VEKTEK

The Productivity Devices Company

PRECISION HYDRAULIC CLAMPING

Call to Order:
800-992-0236
www.vektek.com

DECEMBER 2013

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Quick Reference

Why Use VektorFlo®?

Typically, 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 America's 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. Clamping components commonly use SAE 4 with pumps and manifolds being SAE 6 ported. O-ring porting normally installs without leaking every single time.
- Special seals and wipers help keep leaks from starting by sealing fluid in and contaminants out. Loaded lip and crown seals virtually eliminate external (visible) and internal (invisible) leaks. 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 coolant environments.
- 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, web 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 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. Email us at sales@vektek.com.
- 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

800-992-0236

you talk to Vektek; 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. 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.

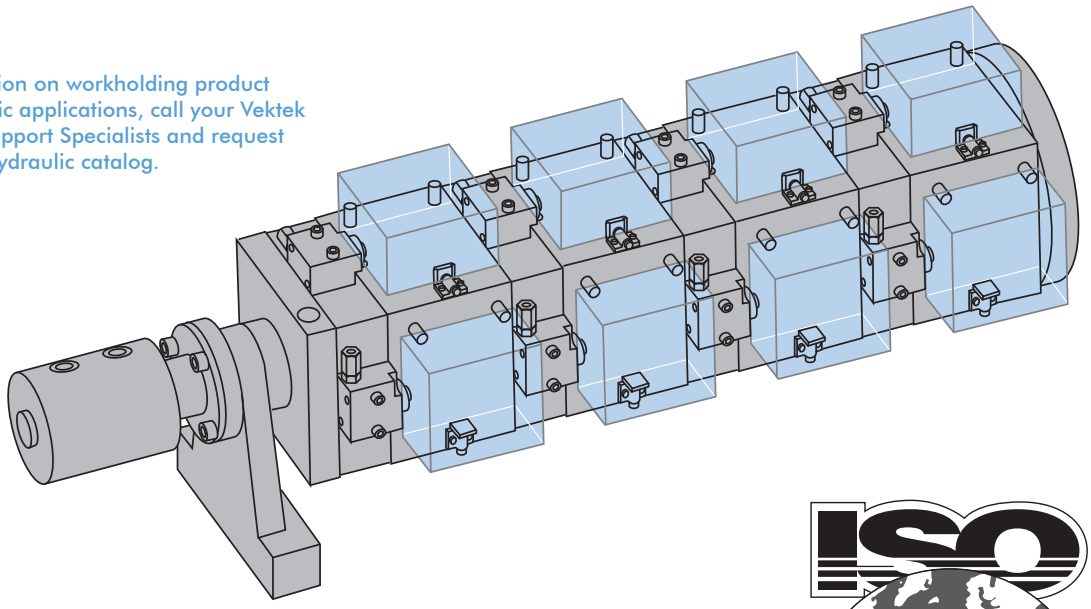
Begin the planning process by asking yourself the following:

* 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 required. 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.



ISO AMERICAN GLOBAL STANDARDS™ 9001 CERTIFIED

In order to support our process of ongoing product improvements, specifications are subject to change without notice. Due to these improvements, products may not be exactly as illustrated. Visit our website pdf catalog for the most current catalog illustrations... www.vektek.com.

You will also find a CAD library on the website to assist in designing Vektek product into your machine fixture projects.

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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 are 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 space is not available, 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 of this catalog.

Step 2:

Prepare an outline of the sequence of events that are taking place during the manufacturing cycle. This will assist you in determining the number of sequence valves that you might need and 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 to ensure that workholding devices are sized and positioned to provide adequate holding. The operation manuals of many machine tools contains 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, 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.

Step 7:

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

Step 9:

To help determine the capacity of the power source you'll need 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 operates the system within your clamping time constraints by working out the following formulas:

(Device Cap.) ÷ (Low Press. Flow) = Position Time

Where . . .

Device capacity is total device oil capacity expressed in cubic inches. Low Pressure 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.

[(System Capacity)÷(High Pressure Flow)] x .01 (System Operating Pressure ÷ 1000) = Pressurize time

Where . . .

High Pressure Flow is high-pressure pump oil volume expressed in cu. in. per minute. System capacity 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 (System Operating Pressure ÷ 1000) takes into account the slight compressibility of oil and system elasticity, which influence the length of time required to pressurize a system. Pressurize 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 first

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 will provide the clamping cycle times you will need. Additional factors you should consider when selecting a power source include a 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.

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 for your fixture. 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 a concept idea for clamping a new part or want a quick review of your design, we are here to help.

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.

Email us at

sales@vektek.com

if you prefer to receive a CAD file CD. Please indicate the file type needed.

Clamp Time Calculation

A-4

To Calculate the Approximate Clamping Time of a Fixture

1. Fluid capacity per cylinder = _____ (cu in)
2. Total number of cylinders = _____
3. Multiply line 1 by line 2 = _____ (cu in)
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 _____ (cu in)
6. System capacity = line 3 + line 4 + line 5 = _____ (cu in)
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) = _____ (cu in)

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 ystems). 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 backpressure of returning oil. If single acting springs are all that is pushing this oil, it is possible that this backpressure 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 your clamps. 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 (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, 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 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).

Frequently Asked Questions

Industrial type double acting cylinders (even high quality ones are 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 affect our 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.

Preventive 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.

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 non-traditional 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.

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 the 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, please 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 hydraulic 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 workpieces, 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. Cylinder malfunction will occur if breathers are plugged. Vektek cylinders are all designed with stainless steel springs to reduce the possibility of corrosion from this coolant contamination.

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 plunger. 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.

800-992-0236

1334 E 6th Avenue
Emporia, KS 66801

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Fixture Documentation Worksheet

A-8

VektorFlo® Hydraulic Fixture Setup Documentation and Troubleshooting Worksheet

Fixture Designed By: _____

Fixture Built By: _____

Built For: _____

Fixture Serial #: _____

1. All pressure gauge readings 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.

VEKTEK®

ISO 9001 CERTIFIED AMERICAN GLOBAL STANDARDS™

Fixture Building Tips

General Tips

- When Manifold mounting VektorFlo® components, the proper seal mating surface must be flat within 0.003 in. with a maximum 63 μ in. R_a surface finish (unless otherwise noted in the catalog).
- Fluorocarbon seals are available for most components (except power supplies) 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.
- Preventive 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.
- To extend the life of Pressure Gauges run your system at 75% of the gauge scale.

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.

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.
- Solidly bolt into place either the shaft or the housing component. Mount the opposing component using a cableway or similar anti-rotation device that allows for some movement.

Power Supplies

- Vektek pumps are shipped with the reservoir plugged. Remove the plug and install the included breather prior to use.
- Hydraulic pumps:
  - * Hydraulic fluid should be changed and the reservoir cleaned out annually
  - * If you operate a full production schedule (one shift daily): change fluid twice annually
  - * Two shifts daily: change fluid three times annually
  - * Three shifts: four times annually
  - * In very dirty conditions (foundries): change hydraulic fluid monthly

    * We recommend the use of the return line filter kit (Page J-8) with our Medium Capacity Pumps in medium to extreme contamination environments.

- **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

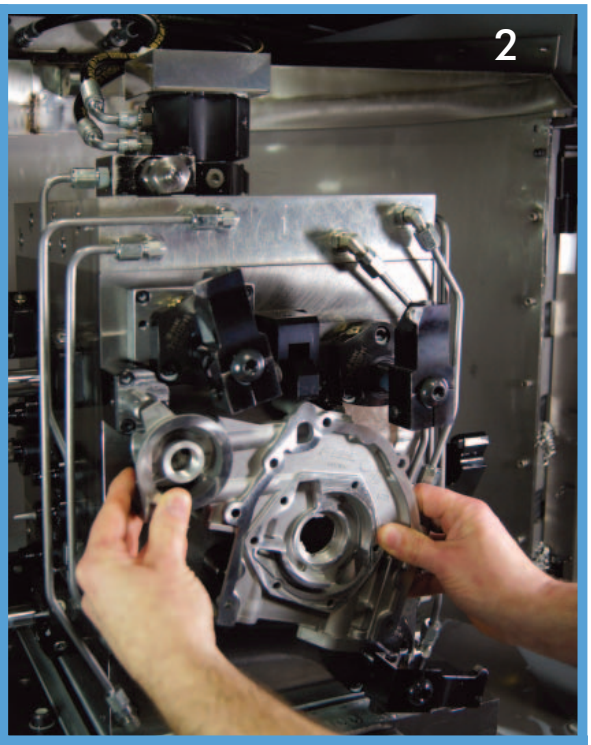
Directional Control Valve

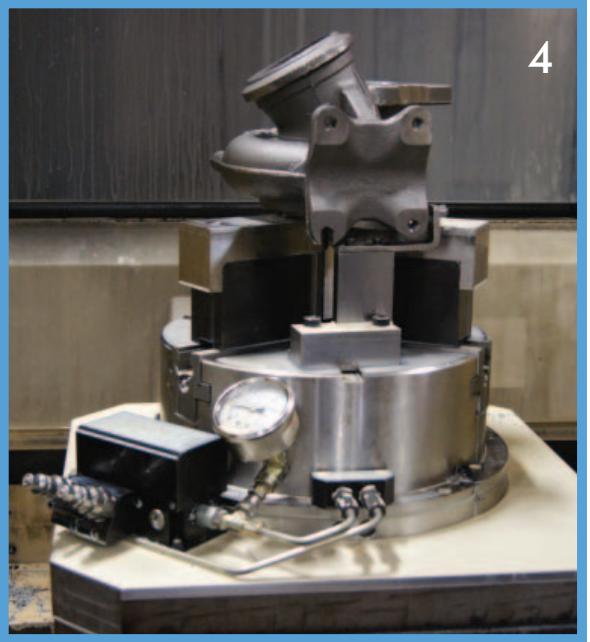
- Reposition handle on manual unit:
  1. Remove the screw on the top of the valve handle "bonnet".
  2. Carefully, lift (pull) the bonnet up, exposing a "detent plate" with a ball bearing resting on one side, and a dowel pin located 180° from the ball. (On the underside of the bonnet, there is a small 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

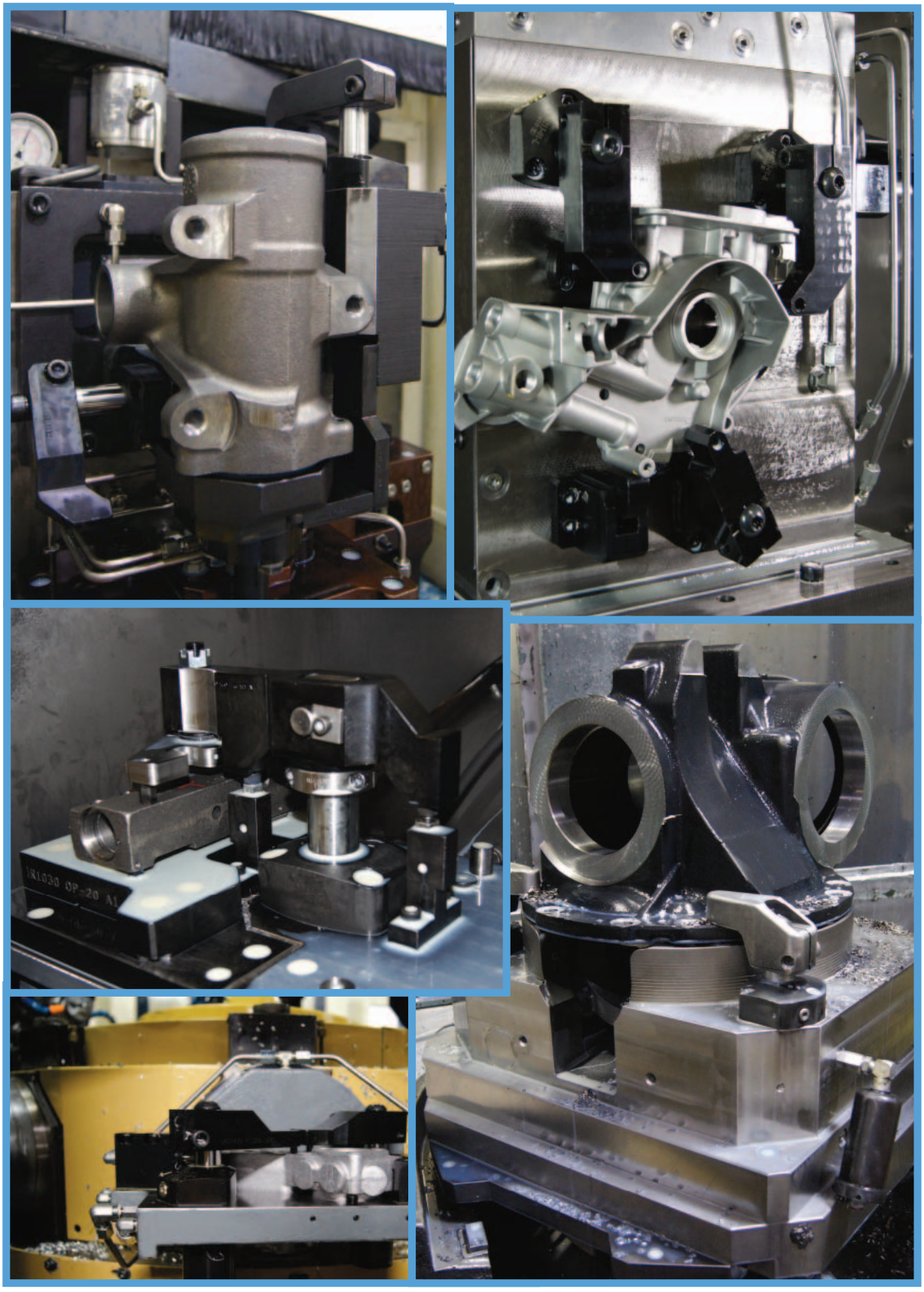
- When installing a Swing Clamp arm, restrict the arm to prevent rotational torque to the plunger and potential internal cam damage. You may then tighten the cap screw to specification without damage to your clamp.

Fixture Building Tips





1. Decoupled System: Link Clamps, Sequence Valves and Decoupler
2. Live System: TuffCam™ Top Flange Swing Clamps, Sequence Valves, Rotary Union
3. Live System: Rotary Union, Link Clamps
4. Decoupled System: Decoupler and Chuck
5. Decoupled System: Manual Shutoff Valve and Swing Clamps



Applications

TuffGrip™ Work Supports

B-1

Frequently Asked Questions, Operation

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/unattended applications. The support plunger is retracted when hydraulic pressure reduction pulls back the shuttle cylinder. You will not be relying on a mechanical spring to return the plunger to its initial starting position.

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 in applications where the single acting fluid advanced work support might **kick** your part out of position when unclamp occurs. The hydraulic pressure on the sleeve gripping the plunger is maintained until the double-acting positioning piston retracts. An internal check valve opens to release the pressure on the sleeve. The plunger is released only after it has been pulled back from the workpiece. This "shuttle" action prevents "work piece ejection" that might be experienced with single acting fluid advanced Work Supports.

I understand that this work support has two (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 support plunger stroke is contained within the piston shuttle stroke. Because the work support plunger is spring advanced it is extended while the sleeve is unlocked. The shuttle strokes forward causing the extended plunger to contact the part and compress the spring. Finally, 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 a full stroke every time. However, it stops on an internal component allowing the inside sequencing to 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 plunger stroke. The catalog chart lists a dimension that represents the fully extended length. For best performance, position your part at the fully extended shuttle stroke minus half of 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?

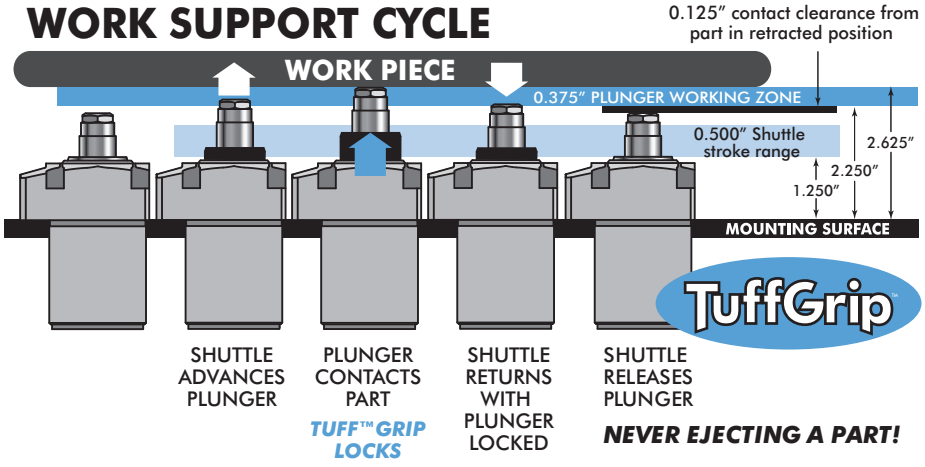
While it is not the best option to clamp over a column of fluid, neither is it always wrong. Certain considerations must be addressed and adhered to when this is done. In this application, the work support is supported by the advance cylinder which is held firmly against a shoulder inside the body. This 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.

I'm wanting to use a cartridge mount double-acting work support. I have never created a cavity and was wondering if you had some tips that would make the process go smoothly?

Suggested machining techniques for creating cavities:

- Roller burnish bore if possible to a roundness within 0.001 inches
- Ball hone (or equivalent) bore to smooth transitions and round chamfer edges
- Vent bottom side of cavity to aid insertion of Work Support into cavity
- Lube o-ring seals with grease prior to installation

2750 lb TOP FLANGE DOUBLE ACTING WORK SUPPORT CYCLE



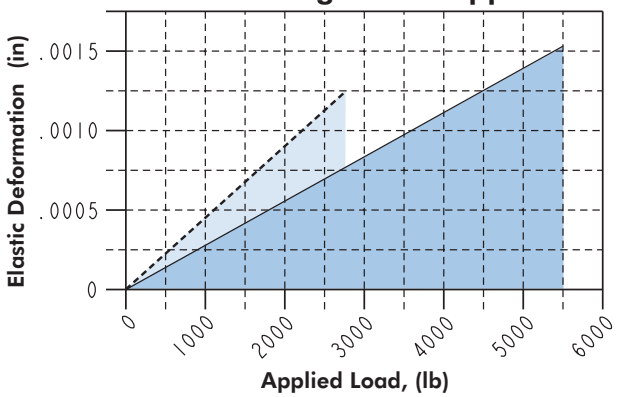
VEKTEK®

TuffGrip™ Work Support Features

- Exclusive Vektek design eliminates part ejection of any workpiece and the need for ancillary part retention devices.
- All TuffGrip™ styles are available in 2750 lb and 5,500 lb capacities at 5,000 psi.
- Innovative design features a spring advanced work support within a double-acting shuttle cylinder.
- A wiper at the shuttle and at the plunger keep chips out and your work support running smoothly.
- 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.
- BHC™ (Black Hard Coat) body, hardened chrome shuttle piston and stainless steel plunger promote long life in harsh machining environments. The Position Sensing option is an aluminum housing that is Black Anodized for corrosion resistance.
- TuffGrip™ Work Supports are presently offered in 2 styles: Top Flange and Cartridge Mount with Position Sensing available for both styles.

Patent Pending

Elastic Deformation
Double Acting Work Supports

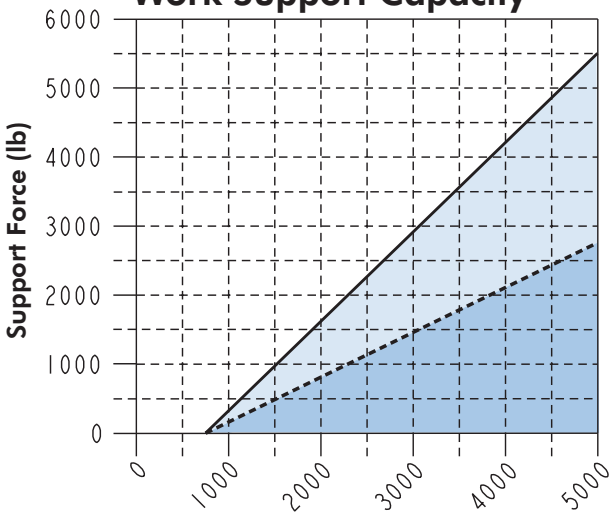


10-0212-00	10-0208-00
10-0212-01	10-0208-01
10-0212-02	10-0208-02
10-0212-03	10-0208-03

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.

ILS100205 REV B

Double Acting
Work Support Capacity



10-0212-00	10-0208-00
10-0212-01	10-0208-01
10-0212-02	10-0208-02
10-0212-03	10-0208-03

ILS100203 REV D

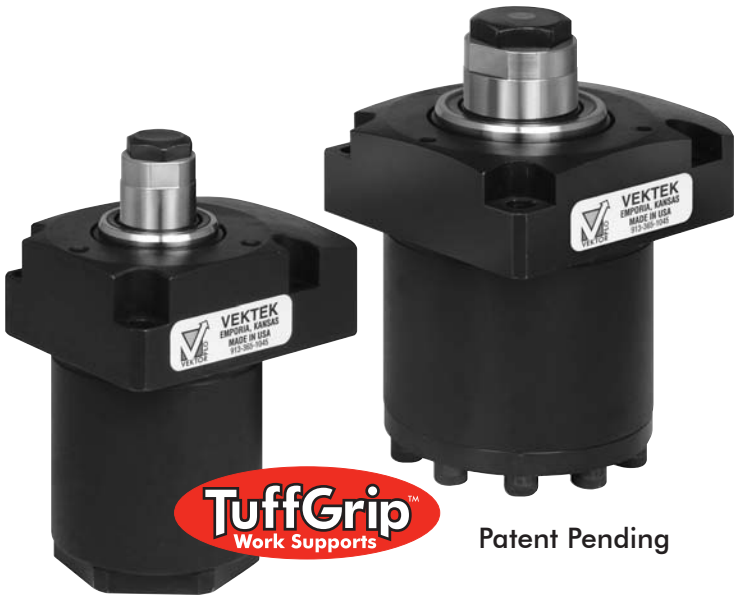
Double Acting Work Support Operation

Advance: Hydraulic pressure extends the shuttle cylinder to the full stroke position, moving the work support plunger 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 allowing 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 (may be separated from the part by as much as 0.50 inches).

TuffGrip™ Work Supports

Double Acting Top Flange



Patent Pending

Double Acting Work Support

- TuffGrip™ Top Flange models are available in 2750 lb or 5500 lb capacities.
- Exclusive Vektek design eliminates part ejection and the need for any ancillary workholding devices.
- Innovative design features a spring advanced work support within a double-acting shuttle cylinder.
- A wiper at the shuttle and at the plunger keep chips out and your work support running smoothly.
- TuffGrip™ sleeve design is 2.5 times thicker than other work support models on the market.
- Top flange body style allows for hydraulic connection through face sealed o-rings or through SAE ports.
- BHC™ (Black Hard Coat) body, hard chrome plated shuttle piston, and stainless steel plunger to extend life in a harsh machining environment.

Model No.	Support Capacity (lb)*	Contact Force (lb)	Work Support Stroke (in)	Shuttle Stroke (in)	Body Dia.	Piston Area (sq in)		Oil Capacity (cu in)		Maximum Oil Flow Rate cu. in. /min	Optional Flow Control Model No.
						Extend	Retract	Extend	Retract		
Double Acting (D/A) Cylinders, actuated hydraulically both directions											
10-0208-00	2750	3.5 - 7.0	0.38	0.50	2.12	1.62	0.52	0.81	0.26	70	70-2037-71
10-0212-00	5500	4.4 - 8.1	0.38	0.50	2.99	3.55	0.79	1.78	0.40	150	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 capacity graph on page B-2.

Dimensions

Model No. ***	A	B*	C**	D	E	F	G	H	J	K	L	M	N	P
Double Acting (D/A)***														
10-0208-00	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
10-0212-00	2.75	0.38	0.50	2.69	1.13	1.75	2.99	1.88	1.25	3.69	1.56	3.13	1.56	1.28

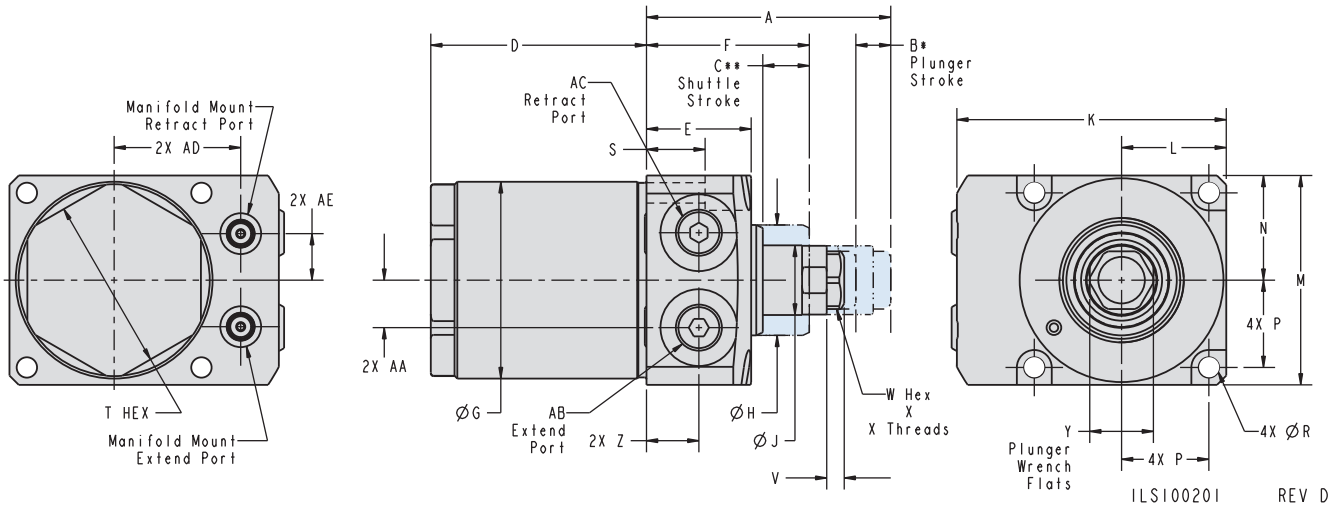
* Plunger Stroke "B" is the available work zone of the plunger. The workpiece must be positioned inside this window.

** Shuttle Stroke "C" is the stroke the shuttle travels to position the work support plunger relative to the workpiece. The shuttle moves the full range of this stroke every cycle.

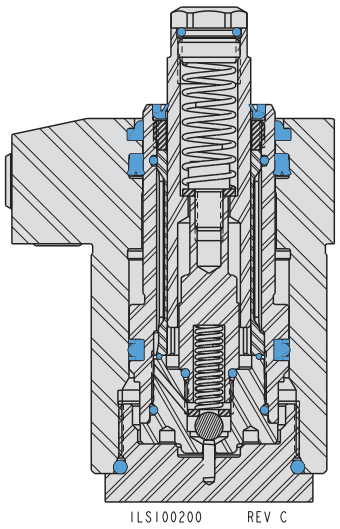
*** The difference between "C" and "B" (C-B) equals the minimum distance the plunger is below the part in the retracted position.

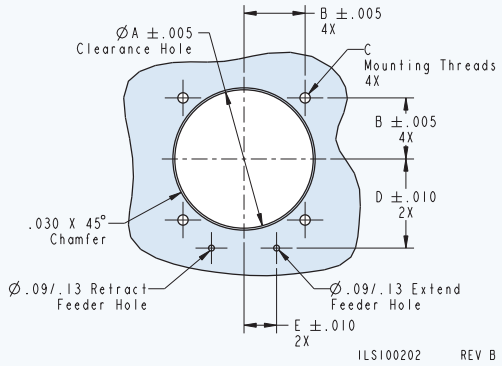
Note: If you would like to produce your own springs for these Work Supports see dimensions drawing on Page B-8

Double Acting Top Flange



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





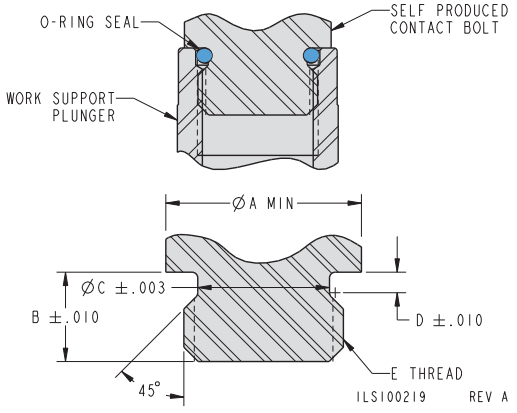
Manifold Port/Bolt Mounting Dimensions

Cavity Dimensions					
Model No.	A	B	C	D	E
10-0208-00	2.130	0.938	10 - 32 UNF	1.360	0.500
10-0212-00	3.005	1.281	1/4 -28 UNF	1.750	0.750

	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD	AE
Cylinders, actuated hydraulically both directions													
	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
	0.28	0.70	N/A	0.25	1.00	3/4-16 X 0.50	1.13	0.56	0.63	SAE 4	SAE 4	1.75	0.75

Custom Contact Bolt

Model No.	Capacity	O-ring Part No.	ØA	B	ØC	D	E
Work Support, D/A Oil Rise							
10-0208-00 10-0208-01 10-0208-02 10-0208-03	2750	39-0000-72 (-013)	0.625	0.312	0.460	0.080	9/16 - 18 UNF - 2A
10-0212-00 10-0212-01 10-0212-02 10-0212-03	5500	39-0510-66 (-016)	0.875	0.500	0.650	0.080	3/4 - 16 UNF - 2A



TuffGrip™ Work Supports

Double Acting Cartridge

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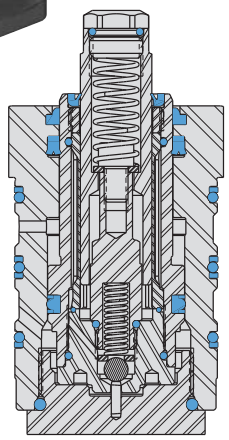
Double Acting Work Support

- TuffGrip™ Cartridge models are available in 2750 lb or 5500 lb capacities.
- Exclusive Vektek design eliminates part ejection and the need for any ancillary workholding devices.
- Compact cartridge mount body has square flange and is ideal in tight spaces.
- Cartridge mount body allows hydraulic feed passages to intersect with cavity from any angle.
- Innovative design features a spring advanced work support integrated with a double-acting shuttle cylinder.
- A wiper at the shuttle and at the plunger keep chips out and your work support running smoothly.
- BHC™ (Black Hard Coat) body, hard chrome plated shuttle piston, and stainless steel plunger to extend life in a harsh machining environment.

Patent Pending



Model No.	Support Capacity (lb)*	Contact Force (lb)	Work Support Stroke (in)	Shuttle Stroke (in)	Body Dia.	Piston Area (sq in)		Oil Capacity (cu in)		Maximum Oil Flow Rate cu. in. /min
						Extend	Retract	Extend	Retract	
Double Acting (D/A) Cylinders, actuated hydraulically both directions										
10-0208-02	2750	3.5 - 7.0	0.38	0.50	2.12	1.62	0.52	0.95	0.40	70
10-0212-02	5500	4.4 - 8.1	0.38	0.50	3.00	3.55	0.79	2.00	0.63	150

* Support Capacities are listed at 5,000 psi maximum operating pressure. Support capacities for other pressures must be determined by consulting the capacity chart on page B-2.

Dimensions

Model No.	A	B*	C**	D	E	F	G	H	J	K
Double Acting (D/A)***										
10-0208-02	2.25	0.38	0.50	2.75	0.75	1.38	2.12	1.19	0.75	2.25
10-0212-02	2.50	0.38	0.50	2.94	0.88	1.50	3.00	1.88	1.25	3.13

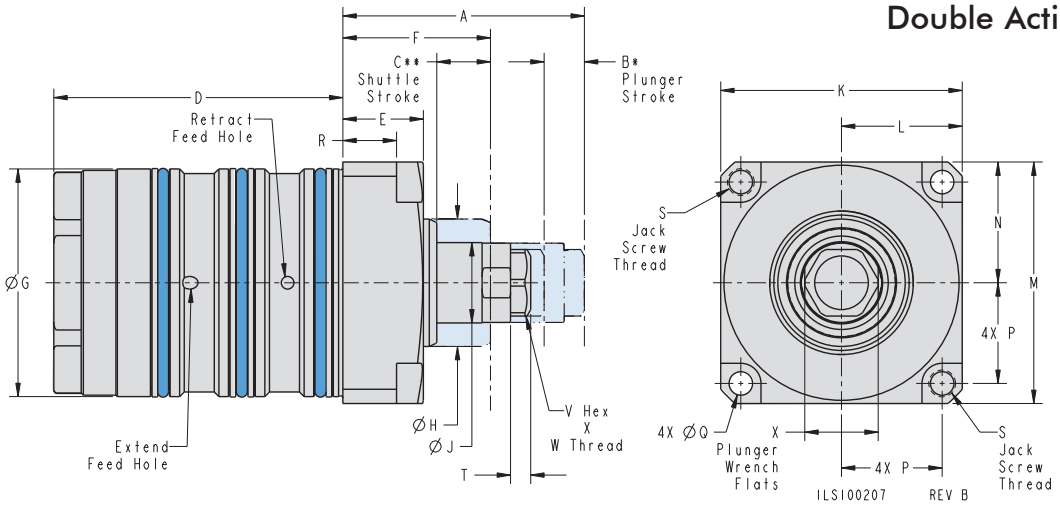
* Plunger Stroke "B" is the available work zone of the plunger. The workpiece must be positioned inside this window.

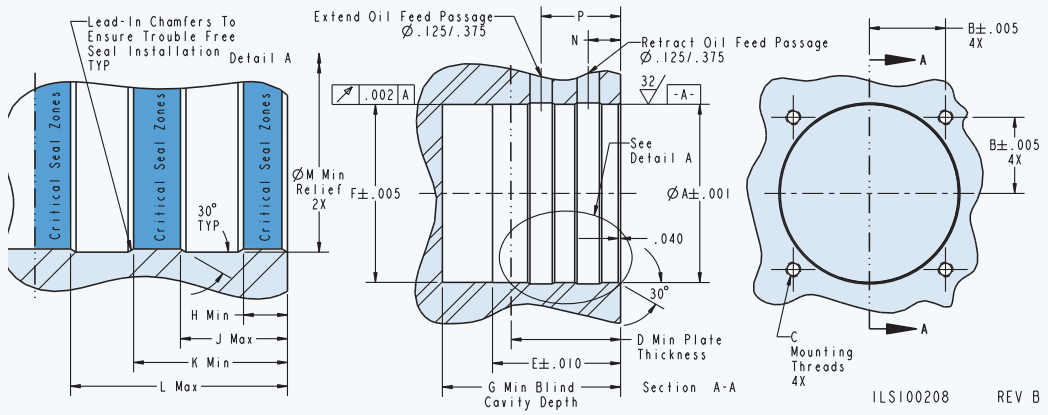
** Shuttle Stroke "C" is the stroke the shuttle travels to position the work support plunger relative to the workpiece. The shuttle moves the full range of this stroke every cycle.

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

Note: If you would like to produce your own springs for these Work Supports see dimensions drawing on Page B-8

Double Acting Cartridge





Cavity Mounting Dimensions

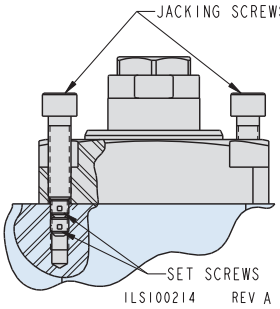
Model No.	A	B	C	D	E	F	G
10-0208-02	2.126	0.938	10 - 32 UNF	1.84	2.156	2.120	2.813
10-0212-02	3.001	1.281	1/4 - 28 UNF	1.84	2.156	2.995	3.000
Model No.	**H**	**J**	**K**	**L**	**M**	**N**	**P**
10-0208-02	0.317	0.772	1.110	1.565	2.172	0.545	1.338
10-0212-02	0.317	0.772	1.110	1.565	3.047	0.545	1.338

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.

Suggested cavity machining techniques :

* Roller burnish bore if possible, roundness within 0.001 inches.
* Ball hone (or equivalent) bore to smooth transitions and round chamfer edges.
* Vent bottom side of cavity to aid insertion of the Work Support into the cavity.
* Lube o-ring seals with grease prior to installation.

	L	M	N	P	Q	R	S	T	V	W	X
											Cylinders, actuated hydraulically both directions
	1.13	2.25	1.13	0.94	0.22	0.50	1/4 - 28 UNF	0.19	0.63	9/16 - 18 X 0.31	0.69
	1.56	3.13	1.56	1.28	0.28	0.50	5/16 - 24 UNF	0.25	1.00	3/4 - 16 X 0.50	1.13



Jacking Screw Directions for all Cartridge mount models:

To ease removal of a cartridge mount work support from cavity, use the Jacking Screw feature built into two of the mounting holes in the body flange (opposite corners). Thread two set screws into mounting hole in fixture with the top screw protruding above the fixture mounting surface. Then thread jacking screws into work support flange until they contact the set screws. Evenly turn jacking screws until the work support body can be removed from the cavity.

Jacking Screws		
Use with Model No.	Set Screw Thread	Jacking Screw Thread
10-0208-02 10-0208-03	10 - 32 UNF	1/4 - 28 UNF
10-0212-02 10-0212-03	1/4 - 28 UNF	5/16 - 24 UNF

TuffGrip™ Work Supports

Frequently Asked Questions, Position Sensing

We are already using TuffGrip™ double acting Work Supports; why would we need to use the Return Position Sensor?

Use the Return Position Sensor in any automated system where work support retraction is critical before the unload/load cycle begins. Extended Work Supports could cause a crash. Monitor the position of Work Supports and confirm all is clear before unloading/loading the part.

Does the Return Position Sensor also tell me that the work support is extended and locked?

No, the Return Position Sensor only communicates that the Work Supports have retracted. Even though the pressure drops when the supports extend, it does not indicate that all the Work Supports have extended or are locked.

Can I add a Return Position Sensor to my existing double-acting work support?

No, adding the Return Position Sensor requires a specific body, a longer plunger and different contact spring. Adding the Return Position Sensor also increases the work support length from the mounting flange to the contact bolt. Please contact your Vektek Customer Support Specialist for more information.

How many Work Supports with Return Position Sensors can I put on one pneumatic circuit?

The maximum number of Return Position Sensors in one circuit is a function of the circuit design and pressure drop over the length of the circuit path. Vektek has tested ten devices plumbed in parallel with excellent results.

What if I want to run a different pneumatic pressure switch than what Vektek engineers recommend?

Any programmable pneumatic switch that interfaces with the machine tool logic can monitor air pressure in the Return Position Sensor circuit.

Can I design my pneumatic circuit to be a series rather than parallel?

Yes, but it is not recommended. Plumbing the Return Position Sensor in series will create a much greater pressure drop along the length of the circuit and will reduce the ability of the pressure switch to see an extended support at the furthest point in the circuit.

Is it okay to route my air through a rotary union?

Yes, size the rotary union so that there is a separate path for the air circuit.

Do I need a pneumatic pressure switch for each work support on my fixture?

No, connect all the Work Supports (that are on the same hydraulic circuit) with an air circuit feeding the Return Position Sensor to one pneumatic pressure switch.

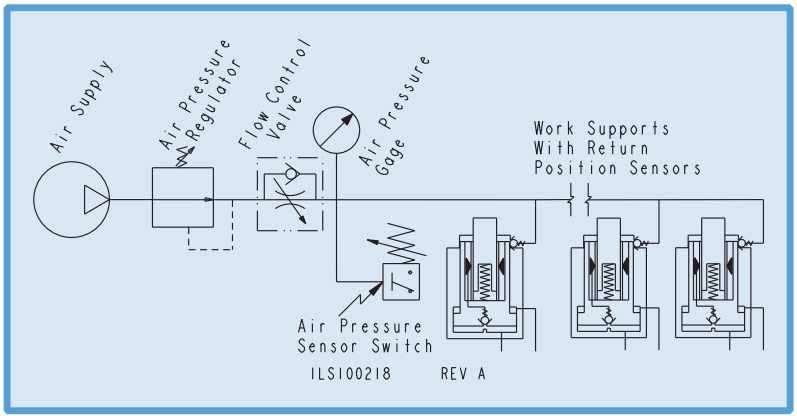
Patent Pending

Device Operation

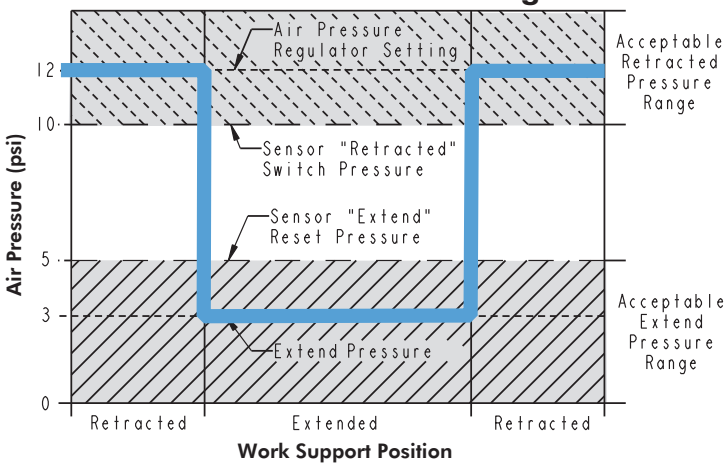
The Return Position Sensor unit requires continuous and regulated air pressure. In the retracted position, air pressure will build in the system to the regulated set pressure. An air logic switch detects the "retracted" pressure condition and signals the controller that Work Supports have retracted. When the work support extends, the internal check opens and vents air from the device. The system air pressure falls to the "extended" preset pressure and an air logic switch resets. When the support retracts, the internal check closes and air pressure again builds to the regulated value. The air pressure switch detects "retracted" pressure and again signals the controller that the device is in the retracted position.

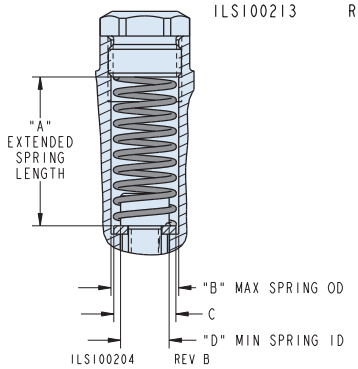
Recommended Pneumatic Circuit Design:

- 0-25 psi Air Pressure Regulator **Model No. 50-0440-01.**
- Vektek Air In-line Flow Control, **Model No. 50-4140-00.**
- 0-20 psi Pneumatic Pressure Gauge.
- IFM efector brand pressure switch or equivalent.
- Parallel circuit design with minimum of 0.125" inside diameter feed line size.
- Circuit design should be simple and free from flow restrictions that can cause excessive pressure drop.
- The maximum number of Return Position Sensors in one circuit is a function of the circuit design and pressure drop over the length of the circuit path. Vektek has tested 10 devices plumbed in parallel with excellent results.



Return Position Sensor Logic





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.

Recommended System Setup:

- Set air pressure regulator to 12 psi when all Work Supports in the system are in the retracted position.
- Adjust and set air flow control so that air pressure falls to 3 psi when the work support at the furthest point of the pneumatic circuit is in the extended position and all other supports in the circuit are retracted.
- Set the air pressure sensor "Retract" switch point to 10 psi.
- Set the air pressure sensor "Extend" reset switch point to 5 psi .

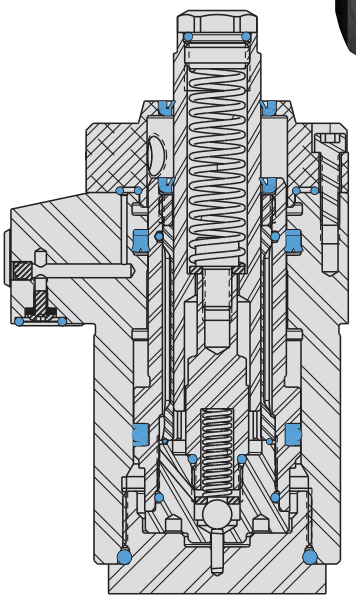
Custom Contact Spring

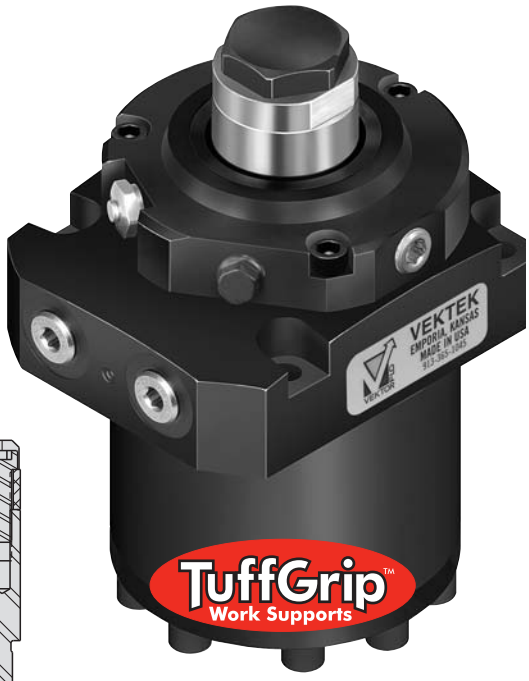
Cavity Dimensions					Standard Spring			
Work Support Series	A	B	C	D	OD	WIRE Ø	Free Length	Rate (lb/in)
10-0208-00	1.13	0.51	0.46	0.38	0.48	0.045	1.50	9.4
10-0208-01	1.69	0.51	0.46	0.38	0.48	0.051	2.25	9.3
10-0208-02	1.13	0.51	0.46	0.38	0.48	0.045	1.50	9.4
10-0208-03	1.69	0.51	0.46	0.38	0.48	0.051	2.25	9.3
10-0212-00	1.13	0.68	0.62	0.47	0.59	0.055	1.56	10.0
10-0212-01	1.78	0.68	0.62	0.47	0.60	0.059	2.5	9.6
10-0212-02	1.13	0.68	0.62	0.47	0.59	0.055	1.56	10.0
10-0212-03	1.78	0.68	0.62	0.47	0.60	0.059	2.5	9.6

Air Position Sensing Top Flange

Return Position Sensing for D/A Top Flange Work Support

- Exclusive Vektek design eliminates part ejection and the need for any ancillary workholding devices.
- TuffGrip™ Return Position Sensors use air to communicate that the work support has retracted and is ready to load/unload.
- TuffGrip™ Return Position Sensors monitor work supports to prevent crashes in automated systems.
- Dual wipers and Pressure Relief Vent keep chips and debris out.
- Failsafe design requires air pressure to build before sensing the retracted position.
- Top flange body style allows for hydraulic connection through face sealed o-rings or through SAE ports.
- Black anodized aluminum sensor housing for superior corrosion resistance.
- Air connection through face sealed o-rings of top flange body or externally plumbed through NPT ports on housing.





Patent Pending

Model No.**	Support Capacity (lb)*	Contact Force (lb)	Work Support Stroke (in)	Shuttle Stroke (in)	Body Dia.	Piston Area (sq in)		Oil Capacity (cu in)		Max Oil Flow Rate cu. in./min	Optional Flow Control Model No.
						Extend	Retract	Extend	Retract		
Double Acting (D/A) Cylinders, actuated hydraulically both directions											
10-0208-01	2750	5.2 - 8.6	0.38	0.50	2.12	1.62	0.52	0.81	0.26	70	70-2037-71
10-0212-01	5500	6.9 - 10.5	0.38	0.50	2.99	3.55	0.79	1.78	0.40	150	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 capacity graph on page B-2.

** Use Return Position Sensor to monitor retracted position only and not plunger advance or plunger lock.

Dimensions

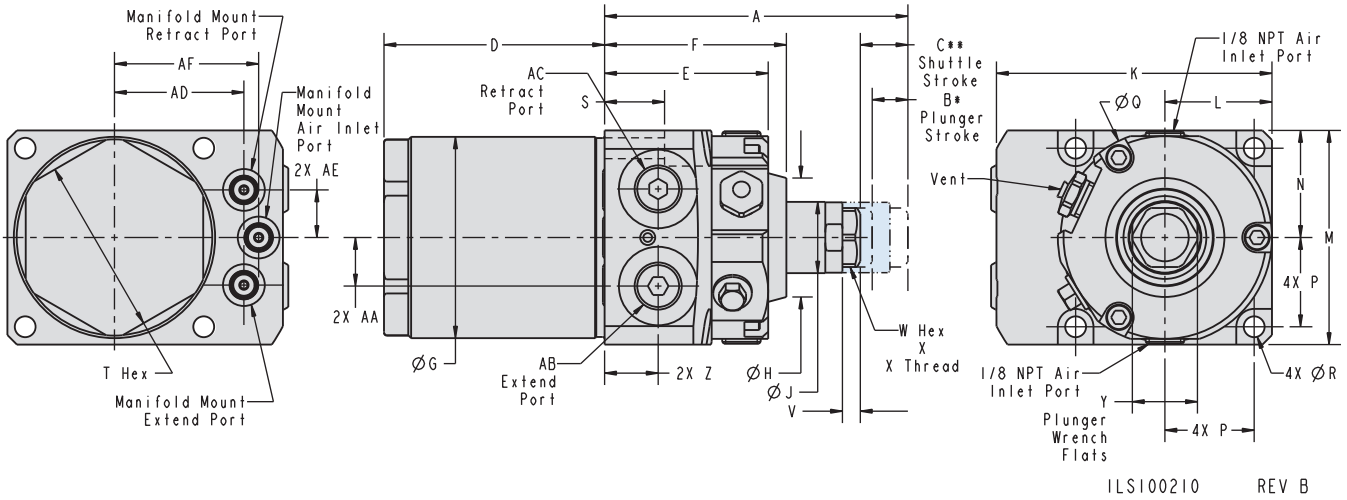
Model No.***	A	B*	C**	D	E	F	G	H	J	K	L	M	N	P	Q
Double Acting (D/A) ***															
10-0208-01	3.19	0.38	0.50	2.32	1.72	1.91	2.12	1.25	0.75	2.90	1.13	2.25	1.13	0.94	2.25
10-0212-01	3.41	0.38	0.50	2.69	1.72	1.91	2.99	2.00	1.25	3.69	1.56	3.13	1.56	1.28	3.12

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

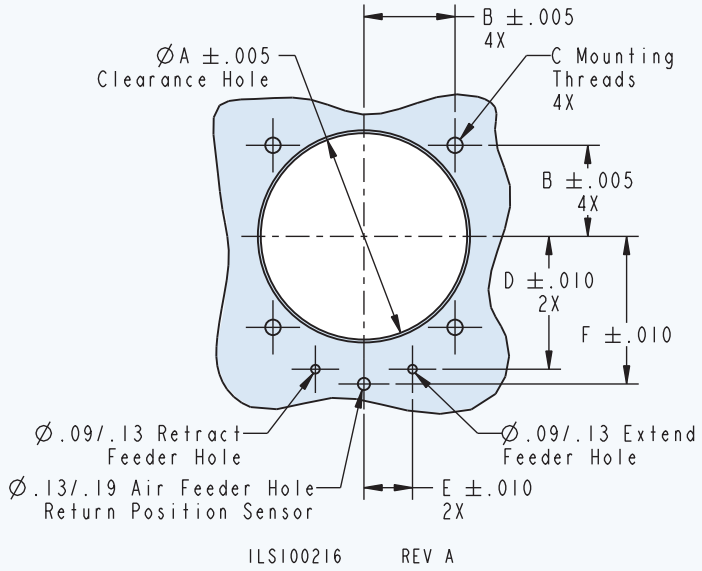
** Shuttle Stroke "C" is the stroke the shuttle travels to position the work support plunger relative to the workpiece. The shuttle moves the full range of this stroke every cycle.

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

Air Position Sensing Top Flange



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



Cavity Mounting Dimensions

Model No.	A	B	C	D	E	F
10-0208-01	2.130	0.938	10 - 32 UNF	1.360	0.500	1.52
10-0212-01	3.005	1.281	1/4 - 28 UNF	1.750	0.750	1.86

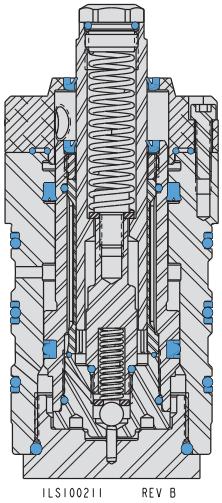
	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
Cylinders, actuated hydraulically both directions														
	0.22	0.63	1.88	0.19	0.63	9/16 - 18 X 0.31	0.69	0.56	0.51	SAE 4	SAE 4	1.36	0.50	1.52
	0.28	0.70	N/A	0.25	1.00	3/4-16 X 0.50	1.13	0.56	0.63	SAE 4	SAE 4	1.75	0.75	1.86

Note: If you would like to produce your own springs for these Work Supports see dimensions drawing on Page B-8

Air Position Sensing Cartridge

Double Acting Work Support

- Exclusive Vektek design eliminates part ejection and the need for any ancillary workholding devices.
- TuffGrip™ Return Position Sensors use air to communicate that the work support has retracted and is ready to load/unload.
- TuffGrip™ Return Position Sensors monitor supports to prevent crashes in automated system.
- Air Pressure Relief Vent keeps unit sealed and free of foreign material.
- Air connection through the fixture via grooved mounting screw or through NPT ports on sensor housing.
- Cartridge mount body allows hydraulic feed passages to intersect with cavity from any angle.
- Dual wipers keep chips and debris from invading support.
- Failsafe design requires air pressure to build before sensing the retracted position.
- Aluminum sensor housing is Black Anodized for superior corrosion resistance.



Patent Pending

Model No.**	Support Capacity (lb)*	Contact Force (lb)	Work Support Stroke (in)	Shuttle Stroke (in)	Body Dia.	Piston Area (sq in)		Oil Capacity (cu in)		Maximum Oil Flow Rate cu. in. / min
						Extend	Retract	Extend	Retract	
Double Acting (D/A) Cylinders, actuated hydraulically both directions										
10-0208-03	2750	5.2 - 8.6	0.38	0.50	2.12	1.62	0.52	0.95	0.40	70
10-0212-03	5500	6.9 - 10.5	0.38	0.50	3.00	3.55	0.79	2.00	0.63	150

* Support Capacities are listed at 5,000 psi maximum operating pressure. Support capacities for other pressures must be determined by consulting the capacity graph on page B-2.

** Use Return Position Sensors to monitor retracted position only and not plunger advance or plunger lock.

Dimensions

Model No.	A	B*	C**	D	E	F	G	H	J	K	L
Double Acting (D/A) ***											
10-0208-03	2.81	0.38	0.50	2.75	1.34	1.54	2.12	1.25	0.75	2.25	1.13
10-0212-03	3.16	0.38	0.50	2.94	1.47	1.66	3.00	2.00	1.25	3.13	1.56

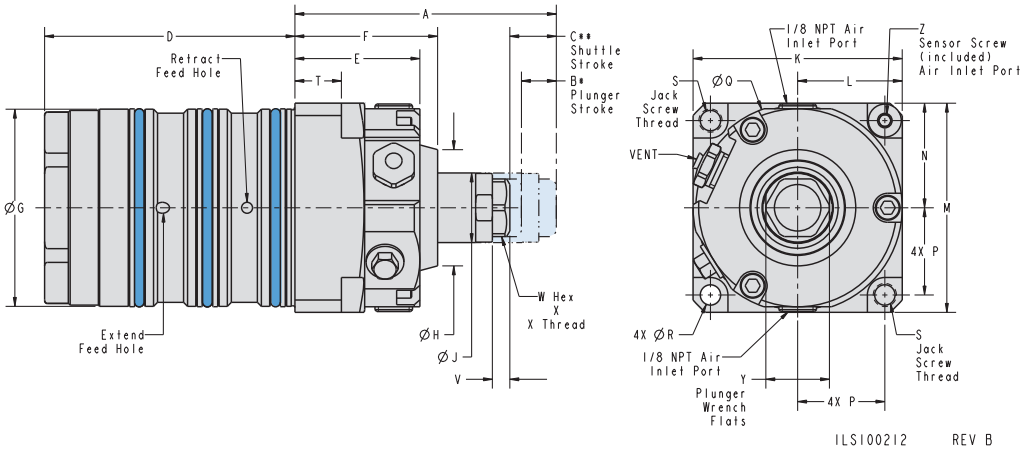
* Plunger Stroke "B" is the available work zone of the plunger. The workpiece must be positioned inside this window.

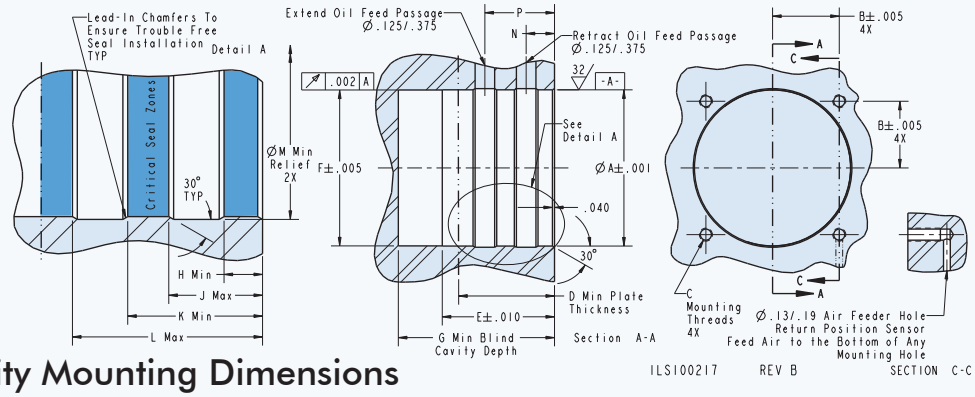
** Shuttle Stroke "C" is the stroke the shuttle travels to position the work support plunger relative to the workpiece. The shuttle moves the full range of this stroke every cycle.

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

Note: If you would like to produce your own springs for these Work Supports see dimensions drawing on Page B-8

Air Position Sensing Cartridge





Cavity Mounting Dimensions

Model No.	A	B	C	D	E	F	G
10-0208-03	2.126	0.938	10 - 32 UNF	1.84	2.156	2.120	2.813
10-0212-03	3.001	1.281	1/4 - 28 UNF	1.84	2.156	2.995	3.000
Model No.	**H**	**J**	**K**	**L**	**M**	**N**	**P**
10-0208-03	0.317	0.772	1.110	1.565	2.172	0.545	1.338
10-0212-03	0.317	0.772	1.110	1.565	3.047	0.545	1.338

Suggested cavity machining techniques preferred by Vektek Engineering:

* Roller burnish bore if possible, roundness within 0.001 inches.
* Ball hone (or equivalent) bore to smooth transitions and round chamfer edges.
* Lube o-ring seals with grease prior to installation.
* Vent bottom side of cavity to aid insertion of the Work Support into the cavity.

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.

M	N	P	Q	R	S	T	V	W	X	Y	Z
											Cylinders, actuated hydraulically both directions
2.25	1.13	0.94	2.25	0.22	1/4 - 28 UNF	0.50	0.19	0.63	9/16 - 18 X 0.31	0.69	10 - 32 X 3/4
3.13	1.56	1.28	3.12	0.28	5/16 - 24 UNF	0.50	0.25	1.00	3/4 - 16 X 0.50	1.13	1/4 - 28 X 1

Position Sensor Air Supply:

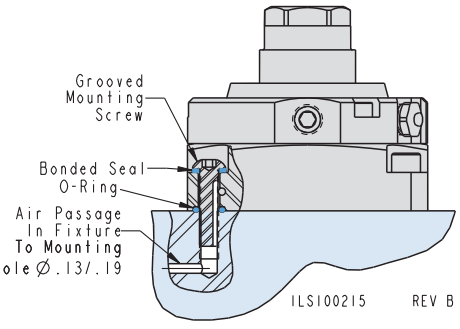
Connecting air to the Return Position Sensor without using external air lines and fittings.

1. Machine an air feeder hole to any one of the 4 threaded mounting holes in the fixture.
2. Install o-ring into groove on bottom side of the work support flange.
3. Install the work support into cavity and rotate it so that the mounting hole with the corresponding air passage aligns with the fixture mounting hole that includes the air supply hole.
4. Install the bonded seal onto grooved mounting screw, thread into fixture and torque.

Grooved Mounting Screw Torque Chart

Model No.	Torque (in - lb)
10-0208-03	20
10-0212-03	50

NOTE: Grooved mounting screw, bonded seal and o-ring included.



Frequently Asked Questions

Why do I need to use Work Supports?

The basics of 3-2-1 of fixture building require that three points define one plane of part location. When machining, a part may require additional support beyond the three basic points of a plane, and a floating location support (work support) is an easy solution. Install a work support anywhere a "screw jack" can be used. It adjusts faster without distortion and is not dependent on operator "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 conditions are present. They can eliminate or decrease most of the problems caused by part movement during machining. All you need is an application, space to insert the support, a power supply and plumbing. Work Supports improve part quality while reducing scrap and re-work. They 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 graph (page B-14).

Can I use Work Supports without other hydraulic clamps?

Yes, hydraulic Work Supports are often used alongside manual clamps. Work Supports reduce dependence on "operator touch," speed operations by locking multiple components with a single adjustment and speed load time dramatically even when used with manual clamps that 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 type of work support can be used in most applications.

Air advance is normally used when a part is very light, fragile, or when heavy contamination is present. Lightweight parts may require clamping before the supports can be advanced. Fine-tune the work support to touch the part lightly without distorting or unseating it before the support locks. 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 to and from the atmosphere. **Air Advance** Work Supports have no breather, but use a continuous air pressure to advance the plunger into position. **Fluid Advance** Work Supports have an internally vented plunger that gives trapped air between the hydraulic advance piston and the support plunger a place to escape.

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 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 to include are: the surface finish at the contact point of the part, 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, you can lay the work support on its side. 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?

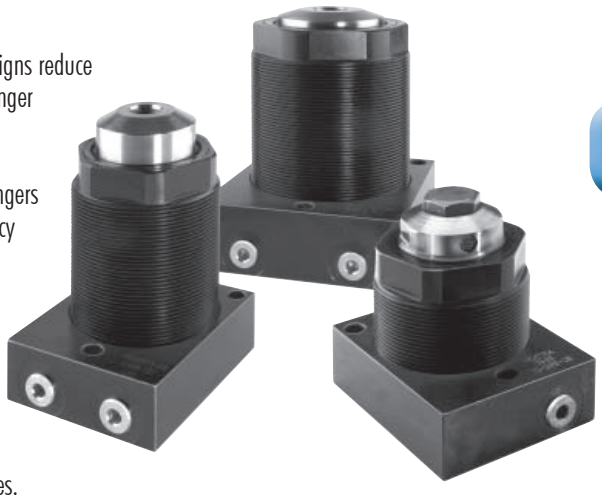
You are correct, the impact of the re-entry of the cutter teeth to the next web of your part will create an interruption and may cause an impact beyond the normal horsepower, depth of cut and tooth loading formulae. In this case, you should plan to allow no less than 2X more capacity than necessary on the work support. 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?

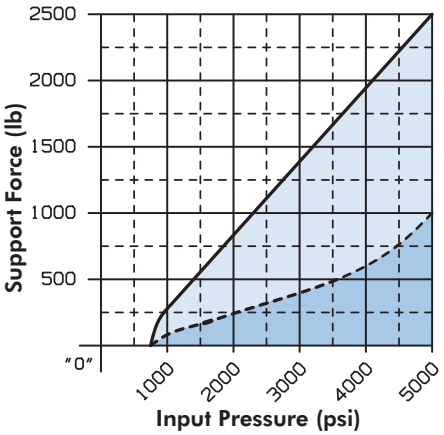
Yes, a torque wrench and a 6 point socket is required. If you use an open end, adjustable or box end wrench you increase the chances of damaging the hex, roundness of the support sleeve or damaging the seals causing leakage between the sleeve and body. Please use an appropriate socket, torque wrench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

Standard Features

- Highly repeatable; plus or minus 0.0002 inches.
- Standard Work Supports may be bolted up or down to mount directly on fixture plates. They may also be installed through a hole in the fixture 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.



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

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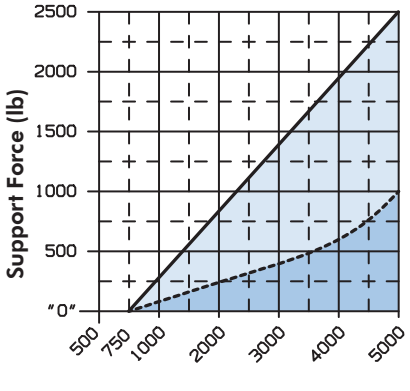
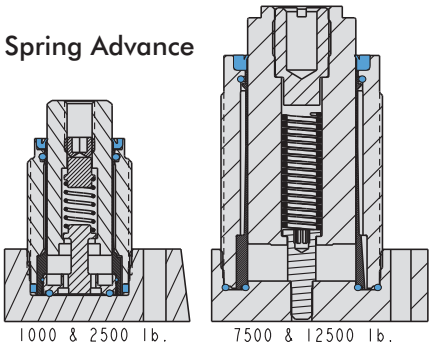


10-0708-07	10-0706-04
10-0708-17	10-0706-14
10-0808-07	10-0806-05
10-0808-17	10-0806-15

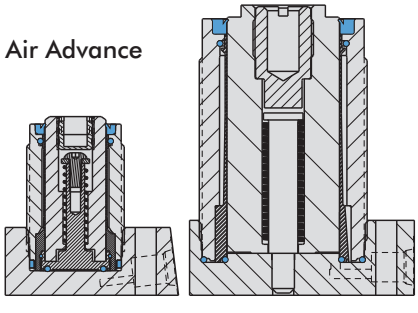
ILS100703 REV F

Spring Advance

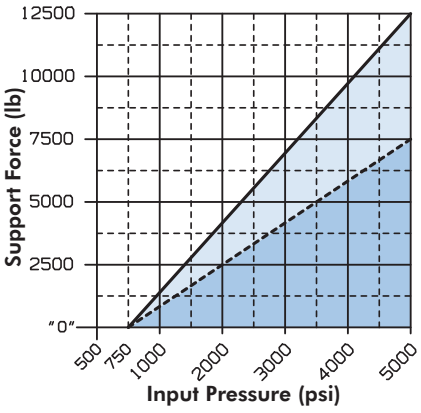


ILS100500 REV J

Air Advance



ILS100600 REV J



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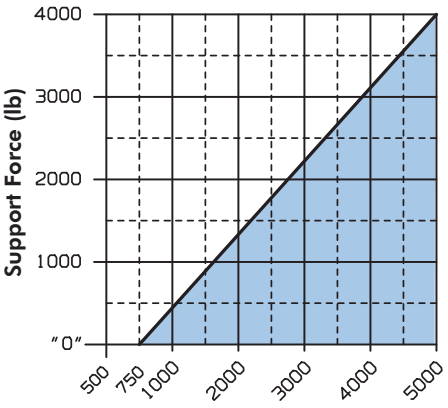
10-0620-07	10-0615-06

ILS100603 REV D



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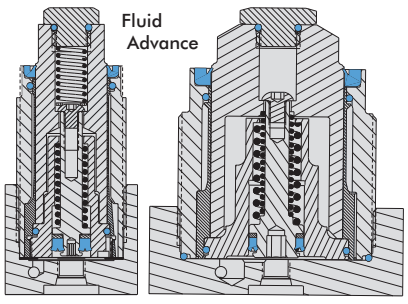
ILS100704 REV D



ILS100700 REV N

Spring Advance

For Supporting Most Parts

- Available in four capacities from 1,000 to 12,500 lb., these units 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. When hydraulic pressure is applied the plunger freezes without exerting any additional force on the part.

Proprietary wiper and seal designs reduce contamination and drag for longer lasting, better performing Work Supports.

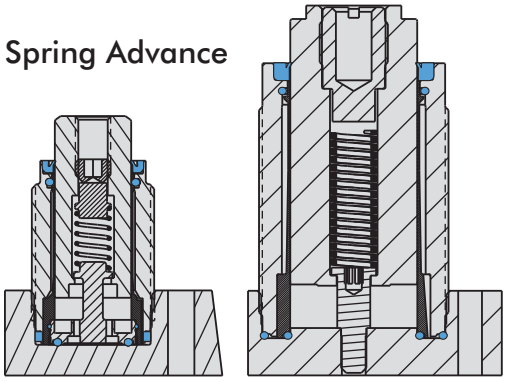
Stainless steel plunger and sleeve assemblies help guard against corrosion in most machining environments.

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 to 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.

Spring Advance



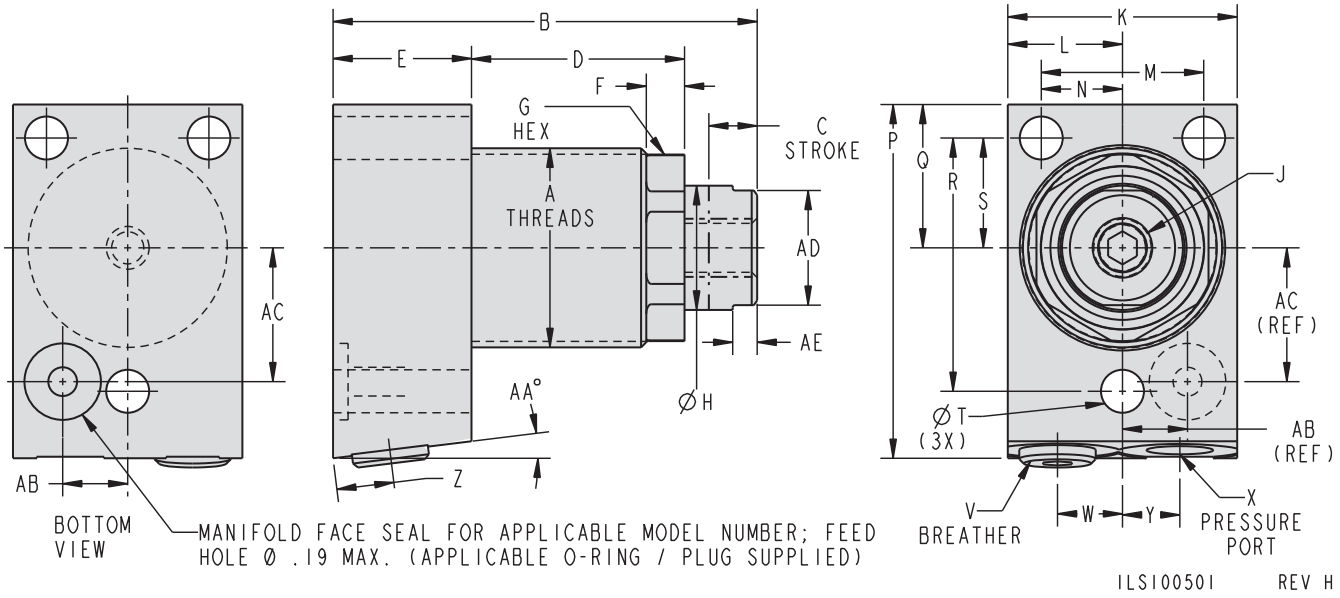
Model No.	Support Capacity* (lb)	Mounting Style **	Contact Force (lb)	Stroke (in)	Base Dimensions (in)	Extended Height (in)	Oil Capacity (cu in)
Spring Advance Work Supports, spring lifts plunger, part weight depresses plunger, hydraulic pressure locks in place							
10-0506-10	1000	Cartridge	1-2	0.25	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 capacity graph on page B-14.

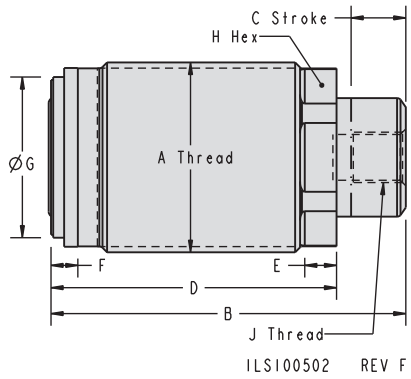
** For cartridge mount models, see cavity dimensions on page B-23.

Dimensions

Model No.	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	1-16	2.18	0.25	1.06	0.85	0.21	0.87	0.63	5/16-18 X 0.27	1.25	0.63	0.90	0.45
10-0506-12		2.24			0.90					1.31	0.66		
10-0509-07	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
10-0509-08													
10-0515-06	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	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



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



Cartridge Dimensions

Model No.	A	B	C	D	E	F	G	H	J
Work Support, Spring Rise, Cartridge									
10-0506-10	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	1 5/16-16	2.43	0.38	1.96	0.25	0.34	1.22	1.12	3/8-16 X 0.46

All dimensions are in inches

	P	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD	AE
Spring Advance Work Supports, spring lifts plunger, part weight depresses plunger, hydraulic pressure locks in place															
	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
	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
	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
	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

Work Supports

Air Advance

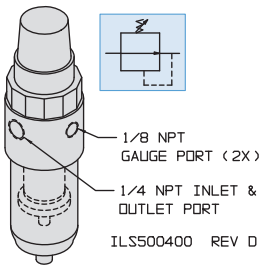
For Supporting Fragile Parts Or Use In Harsh Environments

- Available in four capacities from 1,000 to 12,500 lb.
- Adapts 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-spring" to keep the plunger extended and the problem contaminants out. (You should observe air bubbles escaping around the plunger when used in this manner.)
- 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.

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



Air Filter Regulator

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

The maximum air pressure recommended for advancing the Air Advance Work Support plunger is 25 psi. Order air regulator (0 to 25 psi) to more precisely control plunger advance force.

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

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		Base	SAE Ports			0.85 X 1.25 X 1.75	1.93	0.12
10-0606-12		Base	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		Base	SAE Ports			0.91 X 1.50 X 2.31	2.40	0.13
10-0609-08		Base	Face Seal			0.91 X 1.50 X 2.31	2.40	0.10
10-0615-06	7500	Base	SAE Ports	20	0.50	1.00 X 2.50 X 3.00	3.87	0.81
10-0620-07	12500	Base	SAE Ports	57	0.75	1.25 X 3.50 X 3.81	4.50	1.79

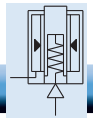
* Support capacities are listed at 5,000 psi maximum operating pressure. Support capacities for other pressures must be determined by consulting the capacity graph on page B-14.

** 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.

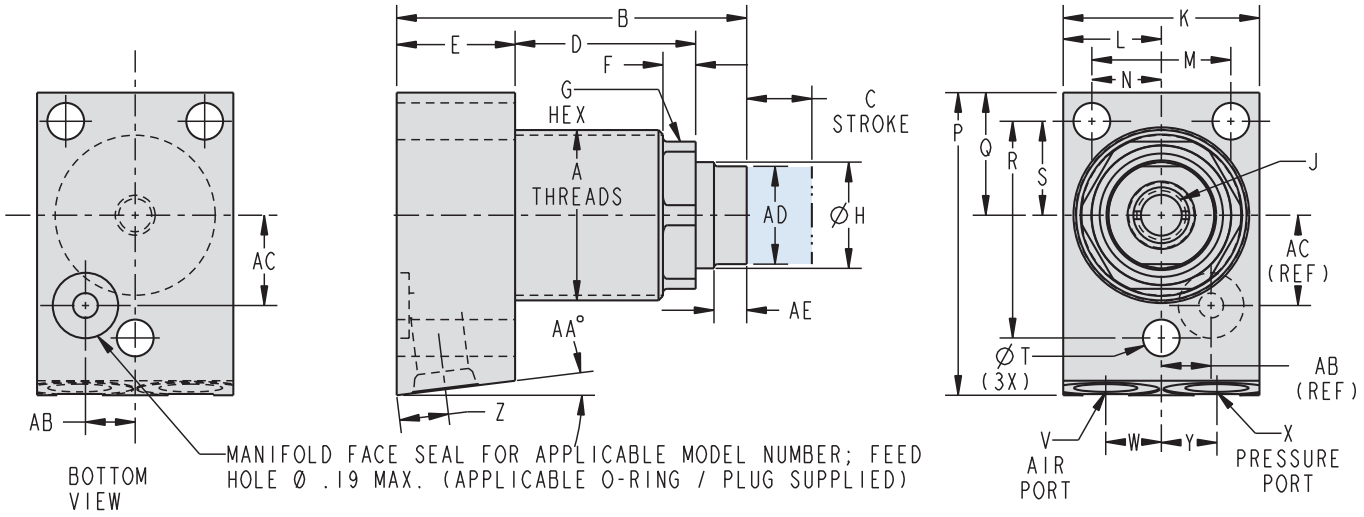
*** For cartridge mount models, see cavity dimensions on pages B-23.

Dimensions

Model No.	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 in place, spring retracts plunger													
10-0606-11	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	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	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	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

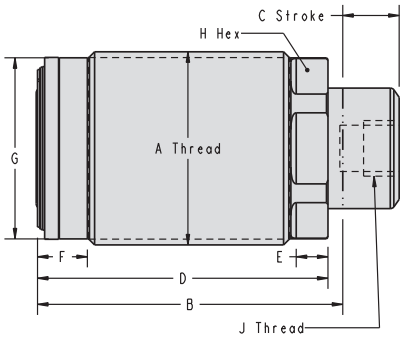


Air Advance



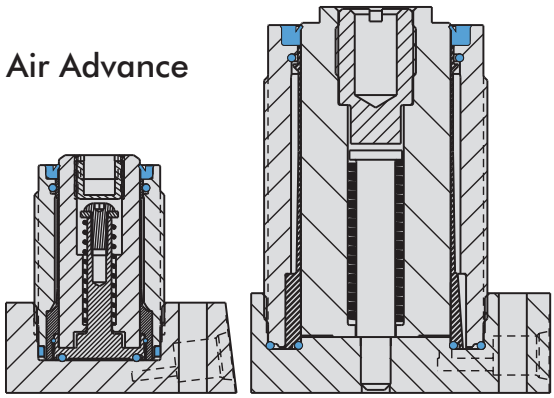
ILS100601 REV G

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



ILS100602 REV F

Air Advance



1000 & 2500 lb. 7500 & 12500 lb.

ILS100600 REV J

Cartridge Dimensions

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

Model No.	F	G	H	J
Work Support, Air Rise Cartridge				
10-0606-10	0.27	0.95	0.87	5/16-18 X 0.29
10-0609-06	0.34	1.22	1.12	3/8-16 X 0.24

All dimensions are in inches.

	P	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD	AE
Air Advance Work Supports, air pressure lifts plunger against part; hydraulic pressure locks 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
	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
	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
	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

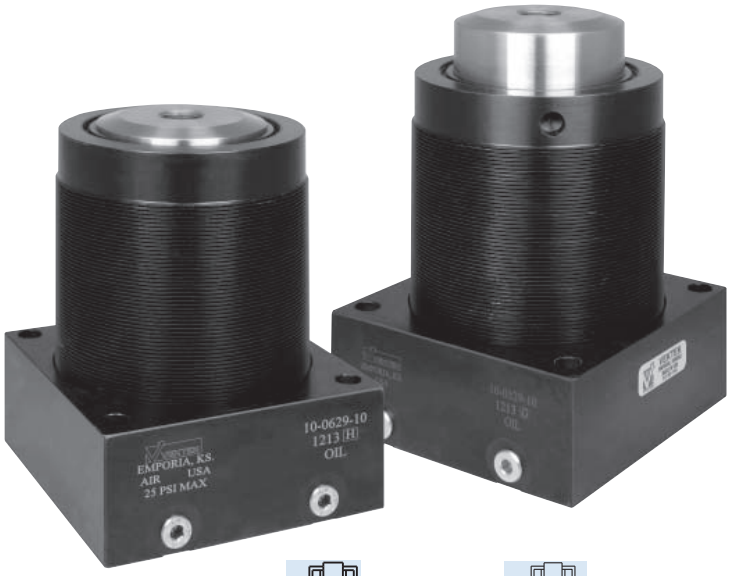
Work Supports

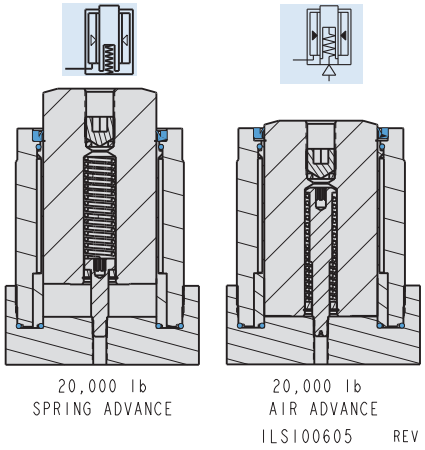
20,000 lb Spring and Air Advance

NEW 20,000 Pounder

Spring and Air Advance Models

- 20,000 lb Work Support Capacity.
- Available in Spring and Air Advance.
- Clamp over with confidence.
- Large castings, no problem.
- Handles extra cutting loads effectvely and efficiently
- Single Acting.
- Air Advance unit is an excellent "air spring".
- Spring Advance extended plungers maintain contact with the part during loading, exerting only spring force against the part. When hydraulic pressure is applied the plunger freezes without exerting any additional force on the part.





20,000 lb SPRING ADVANCE

20,000 lb AIR ADVANCE

ILS100605 REV A

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

Consider Air Advance in flood coolant environments. Attach tubing to the vent port and route to clean dry air keeping coolant from being drawn in and becoming sticky on internal surfaces.

Special large diameter plungers and sleeves provide greater rigidity.

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

Standard SAE porting located in the base of the support for bolt down installation.

Model No.	Support Capacity* (lb)	Mounting Style	Hydraulic Connection	Contact Force** (lb)	Stroke (in)	Base Dimensions (in)	Extended Height (in)	Retracted Height (in)	Oil Capacity (cu in)
Spring Advance Work Supports, spring lifts plunger, part weight depresses plunger, hydraulic pressure locks in place.									
10-0529-10	20000	Base	SAE Ports	38-72	0.82	1.99 x 4.75 x 4.88	6.97	6.15	3.37
Air Advance Work Supports, air pressure lifts plunger against part; hydraulic pressure locks in place, spring retracts plunger									
10-0629-10	20000	Base	SAE Ports	116	1	1.99 x 4.75 x 4.88	7.15	6.15	3.37

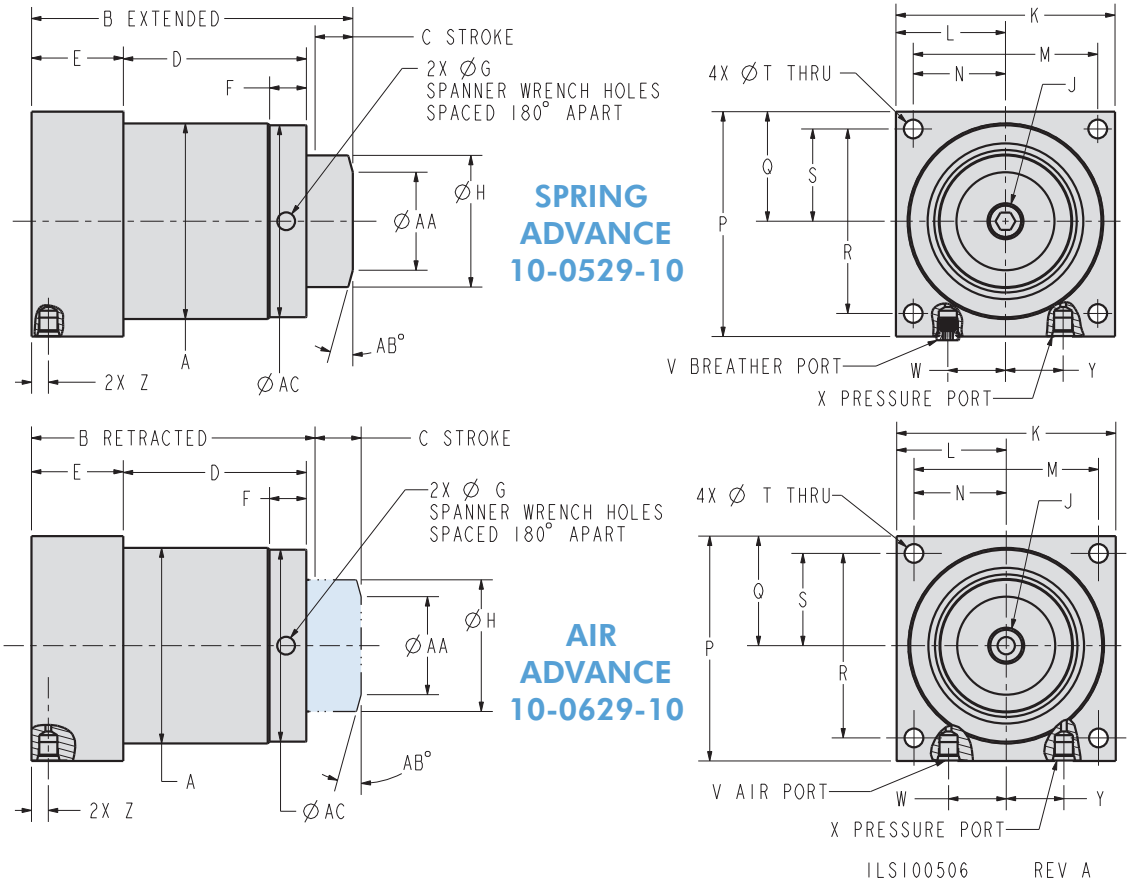
* Support capacities are listed at 5,000 psi maximum operating pressure. Support capacities for other pressures must be determined by consulting the capacity graph o page B-20.

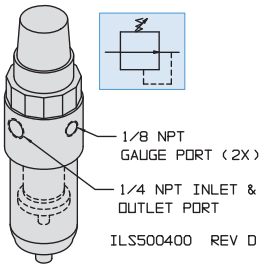
** The maximum air pressure recommended for advancing the Air Advance Work Support plunger is 25 psi. Order air regulator Model No. 50-0440-01 (0 to 25 psi) to more precisely control plunger advance force.

Dimensions

Model No.	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.													
10-0529-10	4 1/4 -16	6.96	0.82	3.97	1.99	0.80	0.39	2.85	3/4-16 X 0.71	4.75	2.38	4.00	2.00
Air Advance Work Supports, air pressure lifts plunger against part; hydraulic pressure locks in place, spring retracts plunger													
10-0629-10	4 1/4 - 16	6.15	1.00	3.97	1.99	0.80	0.39	2.85	3/4-16 X 0.71	4.75	2.38	4.00	2.00

20,000 lb Spring and Air Advance

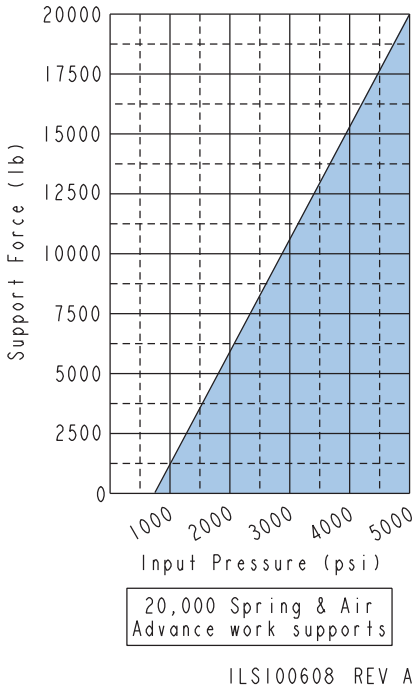




Air Filter Regulator

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

The maximum air pressure recommended for advancing the Air Advance Work Support plunger is 25 psi. Order air regulator (0 to 25 psi) to more precisely control plunger advance force.



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

	P	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC
Spring Advance Work Supports, spring lifts plunger, part weight depresses plunger, hydraulic pressure locks in place.													
	4.88	2.38	4.00	2.00	0.41	SAE 4	1.25	SAE 4	1.25	0.37	2.13	15	4.16
Air Advance Work Supports, air pressure lifts plunger against part; hydraulic pressure locks in place, spring retracts plunger													
	4.88	2.38	4.00	2.00	0.41	SAE 4	1.25	SAE 4	1.25	0.37	2.13	15	4.16

Fluid Advance

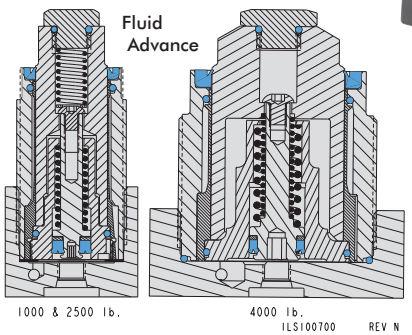
For Retracted Plunger Applications

- 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. Hydraulic pressure then automatically sequences, "freezing" the plunger properly against the part.
- Ventless configuration and built in wiper keeps chips and debris out, reducing the chance of plunger/sleeve sticking or binding.

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-24) and retaining collars (page L-1).



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

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	2.12	0.08
10-0706-14				0.50		2.62	0.09
10-0806-05	1000	SAE/Manifold	1 - 6	0.25	0.90 X 1.31 X 1.75	2.51	0.16
10-0806-15				0.50		3.01	0.17
10-0708-07	2500	Cartridge	3 - 10	0.25	N/A	2.83	0.12
10-0708-17				0.50		3.33	0.14
10-0808-07	2500	SAE/Manifold	3 - 10	0.25	1.25 X 1.50 X 2.31	3.25	0.19
10-0808-17				0.50		3.75	0.21
10-0715-06	4000	Cartridge	8 - 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 capacity graph on page B-14.

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

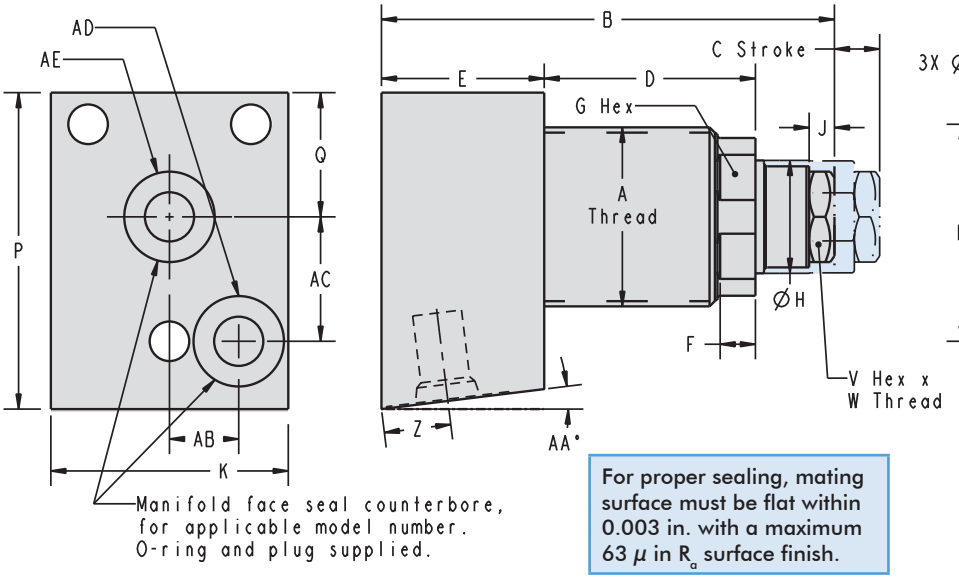
*** For cartridge mount models, see cavity dimensions on pages B-23 and B-24

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

Dimensions

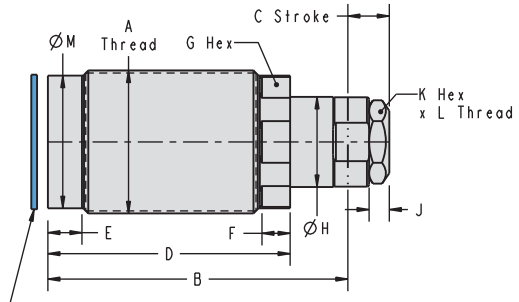
Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P
Fluid Advance Work Supports, hydraulic pressure lifts spring which lifts plunger, hydraulic pressure locks														
10-0806-05	1-16	2.51	0.25	1.17	0.90	0.21	0.88	0.62	0.14	1.31	0.66	0.90	0.45	1.75
10-0806-15		3.01	0.50	1.67										
10-0808-07	1 1/4-16	3.25	0.25	1.35	1.25	0.36	1.13	0.81	0.19	1.50	0.75	1.06	0.53	2.31
10-0808-17		3.75	0.50	1.85										
10-0815-06	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

Fluid Advance



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

ILS100701 REV L



ILS100702 REV K

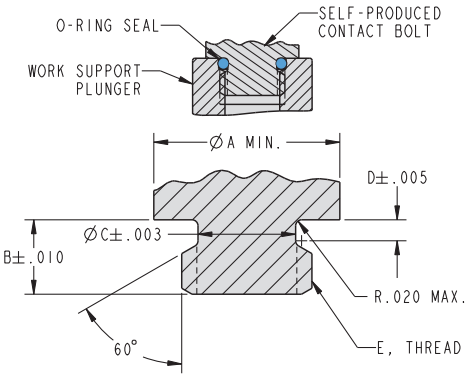
Cartridge Dimensions

Model No.	A	B	C	D	E	F	G
Work Support, Oil Rise, Cartridge							
10-0706-04 10-0706-14	1-16	2.12 2.62	0.25 0.50	1.68 2.18	0.24	0.21	0.88
10-0708-07 10-0708-17	1 1/4-16	2.83 3.33	0.25 0.50	2.17 2.67	0.31	0.36	1.13
10-0715-06	2 1/4-16	2.85	0.50	2.16	0.19	0.50	2.00

Model No.	H	J	K	L	M
Work Support, Oil Rise, Cartridge					
10-0706-04 10-0706-14	0.62	0.14	0.50	5/16-18 X 0.20 3/8 - 24 x 0.20	0.92
10-0708-07 10-0708-17	0.81	0.19	0.63	7/16-14 X 0.25	1.17
10-0715-06	1.50	0.19	0.75	1/2-13 X 0.25	2.16

Self-produced Contact Bolt

Model No.	Capacity	O-ring Part No.	ØA	B	ØC	D	E
Work Support, Oil Rise							
10-0706-04 10-0806-05	1000 Std. Stroke	39-0510-59 (0.236 x 0.059)	0.384	0.197	0.238	0.047	5/16-18 UNC -2A
10-0706-14 10-0806-15	1000 Long Stroke	39-0000-69 (0.301 x 0.064)	0.450	0.197	0.302	0.047	3/8 -24 UNF -2A
10-0708-07 10-0808-07	2500 Std. Stroke	55-2500-05 (0.301 x 0.070)	0.493	0.250	0.328	0.070	7/16-14 UNC-2A
10-0708-17 10-0808-17	2500 Long Stroke	55-2500-05 (0.301 x 0.070)	0.493	0.250	0.328	0.070	7/16-14 UNC-2A
10-0715-06 10-0815-06	4000	39-0020-09 (0.364 x 0.070)	0.555	0.250	0.390	0.070	1/2-13 UNC-2A



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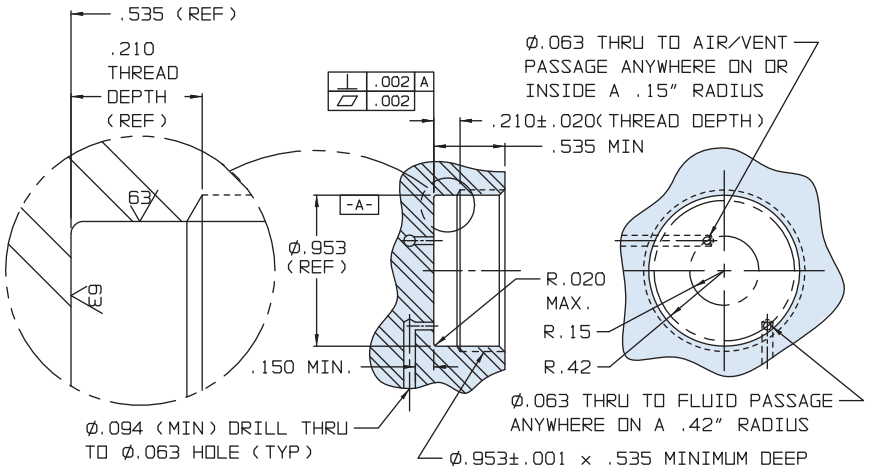
All dimensions are in inches

	Q	R	S	T	V	W	X	Y	Z	AA°	AB	AC	AD	AE
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 0.20 3/8 -24 x 0.20	SAE 2	0.33	0.38	7	0.38	0.69	YES	N/A
	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
	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

Cartridge Mount Cavity



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

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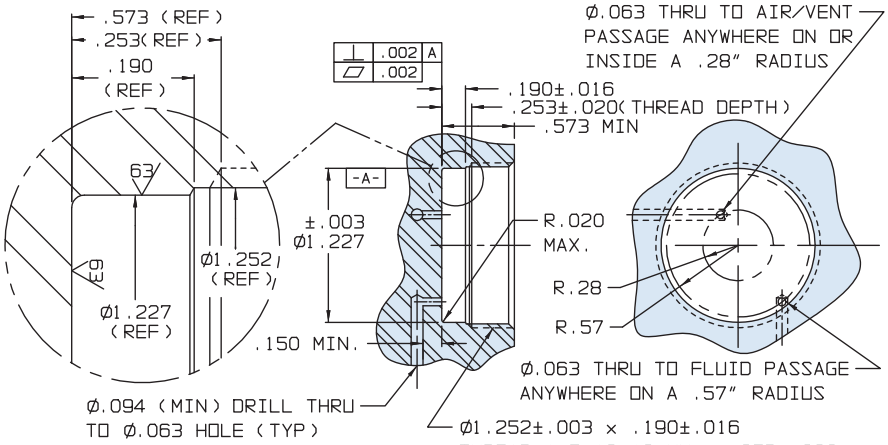

WORK SUPPORT CAVITY DIMENSIONS:
#2500 SPRING ADVANCE 10-0509-06
#2500 AIR ADVANCE 10-0609-06
(TORQUE TO 30 Ft.Lbs.)

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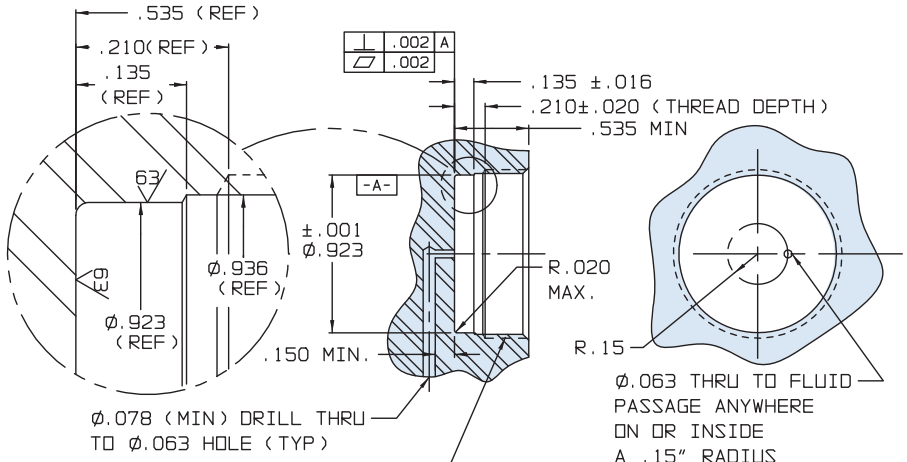

WORK SUPPORT CAVITY DIMENSIONS:
#1000 SINGLE ACTING FLUID ADVANCE
10-0706-04 & 10-0706-14
(TORQUE TO 30 Ft.Lbs.)

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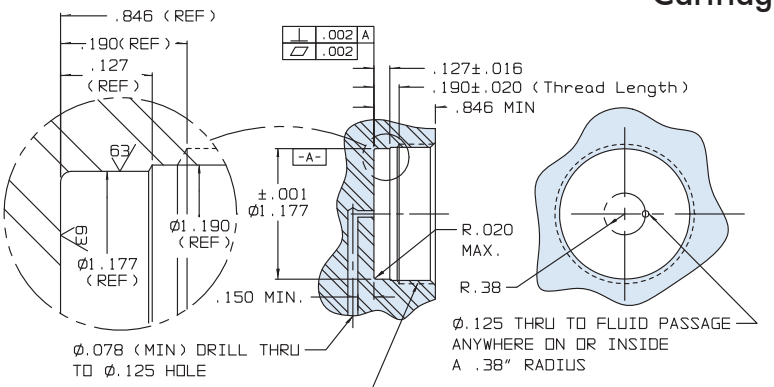
Cartridge Mount Cavity, Feeder Caps, Shield



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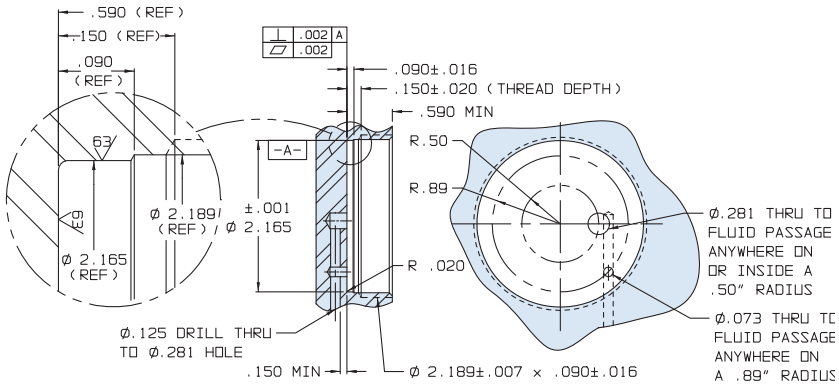

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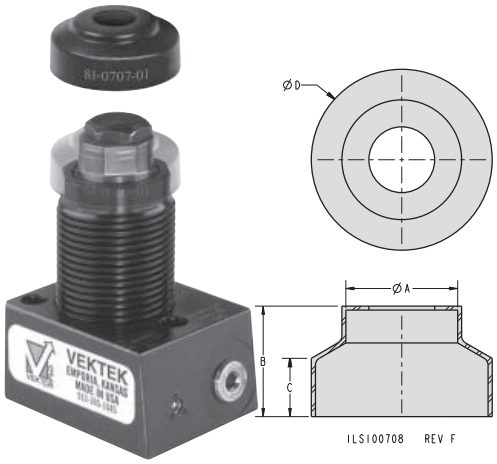
Work Support Accessories



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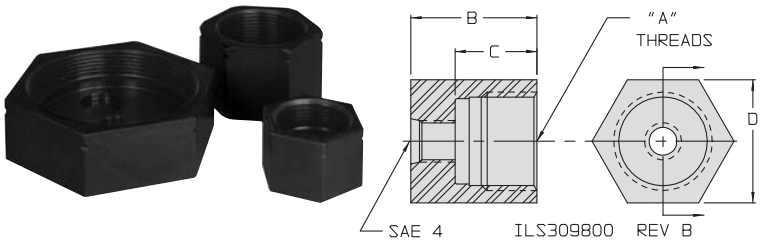

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Feeder Caps

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
30-9872-47	2 1/4 - 16	0.99	0.59	2.50

Fluid Advance Work Support Shields

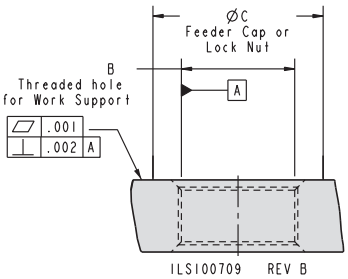
Model No.	Fits Model No.	A	B	C	D
81-0707-01	10-0706-04 10-0706-14 10-0806-05 10-0806-15	0.66	0.50	0.30	1.04
81-0708-01	10-0708-07 10-0708-17 10-0808-07 10-0808-17	0.85	0.84	0.43	1.38
81-0715-01	10-0715-06 10-0815-06	0.92	1.00	0.58	2.36

For use with S/A fluid advance Work Supports only

Machining Specifications

for Work Supports Mounted with a Feeder Cap or Lock Nut

Work Support Capacity (lb)	B	C
1,000	1-16	1.44
2,500	1 1/4 - 16	1.73
4,000	2 1/4 - 16	2.89



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TuffCam™ Swing Clamps

Frequently Asked Questions

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

Applications where speed is essential, massive arms are required, or position sensing is necessary, use the TuffCam™ design most effectively.

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

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

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

No, there are restrictions. TuffCam™ 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™ Swing Clamps is reduced. Consult the **Clamp Time and Flow Rate** chart on page C-2 to determine the maximum speed for your application.

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

The three 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™ Swing Clamps. Can I switch out TuffCam™ for your standard product?

Yes, the TuffCam™ Swing Clamps have the same mounting envelope as their standard swing clamp counterparts.

I want to use Work Supports with TuffCam™ 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. 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 coordinating with TuffCam™, 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™ 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. We recommend changing to a pump designed for clamping applications restrict flow to the table on page C-2.

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

TuffCam™ 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™ Swing Clamp?

The single direction, tri-cam design of TuffCam™ produces the strength and reliability to support faster speeds and larger arms. This design also delivers noticeably better accuracy and repeatability over other brands. The clocking feature, included on all styles, dramatically reduces the time it takes to change arms for maintenance, replacement or design setup.

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 its swing, the positioning time should be somewhere around ½ second or longer. See flow rates and clamping time on page C-2.
* If, while looking directly into the end of the Swing Clamp, you cannot observe the arm move, or it is unclamped and the next thing you can see is the device is 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™ Swing Clamps can actuate at a faster speed. See flow rates and clamping time on page C-2.
* 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 multiply 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 restrictions in the system.

VEKTEK®

*TuffCam™ is a trademark of Vektek, Inc.

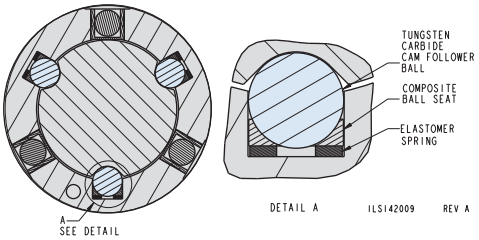
TuffCam™ Swing Clamps

Features, Clocking, Clamp Time and Flow Rates

TuffCam™ 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, Tungsten Carbide ball material for strength and wear, and an elastomer spring, these clamps have reduced static friction for improved clamp breakaway and reduced dynamic friction for improved life.

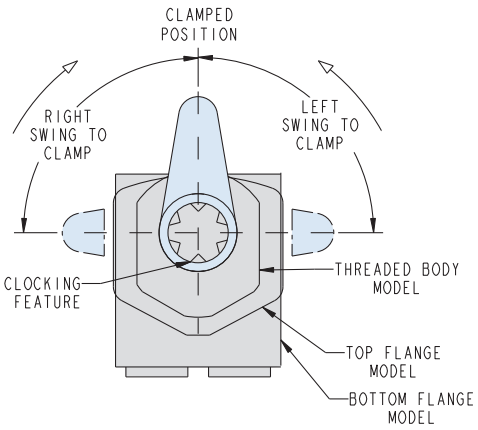
U. S. Patent Nos.
7,032,897
5,820,118

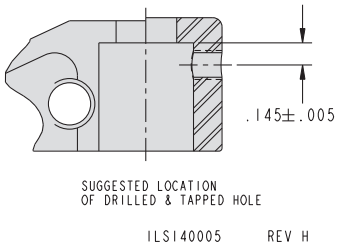
- Available in these body styles:
  - Threaded Body
  - Top Flange Long Stroke
  - Bottom Flange Long Stroke
  - Rod Position Sensing
  - Low Profile Top Flange
  - Top Flange
  - Bottom Flange
  - Cartridge Mount
  - Magnetic Position Sensing
  - Low Profile Bottom Flange
- Single and double acting (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.
- 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.



TuffCam™ Cam Follower Design

- Three cams for more accurate arm positioning, smoother rotation, and lower per cam surface contact pressure
- Composite ball seat improves rotary function, cam follower contact, and reduces friction
- Tungsten carbide ball material





Clamp Time and Fluid Flow Rates, TuffCam™

Swing Clamp Capacity (lb)	Standard Arm		Extended Arm	
	Fastest Allowable Clamp Time (sec.)	Max. Permissible Flow Rate (cu in/min)	Fastest Allowable Clamp Time (sec.)	Max. Permissible Flow Rate (cu in/min)
450	0.2	17	0.5	7
1100	0.3	47	0.7	20
2600	0.4	109	0.8	54
5000	0.5	235	1.0	117

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The flows in the table are maximum recommendations and clamp times are minimum recommendations.

- 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™ Swing Clamps

Threaded Body

Single And Double Acting

- Available in three capacities 450, 1,100 and 2,600 lb.
- 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 ball material for strength and wear.
- Same mounting envelope as standard VektorFlo® Swing Clamps.
- TuffCam™ Clocking feature (page C-2) uses standard length Vektek arm.
- Arms sold separately – see section O.

U. S. Patent No. 7,032,897

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.

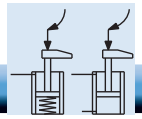
** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above by 5,000, and multiply the Resultant Number 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/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.

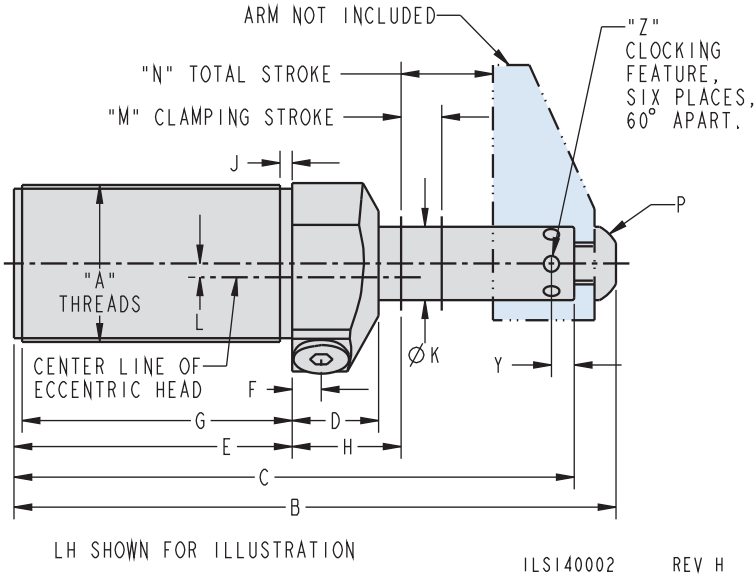
**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-2.

Dimensions

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



Threaded Body



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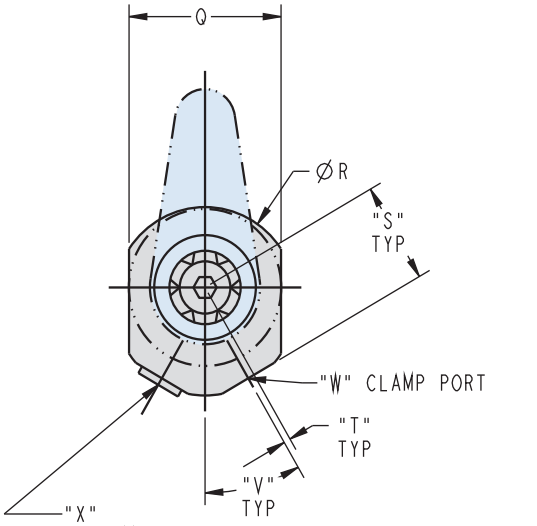
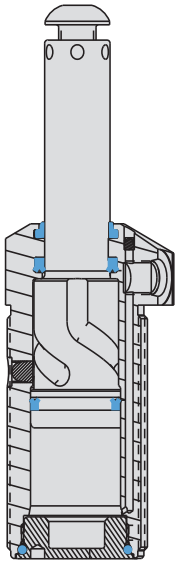


UNCLAMP PORT - D/A
BREATHER PORT - S/A
(BREATHER SHOWN INCLUDED ON S/A MODELS)



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TuffCam™ Swing Clamps

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.

Order arms separately

	K	L	M	N	P	Q	R	S	T	V	W	X	Y±0.005	Z
Cylinders, actuated hydraulically 1 direction, spring returned														
	0.437	0.19	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°
	0.625	0.16	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°
	0.875	0.16	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°
Cylinders, actuated hydraulically both directions														
	0.437	0.19	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°
	0.625	0.16	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°
	0.875	0.16	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°

TuffCam™ Swing Clamp

Top Flange

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 ball material for strength and wear.
- Same mounting envelope as standard VektorFlo® Swing Clamps
- Manifold fitting Model No. 30-8711-20, adapter assembly, and plugs are included and shipped with the clamp. Drawing on page H-5.
- TuffCam™ Clocking feature (page C-2).
- Arms sold separately – see section O.
- Can be either manifold mounted or plumbed (use standard SAE).

U. S. Patent No. 7,032,897

Model No.	Clamp Swing Direction	Cylinder Capacity (lb)**	Vertical Clamping Stroke (in)***	Total Stroke (Swing + Vertical)	Body Dia.	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
14-6118-02-R 14-6118-02-L	Right Left	5000	0.62	1.65	2.37	2.50	1.178	N/A	1.955	70-2037-72
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
14-6218-02-R 14-6218-02-L	Right Left	5000	0.62	1.65	2.37	2.50	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 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/or return springs.)

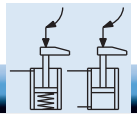
*** To allow for piece part height variations, it is recommended that the vertical travel be set at about 50% of the vertical stroke.

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

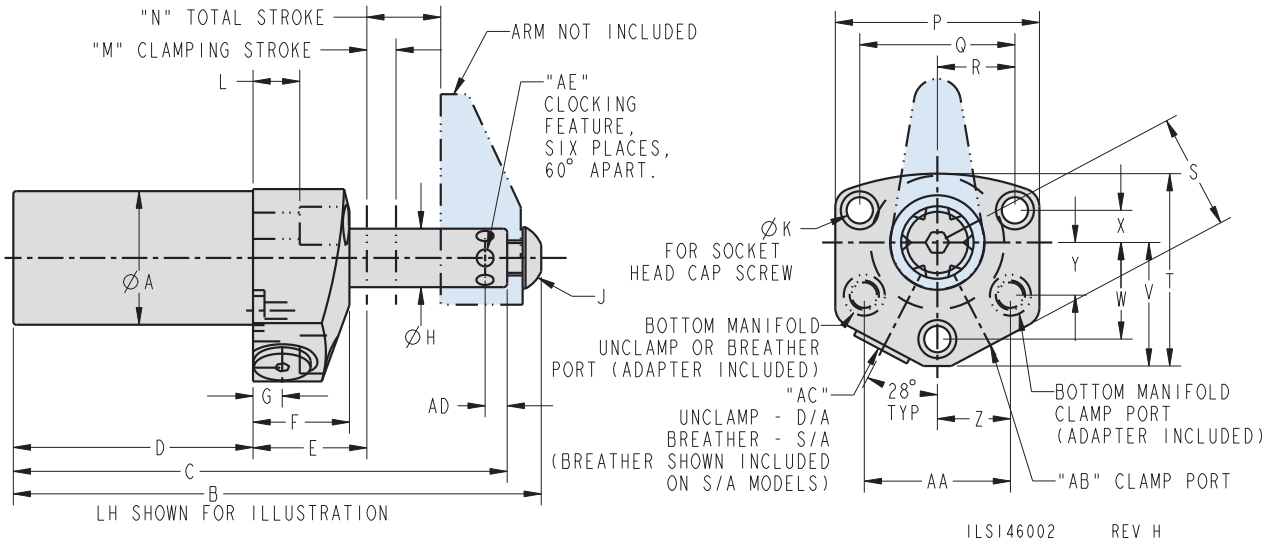
Dimensions

Order arms separately

Model No. Left Swing	Model No. Right Swing	Capacity	A	B	C	D	E	F	G	H	J	K	L
Single Acting (S/A)													
14-6105-01-L	14-6105-01-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
14-6109-01-L	14-6109-01-R	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
14-6113-01-L	14-6113-01-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
14-6118-02-L	14-6118-02-R	5000	2.37	9.92	9.29	4.41	1.80	1.47	0.54	1.250	5/8 - 18 x 0.75	0.41	0.75
Double Acting (D/A)													
14-6205-01-L	14-6205-01-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
14-6209-01-L	14-6209-01-R	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
14-6213-01-L	14-6213-01-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
14-6218-02-L	14-6218-02-R	5000	2.37	9.92	9.29	4.41	1.80	1.47	0.54	1.250	5/8 - 18 x 0.75	0.41	0.75



Top Flange

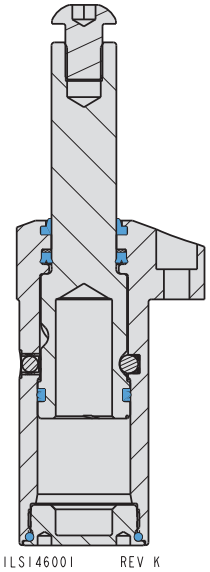


Features

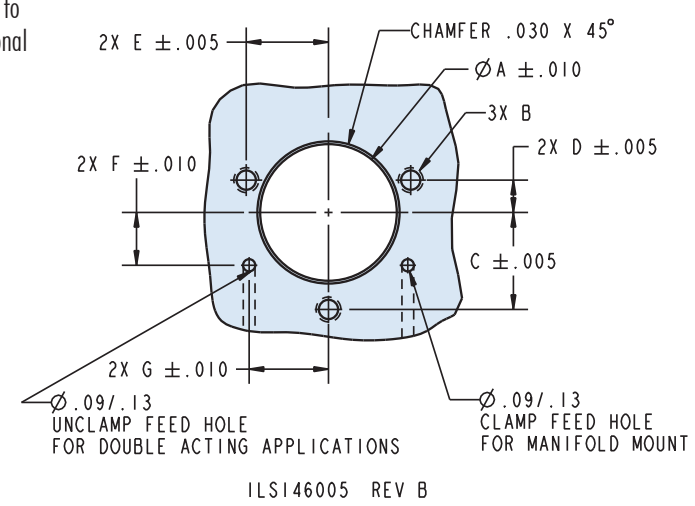
BHC™ (Black Hard Coating) on the cylinder body helps prevent scoring and scratching.

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 μ in R_a surface finish.



Mounting Dimensions

Model No.	A	B	C	D	E	F	G
14-6X05-01-L/R	1.015	10-32	0.795	0.219	0.687	0.438	0.625
14-6X09-01-L/R	1.453	1/4-20	1.032	0.344	0.875	0.562	0.844
14-6X13-01-L/R	1.765	5/16-18	1.250	0.438	1.000	0.531	1.047
14-6X18-02-L/R	2.390	3/8 - 16	1.719	0.601	1.367	0.750	1.406

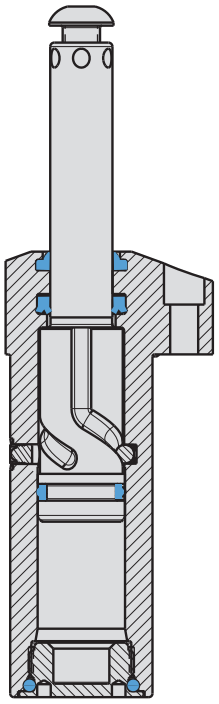
	M	N	P	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD±0.005	AE
Cylinders, actuated hydraulically 1 direction, spring returned																	
	0.22	0.57	1.88	1.38	0.69	0.96	1.58	1.02	0.80	0.22	0.44	0.63	1.25	SAE 2	SAE 2	0.156	Ø.13 X 90°
	0.31	0.79	2.31	1.75	0.88	1.24	2.06	1.32	1.03	0.34	0.56	0.84	1.69	SAE 4	SAE 4	0.156	Ø.19 X 90°
	0.50	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	0.156	Ø.19 X 90°
	0.62	1.65	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	0.156	Ø.19 X 90°
Cylinders, actuated hydraulically both directions																	
	0.22	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	0.156	Ø.13 X 90°
	0.31	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	0.156	Ø.19 X 90°
	0.50	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	0.156	Ø.19 X 90°
	0.62	1.65	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	0.156	Ø.19 X 90°

TuffCam™ Swing Clamps

Top Flange Long Stroke

Double Acting Long Stroke

- Available in 1,100 and 2,600 lb. capacities.
- More than double the vertical clamping stroke for maximum part deviation allowance and swing clearance.
- 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 ball material for strength and wear.
- TuffCam™ Clocking feature (page C-2) uses standard length Vektek arm.
- Arms sold separately – see section O.



ILS146006 REV B

U. S. Patent No. 7,032,897

Model No.*	Clamp Swing Direction	Cylinder Capacity (lb)**	Vertical Clamping Stroke (in)***	Total Stroke (Swing + Vertical)	Body Dia.	Standard Arm Length **	Effective Piston Area (sq in) Retract	Oil Capacity (cu in)**** Extend	Oil Capacity (cu in)**** Retract	Optional Flow Control Model No.
Double Acting (D/A) Cylinders, actuated hydraulically both directions										
14-6209-10-R 14-6209-10-L	Right Left	1100	0.75	1.21	1.43	1.50	0.295	0.73	0.36	70-2037-71
14-6213-10-R 14-6213-10-L	Right Left	2600	1.34	2.00	1.87	2.00	0.626	2.45	1.25	70-2037-71

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

* 2600 lb Long Stroke are not interchangeable with TuffCam™ or Standard Swing Clamp models. Check overall dimensions for correct mounting in fixture.

** 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 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/or return springs.)

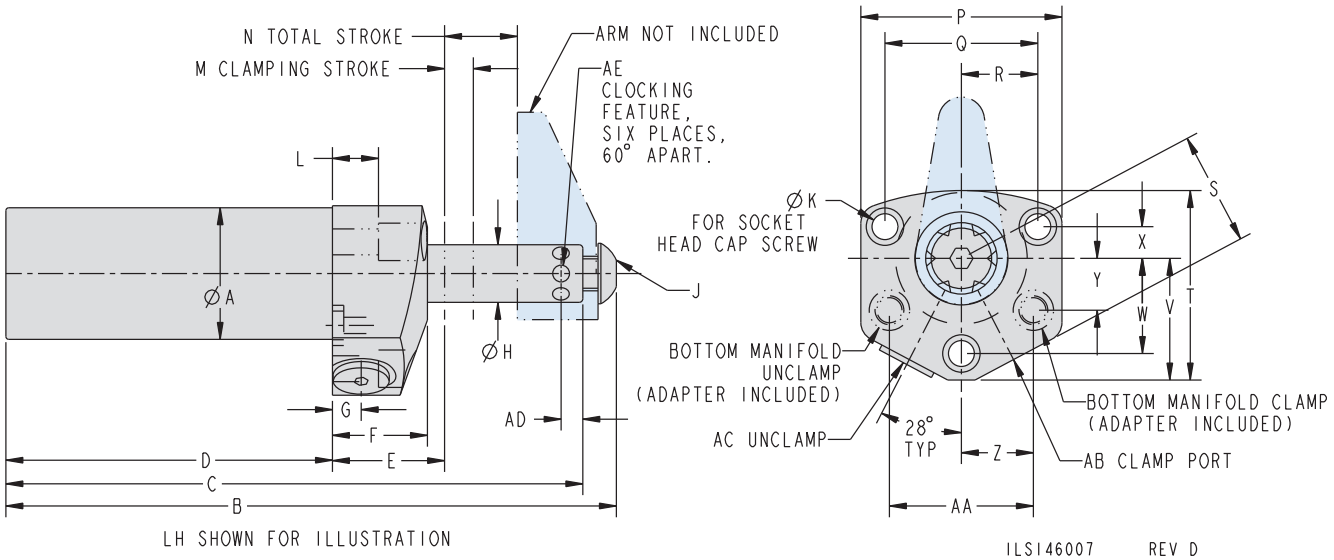
*** To allow for piece part height variations, it is recommended that the vertical travel be set at about 50% of the vertical stroke.

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

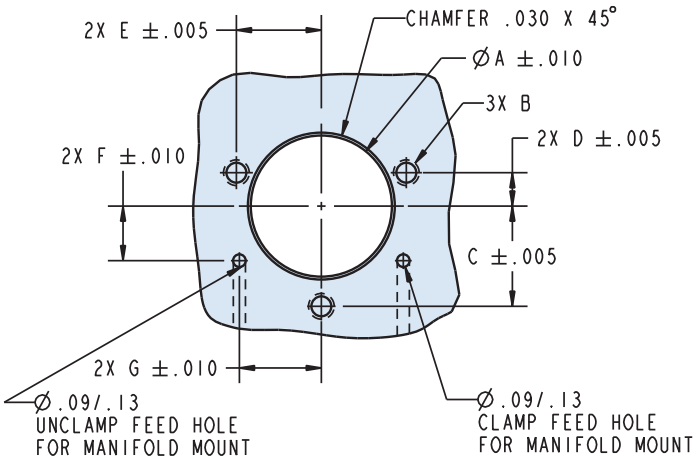
Dimensions

Model No. Left Swing	Model No. Right Swing	Capacity	A	B	C	D	E	F	G	H	J	K	L
Double Acting (D/A)													
14-6209-10-L	14-6209-10-R	1100	1.43	6.93	6.57	3.44	1.21	1.03	0.38	0.625	3/8 - 24 x 0.63	0.28	0.50
14-6213-10-L	14-6213-10-R	2600	1.87	9.80	9.28	4.98	1.30	1.06	0.41	0.875	1/2 - 20 x 0.75	0.34	0.41

Top Flange Long Stroke



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



Mounting Dimensions

Model No.	A	B	C	D	E	F	G
14-6209-10-L/R	1.453	1/4 - 20	1.032	0.344	0.875	0.562	0.844
14-6213-10-L/R	1.885	5/16 - 18	1.250	0.468	1.050	0.750	1.047

	M	N	P	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD	AE
Cylinders, actuated hydraulically both directions																	
	0.75	1.21	2.31	1.75	0.88	1.24	2.08	1.32	1.03	0.34	0.56	0.84	1.69	SAE 4	SAE 4	0.156	Ø 0.19 x 90°
	1.34	2.00	2.71	2.10	1.05	1.53	2.55	1.63	1.25	0.47	0.75	1.05	2.09	SAE 4	SAE 4	0.156	Ø 0.19 x 90°

TuffCam™ Swing Clamp

Bottom Flange

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 ball material for strength and wear.
- TuffCam™ Clocking feature (page C-2) uses standard length Vektek arm.
- Arms sold separately – see section O.

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

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	70-2037-73
14-2118-02-R 14-2118-02-L	Right Left	5000	0.62	1.65	2.50	1.178	N/A	1.955	70-2037-73
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	70-2037-73
14-2218-02-R 14-2218-02-L	Right Left	5000	0.62	1.65	2.50	1.178	3.992	1.955	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 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/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.

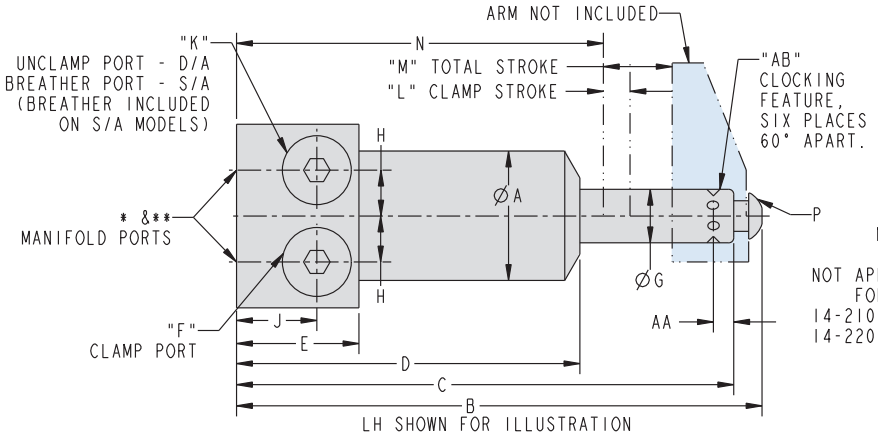
**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-2.

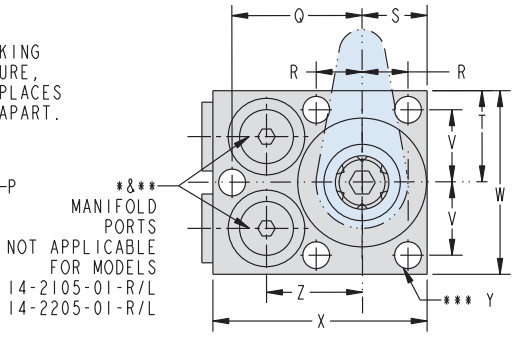
Dimensions

Model No. Left Swing	Model No. Right Swing	Capacity	A	B	C	D	E	F	G	H	J	K	L
Single Acting (S/A)													
14-2105-01-L	14-2105-01-R	450	1.05	4.32	4.06	2.80	1.00	SAE 4	0.438	0.38	0.66	SAE 4	0.22
14-2109-01-L	14-2109-01-R	1100	1.49	5.70	5.33	3.65	1.25	SAE 4	0.625	0.56	0.63	SAE 4	0.31
14-2113-01-L	14-2113-01-R	2600	1.79	7.35	6.83	4.43	1.25	SAE 4	0.875	0.75	0.63	SAE 4	0.50
14-2118-02-L	14-2118-02-R	5000	2.49	9.92	9.29	5.88	1.50	SAE 4	1.250	0.75	0.75	SAE 4	0.62
Double Acting (D/A)													
14-2205-01-L	14-2205-01-R	450	1.05	4.32	4.06	2.80	1.00	SAE 4	0.438	0.38	0.66	SAE 4	0.22
14-2209-01-L	14-2209-01-R	1100	1.49	5.70	5.33	3.65	1.25	SAE 4	0.625	0.56	0.63	SAE 4	0.31
14-2213-01-L	14-2213-01-R	2600	1.79	7.35	6.83	4.43	1.25	SAE 4	0.875	0.75	0.63	SAE 4	0.50
14-2218-02-L	14-2218-02-R	5000	2.49	9.92	9.29	5.88	1.50	SAE 4	1.250	0.75	0.75	SAE 4	0.62

TuffCam™ Swing Clamp

Bottom Flange





ILSI42002 REV K

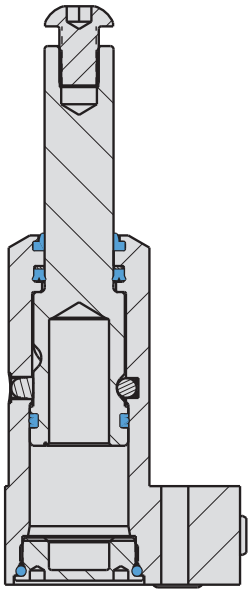
For proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μ in R_a surface finish.

DRAWING NOTES:

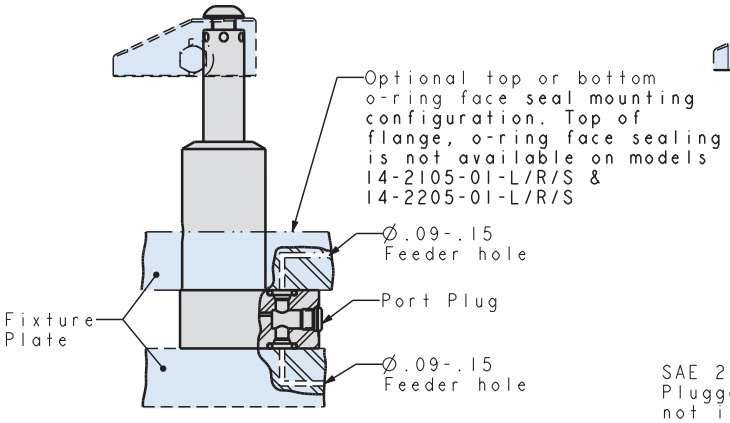
* All ports (except breather) are shipped with removable steel plugs installed.

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

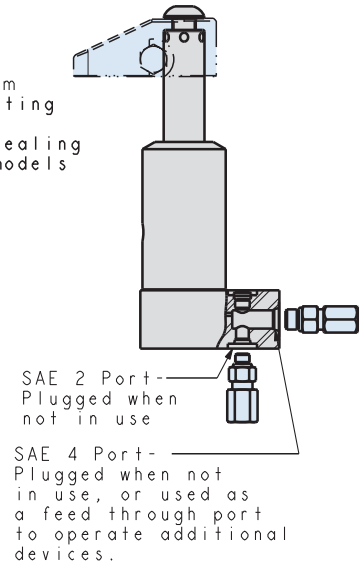
*** When used as manifold mounted, all 5 mounting bolts must be used to assure proper o-ring face sealing.



ILSI42001 REV M



ILSI42005 REV B



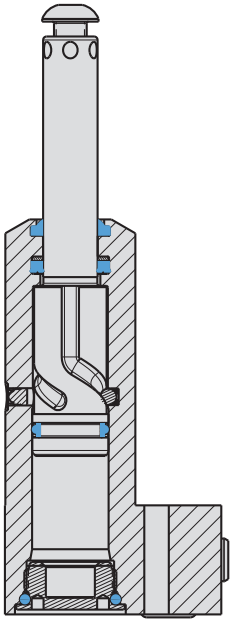
	M	N	P	Q	R	S	T	V	W	X	Y	Z	AA±0.005	AB
Cylinders, actuated hydraulically 1 direction, spring returned														
	0.57	2.99	1/4-28 X 0.38	1.06	0.38	0.53	0.75	0.59	1.50	1.75	0.22	0.78	0.156	Ø 0.13 X 90°
	0.79	3.83	3/8-24 X 0.63	0.99	0.56	0.75	1.00	0.81	2.00	2.50	0.28	1.13	0.156	Ø 0.19 X 90°
	1.16	4.67	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°
	1.65	6.20	5/8-18 x 0.75	2.25	1.06	1.38	1.50	1.19	3.00	3.98	0.41	1.81	0.156	Ø 0.19 X 90°
Cylinders, actuated hydraulically both directions														
	0.57	2.99	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°
	0.79	3.83	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°
	1.16	4.67	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°
	1.65	6.20	5/8-18 x 0.75	2.25	1.06	1.38	1.50	1.19	3.00	3.98	0.41	1.81	0.156	Ø 0.19 X 90°

TuffCam™ Swing Clamps

Bottom Flange Long Stroke

Double Acting Long Stroke

- Available in 1,100 and 2,600 lb capacities.
- More than double the vertical clamping stroke for maximum part deviation allowance and swing clearance.
- 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 ball material for strength and wear.
- TuffCam™ Clocking feature (page C-2) uses standard length Vektek arm.
- Arms sold separately – see section O.



ILS142006 REV B

U. S. Patent No. 7,032,897

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.
Double Acting (D/A)						Cylinders, actuated hydraulically both directions			
14-2209-10-R 14-2209-10-L	Right Left	1100	0.75	1.21	1.50	0.295	0.73	0.36	70-2037-73
14-2213-10-R 14-2213-10-L	Right Left	2600	1.34	2.00	2.00	0.626	2.45	1.25	70-2037-73

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

* 2600 lb Long Stroke may not be interchangeable with TuffCam™ or Standard Swing Clamp models. Check overall dimensions for correct mounting in fixture.

** 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 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/or return springs.)

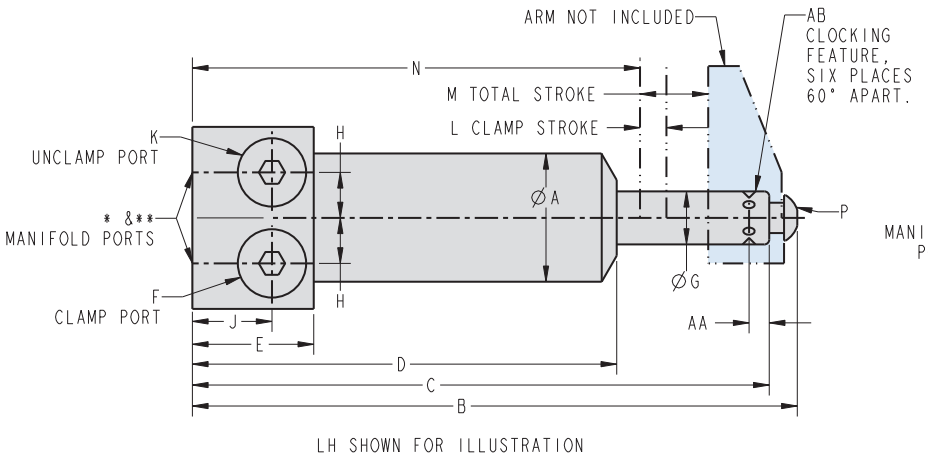
*** To allow for piece part height variations, it is recommended that the vertical travel be set at about 50% of the vertical stroke.

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

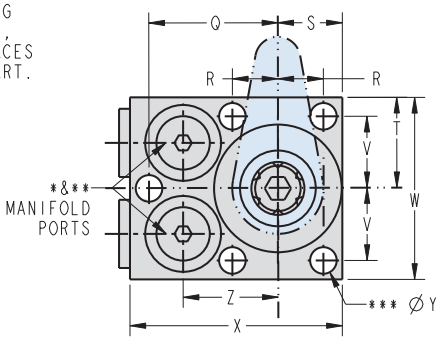
Dimensions

Model No. Left Swing	Model No. Right Swing	Capacity	A	B	C	D	E	F	G	H	J	K	L
Double Acting (D/A)													
14-2209-10-L	14-2209-10-R	1100	1.49	6.97	6.62	4.53	1.25	SAE 4	0.625	0.56	0.63	SAE 4	0.75
14-2213-10-L	14-2213-10-R	2600	1.87	9.84	9.34	6.10	1.25	SAE 4	0.875	0.75	0.63	SAE 4	1.34

Bottom Flange Long Stroke



LH SHOWN FOR ILLUSTRATION



ILS142007 REV E

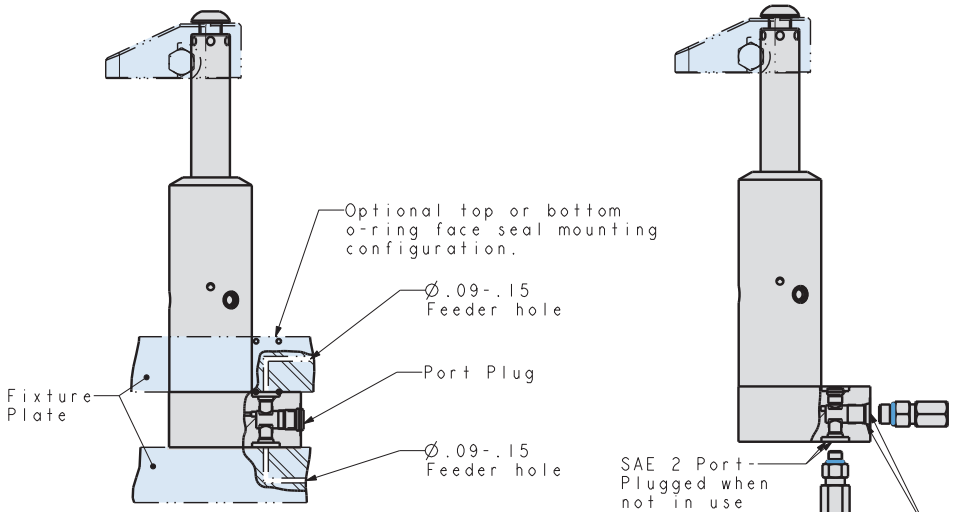
For proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μ in R_a surface finish.

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.



ILS142008 REV B

	M	N	P	Q	R	S	T	V	W	X	Y	Z***	AA	AB
Cylinders, actuated hydraulically both directions														
	1.21	4.70	3/8 - 24 x 0.63	0.99	0.56	0.75	1.00	0.81	2.00	2.48	0.28	1.13	0.156	Ø 0.19 x 90°
	2.00	6.34	1/2 - 20 x 0.75	1.21	0.69	0.94	1.25	1.00	2.50	2.98	0.34	1.25	0.156	Ø 0.19 x 90°

TuffCam™ Swing Clamp

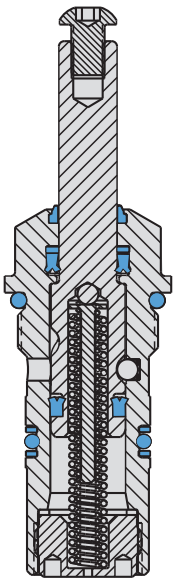
Cartridge Mount

Single And Double Acting

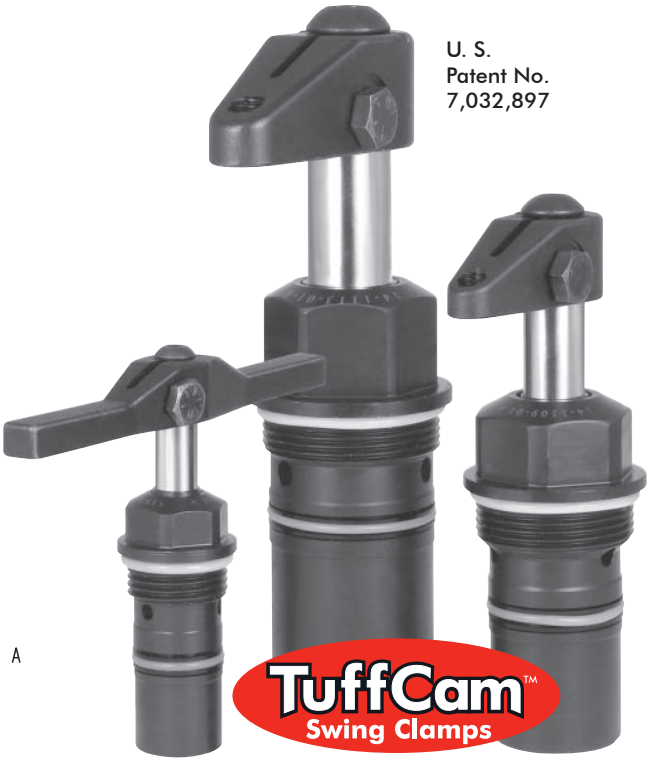
- Three cams for accurate arm positioning, smoother rotation and lower per cam surface contact pressure.
- Patented ball seat for improved rotary function, cam follower contact, and reduced dynamic and static friction.
- Fluorocarbon wipers are standard for improved coolant compatibility.
- Tungsten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

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

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.



ILS141100 REV A



U. S. Patent No. 7,032,897

C-13

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	Right 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 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/or return springs.)

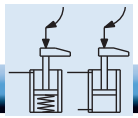
*** To allow for piece part height variations, it is recommended that the vertical travel be set at about 50% of the vertical stroke.

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

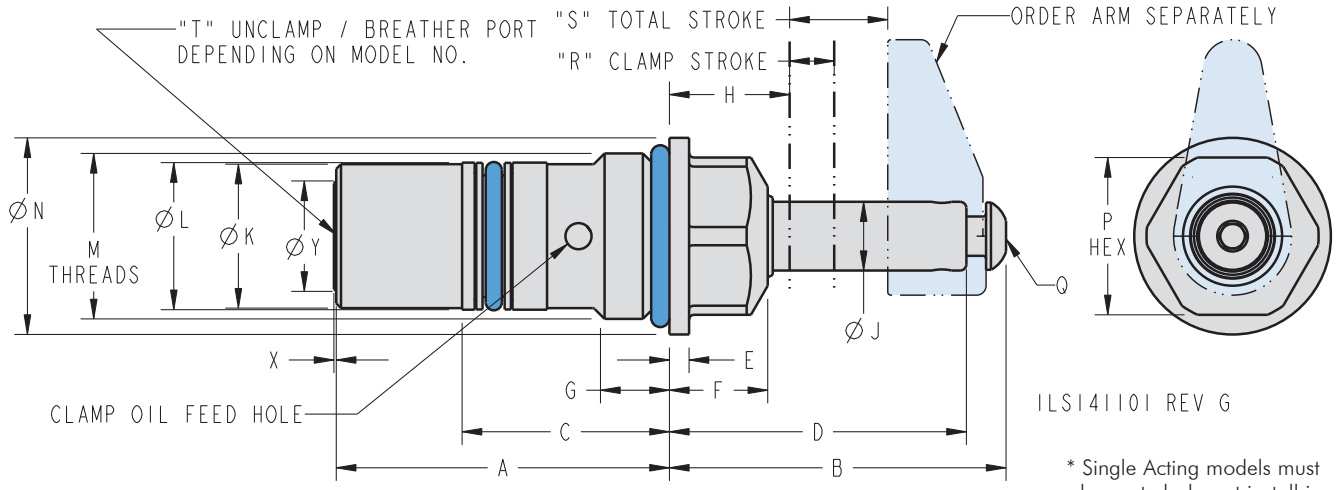
Dimensions

Model No. Left Swing	Model No. Right Swing	Capacity	A	B	C	D	E	F	G
Single Acting (S/A)									
14-1105-01-L	14-1105-01-R	450	2.12	2.13	1.32	1.88	0.13	0.63	0.49
14-1109-01-L	14-1109-01-R	1100	2.66	2.98	1.50	2.63	0.13	0.94	0.65
14-1113-01-L	14-1113-01-R	2600	3.13	4.17	1.50	3.65	0.16	1.25	0.55
Double Acting (D/A)									
14-1205-01-L	14-1205-01-R	450	2.12	2.13	1.32	1.88	0.13	0.63	0.49
14-1209-01-L	14-1209-01-R	1100	2.66	2.98	1.50	2.63	0.13	0.94	0.65
14-1213-01-L	14-1213-01-R	2600	3.13	4.17	1.50	3.65	0.16	1.25	0.55

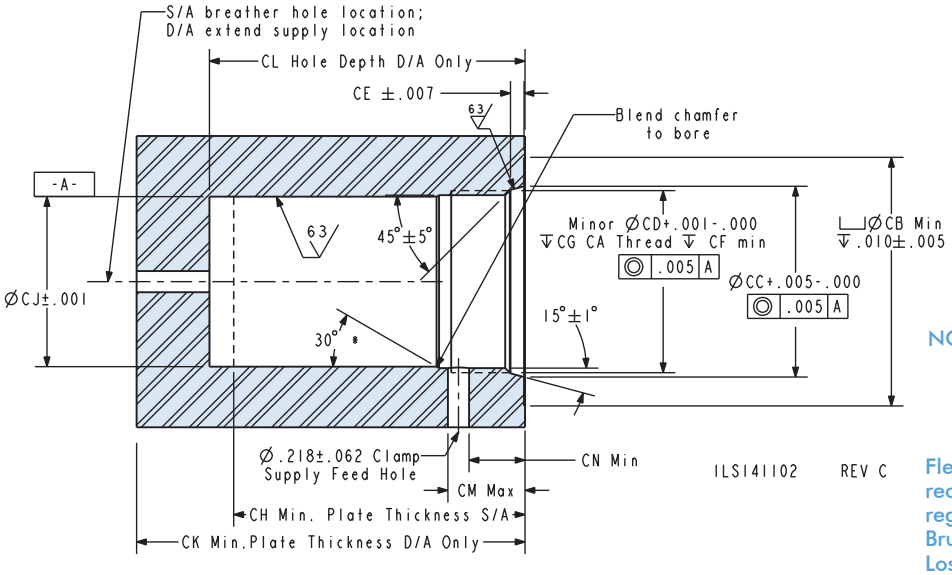
TuffCam™ Swing Clamp



Cartridge Mount



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



Basic cavity can be formed with a standard (SAE J1926/1 Port Detail) O-ring Port Cutter

NOTE: Basic Cavity can be formed with a standard (SAE J1926/1 Port Detail) o-ring Port Contour Cutter

Flexible honing of cavity is strongly recommended. Flex-Hone™ is a registered trademark of Brush Research Manufacturing Co. Inc., Los Angeles, CA,

Please contact Brush Research for additional information. 323-261-2193

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					
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

	H	J	K	L	M	N	P	Q	R	S	T	X	Y
											Cylinders, actuated hydraulically 1 direction, spring returned		
	0.83	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	N/A	N/A
	1.13	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	0.02	1.03
	1.49	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	0.02	1.40
											Cylinders, actuated hydraulically both directions		
	0.83	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	N/A	N/A
	1.13	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	0.02	1.03
	1.49	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	0.02	1.40

TuffCam™ Swing Clamp

Rod Position Sensing

Rod Position Sensing Swing Clamps

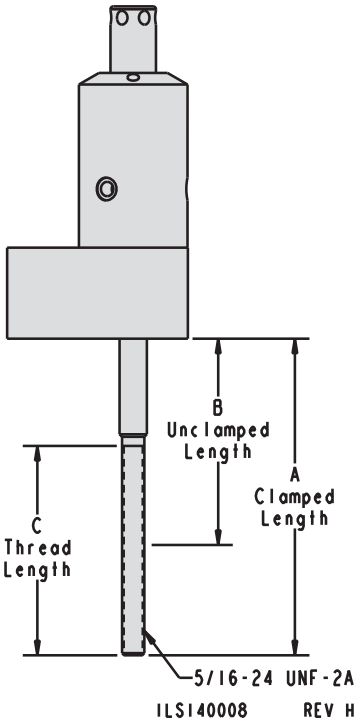
- For use with Double Acting TuffCam™ clamps only.
- Available for use on TuffCam™ Swing Clamp with capacities of 1,100 lbs. and 2,600 lbs. (excluding Long Stroke models)
- Actuator Rod Position System can be used with a mechanical switch or air logic system to detect when clamp is in position.
- Actuator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

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

U. S. Patent No. 7,032,897

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	70-2037-73
14-2209-01-L-PR	Left					
14-2213-01-R-PR	Right	2600	5.04	3.88	3.63	70-2037-73
14-2213-01-L-PR	Left					

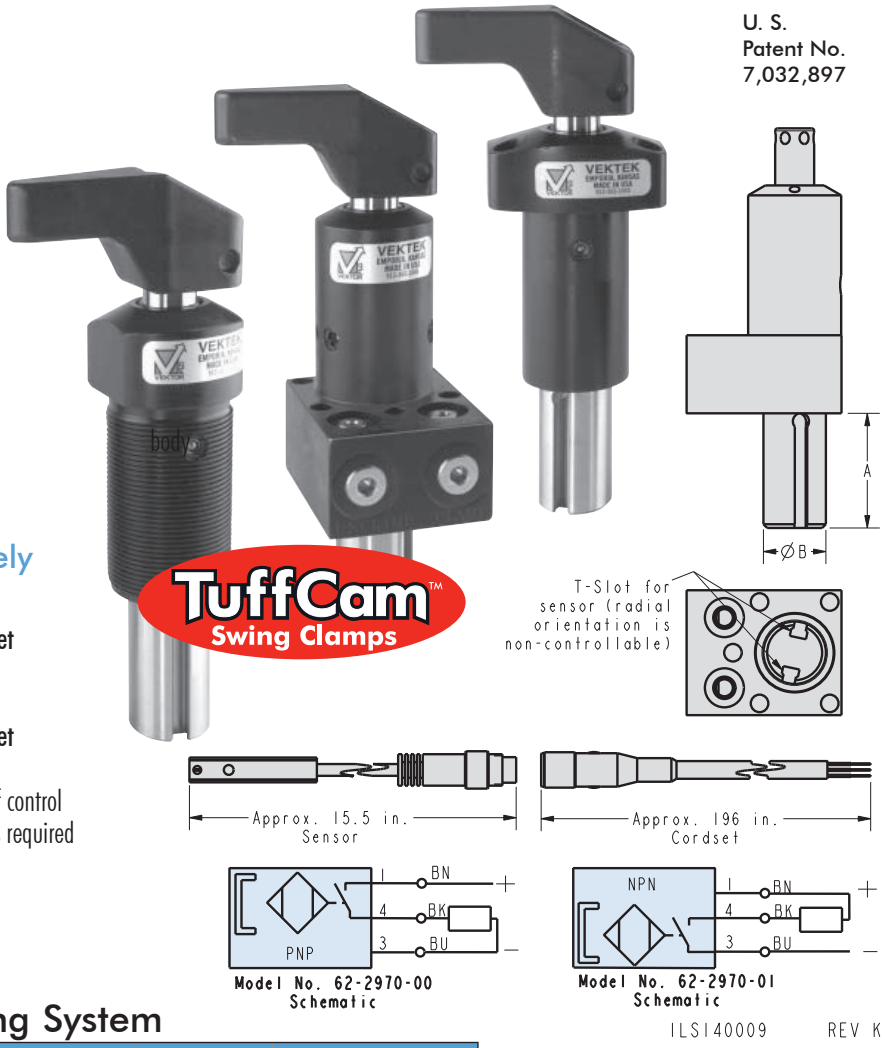


Magnetic Position Sensing Swing Clamps

- Sensors sold separately.
- Sensor mounting housing is concentric to plunger shaft.
- For use with Double Acting clamps only.
- Available for TuffCam™ Swing Clamps 450, 1,100 and 2,600 lb models only (excludes Long Stroke models).
- TuffCam™ Clocking feature uses standard length Vektek arm (page C-2).

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

U. S. Patent No. 7,032,897



Sensor Kits Ordered Separately

62-2970-00 PNP Position Sensing Kit includes:
a 29-7001-00 Sensor and a 27-6424-00 Cord set

62-2970-01 NPN Position Sensing Kit includes:
a 29-7001-01 Sensor and a 27-6424-00 Cord set

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

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	Right	450	1.72	1.00	N/A
14-0205-01-L-PS	Left				
14-0209-01-R-PS	Right	1100	1.89	1.00	N/A
14-0209-01-L-PS	Left				
14-0213-01-R-PS	Right	2600	2.27	1.00	N/A
14-0213-01-L-PS	Left				
TuffCam™ Top Flange (D/A) clamps, hydraulic retract and extend					
14-6205-01-R-PS	Right	450	1.72	1.00	70-2037-70
14-6205-01-L-PS	Left				
14-6209-01-R-PS	Right	1100	1.89	1.00	70-2037-71
14-6209-01-L-PS	Left				
14-6213-01-R-PS	Right	2600	2.27	1.00	70-2037-71
14-6213-01-L-PS	Left				
TuffCam™ Bottom Flange (D/A) clamps, hydraulic retract and extend					
14-2205-01-R-PS	Right	450	1.66	1.00	70-2037-71
14-2205-01-L-PS	Left				
14-2209-01-R-PS	Right	1100	1.84	1.00	70-2037-73
14-2209-01-L-PS	Left				
14-2213-01-R-PS	Right	2600	2.21	1.00	70-2037-73
14-2213-01-L-PS	Left				

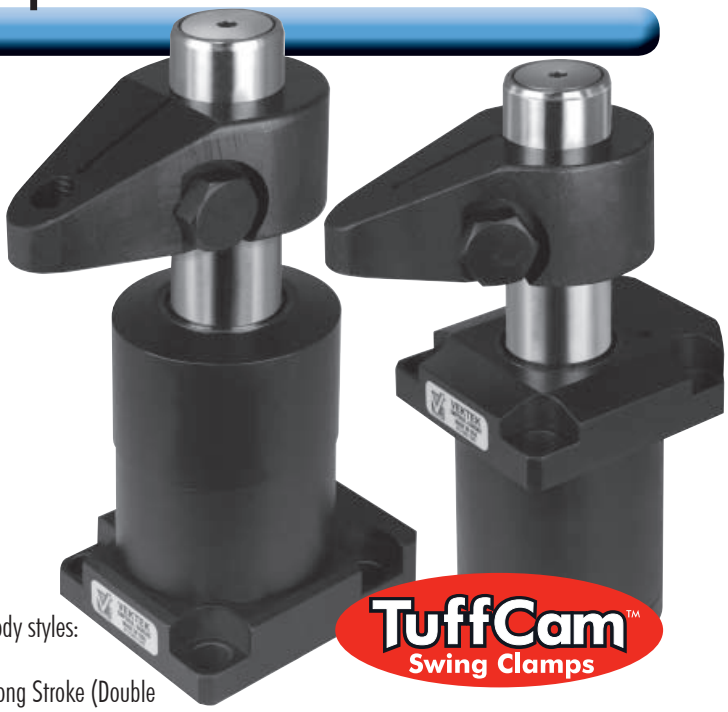
These systems available for Double Acting TuffCam™ Swing Clamps only.

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

TuffCam™ Swing Clamps

Low Profile Features



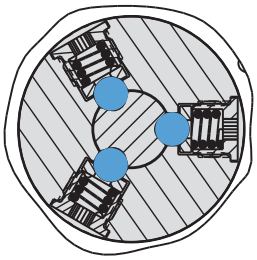
* Tougher Cams
* Stronger Single Acting Springs
* Precise Swing Angle
* Clocking

TuffCam™ Low Profile Swing Clamps

Vektek's TuffCam™ Low Profile Swing Clamps meet your demand for speed, precise positioning, heavy arm applications and/or clamping capacity up to 7500 lbs. These Low Profile tri-cam design clamps, with their exclusive Cam Follower Seat, can position and clamp in one second or less, handle large arms with ease and include the Clocking feature that dramatically reduces the time it takes to change arms for maintenance, replacement or fixture setup.

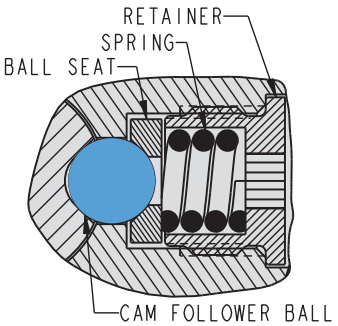
One of the keys to this TuffCam™ innovation is the Cam Follower Ball Seat that was developed to improve strength and wear. Using the Vektek patented V-Groove technology, tungsten carbide ball material for strength and wear, and a stainless steel spring, these clamps have reduced static friction for improved clamp breakaway and extended life.

- Available in these body styles:
  - Top Flange
  - Top Flange Long Stroke (Double Acting Only)
  - Bottom Flange
- Single and double acting models available. The Single Acting models have increased spring forces for positive return in higher backpressure applications.
- 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.



TuffCam™ Low Profile Swing Clamp Cam Follower Design

- Three cams for more accurate arm positioning, smoother rotation, and lower per cam surface contact pressure.
- Patented stainless steel ball seat for improved rotary function, cam follower contact, and reduced dynamic and static friction.
- Increased cam groove contact force provided by stainless steel spring.
- Ball material of Tungsten carbide, one of the world's hardest materials.



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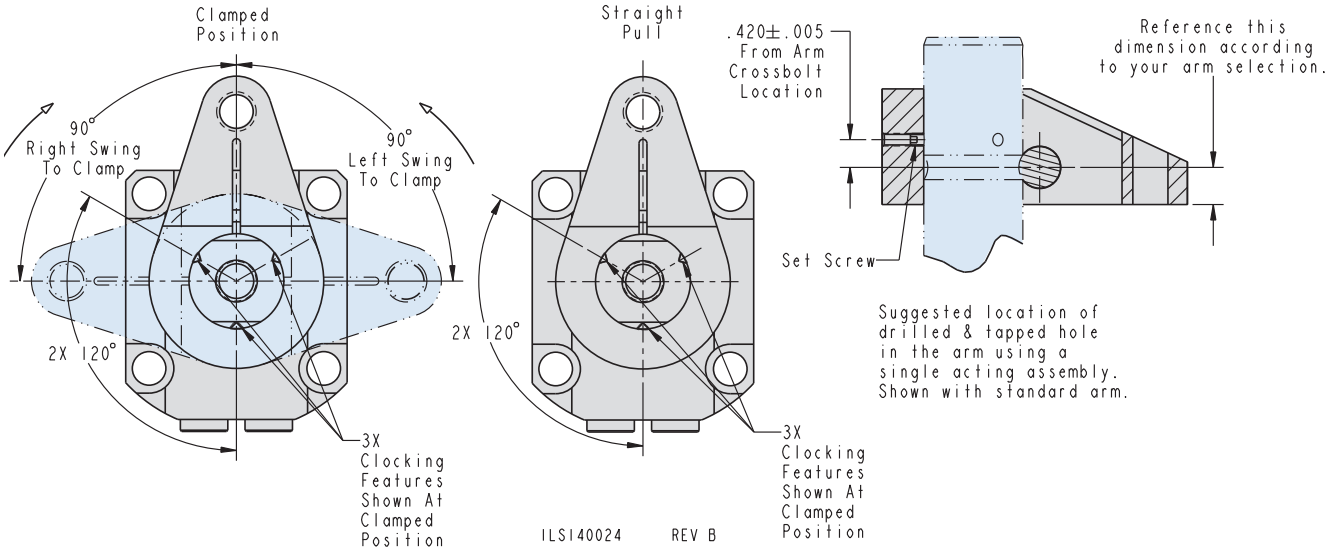
VEKTEK

TuffCam™ Clocking Features

We have added 3 clocking features to Vektek's Low Profile Swing Clamp line. Customers have requested the clocking features to help improve and speed-up arm changes.

Another customer request fulfilled by Vektek...

A drill point on each clamp standardizes arm location at a particular position. An additional 2 (two) orientation drill points reside 120° out from that position and each other. 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.



TuffCam™ Low Profile Swing Clamp Arm Clocking Feature

Views shown apply to double and single acting TuffCam™ Top Flange and Bottom Flange models.
Three counter sunk Ø .19 x 90° clocking feature drill points are shown in the clamped position.
The three (3) Clocking features are equally spaced 120°.

Clamp Time and Fluid Flow Rates for TuffCam™ Swing Clamps

Swing Clamp Capacity (lb)	Standard Arm		Extended Arm	
	Fastest Allowable Clamp Time (sec.)	Maximum Permissible Flow Rate (cu in/min)	Fastest Allowable Clamp Time (sec.)	Maximum Permissible Flow Rate (cu in/min)
5000	0.5	155	1.0	78
7500	0.5	251	1.0	126

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

ILS150108 REV G

The above flows are maximum recommendations and clamp times are minimum recommendations.

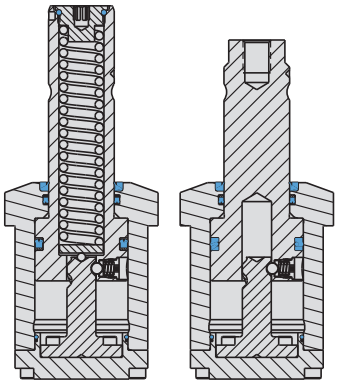
- For upreach and double arms, use extended arm flows and times.
- When using custom arms the extended arm flows and times are to be considered the limiting factor.
- The actual time to position the clamp will vary by custom arm configuration and may require customer testing in specific application to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

TuffCam™ Swing Clamp

Low Profile Top Flange

Single And Double Acting

- Single Acting models have increased spring force for positive return in higher backpressure applications.
- Manifold and SAE mounting capability .
- Low Profile Swing Clamp Arm dimensions are found on pages O-8 and O-9.
- One piece body construction reduces potential leak paths and improves rigidity.
- Tungsten Carbide ball material for strength and wear.
- To avoid cylinder damage and preserve warranty, see page C-18 regarding flow rate limits and time calculations to be observed.
- TuffCam™ Low Profile Clocking feature uses standard length Vektek arm (page C-18).



C-19

Model No.	Clamp Swing Direction	Cylinder Capacity (lb)	Vertical Clamping Stroke (in)***	Total Stroke (Swing + Vertical)	Std 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**				
14-0521-00	Right		0.62							
14-0521-01	Left	7500	0.62	1.18	2.68	N/A	1.787	N/A	2.092	70-2037-72
14-0521-02	Straight		1.18							
Double Acting (D/A)						**Cylinders, actuated hydraulically both directions**				
14-0621-00	Right		0.62							
14-0621-01	Left	7500	0.62	1.18	2.68	3.553	1.787	4.177	2.092	70-2037-72
14-0621-02	Straight		1.18							
Double Acting (D/A) Long Stroke						**Cylinders, actuated hydraulically both directions**				
14-0621-03	Right		1.25							
14-0621-04	Left	7500	1.25	1.81	2.68	3.553	1.787	6.407	3.209	70-2037-72
14-0621-05	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 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/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-18.

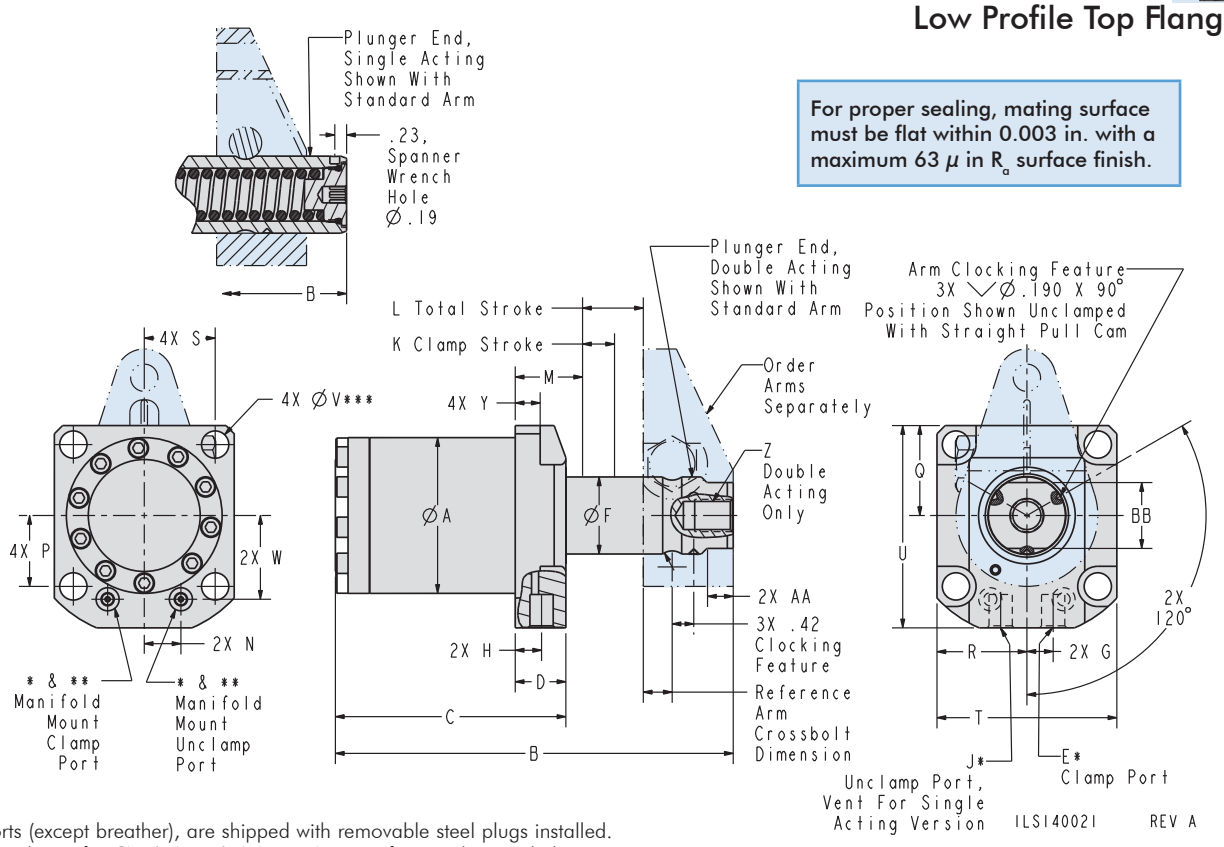
Dimensions

Model No.	ØA	B	C	D	E*	F	G	H	J*	K	L	M
Single Acting (S/A)												
14-0521-00												
14-0521-01	3.03	8.52	4.49	0.99	SAE 4	1.500	0.51	0.51	Breather	0.62	1.18	1.31
14-0521-02												
Double Acting (D/A)												
14-0621-00												
14-0621-01	3.03	7.74	4.49	0.99	SAE 4	1.500	0.51	0.51	SAE 4	0.62	1.18	1.31
14-0621-02												
Double Acting (D/A) Long Stroke												
14-0621-03												
14-0621-04	3.03	8.99	5.11	0.99	SAE 4	1.500	0.51	0.51	SAE 4	1.25	1.81	1.31
14-0621-05												

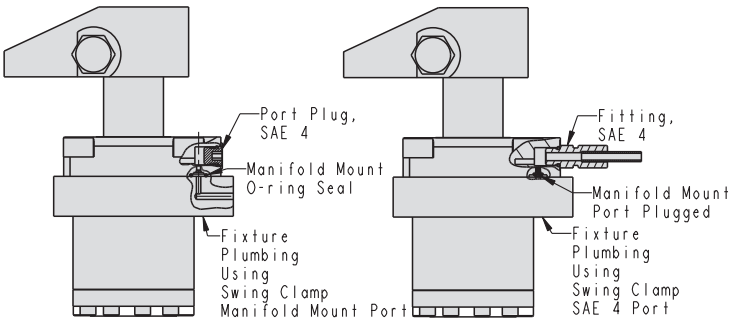
TuffCam™ Swing Clamp

Low Profile Top Flange

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



* 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 four (4) mounting bolts must be used to assure proper o-ring face sealing. Recommended fastener sizes are listed in column CC.



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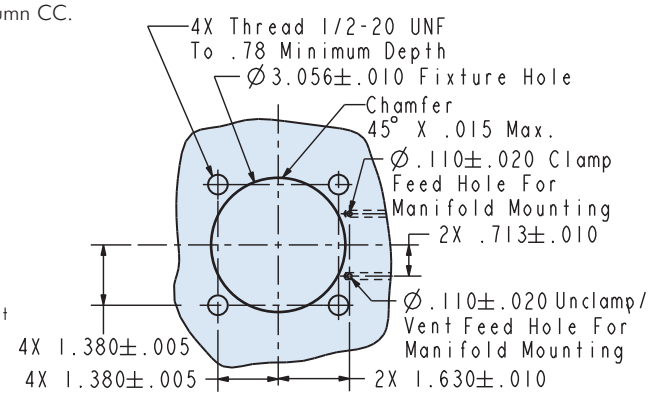


Mounting Dimensions
Model No. 14-0521-XX
Model 14-0621-XX

ILS140023 REV A

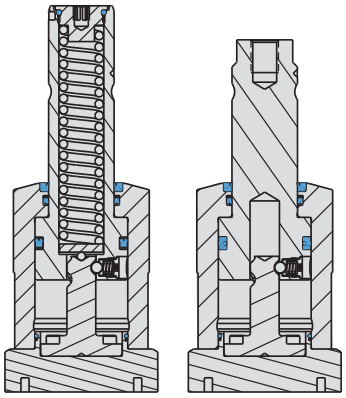
	N	P	Q	R	S	T	U	V***	W	Y	Z	AA	BB	CC
Cylinders, actuated hydraulically 1 direction, spring returned														
	0.71	1.38	1.75	1.75	1.38	3.50	3.94	0.53	1.63	0.49	N/A	N/A	N/A	1/2 -20 x 1.25
Cylinders, actuated hydraulically both directions														
	0.71	1.38	1.75	1.75	1.38	3.50	3.94	0.53	1.63	0.49	M16 x 2.0, Depth 0.75	0.50	1.31	1/2 -20 x 1.25
Cylinders, actuated hydraulically both directions														
	0.71	1.38	1.75	1.75	1.38	3.50	3.94	0.53	1.63	0.49	M16 x 2.0, Depth 0.75	0.50	1.31	1/2 -20 x 1.25

TuffCam™ Swing Clamp

Low Profile Bottom Flange

Single And Double Acting

- Single Acting models have increased spring forces for positive return in higher backpressure applications.
- Manifold mounting capability as well as SAE porting.
- Low Profile Swing Camp Arm dimensions are found on pages 0-8 and 0-9.
- One piece body construction reduces potential leak paths and improves rigidity.
- Tungsten Carbide ball material for strength and wear.
- To avoid cylinder damage and preserve warranty, see page C-18 regarding flow rate limits and time calculations to be observed.
- TuffCam™ Low Profile Clocking feature uses standard length Vektek arm (page C-18).



Model No.	Clamp Swing Direction	Cylinder Capacity (lb)**	Vertical Clamping Stroke (in)***	Total Stroke (Swing + Vertical)	Std 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**
14-2718-00	Right	5000	0.56	1.10	2.50	N/A	1.184	N/A	1.295	70-2037-72
14-2718-01	Left		0.56							
14-2718-02	Straight		1.10							
14-2121-00	Right	7500	0.62	1.18	2.68	N/A	1.787	N/A	2.092	70-2037-72
14-2121-01	Left		0.62							
14-2121-02	Straight		1.18							
Double Acting (D/A)										**Cylinders, actuated hydraulically both directions**
14-2818-00	Right	5000	0.56	1.10	2.50	2.411	1.184	2.647	1.295	70-2037-72
14-2818-01	Left		0.56							
14-2818-02	Straight		1.10							
14-2221-00	Right	7500	0.62	1.18	2.68	3.553	1.787	4.177	2.092	70-2037-72
14-2221-01	Left		0.62							
14-2221-02	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 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/or return springs.)

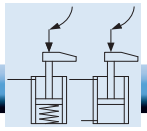
*** To allow for piece part height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-18.

Dimensions

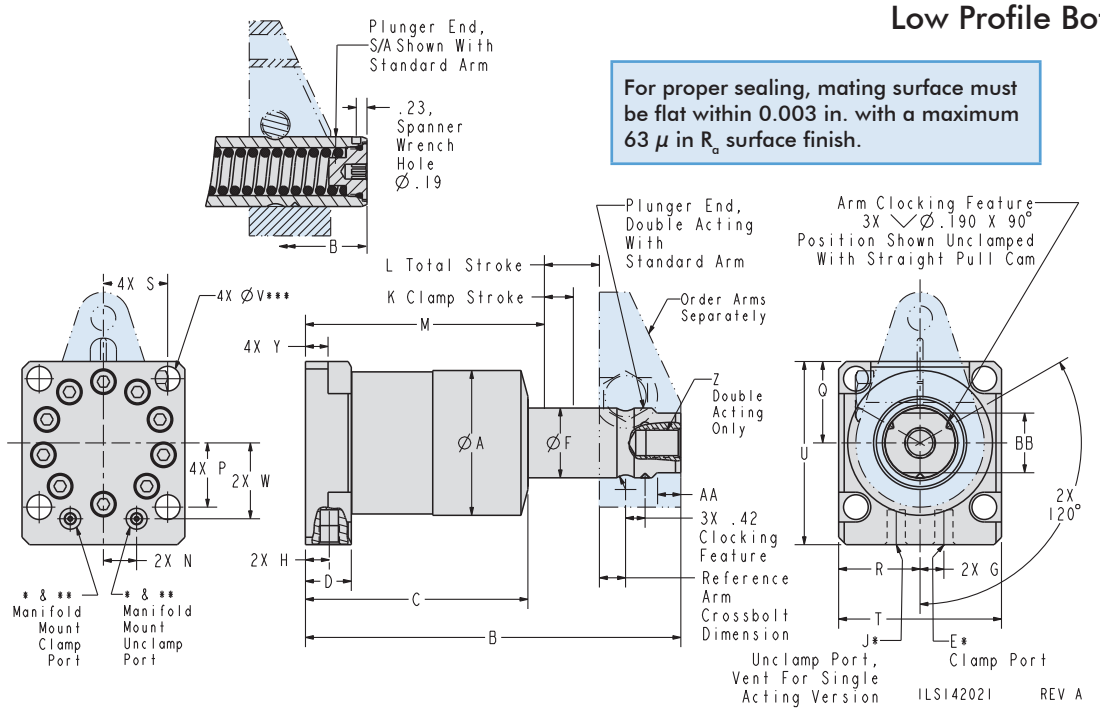
Model No.	A	B	C	D	E*	F	G	H	J*	K	L	M	N	P
Single Acting (S/A)														
14-2718-00	2.47	8.04	4.41	0.98	SAE 4	1.250	0.51	0.49	Breather	0.56	1.10	4.76	0.57	1.08
14-2718-01														
14-2718-02														
14-2121-00	3.11	8.85	4.78	0.99	SAE 4	1.500	0.51	0.51	Breather	0.62	1.18	5.14	0.71	1.38
14-2121-01														
14-2121-02														
Double Acting (D/A)														
14-2818-00	2.47	7.63	4.41	0.98	SAE 4	1.250	0.51	0.49	SAE 4	0.56	1.10	4.76	0.57	1.08
14-2818-01														
14-2818-02														
14-2221-00	3.11	8.07	4.78	0.99	SAE 4	1.500	0.51	0.51	SAE 4	0.62	1.18	5.14	0.71	1.38
14-2221-01														
14-2221-02														

TuffCam™ Swing Clamp

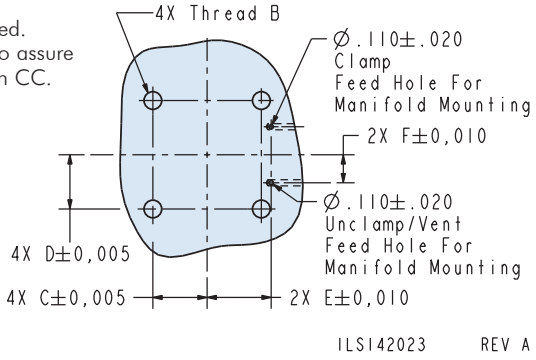


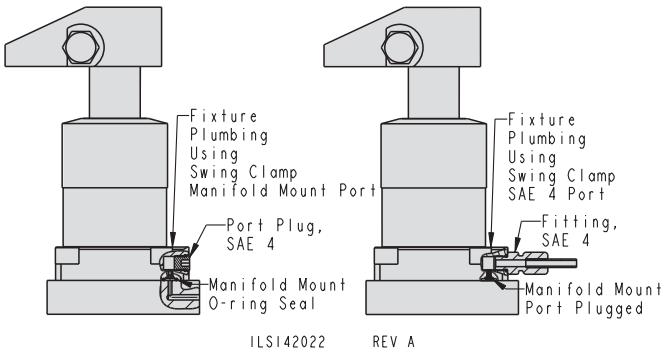
Low Profile Bottom Flange

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



* All ports (except breather), are shipped with removable steel plugs installed.
** Counter bores for Ø7/16 diameter x 1/16 (2-011) o-ring face seals provided.
*** When used as manifold mounted, all four (4)mounting bolts must be used to assure proper o-ring face sealing. Recommended fastener sizes are listed in column CC.





Mounting Dimensions

Model No.	B	C	D	E	F
14-2718-XX 14-2818-XX	3/8 - 24 DP 0.59	1.080	1.080	1.381	0.572
14-2121-XX 14-2221-XX	1/2 - 20 DP 0.78	1.380	1.380	1.630	0.713

	Q	R	S	T	U	V***	W	Y	Z	AA	BB	CC
Cylinders, actuated hydraulically 1 direction, spring returned												
	1.39	1.39	1.08	2.79	3.37	0.42	1.38	0.52	N/A	N/A	N/A	3/8 - 24
	1.75	1.75	1.38	3.50	3.94	0.53	1.63	0.49	N/A	N/A	N/A	1/2 - 20
Cylinders, actuated hydraulically both directions												
	1.39	1.39	1.08	2.79	3.37	0.42	1.38	0.52	M16 x 2.0 Depth 0.75	0.50	1.06	3/8 - 24
	1.75	1.75	1.38	3.50	3.94	0.53	1.63	0.49	M16 x 2.0 Depth 0.75	0.50	1.31	1/2 - 20

Frequently Asked Questions

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 clamps. 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 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: "Can the operator put that fraction of a second to good use?" If the answer is no, slow the clamp down. You may want to consider TuffCam™ Swing Clamps when speed is critical to your process.

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-29, In-port Flow Controls found on page M-2 (if available for your clamp type), or you may 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 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-29). Look to this clamp as a solution to the time sensitivity 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?

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. We have designed a pneumatic Swing Clamp line; please see our pneumatic catalog.

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 (page O-3), 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 clamp's force. Confirm that your Swing Clamp and work support are sized properly. Sequencing is recommended above 2,000 psi only. Use 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 of pressure. 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 lb 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 TuffCam™ Swing Clamp?

TuffCam™ 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.

Standard Swing Clamps

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 help 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.

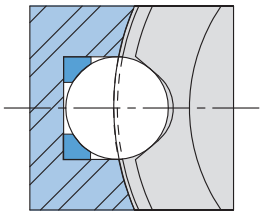
and coolants from sucking past wipers (Unclamp port on double-acting models).

- 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.

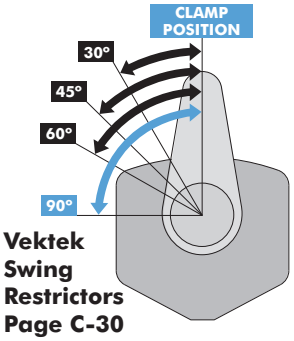
U.S. Patent
Nos. 5,820,118
6,886,820

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) than other clamps.
- 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-24 to C-36) 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.
- Vektek changes the "state-of-the-art" in ball and cam Swing Clamps making them work better at reasonable prices.



SWING CLAMP "V" GROOVE
ILS150103 REV B



Vektek Swing Restrictors Page C-30

Clamp Time and Fluid Flow Rates for Standard Swing Clamps

Swing Clamp Capacity (lb)	Standard Arm		Extended Arm	
	Fastest Allowable Clamp Time (sec.)	Maximum Permissible Flow Rate (cu in/min)	Fastest Allowable Clamp Time (sec.)	Maximum Permissible Flow Rate (cu in/min)
450	0.4	8	0.9	4
1100	0.6	23	1.2	12
2600	0.6	73	1.4	31
5000	0.7	168	1.4	84

ILS150108 REV G

- 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.

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.

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

Standard Swing Clamp

Threaded Body

Single and Double Acting

- Available in four capacities from 450 to 5,000 lb.
- Special concentric design models available to replace competitive product.
- Standard models swing 90°, swing angles of less than 90° readily available using restrictors on page C-30.
- To avoid cylinder damage and preserve warranty, see page C-24 regarding flow rate limits and time calculations to be observed.
- Clocking feature (page C-30) uses standard length Vektek arm.

SAE porting is all on the top of the cylinder body for easy access (call for bottom unclamp porting availability), 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 being drawn 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.

U.S. Patent Nos.
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
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 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/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.

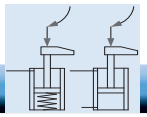
**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-24.

Dimensions

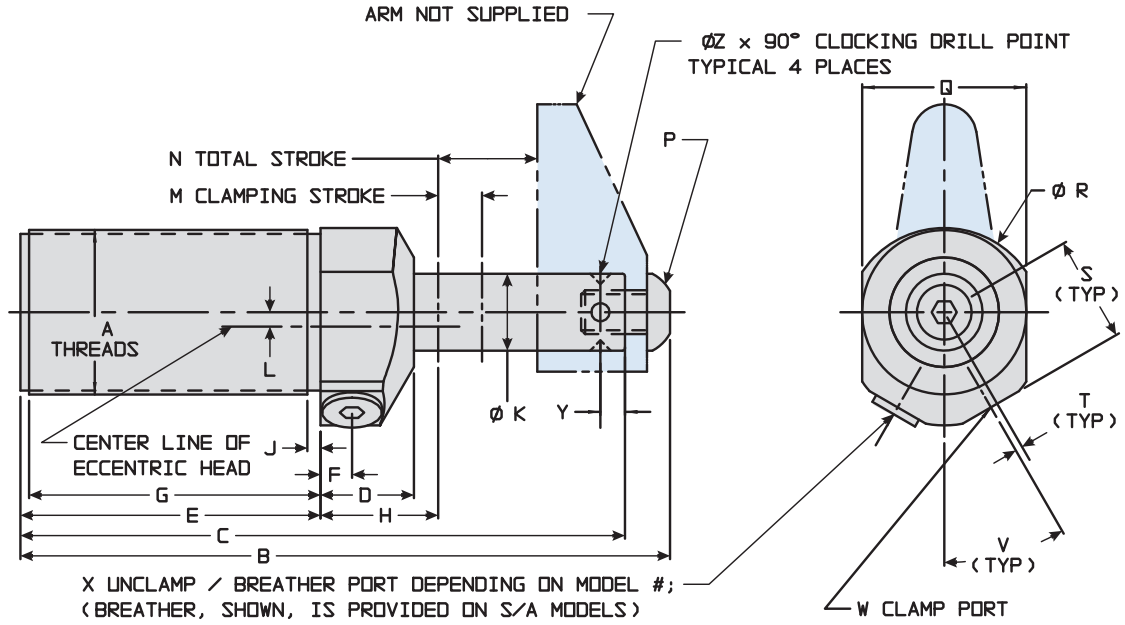
Order arms separately

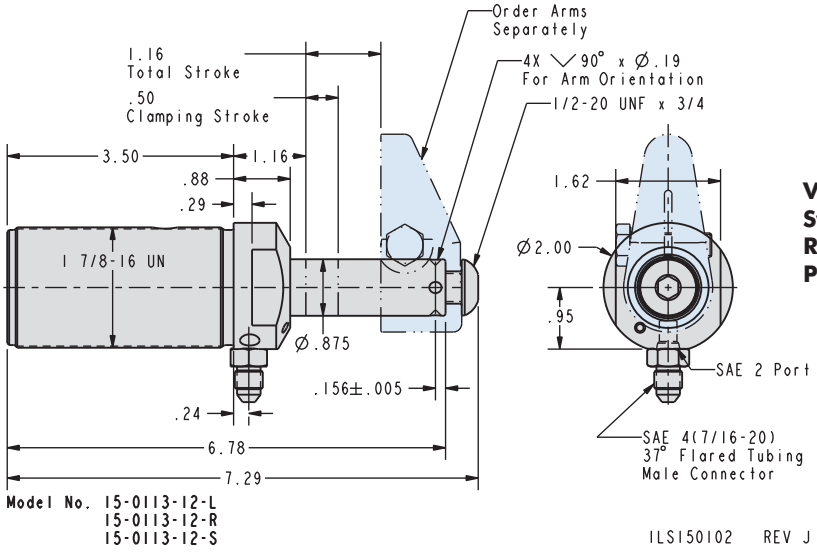
Model No. Left Swing	Model No. Right Swing	Model No. Straight Swing	A	B	C	D	E	F	G	H	J	K
Single Acting (S/A)												
15-0105-00-L	15-0105-00-R	15-0105-00-S	1 1/16-16	4.28	4.02	0.75	2.02	0.27	1.94	0.94	0.15	0.437
15-0109-08-L	15-0109-08-R	15-0109-08-S	1 1/2-16	5.68	5.32	1.09	2.54	0.38	2.40	1.27	0.15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

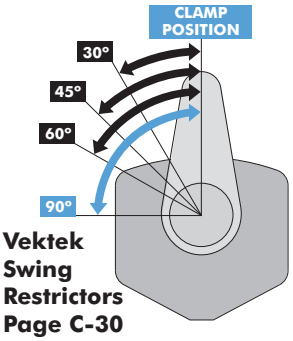
Standard Swing Clamp



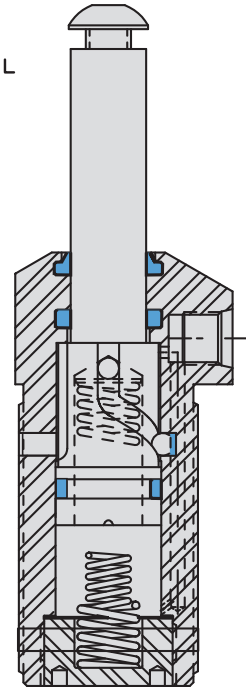
Threaded Body







Vektek Swing Restrictors Page C-30



ILS150100 REV D

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

L	M	N	P	Q	ØR	S	T	V	W	X	Y±0.005	ØZ
Cylinders, actuated hydraulically 1 direction, spring returned												
0.19	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
0.16	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
0.16	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
0.10	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
Cylinders, actuated hydraulically both directions												
0.19	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
0.16	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
0.16	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
0.10	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

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-24 regarding flow rate limits and time calculations to be observed.
- Clocking feature (page C-30) uses standard length 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 body 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.

U.S. Patent Nos.
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

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

* 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, 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/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-24.

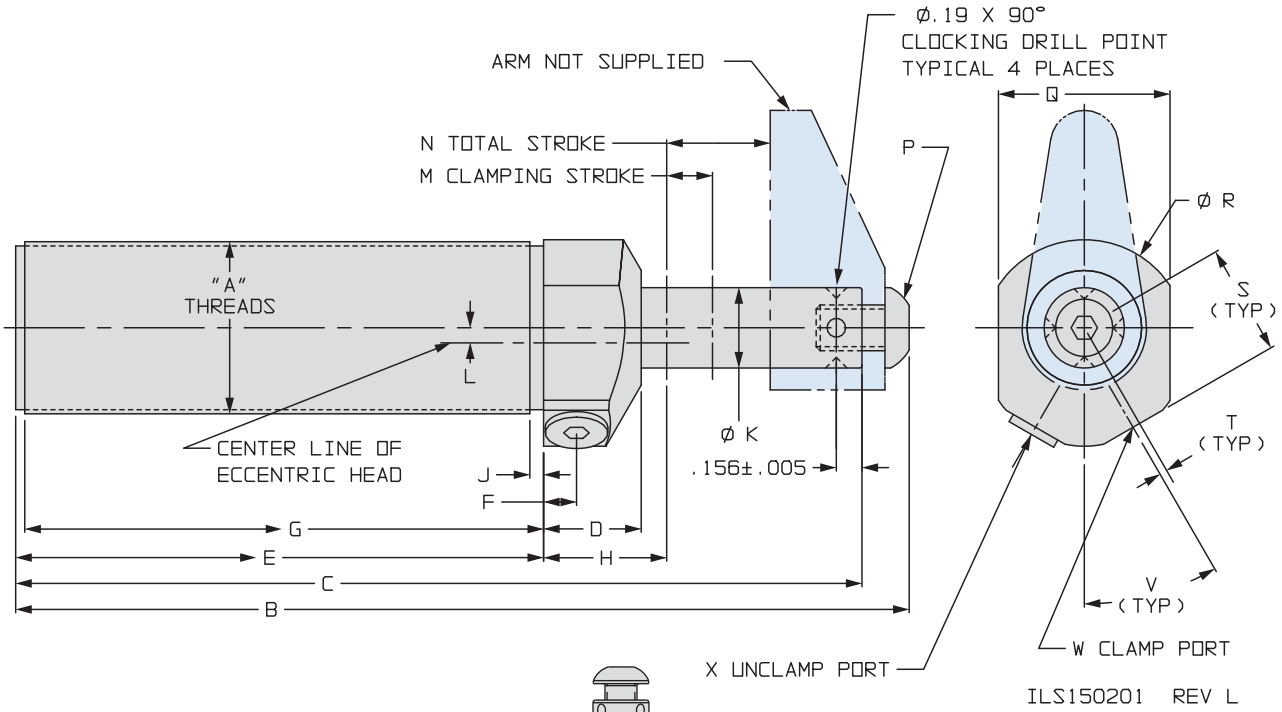
Dimensions

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

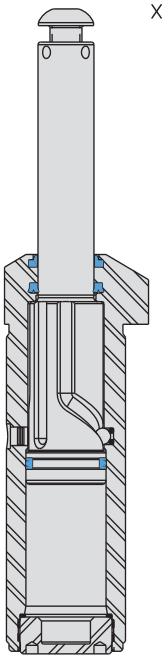
*** For bottom unclamp porting, order either 15-0209-12 or 15-0213-22 (R, L, S).**

Standard Swing Clamp

Threaded Body, Long Stroke



ILS150201 REV L



ILS150200 REV G

	J	ØK	L	M	N	P	Q	ØR	S	T	V	W	X
Cylinders, actuated hydraulically both directions													
	0.15	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
	0.15	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

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.
- To avoid cylinder damage and preserve warranty, see page C-24 regarding flow rate limits and time calculations to be observed.
- Clocking feature (page C-30) uses standard length Vektek arm.
- Arms sold separately – see section O.

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

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

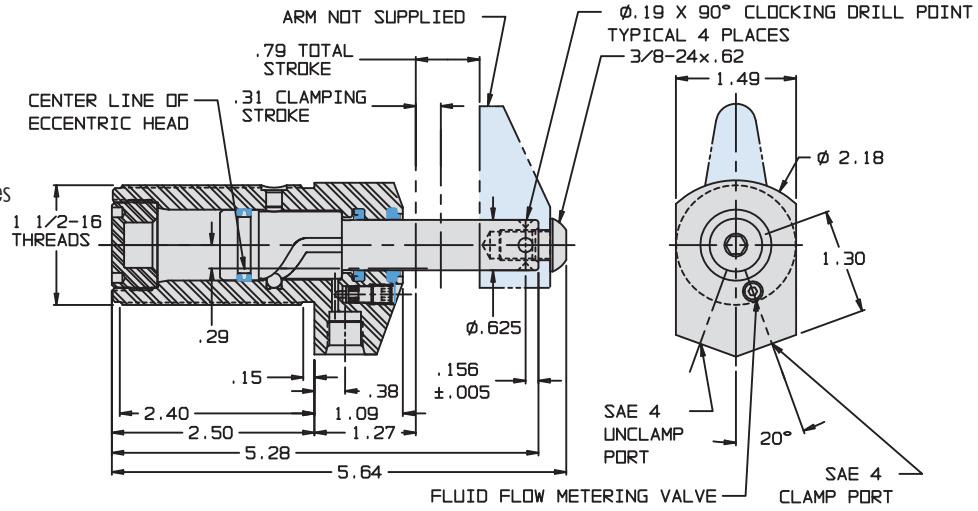
Hardened V-cam tracks resist damage and give you a built in extra cam (opposite swing direction) or straight-line option should you accidentally damage one. Specify right, left or straight cam, we will preset the swing when you order.

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.

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



ILS150202 REV J

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 fixture during arm rotation.

* Includes optional unclamp porting through the bottom of the Swing Clamp

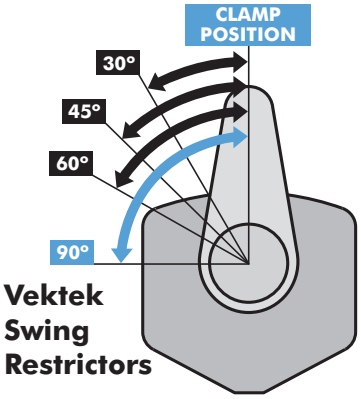
** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate 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/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-24.

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 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 lb	Swing Restriction
81-5505-30	450	30°
81-5505-45	450	45°
81-5505-60	450	60°
81-5509-30	1100	30°
81-5509-45	1100	45°
81-5509-60	1100	60°
81-5513-30	2600	30°
81-5513-45	2600	45°
81-5513-60	2600	60°
81-5518-30	5000	30°
81-5518-45	5000	45°
81-5518-60	5000	60°
81-5519-30	TC LP SC 5000	30°
81-5519-45	TC LP SC 5000	45°
81-5519-60	TC LP SC 5000	60°
81-5522-30	TC LP SC 7500	30°
81-5522-45	TC LP SC 7500	45°
81-5522-60	TC LP SC 7500	60°

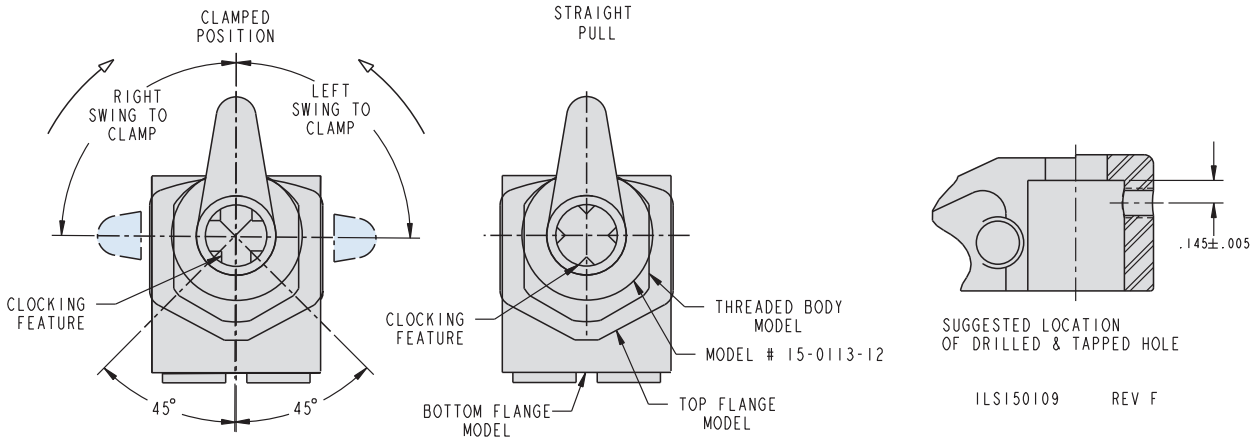
ILS150112 REV C

Clocking

We have added 2 (two) more clocking features to Vektek's standard Swing Clamp line. Customers have requested additional clocking features to help improve and speed-up arm changes.

Another customer request fulfilled by Vektek...

A drill point on each clamp standardizes arm location at a particular position. An additional 3 (three) orientation drill points reside 90° out from that position and each other. 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.
Clocking features 4 @ 90°

Standard Swing Clamp

C-31

Top Flange

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.
- Manifold fitting Model No. 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-30) uses standard length Vektek arm.
- To avoid cylinder damage and preserve warranty, see page C-24 regarding flow rate limits and time calculations to be observed.

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.

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) 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**			
15-0505-00	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 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/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.

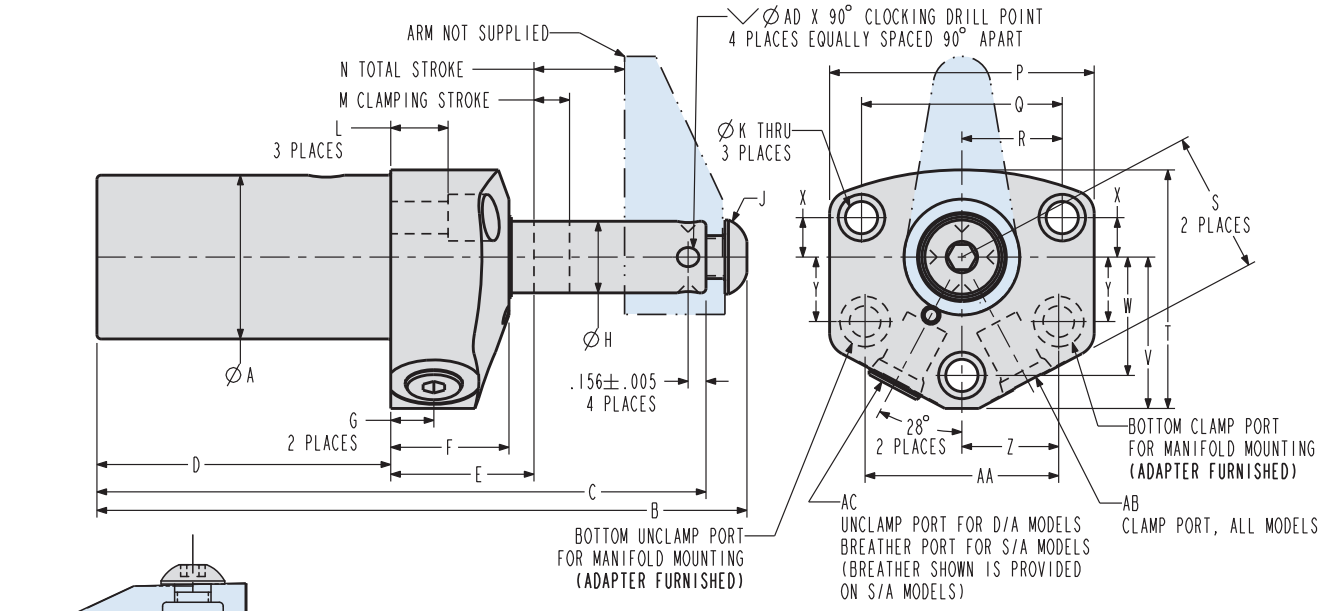
**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-24.

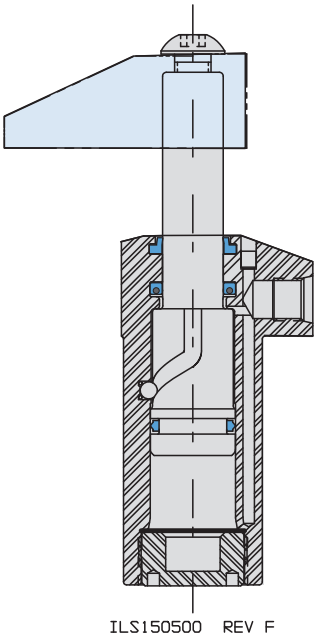
Dimensions

Model No. Left Swing	Model No. Right Swing	Model No. Straight Swing	ØA	B	C	D	E	F	G	ØH	J	ØK
Single Acting (S/A)												
15-0505-00-L	15-0505-00-R	15-0505-00-S	0.99	4.28	4.02	2.02	0.94	0.75	0.31	0.437	1/4 - 28 x 0.38	0.22
15-0509-08-L	15-0509-08-R	15-0509-08-S	1.43	5.68	5.32	2.60	1.21	1.03	0.38	0.625	3/8 - 24 x 0.62	0.28
15-0513-11-L	15-0513-11-R	15-0513-11-S	1.74	7.34	6.82	3.35	1.30	1.06	0.41	0.875	1/2 - 20 x 0.75	0.34
15-0518-00-L	15-0518-00-R	15-0518-00-S	2.37	9.96	9.31	4.43	1.80	1.47	0.54	1.250	5/8 - 18 x 1.0	0.41
Double Acting (D/A)												
15-0605-00-L	15-0605-00-R	15-0605-00-S	0.99	4.28	4.02	2.02	0.94	0.75	0.31	0.437	1/4 - 28 x 0.38	0.22
15-0609-08-L	15-0609-08-R	15-0609-08-S	1.43	5.68	5.32	2.60	1.21	1.03	0.38	0.625	3/8 - 24 x 0.62	0.28
15-0613-11-L	15-0613-11-R	15-0613-11-S	1.74	7.34	6.82	3.35	1.30	1.06	0.41	0.875	1/2 - 20 x 0.75	0.34
15-0618-00-L	15-0618-00-R	15-0618-00-S	2.37	9.96	9.31	4.43	1.80	1.47	0.54	1.250	5/8 - 18 x 1.0	0.41

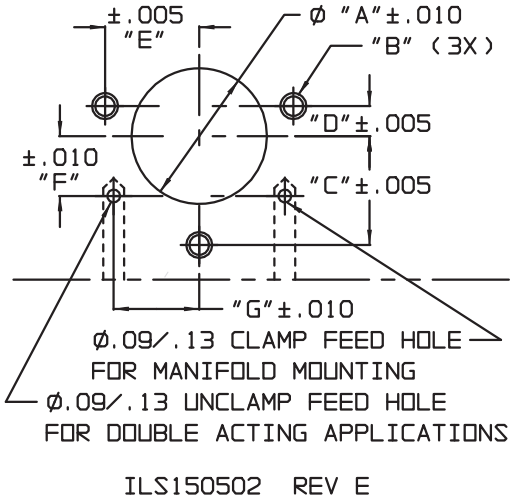
Standard Swing Clamp

Top Flange





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



Mounting Dimensions

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

Order arms separately

	L	M	N	P	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD
Cylinders, actuated hydraulically 1 direction, spring returned																	
	0.31	0.22	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
	0.28	0.31	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
	0.41	0.50	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
	0.75	0.63	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
Cylinders, actuated hydraulically both directions																	
	0.31	0.22	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
	0.28	0.31	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
	0.41	0.50	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
	0.75	0.63	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

Standard Swing Clamp

Bottom Flange

Single And Double Acting

- Simply the easiest to use manifold mount design on the market today. No precision installation holes, no precisely located ports, and no special mounting hardware needed. Only our special patented design gives you all that.
- Available in three sizes : 450, 1,100 and 2,600 lb. capacity.
- 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-30) uses standard length Vektek arm.
- To avoid cylinder damage and preserve warranty, see page C-24 regarding flow rate limits and time calculations to be observed.

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

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.

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.

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)	Oil Capacity (cu in)****		Optional Flow Control Model No.
					Retract	Extend	Retract	
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 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/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-24.

Dimensions

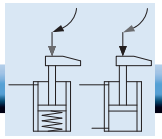
Model No. Left Swing	Model No. Right Swing	Model No. Straight Swing	ØA	B	C	D	E	F	ØG	H*	J	K
Single Acting (S/A)												
15-2105-01-L*	15-2105-01-R *	15-2105-01-S *	1.05	4.32	4.06	2.80	1.00	SAE 4	0.438	0.38	0.66	SAE 4
15-2109-01-L	15-2109-01-R	15-2109-01-S	1.49	5.70	5.33	3.65	1.25	SAE 4	0.625	0.56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

* 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.

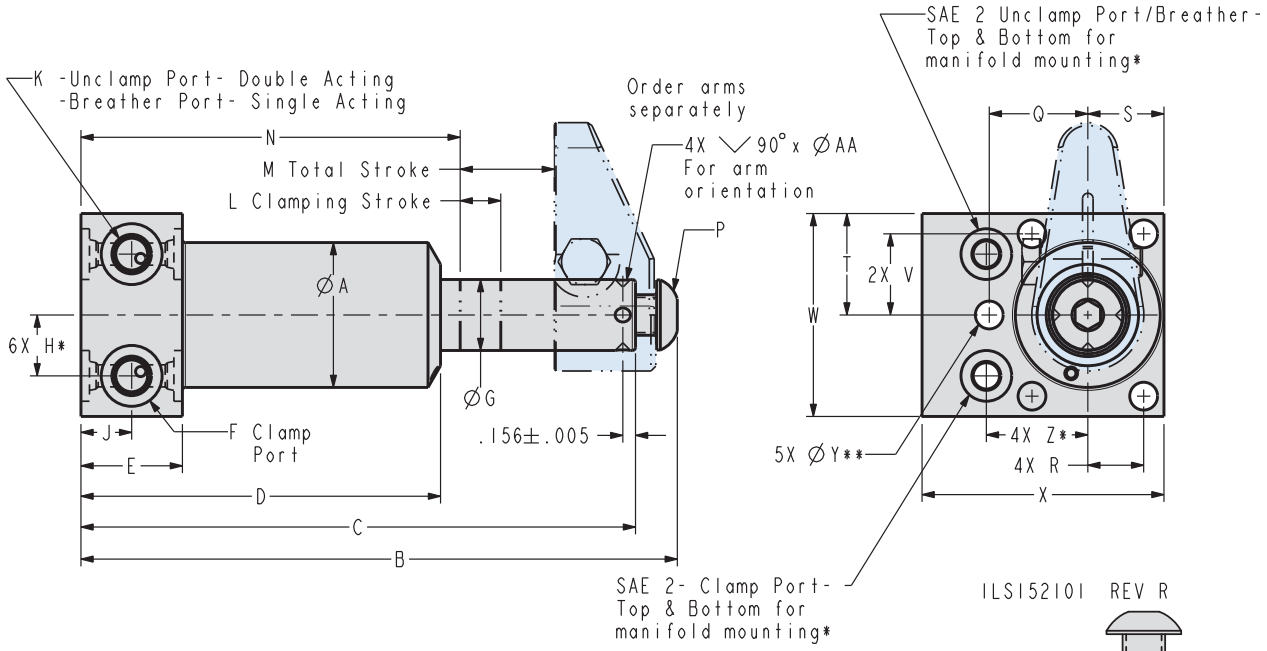
** All five mounting screws must be used when manifold mounting to assure a leak free o-ring seal.

Order arms separately

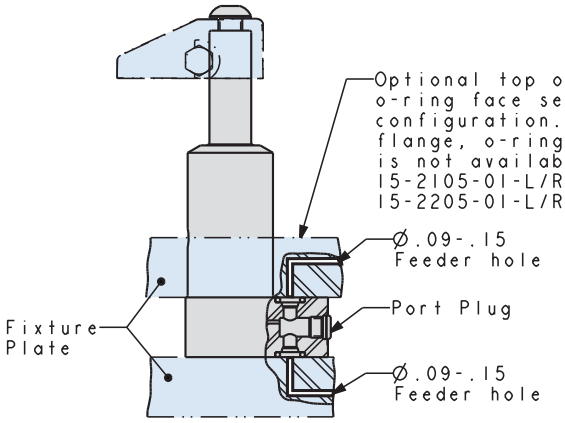
Standard Swing Clamp



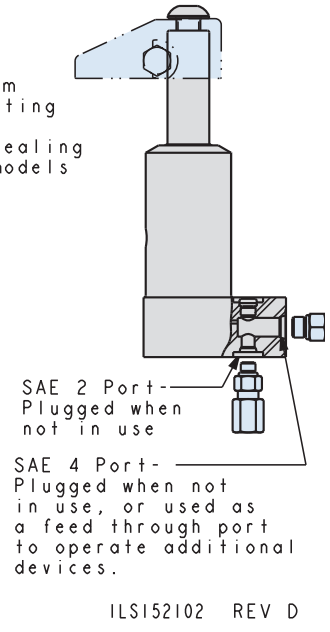
Bottom Flange



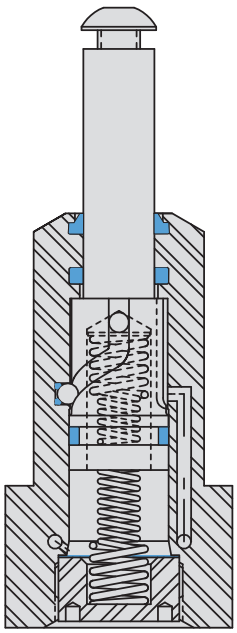
ILS152101 REV R



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



ILS152102 REV D



ILS152100 REV E

	L	M	N	P BHCS	Q	R	S	T	V	W	X	ØY**	Z*	ØAA
Cylinders, actuated hydraulically 1 direction, spring returned														
	0.22	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
	0.31	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
	0.50	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
Cylinders, actuated hydraulically both directions														
	0.22	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
	0.31	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
	0.50	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

Standard Swing Clamp

Cartridge Mount

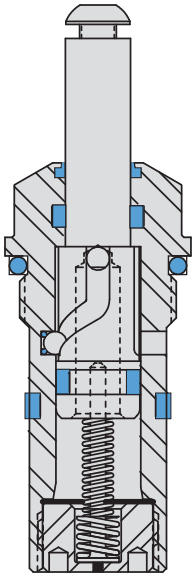
Single And Double Acting

- 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 deep in fixtures to reduce overall installed height and simplify design.
- To avoid cylinder damage and preserve warranty, see page C-24 regarding flow rate limits and time calculations to be observed.
- Arms sold separately.

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.



ILS151100 REV D

U.S. Patent No. 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 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/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.

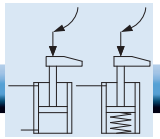
**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-24.

Dimensions

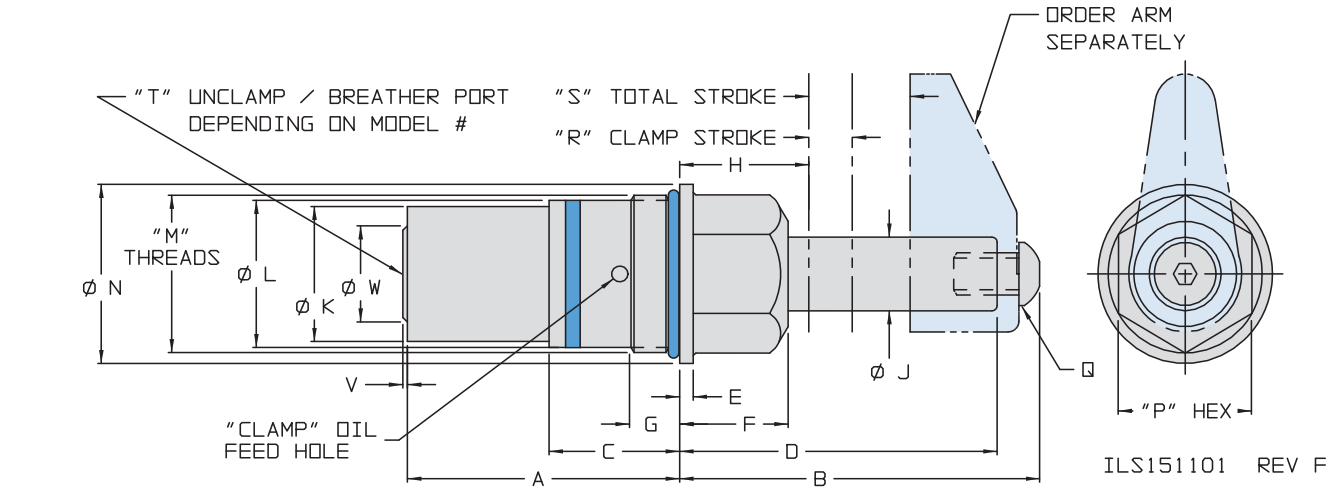
Order arms separately

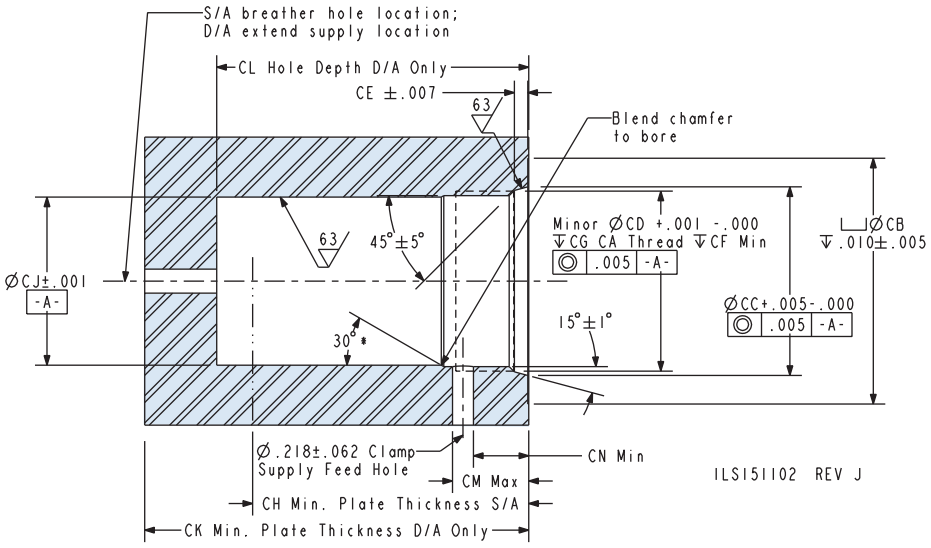
Model No. Left Swing	Model No. Right Swing	Model No. Straight Swing	A	B	C	D	E	F	G	H
Single Acting (S/A)										
15-1105-01-L	15-1105-01-R	15-1105-01-S	2.12	2.13	1.32	1.88	0.13	0.63	0.49	0.83
15-1109-01-L	15-1109-01-R	15-1109-01-S	2.66	2.98	1.50	2.63	0.13	0.94	0.65	1.13
15-1113-01-L	15-1113-01-R	15-1113-01-S	3.13	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	15-1205-01-S	2.12	2.13	1.32	1.88	0.13	0.63	0.49	0.83
15-1209-01-L	15-1209-01-R	15-1209-01-S	2.66	2.98	1.50	2.63	0.13	0.94	0.65	1.13
15-1213-01-L	15-1213-01-R	15-1213-01-S	3.13	4.17	1.50	3.65	0.16	1.25	0.55	1.49

Standard Swing Clamp



Cartridge Mount





* 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 Mfg.
Los Angeles, CA,
323-261-2193.
Please contact Brush Research for additional information.

Basic cavity can be formed with a standard (SAE J1926/1 Port Detail) o-ring Port Cutter

Cavity Dimensions

Model No.	CA	ØCB	ØCC	ØCD	CE	CF	CG MIN	CG MAX	CH	ØCJ	CK	CL	CM	CN
Single Acting (S/A)												**Cylinders, actuated hydraulically 1 direction, spring returned**		
15-1105-01-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
15-1109-01-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
15-1113-01-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**		
15-1205-01-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
15-1209-01-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
15-1213-01-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

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

	J	K	L	M	N	P	Q	R	S	T	V	W
												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	N/A	N/A
	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	0.02	1.03
	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	0.02	1.40
												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	N/A	N/A
	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	0.02	1.03
	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	0.02	1.40

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 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.

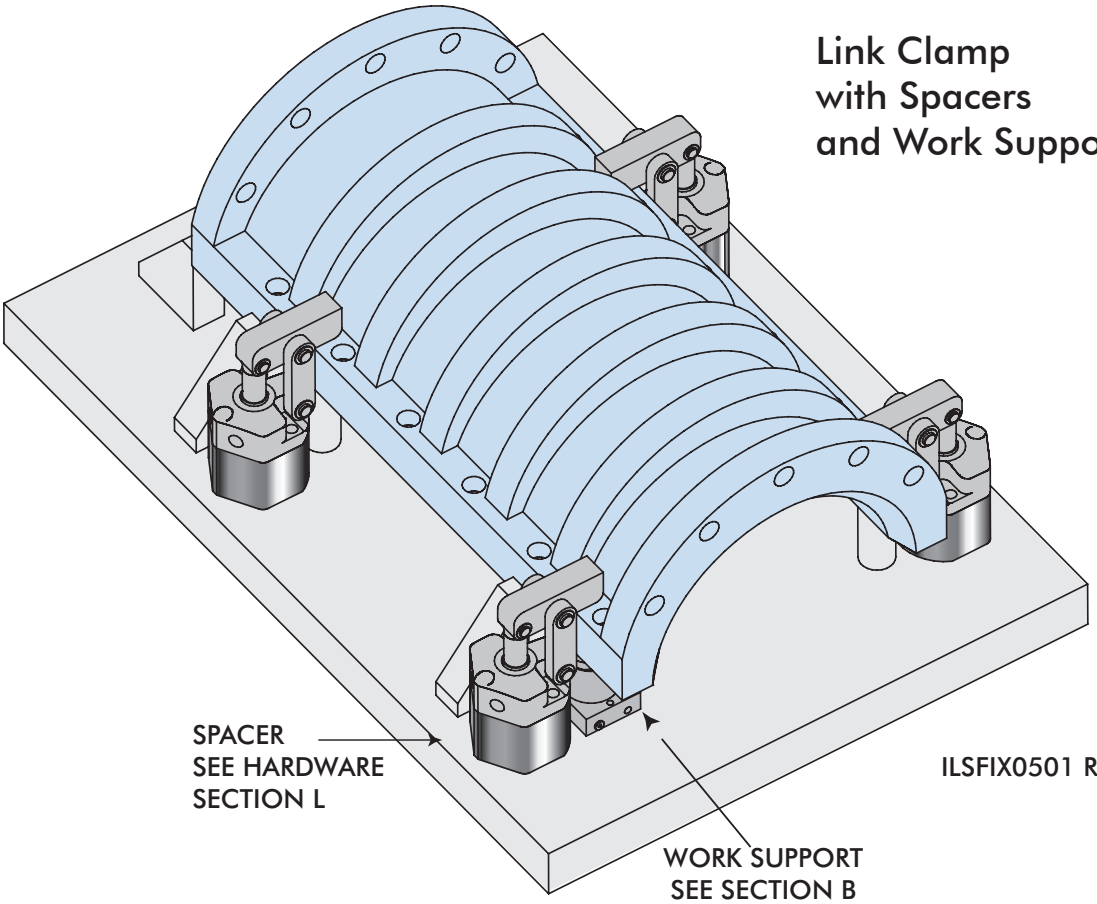
The part thickness varies on my application. Which component will work best for my situation, the swing clamp or the link clamp?

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 misuse or abuse.

Link Clamp with Spacers and Work Support

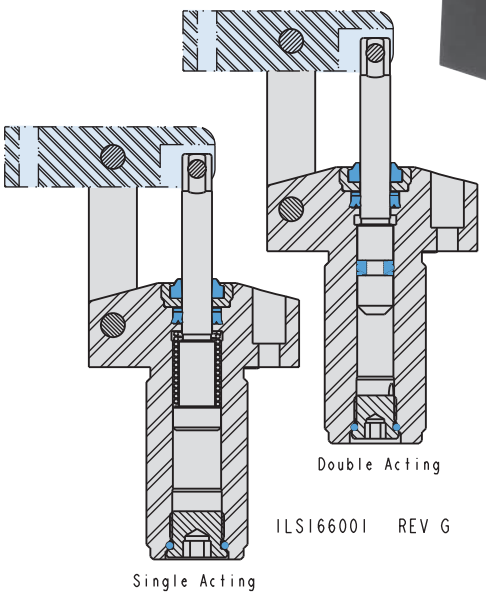


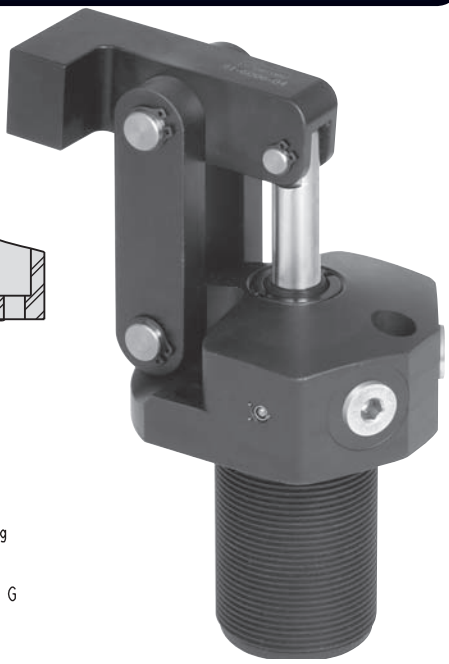
Link Clamps

High Pressure

Single and Double Acting

- Excellent alternative to swing clamps when swing space is limited.
- Available in five sizes: 350 lb to 6,800 lb 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 plumb or manifold mounting using SAE fittings (face seal 39-0510-25 included).
- Levers sold separately (page 0-11 and 0-13).





D-3

Model No.	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)****	Body Thread	Std 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

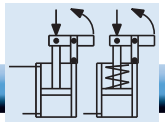
** Clamp capacities are listed at 5,000 psi maximum operating pressure with a standard length link clamp lever installed. Minimum operating pressure is 750 psi for single acting and 500 psi for double acting devices. The clamping force is adjustable by varying the hydraulic system pressure. To determine 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.

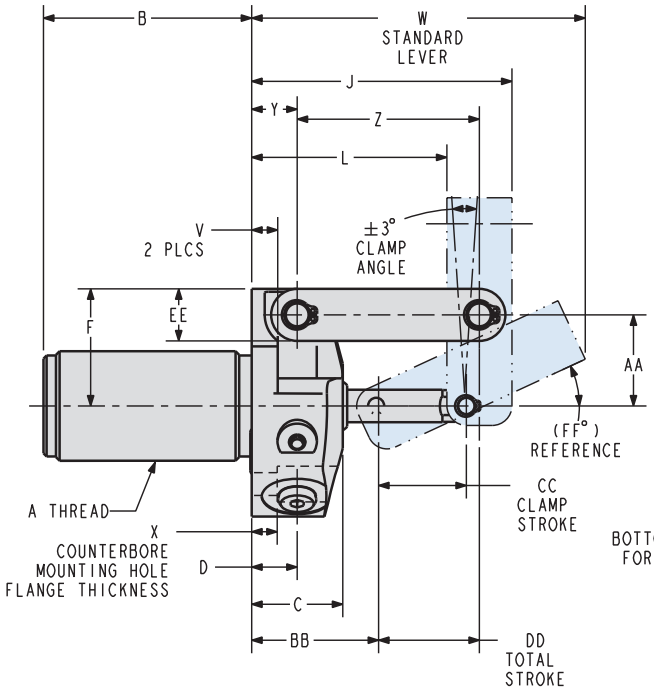
**** Equal to +/- 3° with standard lever.

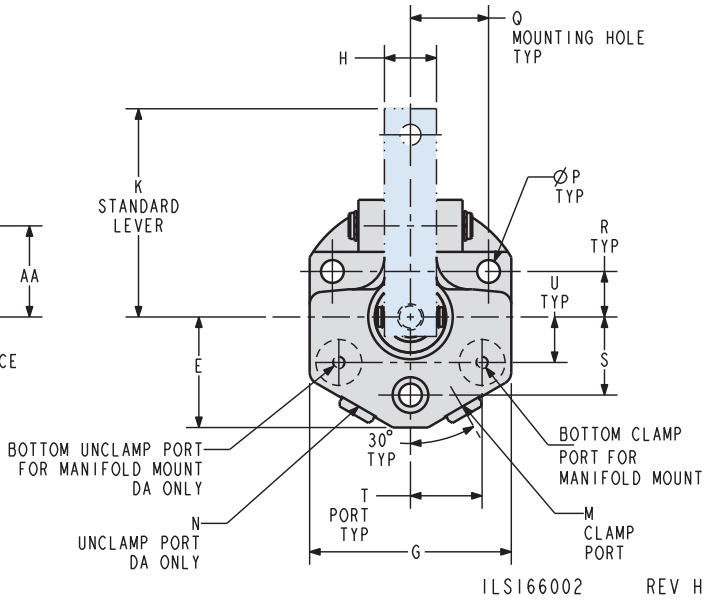
Dimensions

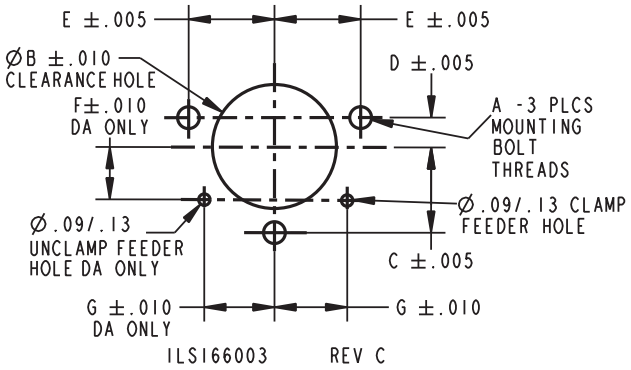
Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P
Single Acting (S/A)														
16-6104-00	1-1/16 - 16 UN	2.00	0.87	0.44	1.06	1.13	1.94	0.50	2.51	2.00	1.88	SAE 2	N/A	0.22
16-6106-00	1-1/2 - 16 UN	2.25	1.31	0.62	1.31	1.50	2.50	0.63	3.38	2.50	2.50	SAE 4	N/A	0.28
16-6109-00	1-7/8 - 16 UN	2.50	1.62	0.87	1.63	1.88	3.25	1.00	4.31	3.13	3.06	SAE 4	N/A	0.41
16-6114-00	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	0.53
16-6116-00	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	0.66
Double Acting (D/A)														
16-6204-00	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	0.22
16-6206-00	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	0.28
16-6209-00	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	0.41
16-6214-00	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	0.53
16-6216-00	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	0.66

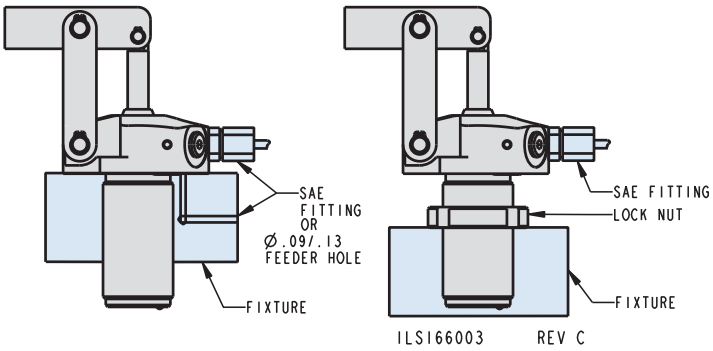


High Pressure









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

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

Mounting Dimensions

Model No.	A	B	C	D	E	F	G
16-6X04-00	10 - 32 UNF	1.125	0.750	0.437	0.750	0.437	0.688
16-6X06-00	1/4 - 20 UNC	1.562	1.000	0.500	1.000	0.375	0.969
16-6X09-00	3/8 - 16 UNC	1.937	1.250	0.625	1.312	0.437	1.250
16-6X14-00	1/2 - 13 UNC	2.562	1.625	0.750	1.687	0.625	1.625
16-6X16-00	5/8 - 11 UNC	3.187	2.000	1.000	2.000	0.750	2.000

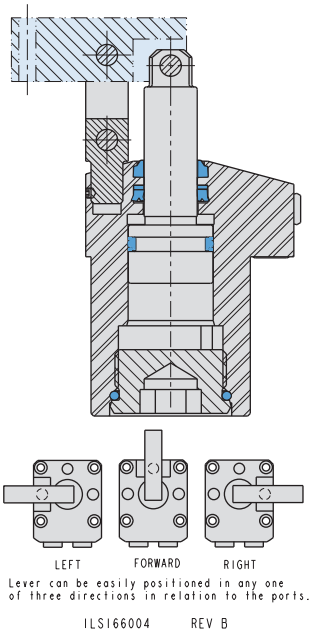
	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF°
Cylinders, actuated hydraulically 1 direction, spring returned																
	0.750	0.437	0.750	0.688	0.437	0.25	3.25	0.25	0.44	1.75	0.88	1.22	0.84	0.94	0.50	24°
	1.000	0.500	1.000	0.969	0.375	0.50	4.25	0.50	0.75	2.13	1.13	1.72	1.03	1.13	0.75	29°
	1.312	0.625	1.250	1.250	0.437	0.50	5.37	0.50	0.88	2.75	1.37	2.19	1.25	1.34	1.00	29°
	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	1.25	27.5°
	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	1.50	27°
Cylinders, actuated hydraulically both directions																
	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	0.50	24°
	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	0.75	29°
	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	1.00	29°
	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	1.25	27.5°
	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	1.50	27°

Link Clamps

Low Pressure

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).
- Levers sold separately (page 0-12 and 0-15).



Model No.	Lever Position	Cylinder Capacity (lb.)*	Vertical Clamping Stroke (in.)****	Std 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.

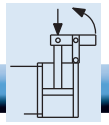
** Use of extended length levers will result in a reduction of clamp capacity. See graphs of lever output curves for clamping force of various lever lengths. Minimum operating pressure is 150 psi for double acting devices. The clamping force is adjustable by varying the hydraulic system pressure. To 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.

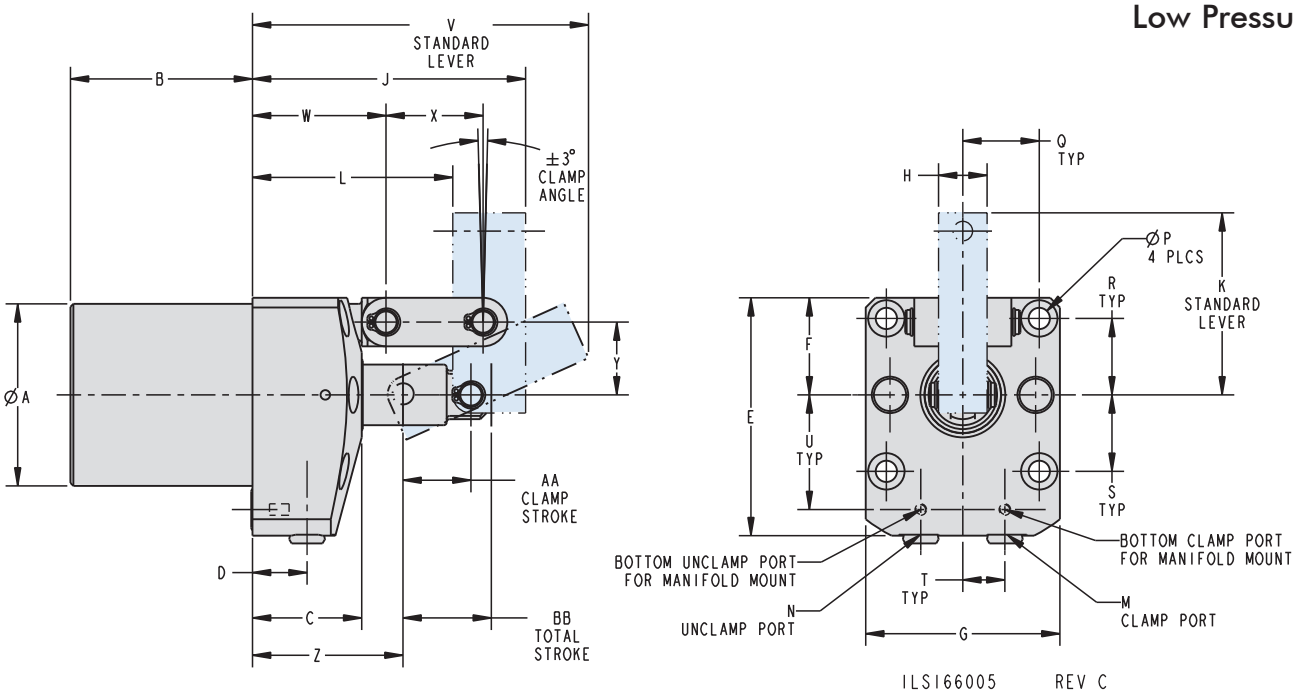
**** Equal to +/- 3° with standard lever.

Dimensions

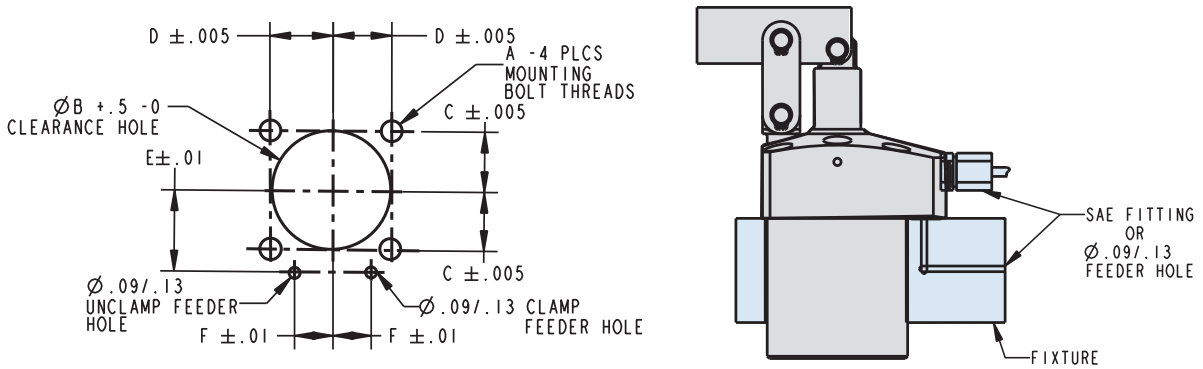
Model No.	Lever Position	Capacity (lb)	A	B	C	D	E	F	G	H	J	K	L	M
Double Acting (D/A)														
16-6211-00 16-6211-01 16-6211-02	Forward Right Left	550	1.88	1.88	1.13	0.56	2.45	1.00	2.00	0.50	2.81	1.88	2.06	SAE 2
16-6215-00 16-6215-01 16-6215-02	Forward Right Left	1100	2.53	2.50	1.19	0.59	3.19	1.38	2.75	0.75	3.44	2.63	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	3.09	2.88	SAE 4



Low Pressure



ILS166005 REV C



ILS166006 REV A

Manifold Port/Bolt Mounting Dimensions

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

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

	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.

Part Crowder

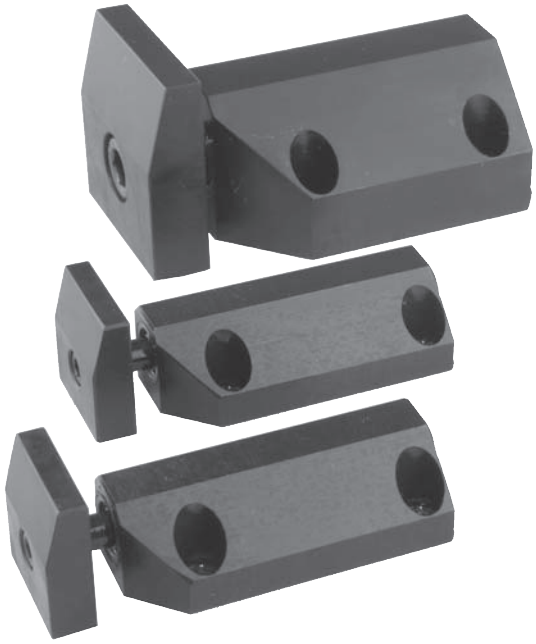
Single Acting

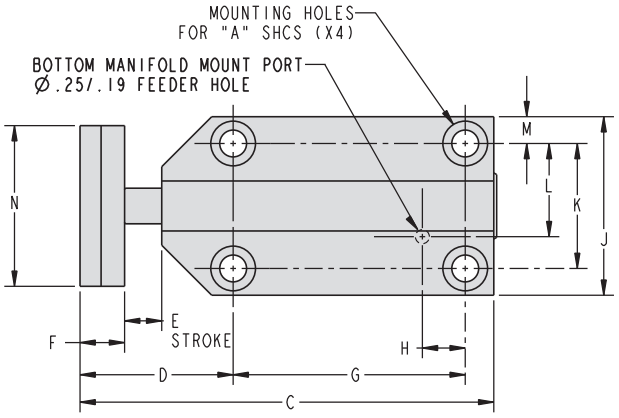
- Use fewer components to secure parts.
- Crowding and clamping pressure applied at the exact same point on parts.
- Spring contact force.
- Hydraulic holding force.
- Select from 3 cylinder capacities: 550 lbs, 980 lbs, and 2200 lbs.
- Flexible plumbing options accommodate either manifold mounting or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

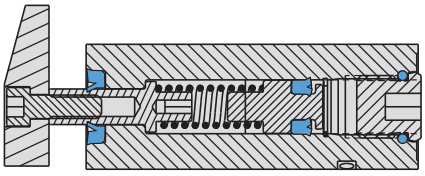
Model No.*	Spring Loaded Contact Force (lb)	Hydraulic Assist Cylinder Capacity** (lb)	Piston Area (sq. in.)	Oil Capacity (cu. in.)
15-9104-00	5.5 -11	550	0.110	0.108
15-9105-00	14 - 20	980	0.196	0.194
15-9108-00	21 - 2 7	2200	0.442	0.350

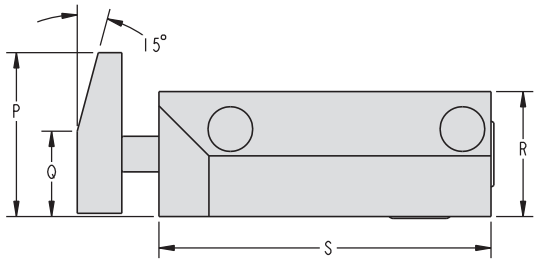
* Add an "F" to the end of the model number to order fluorocarbon seals.

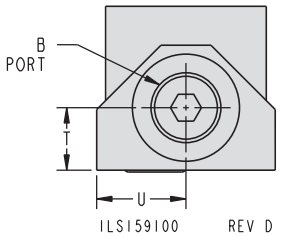
** The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application divide the cylinder capacity shown above by 5,000, and multiply the resultant number by your system operating pressure to obtain the approximate clamping force for your application. (Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.)











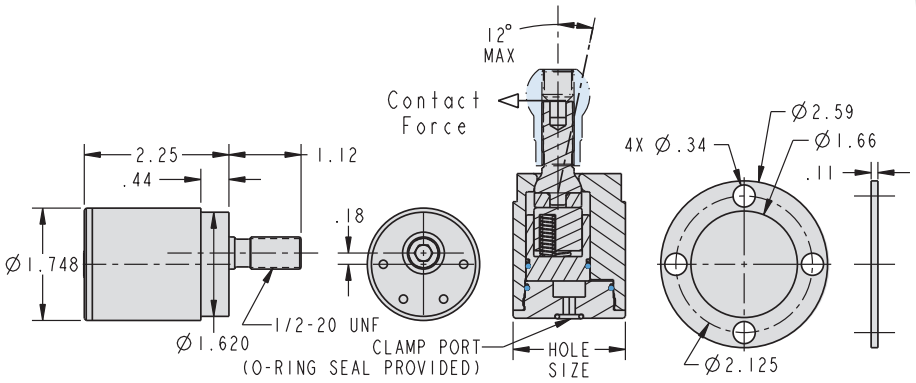
For proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μ in R_a surface finish.

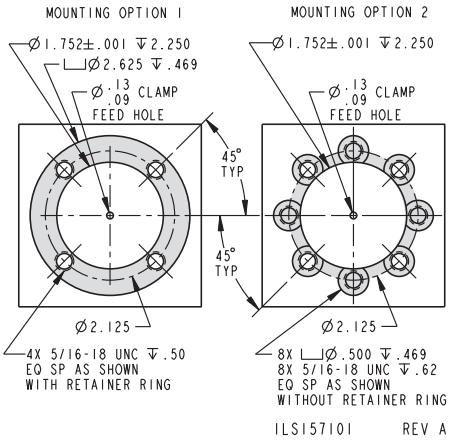
Dimensions

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

Power Pin

- Spring Position and Hydraulic Clamping Pin.
- Spring force pushes part into position against fixed stops and hydraulic actuation moves the club clamping the part.
- Hydraulic manifold mounted.
- Hardened club heads, threaded pivot and spring cup.
- Club Heads ordered separately.
- BHC™ (Black Hard Coat) body finish.
- Adjust club height then rotate the body to adjust position, adjust spring retention force and location.





Power Pin

ILS157100 REV A

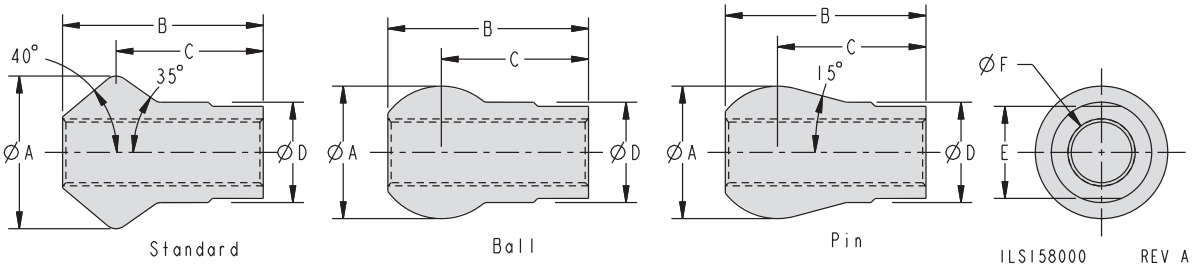
Model No.*	Hydraulic Contact Force (lb)**	Spring Contact Force (lb)***	Piston Area (sq in)	Oil Capacity (cu in)	Pin Lever Ratio	Hole Size Ø (in)
15-7110-00	600	4.2 - 6.1	0.785	0.425	1: 4.2	1.752

* Club heads are sold separately.

** Hydraulic Contact Force is calculated at 5000 psi maximum operating pressure. Force values are calculated at the end of the thread pivot. The hydraulic contact force is adjustable by varying the hydraulic system pressure. To determine the approximate hydraulic contact force for your application divide the hydraulic contact force shown above by 5000 and multiply the result by your system operating pressure.

*** Spring Contact Force values are calculated at the end of the threaded pivot. Actual force values vary at the part depending on the club head design and location of the contact.

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



Club Heads

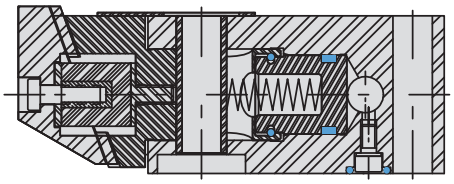
Model No.*	A	B	C	D	E	F
Standard Club Head						
15-8010-01	1.14	1.50	1.10	0.75	0.69	1/2 - 20
Ball Club Head						
15-8010-02	0.99	1.50	1.10	0.75	0.69	1/2 - 20
Pin Club Head						
15-8010-03	0.99	1.50	1.11	0.75	0.69	1/2 - 20

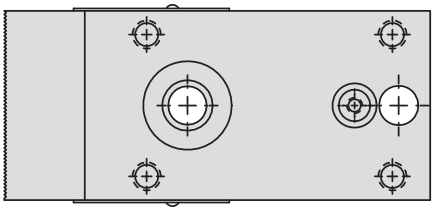
Hardened alloy steel for long life.

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 workpiece down when straight clamping force is applied, see page E-5.





ILS153103 REV E

NOTE: Flexible SAE porting or manifold mounting options.

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

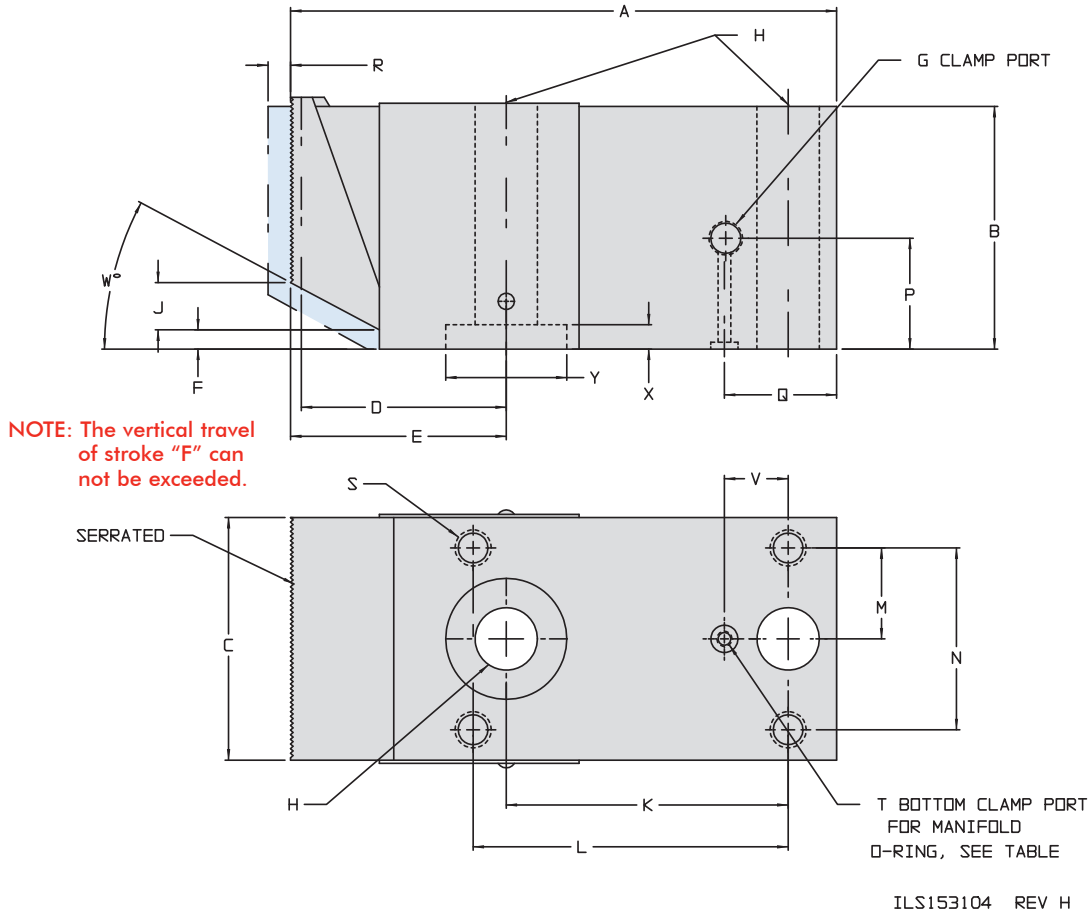
Model No.	Plumbing Style	Lateral Clamp Force (lb.)*	Pull Down Clamp Force (lb.)*	Effective Horizontal Stroke	Oil Capacity (cu. in.)	Piston Area (sq. in.)	Recommended Mounting Bolts (not supplied)	Mounting Bolts Max. Torque (ft.-lb.)
Single Acting (S/A)					Cylinders, actuated hydraulically 1 direction, 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

Pull-Down Clamp



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

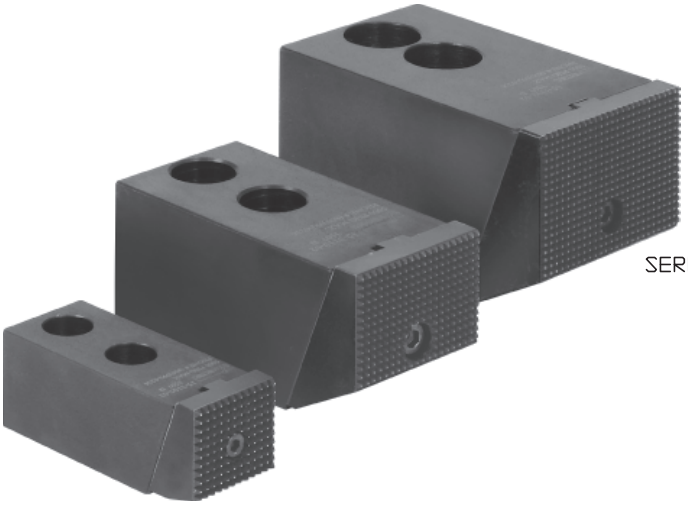
O-rings for Manifold Mounting

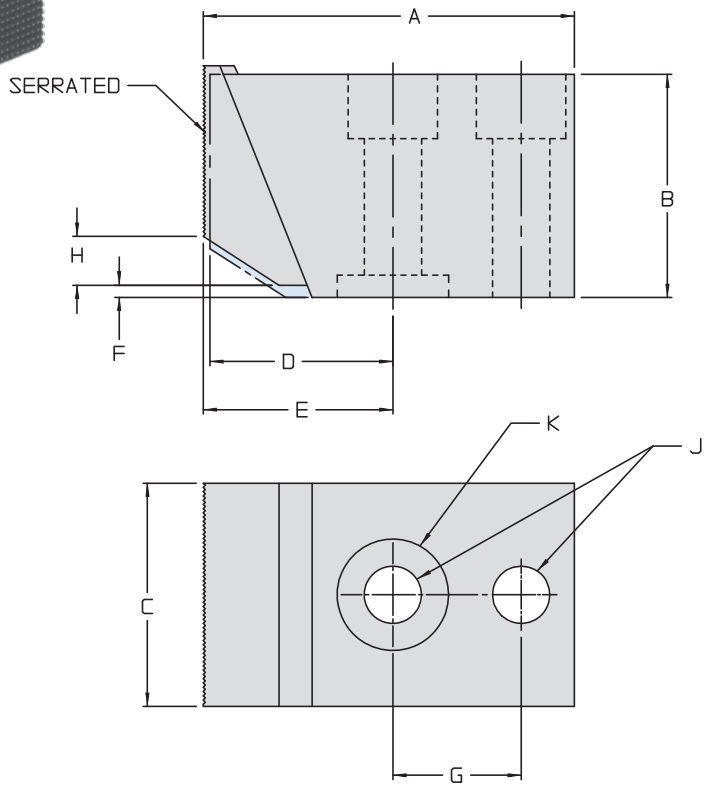
Part No.	Description
39-0510-43	O-ring for 15-3105-00
39-0510-44	O-ring for 15-3110-00, 15-3112-00
(one each supplied)	

	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

Special Use Clamps

Pull-Down Counter-Hold





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.

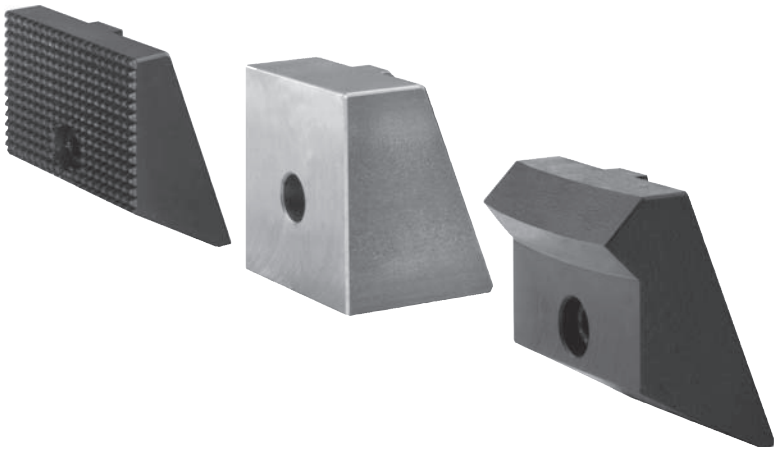
Model No.	Description	Pull Down Force (lb)	Recommended Mounting Bolts (not supplied)
15-3105-02	Mechanical counter hold for 15-3105-00	290	5/16
15-3110-02	Mechanical counter hold for 15-3110-00	1300	7/16
15-3112-02	Mechanical counter hold for 15-3112-00	2100	5/8

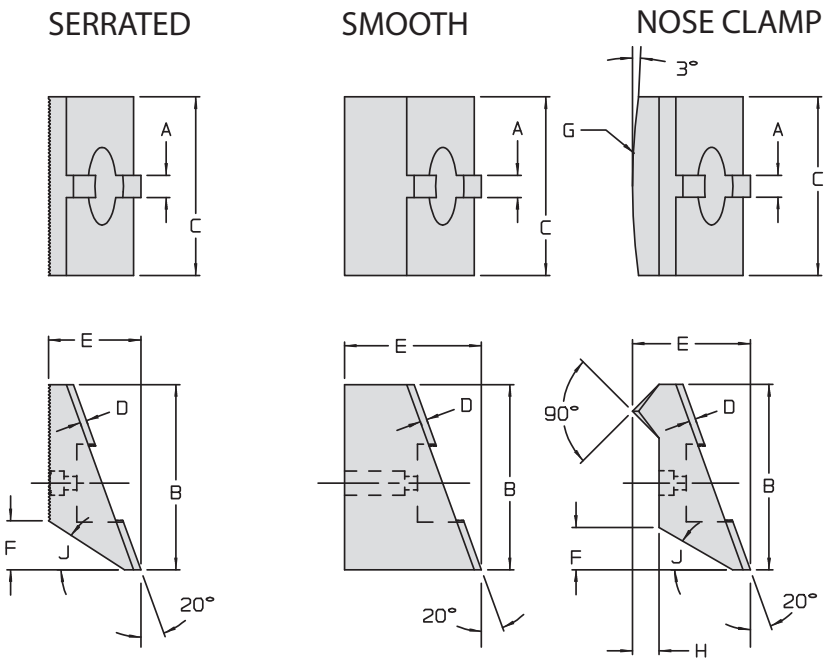
Dimensions

Model No.	A	B	C	D	E ±0.02	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

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.





ILS153106 REV C

Dimensions

Jaw Model No.	Clamp Model No.	A	B	C	D	E ± 0.02	F	G	H	J
Serrated Jaws										
15-3105-03	15-3105-00	0.24	1.16	1.16	0.10	0.87	0.12	N/A	N/A	15°
15-3110-03	15-3110-00	0.39	1.97	1.97	0.12	1.24	0.55	N/A	N/A	30°
15-3112-03	15-3112-00	0.39	2.56	2.56	0.12	1.46	0.69	N/A	N/A	30°
Smooth Jaws*										
15-3105-04	15-3105-00	0.24	1.16	1.16	0.11	1.26	N/A	N/A	N/A	N/A
15-3110-04	15-3110-00	0.39	1.97	1.97	0.12	1.63	N/A	N/A	N/A	N/A
15-3112-04	15-3112-00	0.39	2.56	2.56	0.12	2.05	N/A	N/A	N/A	N/A
Nose Clamp Jaw										
15-3105-05	15-3105-00	0.24	1.16	1.16	0.11	1.06	0.16	12 RAD	0.20	15°
15-3110-05	15-3110-00	0.39	1.97	1.97	0.12	1.48	0.55	8 RAD	0.32	30°
15-3112-05	15-3112-00	0.39	2.56	2.56	0.12	1.85	0.67	12 RAD	0.39	30°

* Smooth jaw is not hardened or treated.

Edge Clamps

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.

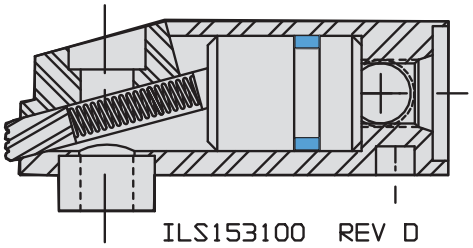
Three SAE 4 fluid ports on standard model, O-ring bolt down face seal on the manifold model simplify leak free installation.

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.

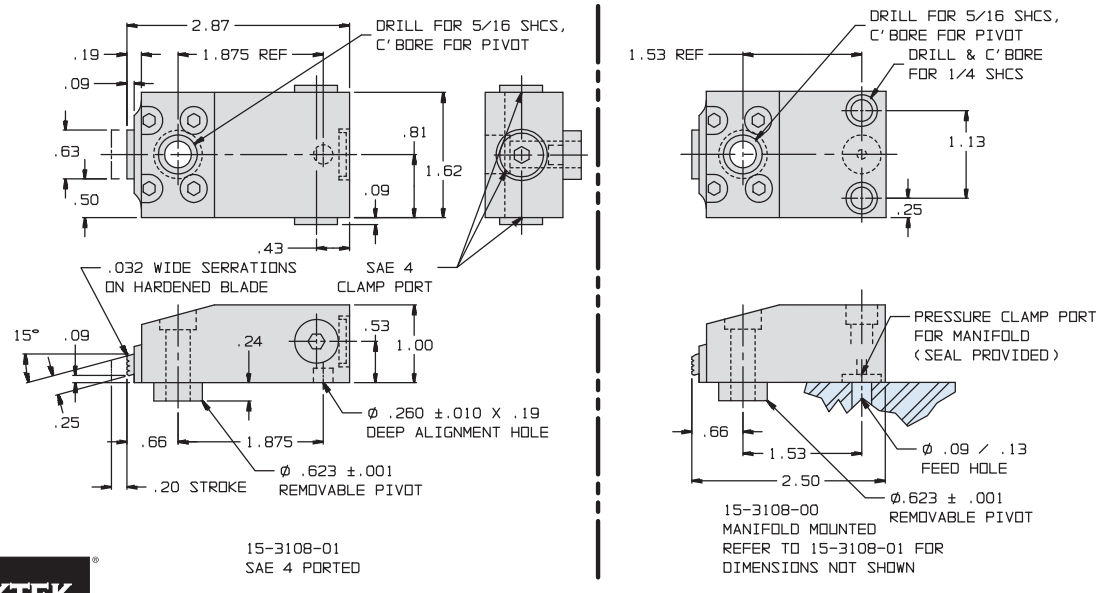
Proprietary seal designs reduce leakage for long lasting cylinders.



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

Model No.	Plumbing Style	Clamp Force (lb.)* Horizontal	Clamp Force (lb.)* Vertical	Effective Horizontal Stroke	Vertical Blade Movement	Body Size	Piston Area (sq. in.)	Oil Capacity (cu. in.)	Approximate Pressure to Extend
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.)



Retract Clamp

Single Acting

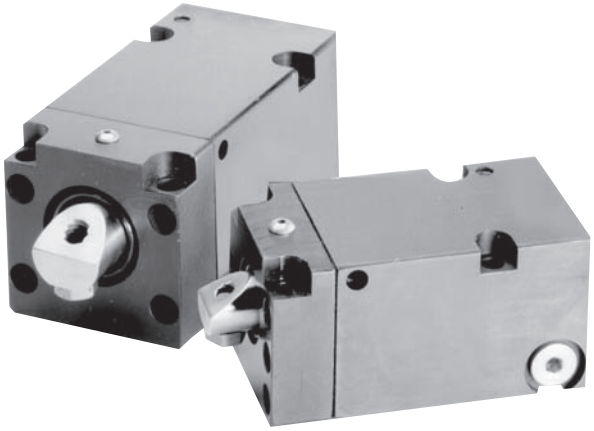
- Available in 1,700 and 3,300 lb. capacities.
- Extends straight forward, then down to contact your part.
- Replaceable spherical contact point (furnished) provides point contact for true vertical clamp force.
- Lifts vertically, then retracts, not like others which can draw the part when unclamping.

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.

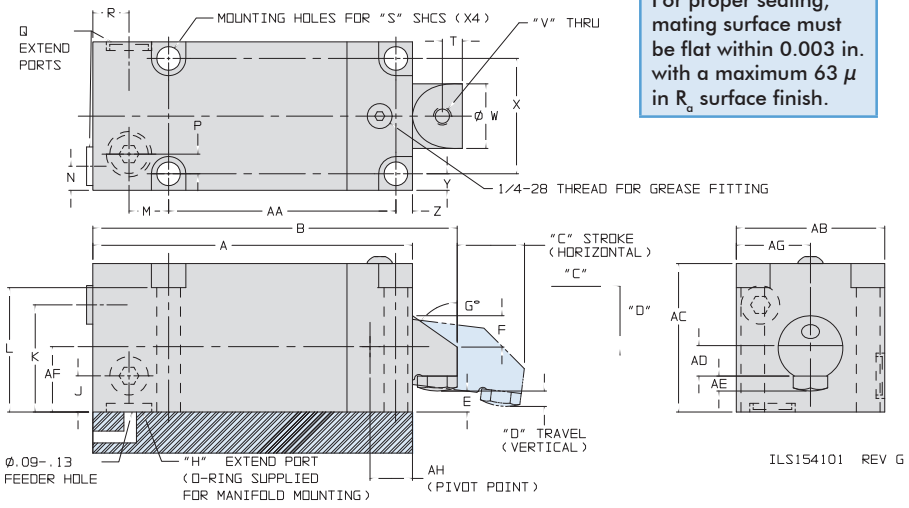
Rear and side porting are included for ease of plumbing in your application.



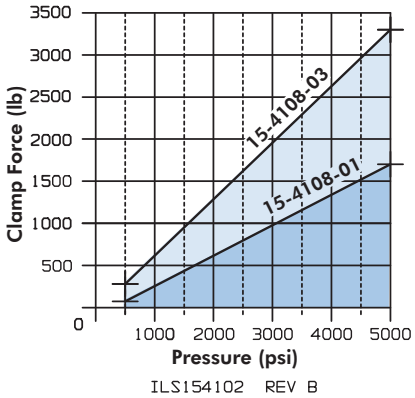
U.S. Patent Nos.
5,979,886
5,752,693

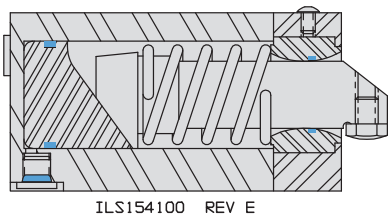
Model No.	Clamping Force (lb.)**	Horizontal Stroke (in.)	Clamping Travel (in.)	Oil Capacity Extend (cu. in.)
Single Acting (S/A)		Cylinders, actuated hydraulically 1 direction, spring return		
15-4108-01	1700	0.74	0.12	1.1
15-4108-03	3300	0.88	0.16	2.1

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



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





Dimensions

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
Single Acting (S/A)								Cylinders, actuated hydraulically 1 direction, spring return							
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	SAE 4
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	SAE 4
R	S	T	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
Single Acting (S/A)								Cylinders, actuated hydraulically 1 direction, spring return							
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
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

Special Use Clamps

5-C Collet Vise

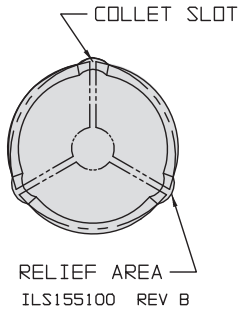
Single And Triple Collet

- Compact design, the smallest known footprint in hydraulic collet vises.
- Concentric piston design "pulls" the collet without the potential side loading of two cylinder styles.
- Ideal for secondary operations on "screw machine parts".
- BHC™ (Black Hard Coated) surfaces provide long life.
- Special "lobed" design reduces the tendency of three jaw collets to stick.
- Through hole design allows you to feed material up to 1.062" diameter through the bottom of the unit by simply removing the plug.

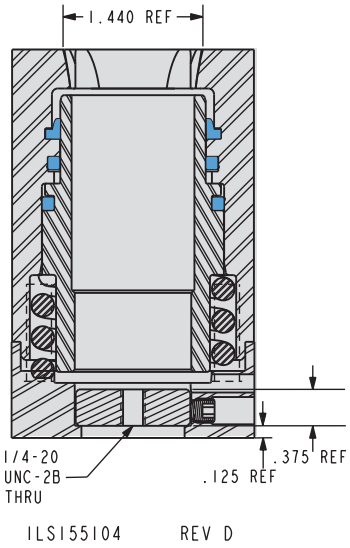
E-9

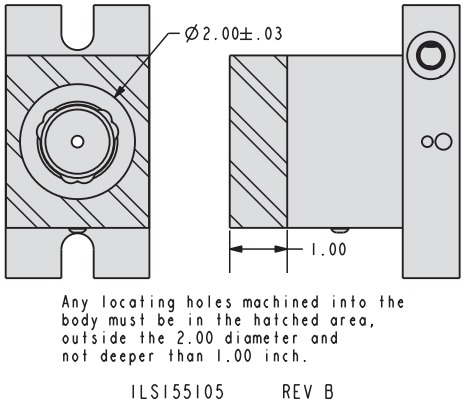
Looking for a way to quickly fixture a number of round parts?

Vektek's collet vises are an excellent solution. Designed to be flexible and conserve space, they can be ganged to fixture 3, 6, 9, 12 or more parts in a small space. Screw machine parts can be fixtured easily for speedy secondary operations. It is made to accept all collets designed to fit 5-C closers, even specials. The single, end located port makes plumbing a breeze.



5-C Collets are round in their "Free" or "Open" position and become lobe shaped as they are closed. To reduce point loading and the tendency for collet sticking, Vektek Collet Vises have relief areas provided for the collet slots. These slots help distribute closing forces more uniformly.

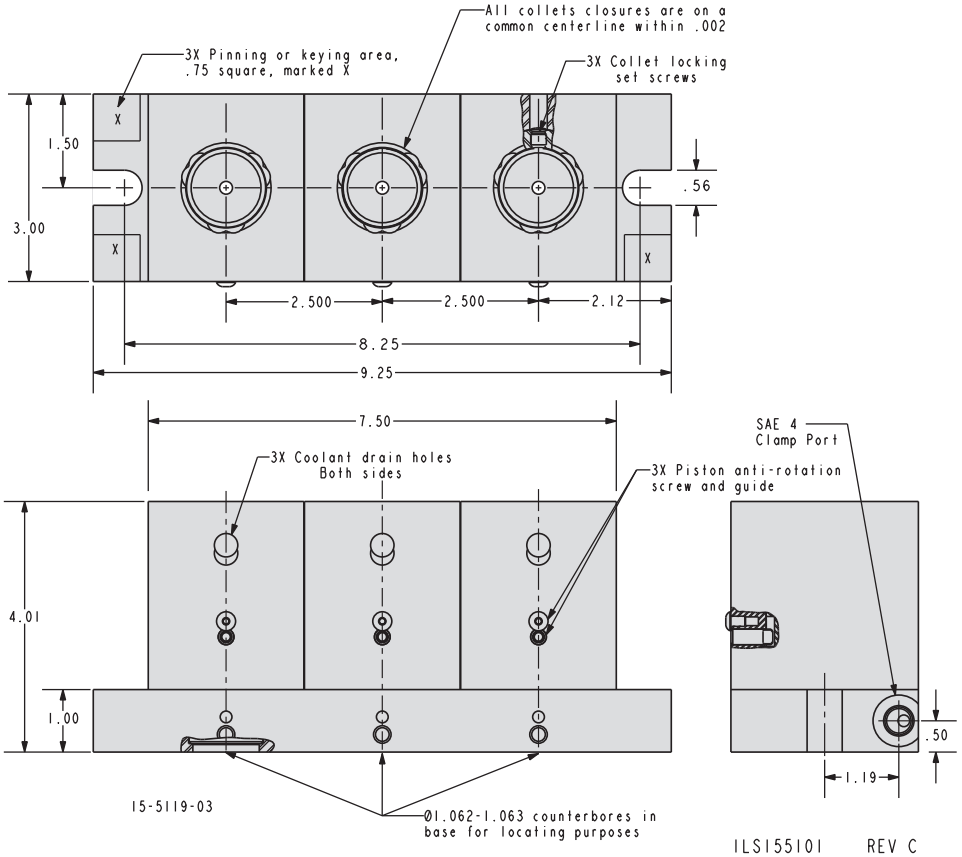


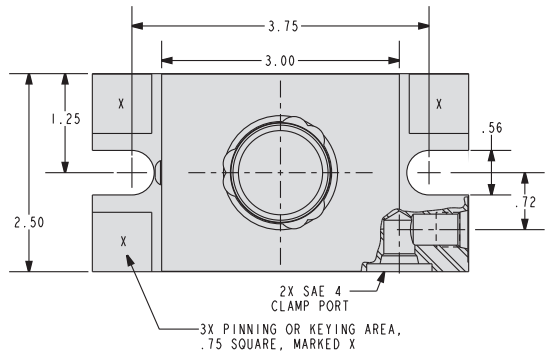


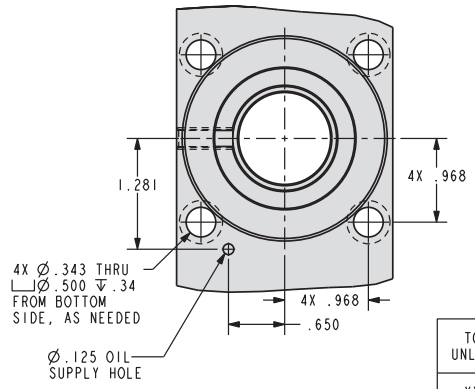
Model No.	Mounting Style	No. of Collet Stations**	Approximate Radial Clamp Force Per Station (lb)*	Approximate Downward Clamp Force Per Station (lb)*	Maximum Oil Capacity (cu. in.)
15-5111-01	Manifold	1	15,000	4950	0.18
15-5119-01	Base	1	15,000	4950	0.18
15-5119-03	Base	3	15,000	4950	0.54

* Clamp forces are given at 5,000 PSI maximum operation pressure.
** Collets not included.

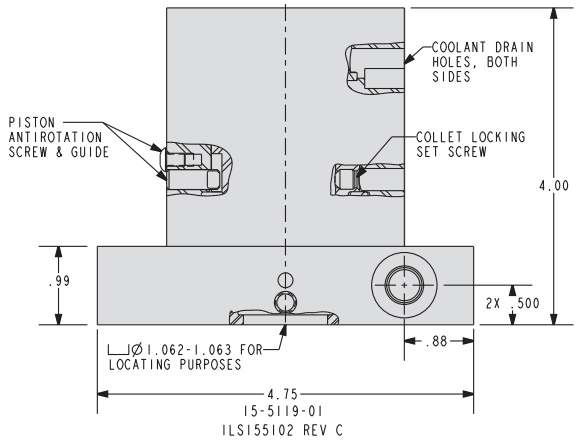
5-C Collet Vise

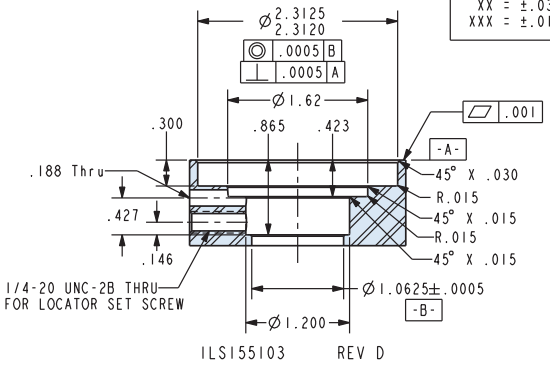






TOLERANCE UNLESS NOTED
XX = ±.03
XXX = ±.010





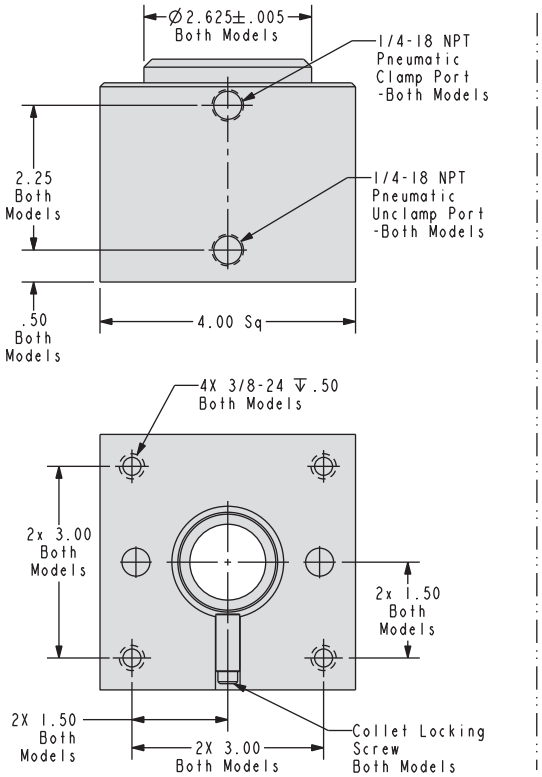
Dimensions for customer produced base.

Special Use Clamps

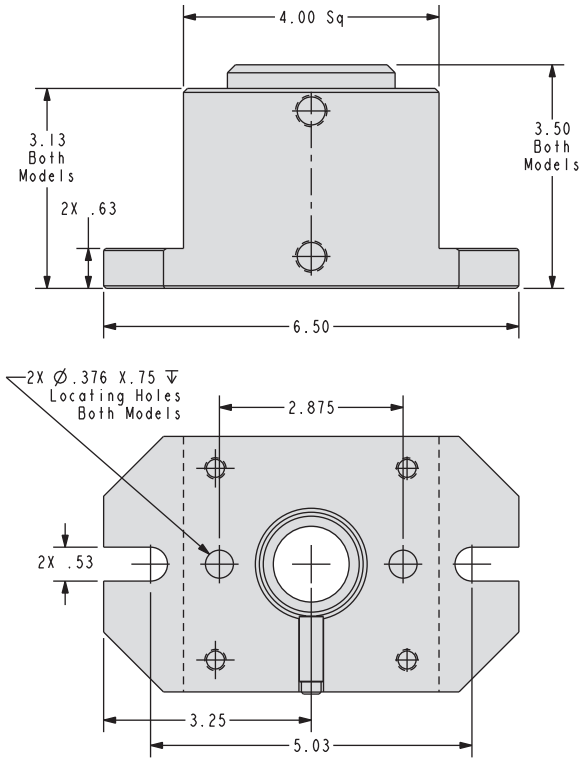
Air Powered Collet Vise

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.
- Lightweight, only 5 lbs.



15-5435-00



15-5435-01

ILS155400 REV G

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

Frequently Asked Questions

Why use Cylinders?

Cylinders 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 single 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.

I am tired of buying cartridge mount double acting cylinders from other companies that leak when installed. They always seem to leak past their external body seals and are very hard to diagnose problems. How can I avoid these problem cylinders?

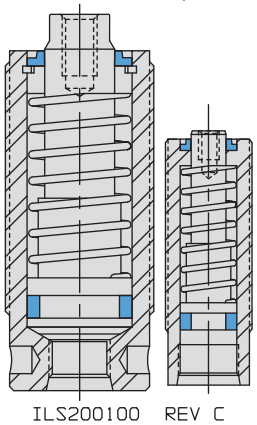
Cartridge cylinders have always required a special cylinder wall or end finish adequate to seal against. The most common sources of cartridge cylinder leakage are from bad finishes or external seals getting damaged when screwed into a poorly made cavity. This cylinder uses an easy to make upper flange O-ring port to avoid the need for smooth cavity walls. Bore the clearance hole, mill the flange recess and drill the ports to connect. This dramatically reduces chances of leakage as all active sealing surfaces are Vektek BHC™ cylinder walls.

I love your single acting cartridge cylinders. How can I get the positive return of double acting and still "bury" my cylinders?

New Easy Mount double acting cartridge cylinders let you hide the cylinder body, use double acting and O-ring manifold mount... The best of all solutions!

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 the (BHC™) Black Hard Coating'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.

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

Threaded Mini

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.

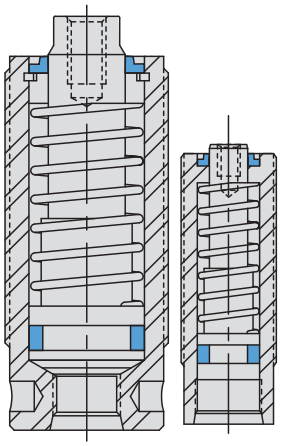
Special tough wipers help keep chips and contaminants out on all cylinder sizes.

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

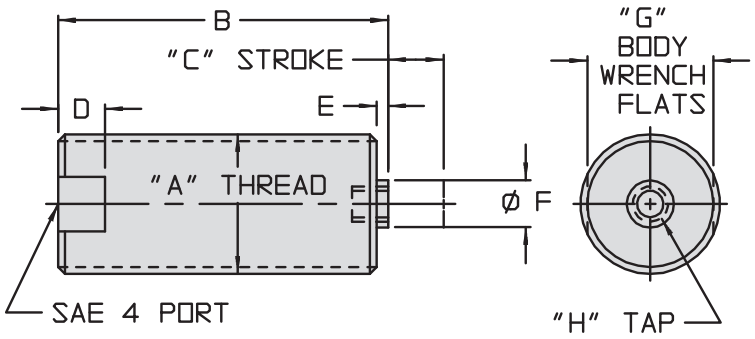
Available in three stroke lengths for each capacity, up to 1 1/4" stroke.

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 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 by your system operating pressure. (Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.)



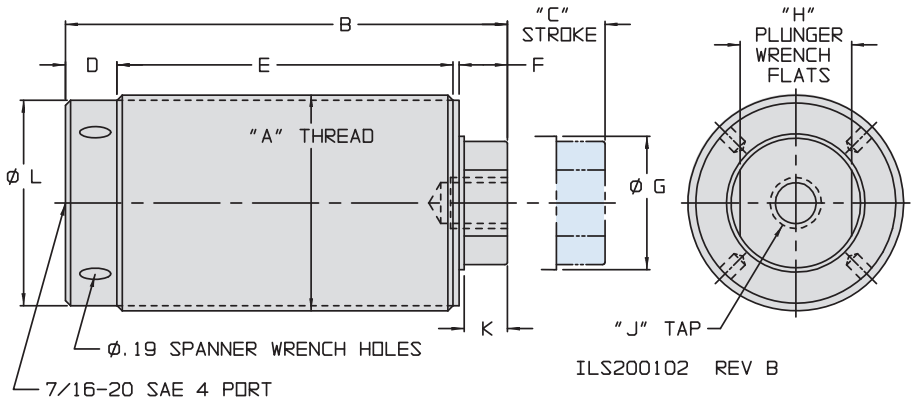
ILS200100 REV C



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			1.97	0.25					
20-0104-07	550	5/8-18	2.60	0.75	0.25	0.10	0.25	0.56	8-32 x 0.25
20-0104-12			3.22	1.25					
20-0105-03			2.00	0.38					
20-0105-07	980	3/4-16	2.63	0.75	0.25	0.06	0.25	0.68	8-32 x 0.25
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			2.19	0.25		1.40	0.26					
20-0108-07	2200	1 1/16-16	2.70	0.75	0.50	1.90	0.26	0.50	0.43	1/4-20 X 0.44	0.19	0.97
20-0108-12			3.39	1.25		2.63	0.21					

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

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.

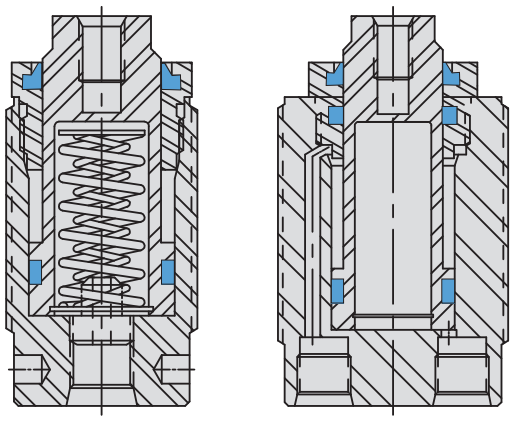
Model No.	Cylinder Capacity (lb.)**		Stroke (in.)	Body Thread	Minimum Length	Effective Piston Area (sq. in.)		Oil Capacity (cu. in.)	
	Extend	Retract				Extend	Retract	Extend	Retract
Single Acting (S/A)			Cylinders, actuated hydraulically 1 direction, spring returned						
20-0110-00	3900	N/A	0.50	1 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 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 by 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								

Threaded



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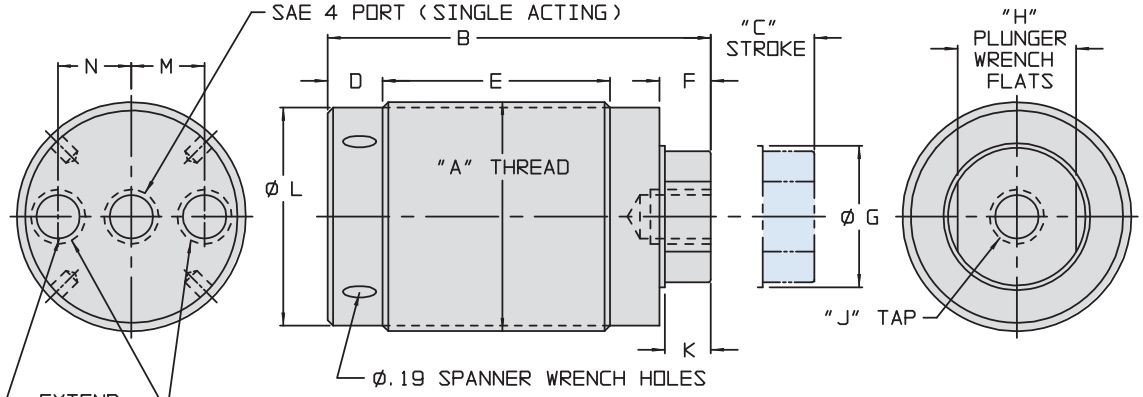


ILS200104 REV C

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.

Block

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

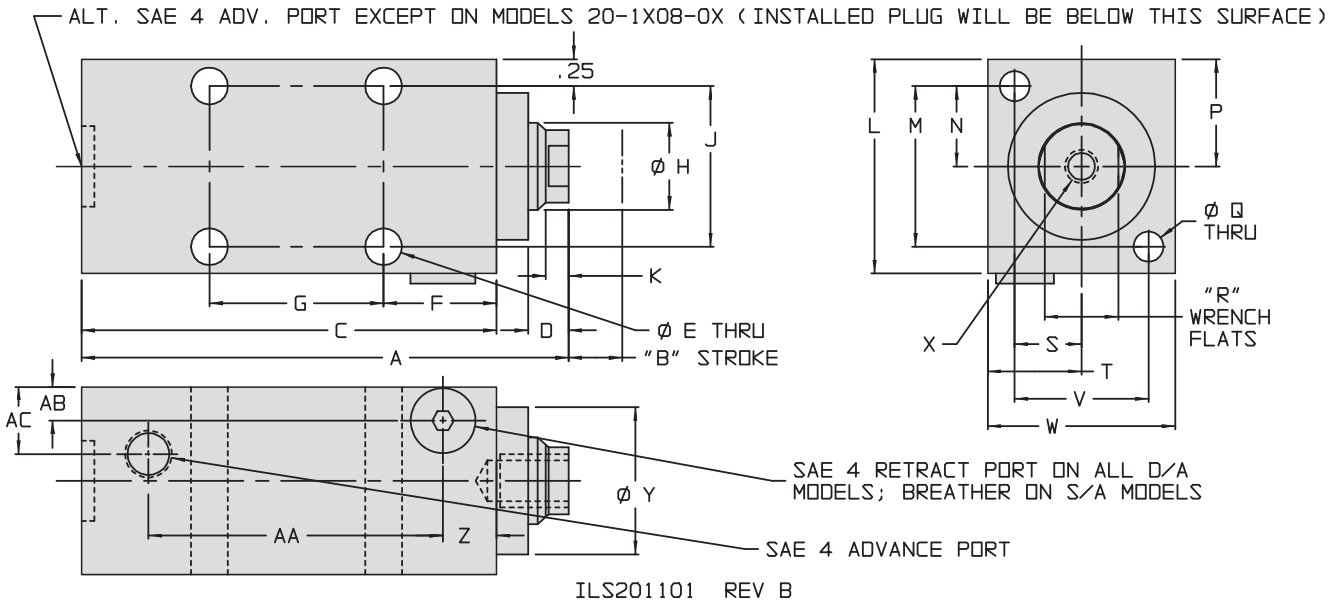
Model No.	Cylinder Capacity (lb.)**		Stroke (in.)	Body Size	Minimum Length (in)	Piston Area (sq. in.)		Oil Capacity (cu. in.)	
	Extend	Retract				Extend	Retract	Extend	Retract
Single Acting (S/A)				**Cylinders, actuated hydraulically 1 direction, spring returned**					
20-1108-00	2200	N/A	0.25	1.13 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 by your system operating 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	F	G	H	J	K	L	M	N
Single Acting (S/A)													
20-1108-00	2.37	0.25	1.84	0.29	0.28	0.92	N/A	0.50	1.31	0.22	2.00	1.31	0.66
20-1108-01	3.12	0.75	2.59										
20-1110-00	2.80	0.50	2.25	0.32	0.34	1.06	N/A	0.81	1.50	0.28	2.00	1.50	0.75
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	2.88	0.50	2.25	0.40	0.34	1.06	N/A	1.13	2.00	0.34	2.50	1.90	0.95
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	2.37	0.25	1.84	0.29	0.28	0.92	N/A	0.50	1.31	0.22	2.00	1.31	0.66
20-1208-01	3.12	0.75	2.59										
20-1210-00	2.80	0.50	2.25	0.32	0.34	1.06	N/A	0.81	1.50	0.28	2.00	1.50	0.75
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	2.88	0.50	2.25	0.40	0.34	1.06	N/A	1.13	2.00	0.34	2.50	1.90	0.95
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						

Block



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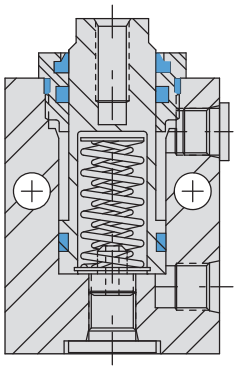

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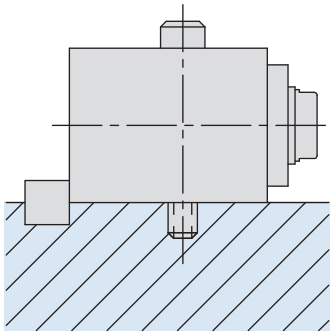


ILS201102 REV B

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.

	P	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC
Cylinders, actuated hydraulically 1 direction, spring returned													
	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
	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
	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													
	0.91	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
	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
	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

Block, Manifold Mount

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	Min. 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	2.69	0.785	N/A	0.393	N/A
21-1110-01			1.00		3.19			0.785	N/A
21-1110-04			1.50		3.81			1.177	N/A
21-1110-02			2.00		4.31			1.570	N/A
21-1115-00	8800	N/A	0.50	2.00 x 2.50	2.77	1.767	N/A	0.884	N/A
21-1115-01			1.00		3.27			1.767	N/A
21-1115-04			1.50		3.77			2.650	N/A
21-1115-02			2.00		4.27			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	2.69	0.785	0.267	0.393	0.134
21-1210-01			1.00		3.19			0.785	0.268
21-1210-04			1.50		3.81			1.177	0.400
21-1210-02			2.00		4.31			1.570	0.536
21-1215-05	8800	3800	0.50	2.00 x 2.50	2.77	1.767	0.773	0.884	0.387
21-1215-01			1.00		3.27			1.767	0.774
21-1215-04			1.50		3.77			2.650	1.160
21-1215-02			2.00		4.27			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.

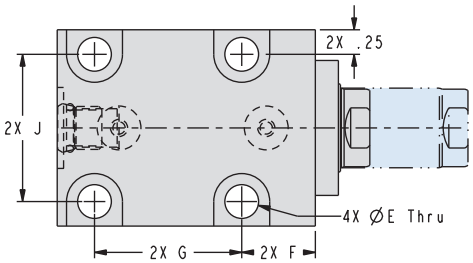
*** Breather or vent must be provided for S/A Models.

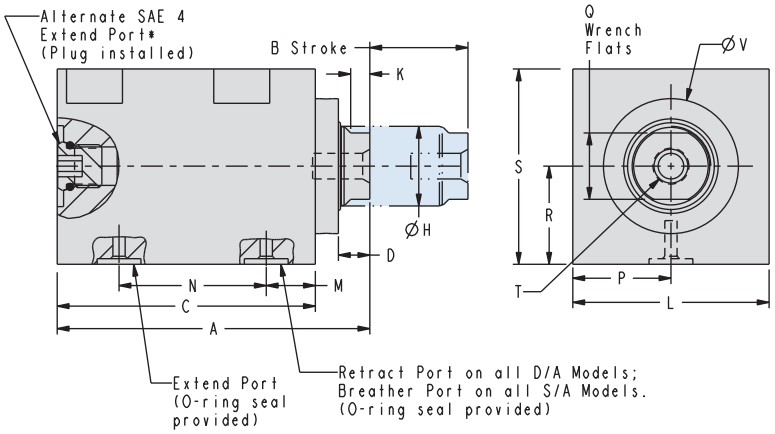
Dimensions

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	

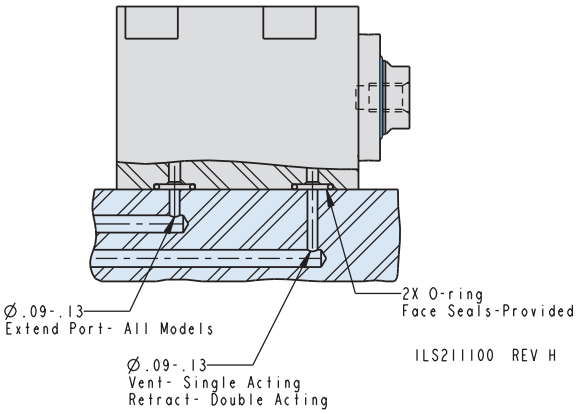
Block, Manifold Mount

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





ILS211101 REV M



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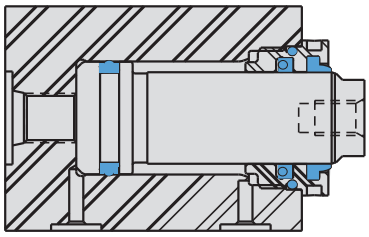
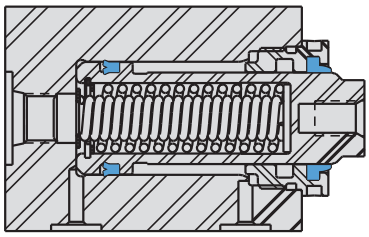




ILS211102 REV F

* Alternate SAE 4 Extend Port not available on Models 21-1108-XX and 21-1208-XX

F-9

	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	1.000	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	1.000	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	1.000	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	1.000	1.99	1/2-13 x 0.51	1.75

Hollow Rod

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.

F-10

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.

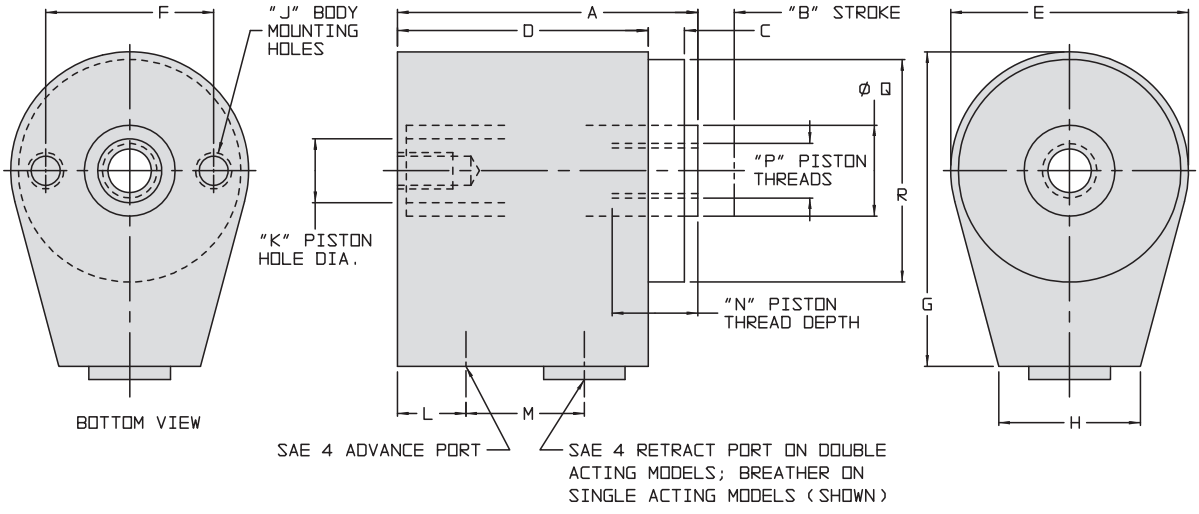
Model No.	Cylinder Capacity (lb.)**	Stroke (in.)	Body Size	Minimum Length (in)	Piston Area (sq. in.)	Oil Capacity (cu. in.)
Single Acting (S/A)					**Cylinders, actuated hydraulically 1 direction, spring returned**	
20-2113-03	4600	0.25	1.63 x 2.16	2.00	0.920	0.230
20-2115-04	6600	0.38	1.95 x 2.44	2.50	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 equals the clamping force (Actual force may vary slightly due to friction and/or return springs.)

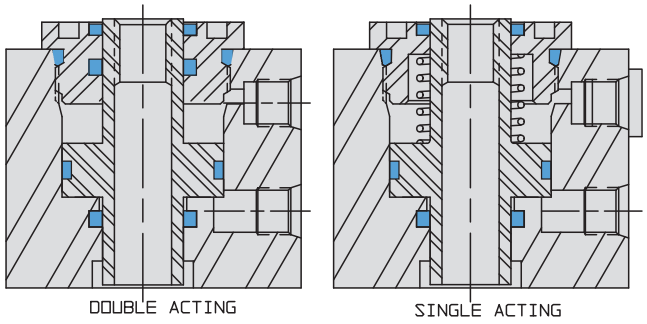
Dimensions

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

Hollow Rod



ILS202101 REV B



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.

Cartridge Mount Mini

Single Acting

- Easy to use, basic hydraulic cylinders in five 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 of 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 body helps prevent scoring and scratching. After years of use, cylinder removal is easier because of BHC's corrosion resistance.

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

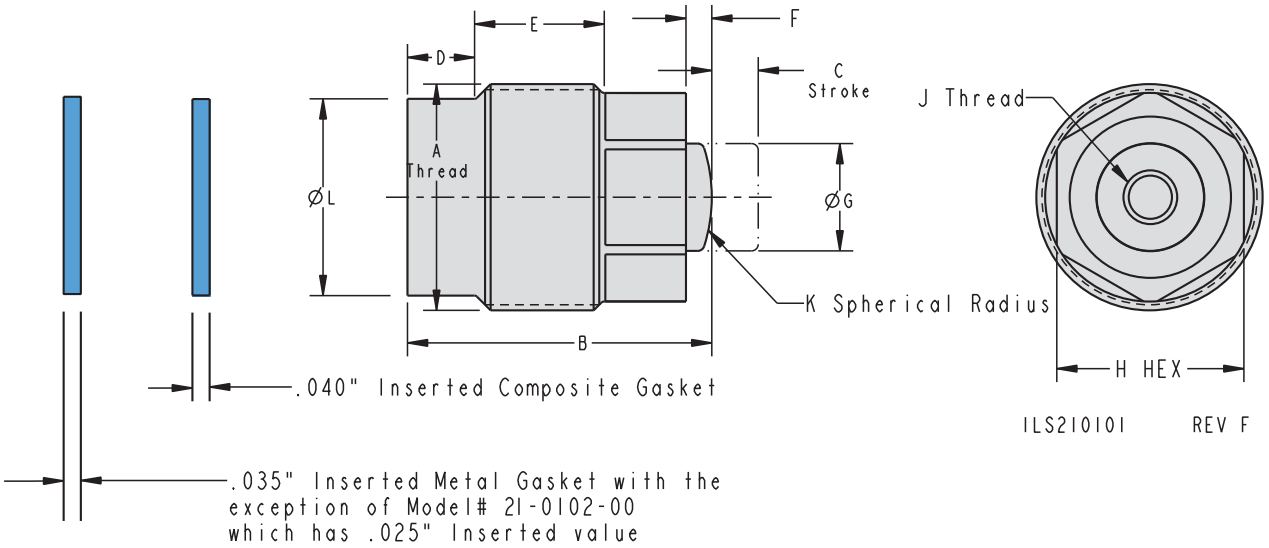
* All cylinder pistons are chrome plated, hardened alloy steel with the exception of Model# 21-0102-00 which has a piston made of unhardened stainless steel.

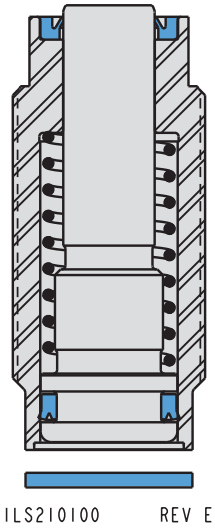
** Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying the hydraulic system pressure. To determine approximate output force for your application, multiply the piston area by the operating pressure. Actual force may vary slightly due to friction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

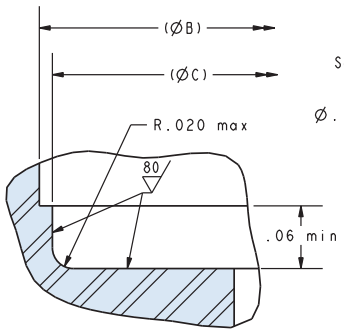
Dimensions

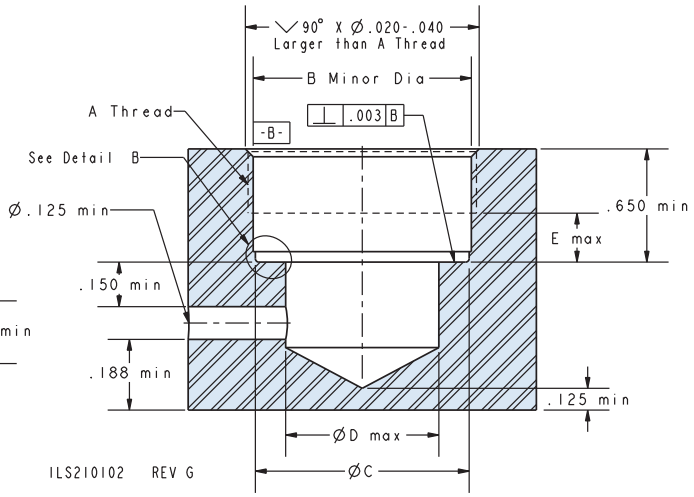
Model No.	A	B	C	D	E	F	ØG	H	J	K	L
Single Acting (S/A)						Cylinders, actuated hydraulically 1 direction, spring returned					
21-0102-00*	3/8-24	1.16	0.12	0.125	0.86	0.04	0.11	0.31	N/A	N/A	0.313
21-0104-02	5/8-18	1.14	0.19	0.203	0.69	0.06	0.18	0.50	N/A	0.25	0.539
21-0105-03	3/4-16	1.48	0.25	0.203	0.98	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	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	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

Cartridge Mount Mini









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 UN-2B	50 FT-LB	25 FT-LB	1.002± 0.003	0.923± 0.005	0.63	0.281
	1 5/16-16 UN-2B	N/A	35 FT-LB	1.253± 0.003	1.228± 0.005	0.88	0.281

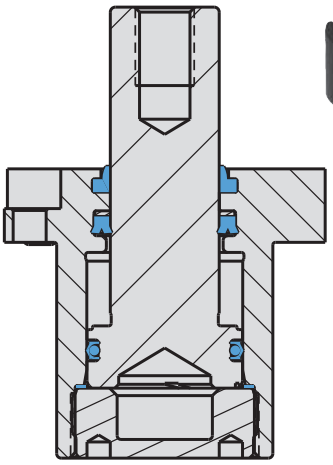
Both metal and composite gaskets are supplied. Use only one gasket of your choice.

Easy Mount Cartridge

Manifold Cartridge Cylinder

Double Acting

- No leak, Top Flange, Compact Cartridge Cylinder.
- Easy to make, simple cavity with no special bore finish requirement.
- Clamp and unclamp circuits feed through O-ring face seals.
- All cylinder sealing surfaces Vektek made.
- BHC™ on cylinder bodies.



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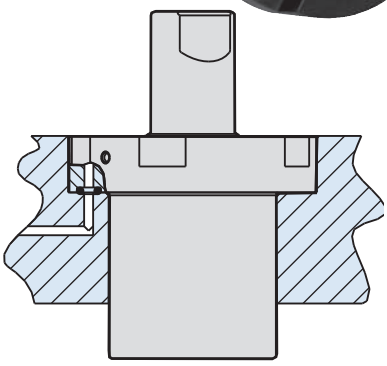


ILS216203 REV A

F-14

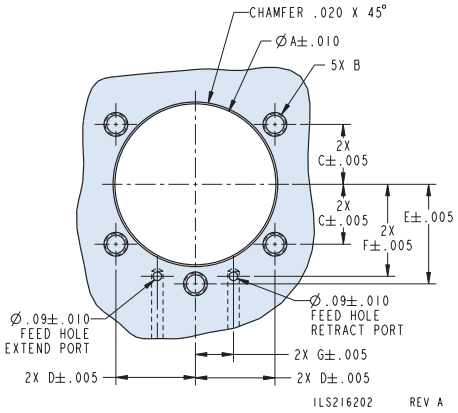
Model No.	Cylinder Capacity (lb.)**		Stroke (in.)	Effective Piston Area (sq. in.)		Oil Capacity (cu. in.)	
	Extend	Retract		Extend	Retract	Extend	Retract
Double Acting (D/A)			Cylinders, actuated hydraulically both directions				
21-6213-02	6100	3100	0.59	1.231	0.630	0.726	0.372

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

Mounting Dimensions

Model No.	Capacity	ØA	B	C	D
21-6213-02	6100/3100	1.754	1/4 - 20	0.653	0.867
Model No.		E	F	G	
21-6213-02	6100/3100	1.085	1.003	0.415	

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



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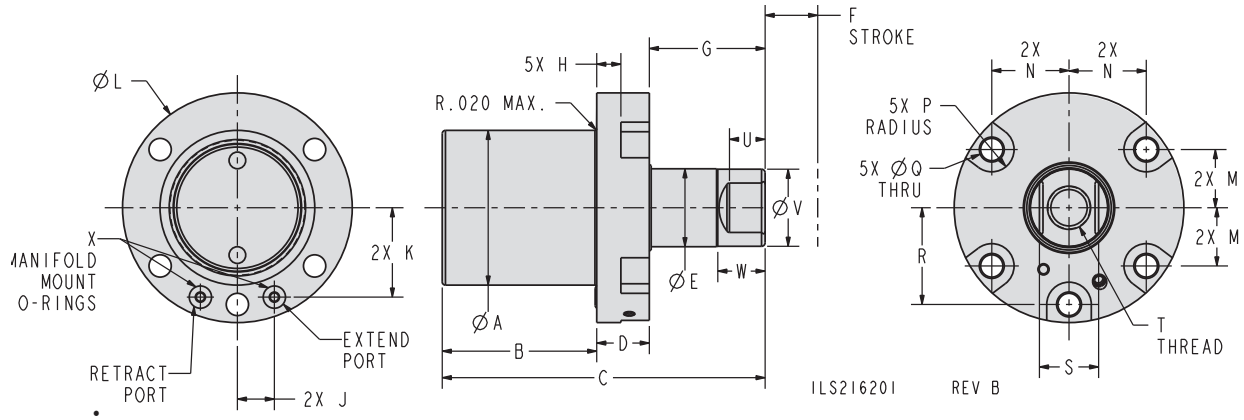


ILS216201 REV B

Dimensions

Model No.	ØA	B	C	D	ØE	F	G	H	J	K	ØL	M	N
Double Acting (D/A)	Cylinders, actuated hydraulically both directions												
21-6213-02	1.74	1.73	3.62	0.59	0.875	0.59	1.30	0.27	0.42	1.00	2.577	0.65	0.87
Model No.	P	ØQ	R	S	T				U	ØV	W	X	
Double Acting (D/A)	Cylinders, actuated hydraulically both directions												
21-6213-02	0.25	0.27	1.09	0.66	1/2 - 20 UNF DEPTH 0.63				0.40	0.87	0.53	0.145 X 0.070	

Push/Pull Cylinders

Features, Frequently Asked Questions, Concept

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.

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?

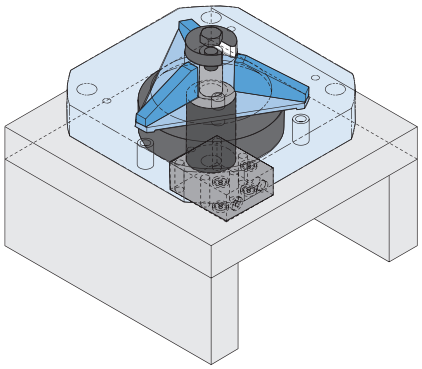
Yes, you may use single acting pull cylinders as stock crowders to hold your part in place, then draw them away for machining. This can often be done with a single hydraulic clamping circuit making your controls very simple. Be sure to use a hardened contact point on your pull cylinder when using it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



Push-Pull Concept

Push/Pull Cylinders

Threaded Body

Single And Double Acting

- Four capacities from 470 lb. to 5600 lb. clamp force at rated pressure.
- 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.

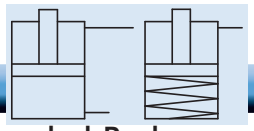
Model No.	Cylinder Capacity (lb.)**		Stroke (in.)	Extended Height (in.)	Effective Piston Area (sq. in.)		Oil Capacity (cu. in.)	
	Extend	Retract			Extend	Retract	Extend	Retract
Single Acting (S/A)					Cylinders, actuated hydraulically 1 direction, spring returned			
25-0105-00	N/A	470	0.57	4.00	N/A	0.098	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 by your system operating pressure. (Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.)

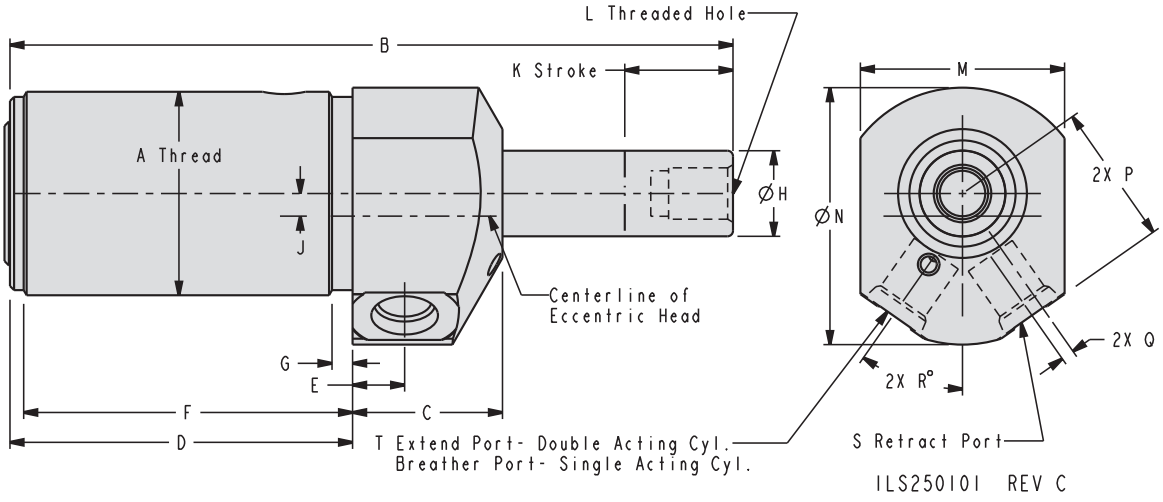
Dimensions

Model No.	A	B	C	D	E	F	G	ØH
Single Acting (S/A)								
25-0105-00	1 1/16 - 16	4.02	0.75	2.02	0.27	1.94	0.15	0.437
25-0109-08	1 1/2 - 16	5.32	1.09	2.54	0.38	2.40	0.15	0.625
25-0113-11	1 7/8 - 16	6.81	1.06	3.35	0.36	3.21	0.15	0.875
25-0118-00	2 1/2 - 16	9.31	1.19	4.71	0.39	4.59	0.15	1.250
Double Acting (D/A)								
25-0205-00	1 1/16 - 16	4.02	0.75	2.02	0.27	1.94	0.15	0.437
25-0209-08	1 1/2 - 16	5.32	1.09	2.54	0.38	2.40	0.15	0.625
25-0213-11	1 7/8 - 16	6.81	1.06	3.35	0.36	3.21	0.15	0.875
25-0218-00	2 1/2 - 16	9.31	1.19	4.71	0.39	4.59	0.15	1.250

Push/Pull Cylinders



Threaded Body



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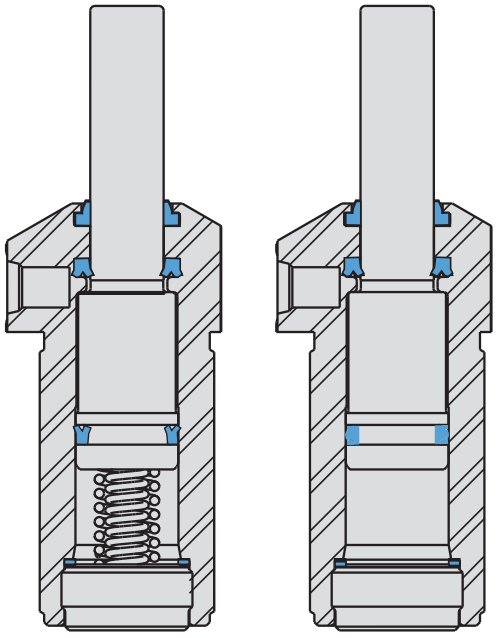


Pull Cylinder Push/Pull Cylinder

ILS250100 REV C

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

Push/Pull Cylinders

Top Flange/Manifold

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.
- Manifold 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.

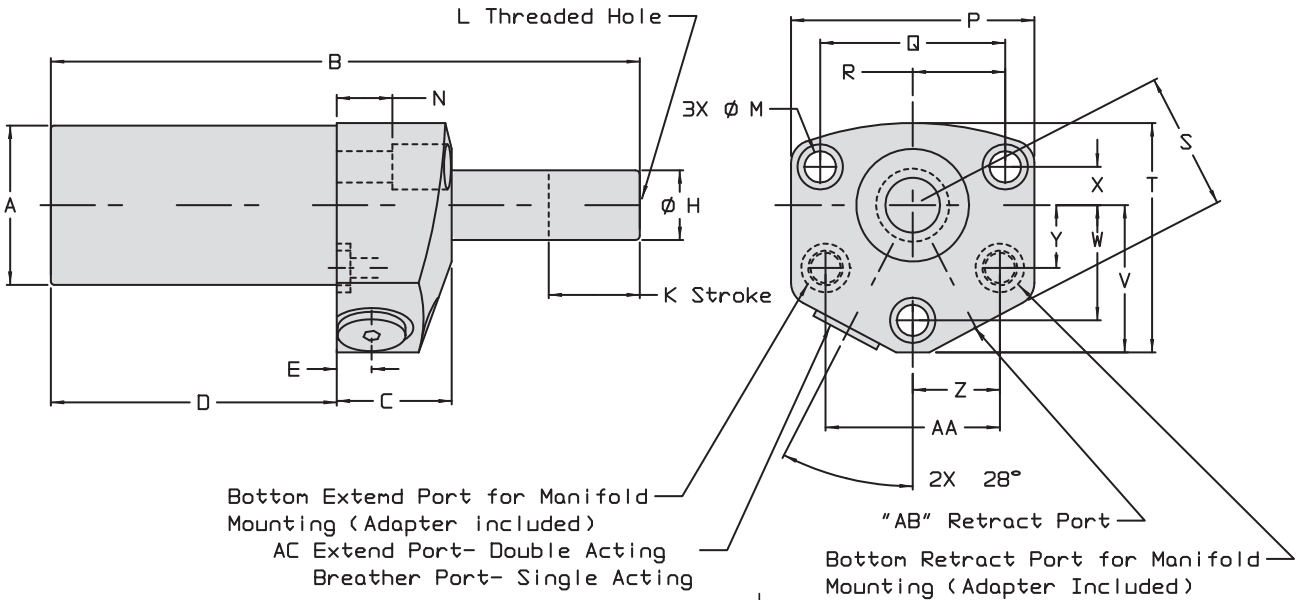
Model No.	Cylinder Capacity (lb)**		Stroke (in)	Extended Height (in)	Effective Piston Area (sq. in.)		Oil Capacity (cu. in.)		Optional Flow Control Model No.
	Extend	Retract			Extend	Retract	Extend	Retract	
Single Acting (S/A)						Cylinders, actuated hydraulically 1 direction, spring returned			
25-0505-00	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 by your system operating pressure. (Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.)

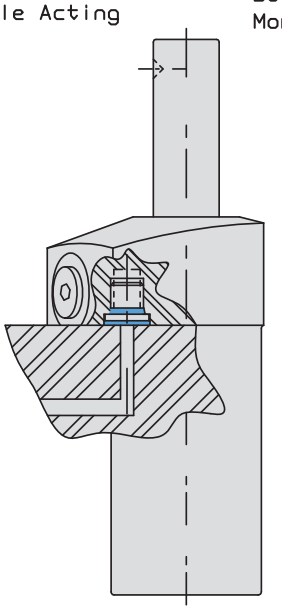
Dimensions

Model No.	ØA	B	C	D	E	ØH	K	L	ØM	N
Single Acting (S/A)										
25-0505-00	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	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	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	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	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	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	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	2.37	9.31	1.47	4.43	0.54	1.250	1.66	5/8 - 18 X 0.75	0.41	0.75

Top Flange/Manifold



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



	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

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 extended capacity of 1200 to 6100 lb., depending on operating pressure. Their retract capacities are the same as the single acting, at the same operating pressures.
- 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.

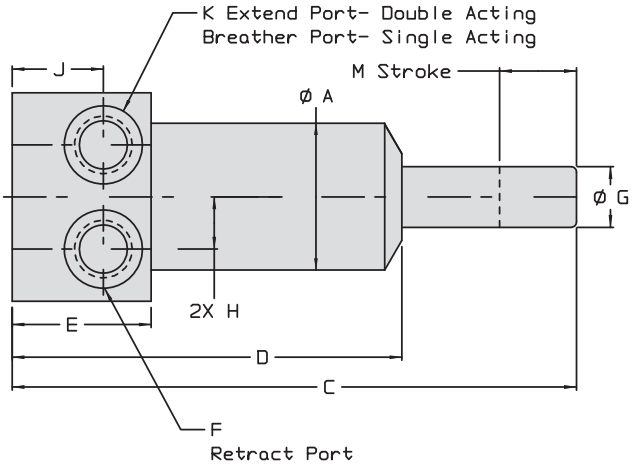
Model No.	Cylinder Capacity (lb.)**		Stroke (in)	Extended Height (in)	Effective Piston Area (sq. in.)		Oil Capacity (cu. in.)		Optional Flow Control Model No.
	Extend	Retract			Extend	Retract	Extend	Retract	
Single Acting (S/A)									**Cylinders, actuated hydraulically 1 direction, spring returned**
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

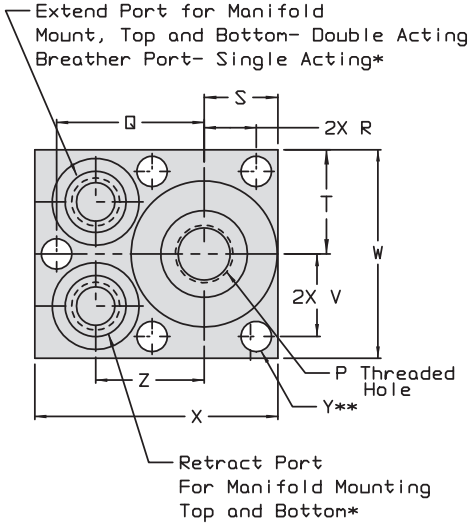
** Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying the hydraulic system pressure. To determine approximate output force for your application, multiply the piston area by your system operating pressure. (Actual force may vary slightly due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

Dimensions

Model No.	ØA	C	D	E	F	ØG	H	J	K	M
Single Acting (S/A)										
25-2105-01*	1.05	4.06	2.80	1.00	SAE 4	0.438	0.38	0.66	Breather	0.57
25-2109-01	1.49	5.33	3.65	1.25	SAE 4	0.625	0.56	0.63	Breather	0.79
25-2113-01	1.79	6.83	4.43	1.25	SAE 4	0.875	0.75	0.63	Breather	1.16
Double Acting (D/A)										
25-2205-01*	1.05	4.06	2.80	1.00	SAE 4	0.438	0.38	0.66	SAE 4	0.57
25-2209-01	1.49	5.33	3.65	1.25	SAE 4	0.625	0.56	0.63	SAE 4	0.79
25-2213-01	1.79	6.83	4.43	1.25	SAE 4	0.875	0.75	0.63	SAE 4	1.16

Bottom Flange/Manifold Mount

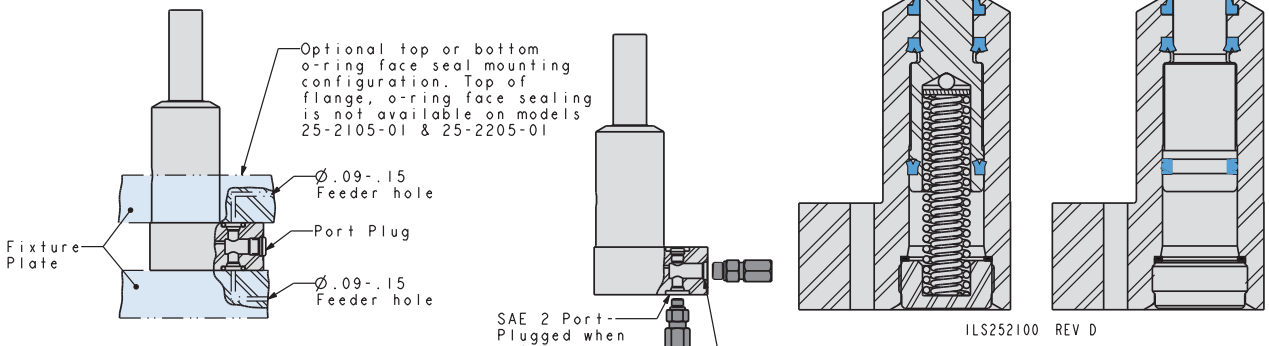




ILS252101 Rev C

* Models 25-2105-01 and 25-2205-01 do not include the option for manifold mounting. 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.



ILS252100 REV D

ILS252102 REV A

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

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

Push/Pull Cylinders

Cartridge Mount

Single And Double Acting

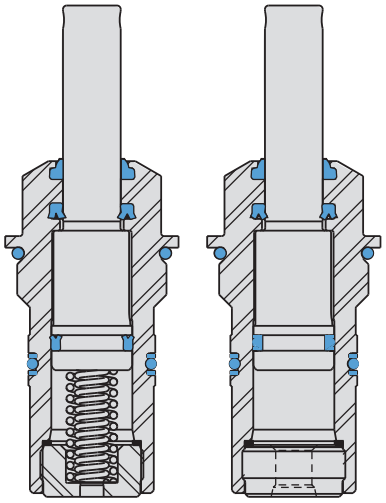
- Cylinders are used when rotational swing arms are not beneficial.
- Single acting are available in three retract capacities from 470 to 3,100 lb force.
- Double acting have an extend capacity of 1,200 to 6,100 lb., with their retract capacities the same as the single acting at the same operating pressure.
- 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.



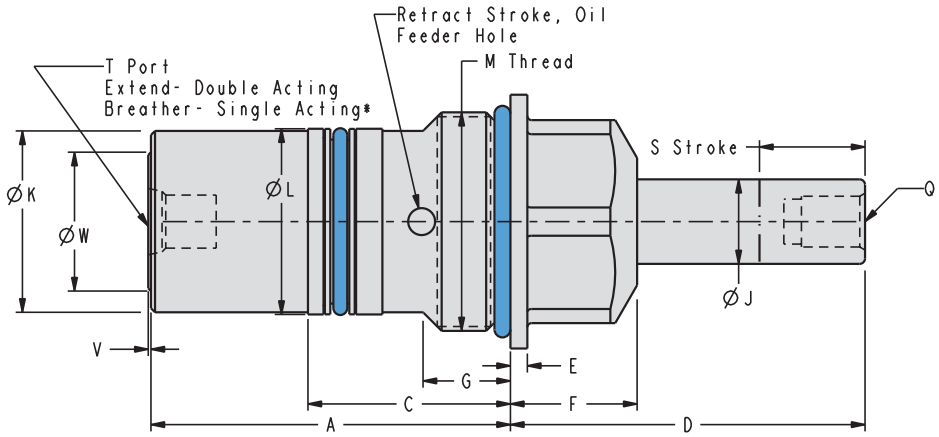
Model No.	Cylinder Capacity (lb.)**		Stroke (in.)	Body Thread	Effective Piston Area (sq. in.)		Oil Capacity (cu. in.)	
	Extend	Retract			Extend	Retract	Extend	Retract
Single Acting (S/A)						Cylinders, actuated hydraulically 1 direction, spring returned		
25-1105-01	N/A	470	0.57	1 1/16-12	N/A	0.098	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

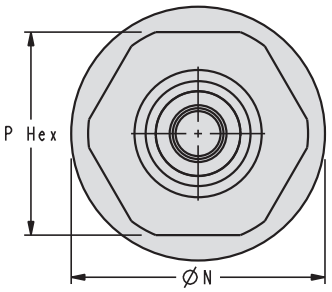
** Cylinder capacities are listed at 5,000 psi maximum operating pressure. The output force is adjustable by varying the hydraulic system pressure. To determine approximate output force for your application, multiply the piston area by your system operating pressure. (Actual force may vary slightly due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

Dimensions

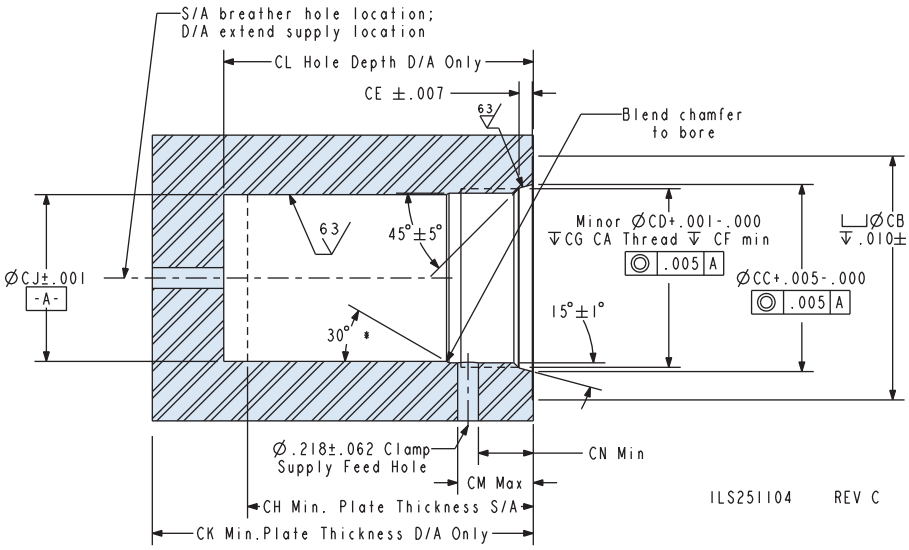
Model No.	A	C	D	E	F	G	ØJ	ØK	ØL
Single Acting (S/A)									
25-1105-01	2.12	1.32	1.88	0.13	0.63	0.49	0.438	0.92	0.935
25-1109-09	2.66	1.50	2.63	0.13	0.94	0.65	0.625	1.34	1.372
25-1113-12	3.13	1.50	3.65	0.16	1.25	0.55	0.875	1.72	1.747
Double Acting (D/A)									
25-1205-01	2.12	1.32	1.88	0.13	0.63	0.49	0.438	0.92	0.935
25-1209-09	2.66	1.50	2.63	0.13	0.94	0.65	0.625	1.34	1.372
25-1213-12	3.13	1.50	3.65	0.16	1.25	0.55	0.875	1.72	1.747

Cartridge Mount





ILS251103 REV D



ILS251104 REV C

Basic cavity can be formed using a standard (SAE J1926/1 Port Detail) O-ring Port Cutter.

* 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. Los Angeles, CA, 323-261-2193. Please contact Brush Research for additional information.

G-9

Cavity Dimensions

Model No.	CA	ØCB	ØCC	ØCD	CE	CF	CG MIN	CG MAX	CH	ØCJ	CK	CL	CM	CN
Single Acting (S/A)												**Cylinders, actuated hydraulically 1 direction, spring returned**		
25-1105-01	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
25-1109-09	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
25-1113-12	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**		
25-1205-01	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
25-1209-09	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
25-1213-12	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

	M	ØN	P	Q	R	S	T*	V	ØW
							Cylinders, actuated hydraulically 1 direction, spring returned		
	1 1/16 - 12	1.25	1.00	1/4 - 28 X 0.28	0.22	0.57	Breather	N/A	N/A
	1 5/8 - 12	1.88	1.50	3/8 - 24 X 0.47	0.31	0.79	Breather	0.02	1.03
	1 7/8 - 12	2.13	1.63	1/2 - 20 X 0.52	0.50	1.16	Breather	0.02	1.40
							Cylinders, actuated hydraulically both directions		
	1 1/16 - 12	1.25	1.00	1/4 - 28 X 0.28	0.22	0.57	SAE 2	N/A	N/A
	1 5/8 - 12	1.88	1.50	3/8 - 24 X 0.47	0.31	0.79	SAE 4	0.02	1.03
	1 7/8 - 12	2.13	1.63	1/2 - 20 X 0.52	0.50	1.16	SAE 4	0.02	1.40

Push/Pull Cylinders

Block Pull Cylinders

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.

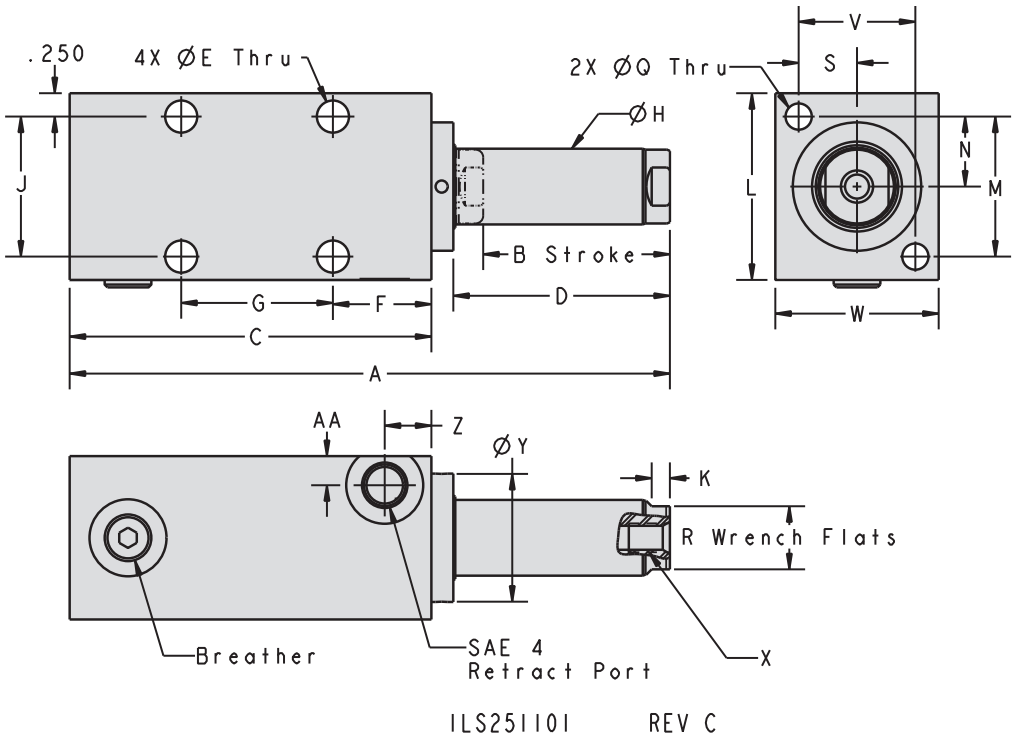
Model No.	Cylinder Capacity (lb.)** Retract	Stroke (in.)	Body Size	Extended Height (in.)	Piston Area (sq. in.)	Oil Capacity (cu. in.)
Single Acting (S/A)				Cylinders, actuated hydraulically 1 direction, spring returned		
25-1110-11	1300	1.00	1.75 x 2.00	4.30	0.267	0.268
25-1110-12		2.00		6.43		0.536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

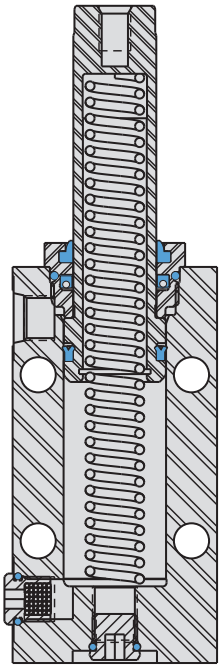
Dimensions

Model No.	A	B	C	D	E	F	G	H	J	K	L
Single Acting (S/A)											
25-1110-11	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	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				

Block Pull Cylinders



ILS251101 REV C



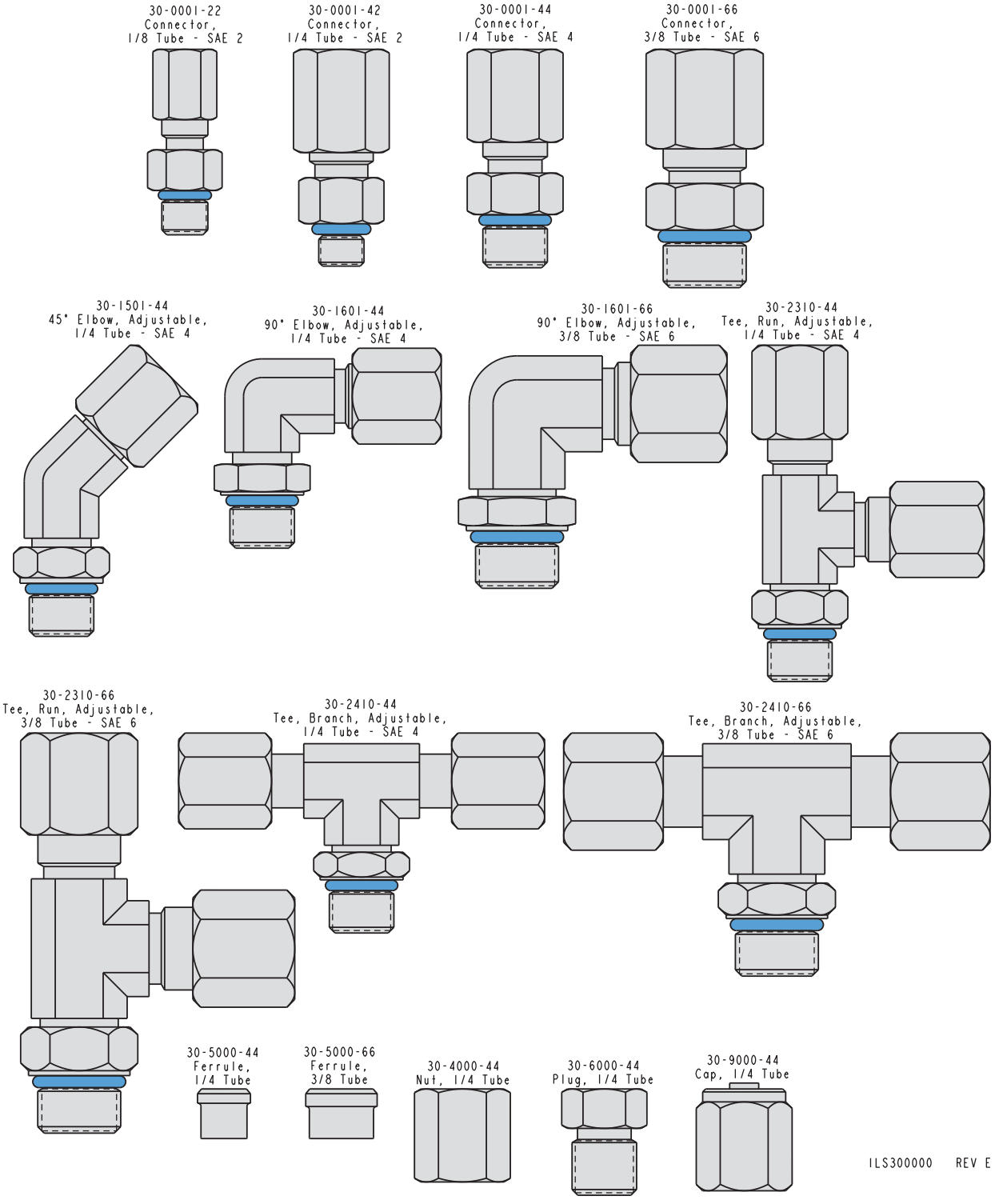
ILS251100 REV D

	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.

Connectors, Elbows and Tees

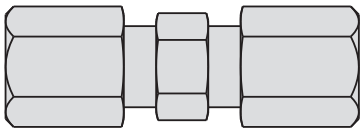
SAE Connectors, Elbows, Tees and Plugs



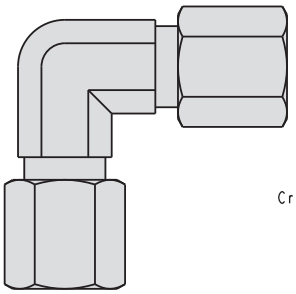
Flareless Tube and Straight Thread Fittings

SAE J514, Flareless Tube Fittings

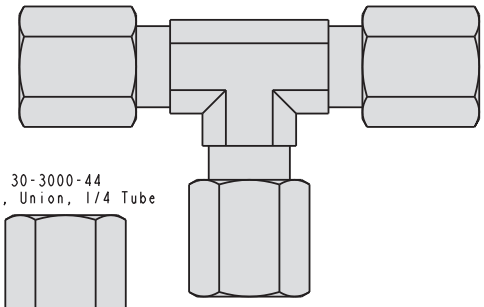
30-0000-44
Union, Straight, 1/4 Tube



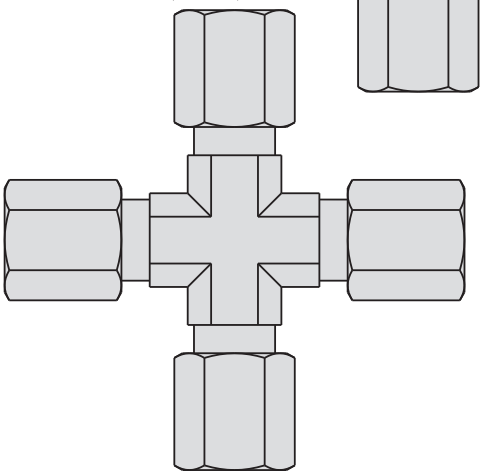
30-1600-44
90° Elbow, Union, 1/4 Tube



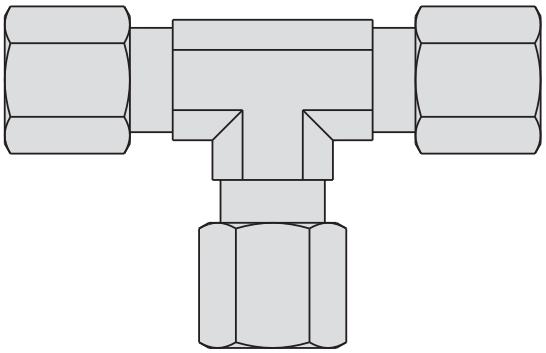
30-2000-44
Tee, Union, 1/4 Tube



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

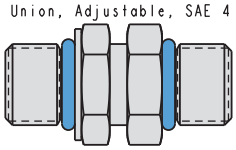


30-2000-66
Tee, Union, 3/8 Tube

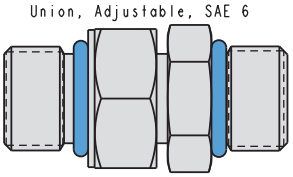


SAE Straight Thread

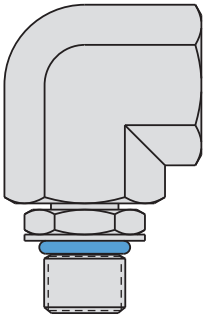
30-0011-44
Union, Adjustable, SAE 4



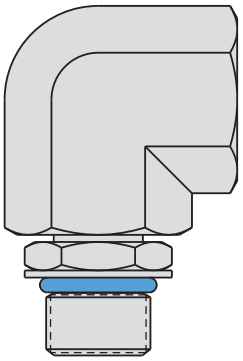
30-0011-66
Union, Adjustable, SAE 6



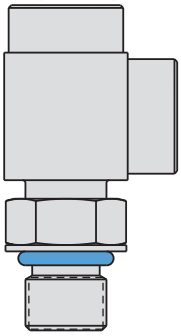
30-1621-44
90° Elbow, Adjustable,
SAE 4 - SAE 4



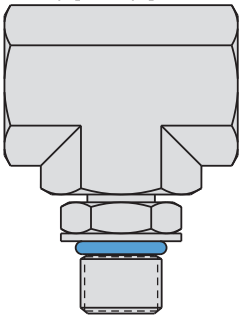
30-1621-66
90° Elbow, Adjustable,
SAE 6 - SAE 6



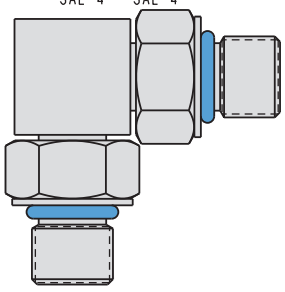
30-2312-44
Tee, Run, Adjustable
SAE 4 - SAE 4



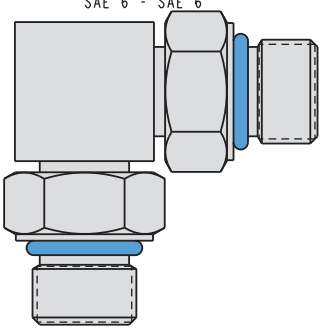
30-2412-44
Tee, Branch, Adjustable,
SAE 4 - SAE 4



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



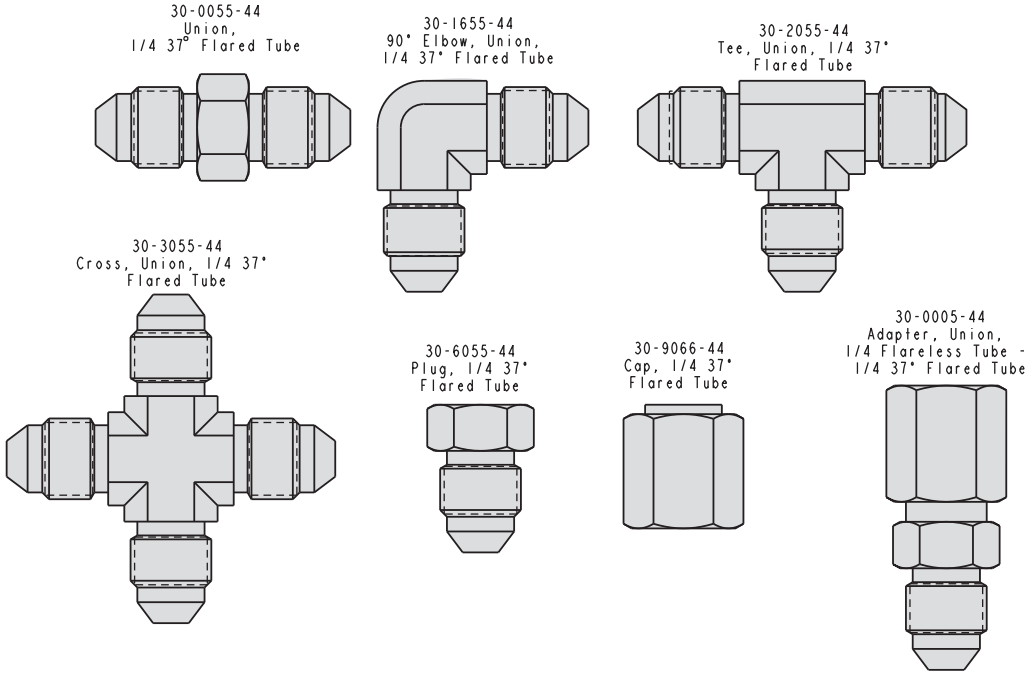
30-1611-66
90° Elbow, Union, Adjustable,
SAE 6 - SAE 6



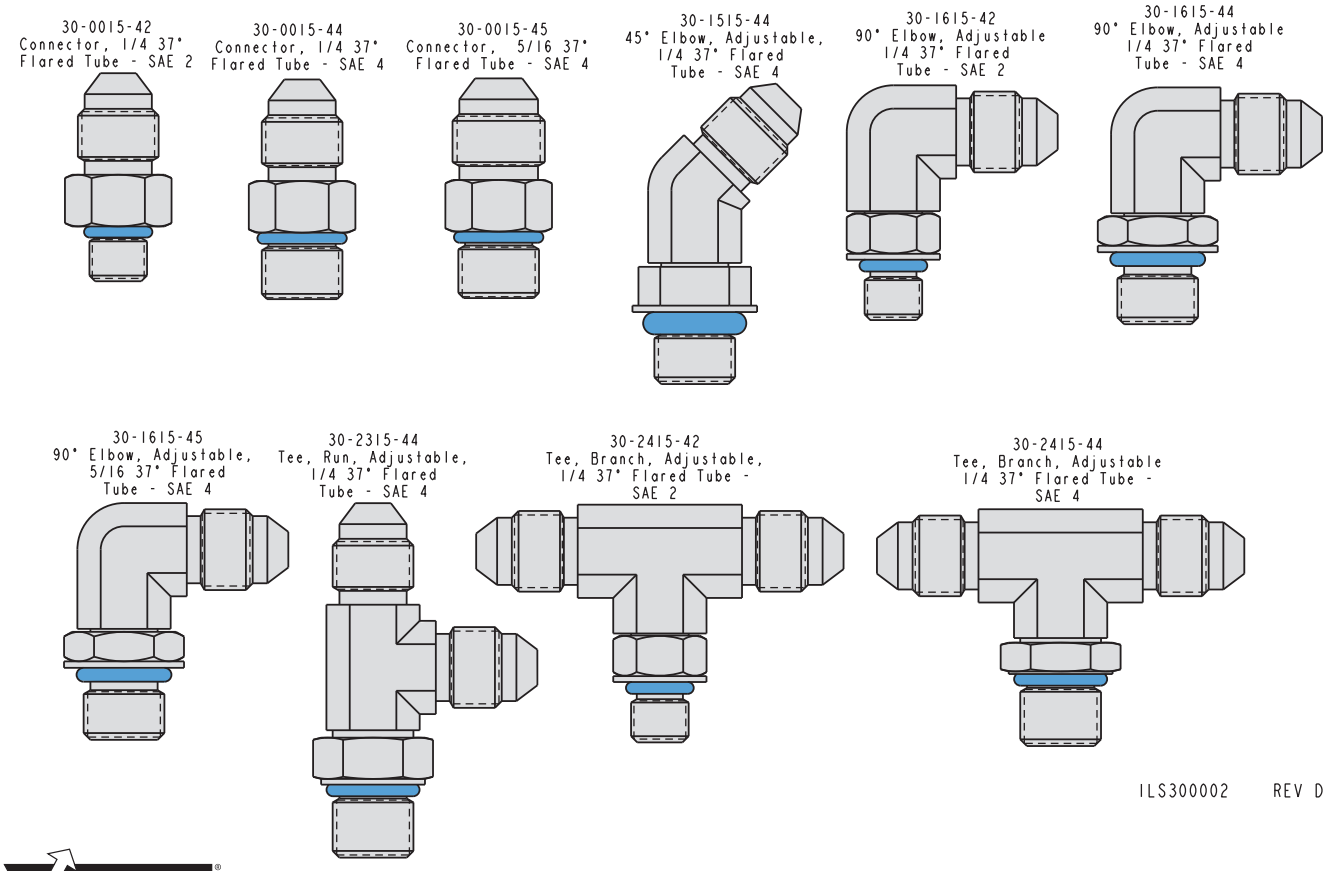
ILS300001 REV C

Flared Tube Fittings

SAE J514 Flared Tube Fittings 37°

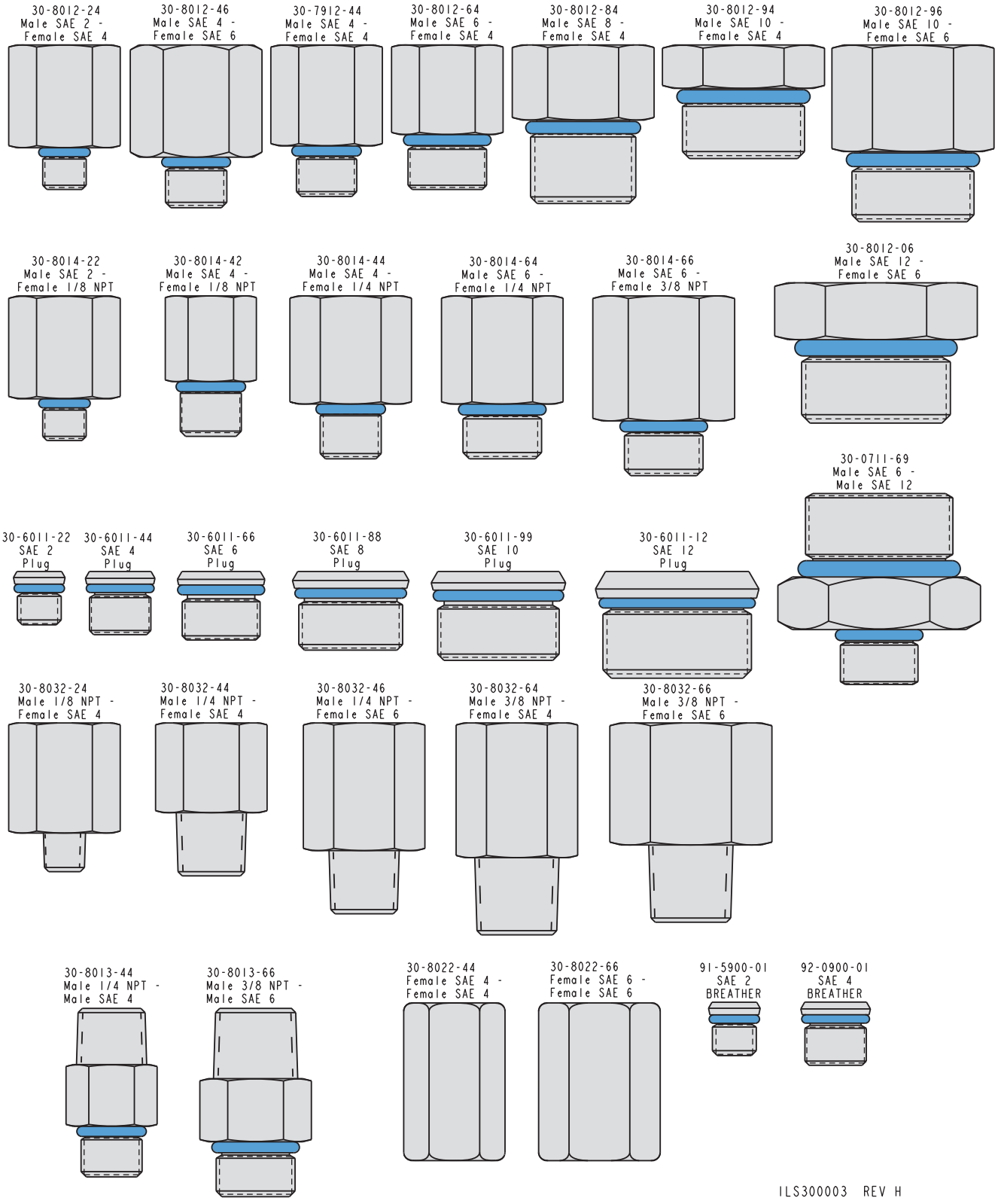


SAE J514 Flared Tube 37° - SAE Straight Thread



ILS300002 REV D

Adapters and Plugs

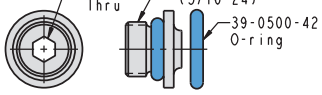


ILS300003 REV H

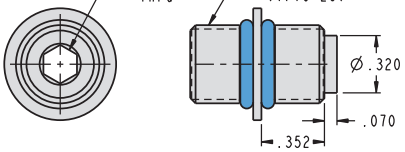
Special Use Adapters

Special Use Adapters

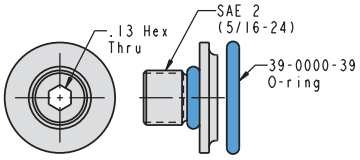
Part No. 30-8711-20
For Manifold Mounting
Top Flange Swing Clamps and
Top Flange Push/Pull Cylinders



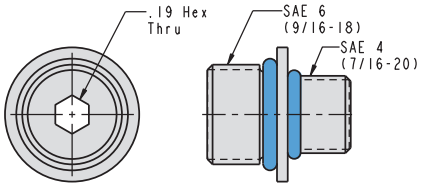
Part No. 30-8711-44



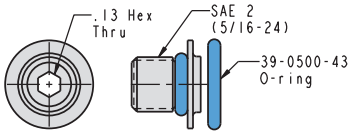
Part No. 30-8711-21



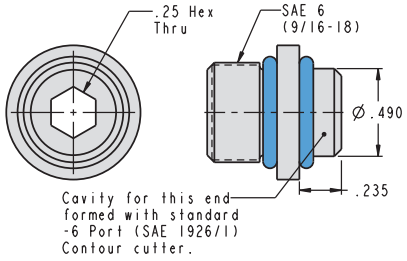
Part No. 30-8711-46



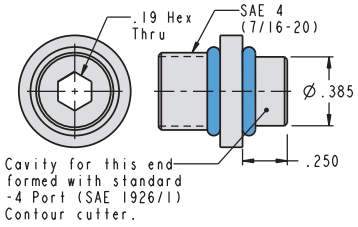
Part No. 30-8711-23
For Manifold Mounting
32-1241-00 & 32-1261-01 Single Path,
32-2242-00 & 32-2262-00 Dual Path and
32-4244-00 & 32-4264-00 Quad Path
Rotary Unions



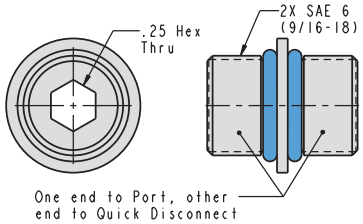
Part No. 30-8711-60
For Manifold Porting
32-1261-01 (SAE 6 Single
Path) Rotary Unions



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

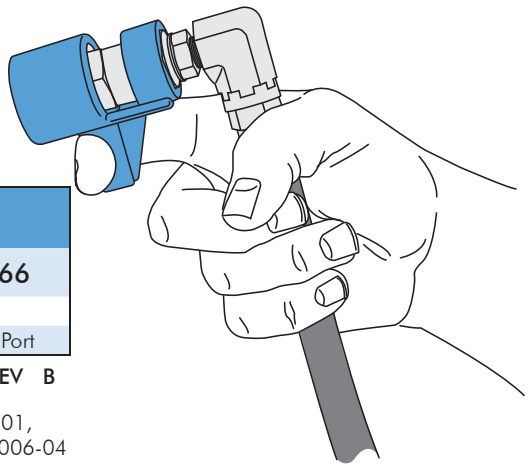


Part No. 30-8711-66
Adapter for Quick Disconnect
30-7827-66, 30-7727-66
30-7827-60, 30-7727-60



O-rings are furnished with all adapters.

ILS300004 REV F



Quick Connect with Trigger

For use with Male coupler Part No. 30-7727-66

Model No.	Description
56-0009-01*	SAE J1926/1:9/16-18 (SAE 6) Straight Thread Port

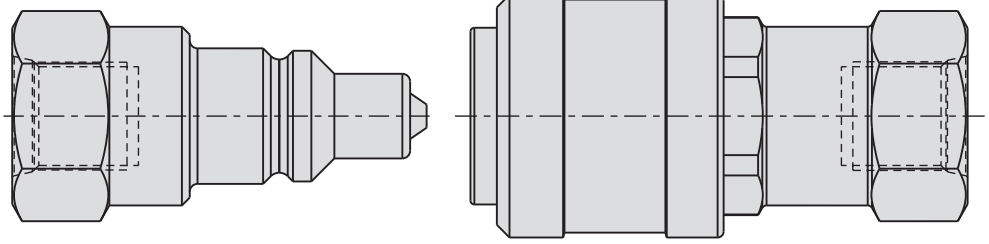
ILS560026 REV B

*For use with: 56-0001-01, 56-0001-02, 56-0001-03, 56-0002-01, 56-0002-02, 56-0002-03, 56-0006-03, and 56-0006-04

Quick Connects

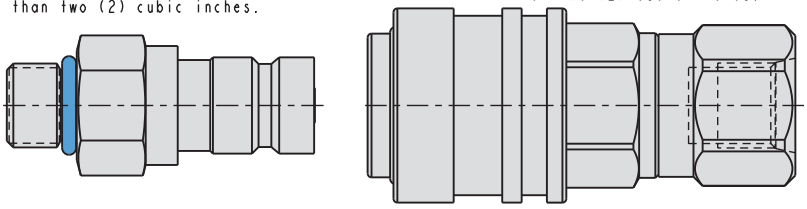
30-7727-66
Male Half, Quick Disconnect.
SAE 6 (9/16-18) Port.
Recommended for use on
main supply hydraulic lines

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



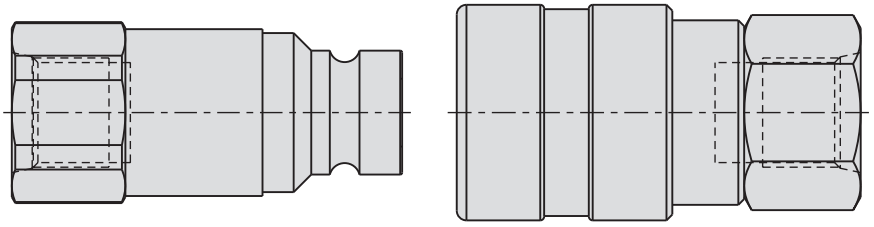
30-7717-44
Male Half, Quick Disconnect
SAE 4 (7/16-20) Stud End
Recommended for use where
the total volume of oil is
less than two (2) cubic inches.

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.

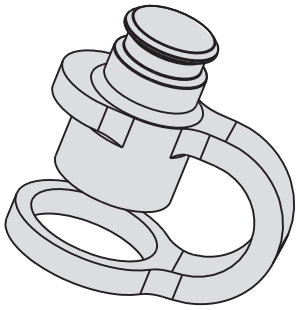


30-7727-60
Male Half, Flat Face
Quick Disconnect.
SAE 6 (9/16-18) Port

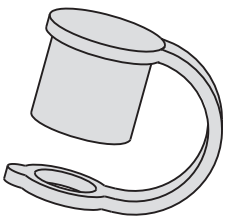
30-7827-60
Female Half, Flat Face
Quick Disconnect.
SAE 6 (9/16-18) Port



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

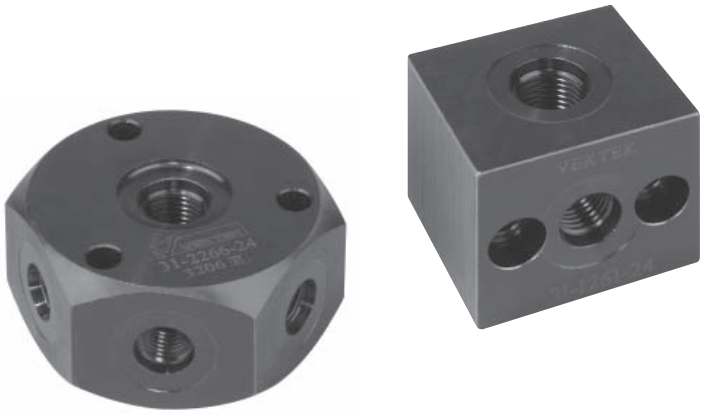


ILS300005 REV F

Manifolds

- Four different styles to work in 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. Model No. 30-6011-66 for SAE 6 and Model No. 30-6011-44 for SAE 4.

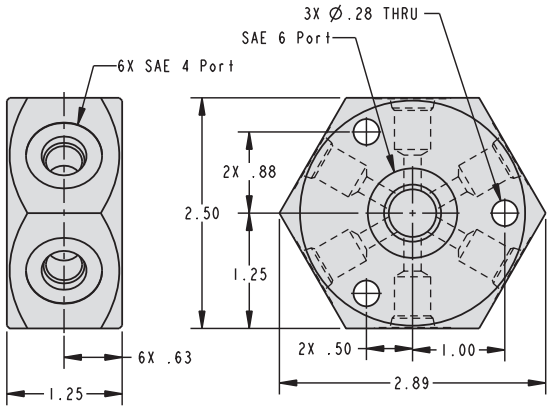


Hexagonal Manifold

Model No.
31-2266-24

- 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.

O-ring (included) to allow manifold stacking and permit 12, 18 or 24 circuits to share one common feed (minor customer modification required).



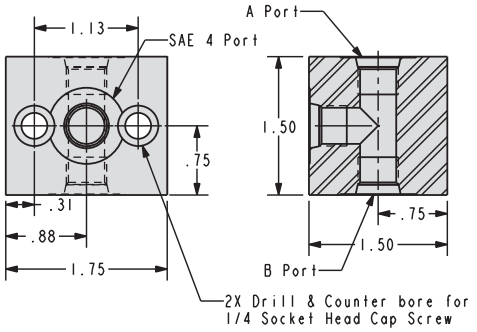
(Plugs Sold Separately)
(30-6011-44 SAE 4) (30-6011-66 SAE 6)

31-2266-24 Manifold

ILS3I2200 REV C

Hydraulic Junction Manifolds

- Available in two block sizes with a choice of five porting configurations 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.

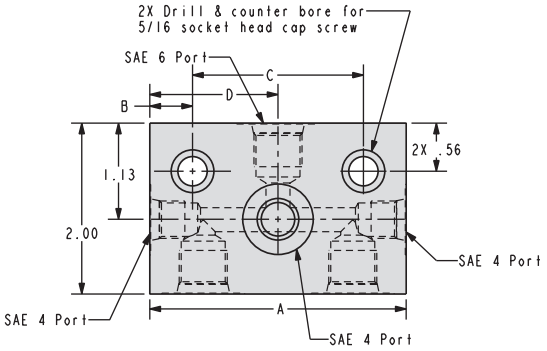


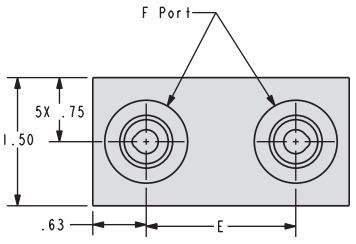
(Plugs Sold Separately)
(30-6011-44 SAE 4) (30-6011-66 SAE 6)

ILS3I1200 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





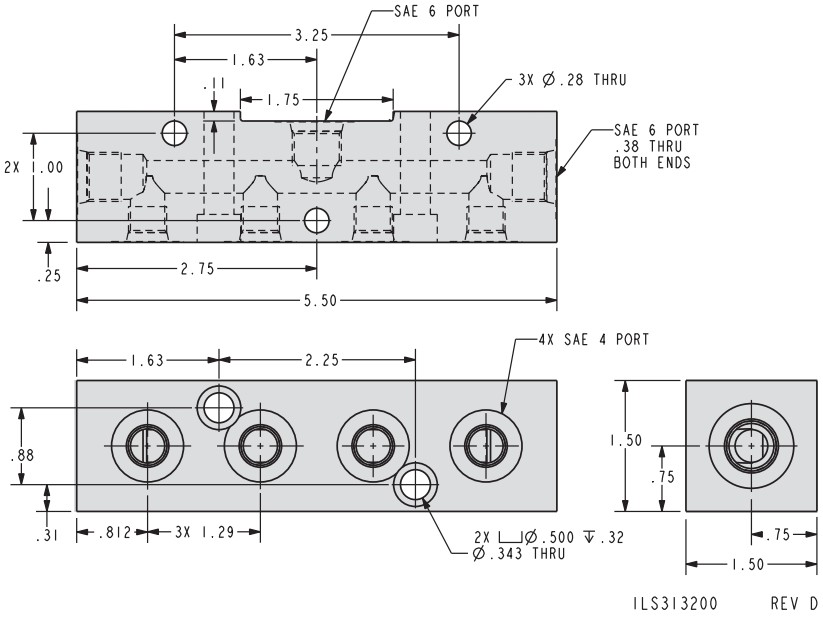
(Plugs Sold Separately)
(30-6011-44 SAE 4) (30-6011-66 SAE 6)

ILS3I1201 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

Manifolds



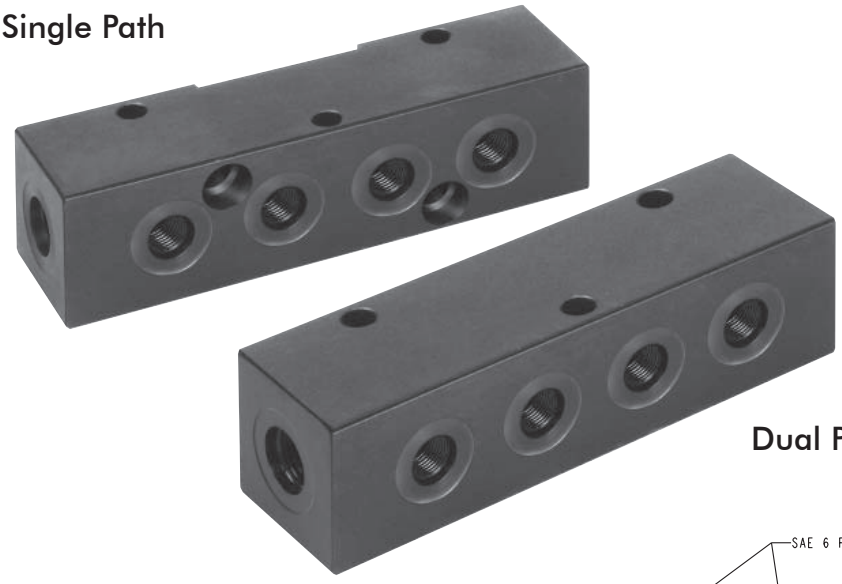
Single Path Rectangular Manifold

Model No.
31-3264-01

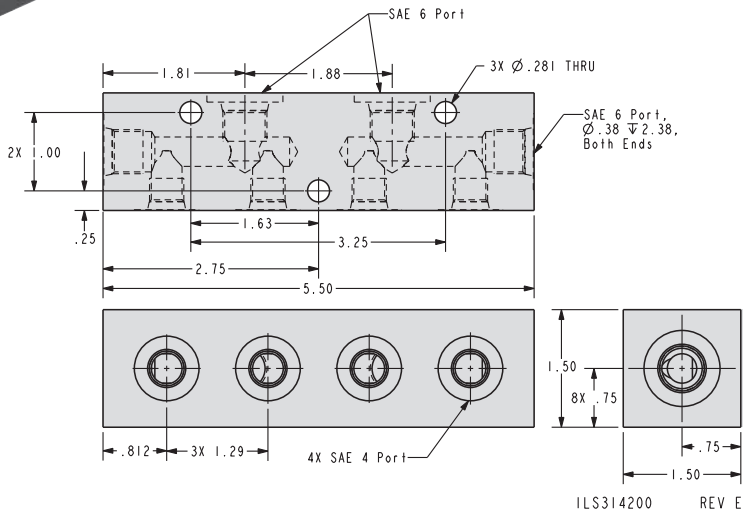
- Wide spacing between ports allows use with elbow and tee tube fittings.
- SAE 6 back port recessed to accept internal hex plug and permit flush mounting.
- 5/16" and 1/4" mounting holes added to provide greater mounting flexibility.
- Two separate flow paths in single manifold simplifies hydraulic connections and reduces the number of components required in double acting systems.
- Wide spacing between ports allows use with elbow and tee tube fittings.

Order plugs separately. Model No. 30-6011-66 for SAE 6 and Model No. 30-6011-44 for SAE 4.

Single Path



Dual Path



Dual Path Rectangular Manifold

Model No.
31-4264-24

Order plugs separately.
Model No. 30-6011-66 for SAE 6 and
Model No. 30-6011-44 for SAE 4

Rotating Unions

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 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.

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
32-1461-41	Single Path	380	190	95	65	50	40
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
32-6246-00 32-6246-01	6 Path	180	140	80	50	40	30
32-6246-00 32-6246-01	6 Path with Slip Ring	100	100	80	50	40	30
32-8248-00 32-8248-01	8 Path	180	140	80	50	40	30
32-8248-00 32-8248-01	8 Path with Slip Ring	100	100	80	50	40	30
32-1224-12 32-1224-13	12 Path	150	110	60	40	30	20
32-1224-12 32-1224-13	12 Path with Slip Ring	100	100	60	40	30	20

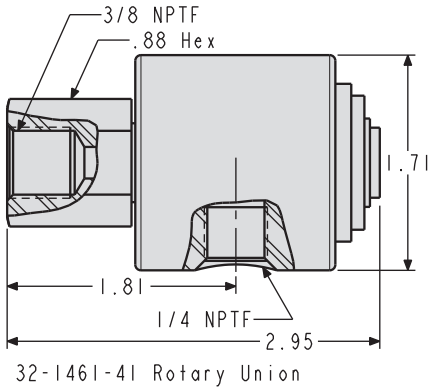
Solidly bolt into place either the shaft or the housing component of the rotary union; not both. Mount the opposing component using a cableway or similar anti-rotation device to allow for some movement in the event of misalignment.

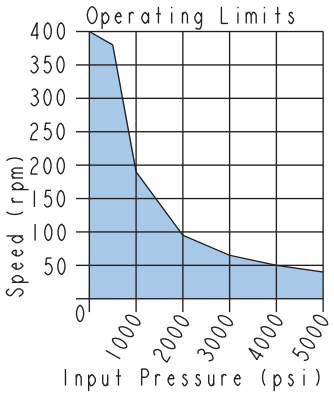
ILS321200 REV F

Rotating Union, Single Path

Single Path Rotating Union NPT Ports

Model No.
32-1461-41



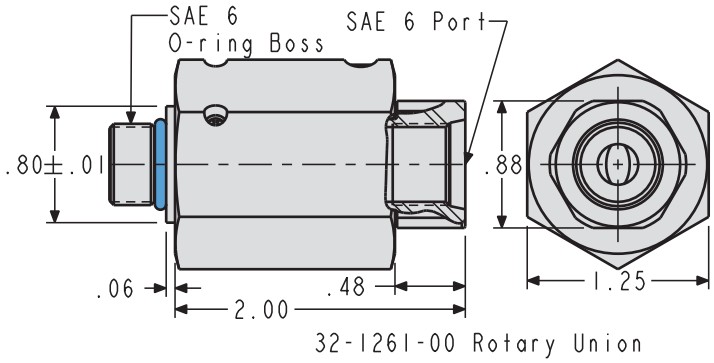


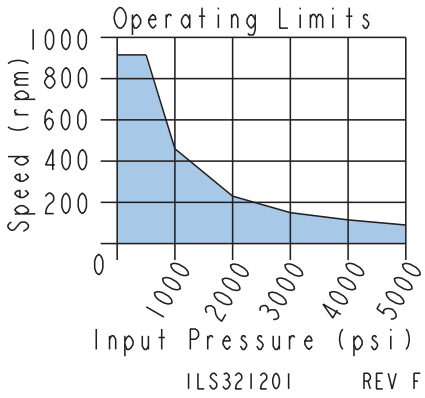
ILS321400 REV E

Operating Parameter Guidelines
- Max Hydraulic Pressure: 5,000 psi
- Max Air Pressure: 200 psi
- Max. Vacuum: 28 Hg
- Max Temperature: 400°F

Single Path Rotating Union SAE In-line

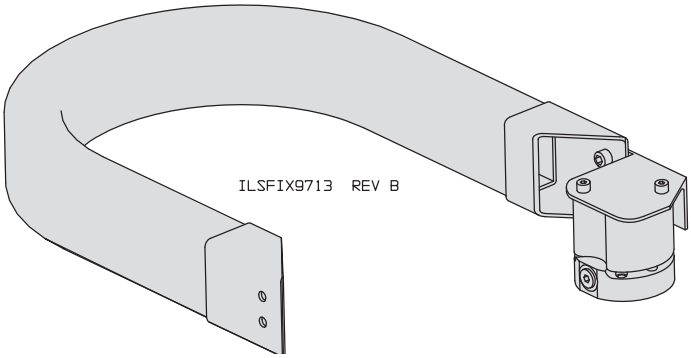
Model No.
32-1261-00





ILS321201 REV F

Operating Parameter Guidelines
- Operating Temperature: 40-160°F

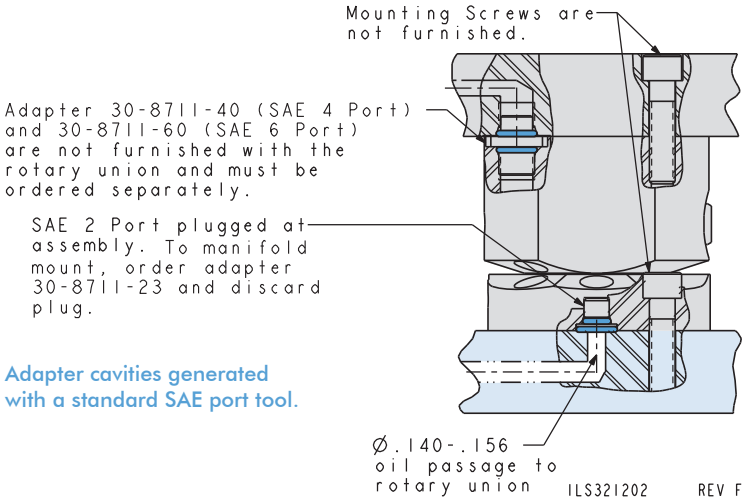


Solidly bolt into place either the shaft or the housing component of the rotary union; not both. Mount the opposing component using a cableway or similar anti-rotation device to allow for some movement in the event of misalignment.

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

Miscellaneous Plumbing

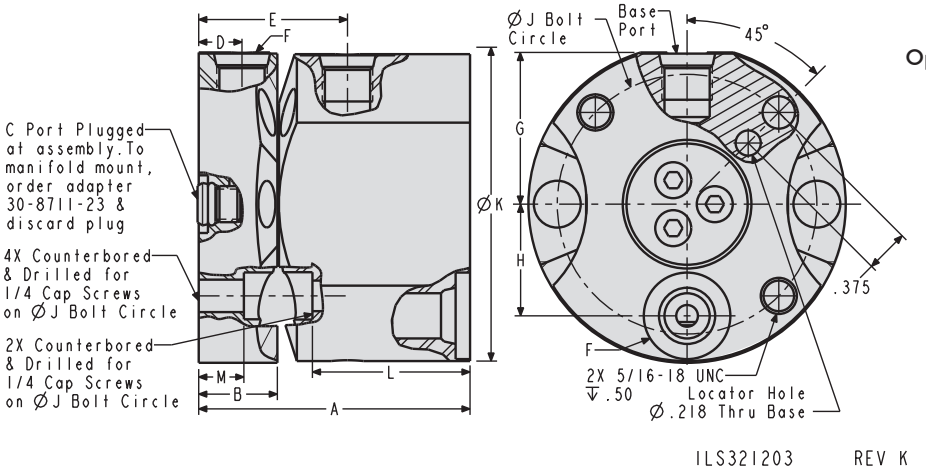
Rotating Union, Single Path



Adapter cavities generated with a standard SAE port tool.

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

Operating Parameter Guidelines
- Operating Temperature Range: 40°-160°F

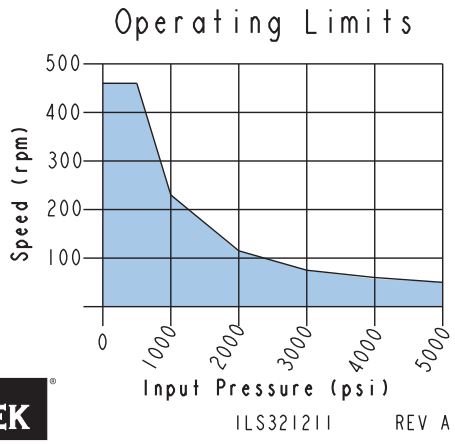


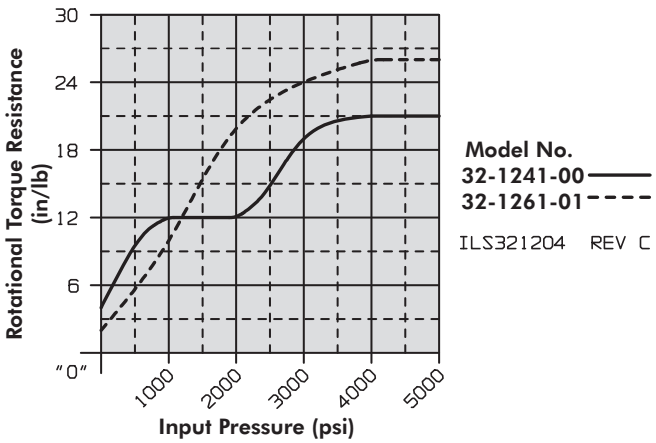
For proper sealing, mating surface must be flat within 0.003 in. with a maximum 32 μ in R_a surface finish.

Dimensions

Model No.	A	B	C	D	E	F	G	H	J	K	L	M
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	0.39
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	0.67

Adapter Model No. 30-8711-23 is needed for manifold mounting (see drawing). Order separately





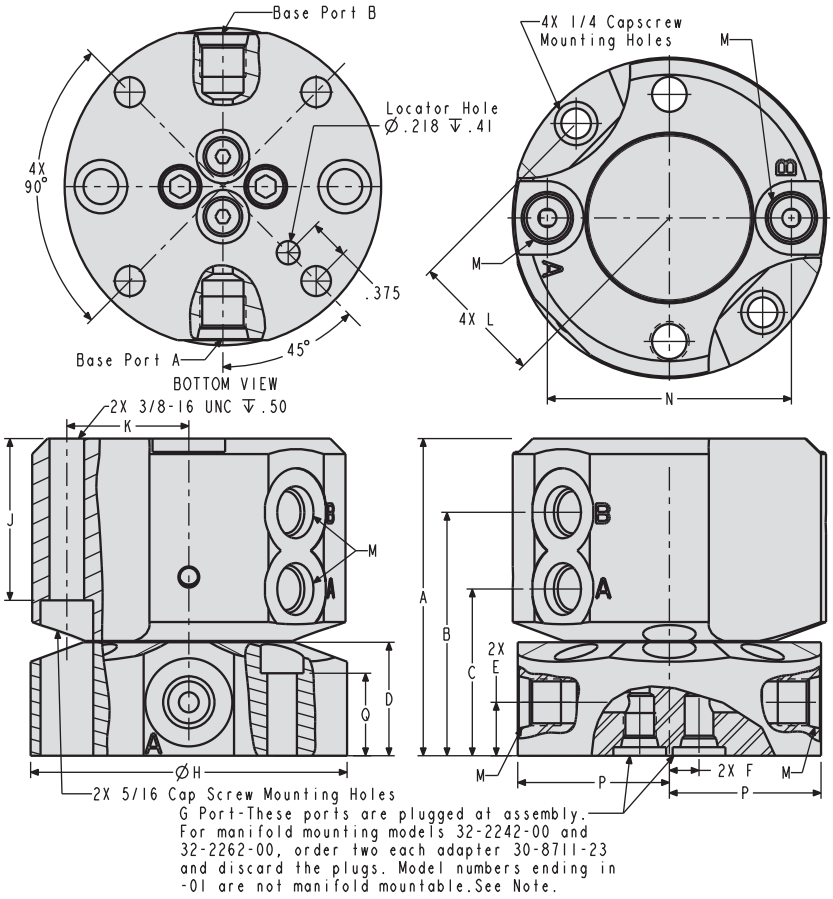
VEKTEK

Rotating Union, 2 Path

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

For proper sealing, mating surface must be flat within 0.003 in. with a maximum 32 μ in R_a surface finish.

Operating Parameter Guidelines
- Max Temperature: 40°-160° F
- Air may be run in any available passage



G Port-These ports are plugged at assembly. For manifold mounting models 32-2242-00 and 32-2262-00, order two each adapter 30-8711-23 and discard the plugs. Model numbers ending in -01 are not manifold mountable. See Note.

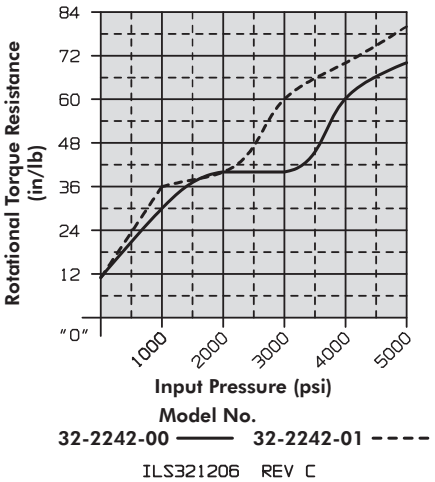
ILS321205 REV N

I-6

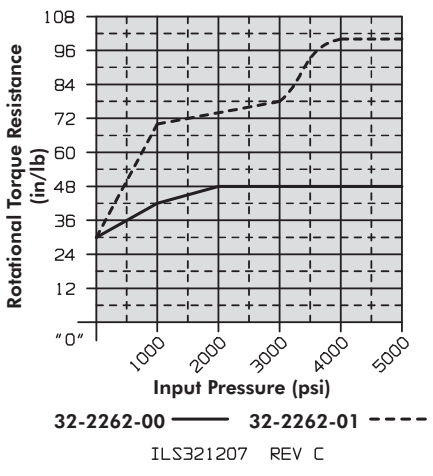
Dimensions

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
32-2242-00	2.97	2.28	1.56	1.06	0.50	0.28	SAE 2	3.00	1.51	1.156	1.25	SAE 4	2.312	1.46	0.77
32-2262-00	3.34	2.56	1.73	1.13	0.63	0.38	SAE 2	3.47	1.82	1.375	1.50	SAE 6	2.750	1.68	0.84
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	1.25	SAE 4	2.312	1.46	0.87
32-2262-01*	3.34	2.56	1.73	1.13	0.63	0.47	SAE 6	3.47	1.82	1.375	1.50	SAE 6	2.750	1.68	0.85

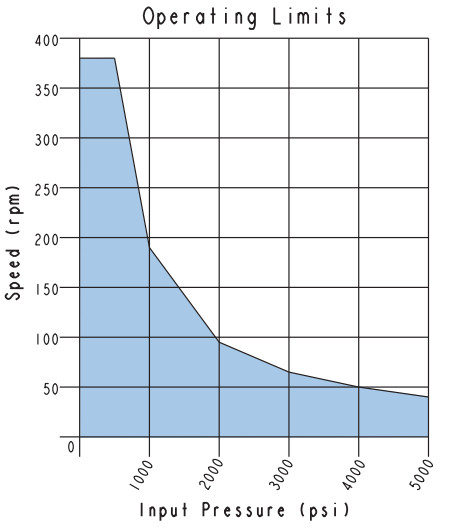
Adapter Model No. 30-8711-23 is needed for manifold mounting (see drawing). Order separately



ILS321206 REV C



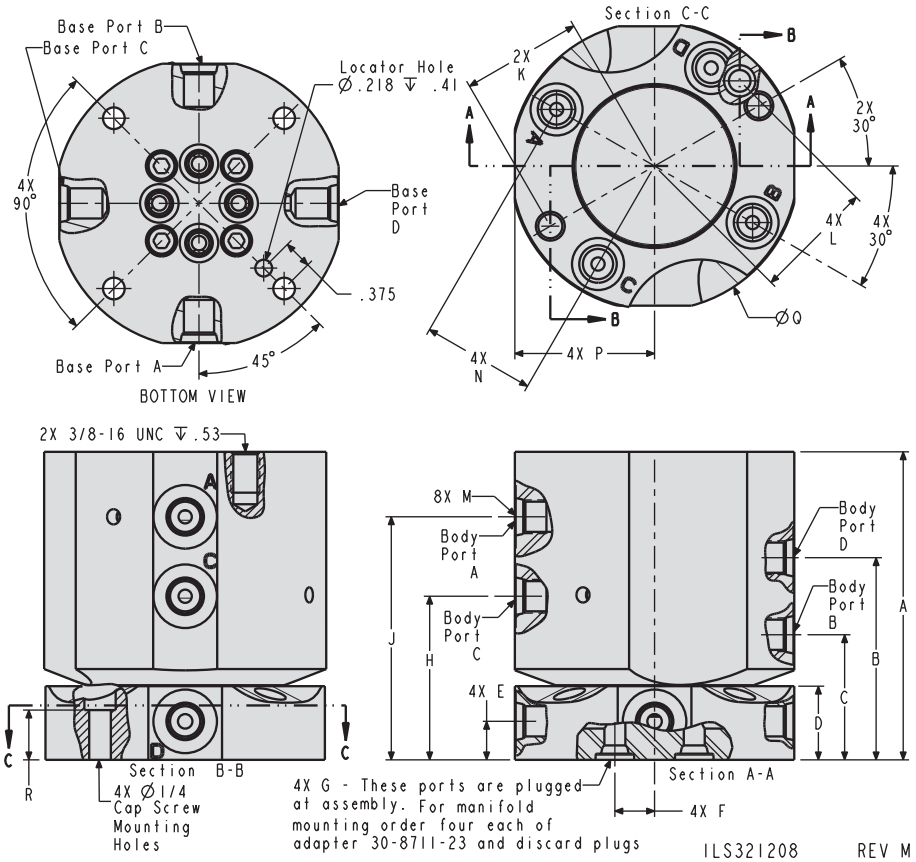
ILS321207 REV C



ILS321212 REV A

Rotating Union, 4 Path

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



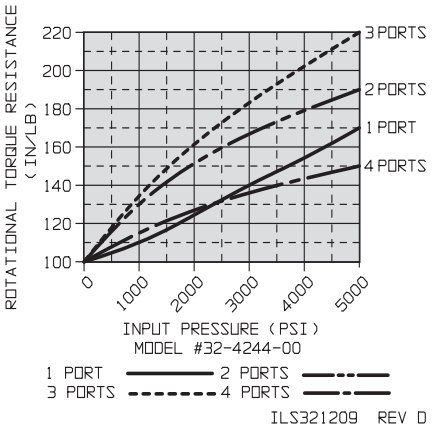
For proper sealing, mating surface must be flat within 0.003 in. with a maximum 32 μ in R_a surface finish.

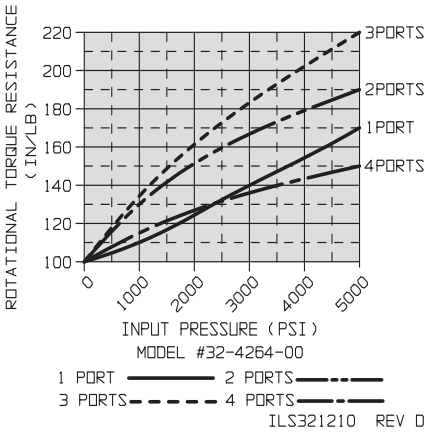
Operating Parameter Guidelines
- Max Temperature: 40°-160° F
- Air may be run in any available passage

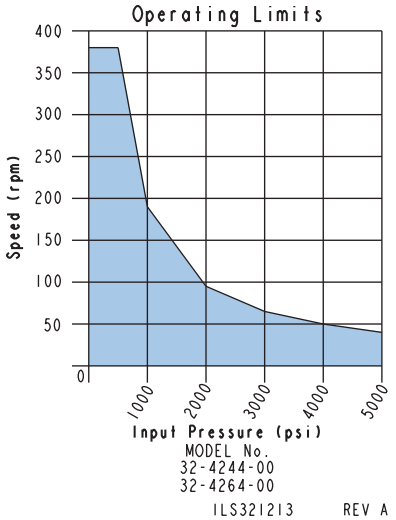
Dimensions

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R
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	0.65
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	0.79

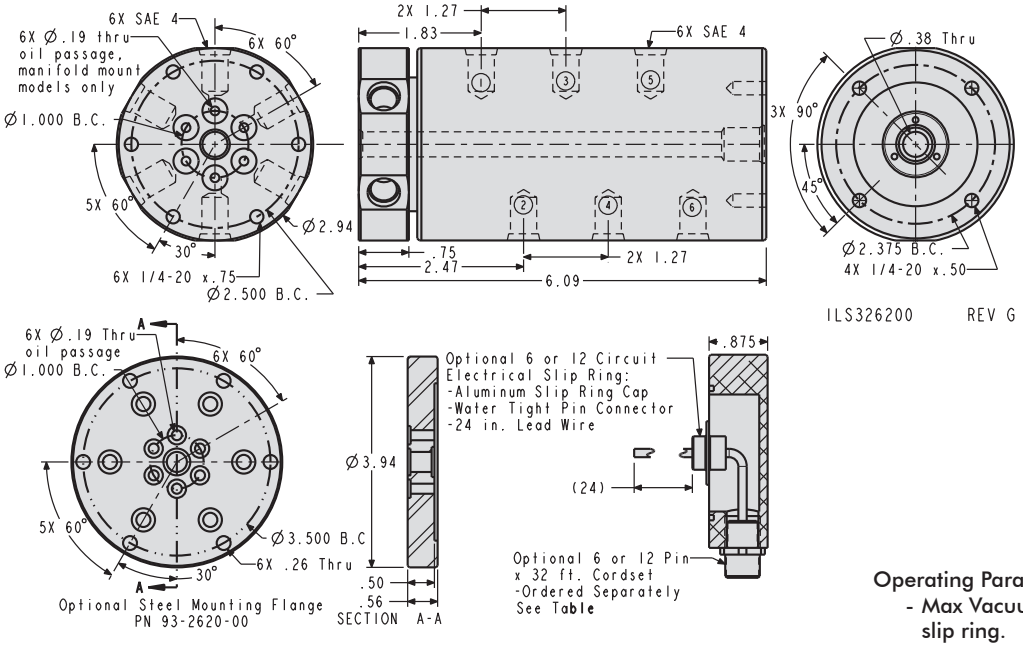
Adapter Model No. 30-8711-23 is needed for manifold mounting (see drawing). Order separately

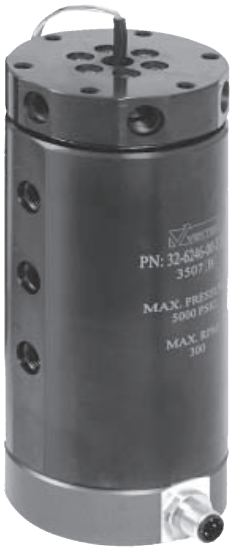






6 Path Rotating Unions





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

Operating Parameter Guidelines:
- Max Vacuum: 30 Hg with or without slip ring.
- Max Temperature Range: 0° - 220° F without slip ring, 0° - 176° F with slip ring
- Air may be run in any available passage

I-8

6 Path Rotary Unions

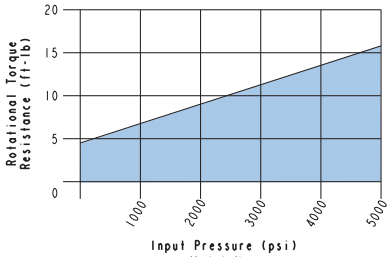
Model No.	Hydraulic Input Connection	Electrical Slip Ring Option	Maximum Current/ Circuit	Maximum Volts/Circuit	Lead Wire Length	Optional Cord set***	Optional Mounting Flange Model No.**
32-6246-00	SAE 4	N/A	N/A	N/A	N/A	N/A	93-2620-00
32-6246-00-ES6A	SAE 4	6 Circuit	2 Amp	120 VAC	24"	27-6424-01	
32-6246-00-ES12A	SAE 4	12 Circuit	2 Amp	120 VDC	24"	27-6424-02	
32-6246-01	O-ring Face Seal*	N/A	N/A	N/A	N/A	N/A	
32-6246-01-ES6A	O-ring Face Seal*	6 Circuit	2 Amp	120 VAC	24"	27-6424-01	
32-6246-01-ES12A	O-ring Face Seal*	12 Circuit	2 Amp	120 VDC	24"	27-6424-02	

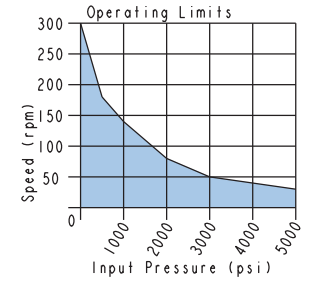
* O-rings furnished: -010, 70A, NBR
Part No. 55-2500-01

** 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 Cord set Separately

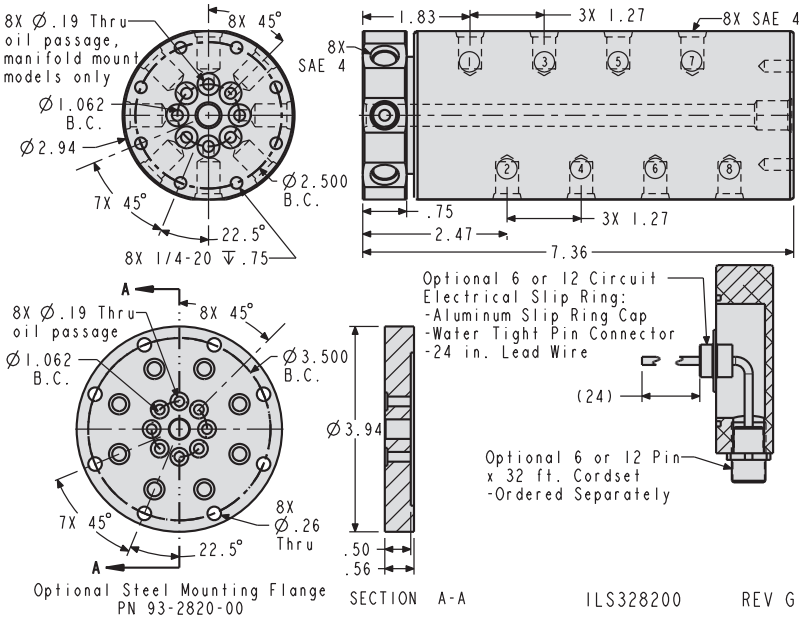
Installation instructions available.
Request IS3205





Rotating Union, 8 Path

8 Path Rotating Unions



Operating Parameter Guidelines:
- Max Vacuum: 30 Hg with or without slip ring.
- Max Temperature Range: 0° - 220° F without slip ring.
- Max Temperature Range:0° - 176° F with slip ring.
- Air may be run in any available passage.

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

8 Path Rotary Unions

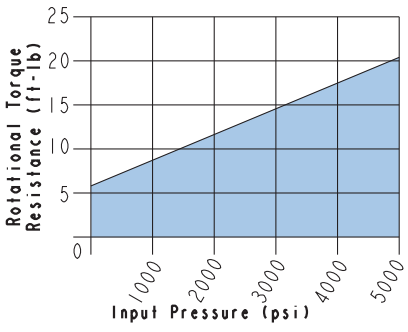
Model No.	Hydraulic Input Connection	Electrical Slip Ring Option	Maximum Current/ Circuit	Maximum Volts/Circuit	Lead Wire Length	Optional Cordset***	Optional Flange Model No.**
32-8248-00	SAE 4	N/A	N/A	N/A	N/A	N/A	93-2820-00
32-8248-00-ES6A	SAE 4	6 Circuit	2 Amp	120 VAC	24"	27-6424-01	
32-8248-00-ES12A	SAE 4	12 Circuit	2 Amp	120 VDC	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	120 VAC	24"	27-6424-01	
32-8248-01-ES12A	O-ring Face Seal*	12 Circuit	2 Amp	120 VDC	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

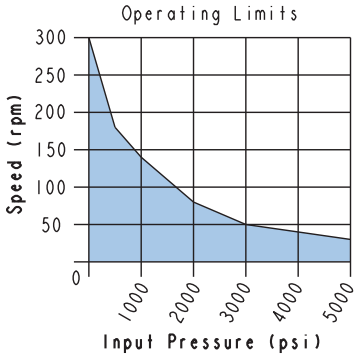
*** Order Cord set Separately

Installation instructions available. Request IS3205



Model No.
32-8248-00 32-8248-01
32-8248-00-ES6A 32-8248-01-ES6A
32-8248-00-ES12A 32-8248-01-ES12A

Torque data based on all passages (ports) pressurized
ILS321215 REV A

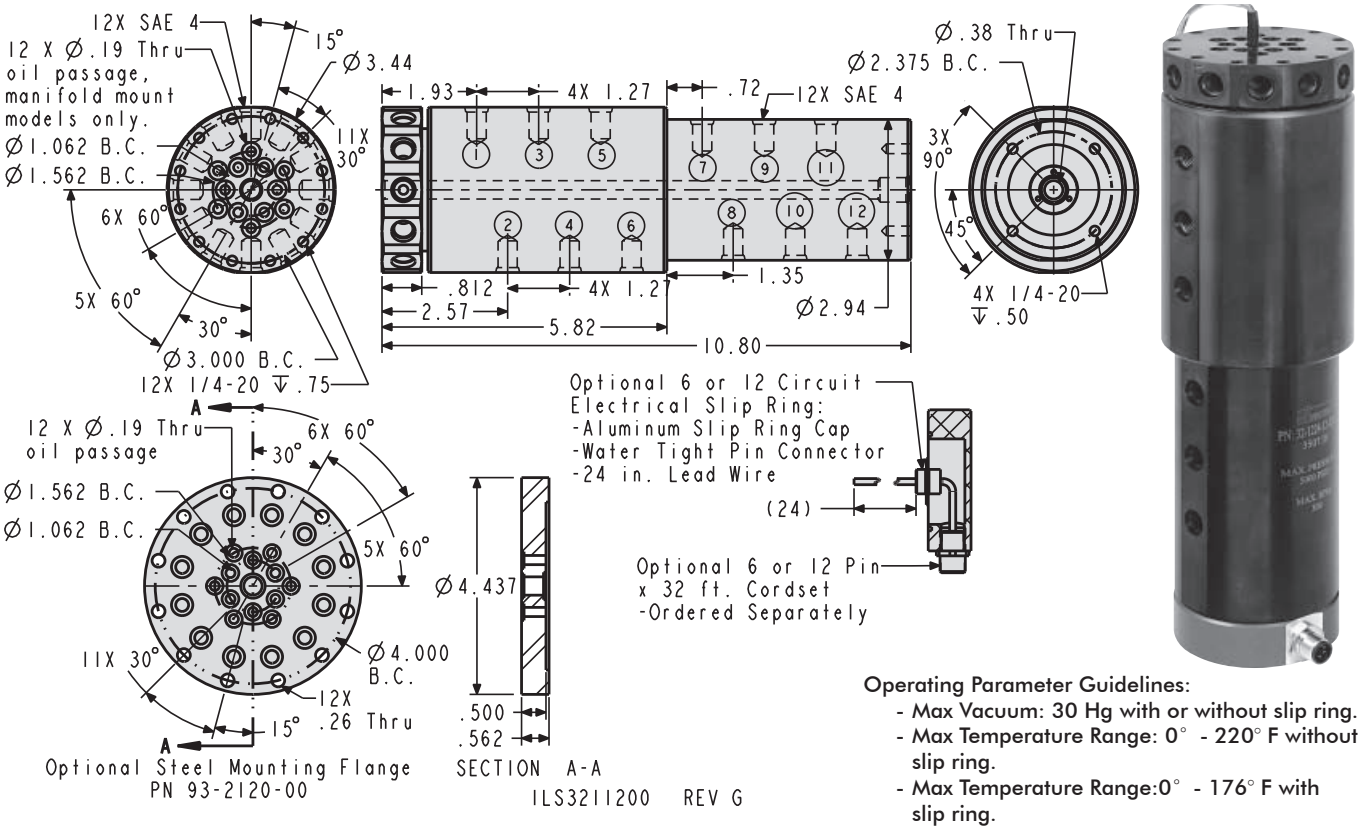


Model No.
32-8248-00 32-8248-01
32-8248-00-ES6A 32-8248-01-ES6A
32-8248-00-ES12A 32-8248-01-ES12A

ILS321218 REV A

12 Path Rotating Unions

Rotating Union, 12 Path



Operating Parameter Guidelines:

- Max Vacuum: 30 Hg with or without slip ring.
- Max Temperature Range: 0° - 220° F without slip ring.
- Max Temperature Range:0° - 176° F with slip ring.
- Air may be run in any available passage.

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12 Path Rotary Unions

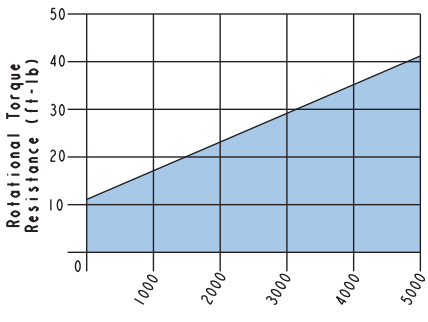
Model No.	Hydraulic Input Connection	Electrical Slip Ring Option	Maximum Current/ Circuit	Maximum Volts/Circuit	Lead Wire Length	Optional Cord Set***	Optional Flange Model No.**
32-1224-12	SAE 4	N/A	N/A	N/A	N/A	N/A	93-2120-00
32-1224-12-ES6A	SAE 4	6 Circuit	2 Amp	120 VAC	24"	27-6424-01	
32-1224-12-ES12A	SAE 4	12 Circuit	2 Amp	120 VDC	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	120 VAC	24"	27-6424-01	
32-1224-13-ES12A	O-ring Face Seal*	12 Circuit	2 Amp	120 VDC	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

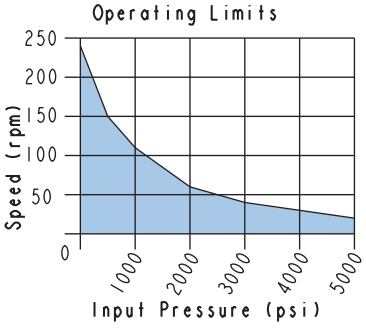
*** Order Cord set Separately

Installation instructions available. Request IS3205



Model No.
32-1224-12 32-1224-13
32-1224-12-ES6A 32-1224-13-ES6A
32-1224-12-ES12A 32-1224-13-ES12A
Torque data based on all passages (ports) pressurized

ILS321216 REV A



Model No.
32-1224-12 32-1224-13
32-1224-12-ES6A 32-1224-13-ES6A
32-1224-12-ES12A 32-1224-13-ES12A

ILS321219 REV A

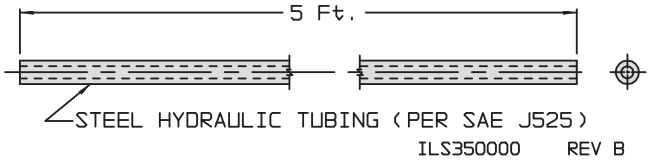
For Proper sealing, mating surface should be flat to 0.003 in. with a maximum 32 μ in. R_a surface finish.

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.

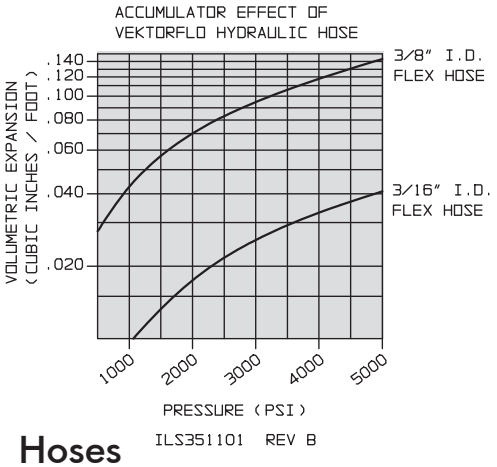
NOTE: Use of standard rubber hoses and end fittings can hamper the action of many devices due to excessive end fitting restrictions. If you choose to purchase hoses from another supplier, be sure that hose diameters and end fittings are not causing excessive restrictions.

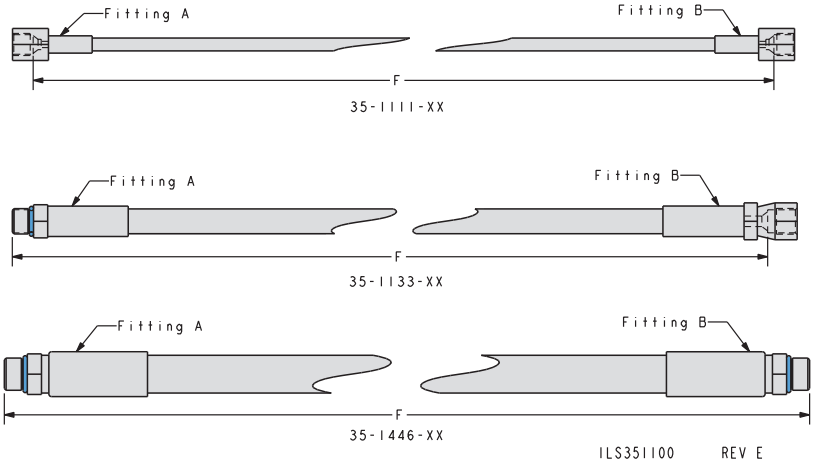


Tubing

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

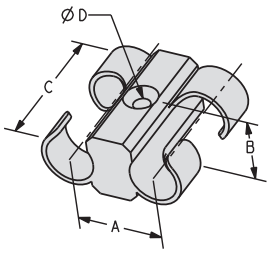
Suggested Center Line Radius 1/4" =0.56 and 3/8" =0.94





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

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

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 going 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 I 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 trouble-shooting. 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 ISO 32 Grade

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® ISO 32 hydraulic oil has the following additional characteristics:

Pour Point	<5°F (-15°C)
Flash Point	>302°F (150°C)….(PMCC)
Viscosity	22-320 cSt @ 104°F (40°C)
	4-24 cSt @ 212°F (100°C)

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.

Phillips Megaflow AW 32	Mobile - DTE 24
Exon - NUTO H 32	Shell Oil Xo - Tellus 32
BP, Inc - Energol HLP 32	Lubriplate H0-0
Texaco - Rando HD32	

Use of hydraulic oil with a viscosity grade higher than ISO 32 may cause sluggish return action of single acting devices and should therefore, only be used on double acting systems.

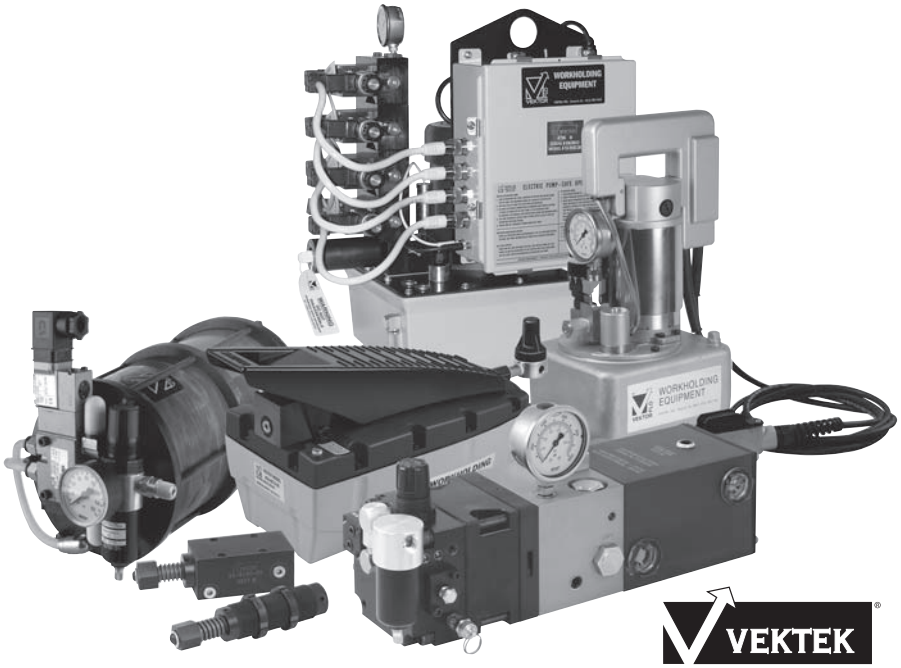
Hydraulic Oil ISO 46 Grade

Cat. No. 65-0016-00, 1 Gal

This ISO Grade 46 hydraulic oil is compatible with Vektek pumps and is less flammable making it ideal in welding applications. It has been fully tested by Vektek Engineering for function and seal compatibility. VektorFlo® ISO 46 hydraulic oil has the following additional characteristics:

Pour Point	-60°F (-51°C)
Flash Point	579°F (304°C).(COC)
Kinematic Viscosity	Typical 46 mm2/s at 104°F / 40°C

If you are presently using Shell IRUS DU-NA 46 (NF), it may be substituted for our oil.

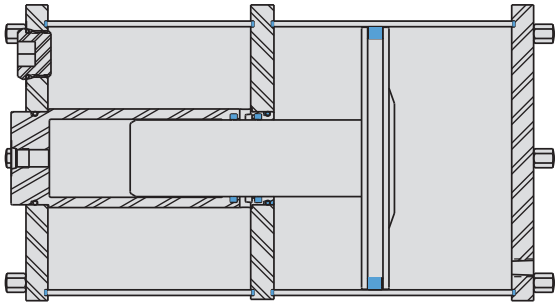


Boosters, Compact Air/Hydraulic

For Single Acting Systems

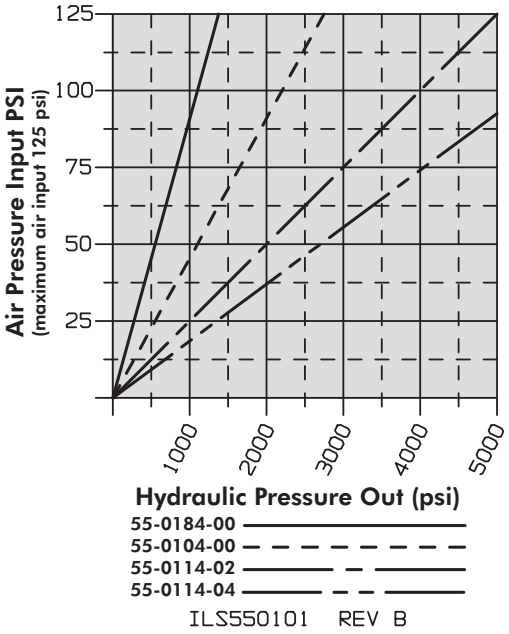
- Multiplies your shop air line pressure to power simple hydraulic systems without electricity.
- Intensification ratios ranging from 11:1 to 54:1.
- Output capacities from 2.4 to 11.1 cu. inches.
- Manual or electric control packages available.

Air/hydraulic boosters are an inexpensive way to power one single acting system. 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.



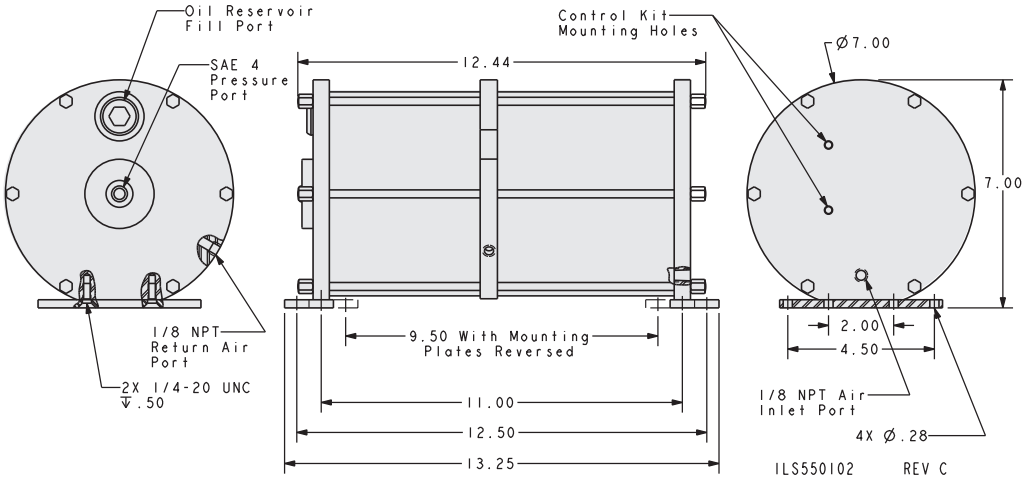
ILS550100 REV D

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



ILS550101 REV B

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

VEKTEK

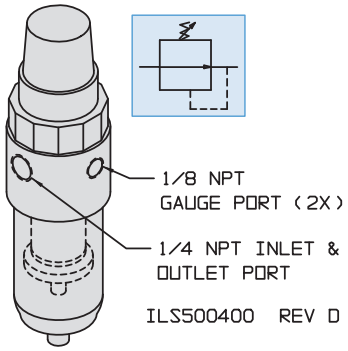
Boosters with Control Packages

- Complete package includes everything you need to use a VektorFlo® booster, including hardware.
- Includes filter/regulator with automatic drain, gauge, 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.

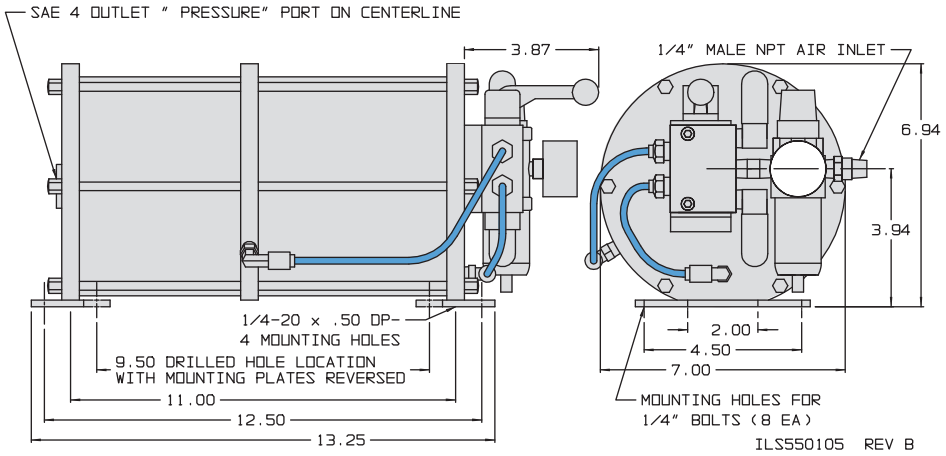
Model No.	Intensification Ratio
Air over Hydraulic Pressure Intensifiers	
55-0184-00	11:1 Booster Without Control
55-0284-16	11:1 Booster With Manual Control
55-0284-17	11:1 Booster With 115 VAC Control
55-0284-18	11:1 Booster With 24 VDC Control
55-0104-00	22:1 Booster Without Control
55-0204-16	22:1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

Boosters With Control Packages Dimensions



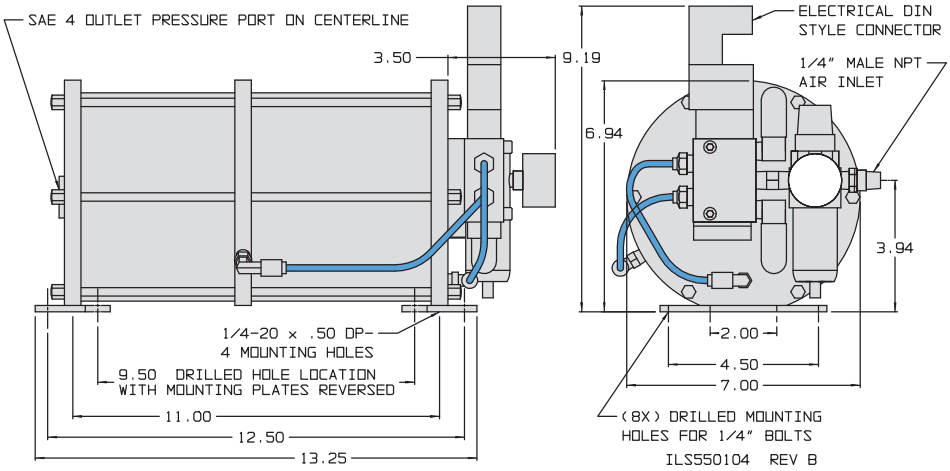
ILS500400 REV D



ILS550105 REV B

Air Filter Regulator

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

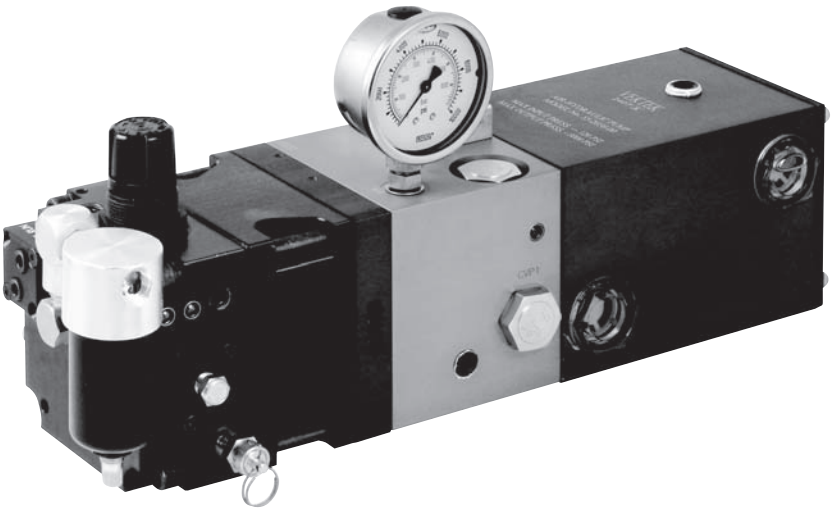


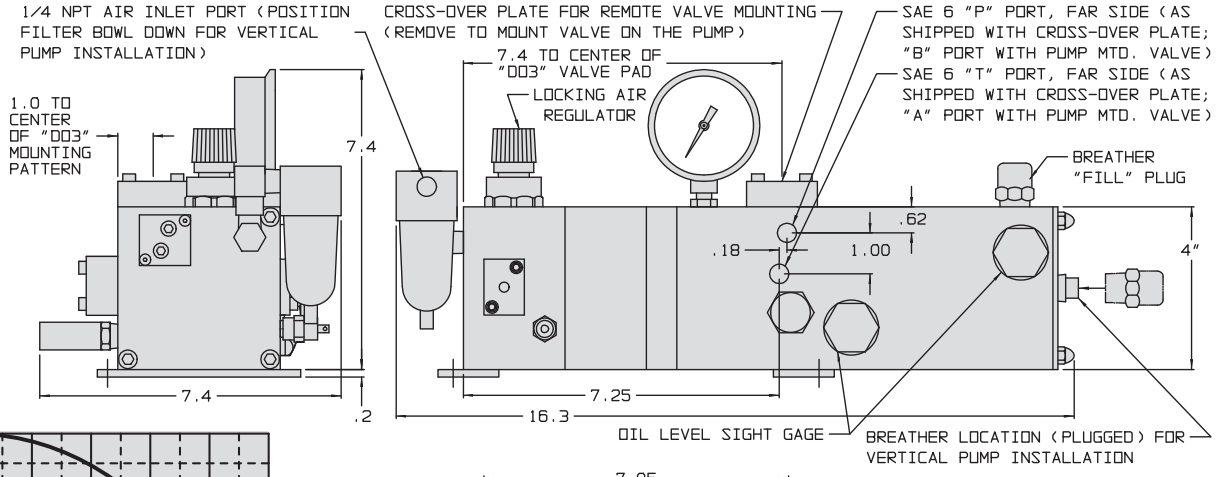
ILS550104 REV B

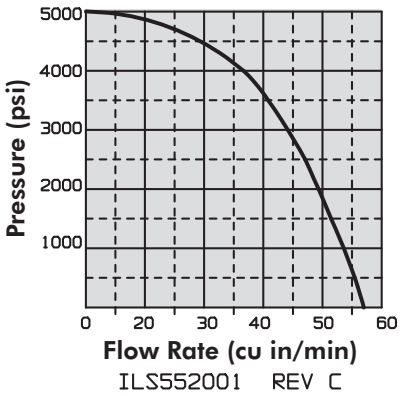
Air/Hydraulic Pump

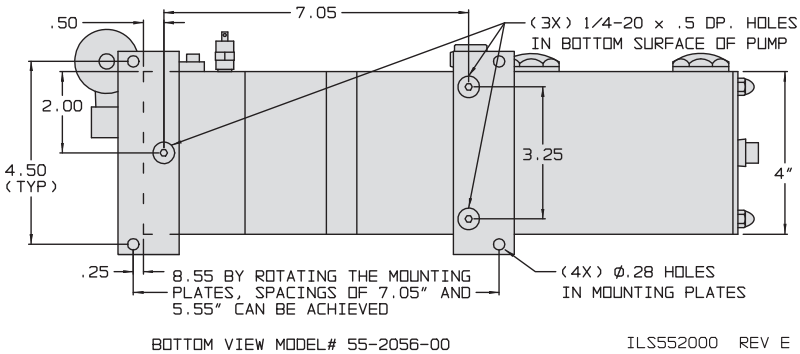
Compact Air/Hydraulic Pump

- 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.



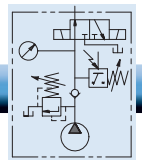






Model No.	Reservoir Capacity	Maximum Air Input	Operating Pressure Range	Mounting Options	Anodized Aluminum Weight
55-2056-00	Horizontal 68 cu. in.	100 psi	1200 to 5000 psi	Horizontal (as shown)	19 lbs
55-2056-00	Vertical 80 cu. in.	100 psi	1200 to 5000 psi	Vertical (Reservoir up, filter bowl down)	19 lbs

WARNING! The use of spool valves invalidates the warranty on VektorFlo® pumps.

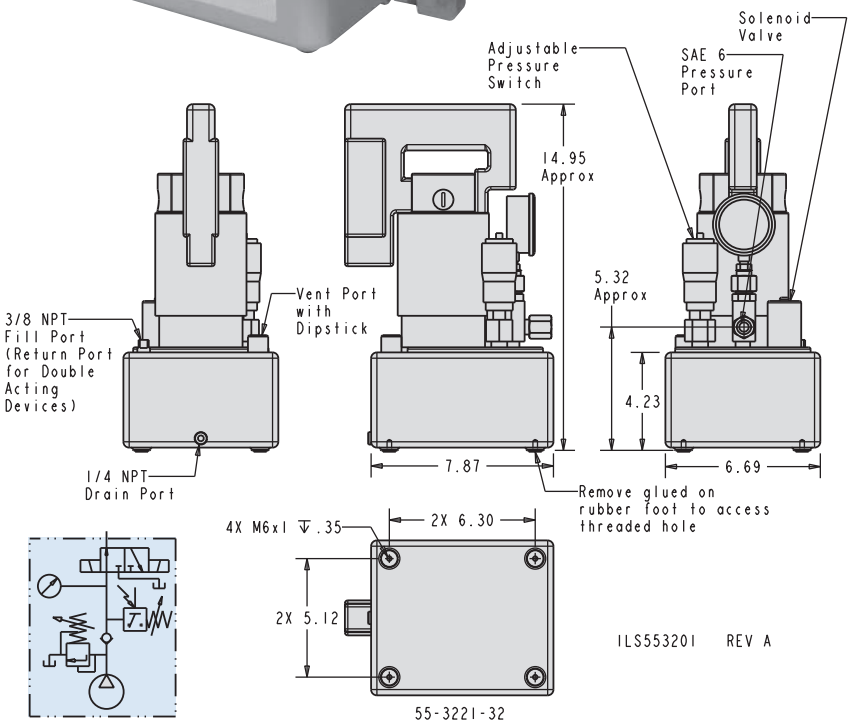


Portable 1/3 hp Electric Hydraulic Pump

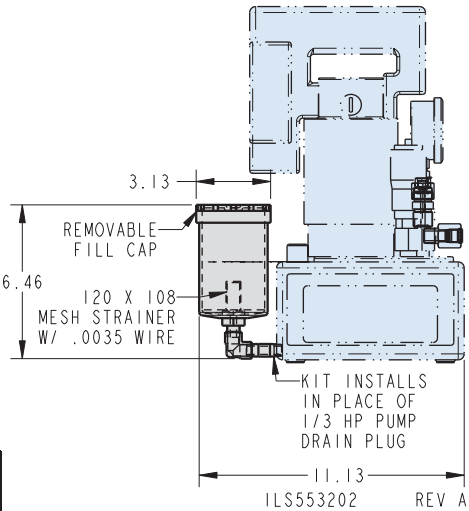
Portable Electric/Hydraulic Pump

- 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.
- Installed length of the pendant cable is 9 feet.

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.



Optional
Reservoir Kit
Sold Separately



1/3 HP Optional Filter Fill Kit

Model No.
62-5530-02

1/3 HP Portable Electric/Hydraulic Pump

Model No.	Cylinder Use	Valve Type*	Cylinder Operation	Motor
55-3221-32	Single Acting or Double Acting*	2 Way 3 Port Electric	Advance, Hold, Release	1/3 hp, 115V/7 amp 1 ph, 50/60 Hz

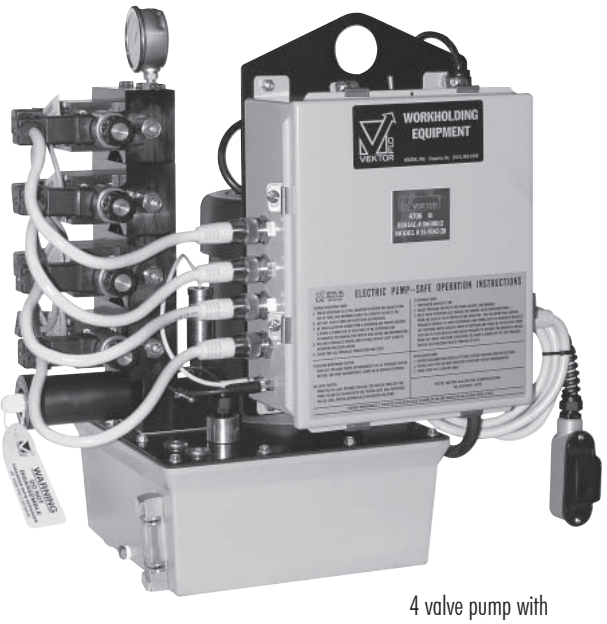
Pump Flow/Minute		Reservoir Capacity	
100 psi	5000 psi	Gross	Useable
120 cu. in.	12 cu. in.	122 cu. in.	108 cu. in.

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.

Power Supplies

Medium Capacity Pump

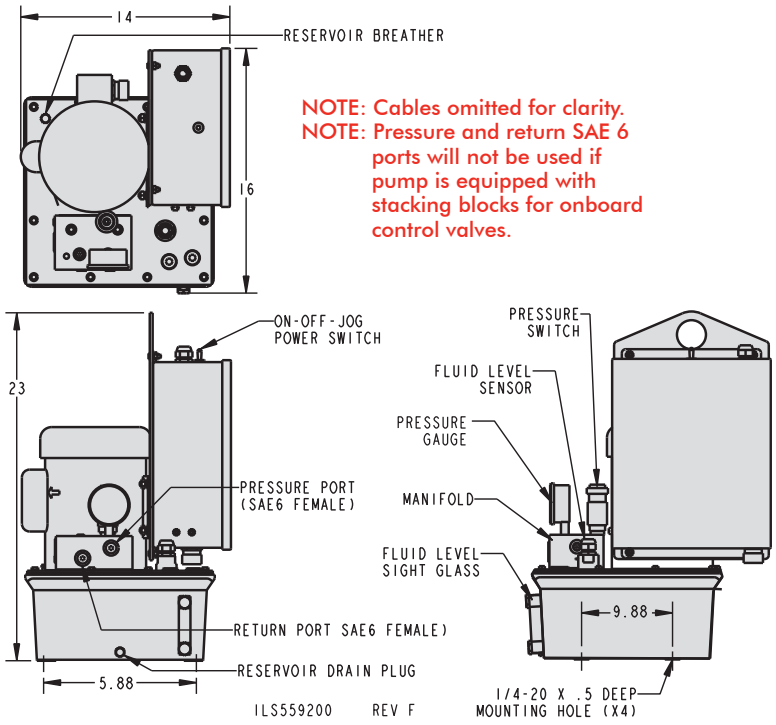


4 valve pump with
1 optional control pendant

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® D03 valves. Stacking of multiple manifolds allows you to select a pump to meet your circuit needs using inexpensive standard components.



NOTE: Cables omitted for clarity.
NOTE: Pressure and return SAE 6 ports will not be used if pump is equipped with stacking blocks for onboard control valves.

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.
Specific pump numbers J-7

Motor	Pump Flow/ Minute 5,000 psi	Reservoir Capacity		Pressure Switch Adjustment Range	Pressure Gauge	Application
		Gross	Useable			
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.

Medium Capacity Pump Systems Fully Configured

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 to 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
DO3 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 called 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 System Pumps				
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 within 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 need to return to tank the valve is actuated to the "center" position. Recommended for control of Auto-Shutoff Pallet Decoupler (2 hose) systems. Operator shifts a manual valve handle, requiring pump to be located within 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
Live Systems				
Manual 3-Position 4-Port Closed Center We recommend use in 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 Recommended to run a single acting coupled system. (May not be used with Auto-Shutoff Decouplers.) Operator interface is by remote pendant or can be wired into a machine controller. If this valve were used to power a decoupled system, valves would 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 This valve is difficult to use with most decoupled systems. Generally we recommend use in a continuously connected system. 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

ILS559202 REV J

Pendant information page J-8.

Medium Capacity Pump Pendants and Filters

Features of Medium Capacity Electric/Hydraulic Pump Intermittent Duty Cycle With Valves

- 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 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.
- 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-7 and buy from a price list, no custom charges or price mystery.

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.

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 - Momentary Connect)
70-7407-80	2/3 Normally closed (off-on)

* Note: Pendant No. 70-7407-79 is only used and shipped with Pump Model Nos. 55-9242-35, 55-9272-35, and 55-9292-35.

Optional Vektek Return Line Filter for Medium Capacity Pump

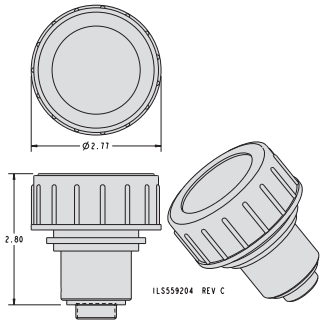
- Superior filtration over screen filters; 25 Micron nominal filter rating.
- Vektek spin-on element is easily serviced.
- Filter service indicator gauge is included.
- Compatible with pumps using a 0 to 4 valve stack.
- Factory installation on new pumps or field installation on existing models.

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.

** DO3 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.

Keep Your System Clean

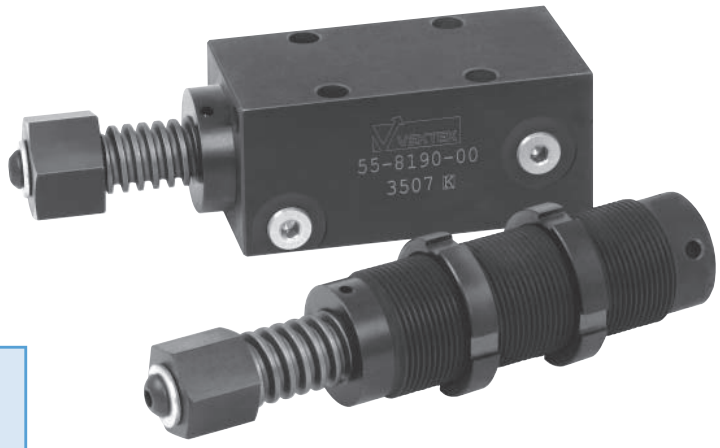


Reservoir Filter Cap/Breather Kit

Model No.	Mesh Size	Wire Dia.
62-5592-05	24	0.014

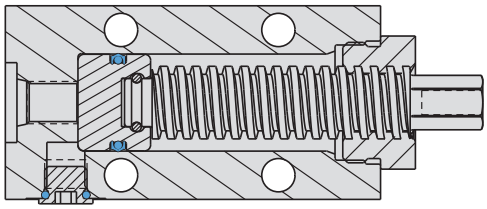
Threaded Body and Block Body Style Screw Pump

- 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.



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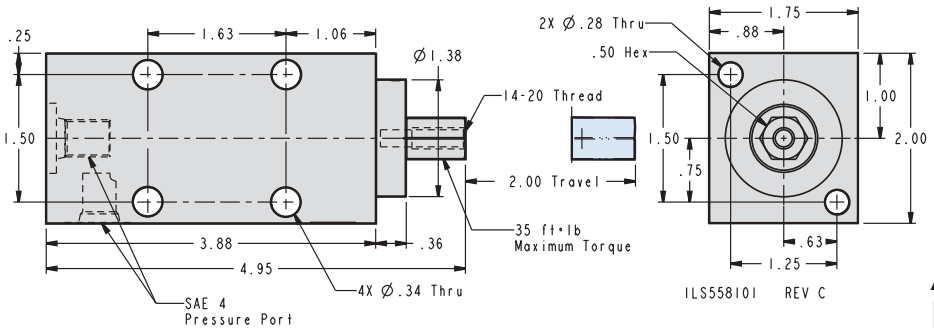
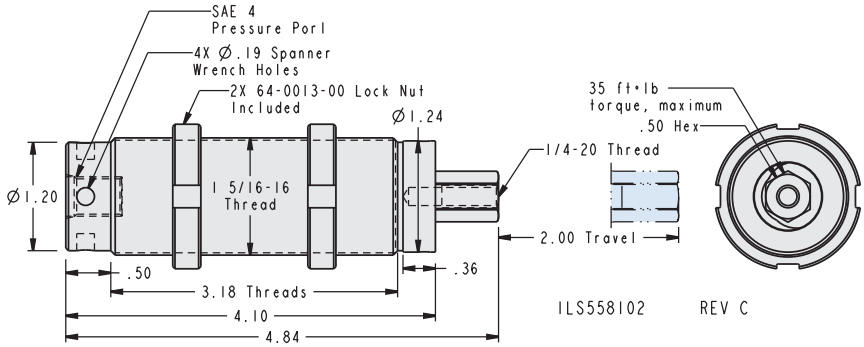


ILS558101 REV C

Block Body Screw Pump

Model No.
55-8190-00



ILS558102 REV C

Applied Torque Produces Approximate Output Pressure

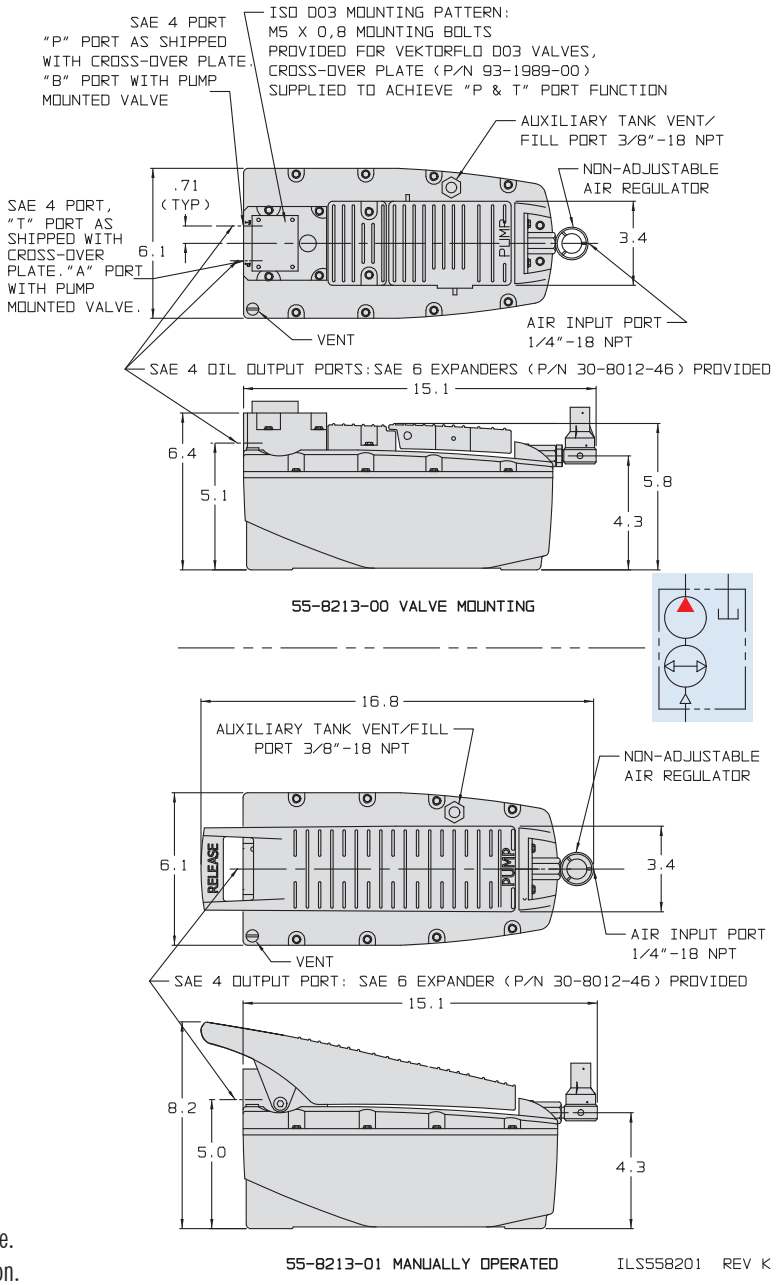
Torque	Pressure
10 Ft. Lb.	1,000 psi
20 Ft. Lb.	2,000 psi
25 Ft. Lb.	3,000 psi
30 Ft. Lb.	4,000 psi
35 Ft. Lb.	5,000 psi
Screw Pump capacity 1.57 cu. in.	
7/8 & 1 1/16 Hex adapters are supplied with each screw pump.	

ILS558103 REV B

Threaded Body Screw Pump

Model No.
55-8190-01

Compact Air/Hydraulic Pump



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.

Compact Air/Hydraulic Pump

Valve Needed 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.

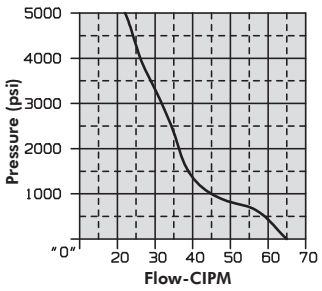
Compact Air/Hydraulic Treadle Pump

No Valve Needed 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.

J-10

Model No.	Reservoir Capacity Gross	Reservoir Capacity Useable	Air Input Pressure Min.	Air Input Pressure Max.	Hydraulic Range	Mounting Options	Wgt
55-8213-00	Horiz. 146.5 cu. in.	Horiz. 128.15 cu. in.	40 psi	85 psi	2,000- to 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 tp 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)	



Model No. 55-8213-00 = 85 psi Air Max
Model No. 55-8213-01 = 85 psi Air Max
Min Air Pressure = 40 psi

ILS558203 REV C

WARNING! Use of spool valves invalidates the warranty on VektorFlo® pumps

Frequently Asked Questions

Some questions about pallet and tombstone clamping are common to both novices and experienced users. The answers to the following questions may help you 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. This 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.

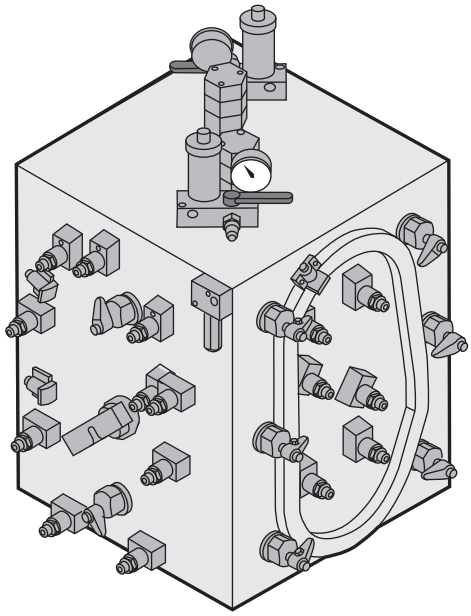
A decoupler must contain a shutoff valve to trap pressurized fluid from the pump within the clamping circuit and allow the hose(s) to be disconnected from the pallet. A decoupler must also contain:

* 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. The accumulator maintains pressure 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 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). Manual Shutoff Valve Decouplers require the operator to 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 anAutomatic Shutoff Valve Decoupler the shutoff valve is actuated by clamp and unclamp pressures from the pump. The operator only needs to control 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 a 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 in 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.

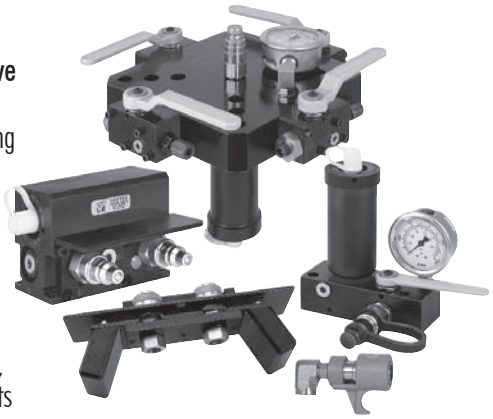
What type of pump do I need to operate decouplers and Tombstone Top Plates?

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.



Automatic Shutoff Valve Decouplers, One-Handed Operating Handle

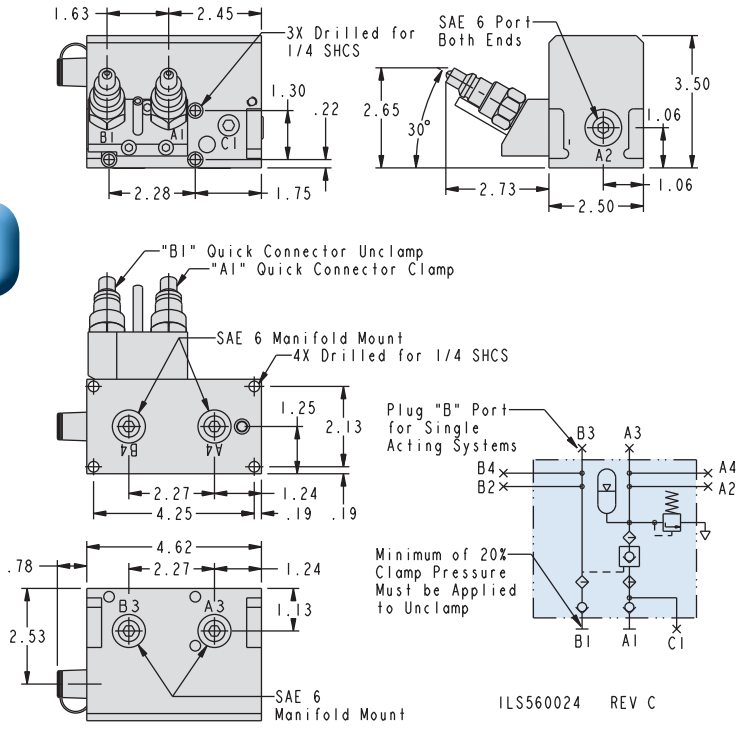
Automatic Shutoff Valve Decouplers for Single and Double Acting Systems

- Decouplers are a convenient, self-contained package that includes quick connect couplings, filters, pilot operated check valve, and an over pressure relief valve.
- Contains a 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 through ports A1, A2, A3, A4, and C1. Extra filtration at port B1. No filtration at remaining ports. (replacement filter kits Model No. 62-5600-05 or 62-5600-06 for a manifold mount configuration)
- 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

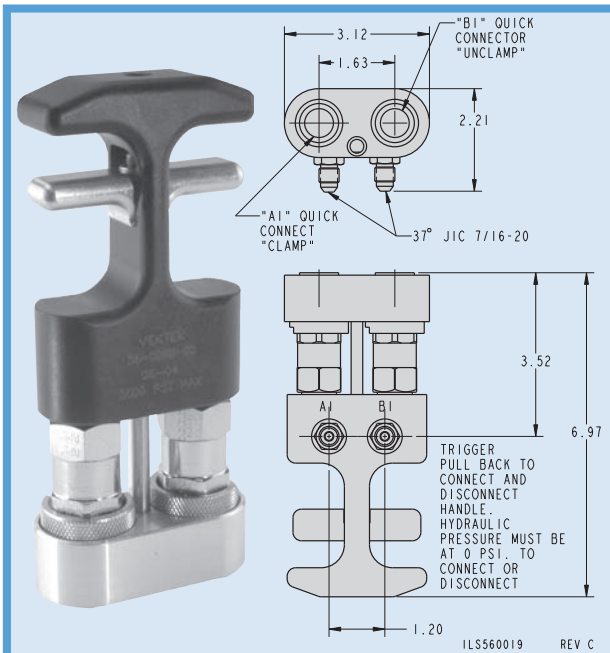
Model No.	Pressure Range	Accumulator Capacity
56-0005-23	1,000-3,500 psi	3.6 cu. in.
56-0005-24	2,000-5,000 psi	3.2 cu. in.

For use with Operating Handle Model No. 56-0008-00



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

NOTES: Field repair requires a special Check Valve Installation Tool. Please order Model No. 65-6000-00



One-Handed Operating Handle

Model No. 56-0008-00

For use with Decoupler Model Nos. 56-0005-23, 56-0005-24, 56-0005-25 or 56-0005-26

- 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-3) 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).

Automatic Shutoff Valve Decouplers, One-Handed Operating Handle

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 an 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 through ports A1, A2, A3, A4, and C1. Extra filtration at port B1. No filtration at remaining ports. (replacement filter kits Model No. 62-5600-05 or 62-5600-06 for a manifold mount configuration)
- 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	1,000-3,500 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-8 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.

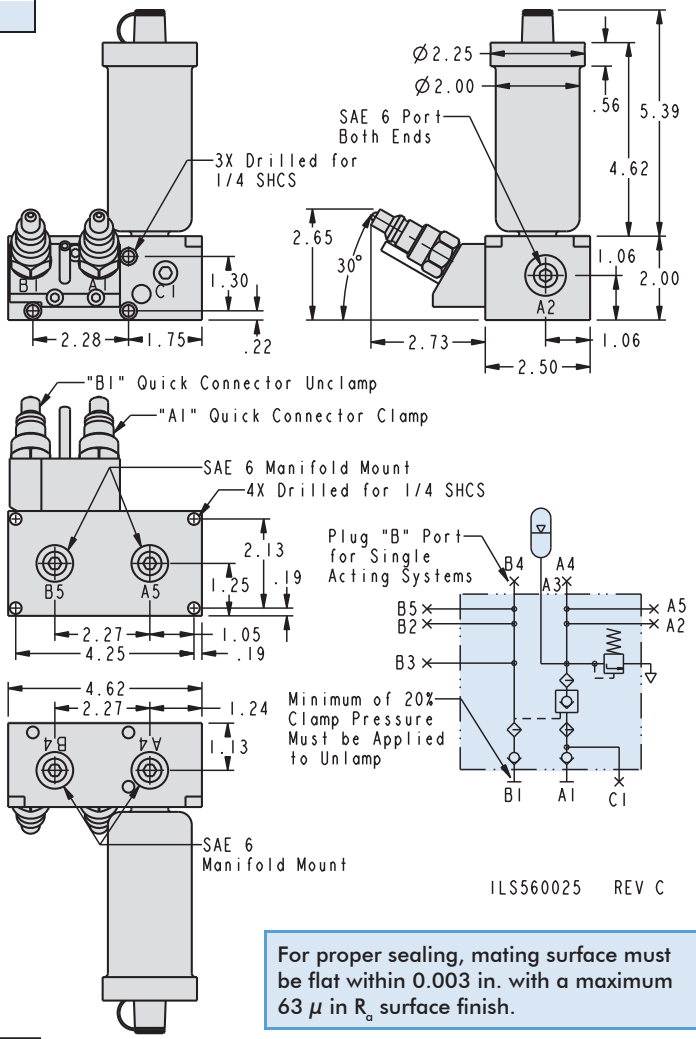
115 VAC, 1 Phase Model No. 55-9242-65

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).



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

NOTES: Field repair requires a special Check Valve Installation Tool. Please order Model No. 65-6000-00

Optional Custom-molded 0.190" riser is available. Please order Model No. 45-6005-11 separately.

K-3

Palletized Fixture Accessories

Automatic Shutoff Valve Decouplers, Two-Handed Operating Handle

Automatic Shutoff Valve Decouplers for Single and Double Acting Systems

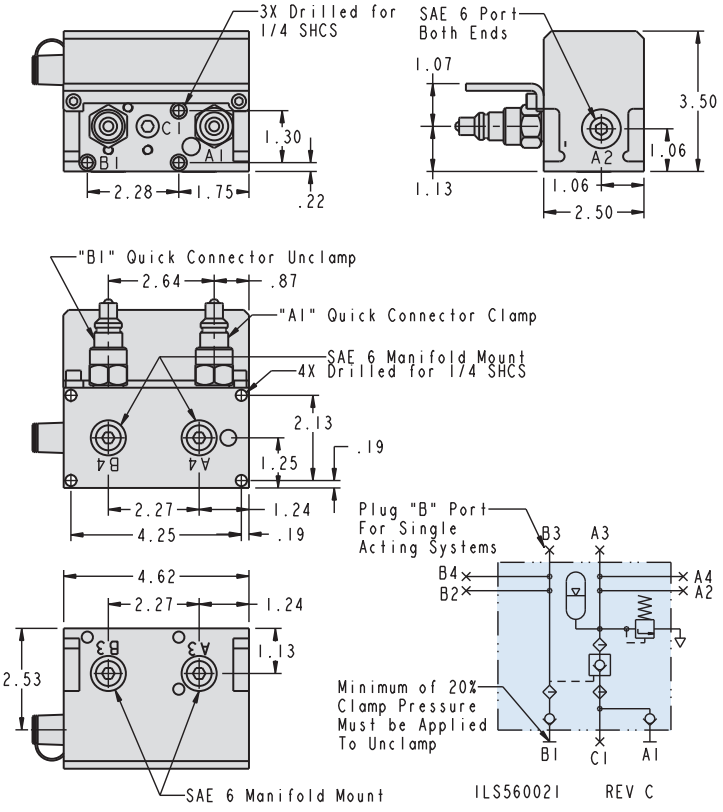
- Decouplers are a convenient, self-contained package that includes quick connect couplings, filters, pilot operated check valve, an over pressure relief valve.
- Robust pilot operated check valve with a 1:5 pilot to check ratio for proven long term reliability.
- Internal 25 micron filters for added protection of the pilot operated check valve through ports A1, A2, A3, A4, and C1. Extra filtration at\ port B1. No filtration at remaining ports. (replacement filter kits Model No. 62-5600-05 or 62-5600-06 for a manifold mount configuration)
- 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 - 3,500 psi	3.6 cu. in.
56-0005-18	2,000 - 5,000 psi	3.2 cu. in.

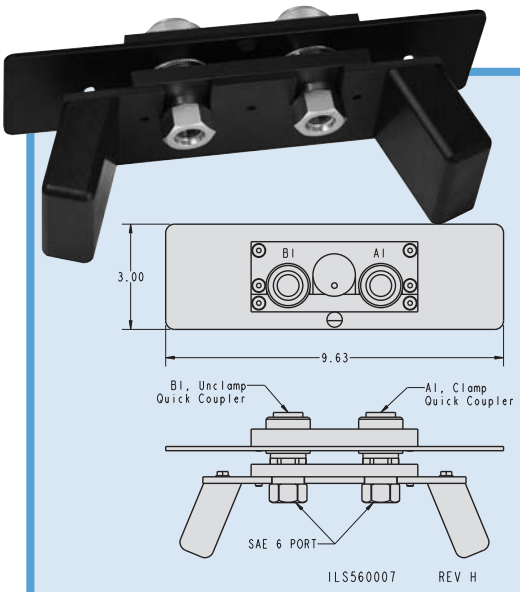
For use with Operating Handle Model No. 56-0005-04

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



NOTES: 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-5) 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).



Two-Handed Operating Handle

Model No. 56-0005-04

For use with Decoupler Models 56-0005-17, 56-0005-18, 56-0005-19 or 56-0005-20

- Provides fast, positive connection to the Decoupler.
- The Two-Handed Handle may be used with the optional Handle Docking Module (page K-7) 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-5, bullet "A", are recommended for use with this handle.

Automatic Shutoff Valve Decouplers, Two-Handed Operating Handle

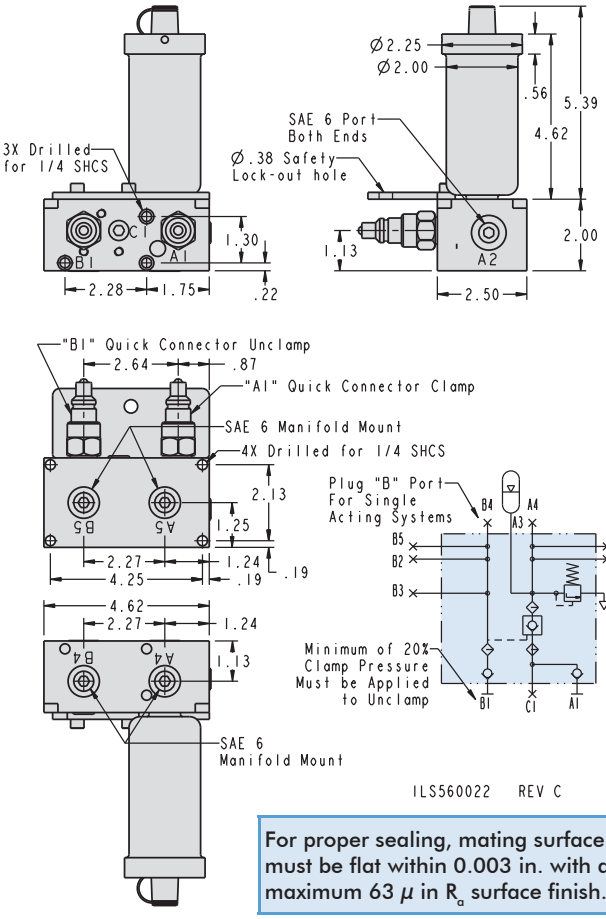
Automatic Shutoff Valve Decouplers for Single and Double Acting Systems

- Decouplers are a convenient, self-contained package that includes quick connect couplings, filters, pilot operated check valve, accumulator and an over pressure relief valve.
- Robust pilot operated check valve with a 1:5 pilot to check ratio for proven long term reliability.
- check valve through ports A1, A2, A3, A4, and C1. Extra filtration at port B1. No filtration at remaining ports. (replacement filter kits Model No. 62-5600-05 or 62-5600-06 for a manifold mount configuration)
- 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	1,000-3,500 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 μ in R_a surface finish.

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-8 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.

NOTES: Field repair requires a special Check Valve Installation Tool. Please order Model No. 65-6000-00

Optional Custom-molded 0.190" riser is available. Please order Model # 45-6005-11 order separately.

NOTE: These automatic Shutoff Valve Decouplers and Operating Handle must be used with a suitable pump 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).

Automatic Shutoff Valve Decouplers, Two-Handed Operating Handle 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.
- Internal 25 micron filters for added protection of the pilot operated check valve through ports A1, A2, A3, A4, and C1. Extra filtration at port B1. No filtration at remaining ports. (replacement filter kits Model No. 62-5600-05 or 62-5600-06 for a manifold mount configuration)
- 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.

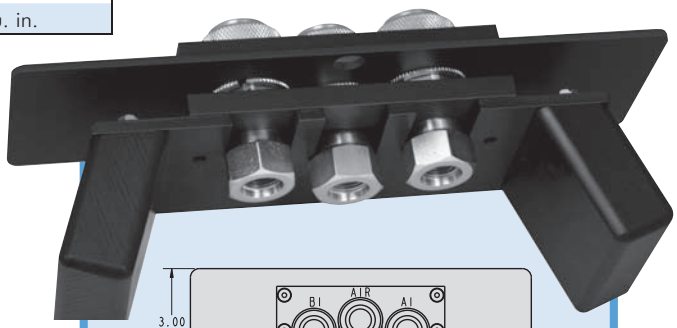
Decouplers with Air and External Accumulator

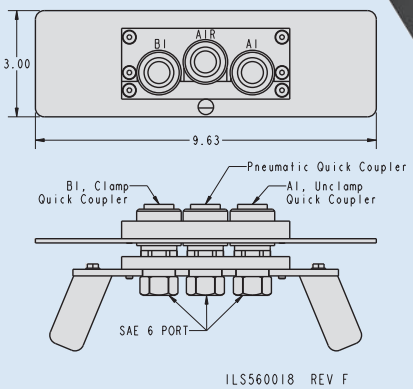
Model No.	Pressure Range	Accumulator Capacity
56-0005-21	1,000-3,500 psi	3.6 cu. in.
56-0005-22	2,000-5,000 psi	3.2 cu. in.

For use with Operating Handle Model No. 56-0007-01

NOTES: Field repair requires a special Check Valve Installation Tool. Please order Model No. 65-6000-00

Optional Custom-molded 0.190" riser is available. Please order Model # 45-6005-11order separately.





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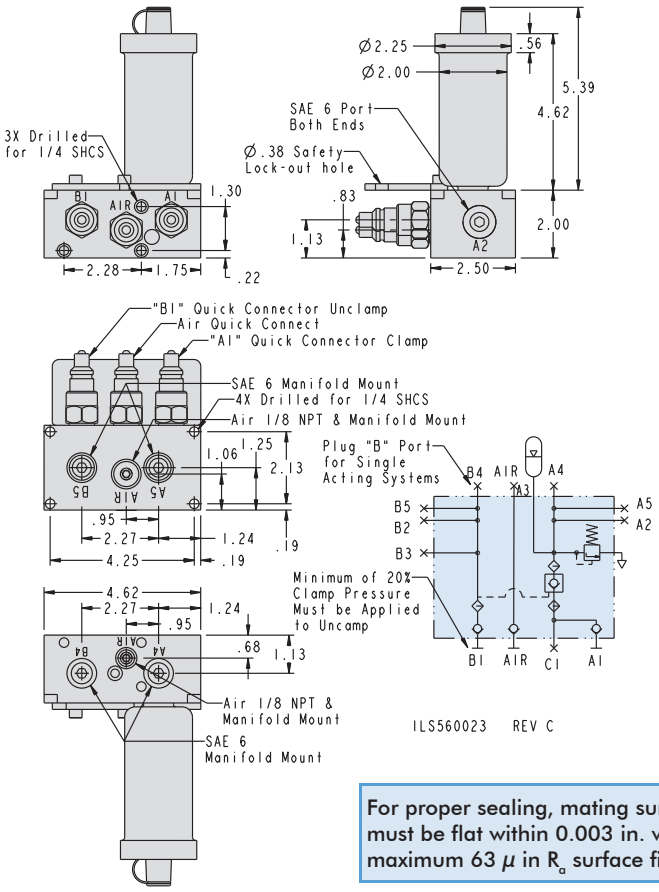
Two-Handed Operating Handle with Air

Model No. 56-0007-01

For use with Decoupler Models 56-0005-21 and 56-0005-22



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

NOTE: This Automatic Shutoff Valve Decoupler and Operating Handle must be used with a suitable pump (see blue inset on K-5) 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).

Handle Docking Module

with controller interface feature

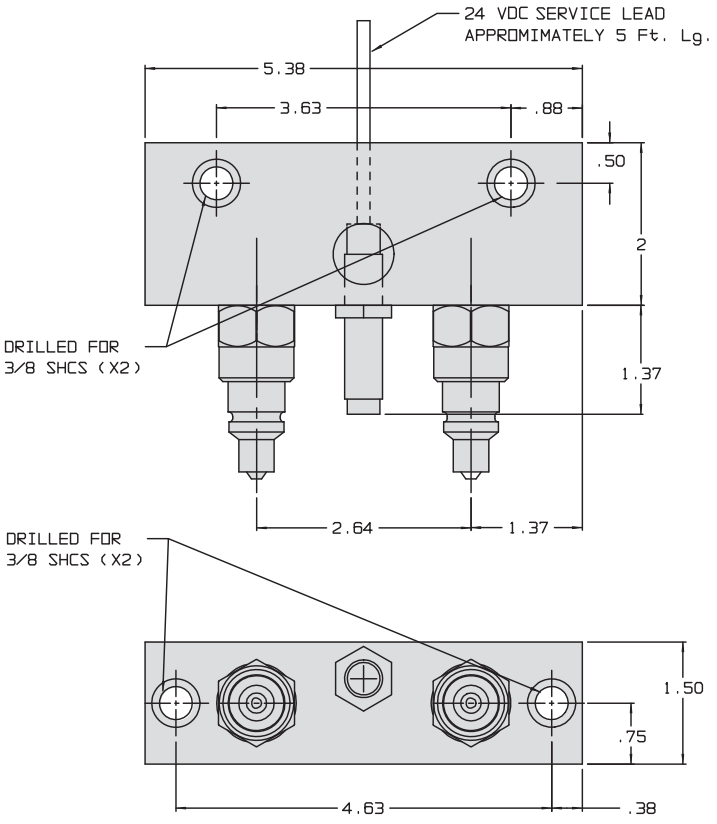
The Docking Module is designed for use with the 2-Handed Automatic Shutoff Pallet Decoupler handle. This docking unit stores your handle while your parts are machined and is equipped with a proximity switch to wire into your controller. Your process simply will not start until the decoupler handle is 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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Accumulators

Accumulators*

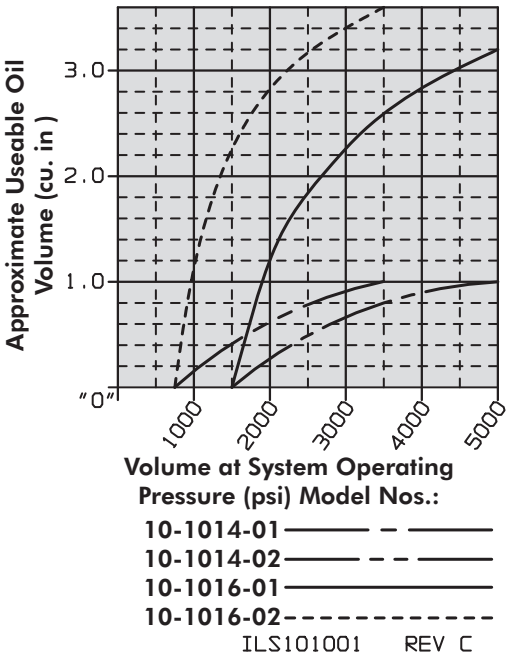
- Maintains circuit pressure while the pallet or tombstone fixture is disconnected from the pump using a decoupler or tombstone Top Plate.
- Piston-type, inert gas precharged accumulators compensate for pallet pressure changes during machining.
- Available in two operating ranges provide up to 3.6 cu. in. of pressure fluid reserve.

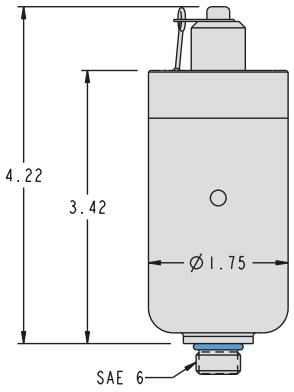
Hydraulic fluid compresses the precharged inert gas across the piston during circuit pressurization. The pressurized gas provides additional fluid to the circuit to reduce pressure changes in the event of small seeps, or thermal expansion/contraction while the pallet or fixture is in the machine. The 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.

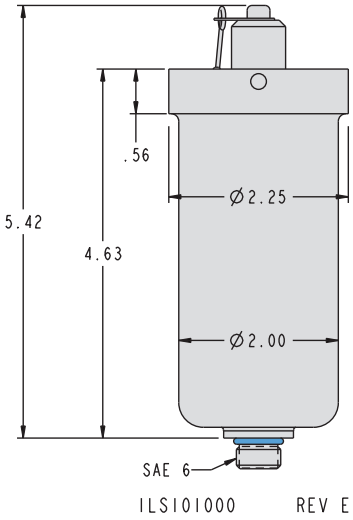
Strictly observe all safety precautions provided with each accumulator.

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

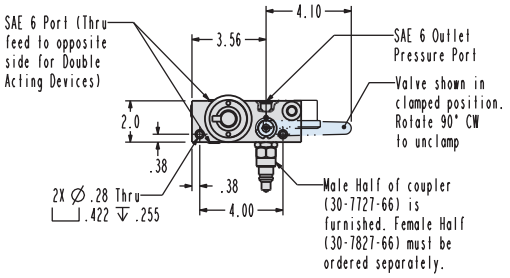
*NOTE: Accumulator's gas precharge must be checked annually. Consult Vektek for technical assistance.

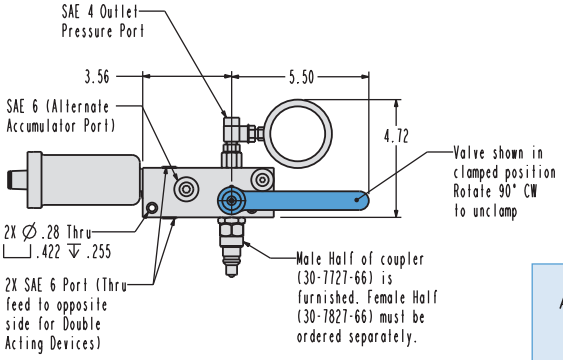
Manual Shutoff Valve Decoupler for Single Acting Systems

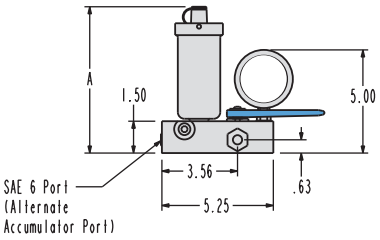
- This Decoupler is a convenient, self-contained package that includes a quick connect coupling, manual shutoff valve, accumulator (choose from horizontal or vertical arrangement), filter screen, pressure gauge, and over-pressure relief valve.
- Models available for circuits operating at 2,000-5,000 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.

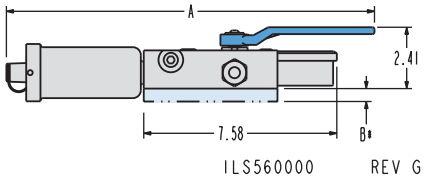
Decoupler with External Accumulator

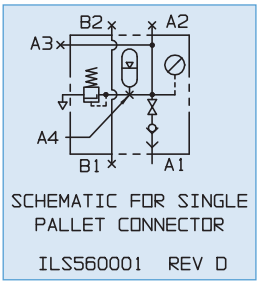
For operation with Female Quick Connect Coupling Model No. 30-7827-66 (page H-6)











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-8 for standard features of all Medium Capacity 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-2 through K-6.

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

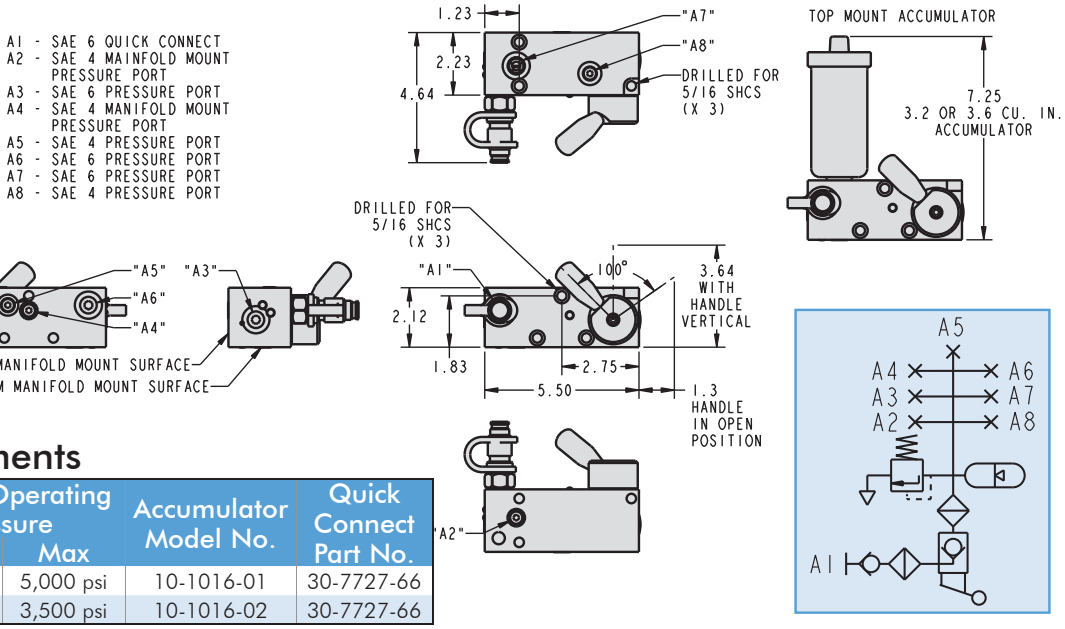
Manual Shutoff Valve Decouplers, Self-Closing Valve

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.

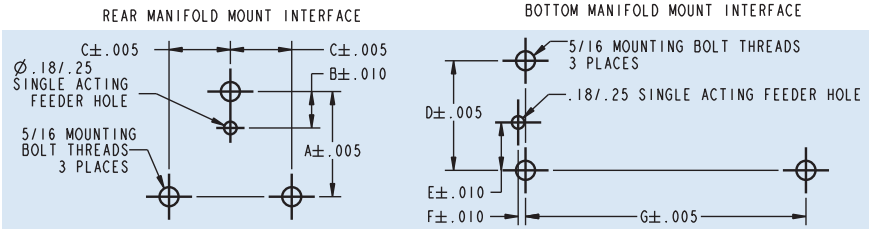
- This Decoupler is a convenient, self-contained package that includes a male quick disconnect with dust cover, accumulator, filter screens on both sides of system, and an over-pressure relief valve. (Pressure gauge sold separately see page M-14.)
- Manual shutoff valve automatically closes on system 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.



Assembly Elements

Model No.	System Operating Pressure Min	Max	Accumulator Model No.	Quick Connect Part No.
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 μ in Ra surface finish.

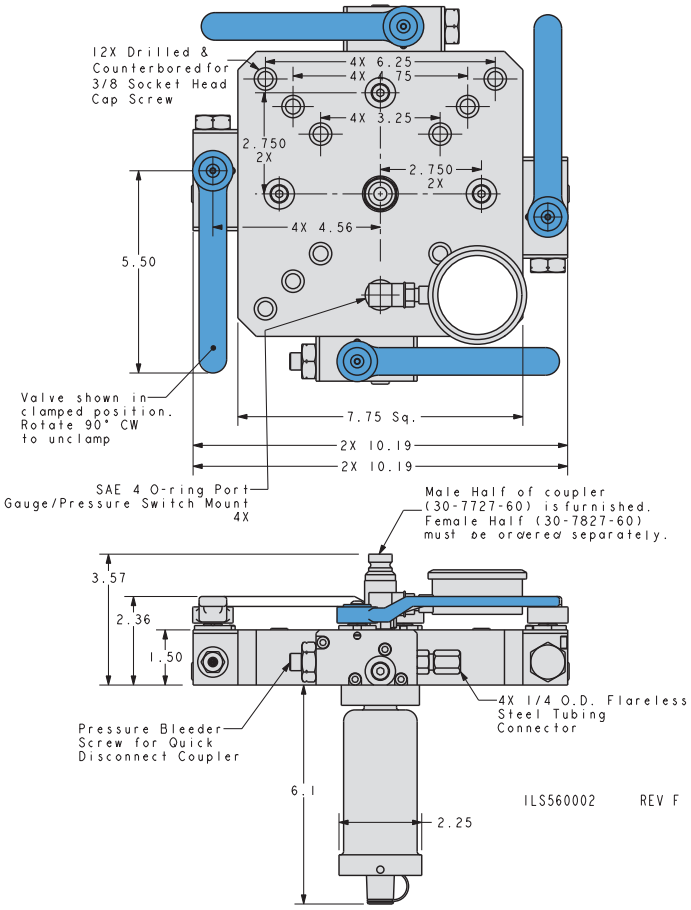


Manifold Mount Dimensions

Model No.	A	B	C	D	E	F	G
56-0006-03	1.500	0.520	0.875	1.563	0.683	0.105	4.000
56-0006-04							

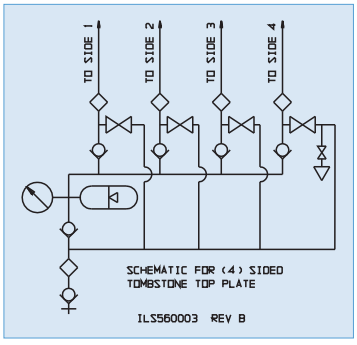
NOTE: This Self-closing Manual Shutoff Valve Decoupler must be used with a suitable pump which includes a 2-Position/3-Port, directional control valve for operation of one single acting circuit.

Manual Shutoff Valves Top Plate, Four-Sided



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-8 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-2 through K-6.

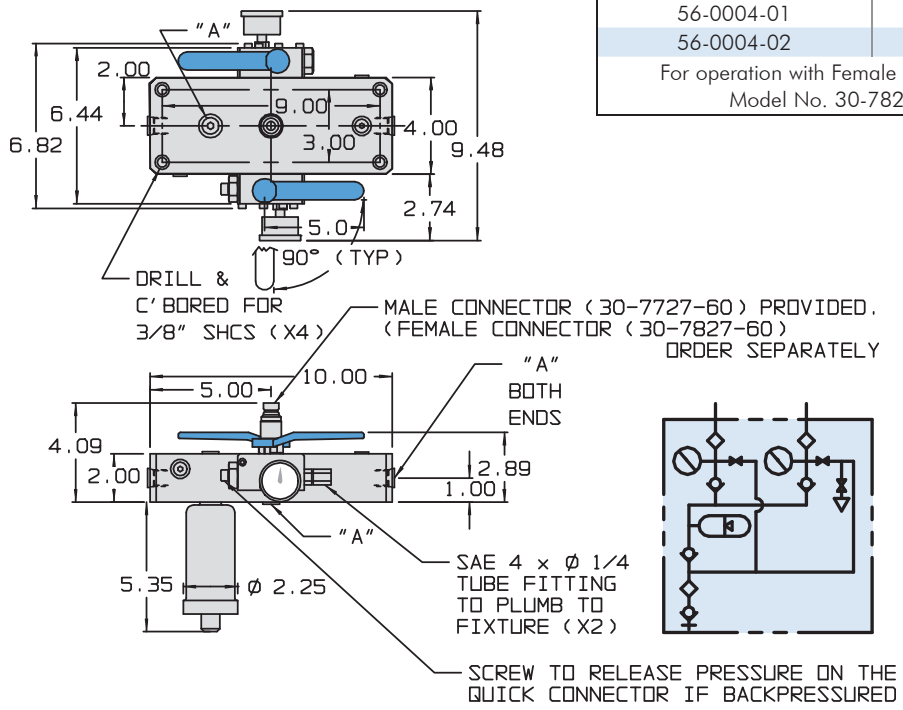
Manual Shutoff Valves Top Plate, Two-Sided

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	Circuits Operating at
56-0004-01	2,000-5,000 psi
56-0004-02	1,000-3,500 psi
For operation with Female Quick Connect Coupling Model No. 30-7827-60 (page H-6).	



ALTERNATE ACCUMULATOR POSITIONS MARKED "A" (4 PLACES)

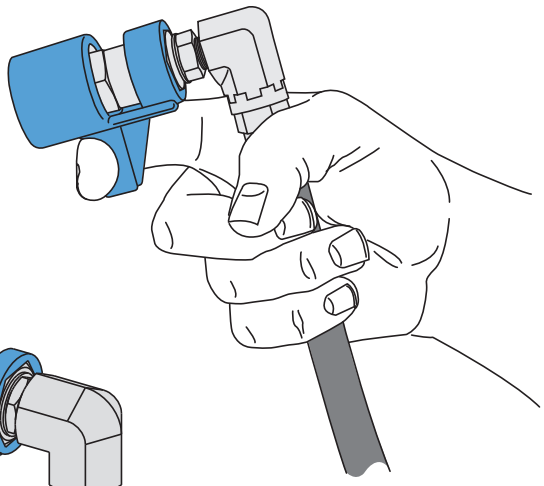
ILS560004 REV D

NOTE: These Manual Shutoff Valve Top Plates must be used with a suitable pump (see page K-11) 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-2 through K-6.

Manual Unload Valve, Quick Connect with Trigger Mechanism

Quick Connect with Trigger Mechanism

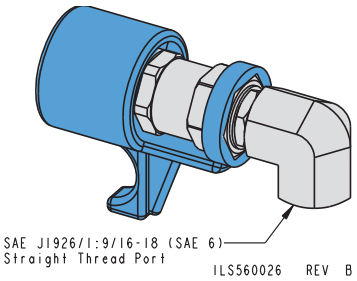
- Faster connects/disconnects with "Pistol-Grip" Trigger Mechanism, Female Connect, and 90° Elbow sold in one convenient package.
- Ergonomic design reduces operator fatigue.
- Easily connect/disconnect to hard-to-reach and tall fixtures.



Quick Connect with Trigger

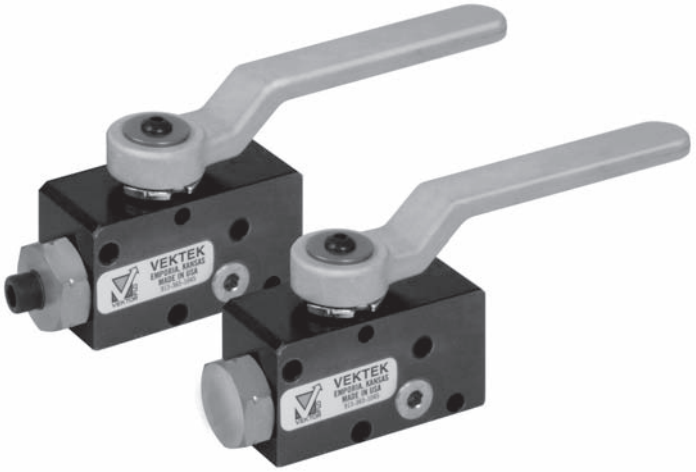
Model No.	Description
56-0009-01*	SAE J1926/1:9/16-18 (SAE 6) Straight Thread Port

For use with Male coupler Part No. 30-7727-66
*Use with decouplers: 56-0001-01, 56-0001-02, 56-0001-03, 56-0002-01, 56-0002-02, 56-0002-03, 56-0006-03, or 56-0006-04



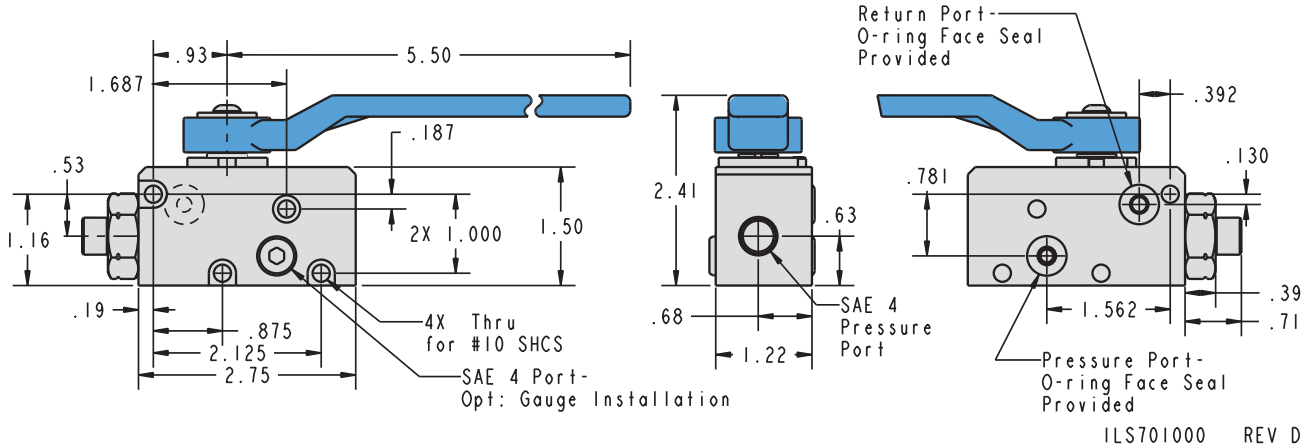
Manual Unload Valves-Tombstone

- 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 Unload Valves

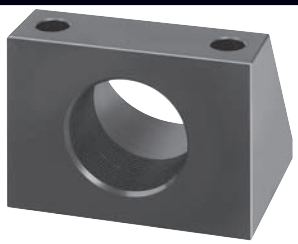
Model No.	Description
70-1017-00	Manual Unload Valve (face mounted)
70-1017-03	Manual Unload Valve with bleed port

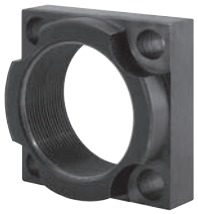


For proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μ in R_a surface finish.

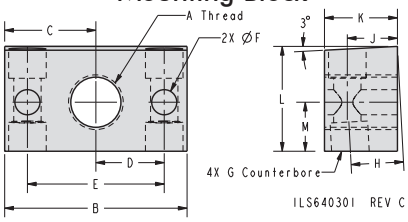
Hardware

Mounting

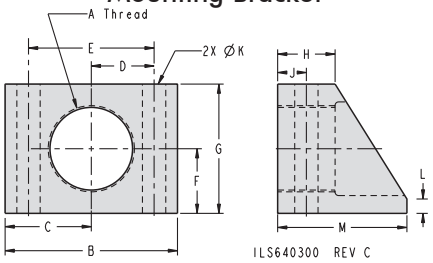




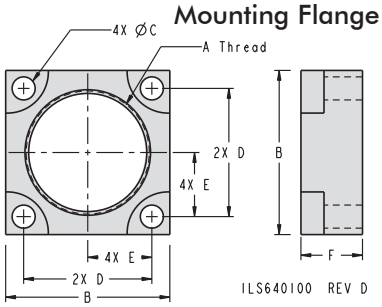
Mounting Block



Mounting Bracket



Mounting Flange



Mounting Block

Model No.	A	B	C	D	E	ØF	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

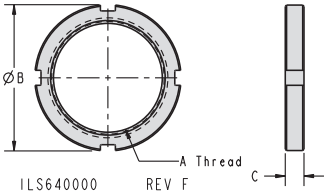
Model No.	A	B	C	D	E	F	G	H	J	ØK	L	M
64-0310-00	1 1/16-16	2.25	1.12	0.81	1.62	0.87	1.75	0.75	0.50	0.34	0.25	2.00
64-0313-00	1 5/16-16	2.50	1.25	0.94	1.88	1.00	2.00	0.75	0.44	0.41	0.25	2.00
64-0315-00	1 1/2-16	3.00	1.50	1.09	2.18	1.12	2.25	1.00	0.50	0.41	0.25	2.25
64-0318-00	1 7/8-16	3.38	1.69	1.28	2.56	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

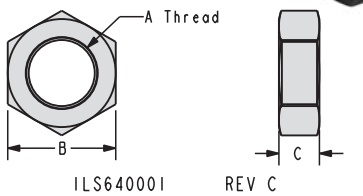
Retaining Collar

Model No.	A	ØB	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



Retaining Collar

Retaining Nut



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

Shipped in 24" lengths

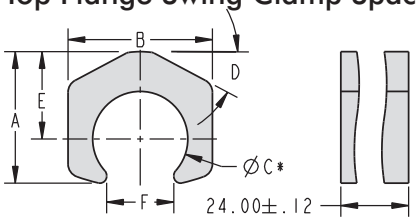
Swing Clamp and Link Clamp Spacers

Top Flange Swing Clamp Spacers

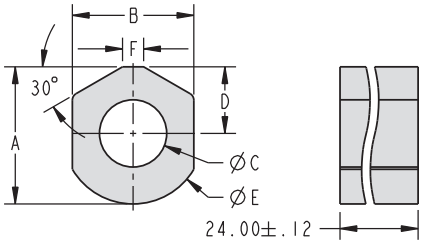
Model No.	Standard Swing Clamp or TuffCam™ Model No.	Standard Swing Clamp or TuffCam™ Clamp Capacity	A	B	ØC*	D	E	F
64-0409-01	15-XX05-00/ 14-6X05-01-L/R	450	1.45	1.88	1.02	28°	1.02	0.75
64-0414-01	15-XX09-08/ 14-6X09-01-L/R	1100	1.97	2.31	1.45	28°	1.32	1.25
64-0417-01	15-XX13-11/ 14-6X13-01-L/R	2600	2.45	2.69	1.77	28°	1.63	1.25

* For model 14-6213-10- L/R the spacer will not fit as shipped. The "C" dimension must be machined to Ø1.88

Top Flange Swing Clamp Spacer



Link Clamp Spacers



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	16-6X14-00	5000	4.50	4.13	2.51	2.13	4.75	0.23
64-0431-01	16-6X16-00	6800	5.44	5.13	3.14	2.56	5.75	0.36

NOTE:
1. Spacers ship in 24" lengths. Customer 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

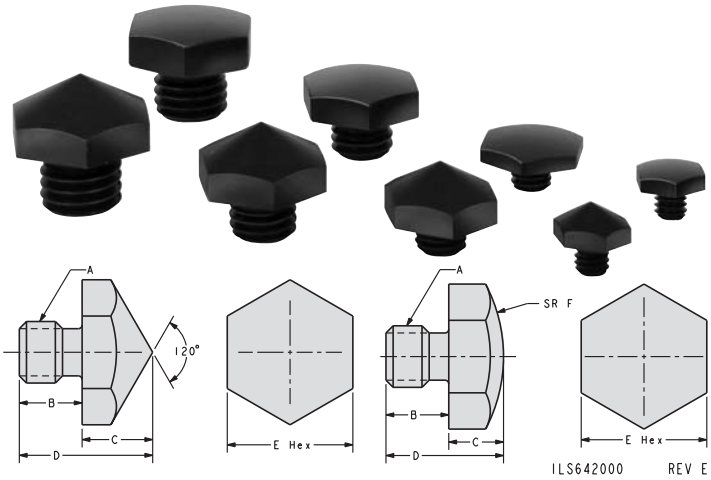
Conical Contact Points

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

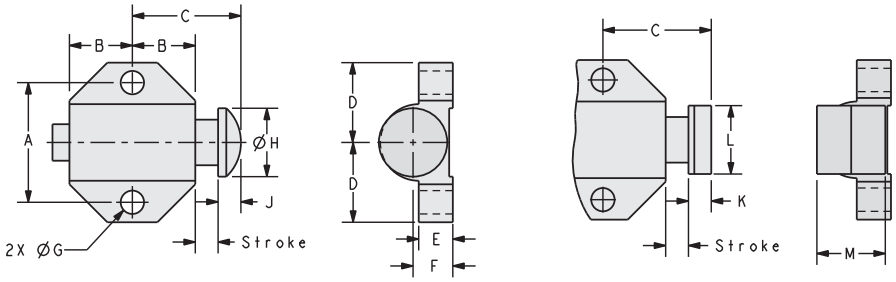
Contact points have been carburized RC 37-42

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



Tooling Components



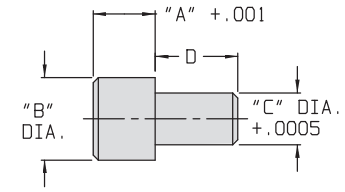
ILS660000 REV H

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	0.75	0.75

** At mid stroke

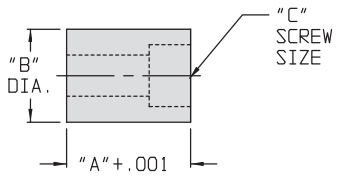
NOTE: Actual dimensions may differ slightly from listed nominal dimensions.



BUTTONS ARE HARDENED & GROUND

Press Fit Rest Buttons

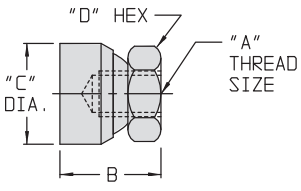
Model No.	A	B	C	D
66-0438-01	0.375	0.38	0.1880	0.38
66-0462-02	0.500	0.62	0.3755	0.62



BUTTONS ARE HARDENED & GROUND

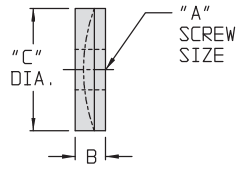
Screw On Buttons

Model No.	A	B	C
66-0562-01	0.375	0.62	1/4 S.H.C.S.
66-0562-02	0.500	0.62	1/4 S.H.C.S
66-0562-04	0.750	0.62	1/4 S.H.C.S
66-0562-05	1.000	0.62	1/4 S.H.C.S



Toggle Pads

Model No.	A	B	C	D
66-0625-00	1/4 - 20 X 0.41	0.62	0.62	0.50
66-0632-00	5/16 - 18 X 0.42	0.75	0.68	0.56
66-0638-00	3/8 - 16 X 0.50	0.81	0.75	0.62
66-0650-00	1/2 - 13 X 0.53	0.94	0.88	0.75
66-0662-00	5/8 - 11 X 0.56	1.00	1.00	0.88



PAR 66

WASHERS ARE HARDENED

Spherical Washers

Model No.	A	B	C
66-0862-00	5/8	0.32	1.38

ILS660400 REV C

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 drawing 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. (inside diameter) 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 and Pressure Reducing Valves

- 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.

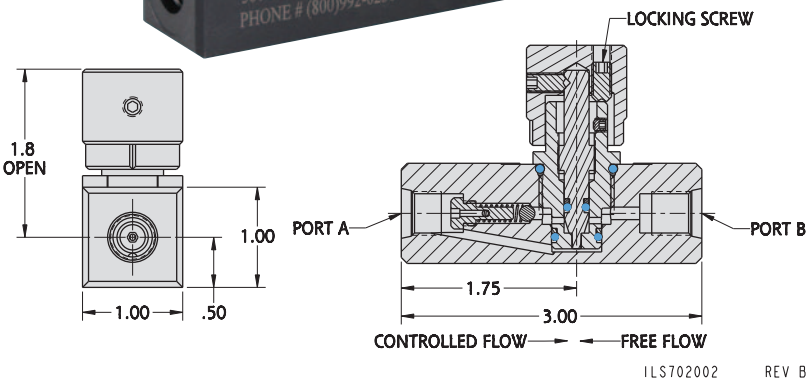
NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves.

Excess flow voids warranty.

Flow Control

Precision In-line Flow Control

- 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.
- Locking adjustment knob.

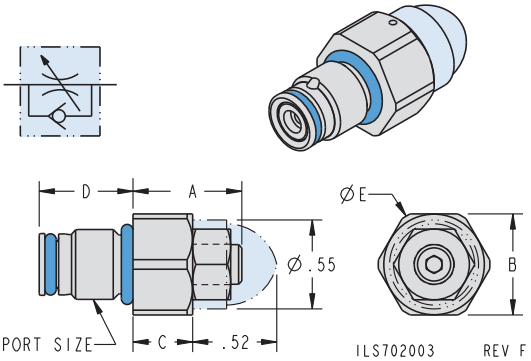


In-line Flow Control

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

- Use with Single or Double Acting clamps.
- 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.
- Adjusting screw is positively retained and will not come out under pressure.



In-Port Flow Control

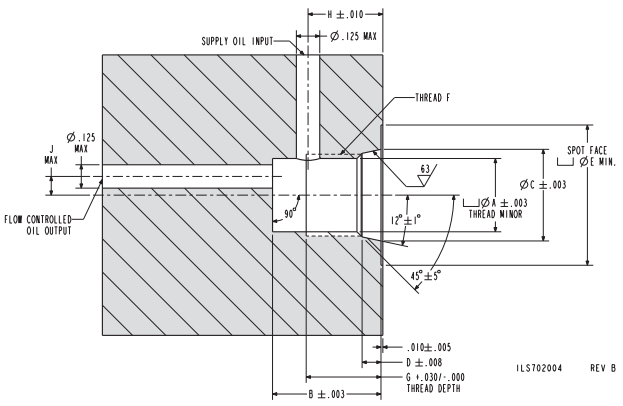
Model No.	Port Size	A Max	B Hex	C Hex	D	ØE
70-2037-70	SAE 2	0.73	0.437	0.36	0.480	0.48
70-2037-71	SAE 4	0.74	0.625	0.37	0.580	0.69
70-2037-72	SAE 4	0.74	0.625	0.37	0.750	0.69
70-2037-73	SAE 4	0.74	0.625	0.37	1.000	0.69

Flow control requires the use of manifold mount ports.

Consult the swing clamp or link clamp specifications page for the valve that is appropriate for your application.

In-Port Flow Control Cavity

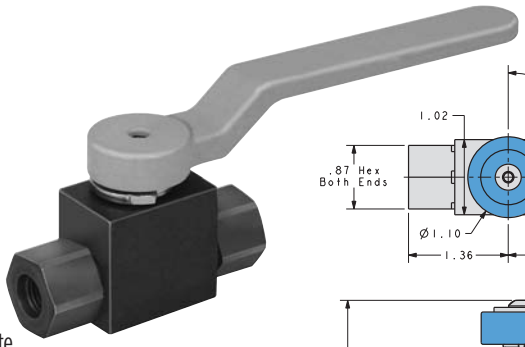
Model No.	Port Size	A	B	C	D	E	F	G	H	J
70-2037-70	SAE 2	0.272	0.480	0.360	0.082	0.682	5/16 - 24 UNF	0.320	0.320	0.050
70-2037-71	SAE 4	0.392	0.580	0.490	0.101	0.750	7/16 - 20 UNF	0.400	0.400	0.100
70-2037-72	SAE 4	0.392	0.750	0.490	0.101	0.750	7/16 - 20 UNF	0.400	0.400	0.100
70-2037-73	SAE 4	0.392	1.000	0.490	0.101	0.750	7/16 - 20 UNF	0.400	0.400	0.100

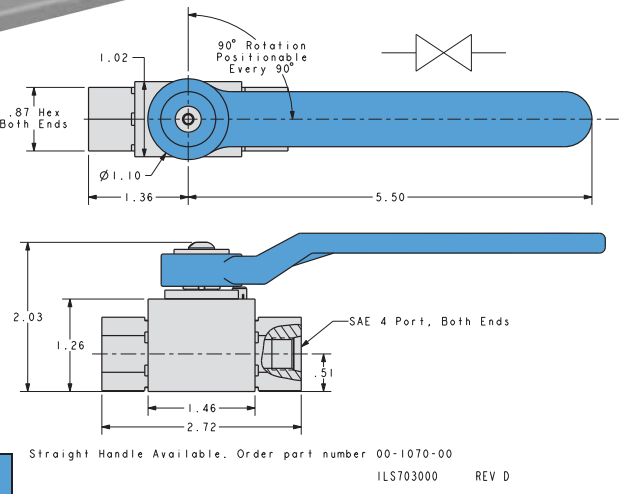


Shutoff Valve

- 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.





Straight Handle Available. Order part number 00-1070-00

ILS703000 REV D

NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in./ minute) for all VektorFlo® special function valves.

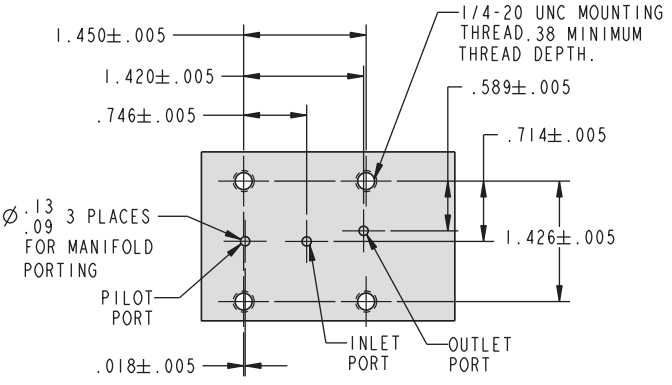
Excess flow voids warranty.

Shutoff Valve

Model No.
70-3000-00

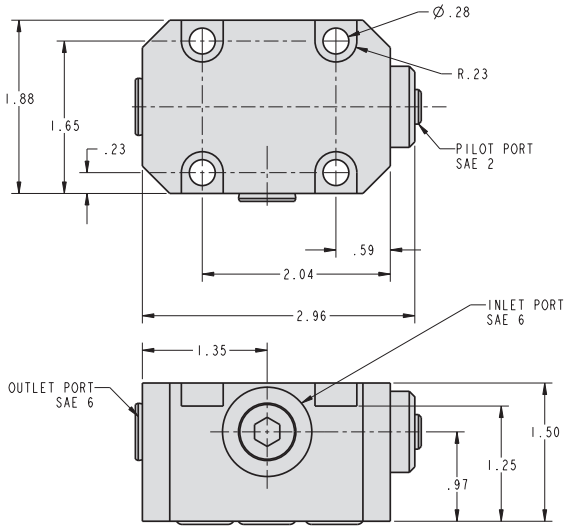
"A" Pilot Operated Check Valve

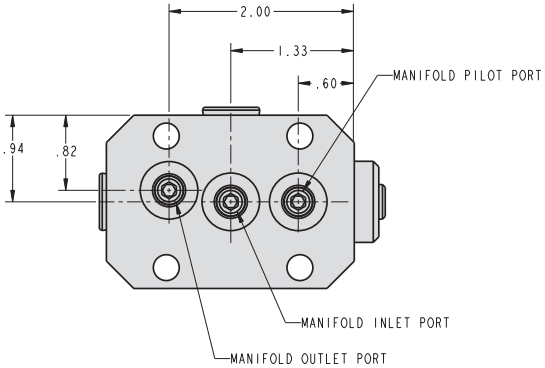
- Sealed pilot piston eliminates cross circuit leakage.
- 5:1 Ratio of Pilot to Check pressure for release.
- Filters on each port location.
- Unclamp device sequencer, provides a way to sequence single circuit unclamp timing.
- Requires a "B" pilot to open "A" line check valve
- Stainless steel inner valve construction.
- Maximum operating pressure 5,000 psi



MOUNTING DIMENSIONS FOR PILOT CHECK MODEL NUMBER 70-3311-11

ILS703303 REV A





PILOT OPERATED CHECK VALVE MODEL NO.70-3311-11

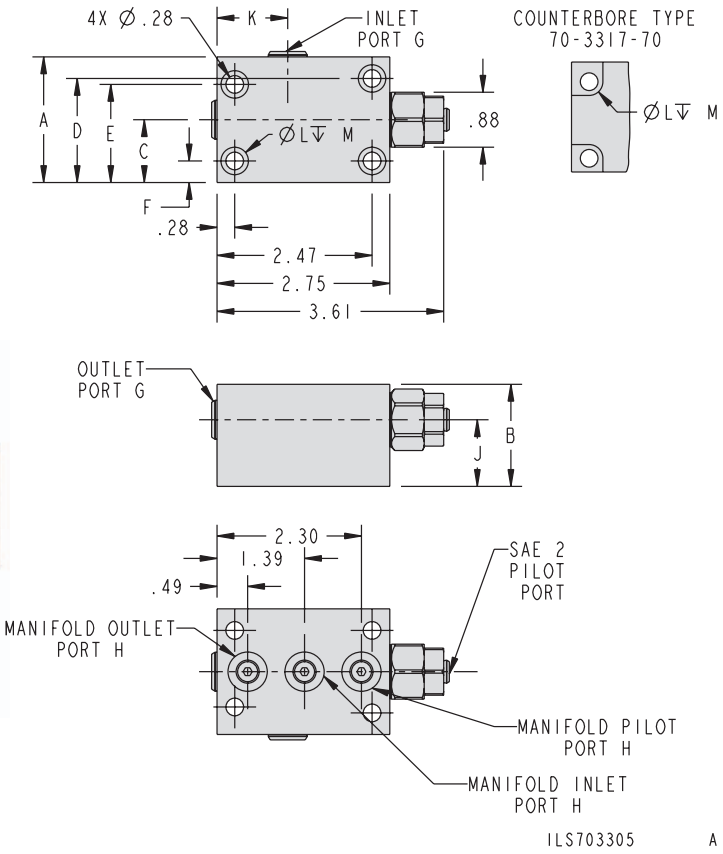
ILS703300 REV B

"A" Pilot Operated Check

Model No.
70-3311-11

Pilot Operated Check Valve

NEW



Pilot Operated Check Valve

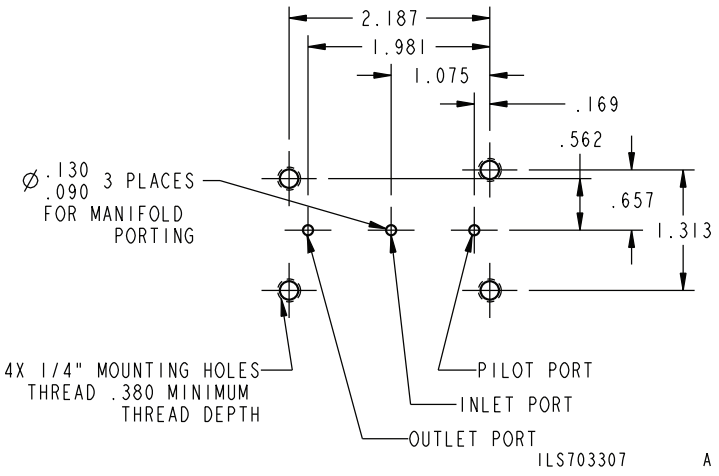
- Cartridge and Manifold Mount versions.
- Sealed pilot piston eliminates cross circuit leakage.
- 5:1 Ratio of Pilot to Check pressure for release.
- Unclamp device sequencer, provides a way to sequence single circuit unclamp timing.
- Flows up to 1.5 gal/min at 5,000 psi maximum pressure.
- Stainless steel inner valve construction.

Assembly Dimensions

Model No.	A	B	C	D	E	F	G	H	J	K	L	M
70-3311-13	2.00	1.63	1.00	1.66	1.56	0.34	SAE 6	SAE 2 Plug	1.06	1.13	0.28	0.44
70-3317-70	1.75	1.50	0.88	1.53	1.44	0.22	N/A	N/A	0.94	N/A	0.28	0.44

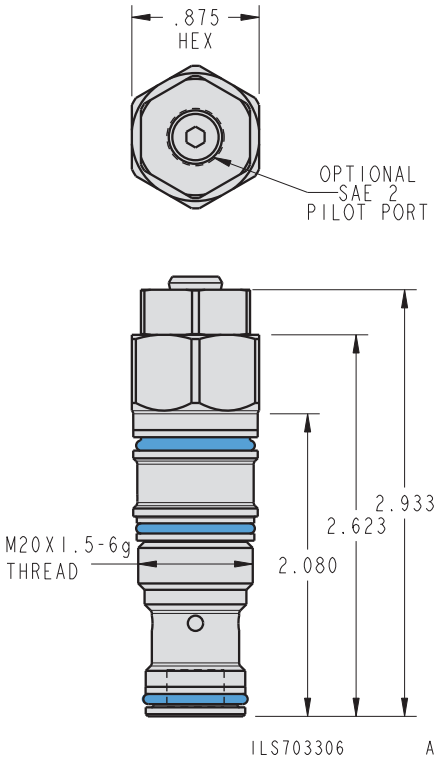
Mounting Dimensions for Pilot Operated Check Valve Assemblies

70-3311-13 and 70-3317-70



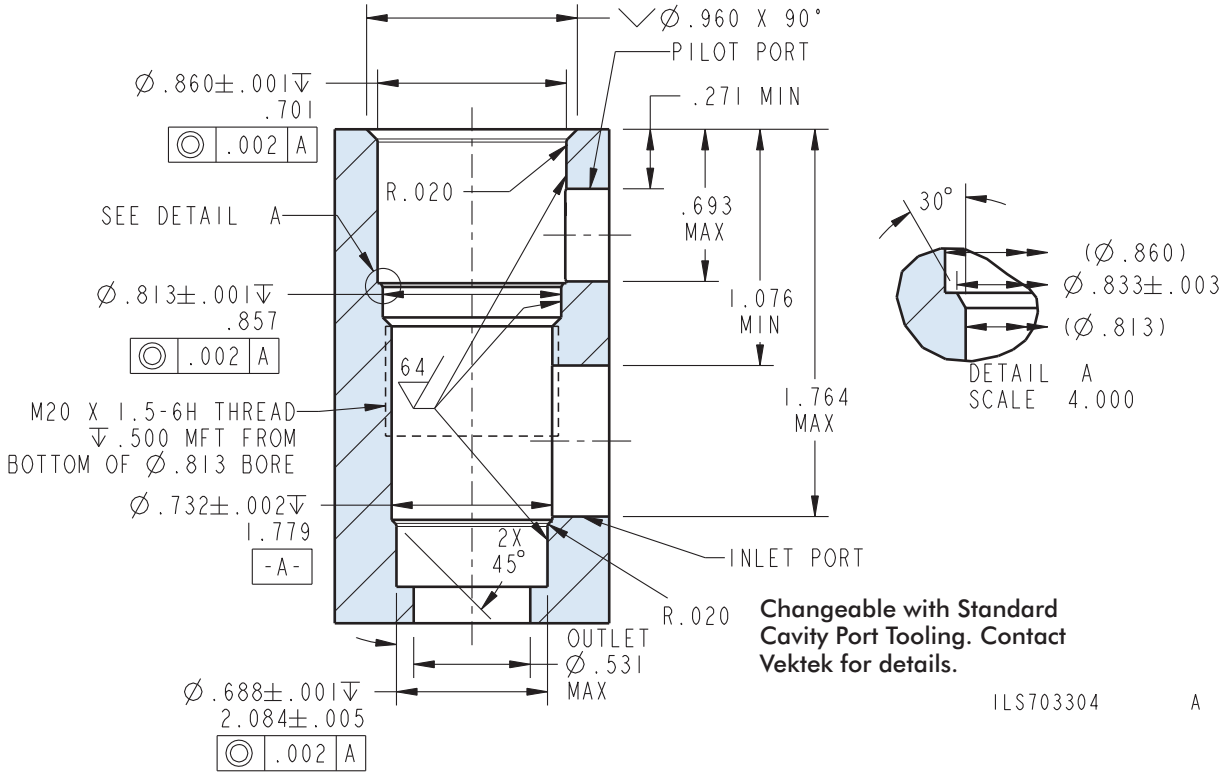
For proper sealing, mating surface must be flat to 0.003 in. with a maximum 63 μ in. R_a surface finish.

Pilot Operated Check Valve



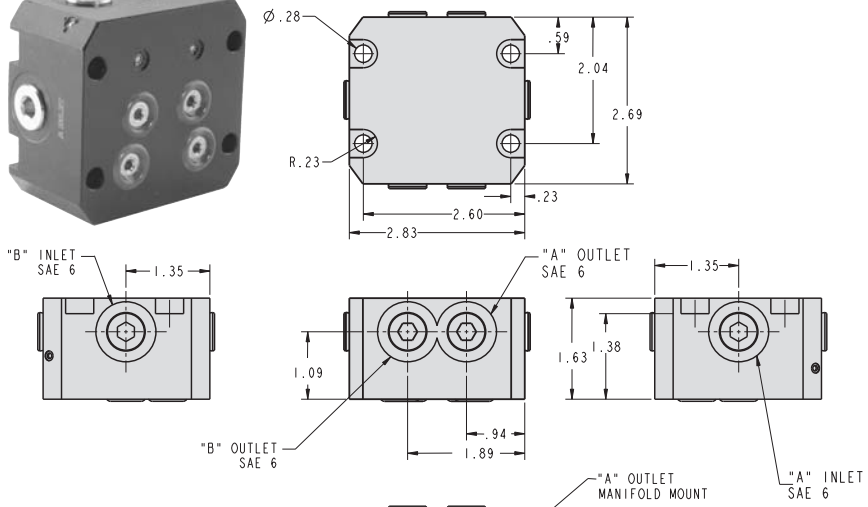
PO Cartridge
Model No.
70-3337-71

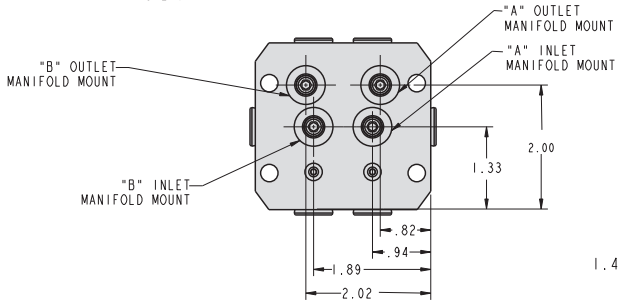
Cartridge Mount Pilot Operated Check Valve Cavity Dimensions



Changeable with Standard Cavity Port Tooling. Contact Vektek for details.

Check Valves





PILOT CHECK VALVE "A-B" CIRCUIT MODEL NO. 70-3311-12

ILS703301 REV A

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.

Field repair requires a special Check Valve Installation Tool. Please order Model No. 65-6000-00.

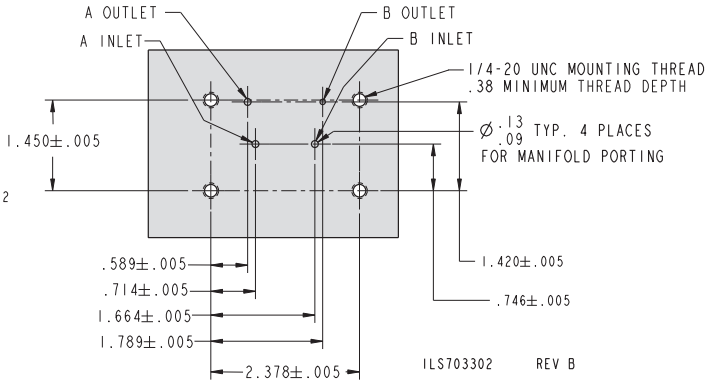
"A-B" Check Valve

- 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.

"A-B" Check Valve

Model No.
70-3311-12

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

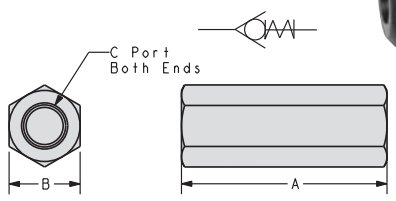


ILS703302 REV B

MOUNTING DIMENSIONS FOR A-B CHECK MODEL NUMBER 70-3311-12

Check Valves

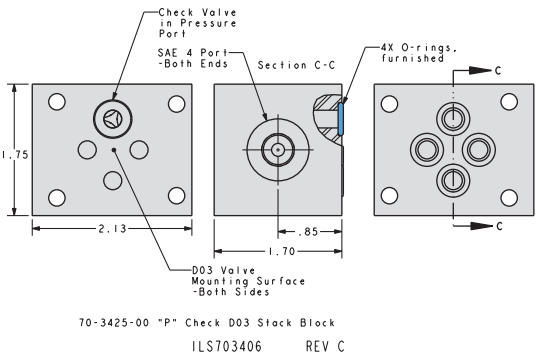
Permits flow in one direction only. Can not be adjusted for reverse flow.



ILS703400 REV C

Check Valve

Model No.
70-3425-00



70-3425-00 "P" Check D03 Stack Block

ILS703406 REV C

Check Valve Dimensions

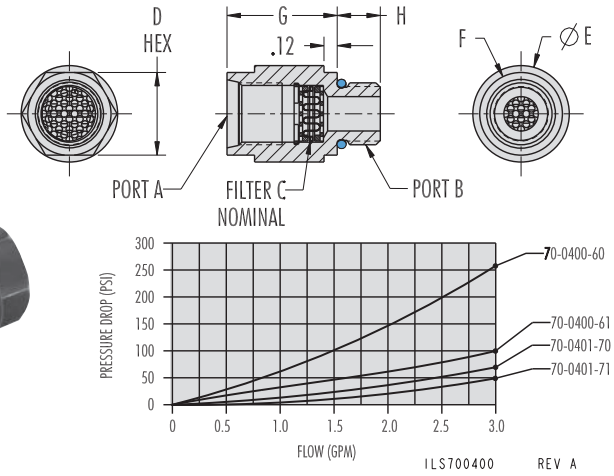
Model No.	A	B	C
70-3400-01	2.17	0.75	SAE 4
70-3400-06	2.60	1.00	SAE 6

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.

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 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

Screen replacement kits available.
Call factory for details

Basic Filter

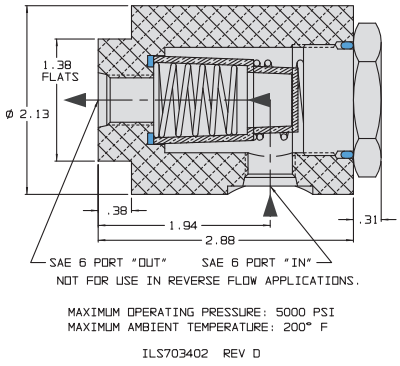
- Keeps chips and debris from reaching valves or other sensitive devices.
- Traps contaminants which may have been missed when cleaning tubing or blind holes prior to fixture startup.
- Easily cleaned or changed filter should be checked when devices become sluggish.

Basic Filter

Model No.	Filtration
70-3401-15	10 Micron
70-3401-12	25 Micron

Basic Filter Pressure Drop

Gal/Min	25 Micron	10 Micron
1	2	2.2
2	7	7.7
3	10	11
4	15	16.5
5	20	22
6	26	28.6
7	33	36.3

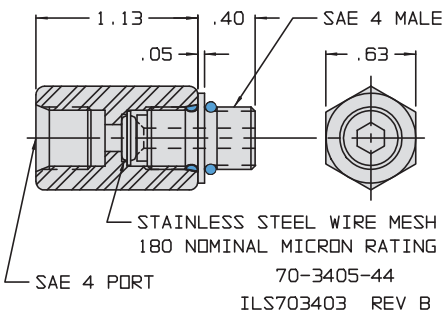


Screen replacement kits available.
Call factory for details

In-line Filter Screens

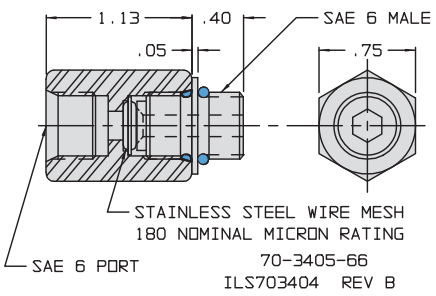
SAE 4 Filter Screen

- Protects valves and devices installed at pump.
- Catches damage causing chips.
- Can be used in in-port applications.



In-line Filter Screens

Model No.	Filtration
70-3405-44	SAE 4
70-3405-66	SAE 6



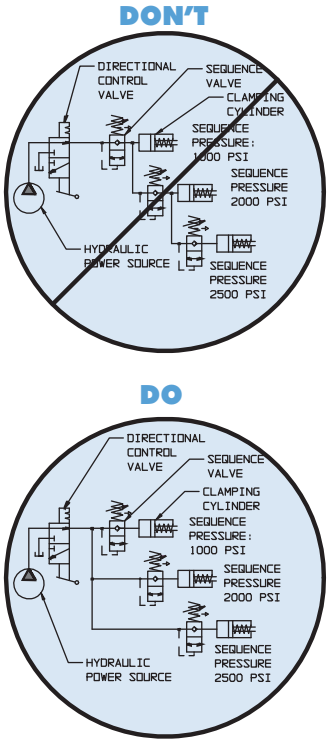
SAE 6 Filter Screen

- Protects devices and individual valves.
- Catches damage causing chips.
- Can be used in in-port applications.

Sequence Valve

Sequence Valve

- Control the timing of fixture devices.
- 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.
- Recommended Filtration: 25 Micron (NOM) / 40 Micron (ABS) (minimum).

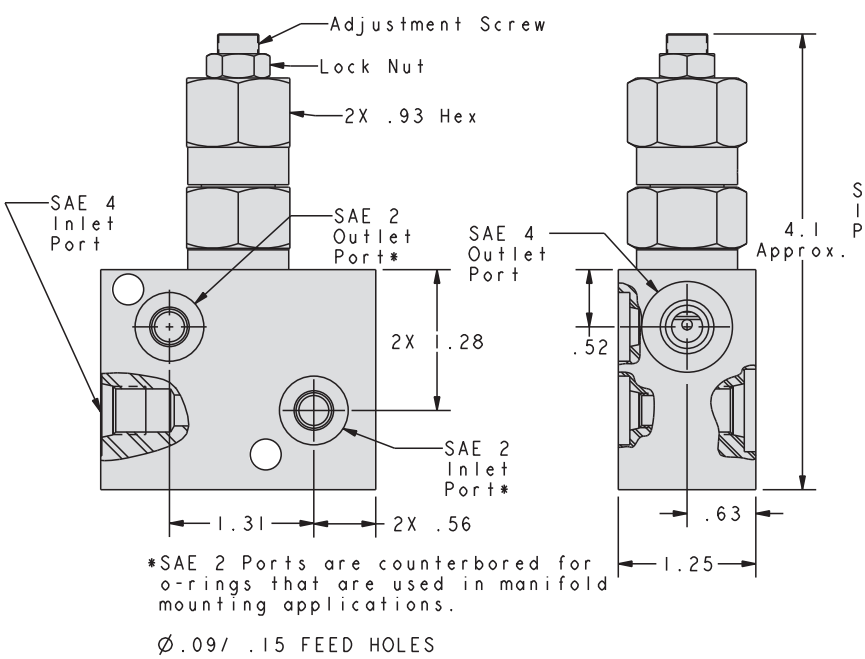


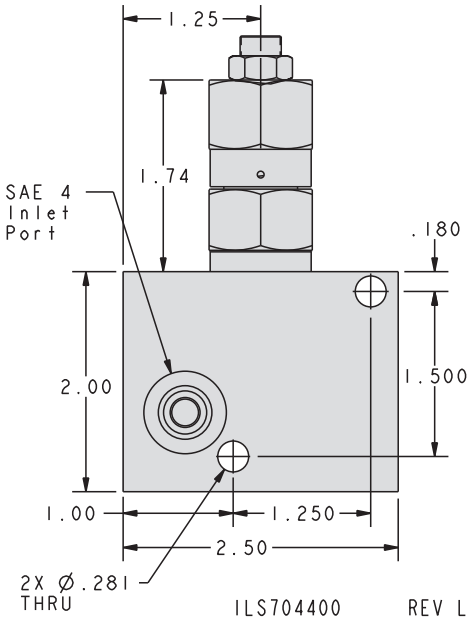
ILSSCHAA REV B

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 downstream. 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.

Sequence Valve

Model No.
70-4400-02 Assembly
70-4430-02 Cartridge





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

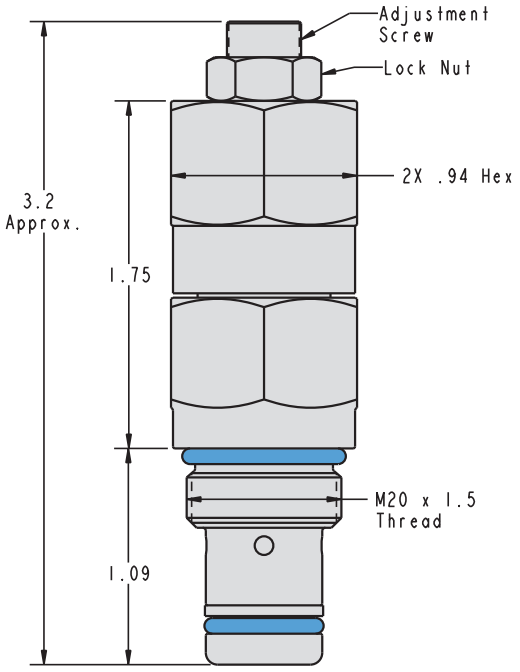
NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves.

Excess flow voids warranty.

Sequence Cartridge

Sequence Valve

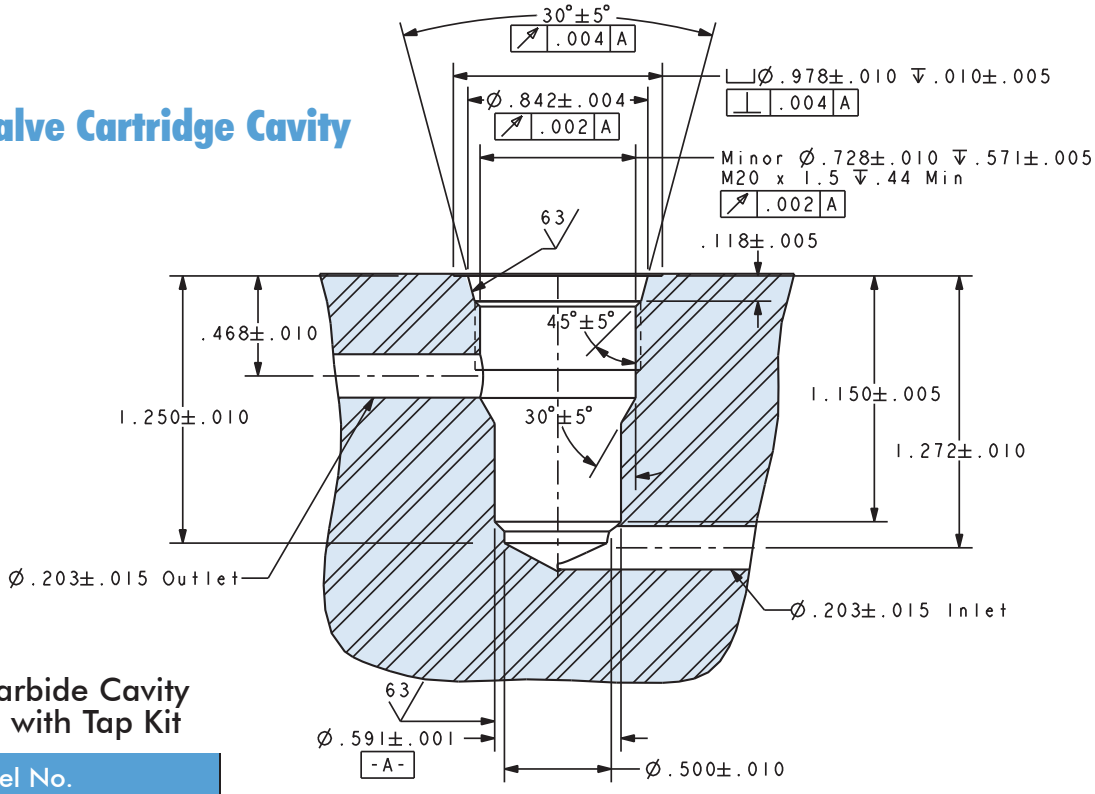
Model No.
70-4430-02 Cartridge



Model No. 70-4430-02 Sequence Valve Cartridge

ILS704401 REV D

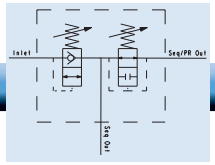
Sequence Valve Cartridge Cavity



ILS704402 REV C

Multi-Step Carbide Cavity Contour Tool with Tap Kit

Model No.
62-7040-00
Reamer and M20 x 1.5 tap



Accessory Valves

Combination Sequence/PRV Block

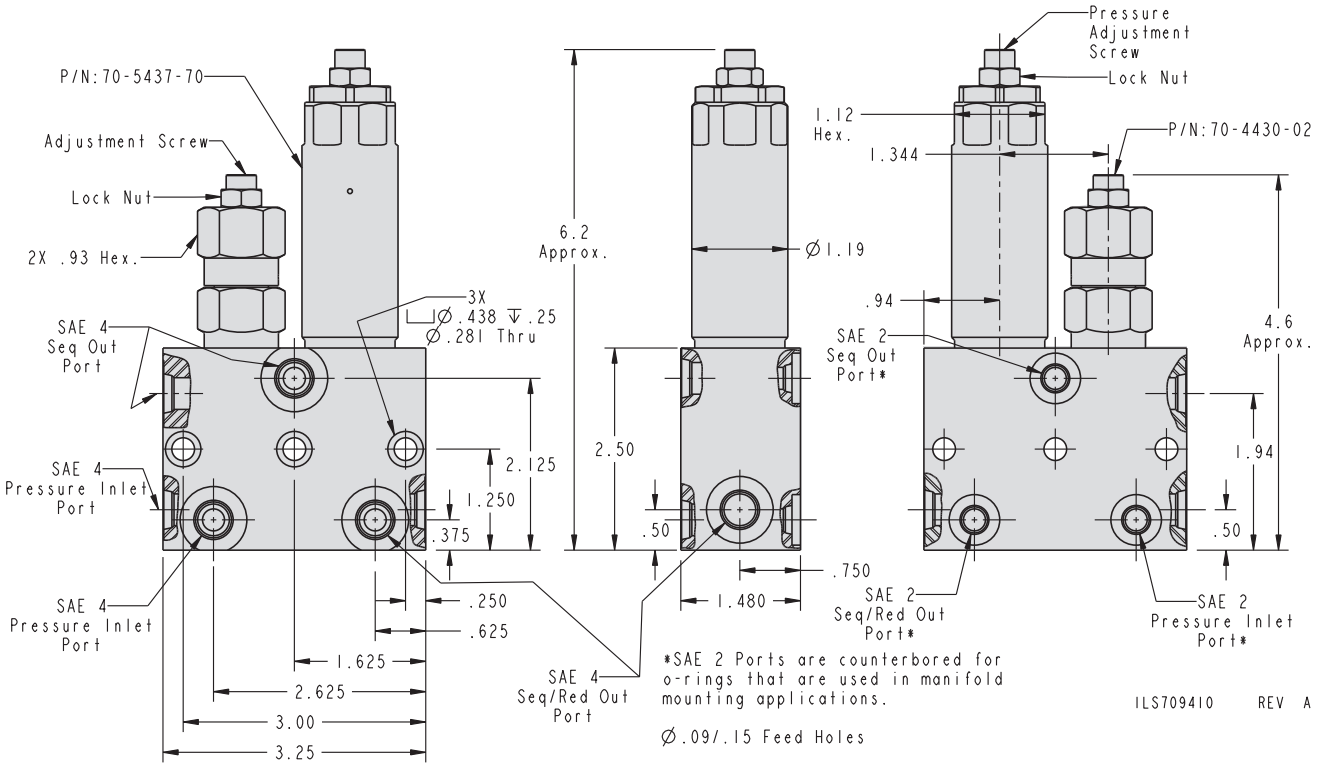
Efficient Space Saving Combination Sequence/PRV Block

- Control both timing and pressure with this dual purpose combination block.
- Common inlet port feeds both sequence and reducing valves.
- 3 (SAE 2) manifold ports: Inlet, Sequenced and Sequenced + Reduced Pressure.
- 6 (SAE 4) ports: 2 x Inlet, 2 x Sequenced and 2 Sequenced + Reduced Pressure.
- Use with single or double acting devices.
- Block includes standard Sequence and PRV cartridges.
- Direct acting poppet style valve construction.
- Sequence Pressure adjustment range: 750 psi to 5,000 psi, PRV adjustment range: 750 to 4,500 psi.
- Elements spaced to accommodate Gauge for setup or trouble shooting.
- Recommended Filtration: 25 Micron (NOM) / 40 Micron (ABS) (minimum).

Timing and Regulated Pressure in One Unit

Sequence/ PRV Block

Model No.
70-9410-00 Assembly
Includes: Block Body, Sequence Valve, PRV Valve and Manifold O-rings



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 within 0.003 in. with a maximum 63 μ in R_a surface finish.

Pressure Reducing Valve

U. S. Patent No. 5,931,182
See page M-11 for cartridge cavity dimensions.

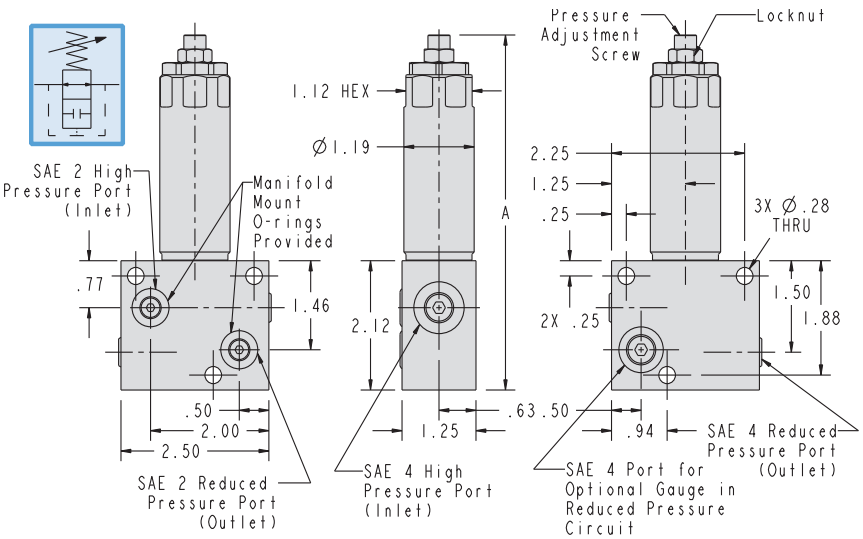
Pressure Reducing Valve

- Control pressure to individual devices.
- For use in double or single acting systems.
- Direct acting, poppet style, adjustable, cartridge construction.
- Cartridge may be installed directly into your manifold.
- Model 70-5410-10 set the pressure range from 750 to 4500 psi. Repeatability ± 7%
- Model 70-5410-01 set the pressure range from 150 to 900 psi . Repeatability ± 10%
- 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.
- Recommended Filtration: 25 Micron (NOM) /40 Micron (ABS) (minimum).

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.

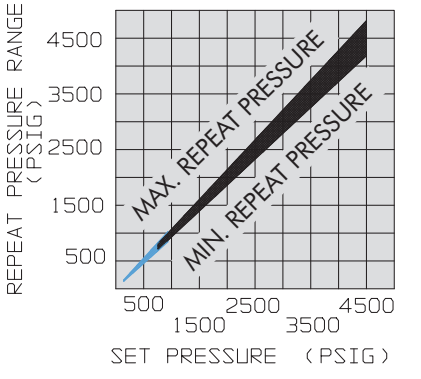
Pressure Reducing Valve				
Model No.	Inlet Pressure*	Set Pressure Range	Repeatability	A
Manifold Mount Valve Assembly				
70-5410-10	5000 psi	750 to 4500 psi	± 7%	5.8
70-5410-01	< 3000 psi >3000 psi	150 to 900 psi 300 to 900 psi	± 10%	6.5

*Maximum Inlet Pressure for PRVs is 5000 psi

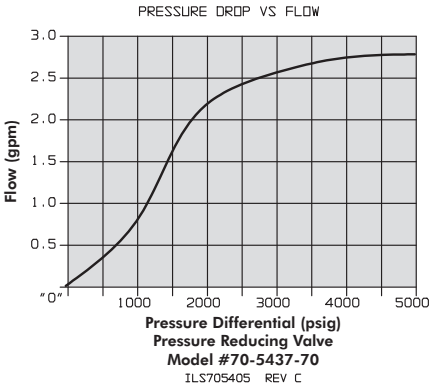


Manifold Mount Pressure Reducing Valve Assembly

ILS705407 REV A



ILS705406 REV C



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 within 0.003 in. with a maximum 63 μ in R_a surface finish.

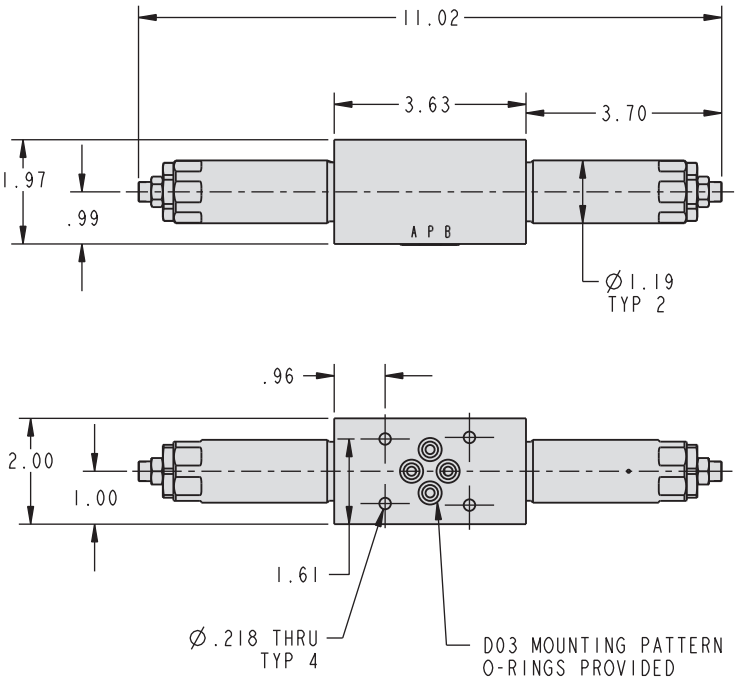
Pressure Reducing Control Block

PRV Control Block

- 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).
- Recommended Filtration: 25 Micron (NOM) / 40 Micron (ABS) (minimum).

PRV Control Block

Model No.
70-8425-50 Dual PRV Assembly
70-8425-51 Single PRV Assembly

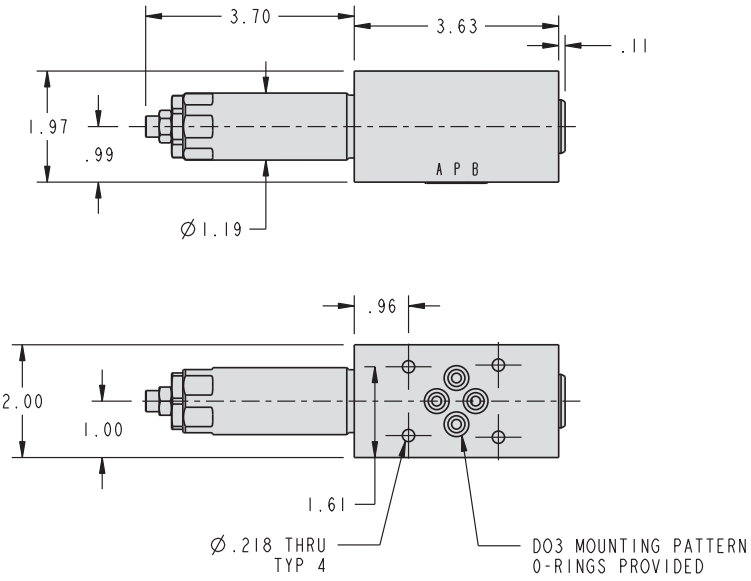


DOUBLE PRV CONTROL BLOCK ASSEMBLY
70-8425-50 D03 MOUNTING

ILS708401 REV C

NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves.

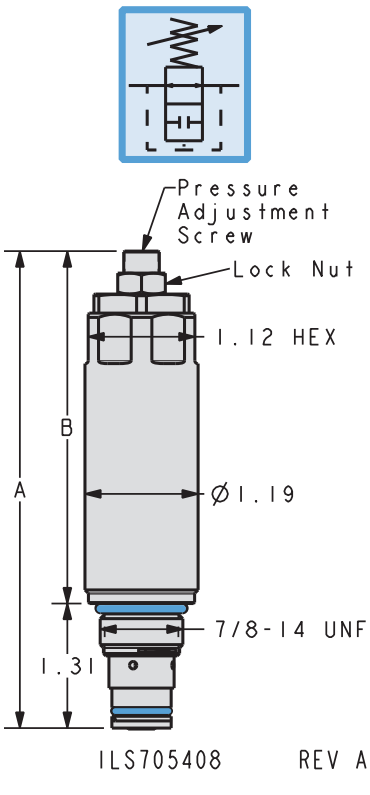
Excess flow voids warranty.

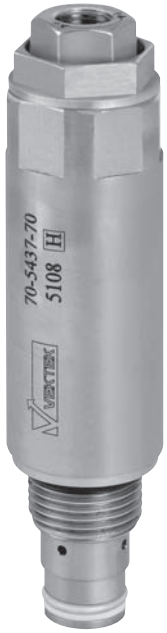


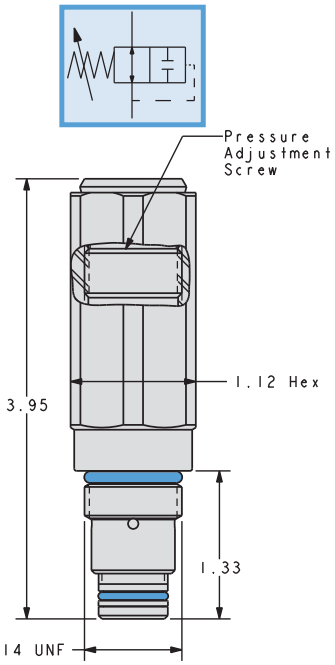
SINGLE PRV CONTROL BLOCK ASSEMBLY
70-8425-51 D03 MOUNTING

ILS708402 REV B

Pressure Limiting Cartridge and Pressure Reducing Cartridge Cavity







See product Page M-12

ILS705401 REV C

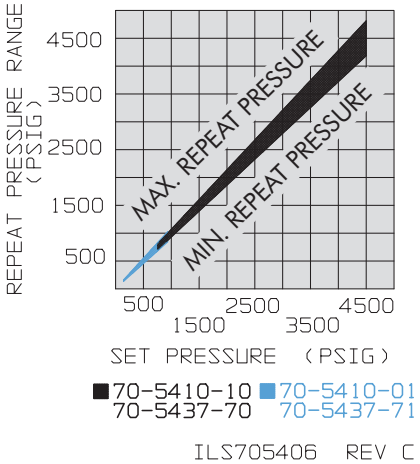
Pressure Limiting Cartridges

Model No.	Pressure Limit
70-5430-08	Pressure Limit 750-2500
70-5430-07	Pressure Limit 1000-3500
70-5430-06	Pressure Limit 1500-5000

Pressure Reducing Cartridge

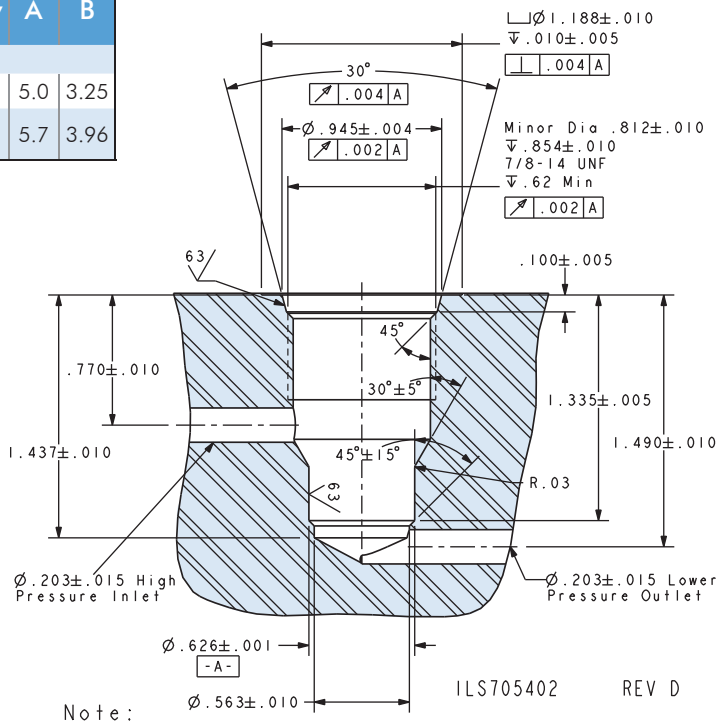
Model No.	Inlet Pressure*	Set Pressure Range	Repeatability	A	B
PRV Cartridge					
70-5437-70	5000 psi	750 - 4500 psi	± 7%	5.0	3.25
70-5437-71	<3000 psi >3000 psi	150 - 900 psi 300 - 900psi	± 10%	5.7	3.96

* Maximum Inlet Pressure for PRV is 5000 psi



ILS705406 REV C

■ Pressure Limiting Cartridge and Pressure Reducing Cartridge use the same mounting cavity.



ILS705402 REV D

Note:
There is no standard porting tool available for this cavity

Pressure Limiting Valve

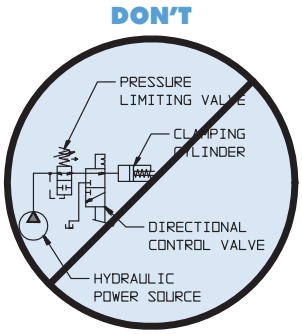
Pressure Limiting Valve

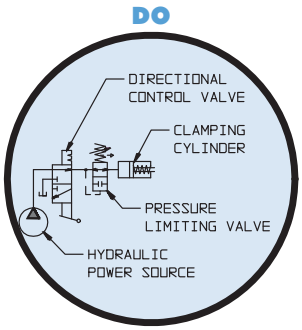
- Recommended for use in single acting systems only.
- Direct acting, poppet style, adjustable, cartridge type construction.
- Cartridge may be installed directly into your manifold.
- All pressure limiting valve configurations are designed to operate with up to 5,000 psi on the inlet (P) port.
- Seal Material: Internal seals are nylon.
- Internal adjustment discourages tampering with pressure adjustment setting.
- Two-port design eliminates need for third fluid line to drain bypass flow (internal leakage) back to system reservoir.
- Recommended Filtration: 25 Micron (NOM) / 40 Micron (ABS) (minimum).

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 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.

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.



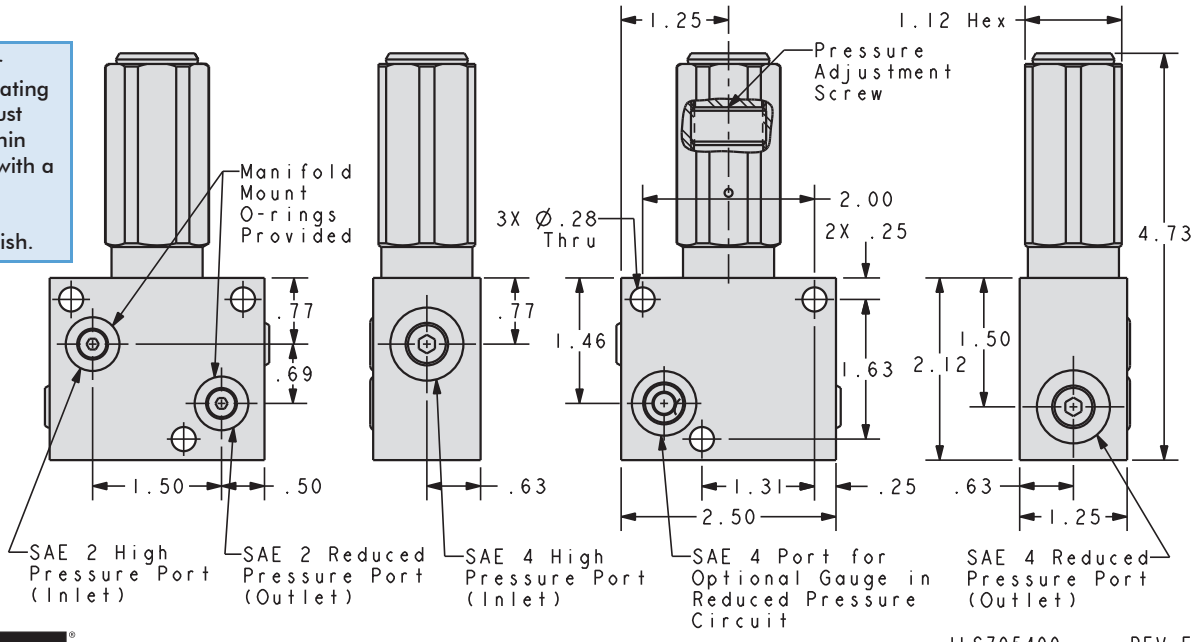


ILSSCHAB REV B

Pressure Adjustment Ranges

Pressure Limiting Models			
Model No.	Range	Factory Preset	Cartridge Model
70-5400-08	750 psi to 2,500 psi	1,000 psi	70-5430-08
70-5400-07	1,000 psi to 3,500 psi	1,500 psi	70-5430-07
70-5400-06	1,500 psi to 5,000 psi	2,000 psi	70-5430-06

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



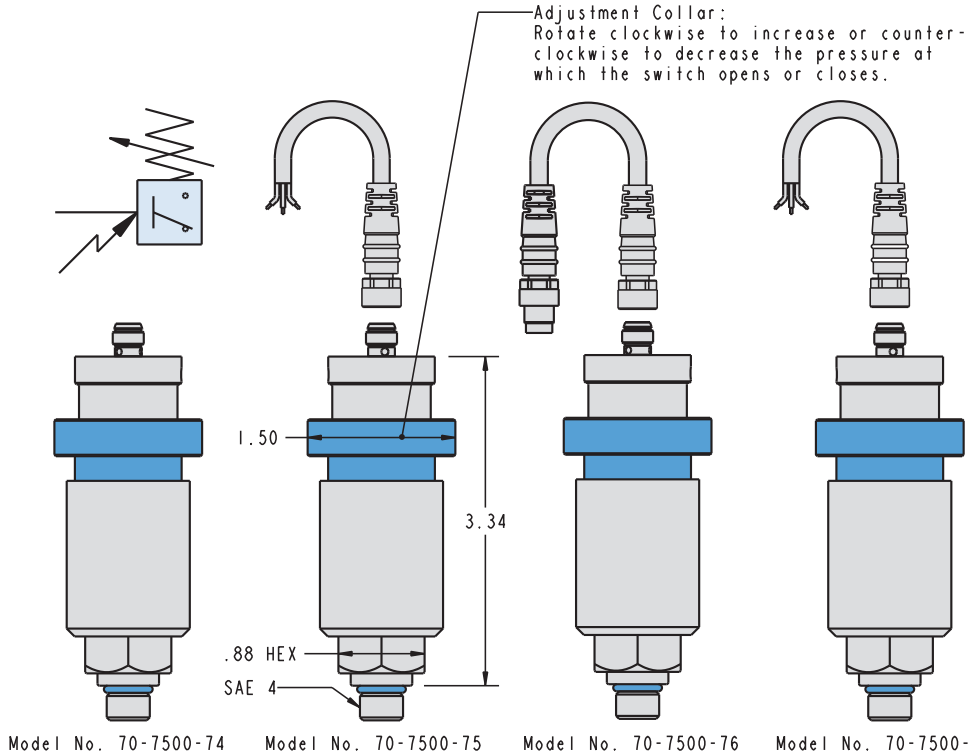
ILS705400 REV E

Waterproof Pressure Switch

- Switch tested to over 1,000,000 cycle lifetime.
- New sealed collar and micro-switch design guard against leaks; making this switch ideal for use in wet environments.
- M8 connectors afford more standard wiring options.
- Superior reinforced cable connections that withstand stress, seal securely and are easily changed or serviced.
- Pressure adjustment 750 to 5000 psi.
- Electrical Rating
  - 1 amp @ 28 VDC resistive
  - 5 amp @ 125/250 VAC
- Reset deadband: approximately 5% of the set pressure.
- Sealed switch for operation in high moisture environments. (Complies with IP 67)

Pressure Switch

Model No.	Pressure Range	Electrical Connection	Wiring Instructions
70-7500-74	750-5000 psi	M8 Male Connection only.	N/A
70-7500-75	750-5000 psi	Part No. 27-6424-03 cordset, 39.3 in. long with female M8 connector and bare ends.	Brown ... N/O Black ... N/C Blue ... Common
70-7500-76	750-5000 psi	Part No. 27-7424-00 cordset, 19.7 in. long with M8 male and female connections.	N/A
70-7500-77	750-5000 psi	Part No. 27-6424-00 cordset, 16.4 ft. long with M8 female connector and bare ends.	Brown ... N/O Black ... N/C Blue ... Common



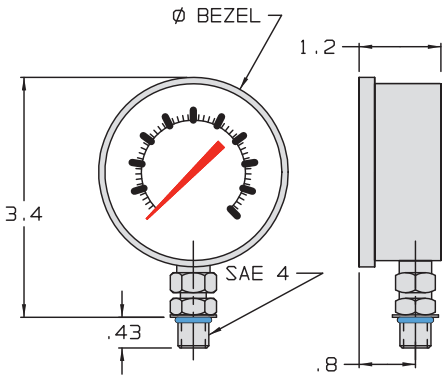
ILS707502 REV C

Accessory Valves

Gauges, Over Pressure Relief

Standard Pressure Gauges

- 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.



ILS722100 REV C

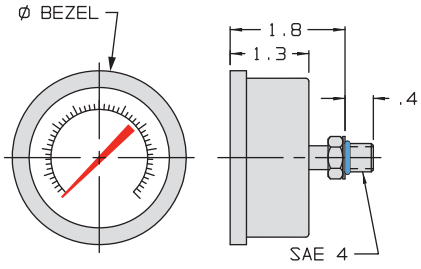
Standard Pressure Gauge

Model No.	Pressure Range	Bezel Diameter (in)
72-2121-37	0 to 1,000 psi	2.7
72-2121-46	0 to 3,000 psi	2.7
72-2121-52	0 to 5,000 psi	2.7
72-2121-62	0 to 10,000 psi	2.7

To extend the life of Pressure Gauges, run your system at no more than **75%** of the gauge scale.

Back Mount Pressure Gauges

- 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.



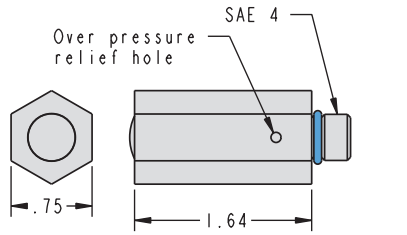
ILS721200 REV H

Back Mount Pressure Gauge

Model No.	Pressure Range	Bezel Diameter (in)
72-1221-39	0 to 1,500 psi	1.66
72-1221-55	0 to 6,000 psi	1.57
72-2121-55	0 to 5,000 psi	2.7
72-2121-65	0 to 10,000 psi	2.7

Over-Pressure Relief Cartridge

- 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

Over-Pressure Relief Cartridge

Model No.
70-6336-70

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.

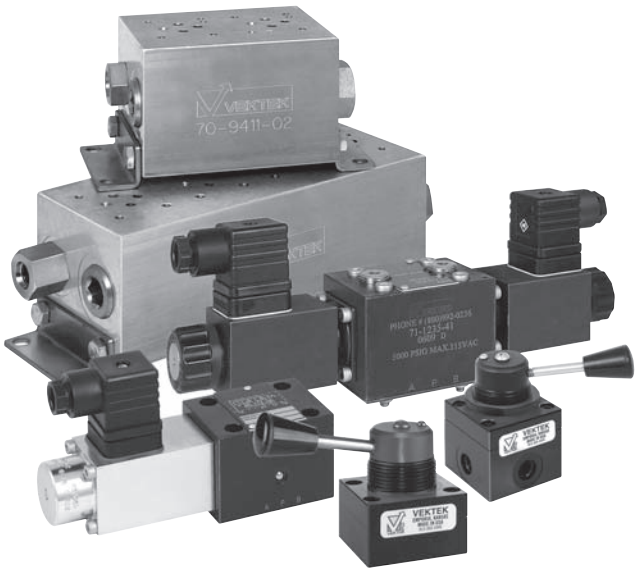
I can get a spool valve locally for a lot less money than your valve. Will it work?

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.

NOTE: Maximum system flow rate 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves.

Excess flow voids warranty



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.

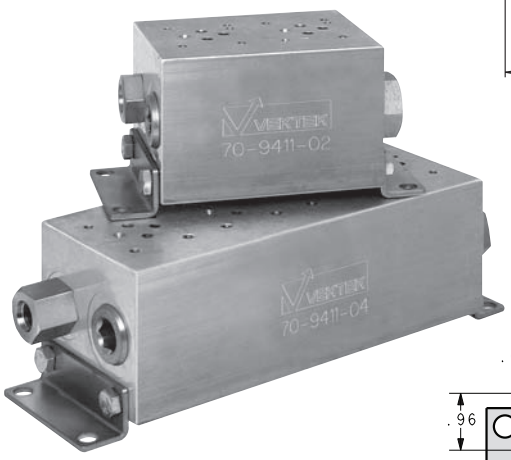
VektorFlo® D03 style valves may be positioned in either of two ways:

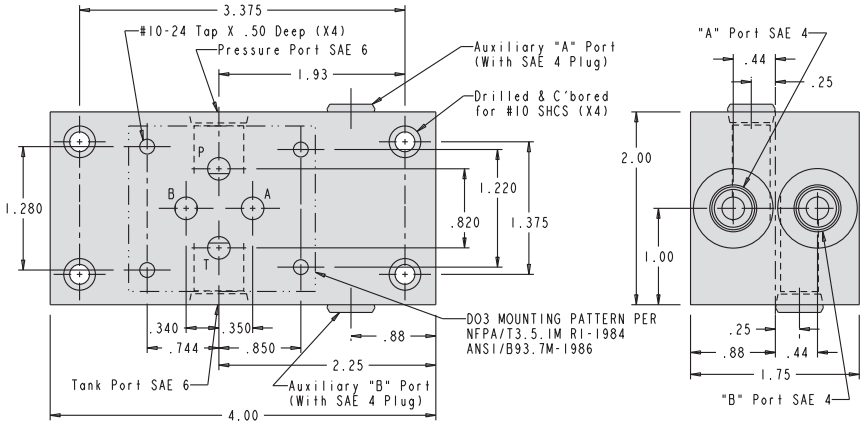
1. Mounted away from the power source on one of our remote valve sub-plates (perhaps mounted directly on your fixture or machine tool).
2. Mounted directly on our large capacity power supply using a direct mount sub-plate. This further simplifies plumbing and eliminates the need for each individual fixture to have its own valves.

Valve Sub-plates

NFPA D03 Standard

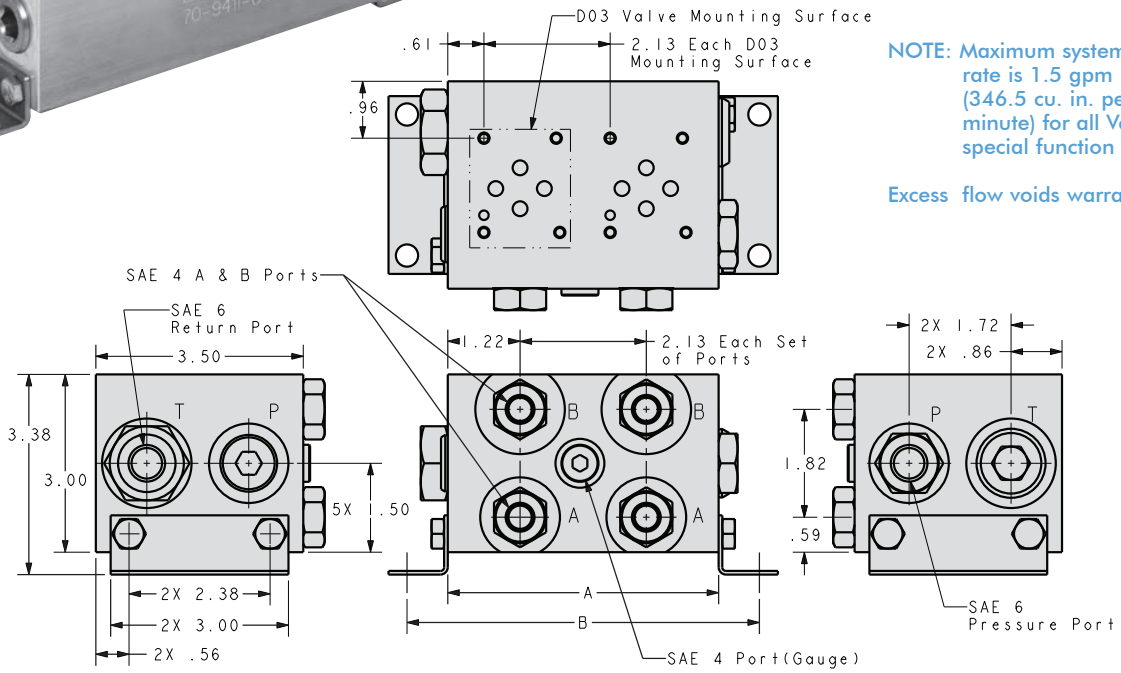
- Contains all plumbing connections for "P", "T", "A", and "B" connections.
- Simplifies "at the fixture" valve mounting for 1, 2 or 4 valve plumbing.
- Makes valve changes simple, just remove four cap screws to change valves.
- All VektorFlo® valves fit the D03 pattern except panel mount model.





ILS709400 REV C

Model No.
70-9411-00
93-1989-00 Crossover Plate
93-1989-01 Blanking Plate



ILS709401 REV D

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.

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			

These sub-plates for use with the following valves:

2-Position 3-Port Manual Valve Model No. 71-1422-02
2-Position 3-Port Solenoid Valves Model Nos. 71-1122-54, 71-1122-13, 71-1150-03, 71-1150-50
3-Position 4-Port Manual Valves Model Nos. 71-1472-00 and 71-1474-00
3-Position 4-Port Solenoid Valves Model Nos. 71-1235-21, 71-1235-22, 71-1235-22, 71-1235-40 and 71-1235-41

Control Valves: 2-Position, 3-Port, D03 Mount

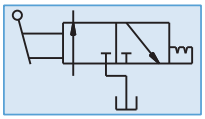
- Available as either manual or solenoid operator.
- Efficient control solutions for single-acting systems.
- 2-Position, 3-Port manual valve is equipped with colored bonnet to differentiate it from the 3-Position, 4-Port.
- Shear style valve design features hardened steel poppets in an aluminum body.
- Low restriction design generates a pressure drop of less than 2 psi with a 2 gpm flow.

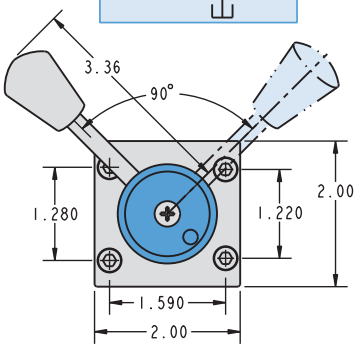
NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in. per minute) for all VektorFlo® special function valves.

Excess flow voids warranty.

2-Position. 3-Port Manual Valve

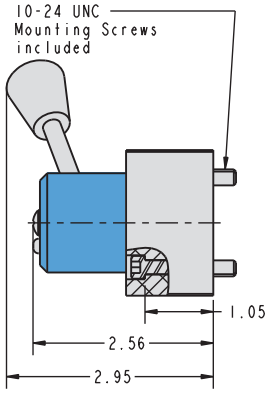
Model No.
71-1422-02



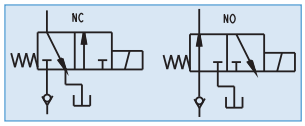


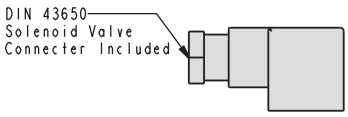
Handle/Bonnet may be repositioned every 90° from position shown.

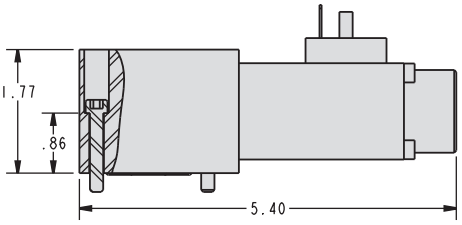
71-1422-02 D03 Mounting

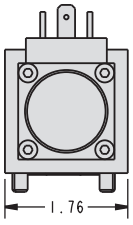


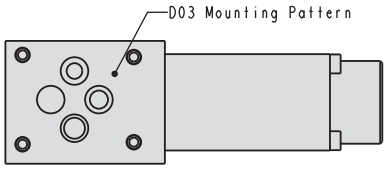
ILS711402 REV D



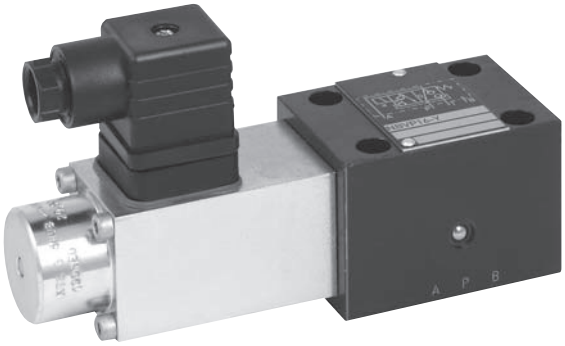








ILS711103 REV G



2-Position, 3-Port Solenoid

Model No.	Function	Valve Connector Part No.	Sole-noid Voltage	Power Consumption (Watts)	Duty Rating
71-1122-54	Normally Open	85-5342-91	24 VDC	27.6	100%
71-1122-13*	Normally Open	87-1123-00	115 VAC	28.6	
71-1150-03	Normally Closed	85-5342-91	24 VDC	27.6	
71-1150-05*	Normally Closed	87-1123-00	115 VAC	28.6	

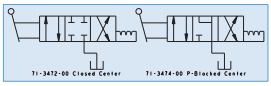
* Supplied with rectified connectors that must be used to insure proper valve function and warranty. Use of any other connector will void the valve warranty.

Directional Control Valves

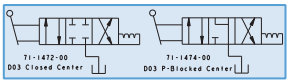
3-Position, 4-Port Manually Operated

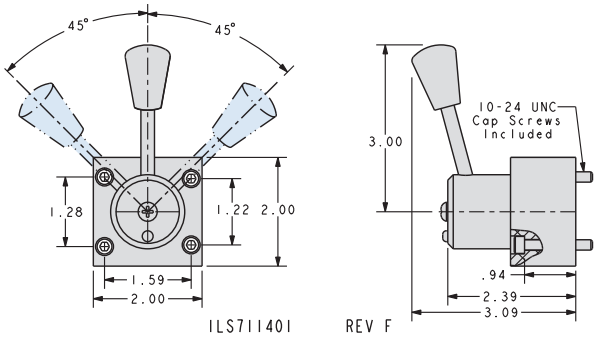
Control Valves: 3-Position, 4-Port

- 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 using an anti-friction rotary bearing. Detented internal rotor snaps into position ensuring accurate alignment of internal flow passages.
- All valves incorporate lightweight aluminum alloy bodies and are furnished with required standard length mounting bolts.

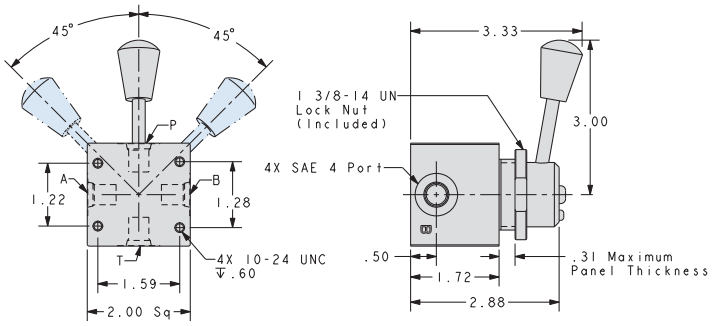


D03 Mount





ILS711401 REV F



ILS713400 REV F

Panel Mount

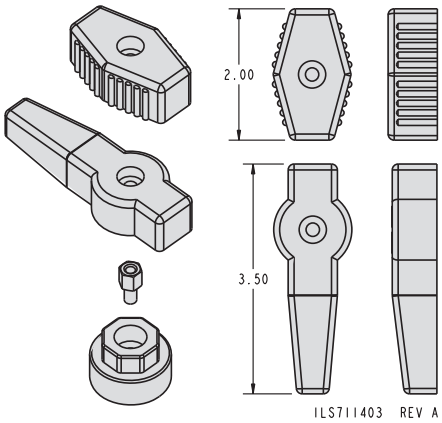
Control Valves: 3-Position, 4-Port Manual

Model No.	Valve Configuration	Seals	Fluid Temp. Maximum	Fluid Flow Maximum	Tank Port Pressure
D03 Mount					
71-1472-00 71-1474-00	Closed Center P-Blocked Center	Buna N Teflon*	158° F	3 gpm	250 psi max
Panel Mount					
71-3472-00 71-3474-00	Closed Center P-Blocked Center	Buna N Teflon*	158° F	3 gpm	250 psi max

Manual Valve Handle Kit

Model No.*	Valve Type
62-7004-08	Kit contains: long and short handles, adapter mounting screw and adapter

ILS711403



ILS711403 REV A

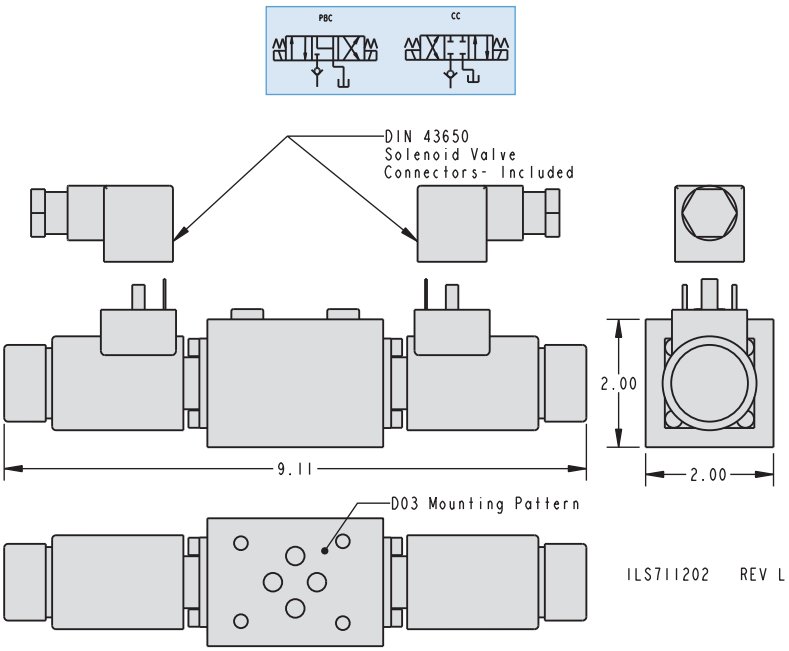
* Use with manual Valves: 71-1422-02, 71-1472-00, 71-1474-00, 71-3472-00, and 71-3474-00

NOTE: Maximum system flow rate is 1.5 gpm (346.5 cu. in./min) for all VektorFlo® special function valves.

Excess flow voids warranty.

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.



Control Valves: 3-Position, 4-Port Solenoid

Model No.	Function	Valve Connector Part No.	Solenoid Voltage	Power Usage (watts)	Duty Rating
7I-1235-21	Closed Center	85-5342-91	24 VDC	27.6	100%
7I-1235-22*	Closed Center	87-1123-00	115 VAC	28.6	
7I-1235-40	P-Blocked Center	85-5342-91	24 VDC	27.6	
7I-1235-41*	P-Blocked Center	87-1123-00	115 VAC	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.

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 0-5 for standard arms and 0-10 for low proifile arms. 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 also welcome you to use our method. Please be sure to put in the 0.02" 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.)

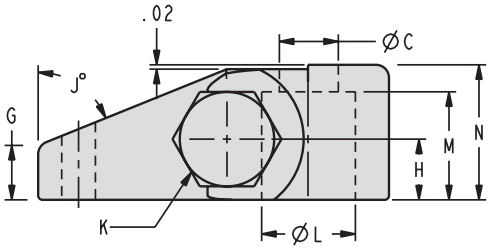
I have a variety of parts to clamp with my swing clamp fixture. Do you have a way to "quick change" the clamp arms?

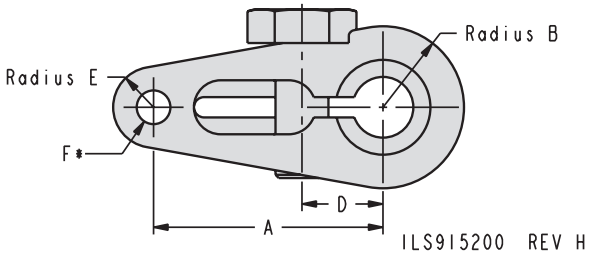
You will need to make a custom attachment. The first option is to set your swing clamp to be able to clamp the tallest part with the standard arm. The height or width can then be adjusted by attaching a contact device to the arm.

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.

Swing Clamp Arms

Standard Length and Upreach



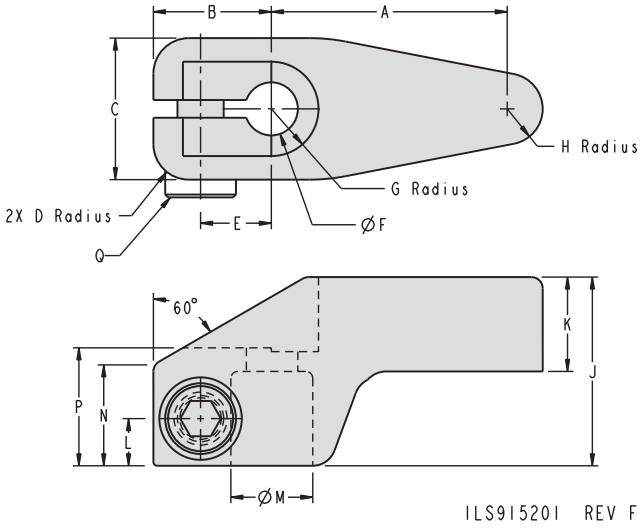


Standard Arm Dimensions

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	0.53
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	1.250/1.252	1.44	1.75

* For arms without threaded holes, order Model No.. 91-52XX-00

NOTE: See catalog page C-30 for suggested location of drilled and tapped hole for Clocking.

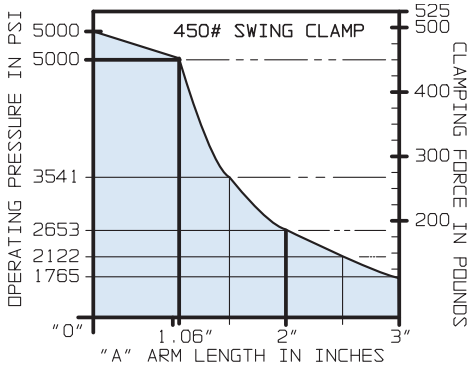


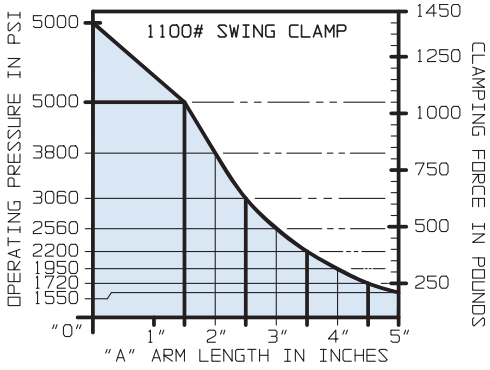
Upreach Arm Dimensions

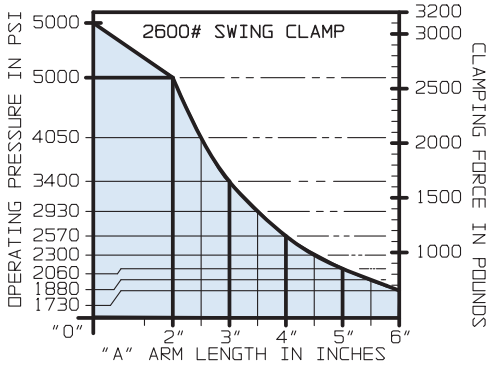
Model No.	Cylinder Capacity	A	B	C	D	E	ØF	G	H	J	K	L	ØM	N	P	Q
91-5205-06	450	1.25	0.63	0.75	0.19	0.38	0.28	0.25	0.19	1.00	0.50	0.25	0.4380/0.4400	0.54	0.63	1/4-28
91-5209-06	1100	1.75	0.75	1.00	0.25	0.50	0.41	0.34	0.25	1.38	0.66	0.32	0.6255/0.6275	0.79	0.88	5/16-24
91-5213-06	2600	2.50	1.03	1.38	0.38	0.66	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	1.250/1.252	1.61	1.75	5/8-18

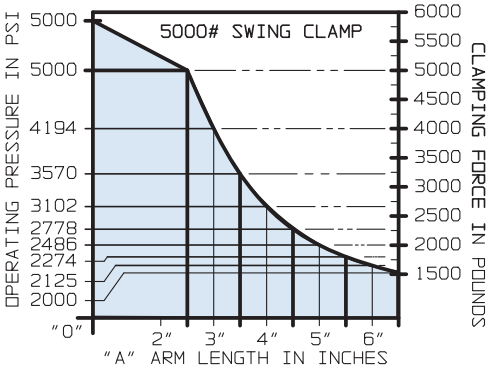
Swing Clamp Arms

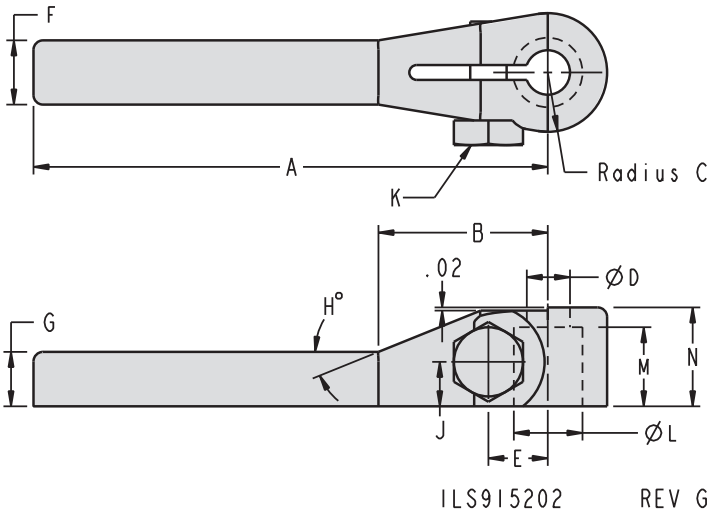
Extended, Arm Length and Pressure Limitations

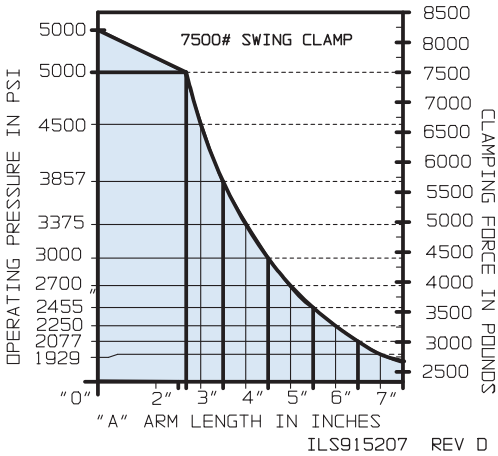












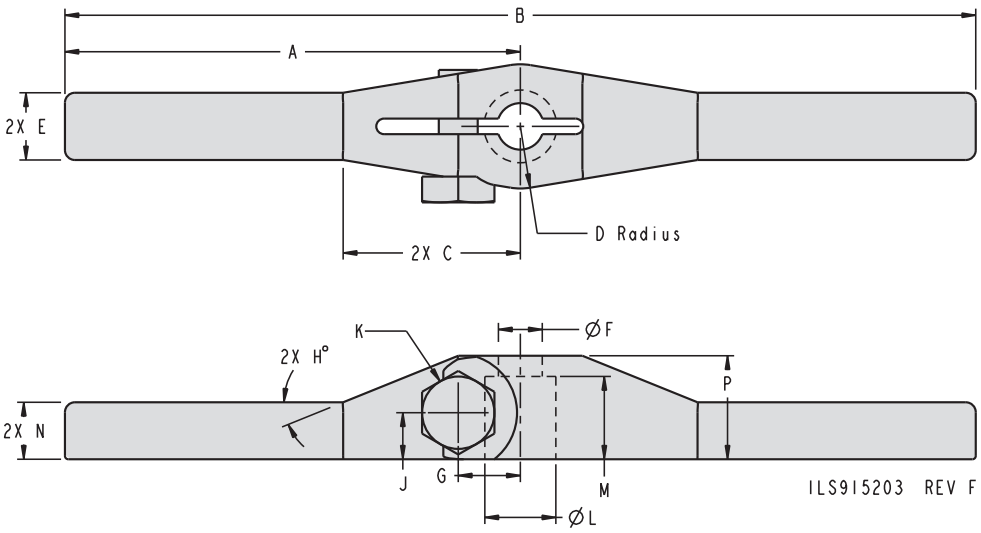
Arm lengths and pressures operating at or below the curves shown are in the safe operating zones for the clamp model indicated.

NOTE: Please reference Clamp Times and Flow Rate charts on page C-2 and C-18 for TuffCam™ or C-24 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	1.250/1.252	1.44	1.75

Double Ended

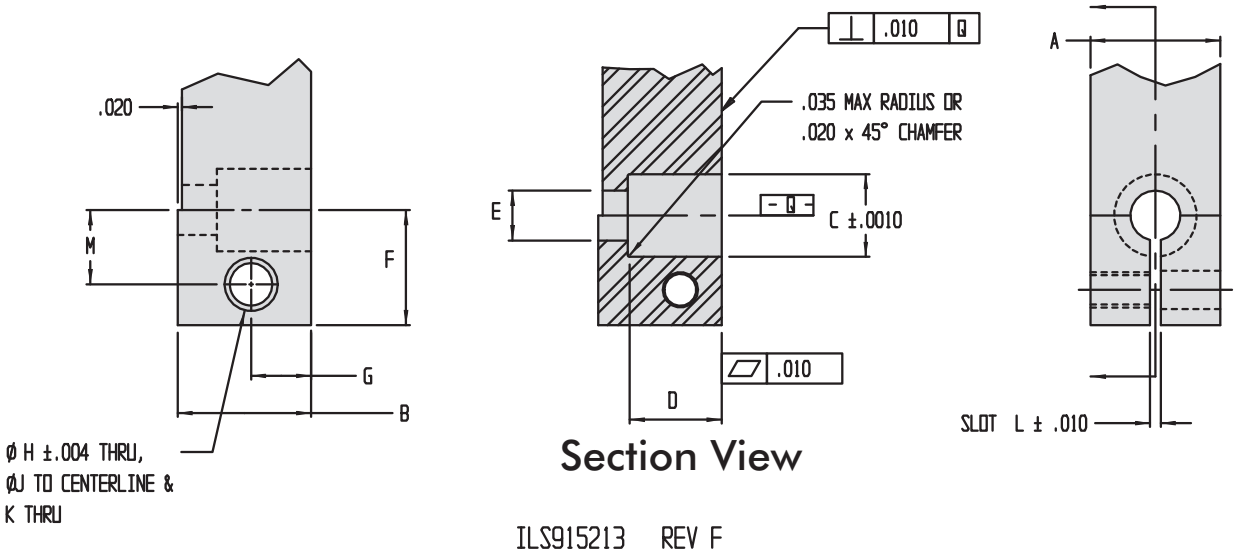


Double Ended Dimensions

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	1.250/1.252	1.44	0.75	1.75

Swing Clamp Arms

Customer-Produced



Section View

ILS915213 REV F

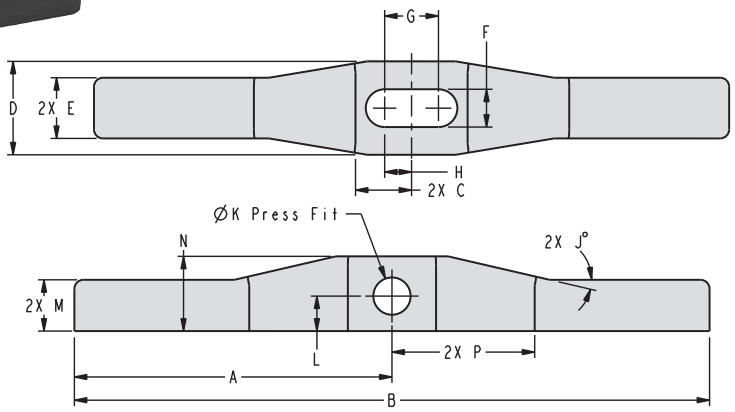
Self-produced Arm Dimensions for Standard and TuffCam™ Cylinders

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	0.88	0.626	0.71	0.41	0.75	0.31	0.272	0.332	5/16-24 UNF 28	0.114	0.50
91-5213-01 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-24 for Standard Swing Clamps.

Swing Clamp Arms

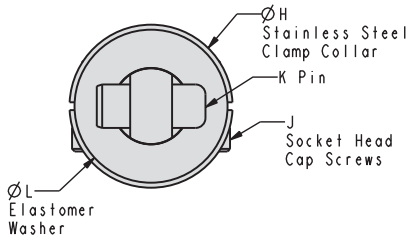
Double Ended Rocker

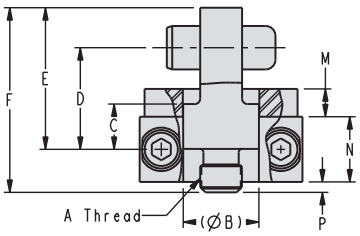


ILS915205 REV E

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

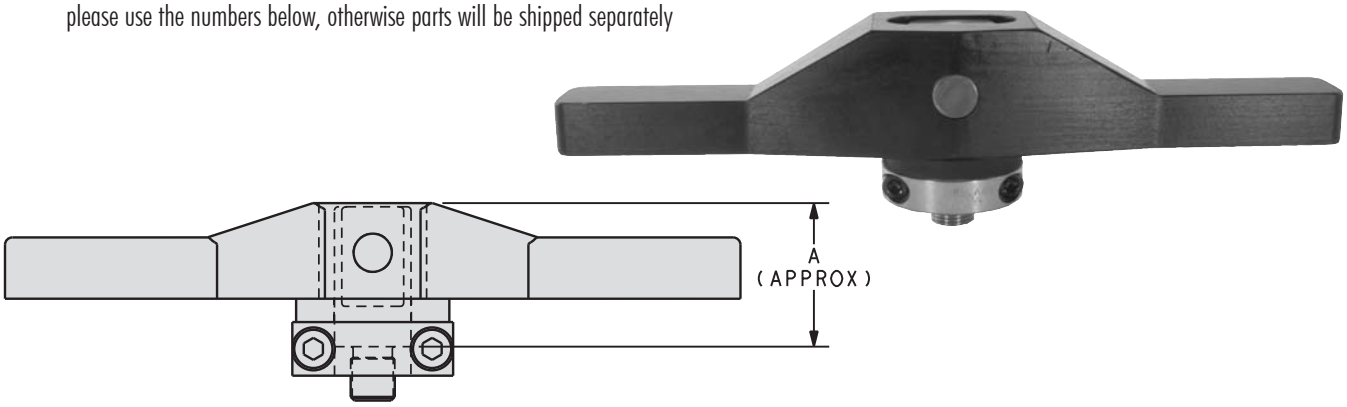
Rocker Arm Attachment Assembly Dimensions

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

Swing Clamp Arms

Double Ended Rocker Arm Assembly

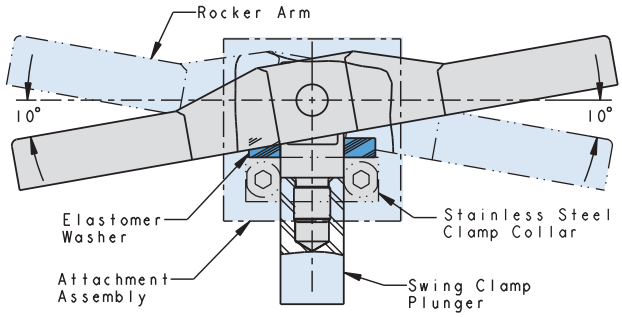
- To order the double ended rocker arms already assembled to the attachment, please use the numbers below, otherwise parts will be shipped separately



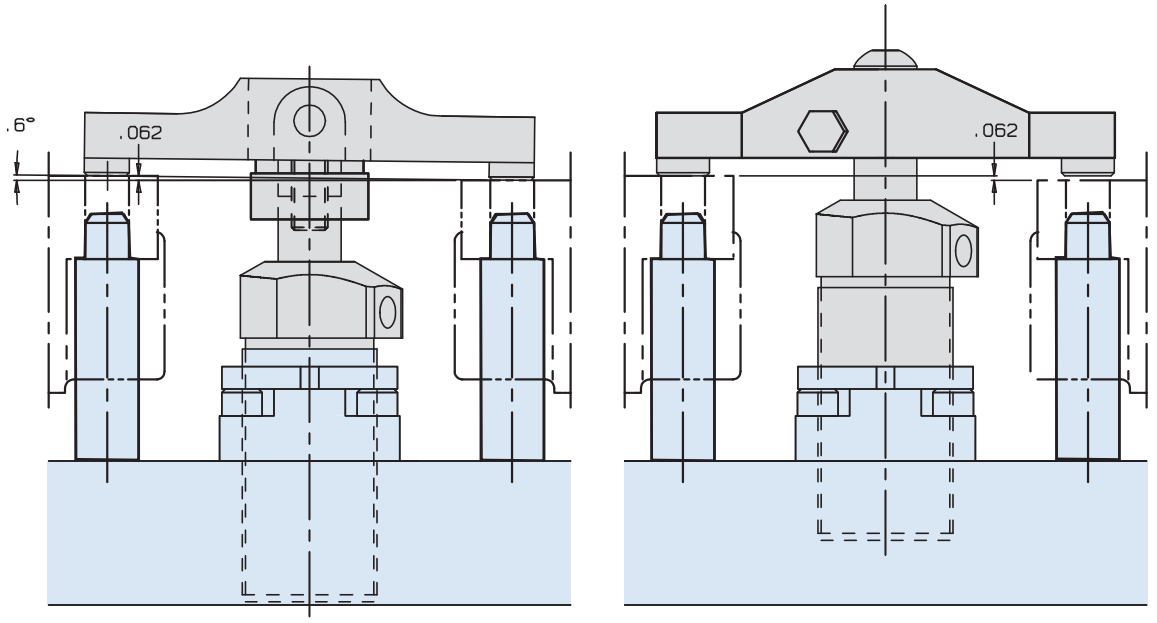
ILS915208 REV E

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



ILS915204 REV C



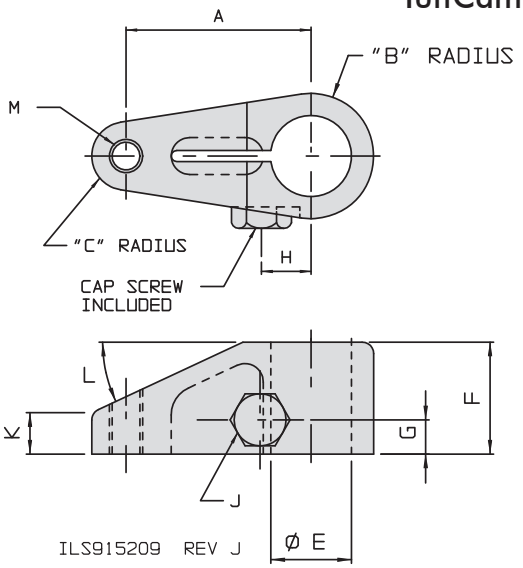
ILSFIX9712 REV B

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

TuffCam™ Low Profile standard and Extended Length



TuffCam™ Low Profile Standard Arm Dimensions

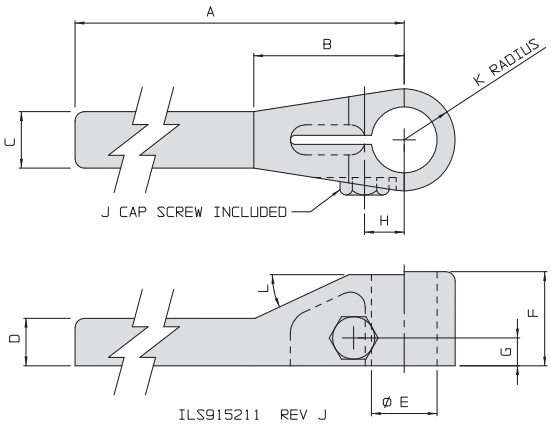
Model No.	Cylinder Capacity	A	B	C	E	F	G	H	J	K	L	M
91-5218-12*	5000	2.50	1.00	0.56	1.250/1.252	1.75	0.50	0.884	M16 x 1.50	0.63	25°	5/8-11
91-5221-11**	7500	2.68	1.37	0.56	1.5005/1.5025	1.75	0.56	1.009	M16 x 1.50	0.65	25°	5/8-11

* For use with the low profile swing clamps, models 15-2718-XX,15-2818-XX, 14-2718-XX and 14-2818-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, 15-2221-XX, 14-0521-XX, 14-0621-XX, 14-2121-XX, and 14-2221-XX only. For arm without tapped hole order model number 91-5218-11 and 91-5221-06.

NOTE: Replacement Cap Screw for 91-5218-12 is model number 21-5000-24.
Replacement Cap Screw for 91-5221-11 is model number 21-5000-28.

NOTE: Please reference Clamp Times and Flow Rate charts on page C-18



TuffCam™ 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	1.250/1.252	1.75	0.50	0.884	M16 X 1.50	1.00	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	1.38	25°

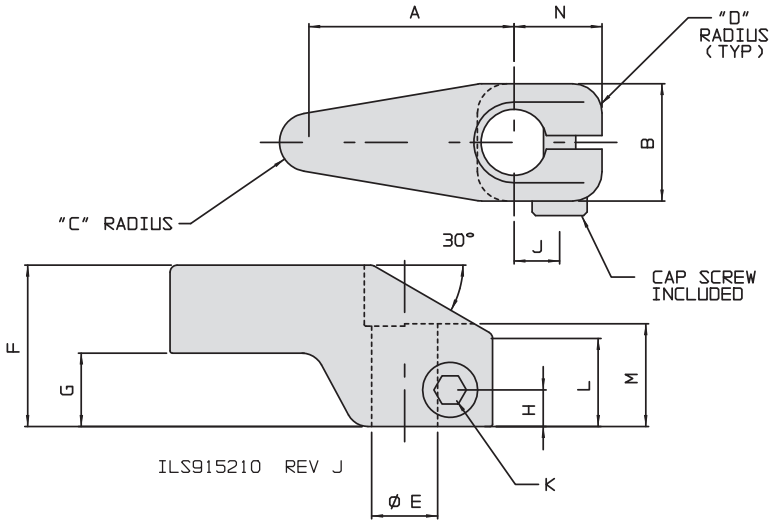
* For use with the low profile swing clamps, models 15-2718-XX,15-2818-XX, 14-2718-XX and 14-2818-XX.

** For use with low profile swing clamps model 15-0121-XX, 15-0221-XX, 15-0521-XX, 15-0621-XX, 15-2121-XX, 15-2221-XX, 14-0521-XX, 14-0621-XX, 14-2121-XX, and 14-2221-XX.

NOTE: Replacement Cap Screw for 91-5218-13 is model number 21-5000-24.
Replacement Cap Screw for 91-5221-07 is model number 21-5000-28.

Swing Clamp Arms

TuffCam™ Low Profile Upreach and Double Ended



TuffCam™ Low Profile Upreach Arm Dimensions

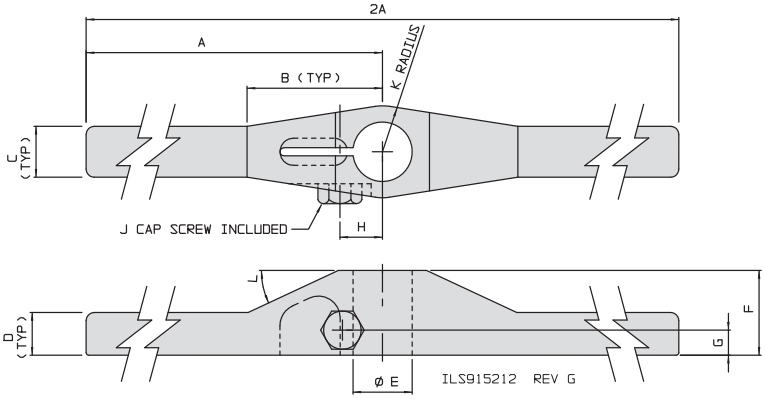
Model No.	Cylinder Capacity	A	B	C	D	E	F	G	H	J	K	L	M	N
91-5218-15*	5000	3.00	2.00	0.56	0.56	1.250/1.252	2.75	1.44	0.53	0.884	M16 x 1.50	1.61	1.75	1.50
91-5221-09**	7500	3.19	2.75	0.56	0.56	1.5005/1.5025	3.00	1.56	0.53	1.009	M16 x 1.50	1.77	1.75	1.62

* For use with the low profile swing clamps, models 15-2718-XX,15-2818-XX, 14-2718-XX and 14-2818-XX only.

** For use with low profile swing clamps model 15-0121-XX, 15-0221-XX, 15-0521-XX, 15-0621-XX, 15-2121-XX, 15-2221-XX, 14-0521-XX, 14-0621-XX, 14-2121-XX, ...and 14-2221-XX only. For arm without tapped hole order model number 91-5218-11 and 91-5221-06.

NOTE: Replacement Cap Screw for 91-5218-15 and 91-5221-09 is model number 21-5000-25.

All dimensions are in inches.



TuffCam™ Low Profile Double Ended Arm Dimensions

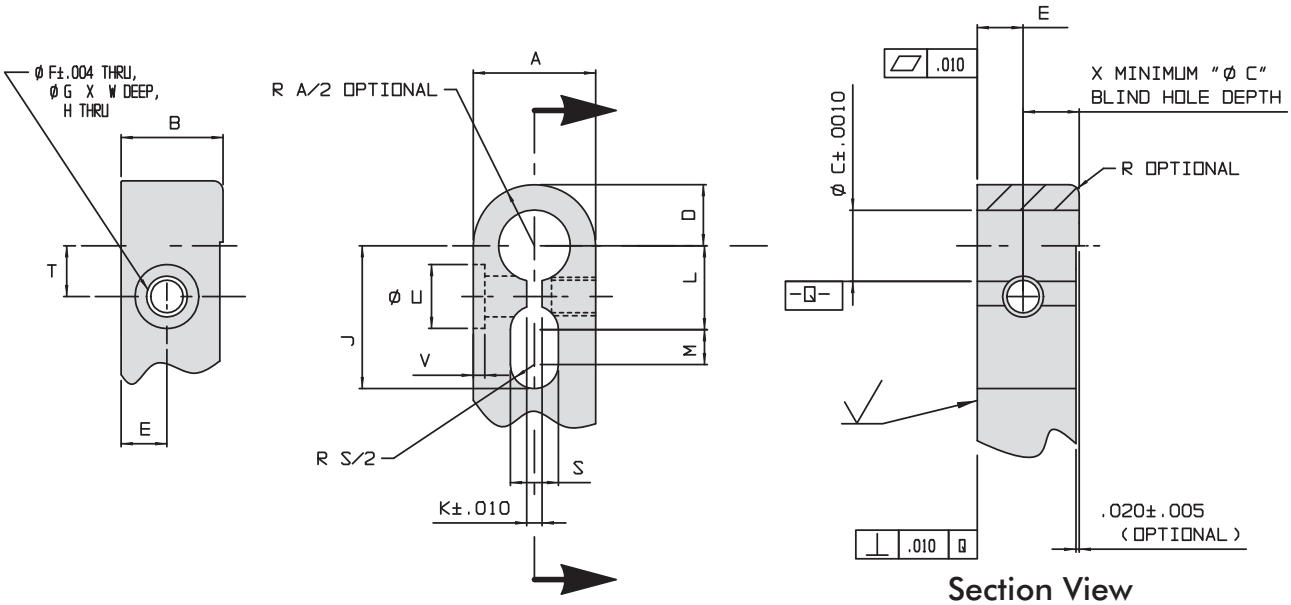
Model No.	Cylinder Capacity	A	2A	B	C	D	E	F	G	H	J	K	L
91-5218-14*	5000	6.50	11.00	2.80	1.13	0.75	1.250/1.252	1.75	0.50	0.884	M16 X 1,50	0.63	25°
91-5221-08**	7500	7.10	14.20	2.69	1.19	1.33	1.5005/1.5025	1.75	0.56	1.009	M16 X 1,50	0.65	25°

* For use with the low profile swing clamps, models 15-2718-XX,15-2818-XX, 14-2718-XX and 14-2818-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, 15-2221-XX, 14-0521-XX, 14-0621-XX, 14-2121-XX, and 14-2221-XX only. For arm without tapped hole order Model Number 91-5218-11 and 91-5221-06.

NOTE: Replacement Cap Screw for 91-5218-14 is model number 21-5000-24.
Replacement Cap screw for 91-5221-08 is model number 21-5000-28.

Customer Produced TuffCam™ Low Profile



Section View

ILS915214 REV G

Self-produced Low Profile Arm Dimensions

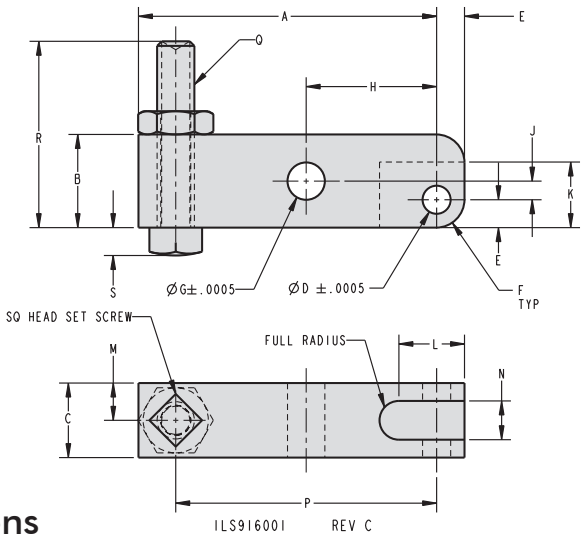
Arm Series	Cylinder Capacity	A	B	ØC	D	E	ØF	ØG	H	J
Recommended Machining Dimensions for Self-produced Clamp Arm										
91-5218-12 91-5218-13 91-5218-14	5000	2.00	1.75	1.251	1.00	0.50	0.57	0.65	M16 x 1.50-6H	2.06
91-5221-07 91-5221-08 91-5221-11	7500	2.75	1.75	1.5015	1.38	0.56	0.57	0.65	M16 x 1.50-6H	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 91-5218-14	5000	0.11	1.00	0.80	0.51	0.88	1.38	0.25	1.01	1.70	1.29
91-5221-07 91-5221-08 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-18

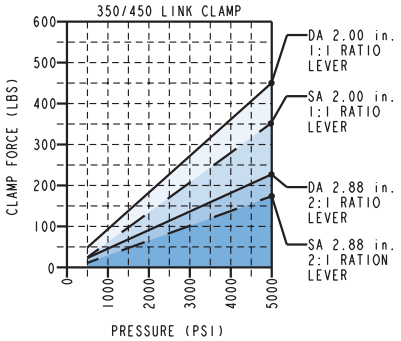
Link Clamp Levers

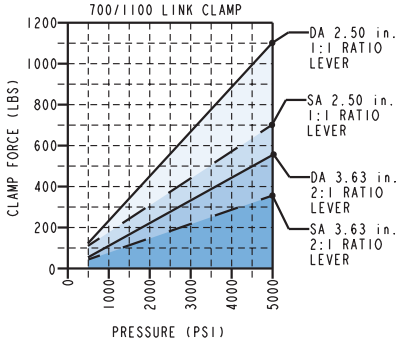
High Pressure

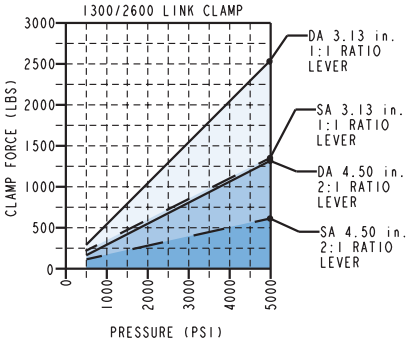


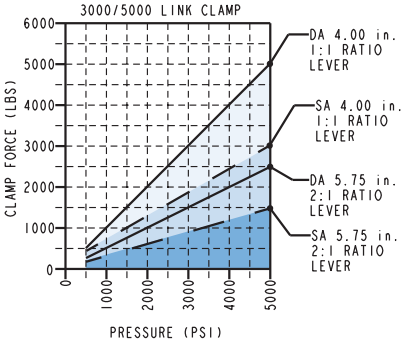
Dimensions

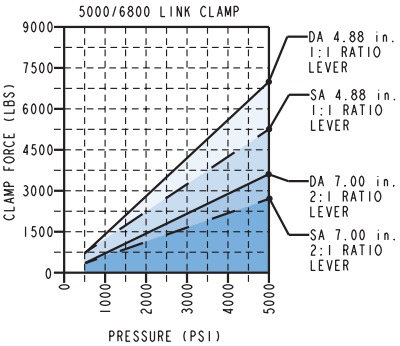
Model No.	Cylinder Capacity S/A-D/A	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S
Standard Length Lever, 1:1 Ratio																		
91-6004-01	350/450	2.00	0.63	0.50	0.189	0.188	0.19	0.250	0.88	0.13	0.44	0.44	0.25	0.26	1.75	1/4 - 20 UNC	1.25	0.19
91-6006-01	700/1100	2.50	0.88	0.63	0.252	0.250	0.25	0.375	1.13	0.13	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) — — — —

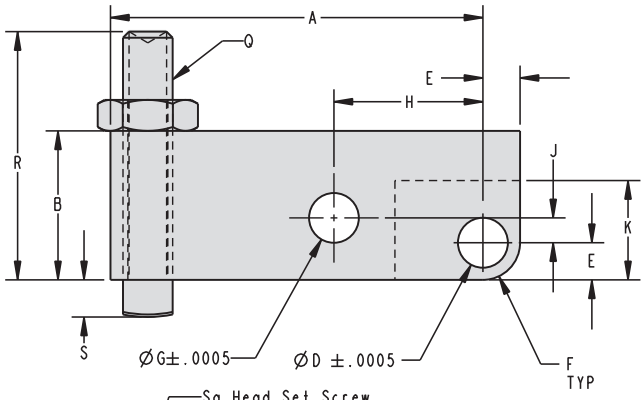
ILS916002 REV B

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.

Low Pressure

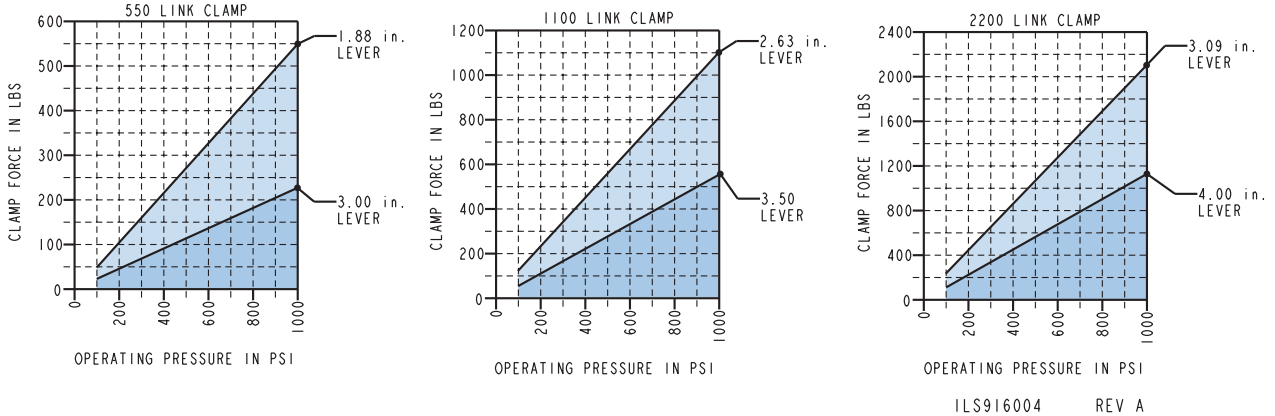


Dimensions

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)

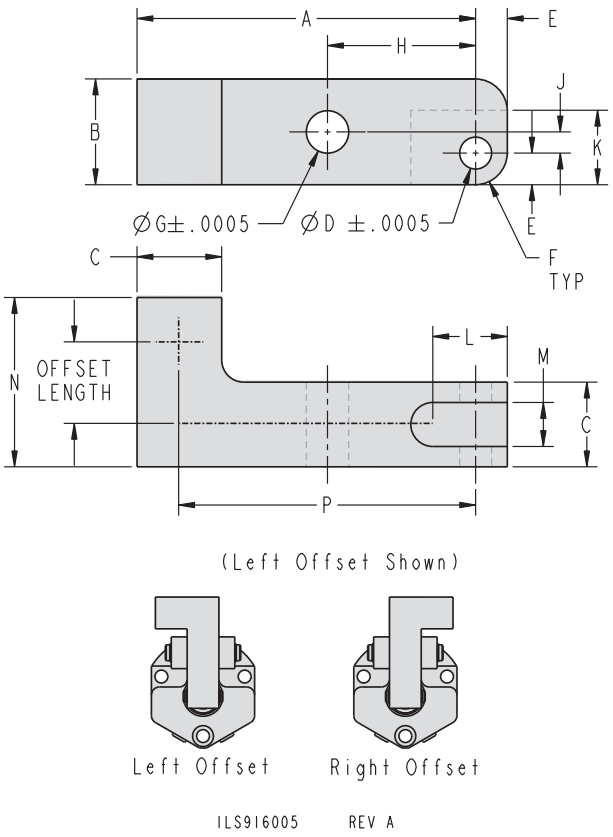


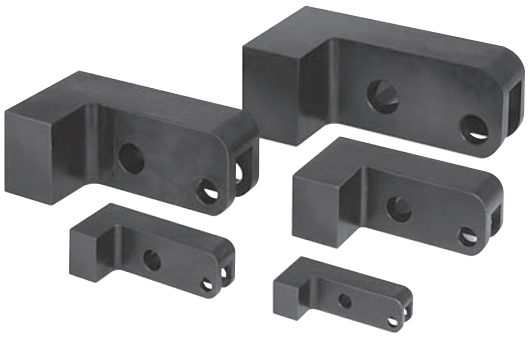
NOTE: Modifications to levers that result in clamp ratios below a 1:1 ratio are not in the safe operating zone for the corresponding link clamp and could result in premature failure.

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.

Link Clamp Levers

High Pressure Offset



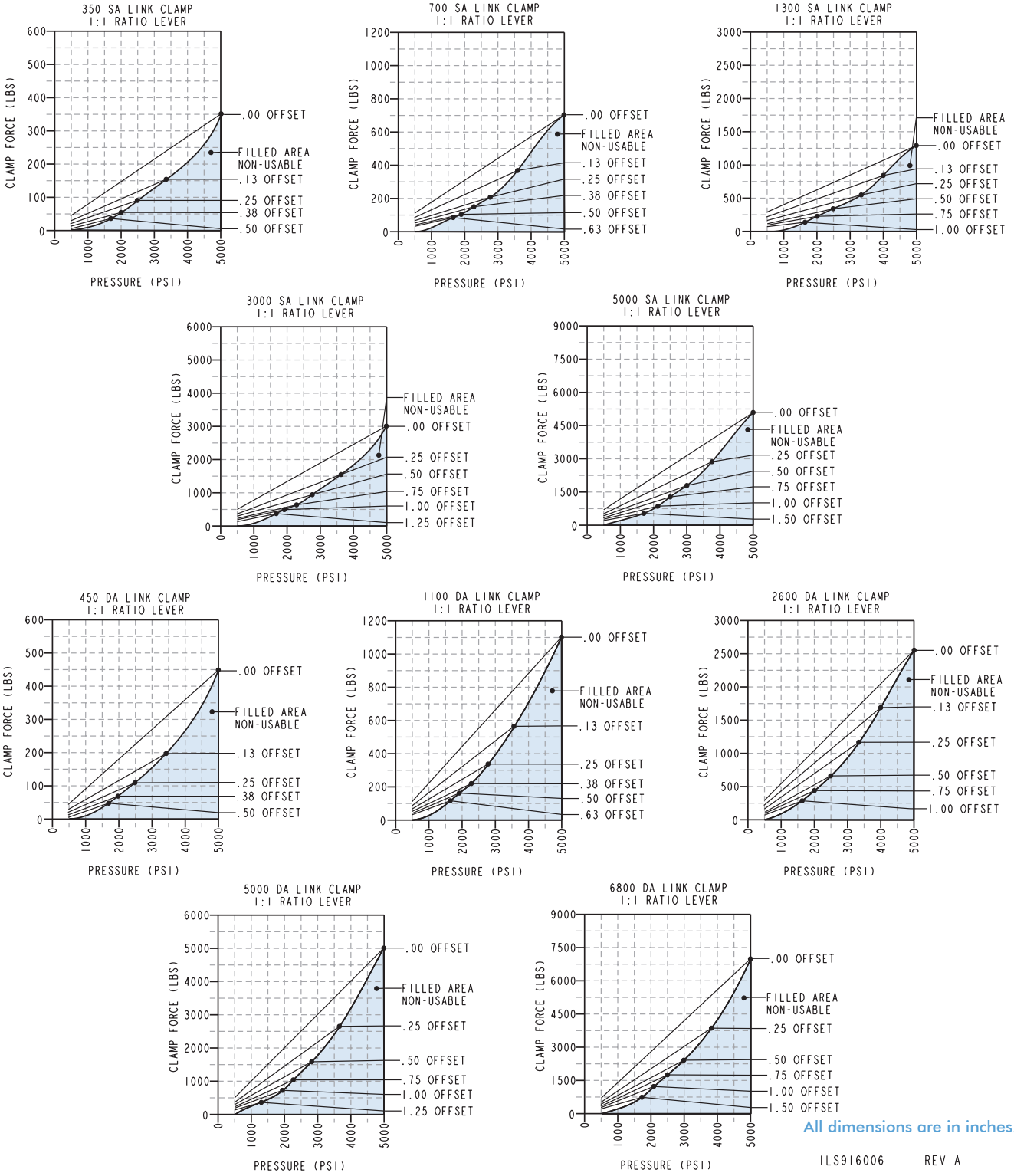


Dimensions

Model No.	Cylinder Capacity S/A or D/A	A	B	C	ØD	E	F	G	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	1300/2600	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
91-6014-04	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	2.50	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

High Pressure Offset Output Curves

Single and Double Acting Link Clamp Lever Output Curves



All dimensions are in inches.

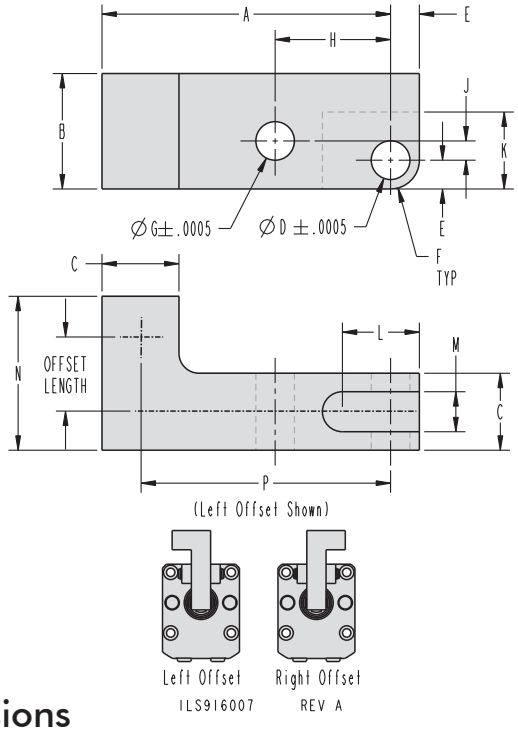
ILS916006 REV A

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.

Link Clamp Levers

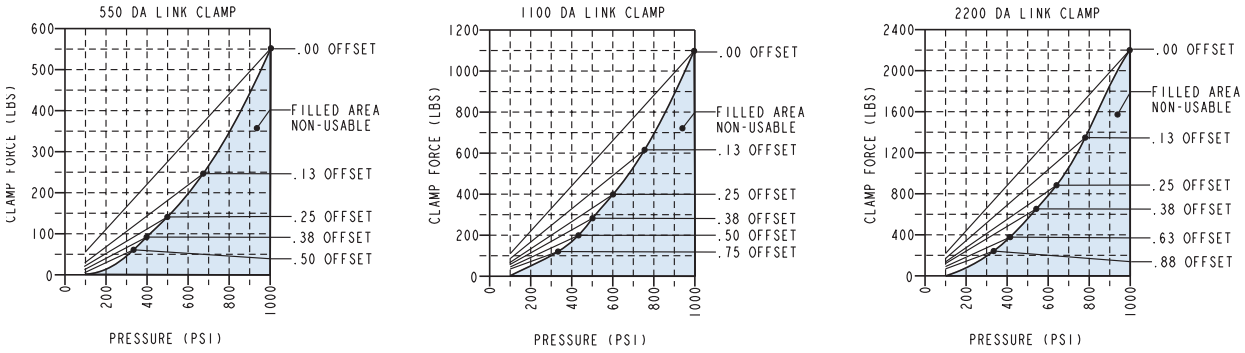
Low Pressure Offset Output Curves



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

Low Pressure Offset Lever Output Curves

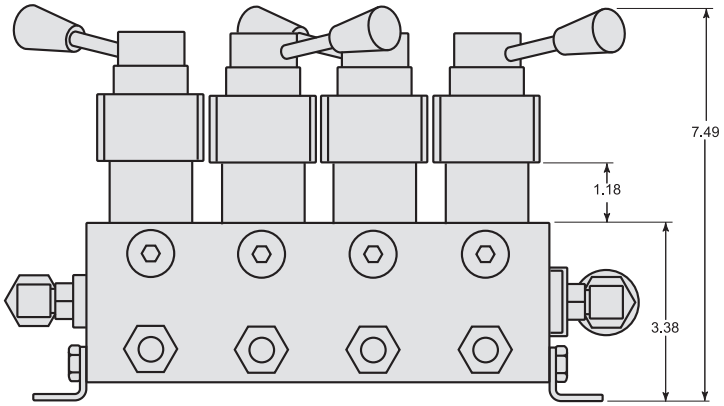


ILS916008 REV A

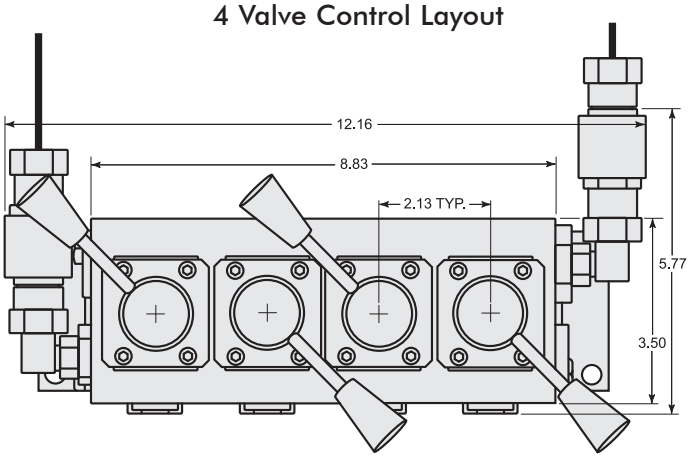
NOTE: Modifications to levers that result in clamp ratios below a 1:1 ratio are not in the safe operating zone for the corresponding link clamp and could result in premature failure.

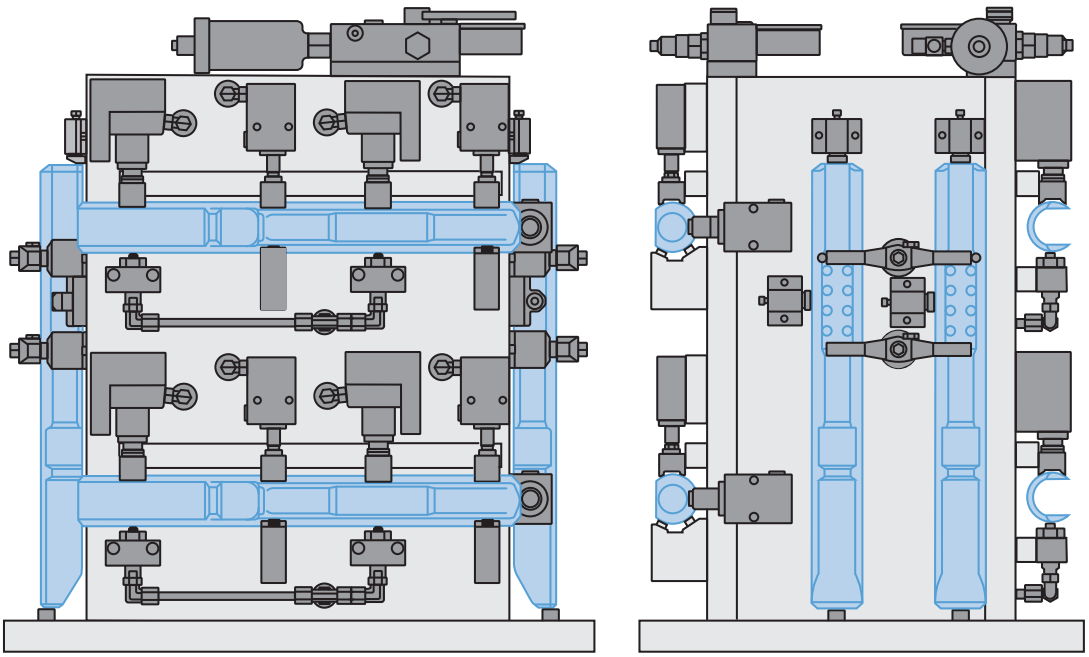
Exceeding the allowable offset values and operating pressures specified in the tables will result in excessive forces on the link clamp pins, links, and rod which could result in premature failure.

Fixture Layouts



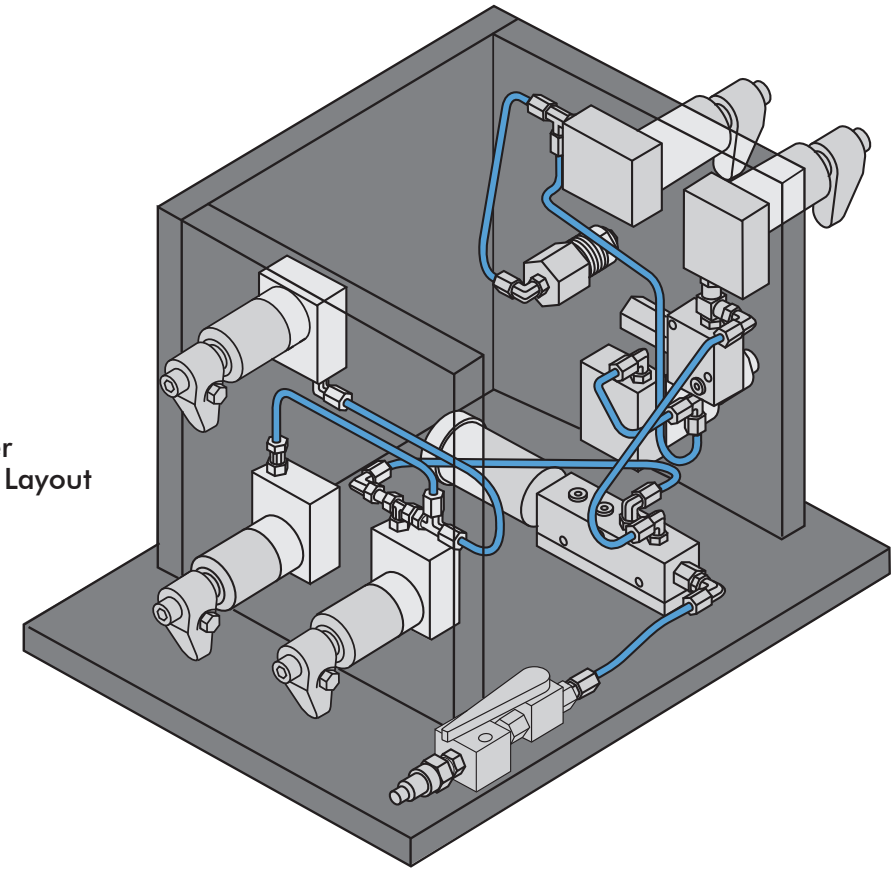
4 Valve Control Layout



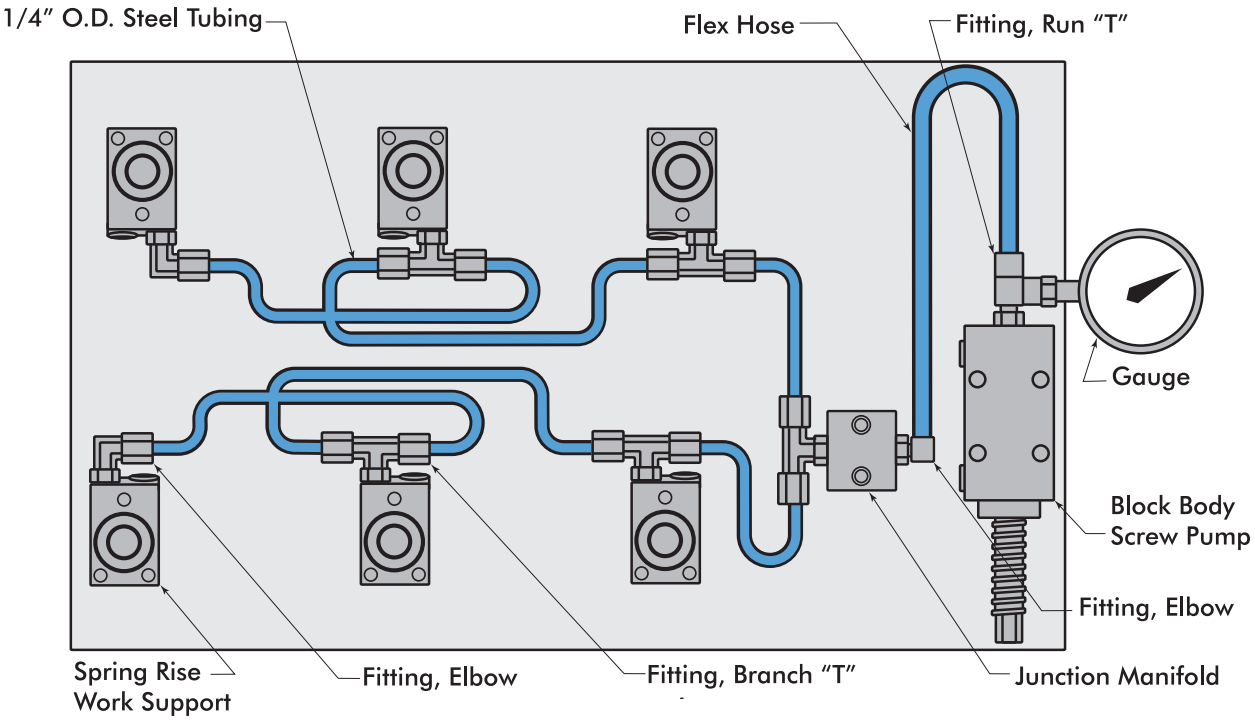


Pallet Fixture With Multiple Part Orientations

Fixture Layouts



Pallet Fixture with Decoupler Components and Plumbing Layout



Screw Pump and Work Support Fixture and Plumbing Layout

Model Number Index

Model Number Index

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Notes

Notes

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 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.

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