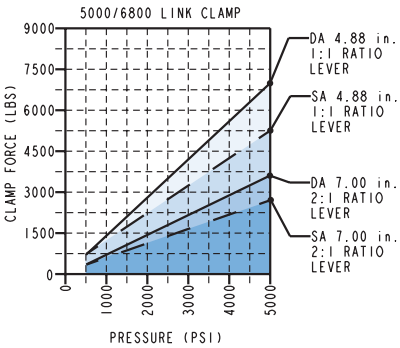
Model No.	Cylinder Capacity S/A-D/A	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S
Standard Length Lever, 1:1 Ratio																		
91-6004-01	350/450	2.00	0.63	0.50	0.189	0.188	0.19	0.250	0.88	0.13	0.44	0.44	0.25	0.26	1.75	1/4 - 20 UNC	1.25	0.19
91-6006-01	700/1100	2.50	0.88	0.63	0.252	0.250	0.25	0.375	1.13	0.13	0.56	0.56	0.31	0.32	2.25	5/16 - 18 UNC	1.75	0.24
91-6009-01	1300/2600	3.13	1.25	1.00	0.377	0.375	0.38	0.500	1.38	0.19	0.81	0.81	0.50	0.51	2.75	3/8 - 16 UNC	2.25	0.28
91-6014-01	3000/5000	4.00	1.75	1.25	0.502	0.500	0.50	0.625	1.75	0.25	1.19	1.19	0.63	0.63	3.50	1/2 - 13 UNC	3.00	0.38
91-6016-01	5000/6800	4.88	2.00	1.50	0.627	0.625	0.63	0.750	2.13	0.25	1.50	1.50	0.75	0.76	4.25	5/8 - 11 UNC	3.50	0.47
Extended Length Lever without Tapped Hole 2:1 Ratio																		
91-6004-02	350/450	2.88	0.63	0.50	0.189	0.188	0.19	0.250	0.88	0.13	0.44	0.44	0.25	0.26	N/A	N/A	N/A	N/A
91-6006-02	700/1100	3.63	0.88	0.63	0.252	0.250	0.25	0.375	1.13	0.13	0.56	0.56	0.31	0.32	N/A	N/A	N/A	N/A
91-6009-02	1300/2600	4.50	1.25	1.00	0.377	0.375	0.38	0.500	1.38	0.19	0.81	0.81	0.50	0.51	N/A	N/A	N/A	N/A
91-6014-02	3000/5000	5.75	1.75	1.25	0.502	0.500	0.50	0.625	1.75	0.25	1.19	1.19	0.63	0.63	N/A	N/A	N/A	N/A
91-6016-02	5000/6800	7.00	2.00	1.50	0.627	0.625	0.63	0.750	2.13	0.25	1.50	1.50	0.75	0.76	N/A	N/A	N/A	N/A











DOUBLE ACTING (DA) ——————
SINGLE ACTING (SA) — — — —

ILS916002 REV B

Link Clamp Lever Output Curves

NOTE: Modifications to levers that result in clamp ratios below a 1:1 ratio are not in the safe operating zone for the corresponding link clamp and could result in premature failure.

Exceeding the allowable offset values and operating pressures specified in the tables will result in excessive forces on the link clamp pins, links, and rod which could result in premature failure.

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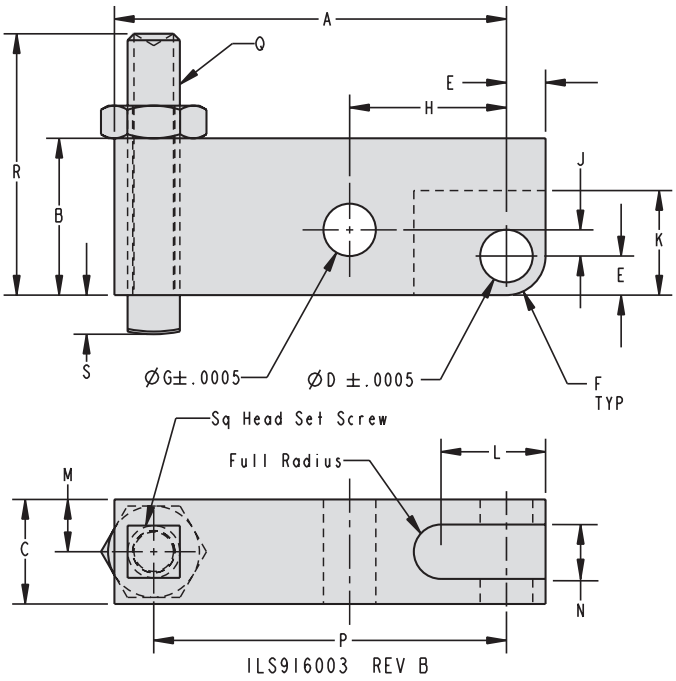
Low Pressure Link Clamp Lever

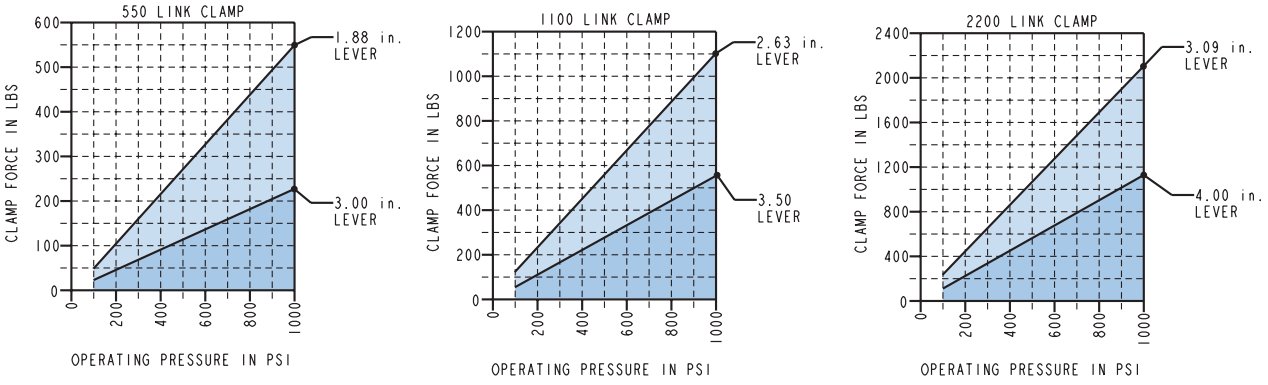


Dimensions

Model No.	Cylinder Capacity	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S
Standard Length Lever																		
91-6011-03	550	1.88	0.75	0.50	0.2515	0.19	0.19	0.2505	0.75	0.13	0.50	0.50	0.25	0.26	1.69	1/4-20 UNC	1.25	0.19
91-6015-03	1100	2.63	1.00	0.75	0.3765	0.31	0.31	0.3755	1.00	0.31	0.75	0.69	0.38	0.39	2.25	3/8-16 UNC	2.25	0.28
91-6021-03	2200	3.09	1.25	0.88	0.5015	0.38	0.38	0.5005	1.19	0.38	0.94	0.88	0.44	0.45	2.69	1/2-13 UNC	3.00	0.38
Extended Length Lever without Tapped Hole																		
91-6011-02	550	3.00	0.75	0.50	0.2515	0.19	0.19	0.2505	0.75	0.13	0.50	0.50	N/A	0.26	N/A	N/A	N/A	N/A
91-6015-02	1100	3.50	1.00	0.75	0.3765	0.31	0.31	0.3755	1.00	0.31	0.75	0.69	N/A	0.39	N/A	N/A	N/A	N/A
91-6021-02	2200	4.00	1.25	0.88	0.5015	0.38	0.38	0.5005	1.19	0.38	0.94	0.88	N/A	0.45	N/A	N/A	N/A	N/A

Low Pressure Link Clamp Lever Output Curves

(Double acting only)



NOTE: Modifications to levers that result in clamp ratios below a 1:1 ratio are not in the safe operating zone for the corresponding link clamp and could result in premature failure.

Exceeding the allowable offset values and operating pressures specified in the tables will result in excessive forces on the link clamp pins, links, and rod which could result in premature failure.

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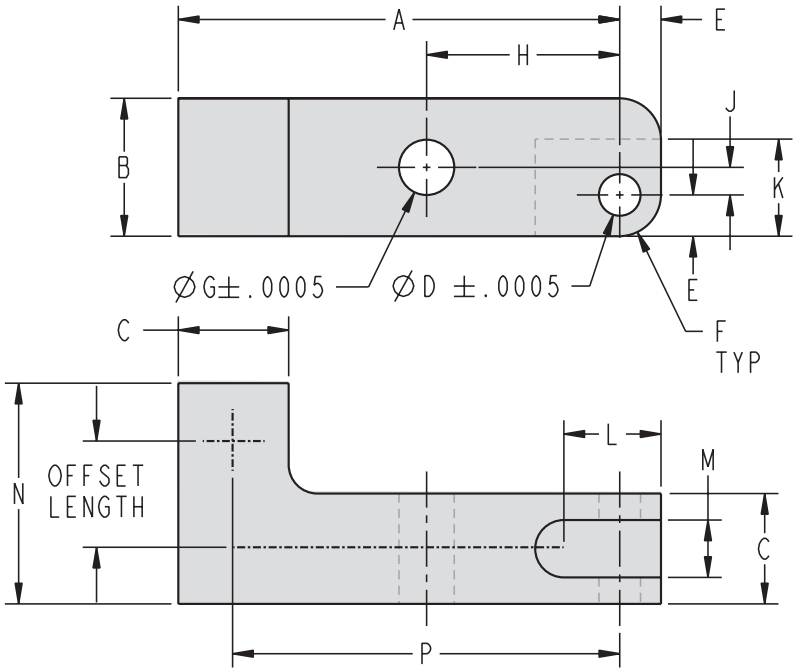
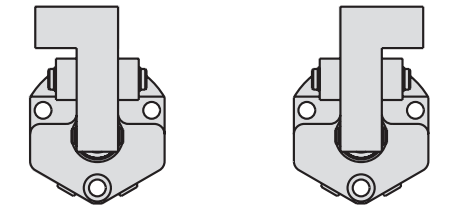
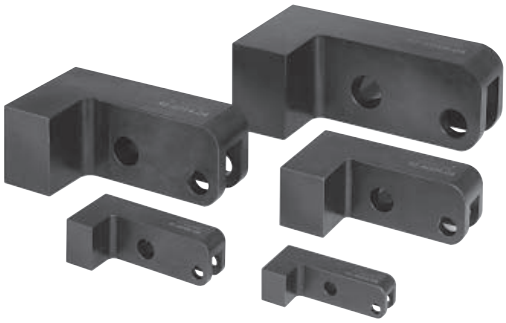
Link Clamp Levers

High Pressure Link Clamp Offset Lever



(Left Offset Shown)





ILS916005 REV A

Dimensions

Model No.	Cylinder Capacity S/A or D/A	A	B	C	ØD	E	F	ØG	H	J	K	L	M	N	P
Left Offset Lever, 1:1 Ratio															
91-6004-04	350/450	2.00	0.63	0.50	0.1885	0.187	0.19	0.2505	0.88	0.13	0.44	0.44	0.26	1.00	1.75
91-6006-04	700/1100	2.50	0.88	0.63	0.2515	0.250	0.25	0.3755	1.13	0.13	0.56	0.56	0.32	1.25	2.25
91-6009-04	1300/1300	3.13	1.25	1.00	0.3765	0.375	0.38	0.5005	1.38	0.19	0.81	0.81	0.51	2.00	2.75
91-6014-04	3000/5000	400	1.75	1.25	0.5015	0.500	0.50	0.6255	1.75	0.25	1.19	1.19	0.63	1.50	3.50
91-6016-04	5000/6800	4.88	2.00	1.50	0.6265	0.625	0.63	0.7505	2.13	0.25	1.50	1.50	0.76	3.00	4.25
Right Offset Lever, 1:1 Ratio															
91-6004-05	350/450	2.00	0.63	0.50	0.1885	0.187	0.19	0.2505	0.88	0.13	0.44	0.44	0.26	1.00	1.75
91-6006-05	700/1100	2.50	0.88	0.63	0.2515	0.250	0.25	0.3755	1.13	0.13	0.56	0.56	0.32	1.25	2.25
91-6009-05	1300/2600	3.13	1.25	1.00	0.3765	0.375	0.38	0.5005	1.38	0.19	0.81	0.81	0.51	2.00	2.75
91-6014-05	3000/5000	4.00	1.75	1.25	0.5015	0.500	0.50	0.6255	1.75	0.25	1.19	1.19	0.63	2.50	3.50
91-6016-05	5000/6800	4.88	2.00	1.50	0.6265	0.625	0.63	0.7505	2.13	0.25	1.50	1.50	0.76	3.00	4.25

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All dimensions are in inches.

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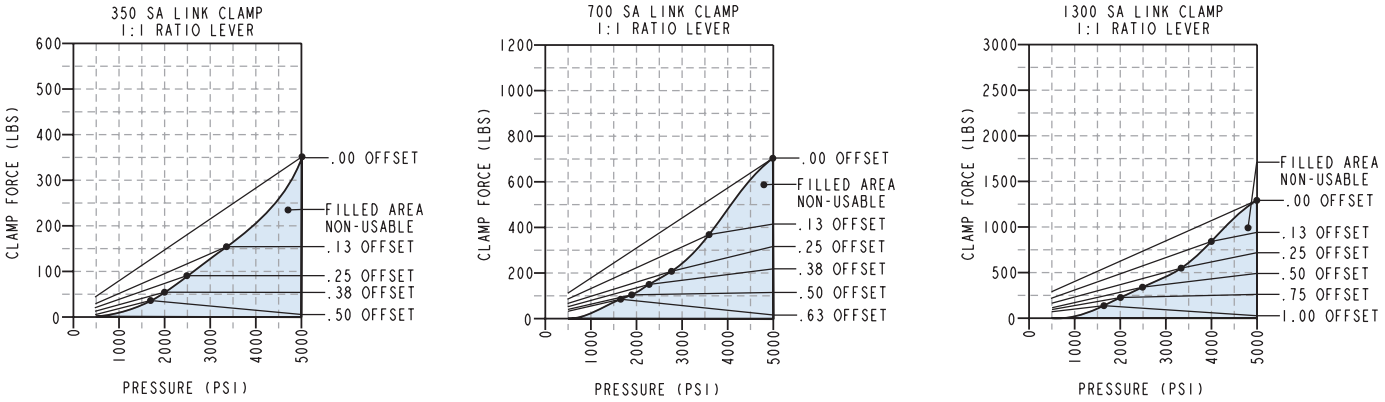
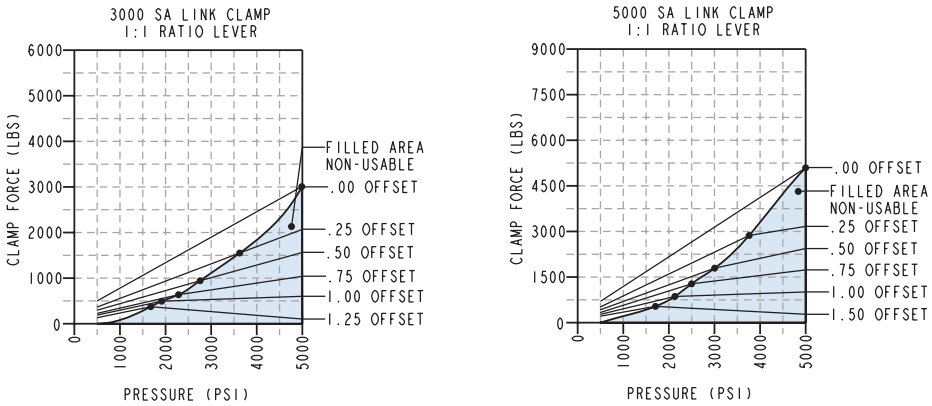
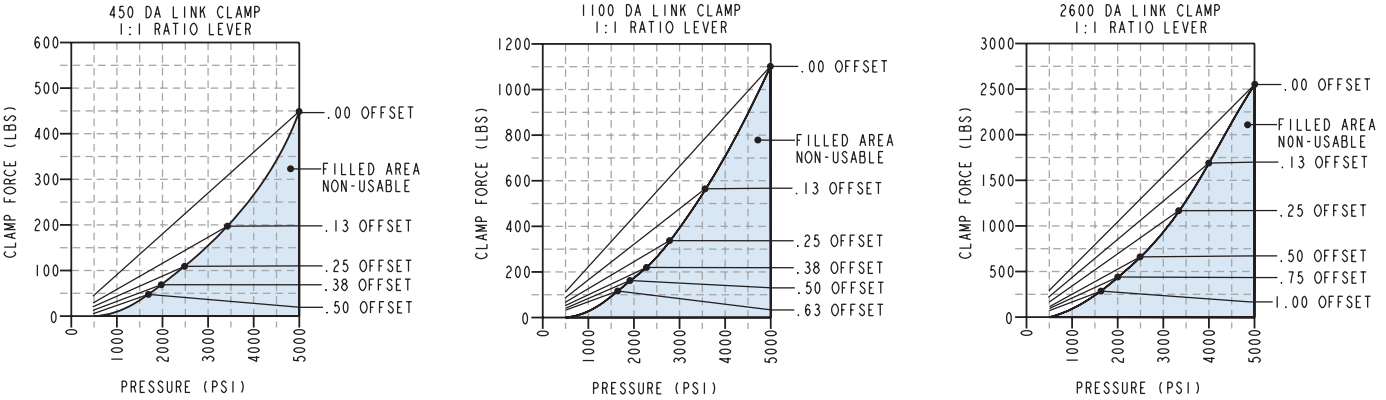
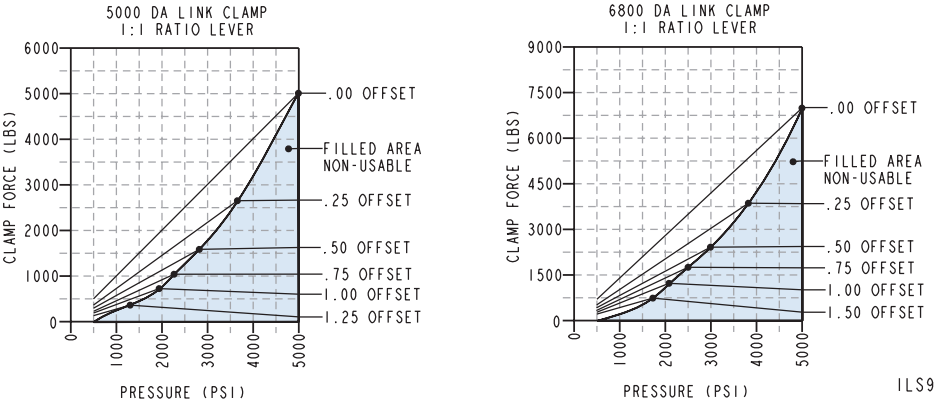
Offset Link Clamp Lever Output Curves

Single and Double Acting Link Clamp Lever Output Curves









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NOTE: Modifications to levers that result in clamp ratios below a 1:1 ratio are not in the safe operating zone for the corresponding link clamp and could result in premature failure.

Exceeding the allowable offset values and operating pressures specified in the tables will result in excessive forces on the link clamp pins, links, and rod which could result in premature failure.

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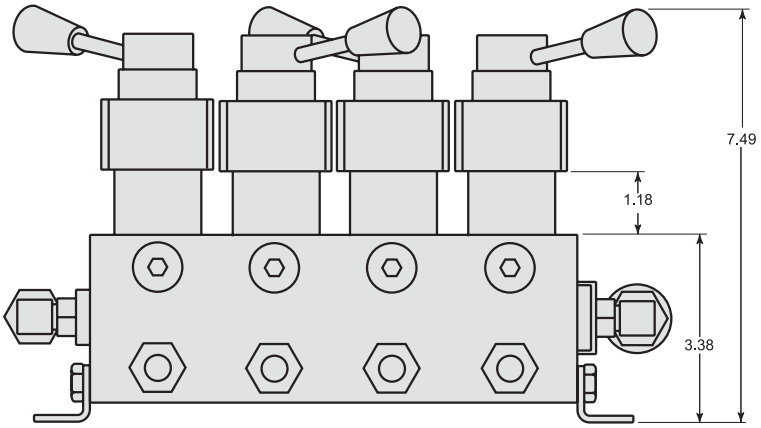
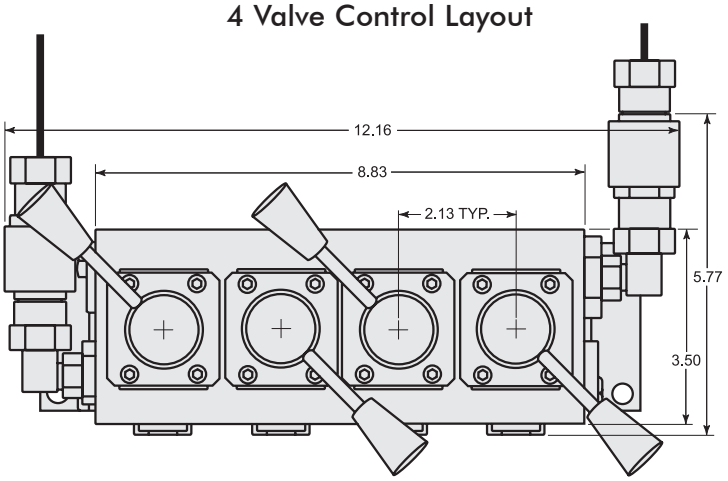
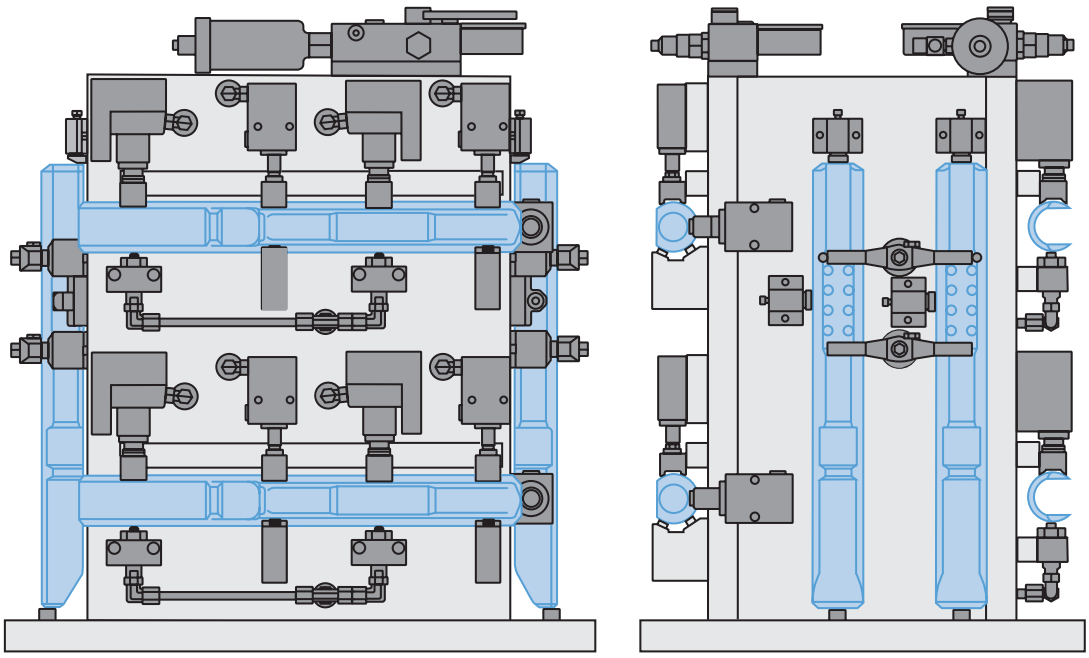


4 Valve Control Layout





Pallet Fixture With Multiple Part Orientations

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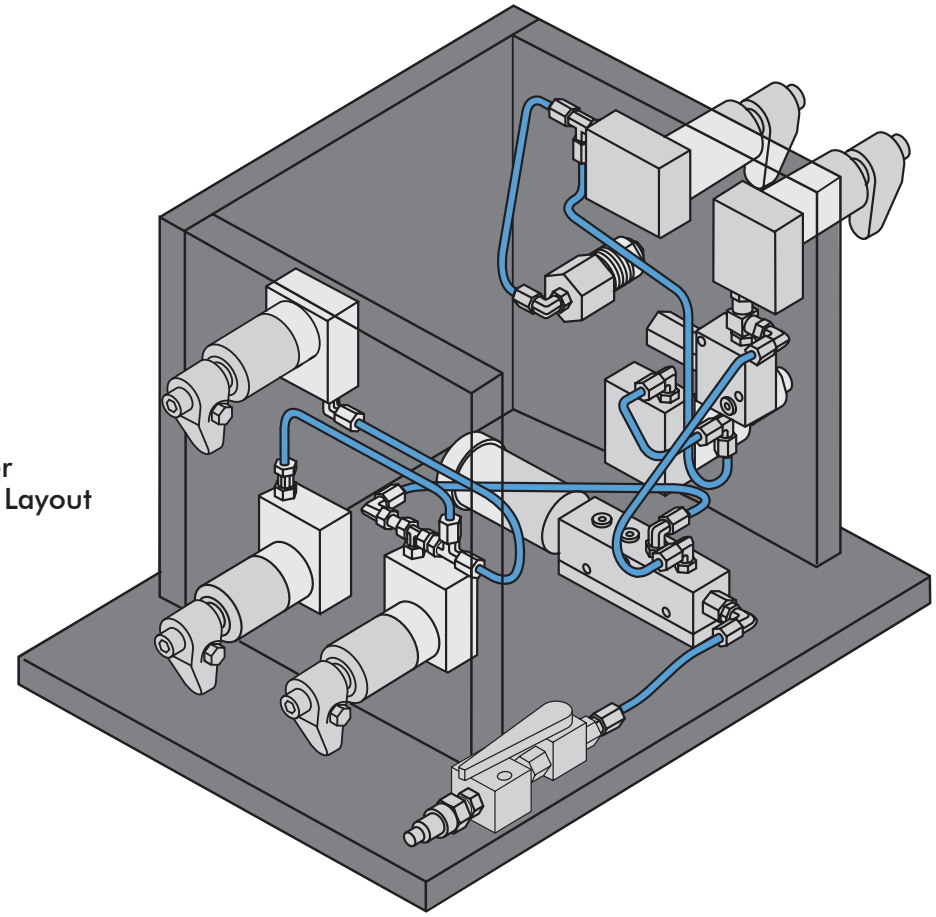
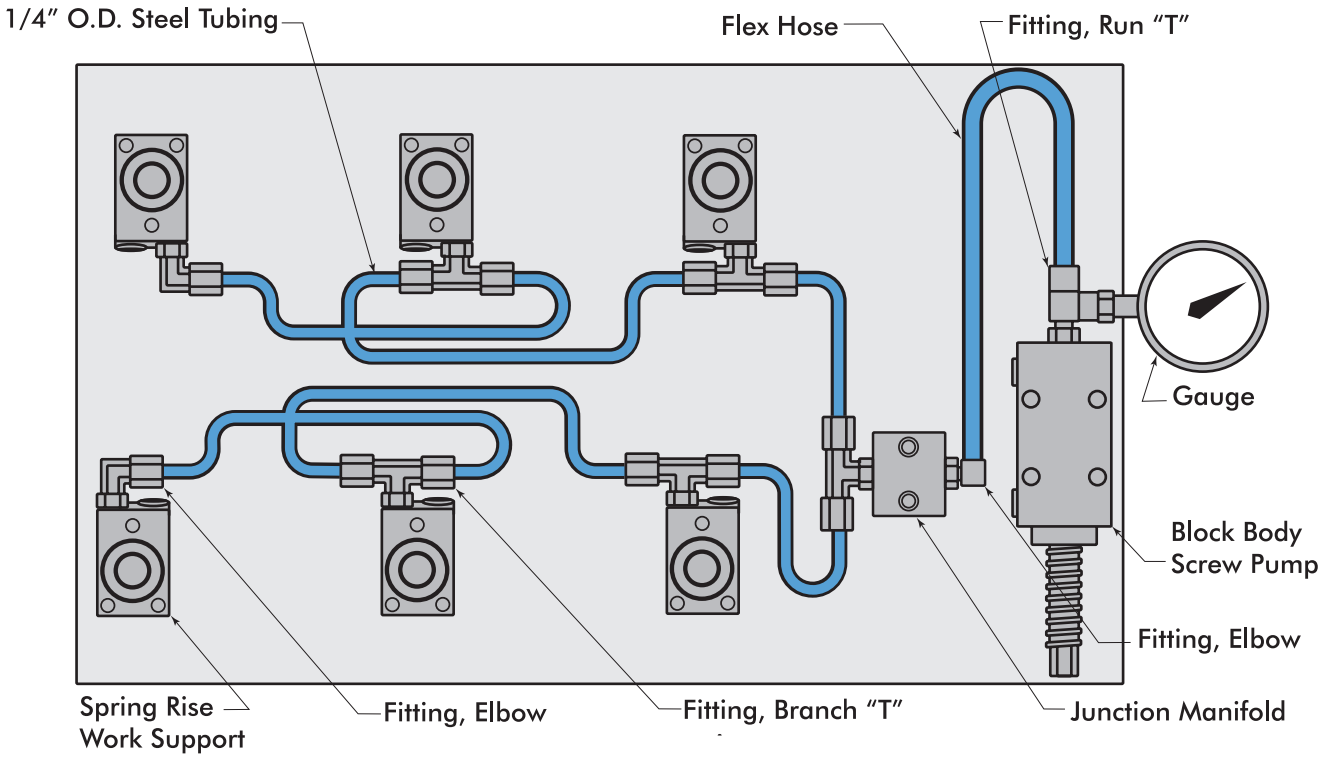
Fixture Layouts

Pallet Fixture with Decoupler Components and Plumbing Layout





Screw Pump and Work Support Fixture and Plumbing Layout

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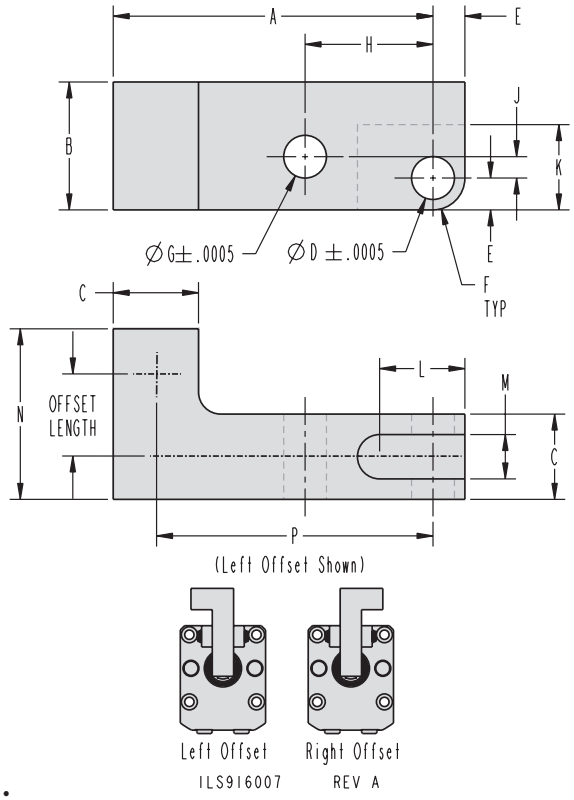
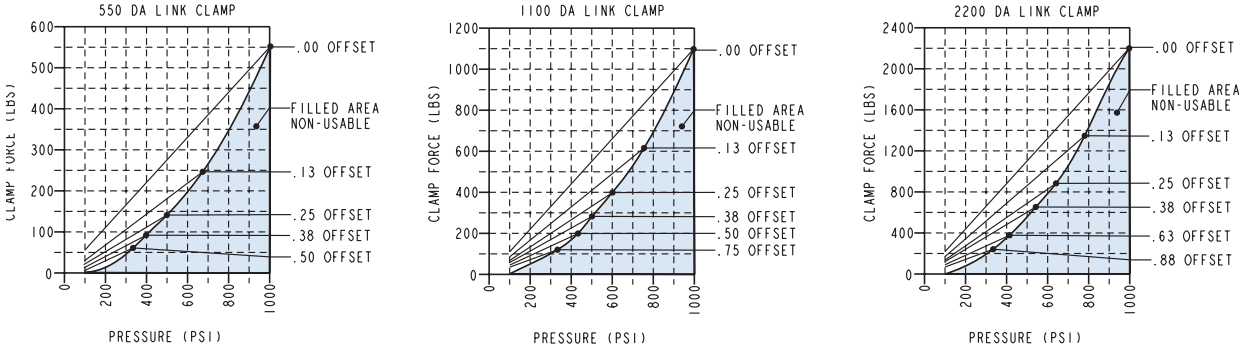
Link Clamp Levers

Low Pressure Link Clamp Offset Lever Output Curves



Dimensions

Model No.	Cylinder Capacity	A	B	C	ØD	E	F	ØG	H	J	K	L	M	N	P
Left Offset Lever, 1:1 Ratio															
91-6011-04	550	1.88	0.75	0.50	0.2515	0.19	0.19	0.2505	0.75	0.13	0.50	0.50	0.26	1.00	1.69
91-6015-04	1100	2.63	1.00	0.75	0.3765	0.31	0.31	0.3755	1.00	0.31	0.75	0.69	0.39	1.50	2.25
91-6021-04	2200	3.09	1.25	0.88	0.5015	0.38	0.38	0.5005	1.19	0.38	0.94	0.88	0.45	1.75	2.69
Right Offset Lever, 1:1 Ratio															
91-6011-05	550	1.88	0.75	0.50	0.2515	0.19	0.19	0.2505	0.75	0.13	0.50	0.50	0.26	1.00	1.69
91-6015-05	1100	2.63	1.00	0.75	0.3765	0.31	0.31	0.3755	1.00	0.31	0.75	0.69	0.39	1.50	2.25
91-6021-05	2200	3.09	1.25	0.88	0.5015	0.38	0.38	0.5005	1.19	0.38	0.94	0.88	0.45	1.75	2.69



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Low Pressure Link Clamp Lever Output Curves

NOTE: Modifications to levers that result in clamp ratios below a 1:1 ratio are not in the safe operating zone for the corresponding link clamp and could result in premature failure.

Exceeding the allowable offset values and operating pressures specified in the tables will result in excessive forces on the link clamp pins, links, and rod which could result in premature failure.

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Fixturing Tips

General Tips

- When Manifold mounting VektorFlo® components the mating surface must be flat within 0.003 inches with a maximum 63 μin R_q surface finish for proper sealing (unless otherwise noted in the catalog).
- Fluorocarbon seals are available for most components that do not include them in the device design. These items may be ordered online or on fax orders by adding an "F" as the last digit of the model number. When ordering with one of our order entry specialists, please mention that you would like fluorocarbon seals.
- Unless otherwise noted in our catalog, VektorFlo® devices require a minimum pressure of 500 psi for double acting components and 750 psi for single acting components.
- Maximum system flow rate is 1.5 gpm (346.5 cu. in./minute) for all VektorFlo® special function valves. Excess flow voids warranty.
- Deburring of pockets or cavities is extremely important to avoid leaks from damaged seals.
- Fluid filtration to catch chips will prevent leaks and extend the life of your components.
- Preventative maintenance is essential to keep hydraulic systems and components running at peak performance through millions of cycles. Be sure to flush your entire system at least once a year and more frequently in high contamination environments.

Work Support Tips

- Length of thread engagement on Fluid Advance work support contact bolt determines the spring contact force.
- Tighten with a six point socket only. Other types of wrenches may damage the work support.

Swing Clamp Tips

- Never allow swing clamp arm to contact the workpiece during arm rotation.
- Use of optional bottom porting on all single acting swing clamp models may significantly reduce contamination potential. Contact your Vektek Customer Service representative for details on the bottom porting option.
- Swing restrictors are available in 30, 45 and 60 degree angles, Order from your Vektek Sales Representative or Order Entry Specialist.
  Other swing restricting angles are available upon request as a special.

Miscellaneous Plumbing Tips

- Use of standard rubber hoses and end fittings can hamper the action of many devices due to excessive end fitting restrictions. If you choose to purchase hoses from another supplier, be sure that hose diameters and end fittings are not causing excessive restrictions.
- Not all VektorFlo® rotary unions are manifold mountable. Confirm that your rotary union selection fits application mounting needs. Refer to the Miscellaneous Plumbing section of the catalog.

Power Supplies

- Vektek pumps are shipped with the reservoir plugged. Remove the plug and install the included breather prior to use.
- **Pump Selection:**
  1. **Flow Rate :** Time Requirement?
     SYSTEM VOLUME ÷ FLOW RATE = TIME
  2. **Power Supply:**
     MANUAL, PNEUMATIC, or ELECTRIC
  3. **System Requirements:**
     SINGLE ACTING, DOUBLE ACTING, CONTINUOUSLY COUPLED, DECOUPLED or PALLETIZED

Accessory Valves

- The "D03" valve interface used on our surface mounted (manifold) valves was designed to allow mounting in only one direction. This interface has (4) fluid passages, P, T, A, and B, as well as four mounting holes. The distance between the mounting holes on one end (1.220") is not equal to the distance between the holes on the opposite end (1.280"). The narrower hole pattern is 0.840" from centerline of mounting hole to centerline of the "P" passage, while the wider hole pattern is only 0.750" center to center. This non equal mounting spacing is intended to prevent the valve from being installed incorrectly.

Directional Control Valve

- Reposition handle on manual unit:
  1. Remove the screw on the top of the valve handle "bonnet".
  2. Carefully, lift (pull) the bonnet up, exposing a "detent plate" with a ball bearing resting on one side, and a dowel pin located °180 from the ball. (On the underside of the bonnet, there is a small spring that pushes the ball against the detent plate. Take care not to drop the spring, as it is not restrained in the bonnet). At this point, you will also see a "square" shaped spindle extending up from the center of the valve. DO NOT ROTATE THE SPINDLE OR THE INTERNAL FLUID PATHS WILL BE OUT OF SEQUENCE.
  3. Remove the dowel pin from the detent plate .
  4. Reposition the detent plate at 90° increments until bonnet will re-install with the handle in the desired position.
  5. Re-install the dowel pin, detent ball, bonnet, and screw.

Arms/Levers

- When installing a swing clamp arm, restrict the arm to prevent rotational torque to the plunger and potential internal cam damage. You may then tighten the cap screw to specification without damage to your clamp.

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Notes

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Safety

Safety First & Always

No power workholding catalog would be complete without a few words about safety. Hydraulic clamping can provide significant safety advantages over manual clamping. But carelessness in planning or operation can injure workers and damage expensive equipment. So take a positive approach. From the planning stage to the work schedule, think and practice safety.

Like other mechanical devices, the use of hydraulic workholding devices is subject to certain hazards that cannot be precluded by mechanical means, but only by the exercise of intelligence, care, and common sense. It is therefore essential to have personnel involved in the use and operation of equipment who are careful, competent, trained and qualified in the safe operation of the equipment. Some examples of hazards include but are not limited to: inadequate clamping capacity; unprotected pinch points; hoses, tubing and fittings not rated for system working pressures; improper installation and maintenance; and inadequate system monitoring.

As with all clamping devices, these clamps have pinch points. Secondary pinch points also exist in some devices such as swing clamps, because of their rotation, and other clamps which may be used with extensions. If any of these conditions exist, personal injury may result from crushing action, flying projectiles and burst tubing. These same actions may also result in destruction of property.

Plan with safety in mind.

Start by providing for good lighting, ample working space and easy access for inspection and maintenance of your workholding equipment. Position valves, safety guards and controls with the operator's safety in mind. Select hose, tubing and hydraulic components that are rated for the highest working pressures your system will encounter. Make sure all components are compatible and adequate to perform their respective functions.

Assemble and install equipment with care.

Even minor leaks from high pressure hydraulics can be dangerous. An improperly secured component can become a projectile. Don't "build in" hazards by careless installation of your hydraulic clamping system.

Route tubing and hose where they won't be exposed to damage. Make sure that connections are tight and properly made. Avoid unsupported straight tubing runs. Use large radius bends to facilitate assembly and allow for expansion and contraction. Align fittings carefully so that connections do not introduce stress.

See that threads are fully engaged on mountings and brackets. Make sure that stops are adequate to withstand the clamping forces that may be developed. Test the system before starting production.

Keep your operators thinking.

With your system on line and in production, set up and enforce work rules that help avoid human injury and damage to equipment. Be sure every operator knows his equipment and develops good work habits. An operator should always make sure valves are in the correct position before he starts a hydraulic pump. Keep hands clear during clamping operations. And use judgment in positioning the workpiece. Be sure the workpiece is properly positioned before clamping forces are applied. Watch for kinked hoses. Monitor gauges to see that system pressures are within limits. Swing clamps must be able to rotate freely through 90° into clamping position before force is applied. Caution: Be sure to keep clear of swing clamp pinch points. Each "new" setup should be carefully planned and checked.

Follow good maintenance practices.

A clean, well-cared-for workplace is a safer workplace. Make daily inspections for damaged hose, bent tubing and leaks. Repair or replace anything that shows signs of wear or damage before minor problems become big ones.

We design and build your components with durability, performance, and safety in mind. Properly selected, installed and maintained, they will serve you long and well. The best hydraulic components embodied in properly designed circuitry can be expected to perform properly only if it is thoroughly cleaned before it is activated. Dirt is the number one enemy of hydraulics!

As an integral part of system design, care must be taken to select the proper devices and accessories ensuring proper integration with your operations and equipment. Sufficient safety measures must be taken to avoid the risk of personal injury and property damage from your application or system.

Vektek, Inc. cannot be responsible for injury or damage caused by unsafe use, maintenance or application of its products.

Please write the Vektek office including specifics for guidance when you are in doubt as to proper safety precautions regarding design, installation or operation in your particular application.

Call 1-800-992-0236

for everything you need in workholding. We have the equipment you need and the expertise to help you put it to work... fast. So when you want a single-source supplier you can count on, call on us.

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The Productivity Devices Company

1334 E 6th Avenue
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Team

FOCUSED & ENGAGED

YOUR workholding success is the primary focus of Team Vektek. Vektek is at your service with technical support, quality products and exceptional service... *today and into the future.*

TESTED & TESTING

Every device that Vektek manufactures for you is tested to insure that it exceeds the industry standard.

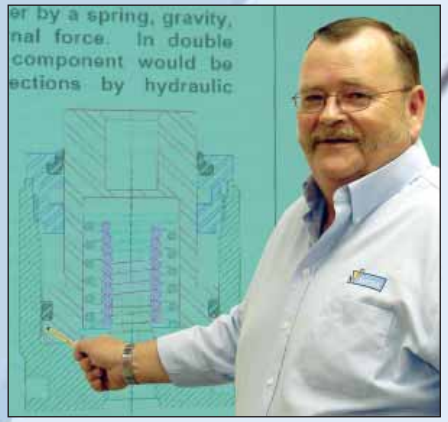
Team Vektek is always in search of, and testing innovative ideas that will improve workholding and productivity.

Customers can rely on Vektek products, because each product design must surpass Vektek's million cycle test. Plus, every device manufactured must pass a cycle test before it is shipped.

COMMITTED TO YOU

Your workholding success is paramount to Team Vektek.

- A trained sales staff to assist you
- Technical advice and support
- Fixture Concepting at no charge
- Technically trained field reps



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  We make sure you received your order promptly and have exactly what you need!
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e-mail: vektek@vektek.com

In order to support our process of ongoing product improvements, specification are subject to change without notice. Due to these improvements, products may not be exactly as illustrated.