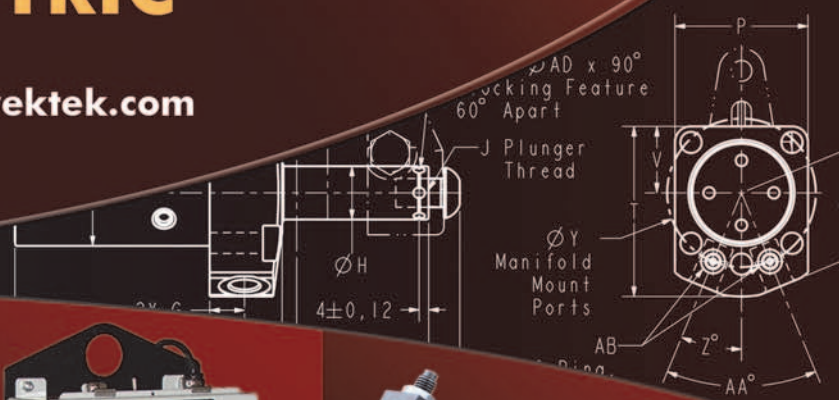
VEKTEK

The Productivity Devices Company

PRECISION HYDRAULIC CLAMPING

METRIC

www.vektek.com



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ISO AMERICAN GLOBAL STANDARDS™ 9001 CERTIFIED

Why use VektorFlo® Metric?

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

The selection of any single brand of hydraulic clamp, as any other important decision, must be made from an informed, intelligent point of view. Your choice should be based on many factors influenced by your specific application. Other factors can be used for general comparison and are strong indicators of the overall quality of the brand selected. Before making any decision, we ask that you take time to accurately compare product quality, product and information availability, technical support and service both before and after the sale. When you do, you'll find VektorFlo® "head and shoulders" above the rest! This is why Vektek is the world'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™, a special 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.
- Hardened and Chromed bearing surfaces are incorporated to provide improved load bearing areas where it is critical to device life.
- Every device is ported using standard G 1/4 or G 1/8 L-Series porting. O-ring porting normally installs without leaking the first and every time.
- Special seals and wipers help keep leaks from starting by sealing fluid in and contaminants out. Loaded lip and crown seals virtually eliminate external (visible) and internal (invisible) leaks. Most devices incorporate a wiper to keep chips from entering the cylinder and damaging the seal. VektorFlo® seals have been tested in most common coolants and found to be stable in all those tested.
- 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. Many 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 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. 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 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 for them to study and propose a clamping concept.
- At your request, we will develop a custom hydraulic clamping concept based on your part and send drawings to help you in the finalization of your fixture design. We can even include a Bill of Materials, if you request one.
- To aid in your fixture design, CAD files for each product are available to you online at www.vektek.com or by requesting a CD from your sales representative.
- After your design is complete, call us to place your order. 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

1-913-365-1045

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

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

VEKTEK®

Planning Your Power Workholding System . . .

Successful powered workholding does not just happen. Like any other manufacturing process, it must be carefully planned. But that does not mean that you need to be a hydraulics engineer to implement a powered workholding system. Designing a system involves nothing more than the common-sense application of a few basic workholding concepts.

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 machine bed because you tried to tie a 30 kN clamp into a T-slot that would only withstand 15 kN of force.

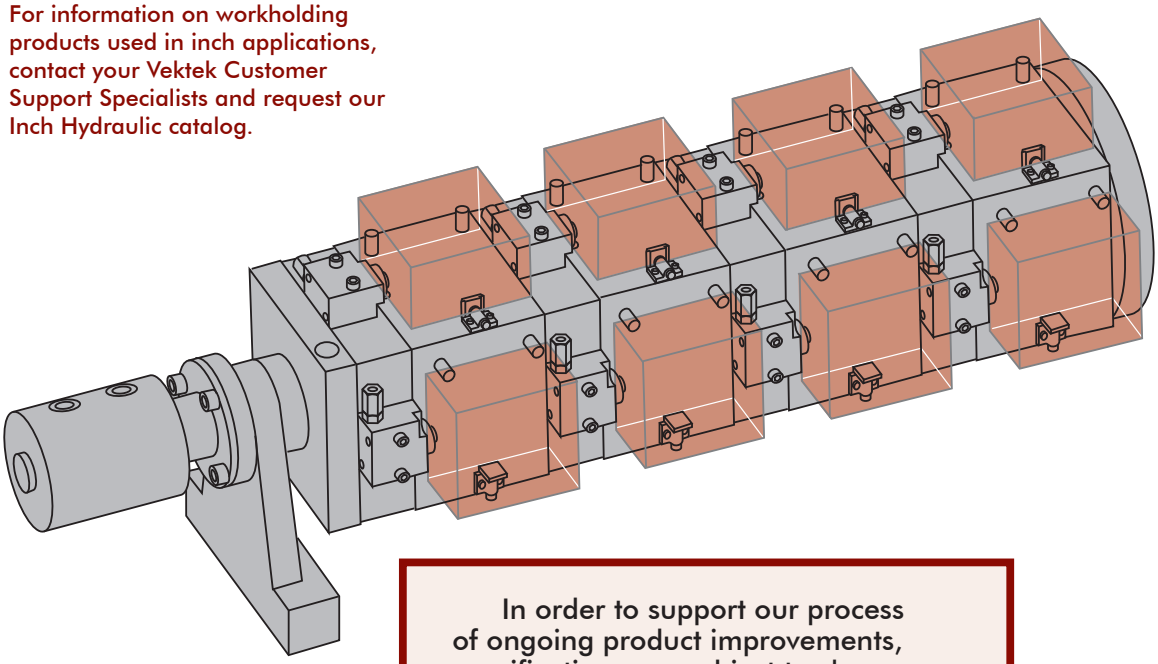
Using power workholding does not in any way invalidate the principles of sound fixture design. The 3-2-1 concept as it relates to the location of the workpiece in three planes is just as applicable when using power workholding devices as when using manual methods. Workholding devices should be positioned 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 is going to use this system? What clamping "speed" is appropriate for the speed at which your production line runs?

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

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

For information on workholding products used in inch applications, contact your Vektek Customer Support Specialists and request our Inch Hydraulic catalog.



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.

Planning

Steps 1-10

Step 1:

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

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

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

Step 2:

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

Step 3:

Calculate the cutting forces generated in the machining process and note the direction that these forces tend to act on the workpiece. If you are planning a retrofit of a manual clamping system, you may use the torques presently being used. However, it is recommended that cutter forces be calculated as a precaution in such a case to ensure that workholding devices are sized to provide an adequate margin of safety. The operation manuals of many machine tools contain tables that list machining forces or simple formulas for calculating these forces. But 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)

Normally you need to calculate the forces required to overcome workpiece weight and friction and to move the part into position against fixture stops. However, with our systems, this is an optional step, thanks to the two-stage design of VektorFlo® hydraulic power sources. The low-pressure high-flow first stage will move clamping devices into position around the workpiece and generate sufficient force to settle the workpiece against fixture stops before high-pressure clamping forces are generated. Additionally, in many applications, the nature of the fixture itself will ensure that the part is located closely enough to eliminate the need for positioning devices as a separate fixture element.

Step 6:

After you have determined the machine cutting forces, it is easy to calculate the clamping force required to hold the workpiece on the fixture or machine table. Again, a simple formula is all you need to arrive at an answer for the materials you'll be working. Give us a call if you need help.

Step 7:

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

Step 8:

Determine the type and number of workholding devices you need based on the total clamping force required and clamping positions you've selected. Choose by the size, strength and shape of the part, and on the machine operation.

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.) ÷ (L. P. flow) = Position time

Where . . .

L.P. flow is low pressure pump oil volume expressed in cubic centimeters/minute. Device cap. is total device oil capacity expressed in cubic centimeters (cm^3). Position time is time to position expressed in decimal parts of a minute.

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

[(Sys. cap.) ÷ (H.P. flow)] x .01 (Sys. op. press. ÷ 70) = Pressurize time

Where . . .

H.P. flow is high-pressure pump oil volume expressed in cm^3 per minute. Sys. cap. is total system oil capacity, the workholding device capacity plus the internal volume of any associated tubing, hoses, manifolds, etc. (For small systems, the plumbing volume may be so small as to be negligible. However, for systems with long runs of tubing or hose, their volume may be of such magnitude as to materially affect the time it takes for operating pressure to be reached.) The expression .01 x (sys. op. press. ÷ 70) 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 initial power source selection may have been too large. In such a case, select a smaller power source and repeat the above calculations to ensure that it still provides the clamping cycle times desired.

Additional factors you should consider when selecting a power source include shop floor plan and/or machine layout and your own preference for the type of power source (shop air vs. electric). If desired, large electrical power sources may be used to supply several workholding systems, each operating independently at several machines. In this case, the timing and sequence of operations for each individual system must be calculated as shown above in order to arrive at a size for the power source.

Step 10:

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

Step 11:

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

Step 12:

Finally, select the plumbing components required to connect the power source to the valves and devices. Review your system specifications and layout to determine what you need in terms of ratings, 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 for clamping a new part or want a quick review of your design we stand ready to help Metric VektorFlo® customers.

Outside the USA, call

+1-913-365-1045

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

http://www.vektek.com

to download our most current CAD files.

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 that you run through this checklist to identify some common problems you might encounter.

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 "plunger return" time is critical (as in some CNC systems). We also recommend use of double acting cylinders in systems operating below 60 bar (6 MPa).

If single acting cylinders must be used ask yourself these quesrtions. 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 G 1/8 or similar size fittings can have this effect on a system. This restriction is even more pronounced when introduced at a main feed line. This can happen with some fittings and many hoses.

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

Proper sizing of fittings for main feed lines and device supply lines will normally be accomplished by using the appropriate VektorFlo® fluid distribution manifold. Device fittings are G 1/4 or G 1/8. Main feed lines should be at least 8 mm to avoid restrictions.

Is my plumbing free of obstructions and contaminants?

Tubing must always be flushed after cutting it. 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. Be sure you haven't created obstructions by using non-standard parts.

Is my pump of appropriate size? It is rated for____l/min, or _____cm^3 per minute. My devices require a total of _____cc. of oil to actuate.

For most normal size fixtures, a pump rated over 8 l/min (Liters per minute) is not recommended. If your pump is rated much more than 4 l/min, call us. It is better to give you sound advice now than have you damage clamps and have to sell you replacements. Be sure that you do not exceed the recommended flow rates for your system. If you aren't sure, ask us.

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

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

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

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

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

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

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

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

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

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

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

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

Frequently Asked Questions

Industrial type double acting cylinders are not designed for clamping. These cylinders, even high quality ones, 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 back pressure 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 would 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 a 35 bar (3.5 MPa) differential.

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 350 bar (35 MPa) operation. We do not recommend the use of lower pressure fittings. Ask your local source for high pressure BSPP S-Series fittings.

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

Our pallet connector was designed with a double acting port incorporated. You can add a second quick disconnect (we suggest a female) to this port, connect a second line and appropriate valves. This is an exclusive feature of the VektorFlo® Pallet Decoupler.

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?

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 fewer 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 small amount 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" "RETRACT" mean?

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

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

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

Frequently Asked Questions

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 178°C; however, fluid type is also important. It may be acceptable in most fluids at lower pressures, but fluorocarbon is not a universal remedy for all fluid problems. There are other acceptable seal compounds for use in water-glycol and other unusual fluids. Our staff can help direct you to a seal that is best suited to perform in your application. Because seals made of fluorocarbon may work in your application, we offer this as an option on many of our cylinders; call for details.

How hot is too hot to run hydraulic fluid?

Anything above 177°C is considered too hot for most hydraulic fluids and seals. Our standard seals are rated to operate at temperatures from 4°C to 71°C. Even seals made of Viton® (fluorocarbon) are not recommended above 177°C. For advice on high heat applications, please contact Vektek's Engineering Department who stand ready to help.

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.

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 with shop air (available in inch measures only).

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 a highly precise location is required, please be sure to use a guide bushing to provide more precise location.

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 reading from the gauge indicates the pressure your clamping system operates at when clamped unless there is a pressure limited circuit branch. (The entire system equalizes at this pressure and Δ P is negligible when under static clamping conditions.)

I need a clamp just like your 41-5011-11 except it needs a 150 mm long rod. Can you help me?

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

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

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

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internationalsales@vektek.com

VektorFlo® Hydraulic Fixture Setup Documentation and Troubleshooting Worksheet

Fixture Designed By: _____

Fixture Built By: _____

Built For: _____

Fixture Serial # _____

1. All pressure gauges reading checked and verified at "0" operating pressure. _____ Yes _____ No
2. Main system operating pressure read from the gauge mounted on the clamping system pump _____ bar (MPa) or inlet air pressure from air gauge on boosters _____ bar (MPa), booster ratio _____:_____.
3. Pump restart pressure checked. Pump restarts at _____ bar (MPa).
4. Fixture operating pressure read at fixture gauge _____bar (MPa), side A and _____bar (MPa), side B
5. Pressure limit circuits pressure checked:

   Side A _____ bar (MPa) Components & location: _____

   Side A _____ bar (MPa) Components & location: _____

   Side A _____ bar (MPa) Components & location: _____

   Side B _____ bar (MPa) Components & location: _____

   Side B _____ bar (MPa) Components & location: _____

   Side B _____ bar (MPa) Components & location: _____
6. Sequence operations set to:

   Side A _____ bar (MPa) Components & location: _____

   Side A _____ bar (MPa) Components & location: _____

   Side A _____ bar (MPa) Components & location: _____

   Side B _____ bar (MPa) Components & location: _____

   Side B _____ bar (MPa) Components & location: _____

   Side B _____ bar (MPa) 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 +1-816-364-0471. We are pleased to be of service.

Fixturing Tips

General Tips

- When Manifold mounting VektorFlo® components the mating surface must be flat within 0.08 mm, with a maximum surface roughness of 1.6 μm R_a for proper sealing (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 34.5 bar (3.4 MPa) for double acting components and 51.7 (5.2 MPa) bar for single acting components.
- Maximum system flow rate is 5.7 l/m 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.

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° 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.

Power Supplies

- Vektek pumps are shipped with the reservoir plugged. Remove the plug and install the included breather prior to use.
- To extend the life of your 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-6) with our Medium Capacity Pumps in medium to extreme contaminations 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

Accessory Valves

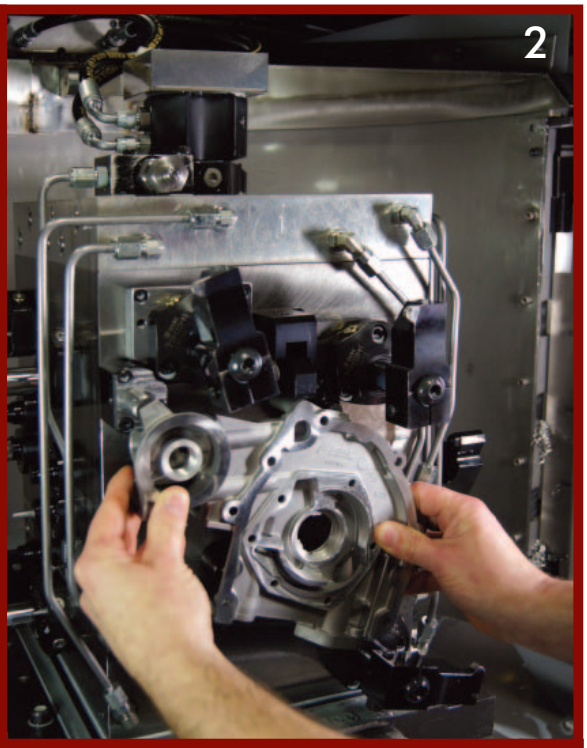
- The "CETOP" valve interface used on our surface mounted (manifold) valves was designed to allow mounting in only one direction. This interface has (4) fluid passages, P, T, A, and B, as well as four mounting holes. The distance between the mounting holes on one end (31 mm) is not equal to the distance between the holes on the opposite end (32.5 mm). The narrower hole pattern is 21.5 mm from centerline of mounting hole to centerline of the "P" passage, while the wider hole pattern is only 19mm center to center. This non-equal mounting spacing is intended to prevent the valve from being installed incorrectly.

Directional Control Valve

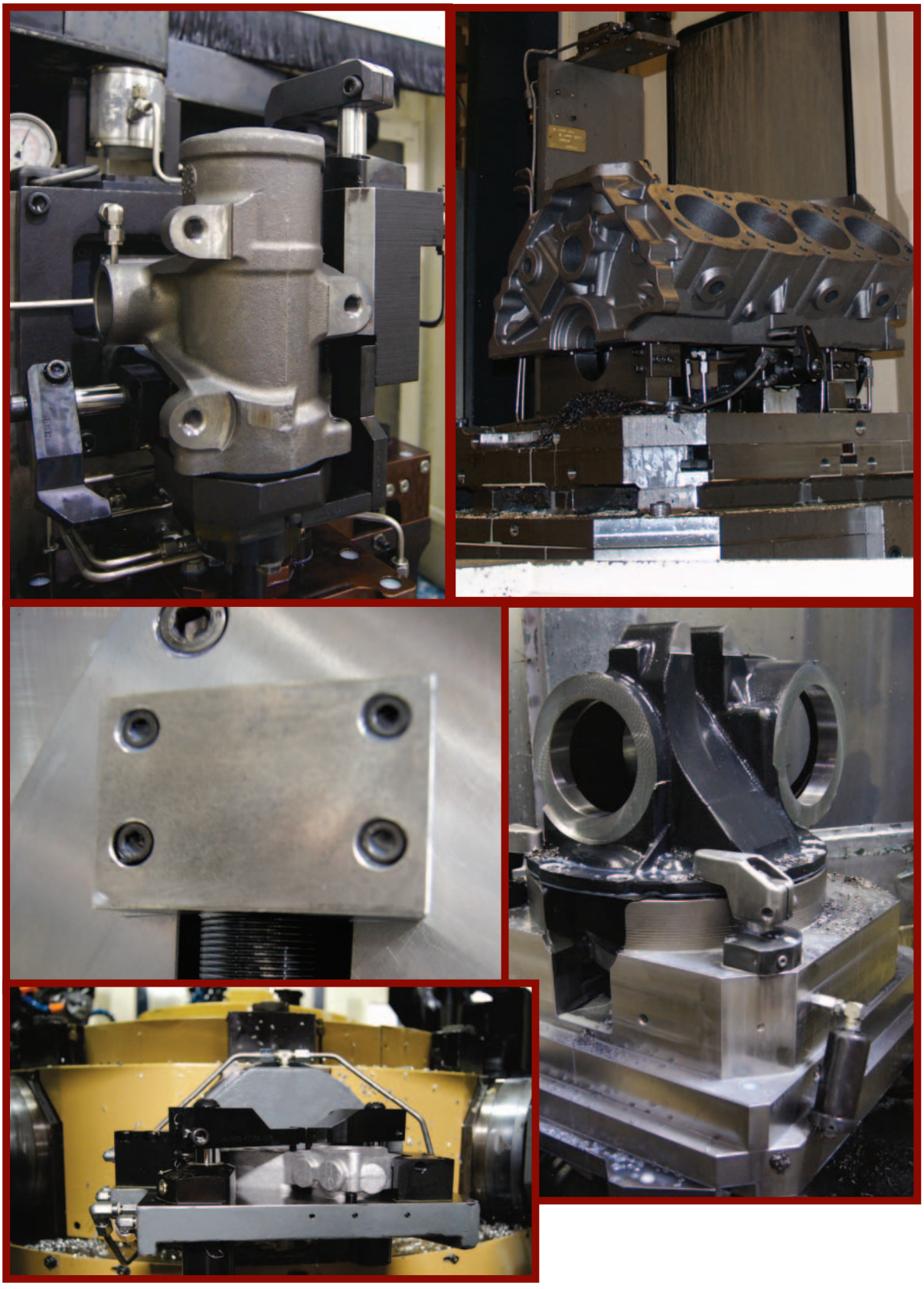
- Reposition handle on manual unit:
  1. Remove the screw on the top of the valve handle "bonnet".
  2. Carefully, lift (pull) the bonnet up, exposing a "detent plate" with a ball bearing resting on one side, and a dowel pin located 180° from the ball. (On the underside of the bonnet there is a small spring that pushes the ball against the detent plate. Take care not to drop the spring, as it is not restrained in the bonnet.) At this point, you will also see a "square" shaped spindle extending up from the center of the valve. DO NOT ROTATE THE SPINDLE OR THE INTERNAL FLUID PATHS WILL BE OUT OF SEQUENCE.
  3. Remove the dowel pin from the detent plate.
  4. Reposition the detent plate at 90° increments until bonnet will re-install with the handle in the desired position.
  5. Re-install the dowel pin, detent ball, bonnet, and screw.

Arms/Levers

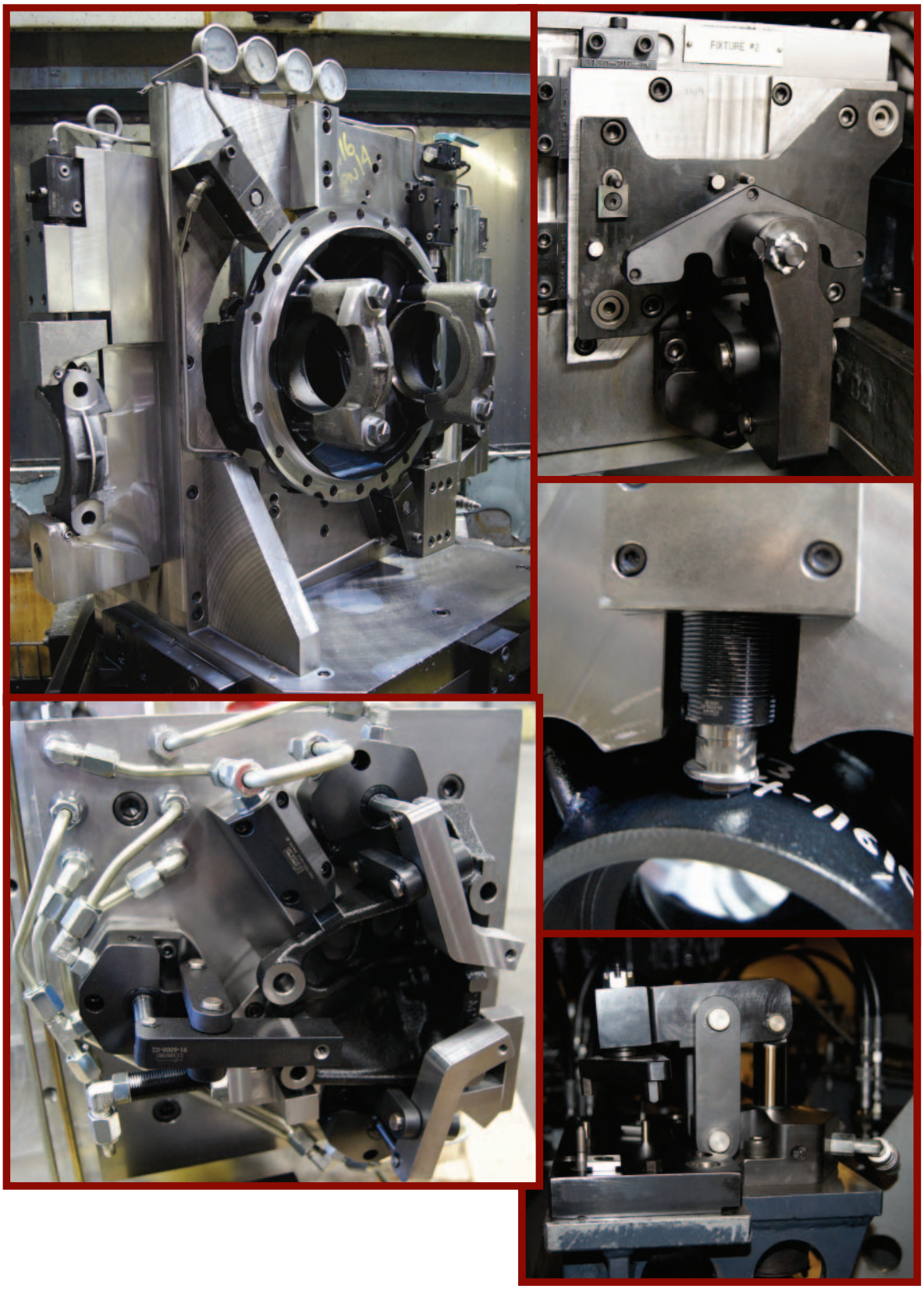
- When installing a swing clamp arm, restrict the arm to prevent rotational torque to the plunger and potential internal cam damage. You may then tighten the cap screw to specification without damage to your clamp.



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



Applications

Frequently Asked Questions

Why do I need to use work supports?

The basics of 3-2-1 fixturing require that three points define the plane of part location. When machining, a floating location support (work support) is an easy solution to a part requiring additional support beyond the three basic locators. You can use a work support anywhere a "screw jack" can be used. It adjusts faster, without distortion and without dependence on the operator's "feel".

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

What is required to use work supports?

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

After the plunger is advanced, hydraulic pressure is used to "squeeze" the sleeve against the plunger, "locking" it securely against the part. It then becomes a solid support holding the part with the capacity indicated on the appropriate chart (page B-2).

Can I use work supports without other hydraulic clamps?

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

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

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

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

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

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

All spring advance work supports require the exchange of air and will work consistently when allowed to exchange air to and from atmosphere.

Air advance work supports have no breather, but use a continuous air advance stream to spring the plunger into position.

Fluid advance work supports ship ventless. This configuration avoids the exchange of dirty fluid through a vent which can then become plugged and restrict movement.

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

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

What about deflection?

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

Can I lay my work support on its side?

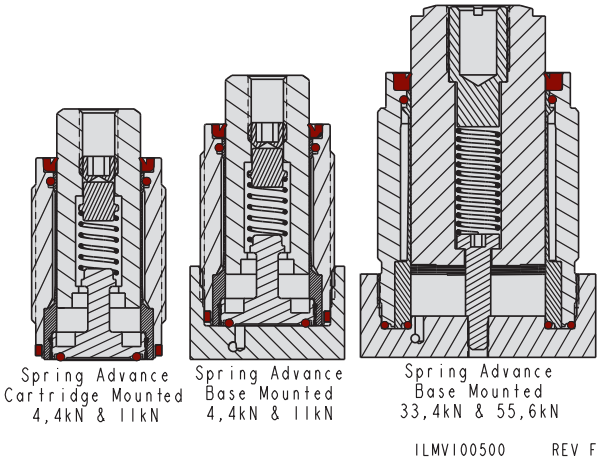
Normally, yes. As long as you are not using a heavy end effector or unusually side loading your support, the physical orientation should not affect performance. If you have a question about a specific application, please give us a call.

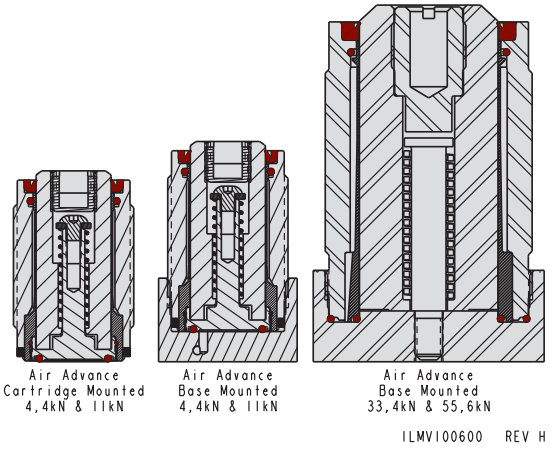
I have an interrupted cut that is going to take place over the top of a work support. The forces involved are transmitted directly down on the support. The cutter is a large straddle milling cutter and the cut is interrupted because I am sawing through webs on a cast part. How do I size the work support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

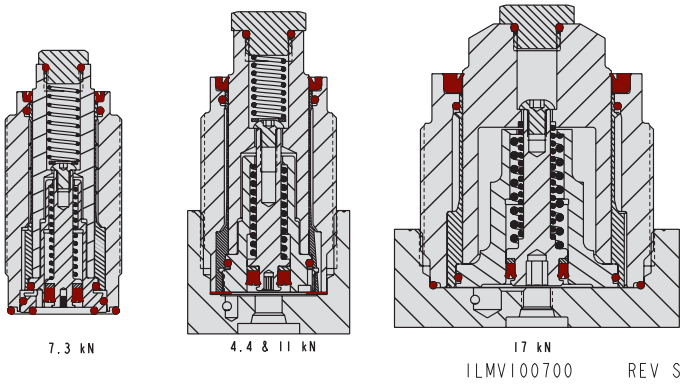
You are correct that the impact of the re-entry of the cutter to the next web of your part will create an interruption and the mass of your straddle mill may cause an impact beyond the normal "horsepower, depth of cut and tooth loading formulae." In this case, you should plan to allow no less than 2X the calculated capacity and should feel safer at a 3-4X calculation. The rule of thumb is that you should always size a support to twice the anticipated loading to account for part weight, cutter vibration and clamping variations. Other outside influences such as impact loading from interrupted cuts will require increasing capacity beyond this safety measure, hence the 1:5 times calculated force in the event of interrupted cuts. Keep in mind that if you are striking with a ball peen hammer the upsizing is less than if you are impact loading with a sledge hammer, 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 thread, 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, repeats position ±0.005 mm.
- Built in polyurethane wipers keep chips and debris out and reduces the chance of plunger/sleeve sticking or binding
- May be bolted up or down to mount directly on fixture plates. May also be installed through a hole and locked in place using retaining collars for easy adjustment.
- Cartridge mount work supports available in all styles for installation into customer machined cavities

Standard G 1/4 and G 1/8 porting is located in the base of the support for easy access to both the clamp and vent ports (bronze filter installed before shipping).

VektorFlo® Metric work supports last longer and stand up to harsh environments and abuse better than other models.

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

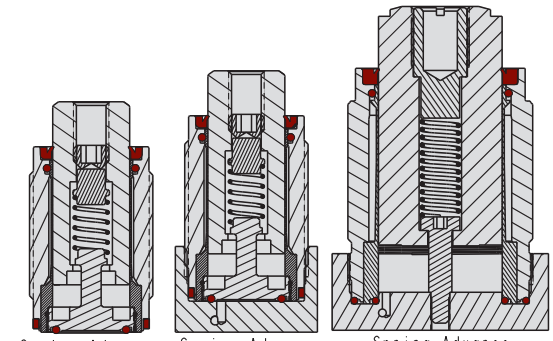
Special corrosion resistant plungers and sleeves reduce the tendency to stick.

BHC™ coating on the work support bodies helps prevent corrosion.

Special large diameter plungers and sleeves provide greater rigidity.

Work Supports

Spring Advance Specifications



ILMV100500 REV F

For Supporting Most Parts

- Work Supports are available in four capacities 4.4 kN to 55.6 kN. Each providing excellent support for light weight or heavy parts and in "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 gives you "floating" locators which won't interfere with your 3, 2 or 1 fixed stops. Clamp opposite your locators then lock the supports. Even clamp over the supports if needed (be sure to use approximately a 2:1 ratio of support to clamp force).
- Spring extended plungers maintain contact with the part during loading exerting only spring force against the part; then hydraulically "freezes" the plunger without exerting any additional force on the part

Proprietary wiper and seal design reduces contamination and drag for longer lasting and better performing work supports.

Special corrosion-resistant plungers and sleeves reduce the tendency to stick.

Hand fitted plunger/sleeve assemblies allow VektorFlo® Metric work supports to begin locking at lower pressures and building support faster.

If spring advance supports must be used in flood coolant environments (we recommend 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.

Specifications

Model No.	Support Capacity* (kN)	Mounting Style	Contact Force (N)	Stroke (mm)	Base Dimensions (mm)	Extended Height (mm)	Oil Capacity (cm^3)
Spring Advance Work Supports, spring lifts plunger, part weight depresses plunger, hydraulic pressure locks in place.							
41-0050-07 41-0051-07	4.4	Base Cartridge	4.5 - 9	6.5	24 x 33.5 x 44,5 N/A	56 47.5	0.16
41-0050-06 41-0051-06	11	Base Cartridge	9 - 26.5	9.5	25 x 41.5 x 59 N/A	70.5 62	0.33
41-0050-04	33.4	Base	40 - 80	12.5	25 x 63.5 x 76	111	1,.64
41-0050-05	55.6	Base	49 - 71	19	31.5 x 89 x 97	133	4.26

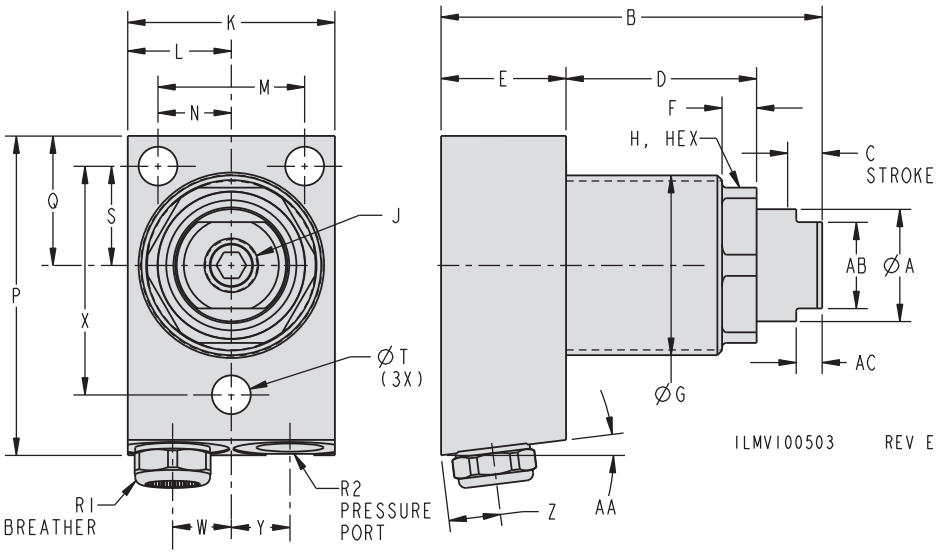
* Support capacities are listed at 350 bar (35 MPa) maximum operating pressure.
Support capacities for other pressures must be determined by consulting the graphs ILMV100507 and ILMV100508 on page B-2.

Minimum fluid pressure is 52 bar (5.2 MPa)

Note: DIN ISO 2768 T1 and T2 not applicable

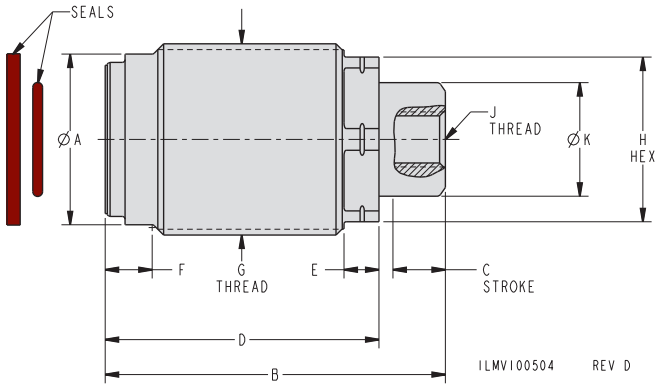
For minimum operating pressures and resulting capacities see Capacity Charts.

Spring Advance Dimensions



For proper sealing, the mating surface must be flat within 0.08 mm, with a maximum surface roughness of 1,6 µm R_a

Dimensions													
Model No.	A	B	C	D	E	F	G		H	J	K	L	M
Spring Advance Supports, spring force lifts plunger, part weight depresses plunger, hydraulic pressure locks.													
41-0050-07	16	56	6.5	25	24	5.5	M26 x 1.5		23	M8 x 1.25 x 7,5	33.5	16.5	24.5
41-0050-06	20.5	70.5	9.5	33	25	6.5	M35 x 1.5		30	M10 x 1.5 x 11,5	41.5	20.5	30
41-0050-04	38	111	12.5	68.5	25	12.5	Ø 57		50	M12 x 1.75 x 15	63.5	31.5	52.5
41-0050-05	51	133	19	76	31.5	12.5	Ø 76		70	M16 x 2 x 20	89	44.5	73
Model No.	N	P	Q	R1	R2	S	T	W	X	Y	Z	AA°	AB	AC
Spring Advance Supports, spring force lifts plunger, part weight depresses plunger, hydraulic pressure locks.														
41-0050-07	12	44.5	17.5	G 1/8	G 1/8	13	5.5	9	31	9	8.5	7°	N/A	N/A
41-0050-06	15	59	24	G 1/8	G 1/8	18	7	10	43	10	8.5	7°	N/A	N/A
41-0050-04	26	76	31.5	G 1/8	G 1/8	26	7	16	61	16	10.3	N/A	28.5	4
41-0050-05	36.5	97	44.5	G 1/8	G 1/8	36.5	9	24	81.5	24	10.3	N/A	41.5	4



Cartridge Dimensions										
Model No.	A	B	C	D	E	F	G	H	J	K
Work Support, Spring Rise, Cartridge										
41-0051-07	24	47.5	6.5	40.5	5.5	7.5	M26 x 1.5	23	M8 x 1.25 x 7.5	16
41-0051-06	31	62	9.5	49.5	6.5	8.5	M35 x 1.5	30	M10 x 1.5 x 11.5	20.5

All dimensions are in millimeters.
NOTE: DIN ISO 2768 T1 and T2 not applicable

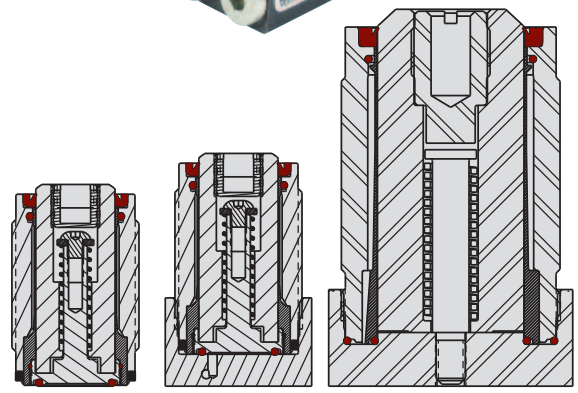
B-5

For Supporting Fragile Parts Or Use In Harsh Environments

- Work Supports are available in four capacities 4.4 kN to 55.6 kN. Each providing excellent support for light weight or heavy parts and in "hog out" applications.
- 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 hydraulically.
- Heavier attachments 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.

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



Air Advance Cartridge Mounted 4,4kN & 11kN

Air Advance Base Mounted 4,4kN & 11kN

Air Advance Base Mounted 33,4kN & 55,6kN

ILMV100600 REV H

Specifications

Model No.	Support Capacity* (kN)	Mounting Style***	Hydraulic Connection	Maximum Contact Force** (N)	Stroke (mm)	Base Dimensions (mm)	Retracted Height (mm)	Oil Capacity (cm^3)
Air Advance Work Supports, air pressure lifts plunger against part; hydraulic pressure locks in place, spring retracts plunger.								
41-0060-07 41-0061-07	4.4	Base Cartridge	G 1/8 Port Thru Cavity	17.5	6.5	24 x 33.5 x 44.5 N/A	49.5 41	0.16
41-0060-06 41-0061-06	11	Base Cartridge	G 1/8 Port Thru Cavity	35.5	9.5	25 x 41.5 x 59 N/A	61 52.5	0.33
41-0060-04	33.4	Base	G 1/8 Port	89	12.5	25 x 63.5 x 76	98	1.64
41-0060-05	55.6	Base	G 1/8 Port	253.5	19	31.5 x 89 x 97	114	4.26

* Support Capacities are calculated at 350 bar (35 MPa) maximum operating pressure. Support capacities at other pressures are shown on the Capacity Charts at the beginning of this section.

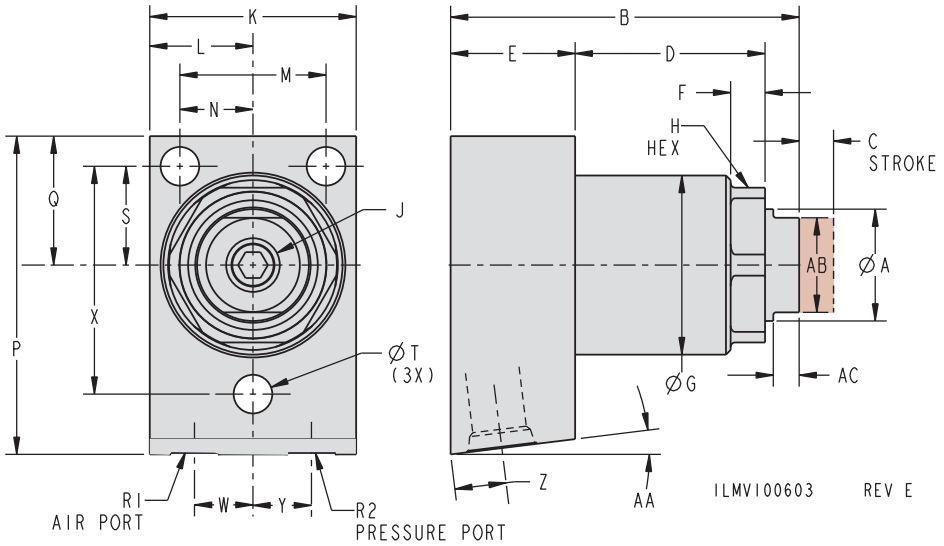
** The maximum air pressure recommended for advancing the plunger is 1.7 bar (0.17 MPa). Order air regulator Model No. 50-0440-01 with a 0-1.7 bar (0.17MPA) output, to more precisely control plunger advance force.

*** For cartridge mounted models, see the Cartridge Mount Cavity dimension drawings at the end of this section.

NOTE: Minimum fluid pressure is 52 bar (5.2 MPa)
DIN ISO 2768 T1 and T2 not applicable

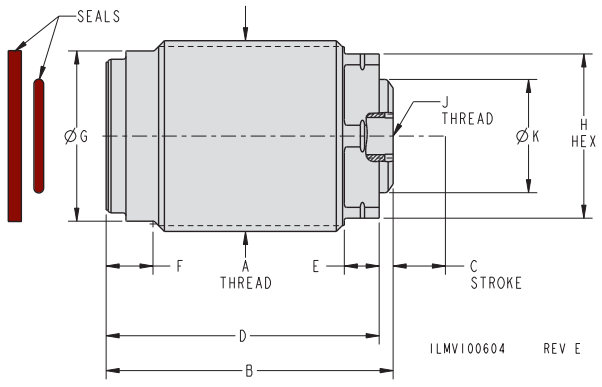
For minimum operating pressures and resulting capacities see Capacity Charts.

Air Advance Dimensions



For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

Dimensions													
Model No.	A	B	C	D	E	F	G	H	J	K	L	M	
Air Advance Work Supports, air pressure lifts plunger against part; hydraulic pressure locks in place, spring retracts plunger.													
41-0060-07	16	49.5	6.5	25	24	5.5	M26 x 1.5	23	M6 x 1 x 7.5	33.5	16.5	24.5	
41-0060-06	20.5	61	9.5	33	25	6.5	M35 x 1.5	30	M8 x 1.25 x 6	41.5	20.5	30	
41-0060-04	38	98	12.5	68.5	25	12.5	Ø 57	50	M12 x 1.75 x 15	63.5	31.5	52.5	
41-0060-05	51	114	19	76	31.5	12.5	Ø 76	70	M16 x 2 x 20	89	44.5	73	
Model No.	N	P	Q	R1	R2	S	T	W	X	Y	Z	AA°	AB	AC
Air Advance Work Supports, air pressure lifts plunger against part; hydraulic pressure locks in place, spring retracts plunger.														
41-0060-07	12	44.5	17.5	G 1/8	G 1/8	13	5.5	9	31	9	8.5	7°	N/A	N/A
41-0060-06	15	59	24	G 1/8	G 1/8	18	7	10	43	10	8.5	7°	N/A	N/A
41-0060-04	26	76	31.5	G 1/8	G 1/8	26	7	16	61	16	10.3	N/A	28.5	4
41-0060-05	36.5	97	44.5	G 1/8	G 1/8	36.5	9	24	81.5	24	10.3	N/A	41.5	4



Cartridge Dimensions										
Model No.	A	B	C	D	E	F	G	H	J	K
Work Support, Air Rise, Cartridge										
41-0061-07	M26 x 1.5	41	6.5	40.5	5.5	7.5	24	23	M6 x 1 x 7.5	16
41-0061-06	M35 x 1.5	52.5	9.5	49.5	6.5	8.5	31	30	M8 x 1.25 x 6	20.5

All dimensions are in millimeters.
NOTE: DIN ISO 2768 T1 and T2 not applicable

Fluid Advance Specifications

NEW Universal

7.3 kN Capacity Cartridge

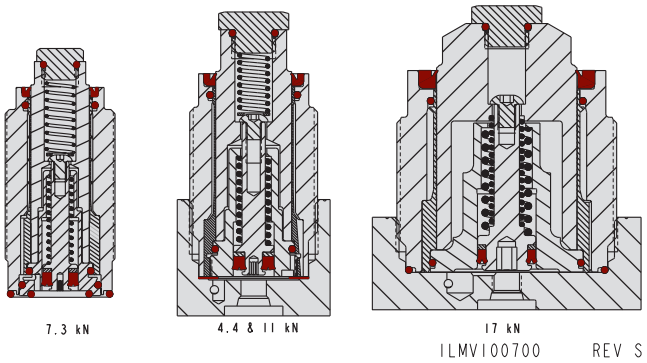
For Retracted Plunger Applications

- Work Supports are available in four capacities, 4 kN, 7.3, 11 kN and 17 kN.
- Normally retracted plungers do not interfere with part loading. Advance them with hydraulic pressure, exerting only spring force when contacting your part. Hydraulic pressure automatically sequences, and "freezes" 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 G Series 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.

Heavy end effectors/contact points are not recommended.



Specifications

Model No.	Support Capacity* (kN)	Mounting Style	Contact Force (N)	Stroke (mm)	Base Dimensions (mm)	Retracted Height (mm)	Oil Capacity (cm^3)
Fluid Advance Work Support, hydraulic pressure pushes a spring which lifts plunger; hydraulic pressure locks in place.							
41-0070-04	4.4	Base/Manifold	4.4 - 26.7	6.5	23 x 33.5 x 44.5	62.5	2.6
41-0070-14				12.5		75	2.8
41-0071-04	4.4	Cartridge	4.4 - 26.7	6.5	N/A	53.5	1.3
41-0071-14				12.5		66.5	1.5
41-0171-12	7.3	Cartridge	4.4 - 26.7	12.5	N/A	67	1.5
41-0070-03	11	Base/Manifold	13.5 - 44.5	6.5	31.5 x 41.5 x 58.5	82.5	3.1
41-0070-13				12.5		95.5	3.4
41-0071-03	11	Cartridge	13.5 - 44.5	6.5	N/A	72	2
41-0071-13				12.5		84.5	2.3
41-0070-05	17	Base/Manifold	26.5 - 53.5	12.5	25 x 73 x 81	82.5	10.7
41-0071-05		Cartridge			N/A	72.5	9.7

* Support capacities are listed at 350 bar (35 MPa) maximum operating pressure. Support capacities for other pressures must be determined by consulting capacity charts ILMV100710, IMV100711 and ILMV100717.

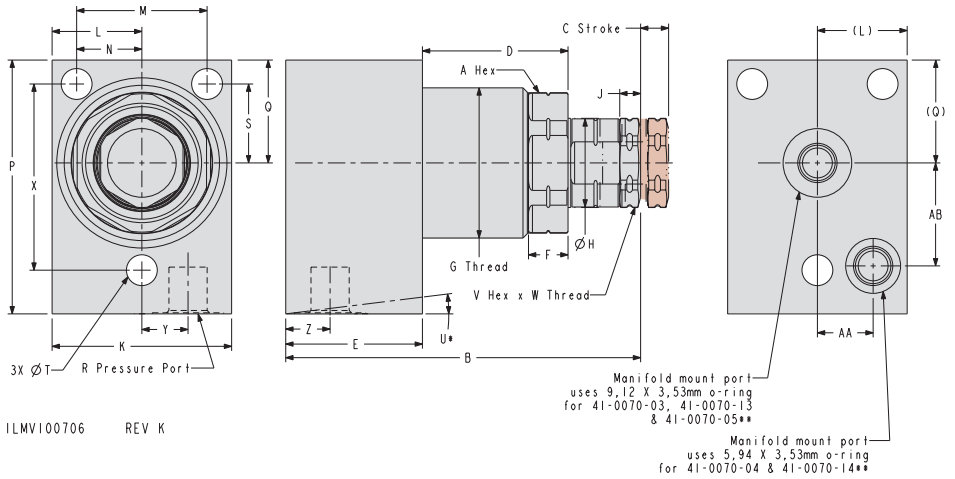
** Interchangeable with many competitive products.

NOTE:
1 Restrict the flow rate to a maximum of 2.13 l/min
2 Minimum fluid pressure 52 bar (5.2 MPa)
3 DIN ISO 2768 T1 and T2 not applicable
4 The maximum system back-pressure a fluid advance work support can overcome is 0.7 bar (0.07 MPa). Return back-pressure greater than 0.7 bar (0.07 MPa) may cause slow or failed retraction.

VEKTEK®

Fluid Advance Dimensions

For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a



ILMV100706 REV K

Dimensions

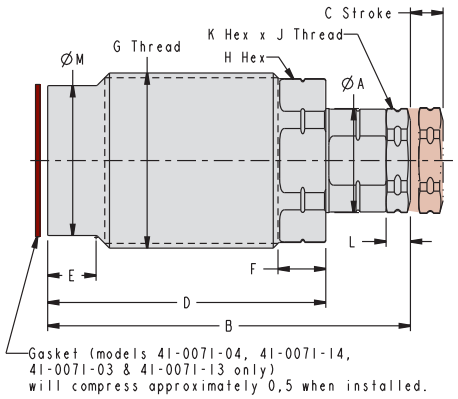
Model No.**	A	B	C	D	E	F	G	H	J	K	L	M	N
Fluid Advance Work Support, hydraulic pressure pushes a spring which lifts plunger; hydraulic pressure locks in place													
41-0070-04 41-0070-14	23	62.5 75	6.5 12.5	28.5 41	23	5.5	M26 x 1.5	16	3.5	33.5	16.5	24.4	12.2
41-0070-03 41-0070-13	30	82.5 95.5	6.5 12.5	34 47	31.5	9	M35 x 1.5	20.5	5	41.5	21	30.2	15.1
41-0070-05	54	82.5	12.5	40	25	12.5	M60 x 1.5	38	5	73	36.5	52.4	26.2

Model No.**	P	Q	R	S	T	U*	V	W	X	Y	Z	AA	AB
Fluid Advance Work Support, hydraulic pressure pushes a spring which lifts plunger; hydraulic pressure locks in place													
41-0070-04 41-0070-14	44.5	17.5	G 1/8	13	5.6	7°	13	M8 x 1.25 x 5 M10 x 1.5 x 5	31	9	8.5	9.7	17.5
41-0070-03 41-0070-13	58.5	24	G 1/8	18.3	7.1	N/A	19	M12 x 1.75 x 6.5 M12 x 1.75 x 6.5	43.1	10.5	10.5	N/A	N/A
41-0070-05	81	36.5	G 1/8	26.2	7.1	N/A	19	M12 x 1.75 x 6.5	62.6	16	10.5	N/A	N/A

NOTE: DIN ISO 2768 T1 and T2 not applicable

* Dimension "U" applies to models 41-0070-04 and 41-0070-14 only.

** All models have one manifold mount pressure port that is plugged at the time of assembly. Refer to drawing ILMV100706 for the manifold mount pressure port location. For manifold mounting, remove the port plug and install the o-ring (provided) at final installation.

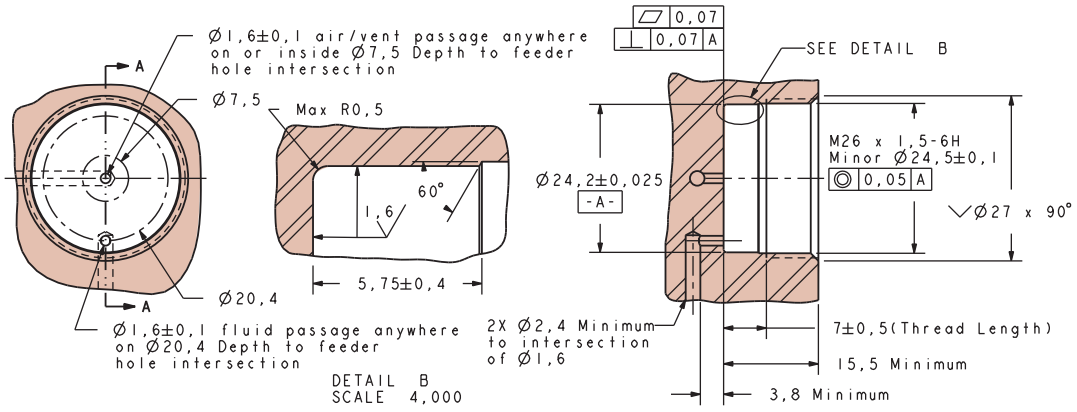


ILMV100705 REV J

Cartridge Dimensions

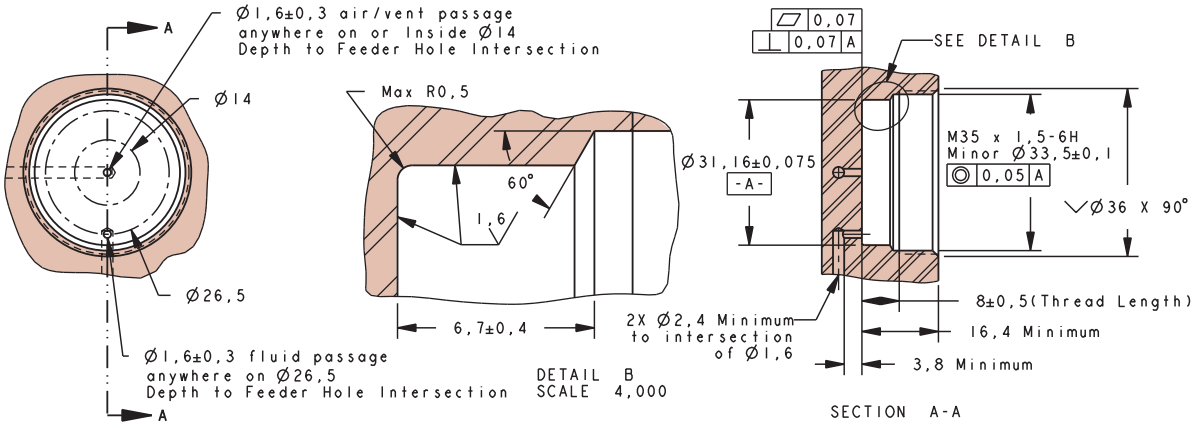
Model No.	A	B	C	D	E	F	G	H	J	K	L	M
Fluid Advance Supports, hydraulic pressure lifts spring which lifts plunger, hydraulic pressure locks in place.												
41-0071-04 41-0071-14	16	53.5 66.5	6.5 12.5	42.5 55.5	7	5.5	M26 x 1.5	23	M8 x 1.25 x 5 M10 x 1.5 x 5	13	3.5	23.3
41-0171-12	16	67	12.5	56.5	9	5.5	M30 x 1.5	24	M10 x 1.5 x 5	13	3.5	28.3
41-0071-03 41-0071-13	20.5	72 84.5	6.5 12.5	55 68	9.5	9	M35 x 1.5	30	M12 x 1.75 x 6.5 M12 x 1.75 x 6.5	19	5	29.7
41-0071-05	38	72.5	12.5	55	6.5	12.5	M60 x 1.5	54	M12 x 1.75 x 6.5	19	5	54.8

Cartridge Mount Cavity Dimensions



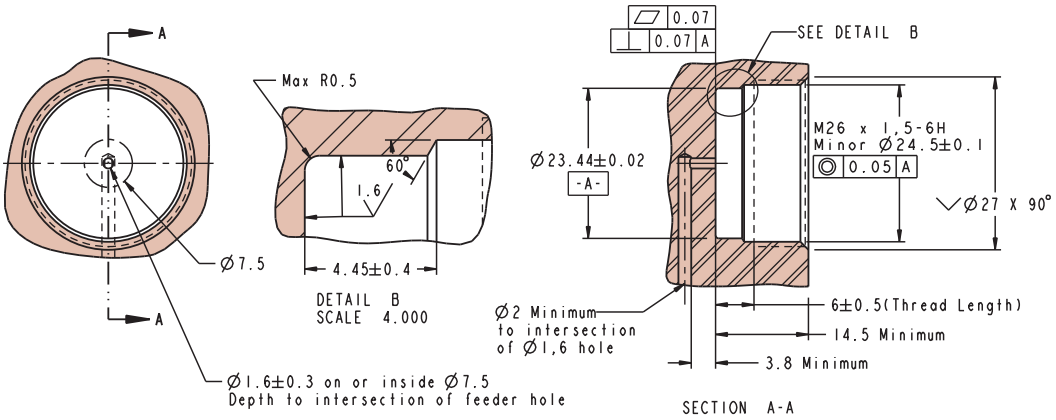
Work Support Cavity Dimensions
Model No. 41-0051-07, Spring Advance, 4,4kN
Model No. 41-0061-07, Air Advance, 4,4 kN
(Tighten to 40,5 Nm torque)

ILMV100505 REV F



Work Support Cavity Dimensions
Model No. 41-0051-06, Spring Advance, 11kN
Model No. 41-0061-06, Air Advance, 11kN
(Tighten to 40,5Nm torque)

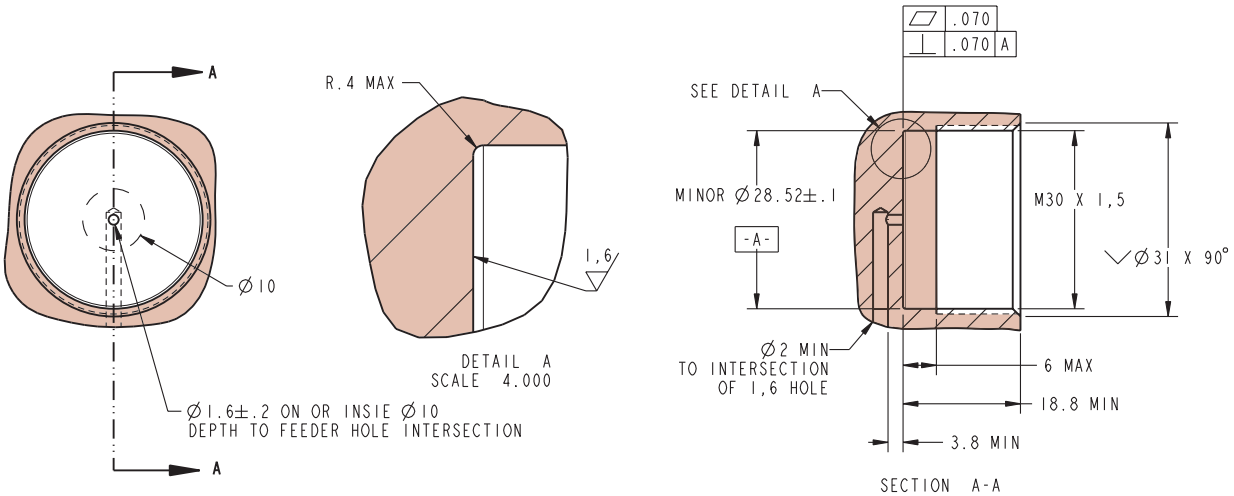
ILMV100506 REV E



Work Support Cavity Dimensions
Model No.41-0071-04 & 41-0071-14
Single Acting, Fluid Advance, 4,4kN
Tighten to 40,5Nm torque.

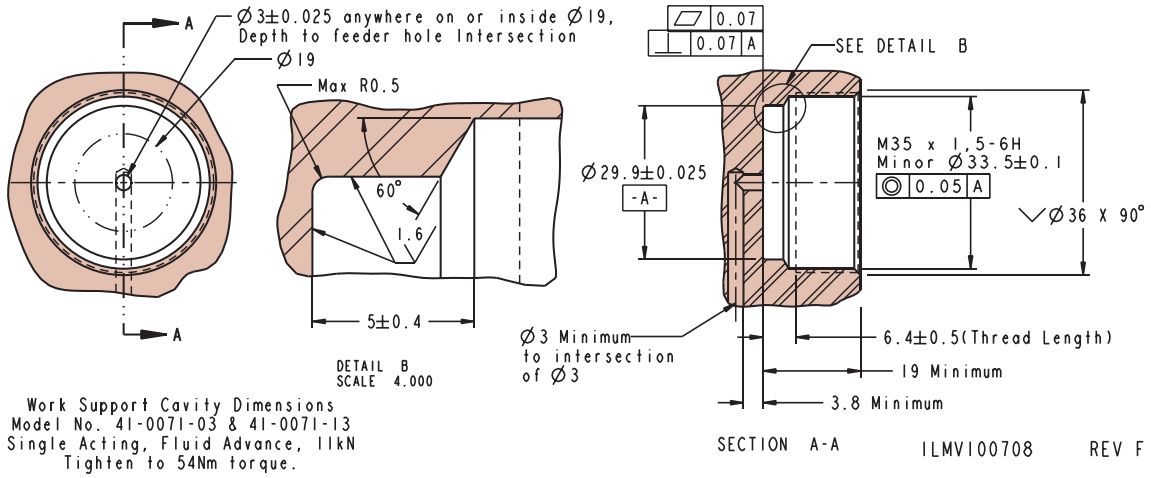
ILMV100707 REV F

Cartridge Mount Cavity Dimensions



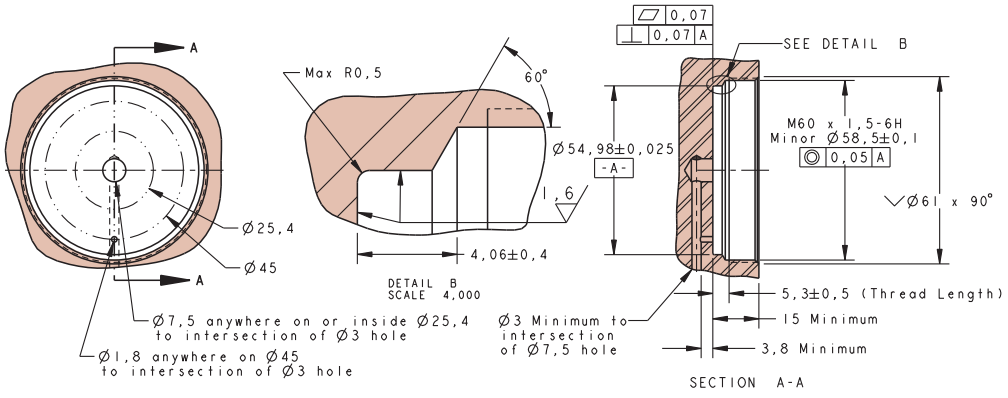
Work Support Cavity Dimensions
Model No. 41-0171-12
Single Acting, Fluid Advance, 7,3kN
Tighten to 40,5 Nm torque

ILMV100716 REV A



Work Support Cavity Dimensions
Model No. 41-0071-03 & 41-0071-13
Single Acting, Fluid Advance, 11kN
Tighten to 54Nm torque.

ILMV100708 REV F

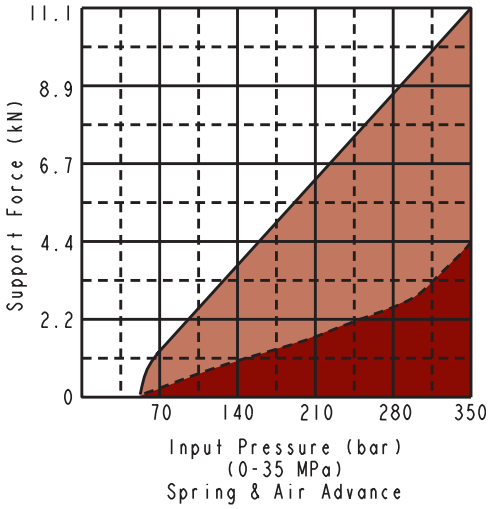


Work Support Cavity Dimensions
Model No. 41-0071-05,
Single Acting Fluid Advance, 17 kN
(Tighten to 136 Nm torque)

ILMV100709 REV E

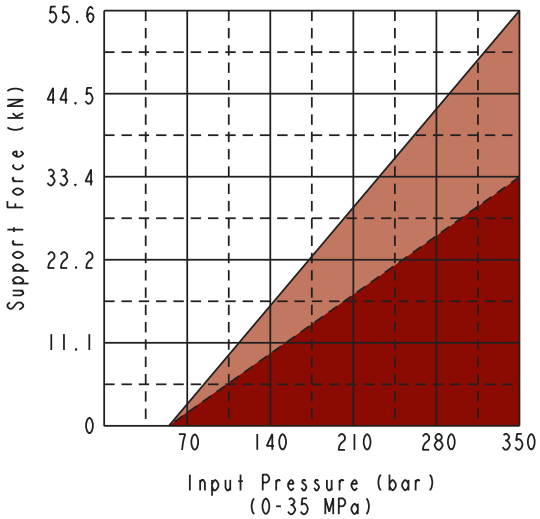
Capacity Chart

Capacity Charts For All Work Support Models



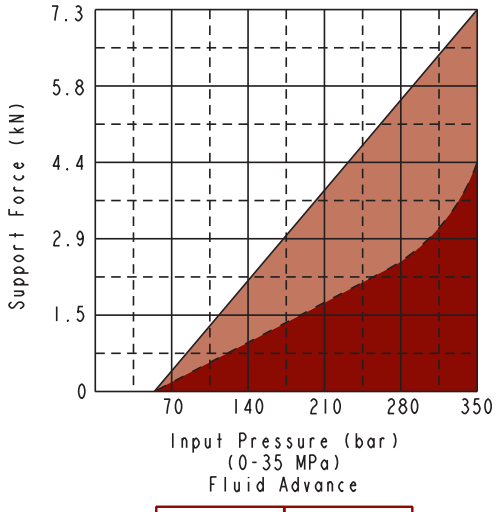
4.4 kN	11 kN
Model No.	Model No.
41-0051-07	41-0051-06
41-0050-07	41-0050-06
41-0061-07	41-0061-06
41-0060-07	41-0060-06

ILMV100507 REV D



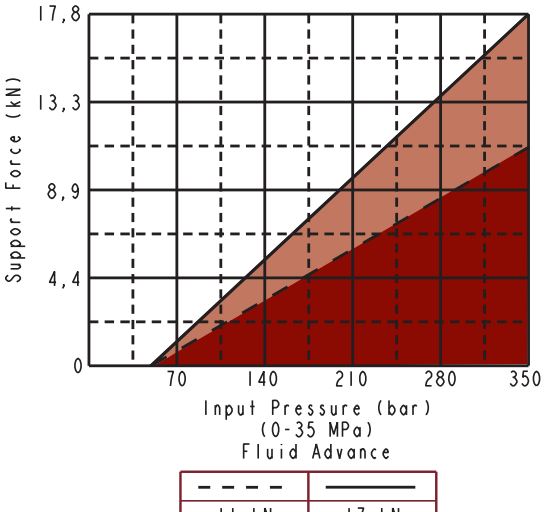
33 kN	55 kN
Model No.	Model No.
41-0050-04	41-0050-05
41-0060-04	41-0060-05

ILMV100508 REV D



4.4 kN	7.3 kN
Model No.	Model No.
41-0070-04	41-0171-12
41-0070-14	
41-0071-04	
41-0071-14	

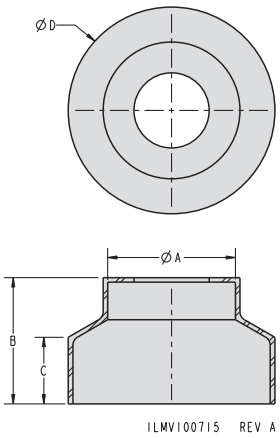
ILMV100710 REV. G



11 kN	17 kN
Model No.	Model No.
41-0070-03	41-0071-05
41-0070-13	41-0070-05
41-0071-03	
41-0071-13	

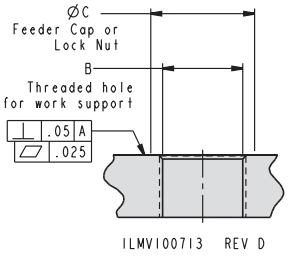
ILMV100711 REV C

Fluid Advance Work Support Shields



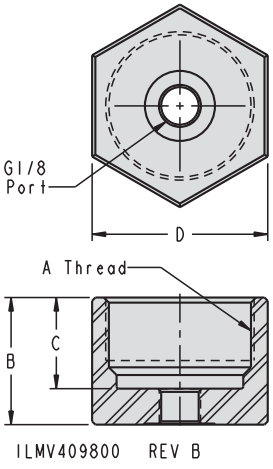
Fluid Advance Work Support Shield					
Shield Model No.	Work Support Model No.	A	B	C	D
41-0707-01	41-0070-04 41-0071-04	16.8	12.7	7.6	26.4
41-0708-01	41-0070-03 41-0071-03	21.6	21.3	10.9	35.1
41-0715-01	41-0070-05 41-0071-05	23.4	25.4	14.7	59.9

Fluid Advance Work Support Feeder Caps

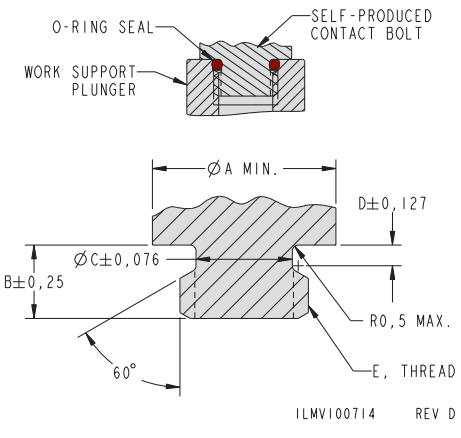


Feeder Caps For use with Fluid Advance work supports only				
Model No.	A	B	C	D
40-9872-40	M26 x 1.5	23	14.5	32
40-9872-43	M35 x 1.5	30	21.5	41.5
40-9872-47	M60 x 1.5	23.5	15	66.5

Machining Specifications Supports Mounted with a Feeder Cap or Lock Nut		
Capacity	B	C
4.4 kN	M26 x 1.5	37
11 kN	M35 x 1.5	48
17 kN	M60 x 1.5	77



Fluid Advance Work Support Contact Bolts



Self-produced Contact Bolt Fluid Advance Work Supports							
Model No.	Capacity (kN)	O-ring Part No.	A	B	C	D	E
Fluid Advance Supports							
41-0070-04 41-0071-04	4.4	39-0510-59 (6 x 1.5 mm)	9.75	5.0	6.05	1.19	M8x1.25 - 6G
41-0070-14 41-0071-14	4.4	39-0000-69 (7.65 x 1.63 mm)	11.43	5.0	7.67	1.19	M10 x 1.5 -6G
41-0171-12	7.3	39-0000-69 (7.65 x 1.63 mm)	11.43	5.0	7.67	1.19	M10 x 1.5 - 6G
41-0070-03 41-0071-03	11	39-0020-09 (9.25 x 1.78 mm)	14.1	6.35	9.91	1.78	M12x1.75 - 6G
41-0070-13 41-0071-13	11	39-0020-09 (9.25 x 1.78 mm)	14.1	6.35	9.91	1.78	M12x1.75 - 6G
41-0070-05 41-0071-05	17	39-0020-09 (9.25 x 1.78 mm)	14.1	6.35	9.91	1.78	M12x1.75 - 6G

TuffCam™ Swing Clamps

Frequently Asked Questions

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

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

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

Where arm mass damages the swing mechanism of standard swing clamps, the tri-cam design of the TuffCam™ Swing Clamp strengthens the ball and cam link. The beefier design, capacity and reinforced rotation mechanism of the TuffCam™ Swing Clamp 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 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. (Low Profile units have a stainless steel ball seat and stainless steel springs.) 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 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 is some lag between the unclamp of swing clamps and the full release of pressure in any work support circuit. This is critical with fluid advance supports, as the circuit must have time to evacuate under low pressure to allow the plungers to retract for reloading the fixture. If speed is the issue in work support retraction coordinating with TuffCam™ Swing Clamps, an air advance support must be used with the air circuit released prior to hydraulic circuit release. When the hydraulic circuit is released, the support will begin to immediately retract pushing only the air from the line rather than the higher viscosity hydraulic fluid.

I'm using a high-volume pump and it is "blowing out" my swing clamps. Will TuffCam™ 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™, and we recommend changing to a pump designed for clamping applications or appropriate flow restriction.

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

TuffCam™ 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 and watch the arm "swing" into position.
* The eye can track speed of movement at roughly 1/16 sec. 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 sec. or longer. See flow rates and clamping time on page C-2 of this catalog.
* 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 that it in the clamped position, the positioning time is something substantially less than 1/2 sec. 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 (cu. in.) by your pump's output volume (cu. in./minute) and then multiplying that number by 60 (60 sec./min.). This will give you the theoretical calculated time to move a device through its stroke, but does not account for flow loss due to flow restrictions in the system.

VEKTEK®

*TuffCam™ is a trademark of Vektek, Inc.

TuffCam™ Swing Clamp

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 sec. and handle larger arms than standard swing clamps.

- Available in these body styles:
  - Top Flange
  - Bottom Flange
  - Low Profile Top Flange
  - Top Flange Long Stroke
  - Bottom Flange Long Stroke
  - Low Profile Bottom Flange
- Available as single or double acting clamps.
- The TuffCam™ design includes 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, with reduced dynamic and static friction.
- Ball material is made of tungsten carbide.
- BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.
- Arm clocking feature uses standard Vektek arms.
- Same mounting envelope as Standard VektorFlo® Swing Clamps.

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

Clamp Time and Fluid Flow Rates for TuffCam™ Swing Clamps

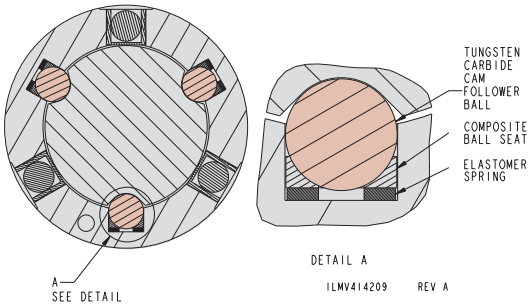
TuffCam™ Swing Clamp Capacity (kN)	Standard Arm		Extended Arm	
	Fastest Allowable Clamp Time (sec.)	Maximum Permissible Flow Rate (cm^3/min)	Fastest Allowable ClampTime (sec.)	Maximum Permissible Flow Rate (cm^3/min)
2	0.2	276	0.5	110
5	0.3	764	0.7	327
11	0.4	1785	0.8	893
Low Profile TuffCam™				
22	0.5	2544	1.0	1272
33	0.5	4116	1.0	2058

ILMV150203 REV E

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

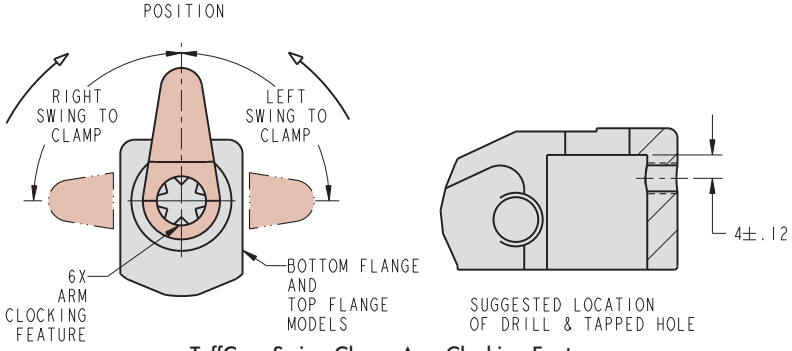
The above flows are maximum recommendations and clamp times are minimum recommendations.

- 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™

* Improved clamp breakaway
* Increased cam life
* Enhanced cam/track contact



TuffCam Swing Clamp Arm Clocking Feature

Drill points shown in the clamped position

Six Arm Clocking features equally spaced 60° apart

ILMV414207 REV D

TuffCam™ Swing Clamps

Top Flange Swing Clamp

Single And Double Acting

- Three cams for accurate arm positioning, smoother rotation and lower per cam surface contact pressure.
- Patented ball seat for improved rotary function, cam follower contact, and reduced dynamic and static friction.
- See page C-2 for flow rate limits and time calculations needed to avoid cylinder damage and preserve warranty.
- Fluorocarbon wipers are standard for improved coolant compatibility.
- Tungsten Carbide ball material for strength and wear.
- Same mounting envelope as standard VektorFlo® Metric Swing Clamps.
- TuffCam™ Clocking feature (page C-2) uses standard length Vektek arm.
- Arms sold separately – see section O.
- Top flange TuffCam™ swing clamps can be either manifold mounted or standard plumbed.

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

ILMV41460I REV C

Specifications

Model No.	Swing Direction	Cylinder Capacity* (kN)	Vertical Clamp Stroke ** (mm)	Total Stroke (Swing + Vertical) (mm)	Piston Area (cm^2) Retract	Oil Capacity*** (cm^3) Extend	Oil Capacity*** (cm^3) Retract	Optional Flow Control Model No.
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.								
41-4602-11 41-4602-12	Right Left	2	5.5	14	0.63	N/A	0.92	47-0203-71
41-4605-11 41-4605-12	Right Left	4.9	8	20	1.90	N/A	3.82	47-0203-71
41-4611-11 41-4611-12	Right Left	11.6	13	29.5	4.04	N/A	11.9	47-0203-74
Double Acting (D/A) Cylinders, actuated hydraulically both directions.								
41-4602-21 41-4602-22	Right Left	2	5.5	14	0.63	2.3	0.92	47-0203-71
41-4605-21 41-4605-22	Right Left	4.9	8	20	1,.90	7.8	3.82	47-0203-71
41-4611-21 41-4611-22	Right Left	11.6	13	29.5	4.04	23	11.9	47-0203-74

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

* Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 52 bar (5.2 MPa) for single acting, 35 bar (3.5 MPa) 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 350, and multiply the resultant number times 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.)

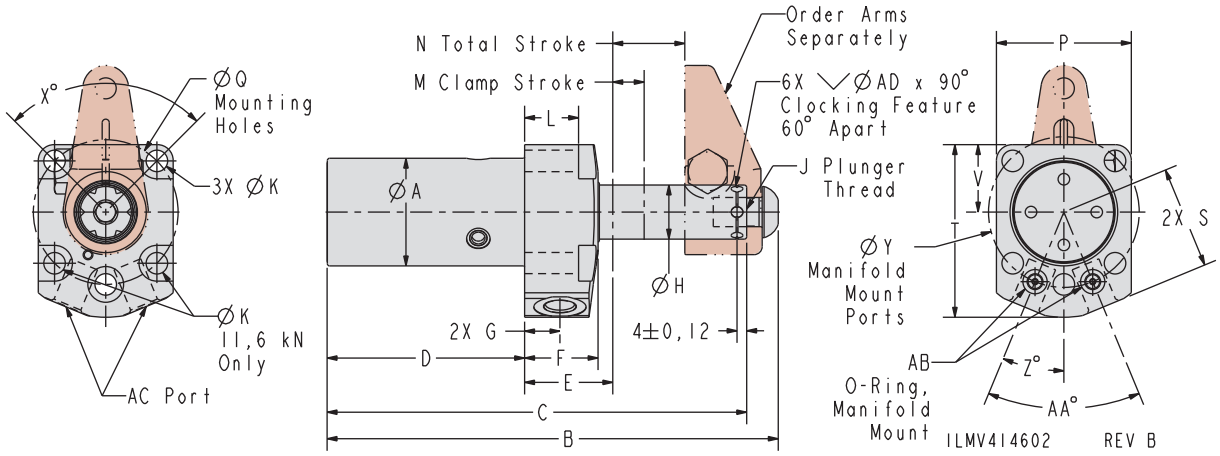
** To allow for workpiece height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

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

VEKTEK®

TuffCam™ Swing Clamps

Top Flange Swing Clamp



Dimensions

Model No.	ØA	B	C	D	E	F	G	ØH	J	ØK	L	M	N	P	ØQ	S	T	V
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.																		
41-4602-11 41-4602-12	25	108	101.5	44	31	26	13	11.13	M6 x 1 Depth 7	6	18	5.5	14	45	40	31	47	15.5
41-4605-11 41-4605-12	36	143	134	64.5	31.5	27	13	15.88	M10 x 1.5 Depth 12	7	17.8	8	20	57	50	33.5	54	19
41-4611-11 41-4611-12	44	185	172	81	36	30	14.5	22.23	M12 x 1.75 Depth 13	9	22.1	13	29.5	55.5	59.5	42	71	27.5
Double Acting (D/A) Cylinders, actuated hydraulically both directions.																		
41-4602-21 41-4602-22	25	108	101.5	44	31	26	13	11.13	M6 x 1 Depth 7	6	18	5.5	14	45	40	31	47	15.5
41-4605-21 41-4605-22	36	143	134	64.5	31.5	27	13	15.88	M10 x 1.5 Depth 12	7	17.8	8	20	57	50	33.5	54	19
41-4611-21 41-4611-22	44	185	172	81	36	30	14.5	22.23	M12 x 1.75 Depth 13	9	22.1	13	29.5	55.5	59.5	42	71	27.5

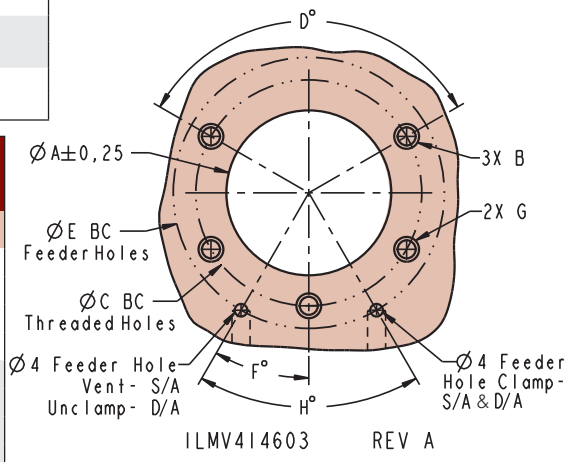
Model No.	X°	ØY	Z°	AA°	AB O-ring	AC	AD
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.							
41-4602-11 41-4602-12	120	42	30	60	Ø7.65 x 1.78	G1/8	3.2
41-4605-11 41-4605-12	120	50	55	110	Ø7.65 x 1.78	G1/8	4.8
41-4611-11 41-4611-12	90	62	22.5	45	Ø6.0 x 2.0	G1/4	4.8
Double Acting (D/A) Cylinders, actuated hydraulically both directions.							
41-4602-21 41-4602-22	120	42	30	60	Ø7.65 x 1.78	G1/8	3.2
41-4605-21 41-4605-22	120	50	55	110	Ø7.65 x 1.78	G1/8	4.8
41-4611-21 41-4611-22	90	62	22.5	45	Ø6.0 x 2.0	G1/4	4.8

For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

Mounting Dimensions

TuffCam™ Top Flange Swing Clamps

Model No	ØA	B	ØC	D°	ØE	F°	G	H°
41-4602-11 41-4602-12 41-4602-21 41-4602-22	25.5	M5	40	120	42	30	N/A	60
41-4605-11 41-4605-12 41-4605-21 41-4605-22	36.5	M6	50	120	50	55	N/A	110
41-4611-11 41-4611-12 41-4611-21 41-4611-22	44.5	M8	59.4	90	62	22.5	M8	45



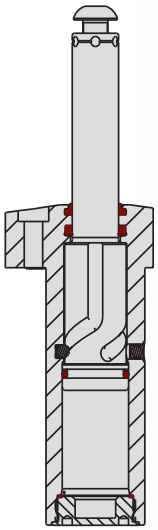
TuffCam™ Swing Clamps

Top Flange Long Stroke Swing Clamp

Double Acting Long Stroke

- Long Stroke Swing Clamps are available in 4.9 kN and 11.6 kN 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
- See page C-2 for flow rate limits and time calculations needed to avoid cylinder damage and preserve warranty.
- Fluorocarbon wipers are standard for improved coolant compatibility.
- Tungsten Carbide ball material for strength and wear.
- Same mounting envelope as standard VektorFlo®Metric Swing Clamps.
- TuffCam™ Clocking feature (page C-2) uses standard length Vektek arm.
- Arms sold separately – see section O.
- Top flange TuffCam™ swing clamps can be either manifold mounted or standard plumbed.

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



_MV414604 REV B

Specifications

Model No.	Swing Direction	Cylinder Capacity* (kN)	Vertical Clamp Stroke ** (mm)	Total Stroke (Swing + Vertical) (mm)	Piston Area (cm^2) Retract	Oil Capacity*** (cm^3) Extend	Oil Capacity*** (cm^3) Retract	Optional Flow Control Model No.
Double Acting (D/A) Cylinders, actuated hydraulically both directions.								
41-4605-23 41-4605-24	Right Left	4.9	19	31	1.90	11.96	5.90	47-0203-71
41-4611-23 41-4611-24	Right Left	11.6	34	51	4.04	40.15	20.48	47-0203-74

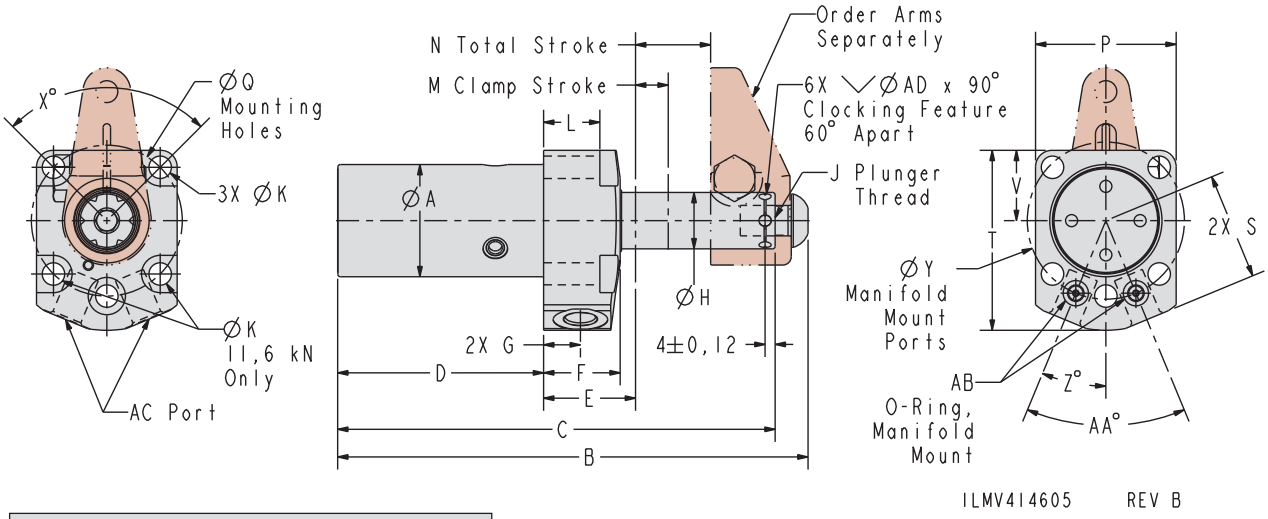
WARNING! Never allow swing arm to contact workpiece or fixture during arm rotation.

* Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 52 bar (5.2 MPa) for single acting, 35 bar (3.5 MPa) 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 350, and multiply the resultant number times 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 workpiece height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

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

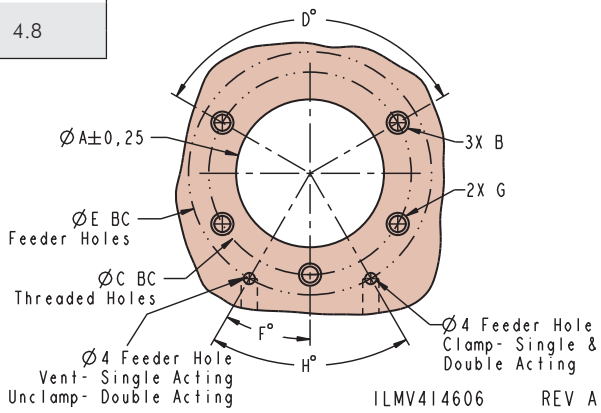
Top Flange Long Stroke Swing Clamp



For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

Dimensions																		
Model No.	ØA	B	C	D	E	F	G	ØH	J	ØK	L	M	N	P	ØQ	S	T	V
Double Acting (D/A) Cylinders, actuated hydraulically both directions.																		
41-4605-23 41-4605-24	36	177	167	86.5	31.5	27	13	15.88	M10 x 1.5 Depth 12	7	19	19	31	57	50	33.5	54	19
41-4611-23 41-4611-24	47	249	236	123.5	36	30	14.5	22.23	M12 x 1.75 Depth 13	9	22.1	34	51	55.5	59.5	42	71	27.5

Model No.	X°	ØY	Z°	AA°	AB O-ring	AC	AD
Double Acting (D/A) Cylinders, actuated hydraulically both directions.							
41-4605-23 41-4605-24	120	50	55	110	Ø7.65 x 1.78	G 1/8	4.8
41-4611-23 41-4611-24	90	62	22.5	45	Ø6.0 x 2.0	G 1/4	4.8



Mounting Dimensions TuffCam™ Top Flange Long Stroke Swing Clamps								
Model No	ØA	B	ØC	D°	ØE	F°	G	H°
41-4605-23 41-4605-24	36.5	M6	50	120	50	55	N/A	110
41-4611-23 41-4611-24	47.7	M8	59.4	90	62	22.5	M8	45

TuffCam™ Swing Clamps

Bottom Flange Swing Clamp

Single and Double Acting

- Bottom flange Swing Clamps are available in 2 kN, 4.9 kN and 11.6 kN capacities.
- 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
- See page C-2 for flow rate limits and time calculations needed to avoid cylinder damage and preserve warranty.
- Fluorocarbon wipers are standard for improved coolant compatibility.
- Tungsten Carbide ball material for strength and wear.
- Same mounting envelope as standard VektorFlo®Metric Swing Clamps.
- TuffCam™ Clocking feature (page C-2) uses standard length Vektek arm.
- Arms sold separately – see section O.
- Bottom flange TuffCam™ swing clamps can be either manifold mounted or standard plumbed.

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

ILMV414201 REV B

Specifications

Model No.	Swing Direction	Cylinder Capacity* (kN)	Vertical Clamp Stroke ** (mm)	Total Stroke (Swing + Vertical) (mm)	Piston Area (cm^2) Retract	Oil Capacity*** (cm^3) Extend	Oil Capacity*** (cm^3) Retract	Optional Flow Control Model No.
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.								
41-4202-11 41-4202-12	Right Left	2	5.5	14	0.63	N/A	0.92	47-0203-71
41-4205-11 41-4205-12	Right Left	4.9	8	20	1.90	N/A	3.82	47-0203-71
41-4211-11 41-4211-12	Right Left	11.6	13	29.5	4.04	N/A	11.9	47-0203-74
Double Acting (D/A) Cylinders, actuated hydraulically both directions.								
41-4202-21 41-4202-22	Right Left	2	5.5	14	0.63	2.3	0.92	47-0203-71
41-4205-21 41-4205-22	Right Left	4.9	8	20	1.90	7.8	3.82	47-0203-71
41-4211-21 41-4211-22	Right Left	11.6	13	29.5	4.04	23	11.9	47-0203-74

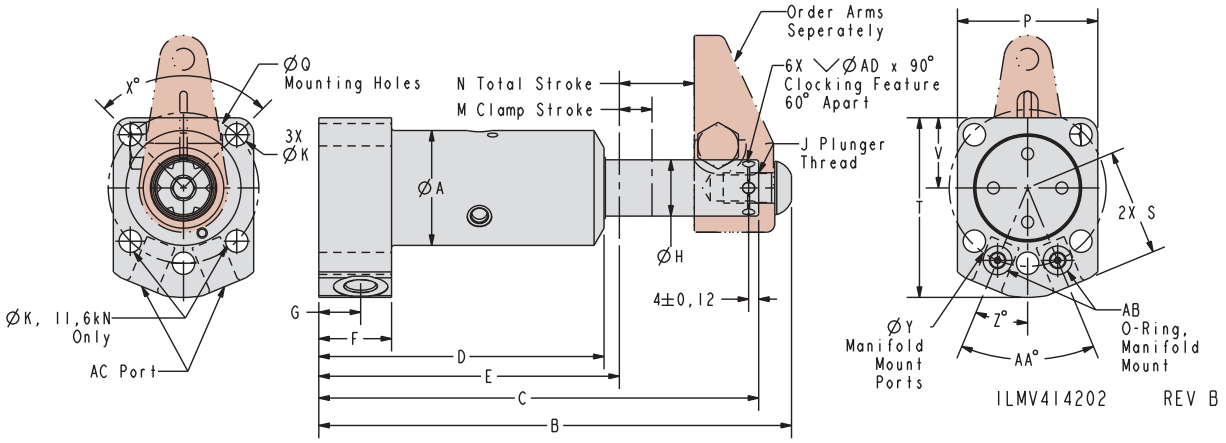
WARNING! Never allow swing arm to contact workpiece or fixture during arm rotation.

* Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 52 bar (5.2 MPa) for single acting, 35 bar (3.5 MPa) 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 350, and multiply the resultant number times 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 workpiece height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

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

Bottom Flange Swing Clamp



Dimensions

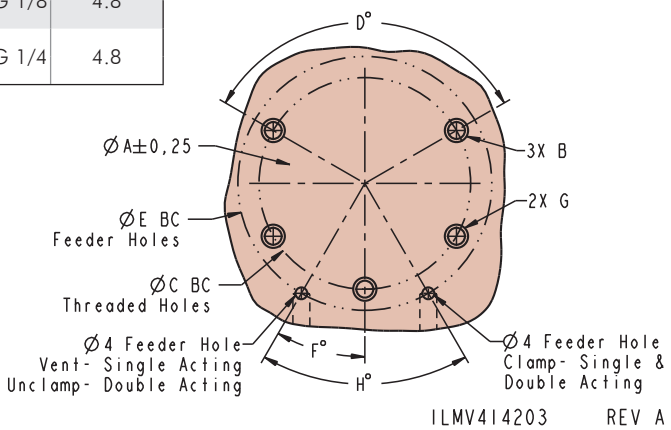
Model No.	ØA	B	C	D	E	F	G	ØH	J	ØK	M	N	P	ØQ	S	T	V
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.																	
41-4202-11 41-4202-12	26.5	109.5	103	71	76	26.5	13.5	11.13	M6 x 1 Depth 7	6	5.5	14	45	40	31	47	15.5
41-4205-11 41-4205-12	38	145	135.5	92.5	97.5	25	15	15.88	M10 x 1.5 Depth 12	7	8	20	57	50	33.5	54	19
41-4211-11 41-4211-12	45.5	186.5	173.5	112.5	118.5	28.5	16.5	22.23	M12 x 1.75 Depth 13	9	13	29.5	55	59.4	42	71	27.5
Double Acting (D/A) Cylinders, actuated hydraulically both directions.																	
41-4202-21 41-4202-22	26.5	109.5	103	71	76	26.5	13.5	11.13	M6 x 1 Depth 7	6	5.5	14	45	40	31	47	15.5
41-4205-21 41-4205-22	38	145	135.5	92.5	97.5	25	15	15.88	M10 x 1.5 Depth 12	7	8	20	57	50	33.5	54	19
41-4211-21 41-4211-22	45.5	186.5	173.5	112.5	118.5	28.5	16.5	22.23	M12 x 1.75 Depth 13	9	13	29.5	55	59.4	42	71	27.5

Model No.	X°	ØY	Z°	AA°	AB O-ring	AC	AD
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.							
41-4202-11 41-4202-12	120	42	30	60	Ø7.65 x 1.78	G 1/8	3.2
41-4205-11 41-4205-12	120	50	55	110	Ø7.65 x 1.78	G 1/8	4.8
41-4211-11 41-4211-12	90	62	22.5	45	Ø7.65 x 1.78	G 1/4	4.8
Double Acting (D/A) Cylinders, actuated hydraulically both directions.							
41-4202-21 41-4202-22	120	42	30	60	Ø7.65 x 1.78	G 1/8	3.2
41-4205-21 41-4205-22	120	50	55	110	Ø7.65 x 1.78	G 1/8	4.8
41-4211-21 41-4211-22	90	62	22.5	45	Ø7.65 x 1.78	G 1/4	4.8

For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

Mounting Dimensions
TuffCam™ Bottom Flange Swing Clamps

Model No	B	ØC	D°	ØE	F°	G	H°
41-4202-11 41-4202-12 41-4202-21 41-4202-22	M5	40	120	42	30	N/A	60
41-4205-11 41-4205-12 41-4205-21 41-4205-22	M6	50	120	50	55	N/A	110
41-4211-11 41-4211-12 41-4211-21 41-4211-22	M8	59.4	90	62	22.5	M8	45



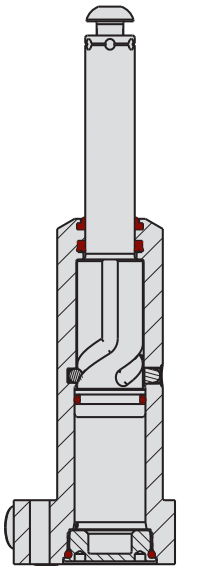
TuffCam™ Swing Clamps

Bottom Flange Long Stroke

Double Acting Long Stroke

- Long Stroke Swing Clamps are available in 4.9 kN and 11.6 kN 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
- See page C-2 for flow rate limits and time calculations needed to avoid cylinder damage and preserve warranty.
- Fluorocarbon wipers are standard for improved coolant compatibility.
- Tungsten Carbide ball material for strength and wear.
- Same mounting envelope as standard VektorFlo®Metric Swing Clamps.
- TuffCam™ Clocking feature (page C-2) uses standard length Vektek arm.
- Arms sold separately – see section O.
- Bottomflange TuffCam™ swing clamps can be either manifold mounted or standard plumbed.

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



ILMV414204 REV B

Specifications

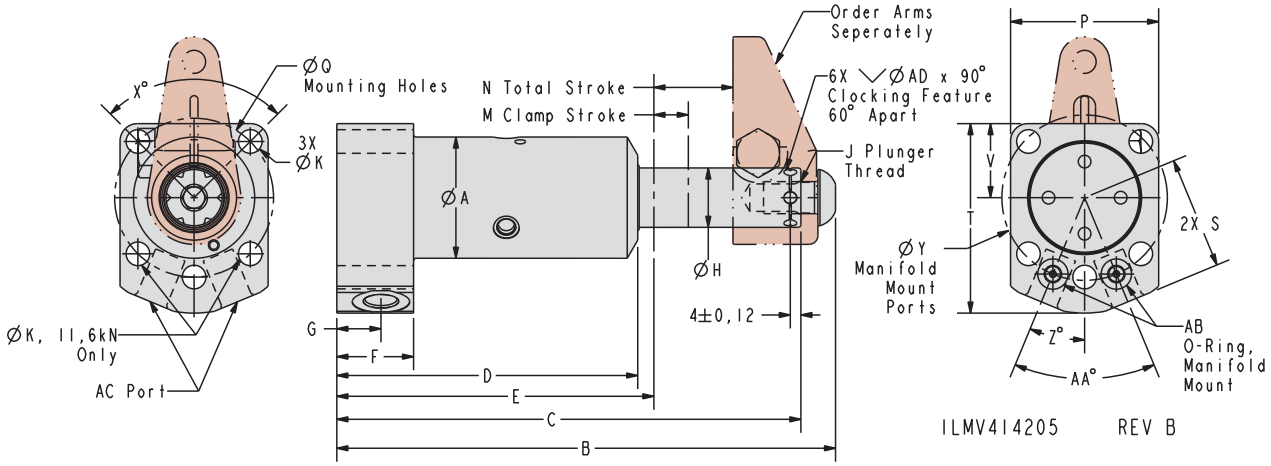
Model No.	Swing Direction	Cylinder Capacity* (kN)	Vertical Clamp Stroke ** (mm)	Total Stroke (Swing + Vertical) (mm)	Piston Area (cm^2) Retract	Oil Capacity*** (cm^3) Extend	Oil Capacity*** (cm^3) Retract	Optional Flow Control Model No.
Double Acting (D/A) Cylinders, actuated hydraulically both directions.								
41-4205-23 41-4205-24	Right Left	4.9	19	31	1.9	11.96	5.9	47-0203-71
41-4211-23 41-4211-24	Right Left	11.6	34	51	4.04	40.15	20.48	47-0203-74

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

* Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 52 bar (5.2 MPa) for single acting, 35 bar (3.5 MPa) 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 350, and multiply the resultant number times 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 workpiece height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

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



For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

Dimensions

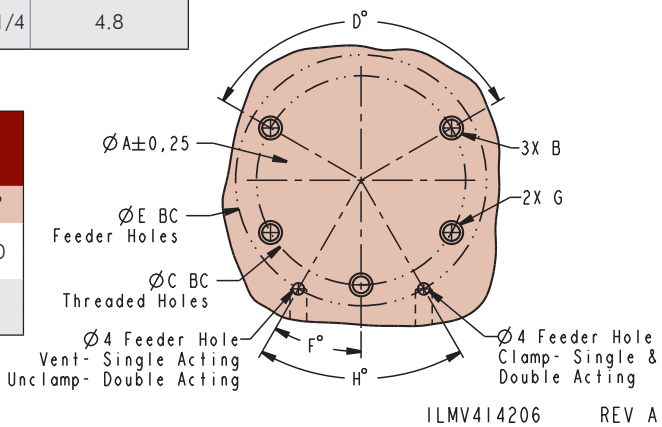
Model No.	ØA	B	C	D	E	F	G	ØH	J	ØK	M	N	P	ØQ	S	T	V
Double Acting (D/A) Cylinders, actuated hydraulically both directions.																	
41-4205-23 41-4205-24	38	178	168.5	115	119.5	25	15	15.88	M10 x 1.5 Depth 12	7	19	31	57	50	33.5	54	19
41-4211-23 41-4211-24	47.5	250	237	155	161	28.5	16.5	22.23	M12 x 1.75 Depth 13	9	34	51	58.5	63	42	72.5	29

Model No.	X°	ØY	Z°	AA°	AB O-ring	AC	AD
Double Acting (D/A) Cylinders, actuated hydraulically both directions.							
41-4205-23 41-4205-24	120	50	55	110	Ø7.65 x 1.78	G 1/8	4.8
41-4211-23 41-4211-24	90	62	22.5	45	Ø7.65 x 1.78	G 1/4	4.8

Mounting Dimensions TuffCam™

Bottom Flange Long Stroke Swing Clamps

Model No	B	ØC	D°	ØE	F°	G	H°
41-4205-23 41-4205-24	M6	50	120	50	55	N/A	110
41-4211-23 41-4211-24	M8	63	90	62	22.5	M8	45



TuffCam™ Swing Clamps

Low Profile Features

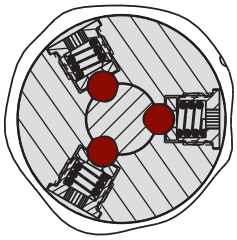
* Tougher Cams
* Stronger Single Acting Springs
* Precise Swing Angle
* Clocking

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 33 kN. These Low Profile TuffCam™ Swing clamps can position and clamp in one second or less, handle large arms with ease and include our Clocking feature. The clocking feature dramatically reduces the time it takes to change arms for maintenance, replacement or fixture setup.

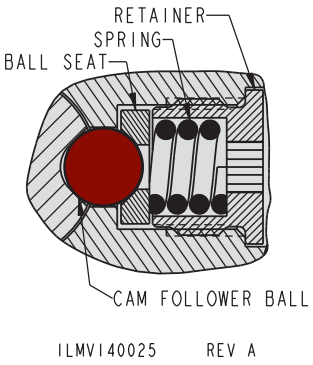
One of the keys to this TuffCam™ innovation is the patented Cam Follower Ball Seat that was developed to improve strength and wear. Using the Vektek V-Groove technology, a tungsten carbide ball, and a stainless steel spring, these clamps have reduced static friction for improved clamp breakaway and extended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

- Available in these body styles:
  - Top Flange
  - Top Flange Long Stroke (Double Acting Only)
  - Bottom Flange
  - Bottom Flange Long Stroke (Double Acting Only)
- Single and double acting models available. The Single Acting models have increased spring forces for positive return in higher back pressure 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 friction.
- Increased cam groove contact force provided by stainless steel spring.
- Ball material of Tungsten carbide, one of the world's hardest materials.



ILMV140025 REV A

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

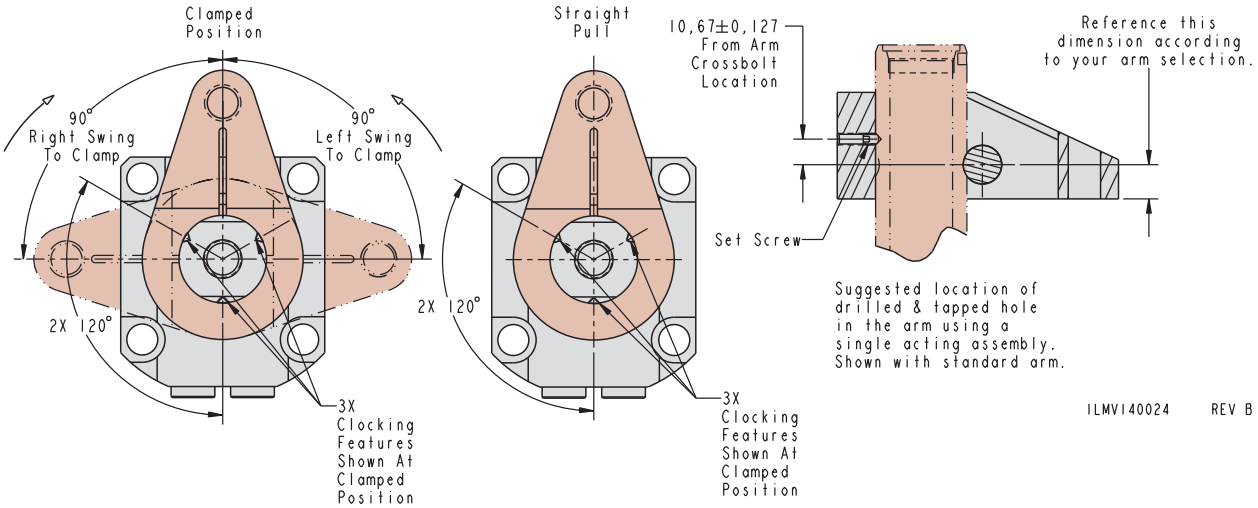
*TuffCam™ is a trademark of Vektek, Inc.

TuffCam™ Low Profile Clocking Feature

We have added 3 clocking features to Vektek's Low Profile swing clamps. 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



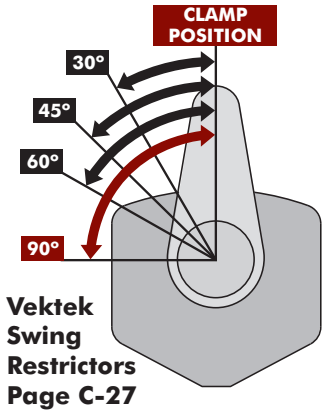
TuffCam™ Low Profile Swing Clamp Arm Clocking Feature

Views shown apply to Double and Single Acting TuffCam Top and Bottom Flange models.

- Three counter sunk Ø 4.8 x 90° clocking feature drill points are shown in the clamped position.
- The three clocking features are equally spaced 120° apart.

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 product will be 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°.



Vektek Swing Restrictors Page C-27

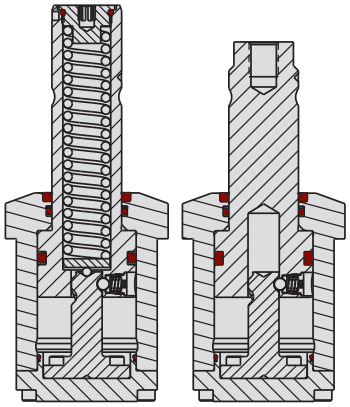
TuffCam™ Swing Clamps

Low Profile, Top Flange Specifications

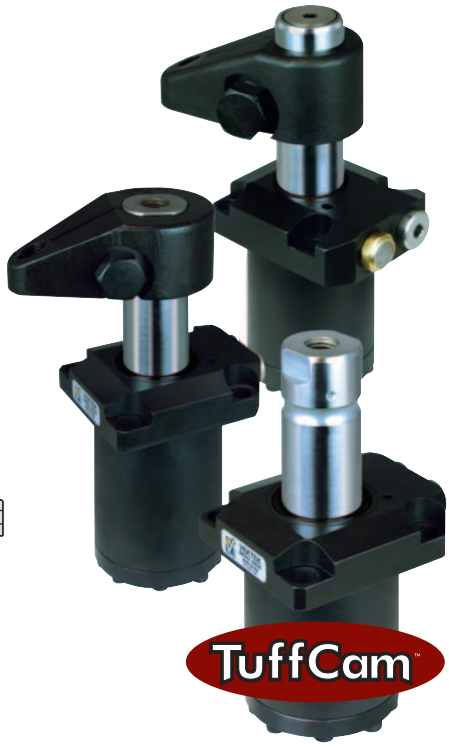
Single And Double Acting

22 kN and 33 kN

- Three cams and three cam balls guide the rotation of the plunger and provide greater guide, support and directional stability.
- Ideal for applications where speed is essential or massive arms are required.
- Low profile swing clamp arm details are found on pages O-8 through O-10. Order Arms Separately.
- See page C-2 regarding flow rate limits and time calculations needed to avoid cylinder damage.
- TuffCam™ Clocking drawing is on , page C-12. This feature uses standard length Vektek Arms.



ILMV140020 REV B



Specifications

Model No.	Swing Direction	Cylinder Capacity* (kN) Extend	Cylinder Capacity* (kN) Retract	Vertical Clamp Stroke ** (mm)	Total Stroke (Swing + Vertical) (mm)	Piston Area (cm^2) Extend	Piston Area (cm^2) Retract	Oil Capacity*** (cm^3) Extend	Oil Capacity*** (cm^3) Retract	Weight (g)	Optional Flow Control Model No.
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.											
41-4622-11	Right			14.5							
41-4622-12	Left	N/A	22	14.5	28	N/A	7.6	N/A	21.2	2550	47-0203-74
41-4622-15	Straight			28							
41-4633-11	Right			16							
41-4633-12	Left	N/A	33	16	30	N/A	11.4	N/A	34.3	3992	47-0203-74
41-4633-15	Straight			30							
Double Acting (D/A) Cylinders, actuated hydraulically both directions.											
41-4622-21	Right			14.5							
41-4622-22	Left	54	22	14.5	28	15.5	7.6	43.3	21.2	2590	47-0203-74
41-4622-15	Straight			28							
41-4633-21	Right			16							
41-4633-22	Left	80	33	16	30	22.8	11.4	68.4	34.3	4355	47-0203-74
41-4633-25	Straight			30							
Double Acting (D/A) Long Stroke Cylinders, actuated hydraulically both directions.											
41-4622-23	Right	54	22	32	45.5	15.5	7.6	71.3	34.9	2948	47-0203-74
41-4622-24	Left										
41-4633-23	Right	80	33	32	46	22.8	11.4	105	52.6	4881	47-0203-74
41-4633-24	Left										

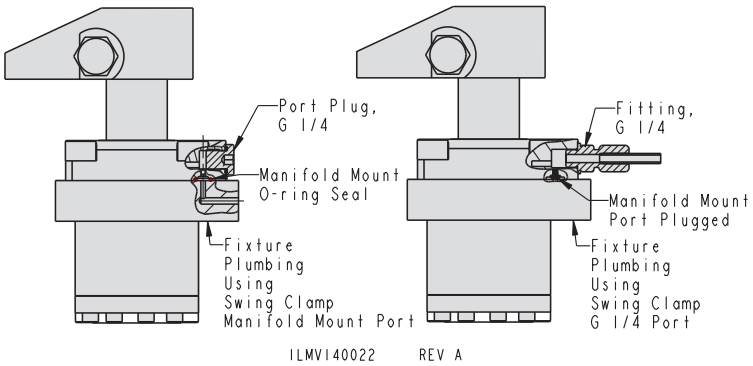
WARNING!: Never allow swing arm to contact workpiece or fixture during rotation.

* Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure with standard length VektorFlo arm installed. Minimum operating pressure is 52 bar (5.2 MPa) for single acting cylinders and 35 bar (3.5 MPa) for double acting cylinders. The clamping force is adjustable by varying the system hydraulic pressure. To determine the approximate output force for your application, divide the cylinder capacity by 350 (35 MPa), and multiply the resultant number by Your System Operating HydraulicPressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return spring forces.)

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

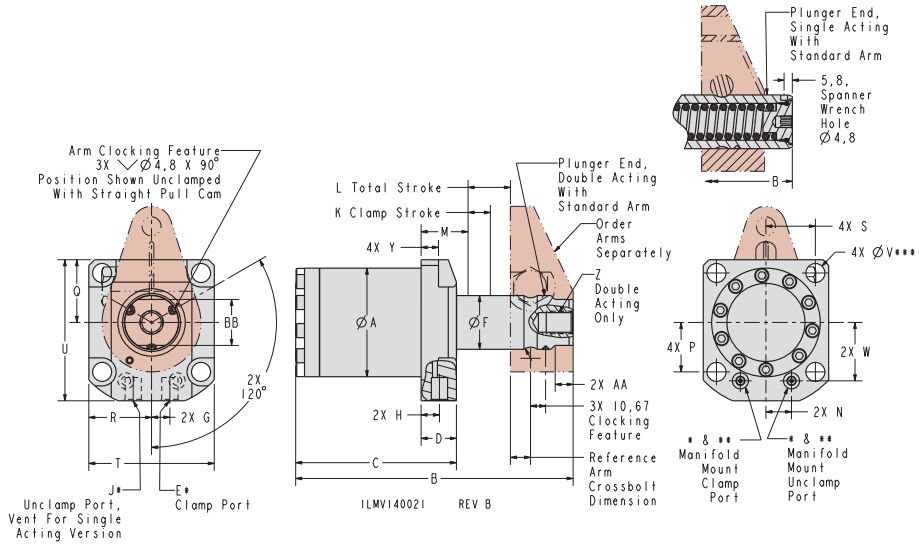
*** To insure maximum service life and trouble-free operation, restrict fluid flow according to the "Clamp Time and Fluid Flow Rates per table on page C-2

NOTE: Follow arm length limitations on page O-3



ILMV140022 REV A

Low Profile, Top Flange



For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

Dimensions

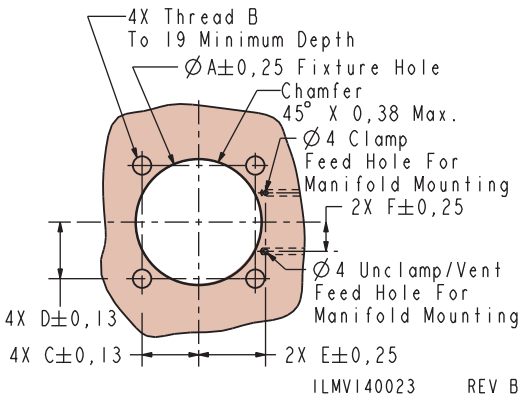
Model No.	A	B	C	D	E*	F	G	H	J*	K	L	M	N	P	Q	R	S	T
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.																		
41-4622-11 41-4622-12 41-4622-15	62.8	196	104.5	25	G1/4	31.74	13	13	Breather	14.5	28	33.5	14.5	27.4	35.5	35.5	27.4	71
41-4633-11 41-4633-12 41-4633-15	77	216.5	114	25	G1/4	38.09	13	13	Breather	16	30	33.5	18.1	35.1	44.5	44.5	35.1	89
Double Acting (D/A) Cylinders, actuated hydraulically both directions.																		
41-4622-21 41-4622-22 41-4622-25	62.8	185.5	104.5	25	G1/4	31.74	13	13	G1/4	14.5	28	33.5	14.5	27.4	35.5	35.5	27.4	71
41-4633-21 41-4633-22 41-4633-25	77	196.5	114	25	G1/4	38.09	13	13	G1/4	16	30	33.5	18.1	35.1	44.5	44.5	35.1	89
Double Acting (D/A) Long Stroke Cylinders, actuated hydraulically both directions.																		
41-4622-23 41-4622-24	62.8	220.5	122	25	G1/4	31.74	13	13	G1/4	32	45.5	33	14.5	27.4	35.5	35.5	27.4	71
41-4633-23 41-4633-24	77	228.5	130	25	G1/4	38.09	13	13	G1/4	32	46	33.5	18.1	35.1	44.5	44.5	35.1	89

Model No.	U	V***	W	Y	Z	AA	BB	CC***
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.								
41-4622-11 41-4622-12 41-4622-15	85.5	10.7	35.1	13	N/A	N/A	N/A	M10 x 25
41-4633-11 41-4633-12 41-4633-15	100	13.5	41.4	12.5	N/A	N/A	N/A	M12 x 25
Double Acting (D/A) Cylinders, actuated hydraulically both directions.								
41-4622-21 41-4622-22 41-4622-25	85.5	10.7	35.1	13	M16 x 2.0 Depth 19	12.5	26.5	M10 x 25
41-4633-21 41-4633-22 41-4633-25	100	13.5	41.4	12.5	M16 x 2.0 Depth 19	12.5	32.5	M12 x 25
Double Acting (D/A) Long Stroke , actuated hydraulically both directions.								
41-4622-23 41-4622-24	85.5	10.7	35.1	13	M16 x 2.0 Depth 19	12.5	26.5	M10 x 25
41-4633-23 41-4633-24	100	13.5	41.4	12.5	M16 x 2.0 Depth 19	12.5	32.5	M12 x 25

* All ports (except breather) are shipped with a removable steel plug installed

** Counter bores for Ø7/16 x 1/16 (2-011) O-ring face seals provided

*** When used as manifold mounted, all (4) mounting bolts must be used to assure proper O-ring face sealing. The recommended bolt listed in column CC.



Mounting Dimension
Low ProfileTop Flange Swing Clamps

Model No	A	B	C	D	E	F
41-4622-XX	63.4	M10	27.4	27.4	35.1	14.5
41-4633-XX	77.6	M12	35.1	35.1	41.4	18.1

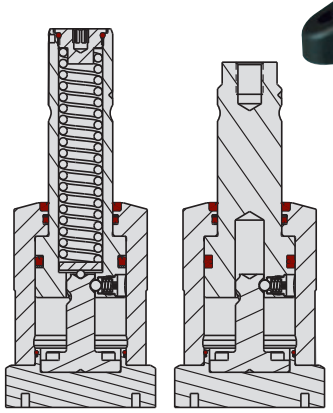
TuffCam™ Swing Clamps

Low Profile, Bottom Flange Specifications

Single And Double Acting

22 kN and 33 kN

- Three cams and three cam balls guide the rotation of the plunger and provide greater guide, support and directional stability.
- Ideal for applications where speed is essential or massive arms are required.
- High clamp force capacity in compact package.
- Manifold mounting capability and porting.
- Low profile swing clamp arm details are found on pages O-8 through O-10. Order Arms Separately.
- See page C-2 regarding flow rate limits and time calculations needed to avoid cylinder damage and preserve warranty.
- TuffCam™ Clocking drawing is on , page C-12. This feature uses standard length Vektek Arms.



ILMVI42020 REV B

Specifications

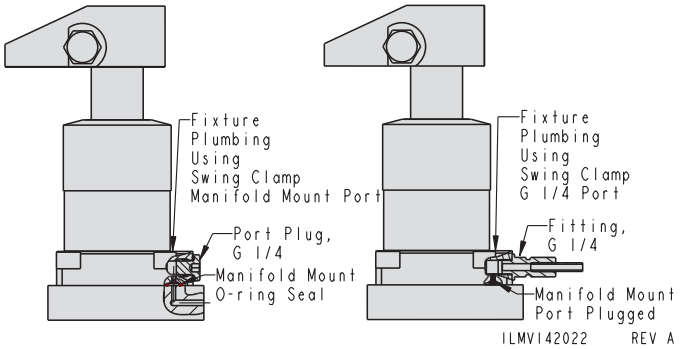
Model No.	Swing Direction	Cylinder Capacity* (kN)		Vertical Clamp Stroke ** (mm)	Total Stroke (Swing + Vertical) (mm)	Effective Piston Area (cm²)		Oil Capacity*** (cm³)		Weight (g)	Optional Flow Control Model No.
		Extend	Retract			Extend	Retract	Extend	Retract		
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.											
41-4222-11	Right			14.5							
41-4222-12	Left	N/A	22	14.5	28	N/A	7.6	N/A	21.2	3030	47-0203-74
41-4222-15	Straight			28							
41-4233-11	Right			16							
41-4233-12	Left	N/A	33	16	30	N/A	11.4	N/A	34.3	4854	47-0203-74
41-4233-15	Straight			30							
Double Acting (D/A) Cylinders, actuated hydraulically both directions.											
41-4222-21	Right			14.5							
41-4222-22	Left	54	22	14.5	28	15.5	7.6	43.3	21.2	3070	47-0203-74
41-4222-25	Straight			28							
41-4233-21	Right			16							
41-4233-22	Left	80	33	16	30	22.8	11.4	68.4	34.3	4854	47-0203-74
41-4233-25	Straight			30							

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

* Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure with standard length VektorFlo arm installed. Minimum operating pressure is 52 bar (5.2 MPa) for single acting cylinders and 35 bar (3.5 MPa) for double acting cylinders. The clamping force is adjustable by varying the system hydraulic pressure. To determine the approximate output force for your application, divide the cylinder capacity by 350 (35 MPa), and multiply the resultant number by Your System Operating Hydraulic 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 spring forces.)

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

*** To insure maximum service life and trouble-free operation, restrict fluid flow according to the "Clamp Time and Fluid Flow Rates per table on page C-2

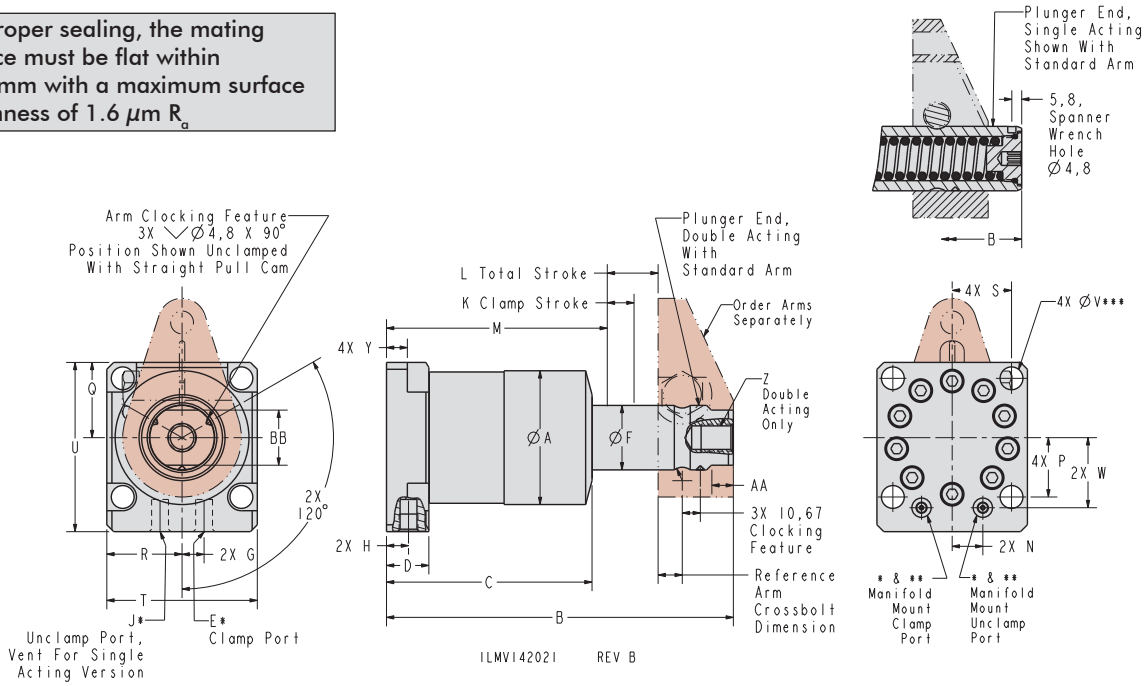


ILMVI42022 REV A

NOTE: Follow arm length limitations on page O-3

Low Profile, Bottom Flange Dimensions

For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a



Dimensions

Model No.	A	B	C	D	E*	F	G	H	J*	K	L	M	N	P	Q	R	S	T
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.																		
41-4222-11 41-4222-12 41-4222-15	62.8	204	112	25	G1/4	31.74	13	12.5	Breather	14.5	28	121	14.5	27.4	35.5	35.5	27.4	71
41-4233-11 41-4233-12 41-4233-15	79	224.5	121.5	25	G1/4	38.09	13	13	Breather	16	30	130.5	18.1	35.1	44.5	44.5	35.1	89
Double Acting (D/A) Cylinders, actuated hydraulically both directions.																		
41-4222-21 41-4222-22 41-4222-25	62.8	194	112	25	G1/4	31.74	13	12.5	G1/4	14.5	28	121	14.5	27.4	35.5	35.5	27.4	71
41-4233-21 41-4233-22 41-4233-25	79	205	121.5	25	G1/4	38.09	13	13	G1/4	16	30	130.5	18.1	35.1	44.5	44.5	35.1	89

Model No.	U	V***	W	Y	Z	AA	BB	CC***
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.								
41-4222-11 41-4222-12 41-4222-15	85.5	10.7	35.1	13	N/A	N/A	N/A	M10 x 25
41-4233-11 41-4233-12 41-4233-15	100	13.5	41.4	12.5	N/A	N/A	N/A	M12 x 25
Double Acting (D/A) Cylinders, actuated hydraulically both directions.								
41-4222-21 41-4222-22 41-4222-25	85.5	10.7	35.1	13	M16 x 2.0 Depth 19	12.5	26.5	M10 x 25
41-4233-21 41-4233-22 41-4233-25	100	13.5	41.4	12.5	M16 x 2.0 Depth 19	12.5	32.5	M12 x 25

* All ports (except breather) are shipped with a removable steel plug installed

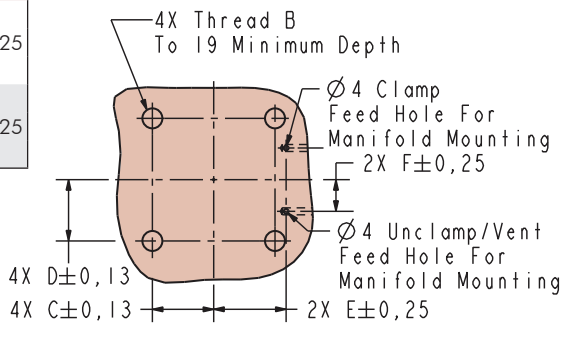
** Counter bores for Ø7/16 x 1/16 (2-011) O-ring face seals provided

*** When used as manifold mounted, all (4) mounting bolts must be used to assure proper O-ring face sealing. The ecommended bolt is listed in column CC.

Mounting Dimensions

Low Profile Bottom Flange Swing Clamps

Model No	B	C	D	E	F
41-4222-XX	M10	27.4	27.4	35.1	14.5
41-4233-XX	M12	35.1	35.1	41.4	18.1



ILMV142023 REV A

Frequently Asked Questions

Where and when should I use swing clamps?

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

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

Yes, swing clamps should not be used without fixed stops or hard locators into which the cutter force is transmitted. If swing clamps are oriented to hold vertically, horizontal cutter forces should be transmitted into solid stops that can easily absorb their energy. If forces are transmitted to swing clamps at 90° to the clamp action, all of the force is transmitted into the rotating mechanism. This may result in premature wear and early failure.

How do I size swing clamps?

First, calculate your cutter forces or climbing 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 200 bar to 275 bar (20 MPa - 27.5 MPa) 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?

The table on page C-18 lists clamp time and fluid flow rates for standard swing clamps. A good rule of thumb, , "If you see the clamp open, then see it closed, but don't see it move; it swung into position in less than 1/16th second. That is always too fast." Finally, ask yourself, "Can the operator put that extra fraction of a second to good use?" If the answer is no use, then slow the clamp down by adjusting the hydraulic pressure.

I am planning to exceed the flow rating of your clamps, but I will be using low pressure. 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. This action shortens the clamp life even at low pressures. We recommend not exceeding the maximum flow rates on page C-18.

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

Flow restrictions, excess fittings, long tubing runs and different springs can all cause swing clamps to actuate at varying times. Despite the appearance, they actually build to pressure at approximately the same time.

NOTE: Do not use this as a sequence valve.

My application calls for an arm about the size of a baseball bat weighing 6.4 kg. 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 table on page C-18.

I want to use a 2 kN swing clamp but need a 22 kN swing clamp arm for length. How do I fit this arm onto the clamp? What are my flow and pressure restrictions?

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

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 work support has built sufficient pressure to hold the potential clamp force and that they are properly sized. Sequencing is recommended only above 140 bar (14 MPa) using a Vektek sequence valve (other brands will not work). The recommended swing clamp to work support ratio is approximately 1:2 (5 kN swing clamp, 11 kN work support).

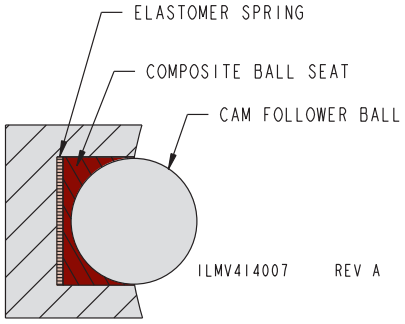
Standard Features

- Large ball and cam rotational mechanism assures the swing action.
- Standard models swing is 90° with swing angles of less than 90° readily available, see page C-27. 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.
- Special wipers and swept-line cylinder top helps keep chips from packing and coolant contaminants from entering the operation.
- Vent port with bronze filter gives the cylinder a place to "breathe" and it helps keep chips and coolants from drawing 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. This is especially true in the event of high side or "kick loads" which promote excessive scoring in many other brands. BHC™ gives a Rockwell 60C skin hardness.
- Chromed and hardened 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 B1

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 (please follow recommended flow rates for longest swing clamp life).
- Lasts longer and withstands operator induced "crashes" with less damage from improperly loaded parts.
- V-groove provides larger surface ball to cam contact area in the event of a crash.
- V-groove withstands swing interference better than other cam designs.
- Standard swing clamp models (pages C-19 to C-26) have hardened V-cam tracks that resist damage and give you a built in extra cam (opposite swing direction) or straight line option should you accidentally damage one.
- Vektek again changes the "state of the art" in ball and cam swing clamps making them work better at reasonable prices.



- Improved clamp break away
- Increased cam life
- Better cam track contact

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

Clamp Time and Fluid Flow Rates for Standard Swing Clamps

Swing Clamp Capacity (kN)	Standard Arm Fastest Allowable Clamp Time (sec)	Standard Arm Maximum Permissible Flow Rate (cm^3/min)	Extended Arm Fastest Allowable Clamp Time (sec)	Extended Arm Maximum Permissible Flow Rate (cm^3/min)
2	0.4	138	0.9	61
5	0.6	382	1.2	191
11	0.6	1190	1.4	510
22	0.7	1817	1.4	909

- 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.

ILMV150203 REV E

Standard Swing Clamps

Threaded Body Specifications

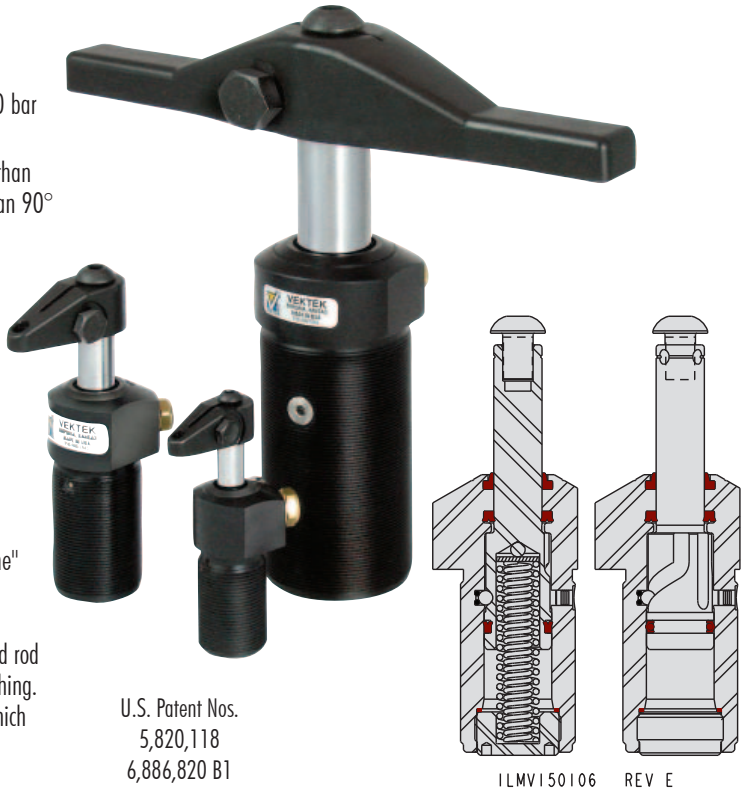
Single And Double Acting

- Available in four capacities from 2 kN to 11.6 kN at 350 bar (35 MPa).
- Standard models swing is 90° with swing angles of less than 90° readily available, see page C-27. Swings of more than 90° are special order products.
- See page C-18 for flow rate limits and time calculations needed to avoid cylinder damage and preserve warranty.
- Standard Arm Clocking feature, page C-27, uses standard length Vektek Arms.
- Arms sold separately – see Section O.

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

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

Exclusive BHC™ (Black Hard Coating) on the cylinder bodies and rod bearing surface helps prevent leaks caused by scoring and scratching. This is especially true 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 B1

ILMVI50106 REV E

Specifications

Model No.	Swing Direction	Cylinder Capacity* (kN)	Vertical Clamping Stroke** (mm)	Total Stroke (Swing + Vertical) (mm)	Body Thread	Effective Piston Area (cm^2) Retract	Oil Capacity*** (cm^3) Extend	Oil Capacity*** (cm^3) Retract
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.								
41-5002-11 41-5002-12 41-5002-15	Right Left Straight	2	6	14.5	M28 x 1.5	0.63	N/A	0.92
41-5005-11 41-5005-12 41-5005-15	Right Left Straight	4.9	8	20	M38 x 1.5	1.90	N/A	3.82
41-5011-11 41-5011-12 41-5011-15	Right Left Straight	11.6	13	29.5	M48 x 1.5	4.04	N/A	11.9
41-5022-11 41-5022-12 41-5022-15	Right Left Straight	22	16	42	M65 x 1.5	7.60	N/A	32
Double Acting (D/A) Cylinders, actuated hydraulically both directions.								
41-5002-21 41-5002-22 41-5002-25	Right Left Straight	2	6	14.5	M28 x 1.5	0.63	2.3	0.92
41-5005-21 41-5005-22 41-5005-25	Right Left Straight	4.9	8	20	M38 x 1.5	1.90	7.8	3.82
41-5011-21 41-5011-22 41-5011-25	Right Left Straight	11.6	13	29.5	M48 x 1.5	4.04	23	11.9
41-5022-21 41-5022-22 41-5022-25	Right Left Straight	22	16	42	M65 x 1.5	7.60	65.4	32

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

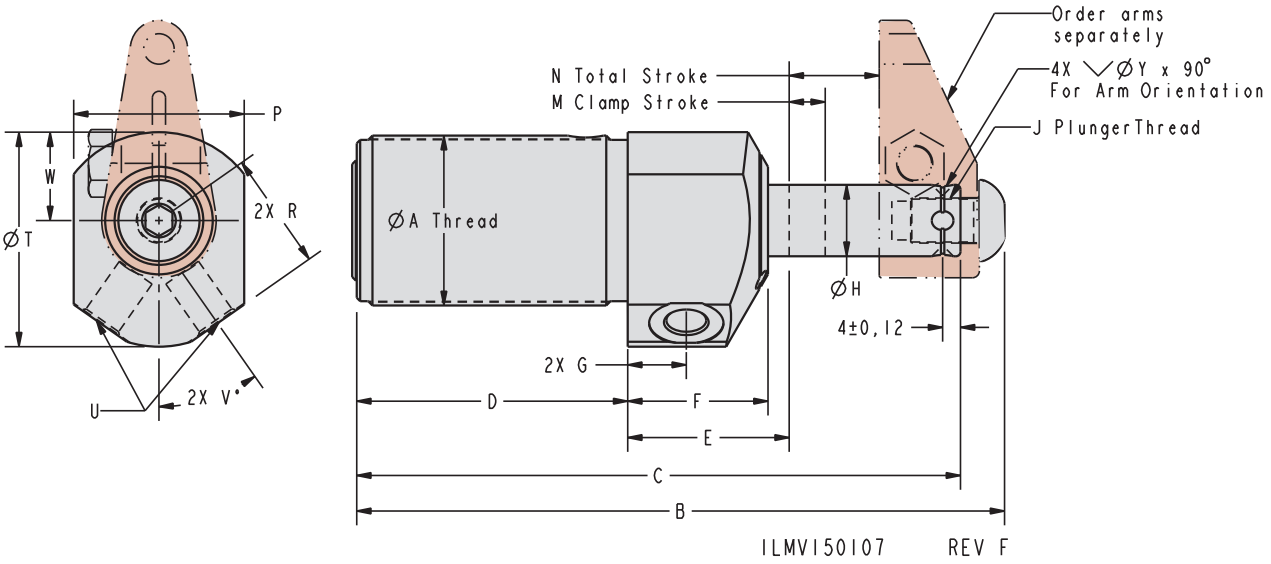
* Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 52 bar (5.2 MPa) for single acting, 35 bar (3.5 MPa) for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above by 350 (35), 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 workpiece 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.

Standard Swing Clamps

Threaded Body Dimensions



Dimensions																		
Model No.	ØA	B	C	D	E	F	G	ØH	J	M	N	P	R	ØT	U	V°	W	ØY
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.																		
41-5002-11 41-5002-12 41-5002-15	M28 x 1.5	108	102	44	30.5	25.5	13	11.13	M6 x 1 x 7	6	14.5	32	20.5	38	G 1/8	25°	14	3.2
41-5005-11 41-5005-12 41-5005-15	M38 x 1.5	143	134	60	36	31	13	15.88	M10 x 1.5 x 12	8	20	38	26	47.5	G 1/8	35°	19.5	4.8
41-5011-11 41-5011-12 41-5011-15	M48 x 1.5	185	172	79	38	32	13	22.23	M12 x 1.75 x 13	13	29.5	47.5	31.5	60	G 1/4	30°	25.5	4.8
41-5022-11 41-5022-12 41-5022-15	M65 x 1.5	252	236	115.5	42	34	13	31.71	M16 x 2 x 19	16	42	65	37	73	G 1/4	30°	33	4.8
Double Acting (D/A) Cylinders, actuated hydraulically both directions.																		
41-5002-21 41-5002-22 41-5002-25	M28 x 1.5	108	102	44	30.5	25.5	13	11.13	M6 x 1 x 7	6	14.5	32	20.5	38	G 1/8	25°	14	3.2
41-5005-21 41-5005-22 41-5005-25	M38 x 1.5	143	134	60	36	31	13	15.88	M10 x 1.5 x 12	8	20	38	26	47.5	G 1/8	35°	19.5	4.8
41-5011-21 41-5011-22 41-5011-25	M48 x 1.5	185	172	79	38	32	13	22.23	M12 x 1.75 x 13	13	29.5	47.5	31.5	60	G 1/4	30°	25.5	4.8
41-5022-21 41-5022-22 41-5022-25	M65 x 1.5	252	236	115.5	42	34	13	31.71	M16 x 2 x 19	16	42	65	37	73	G 1/4	30°	33	4.8

All dimensions are in mm.

NOTE: Follow arm length limitations on page O-3

Order Arms Separately

Standard Swing Clamps

Threaded Body, Long Stroke Specifications

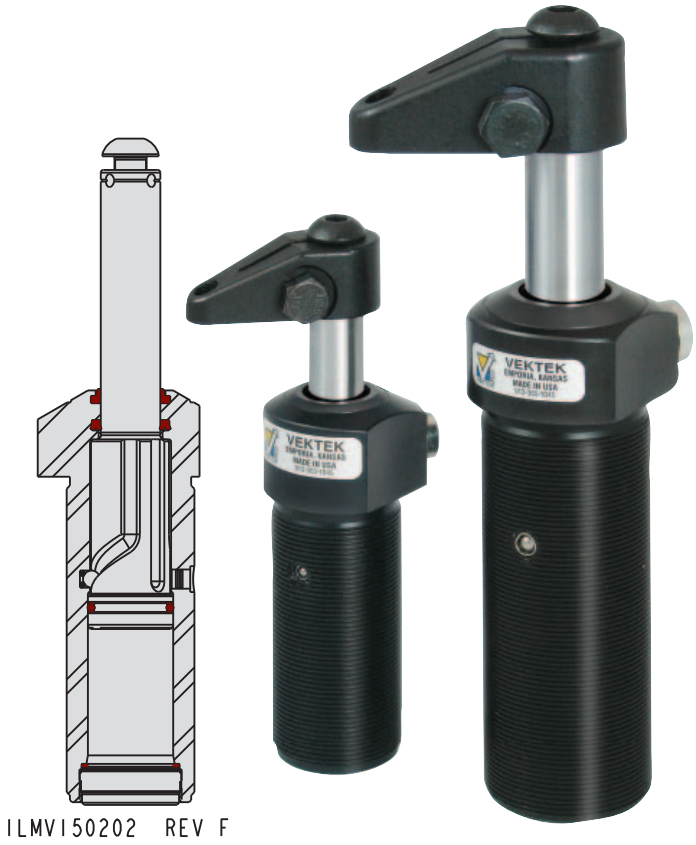
Double Acting

- Available in 4.9 kN and 11.6 kN at 350 bar (35 MPa).
- Standard models swing is 90° with swing angles of less than 90° readily available, see page C-27. Swings of more than 90° are special order products.
- See page C-18 for flow rate limits and time calculations needed to avoid cylinder damage and preserve warranty.
- Standard Arm Clocking feature, page C-27, uses standard length Vektek Arms.
- Arms sold separately – see Section O.

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

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

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



ILMV150202 REV F

U.S. Patent Nos.
5,820,118
6,886,820 B1

Specifications

Model No.	Swing Direction	Cylinder Capacity* (kN)*	Vertical Clamping Stroke** (mm)	Total Stroke (Swing + Vertical) (mm)	Body Thread	Effective Piston Area (cm^2) Retract	Oil Capacity*** (cm^3) Extend	Oil Capacity*** (cm^3) Retract
Double Acting (D/A) Cylinders, actuated hydraulically both directions.								
41-5005-23 41-5005-24 41-5005-26	Right Left Straight	4.9	19	31	M38 x 1.5	1.90	11.9	5.9
41-5011-23 41-5011-24 41-5011-26	Right Left Straight	11.6	34	51	M48 x 1.5	4.04	40	20.5

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

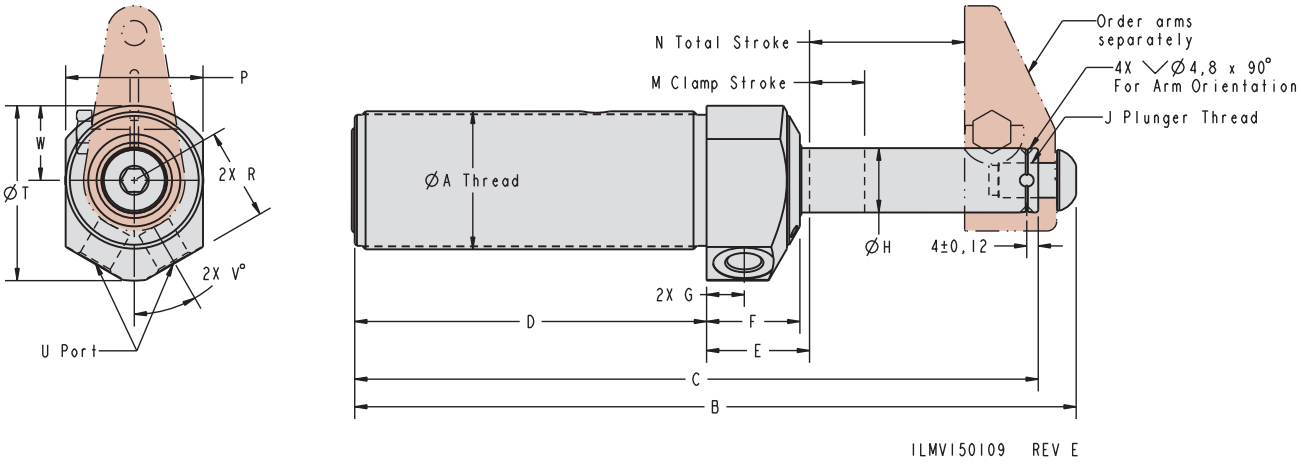
* Cylinder capacities are listed at 350 bar (356 MPa) maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 52 bar (5.2 MPa) for single acting, 35 bar (3.5 MPa) for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above by 350 (35), and multiply the resultant number X your system operating pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

** To allow for workpiece 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.

Standard Swing Clamps

Threaded Body, Long Stroke Dimensions



Dimensions																	
Model No.	ØA	B	C	D	E	F	G	ØH	J	M	N	P	R	ØT	U	V°	W
Double Acting (D/A) Cylinders, actuated hydraulically both directions.																	
41-5005-23 41-5005-24 41-5005-26	M38 x 1.5	176.5	167	82.5	35.5	31	13	15.88	M10 x 1.5 x 12	19	31	38	26	47.5	G 1/8	35°	19.5
41-5011-23 41-5011-24 41-5011-26	M48 x 1.5	249	235.5	121.5	38	32	13	22.23	M12 x 1.75 x 13	34	51	47.5	31.5	60	G 1/4	30°	25.5

Order Arms Separately

All dimensions are in mm.

NOTE: Follow arm length limitations on page O-3

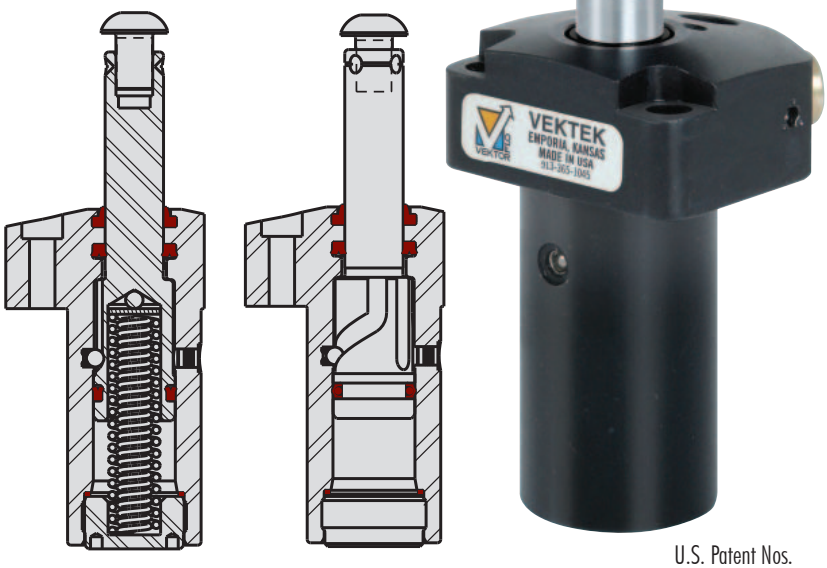
Standard Swing Clamps

Top Flange/Manifold Mount Specifications

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 capacities from 2 kN to 11.6 kN at 350 bar (35 MPa) pressure.
- Can be either manifold mounted or standard plumbed using standard fittings.
- Single piece body and mounting give a rigid installation, no threads to rock around or additional mounting hardware to buy.
- See page C-18 regarding flow rate limits and time calculations needed to avoid cylinder damage and preserve warranty.
- Standard Arm Clocking, feature page C-27, uses standard length Vektek Arms.
- Arms sold separately – see Section O.

Low installed clamping height can be fine tuned to fit your part.



ILMV152300 REV G

U.S. Patent Nos.
5,820,118
6,886,820 B1

Specifications

Model No.	Swing Direction	Cylinder Capacity* (kN)	Vertical Clamping Stroke** (mm)	Total Stroke (Swing + Vertical) (mm)	Piston Area (cm^2) Retract	Oil Capacity*** (cm^3) Extend	Oil Capacity*** (cm^3) Retract	Optional Flow Control Model No.
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.								
41-5602-11 41-5602-12 41-5602-15	Right Left Straight	2	6	14.5	0.63	N/A	0.92	47-0203-71
41-5605-11 41-5605-12 41-5605-15	Right Left Straight	4.9	8	20	1.90	N/A	3.82	47-0203-71
41-5611-11 41-5611-12 41-5611-15	Right Left Straight	11.6	13	29.5	4.04	N/A	11.9	47-0203-74
Double Acting (D/A) Cylinders, actuated hydraulically both directions.								
41-5602-21 41-5602-22 41-5602-25	Right Left Straight	2	6	14.5	0.63	2.3	0.92	47-0203-71
41-5605-21 41-5605-22 41-5605-25	Right Left Straight	4.9	8	20	1.90	7.8	3.82	47-0203-71
41-5611-21 41-5611-22 41-5611-25	Right Left Straight	11.6	13	29.5	4.04	23	11.9	47-0203-74

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

* Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 52 bar (5.2 MPa) for single acting, 35 bar (3.5 MPa) 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 350 (35), 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.)

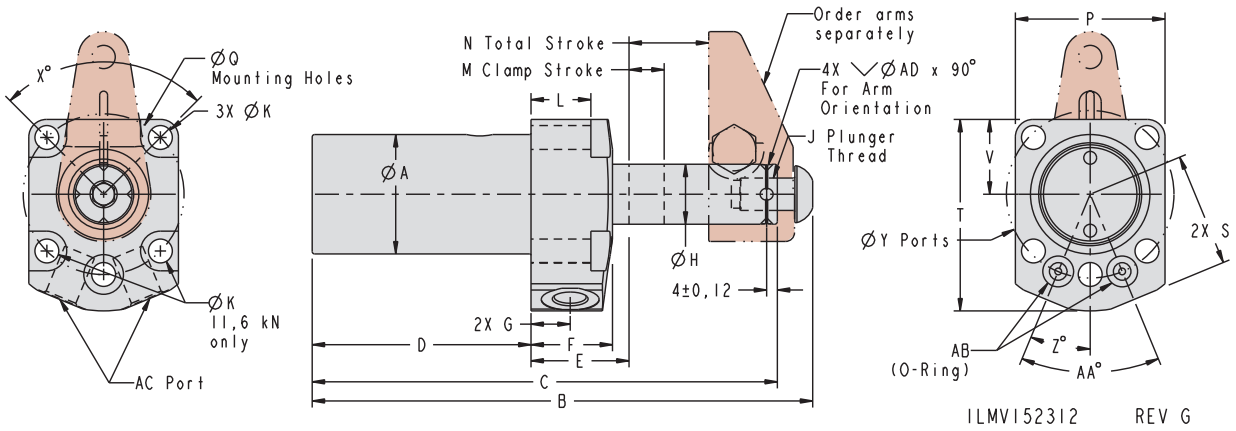
** To allow for workpiece height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

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

VEKTEK®

Standard Swing Clamps

Top Flange/Manifold Mount Dimensions



All dimensions are in mm.

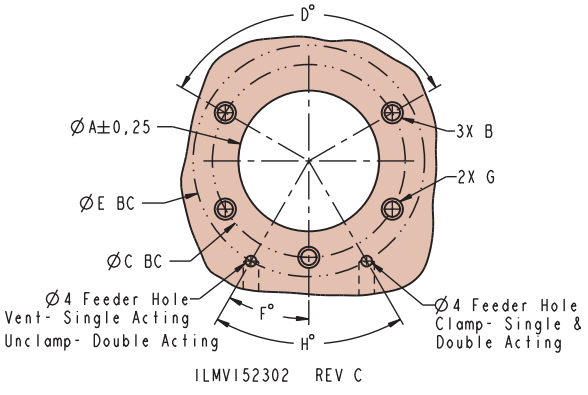
NOTE: Follow arm length limitations on page O-3

For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

Dimensions

Model No.	ØA	B	C	D	E	F	G	ØH	J	ØK	L	M	N	P	ØQ	S	T	V
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.																		
41-5602-11 41-5602-12 41-5602-15	25	108	101.5	44	31	26	13	11.13	M6 x 1 x 7	6	18	5.5	14.5	45	40	31	47	15.5
41-5605-11 41-5605-12 41-5605-15	36	143	134	64.5	31.5	27	13	15.88	M10 x 1.5 x 12	7	17.8	8	20	57	50	33.5	54	19
41-5611-11 41-5611-12 41-5611-15	44	185	172	81	36	30	14.5	22.23	M12 x 1.75 x 13	9	22.1	13	29.5	55	59.5	42	71	27.5
Double Acting (D/A) Cylinders, actuated hydraulically both directions.																		
41-5602-21 41-5602-22 41-5602-25	25	108	101.5	44	31	26	13	11.13	M6 x 1 x 7	6	18	5.5	14.5	45	40	31	47	15.5
41-5605-21 41-5605-22 41-5605-25	36	143	134	64.5	31.5	27	13	15.88	M10 x 1.5 x 12	7	17.8	8	20	57	50	33.5	54	19
41-5611-21 41-5611-22 41-5611-25	44	185	172	81	36	30	14.5	22.23	M12 x 1.75 x 13	9	22.1	13	29.5	55	59.5	42	71	27.5

Model No.	X°	ØY	Z°	AA°	AB (O-ring)	AC	AD
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.							
41-5602-11 41-5602-12 41-5602-15	120°	42	30°	60°	Ø7.65 x 1.78.	G 1/8	3.2
41-5605-11 41-5605-12 41-5605-15	120°	50	55°	110°	Ø7.65 x 1.78	G 1/8	4.8
41-5611-11 41-5611-12 41-5611-15	90°	62	22.5°	45°	Ø7.65 x 1.78	G 1/4	4.8
Double Acting (D/A) Cylinders, actuated hydraulically both directions.							
41-5602-21 41-5602-22 41-5602-25	120°	42	30°	60°	Ø7.65 x 1.78	G 1/8	3.2
41-5605-21 41-5605-22 41-5605-25	120°	50	55°	110°	Ø7.65 x 1.78	G 1/8	4.8
41-5611-21 41-5611-22 41-5611-25	90°	62	22.5°	45°	Ø7.65 x 1.78	G 1/4	4.8



Mounting Dimensions

Model No.	ØA	B	ØC	D°	ØE	F°	G	H°
41-5602-XX	25.5	M5	40	120°	42	30°	N/A	60°
41-5605-XX	36.5	M6	50	120°	50	55°	N/A	110°
41-5611-XX	44.5	M8	59.5	90°	62	22.5°	M8	45°

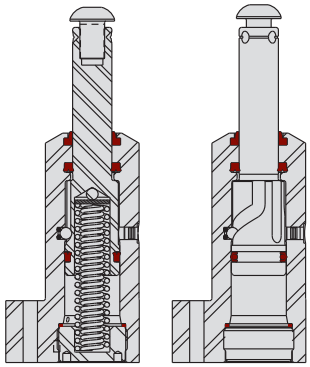
Standard Swing Clamps

Manifold/Bottom Flange Mount Specifications

U.S. Patent Nos.
5,192,158
5,820,118
6,886,820 B1

Single And Double Acting

- Simply the easiest to use manifold mount design on the market today. No precision installation holes, no precisely located ports, no special mounting hardware, only our special patented design.
- Available in sizes from 2 kN, to 11.6 kN at 350 bar (35 MPa) pressure.
- Unique, bolt up, bolt down or standard ported "foot" design allows you the maximum flexibility in fixture design.
- See page C-18 for flow rate limits and time calculations needed to avoid cylinder damage and preserve warranty.
- Standard Arm Clocking feature, page C-27,feature uses standard length Vektek Arms.
- Arms sold separately – see section O.



ILMV152101 REV G

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

Specifications

Model No.	Swing Direction	Cylinder Capacity* (kN)	Vertical Clamping Stroke** (mm)	Total Stroke (Swing + Vertical) (mm)	Effective Piston Area (cm^2) Retract	Oil Capacity *** (cm^3) Extend	Oil Capacity *** (cm^3) Retract	Optional Flow Control Model No.
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.								
41-5202-11 41-5202-12 41-5202-15	Right Left Straight	2	6	14.5	0.63	N/A	0.92	47-0203-71
41-5205-11 41-5205-12 41-5205-15	Right Left Straight	4.9	8	20	1.90	N/A	3.82	47-0203-71
41-5211-11 41-5211-12 41-5211-15	Right Left Straight	11.6	13	29.5	4.04	N/A	11.9	47-0203-74
Double Acting (D/A) Cylinders, actuated hydraulically both directions.								
41-5202-21 41-5202-22 41-5202-25	Right Left Straight	2	6	14.5	0.63	2.3	0.92	47-0203-71
41-5205-21 41-5205-22 41-5205-25	Right Left Straight	4.9	8	20	1.90	7.8	3.82	47-0203-71
41-5211-21 41-5211-22 41-5211-25	Right Left Straight	11.6	13	29.5	4.04	23	11.9	47-0203-74

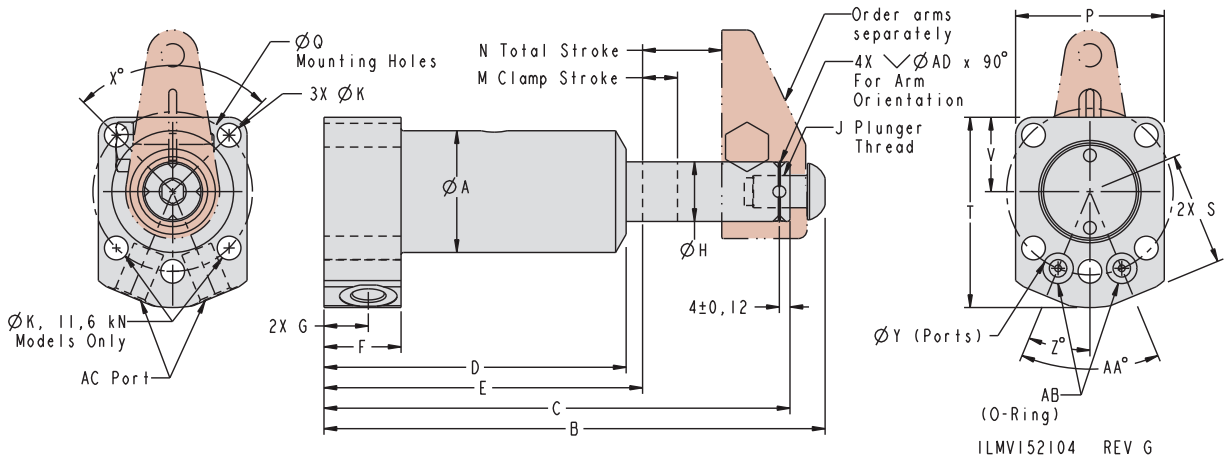
WARNING! Never allow swing arm to contact workpiece or fixture during arm rotation.

* Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 52 bar (5.2 MPa) for single acting, 35 bar (3.5 MPa) 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 350 (35), 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 workpiece 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.

Manifold/Bottom Flange Mount Dimensions



For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

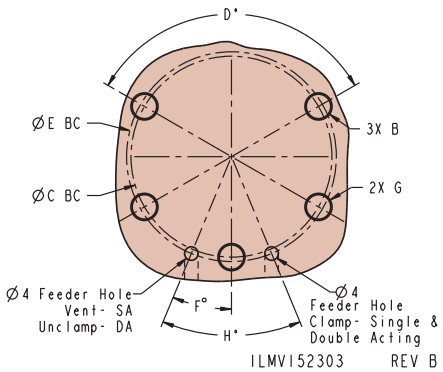
NOTE: Follow arm length limitations on page O-3

Dimensions

Model No.	ØA	B	C	D	E	F	G	ØH	J	ØK	M	N	P	ØQ	S	T	V
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.																	
41-5202-11 41-5202-12 41-5202-15	26.5	109.5	103	71	76	26.5	13.5	11.13	M6 x 1 x 7	6	6	14.5	45	40	31	47	15.5
41-5205-11 41-5205-12 41-5205-15	38	145	135	92.5	97	25	15	15.88	M10 x 1.5 x 12	7	8	20	57	50	33.5	54	19
41-5211-11 41-5211-12 41-5211-15	45	186	173	112.5	118.5	28.5	16.5	22.23	M12 x 1.75 x 13	9	13	29.5	55	59.4	42	71	27.5
Double Acting (D/A) Cylinders, actuated hydraulically both directions.																	
41-5202-21 41-5202-22 41-5202-25	26.5	109.5	103	71	76	26.5	13.5	11.13	M6 x 1 x 7	6	6	14.5	45	40	31	47	15..5
41-5205-21 41-5205-22 41-5205-25	38	145	135	92.5	97	25	15	15.88	M10 x 1.5 x 12	7	8	20	57	50	33.5	54	19
41-5211-21 41-5211-22 41-5211-25	45	186	173	112.5	118.5	28.5	16.5	22.23	M12 x 1.75 x 13	9	13	29.5	55	59.4	42	71	27.5

Model No.	X°	ØY	Z°	AA°	AB	AC	ØAD
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.							
41-5202-11 41-5202-12 41-5202-15	120°	42	30°	60°	Ø7.65 x 1.78	G 1/8	3.2
41-5205-11 41-5205-12 41-5205-15	120°	50	55°	110°		G 1/8	4.8
41-5211-11 41-5211-12 41-5211-15	90°	62	22.5°	45°		G 1/4	4.8
Double Acting (D/A) Cylinders, actuated hydraulically both directions.							
41-5202-21 41-5202-22 41-5202-25	120°	42	30°	60°	Ø7.65 x 1.78	G 1/8	3.2
41-5205-21 41-5205-22 41-5205-25	120°	50	55°	110°		G 1/8	4.8
41-5211-21 41-5211-22 41-5211-25	90°	62	22.5°	45°		G 1/4	4.8

All dimensions are in mm.



Mounting Specifications

Model No.	B	ØC	D°	ØE	F°	G	H°
41-5202-XX	M5	40	120°	42	30°	N/A	60°
41-5205-XX	M6	50	120°	50	55°	N/A	110°
41-5211-XX	M8	59.4	90°	62	22.5°	M8	45°

Standard Swing Clamps

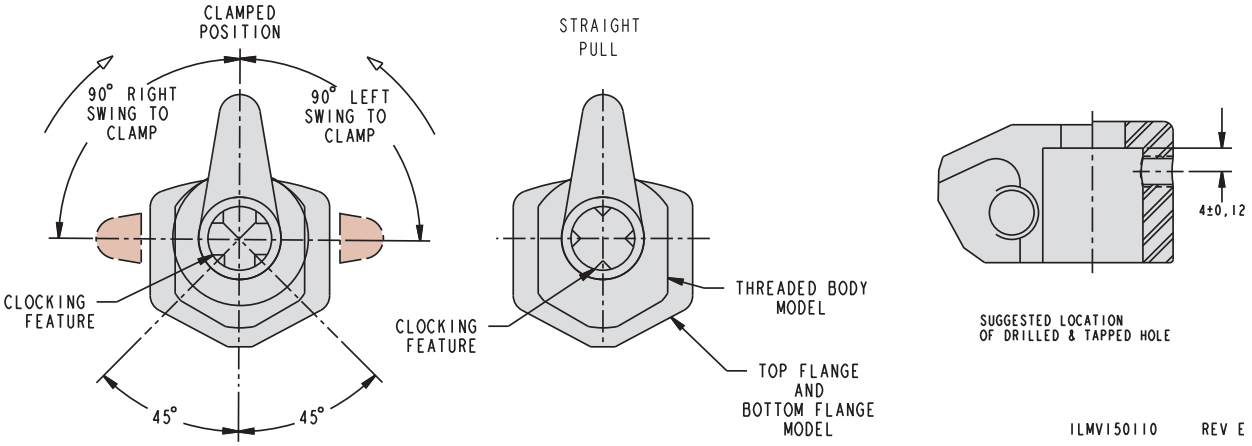
Standard Clocking and Swing Restrictors

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...

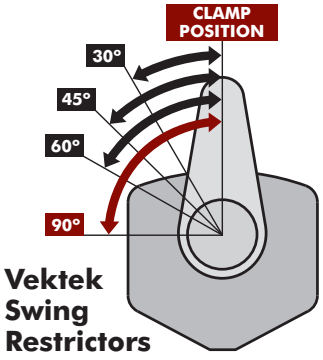
A drill point on each clamp standardizes arm location at a particular position. An additional 3 (three) orientation drill points reside 90° out from that position and each other. Access to the positioning feature is through the back or side of the arm, making modification a snap for users. Each arm position can have its own specification.



Standard Swing Clamp Arm Clocking Feature
Drill points shown in the clamped position
Clocking feature 4@90°

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 product will be specially marked to avoid intermingling clamps with varying swing angles in your shop. Contact your Vektek Customer Service specialist should you need swing angles greater than 90°.



Swing Clamp Swing Restrictors

Model No	Clamp Capacity	Swing Restriction
81-5505-30	2kN	30°
81-5505-45	2kN	45°
81-5505-60	2kN	60°
81-5509-30	4.9kN	30°
81-5509-45	4.9kN	45°
81-5509-60	4.9kN	60°
81-5513-30	11.6kN	30°
81-5513-45	11.6kN	45°
81-5513-60	11.6kN	60°
81-5518-30	22kN	30°
81-5518-45	22kN	45°
81-5518-60	22kN	60°
81-5519-30	TC LP SC, 22kN	30°
81-5519-45	TC LP SC, 22kN	45°
81-5519-60	TC LP SC, 22kN	60°
81-5522-30	TC LP SC, 33kN	30°
81-5522-45	TC LP SC, 33kN	45°
81-5522-60	TC LP SC, 33kN	60°

ILMV150112 REV B

Frequently Asked Questions

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

When should I use a link clamp?

A link clamp is often preferred when you must reach over, not swing over or around a height obstacle. Reaching down into a die casting, between two mounting lugs, or a direct overhead vertical load are good examples where these devices are required. Keep in mind that the 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 this stroke 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. The 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 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 I avoid using a link clamp?

If you are clamping on a draft angle, the angle will exert undue stress on the linkage mechanism. Please avoid this additional strain on the guidance mechanisms of either swing clamps or link clamps. Extra stress causes premature failure not covered by warranty due to misapplication.

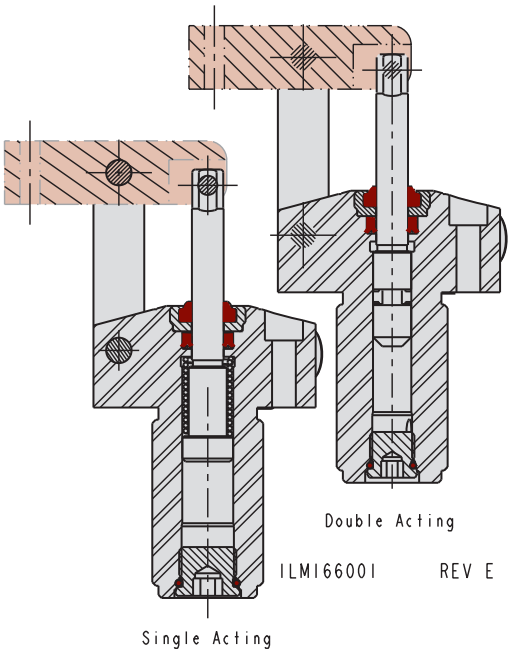
Link Clamps

Link Clamp Specifications

Single and Double Acting

- Available in sizes from 1.5 kN to 22 kN capacities at 350 bar (35 MPa) maximum operating pressure.
- Single piece body/pivot design for accuracy and long life.
- Link clamps clear large obstructions better than other types of clamps.
- Pivot pins are corrosion resistant and heat treated.
- Manifold mounted or standard plumbed using G 1/4 or G 1/8 S-Series fittings (face seal Model No. 39-0510-25 included).
- Fluorocarbon seals are available on request.
- Levers sold separately (page O-11).

NOTE: User manufactured levers may reduce linkage life



Specifications									
Model No.	Cylinder Capacity** (kN)	Vertical Clamp Stroke**** (mm)	Body Thread	Standard Lever Length (mm)	Effective Piston Area (cm^2) Extend	Oil Capacity (cm^3) Extend	Oil Capacity (cm^3) Retract	Maximum Flow Rate *** (l/min)	Optional Flow Control Model No.
Single Acting (S/A) Cylinders, actuated hydraulically one direction spring returned.									
41-6610-40	1.5	2.3	M28 x 1.5 - 6G	22.4	0.49	1.69	N/A	0.20	47-0203-70
41-6610-60	3	3.1	M38 x 1.5 - 6G	28.7	0.97	4.70	N/A	0.56	47-0203-71
41-6610-90	6	3.6	M48 x 1.5 - 6G	35.1	1.98	13.45	N/A	1.61	47-0203-73
41-6611-40	13	4.6	M65 x 1.5 - 6G	44.5	5.06	35.20	N/A	4.23	47-0203-74
Double Acting (D/A) Cylinders, actuated hydraulically both directions.									
41-6620-40	2	2.3	M28 x 1.5 - 6G	22.4	0.71	1.69	0.52	0.20	47-0203-70
41-6620-60	5	3.1	M38 x 1.5 - 6G	28.7	1.60	4.70	1.85	0.56	47-0203-71
41-6620-90	11	3.6	M48 x 1.5 - 6G	35.1	3.88	13.45	6.64	1.61	47-0203-73
41-6621-40	22	4.6	M65 x 1.5 - 6G	44.5	7.92	35.20	12.67	4.23	47-0203-74

** Clamp capacities are listed at 350 bar (35 MPa) maximum operating pressure with a standard length link clamp lever installed. See graph on page O-12 for clamping force with various lever lengths. Minimum operating pressure is 52 bar (5.2 MPa) for single acting and 35 bar (3.5 MPa) 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 350 (35) 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.)

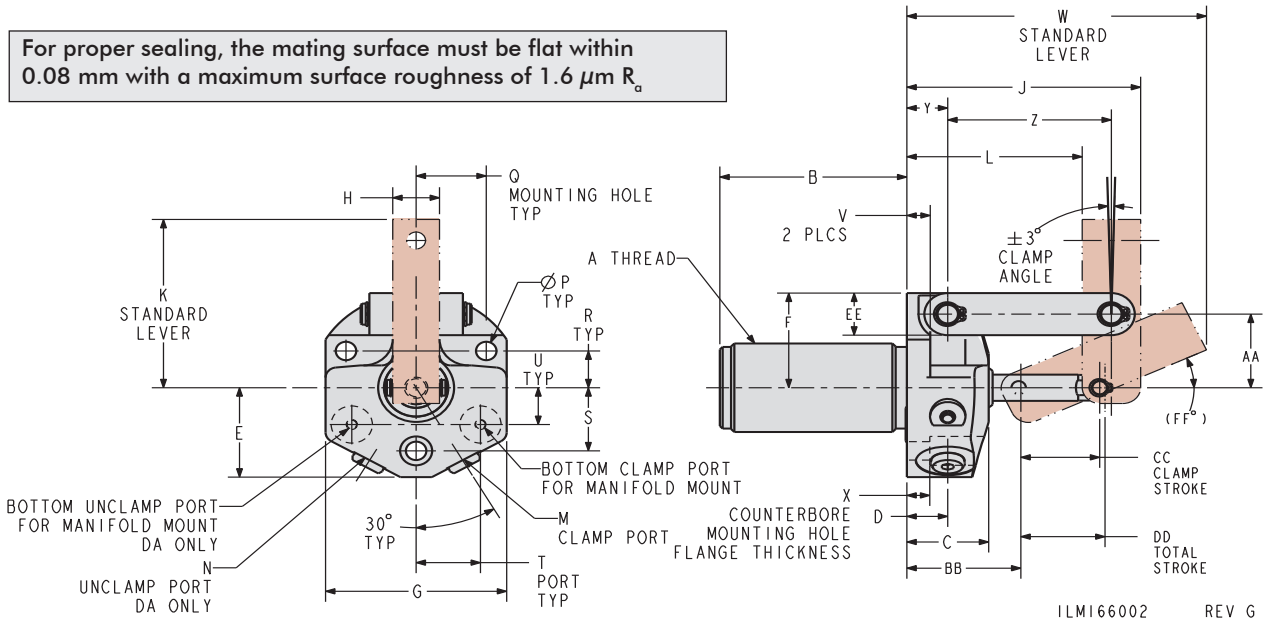
*** To insure maximum service life and trouble-free operation, restrict fluid flow to the above flow ratings when clamping. If you are unable to measure flow rates, the devices should be positioned in no less than 1/2 second. These recommendations apply when using the standard lever. When using the optional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

Levers sold separately, see details on page O-11

Link Clamp Dimensions

For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a



Dimensions

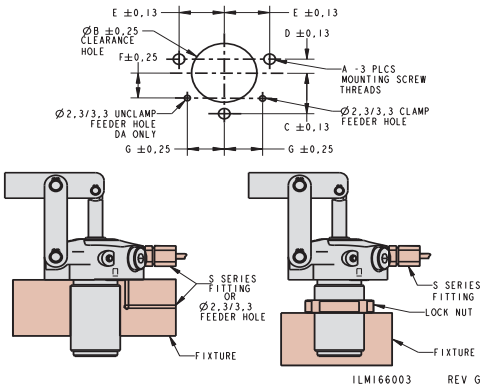
Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	ØP	Q
Single Acting (S/A) Cylinders, actuated hydraulically one direction spring returned.															
41-6610-40	M28 x 1.5 - 6G	47.6	25.4	13.3	27.0	28.7	49.2	12.7	66.8	50.8	50.8	G 1/8	N/A	5.9	19.1
41-6610-60	M38 x 1.5 - 6G	57.2	33.3	15.9	33.3	38.1	63.5	16.0	85.9	63.5	63.5	G 1/8	N/A	7.1	25.4
41-6610-90	M48 x 1.5 - 6G	63.5	41.3	21.2	41.3	47.8	82.6	25.4	109.5	79.5	77.7	G 1/4	N/A	11.1	33.3
41-6611-40	M65 x 1.5 - 6G	76.2	47.6	22.2	54.0	60.5	104.8	31.8	143.8	101.6	99.3	G 1/4	N/A	13.1	42.9
Double Acting (D/A) Cylinders, actuated hydraulically both directions.															
41-6620-40	M28 x 1.5 - 6G	47.6	25.4	13.3	27.0	28.7	49.2	12.7	66.8	50.8	50.8	G 1/8	G 1/8	5.9	19.1
41-6620-60	M38 x 1.5 - 6G	57.2	33.3	15.9	33.3	38.1	63.5	16.0	85.9	63.5	63.5	G 1/8	G 1/8	7.1	25.4
41-6620-90	M48 x 1.5 - 6G	63.5	41.3	21.2	41.3	47.8	82.6	25.4	109.5	79.5	77.7	G 1/4	G 1/4	11.1	33.3
41-6621-40	M65 x 1.5 - 6G	76.2	47.6	22.2	54.0	60.5	104.8	31.8	143.8	101.6	99.3	G 1/4	G 1/4	13.1	42.9

Model No.	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF°
Single Acting (S/A) Cylinders, actuated hydraulically one direction spring returned.															
41-6610-40	11.1	19.1	17.5	11.1	9.5	85.1	16.8	14.3	44.5	22.2	34.2	21.4	23.8	12.7	24°
41-6610-60	12.7	25.4	24.6	9.5	12.7	106.8	12.8	19.1	54.0	28.6	43.6	26.2	28.6	19.1	29°
41-6610-90	15.9	31.8	31.8	11.1	12.7	135.9	24.5	22.2	69.9	34.9	55.6	31.7	34.1	25.4	29°
41-6611-40	19.1	41.3	41.3	15.9	19.1	171.5	18.9	28.6	85.7	44.5	66.7	41.3	44.5	31.8	27.5°
Double Acting (D/A) Cylinders, actuated hydraulically both directions.															
41-6620-40	11.1	19.1	17.5	11.1	9.5	85.1	16.8	14.3	44.5	22.2	34.2	21.4	23.8	12.7	24°
41-6620-60	12.7	25.4	24.6	9.5	12.7	106.8	12.8	19.1	54.0	28.6	43.6	26.2	28.6	19.1	29°
41-6620-90	15.9	31.8	31.8	11.1	12.7	135.9	24.5	22.2	69.9	34.9	55.6	31.7	34.1	24.4	29°
41-6621-40	19.1	41.3	41.3	15.9	19.1	171.5	18.9	28.6	85.7	44.5	66.7	41.3	44.5	31.8	27.5°

All dimensions are in mm.

Manifold Port/Bolt Mounting Dimensions

Model No.	Capacity (kN)	A	B	C	D	E	F	G
Double Acting (D/A) Cylinders, actuated hydraulically both directions.								
41-66X0-40	2	M5 x 0.8	28.58	19.05	11.10	19.05	11.10	17.48
41-66X0-60	5	M6 x 1	39.67	25.40	12.70	25.40	9.53	24.61
41-66X0-90	11	M10 x 1.5	49.20	31.75	15.88	33.32	11.10	31.75
41-66X1-40	22	M12 x 1.75	66.00	41.28	19.05	42.85	15.88	41.28



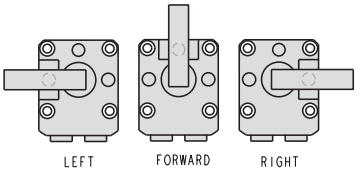
NOTE: Levers are to be adjusted to within +/- 3° of nominal clamp angle to prevent premature failure.

Link Clamps

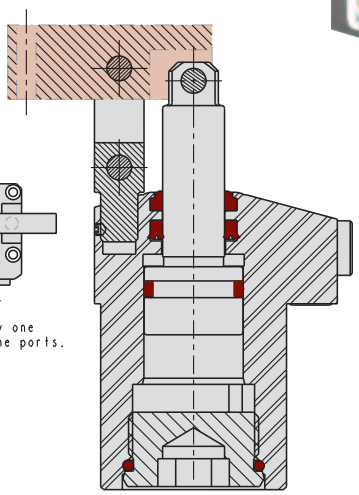
Low Pressure Link Clamp Specifications

Double Acting

- Available in three sizes 2.5 kN, 5 kN and 10 kN capacities at 70 bar (7 MPa).
- Excellent alternative to a swing clamp when swing space or hydraulic pressure is limited.
- Top flange body mount.
- Left, forward, or right lever positions for added flexibility and is user adjustable.
- Manifold mounted or standard plumbed using G 1/4, G 1/8, S-Series or L-Series fittings (face seal Model No. 39-0510-25 included).
- Standard fluorocarbon seals.
- Levers sold separately (page 0-13).
- Minimum operating pressure is 10 bar (1 MPa)



Lever can be easily positioned in any one of three directions in relation to the ports.



ILM166004 REV C

NOTE: User manufactured arms will reduce linkage life

Specifications

Model No.	Lever Position	Clamp Capacity* (kN)	Vertical Clamping Stroke**** (mm)	Standard Lever Length** (mm)	Effective Piston Area (cm^2)	Oil Capacity (cm^3)		Maximum Flow Rate*** (l/min)	Optional Flow Control Model No.
					Extend	Extend	Retract		
Double Acting (D/A) Cylinders, actuated hydraulically both directions.									
41-6621-10 41-6621-11 41-6621-12	Forward Right Left	2.5	2.3	47.6	5.06	11.66	7.10	1.40	47-0203-70
41-6621-50 41-6621-51 41-6621-52	Forward Right Left	5	3.1	66.7	11.40	32.58	24.43	3.91	47-0203-73
41-6622-10 41-6622-11 41-6622-12	Forward Right Left	10	3.1	78.6	22.88	73.97	67.37	8.88	47-0203-73

* Clamp capacities are listed at 70 bar (7 MPa) maximum operating pressure with a standard length link clamp lever installed.

** Use of an extended length lever will result in a reduction of clamp capacity. See graphs, on O-13, of lever output curves for clamping force of various lever lengths. The minimum operating pressure for low pressure link clamps is 10 bar (1 MPa). 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 70 bar (7 MPa) 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.)

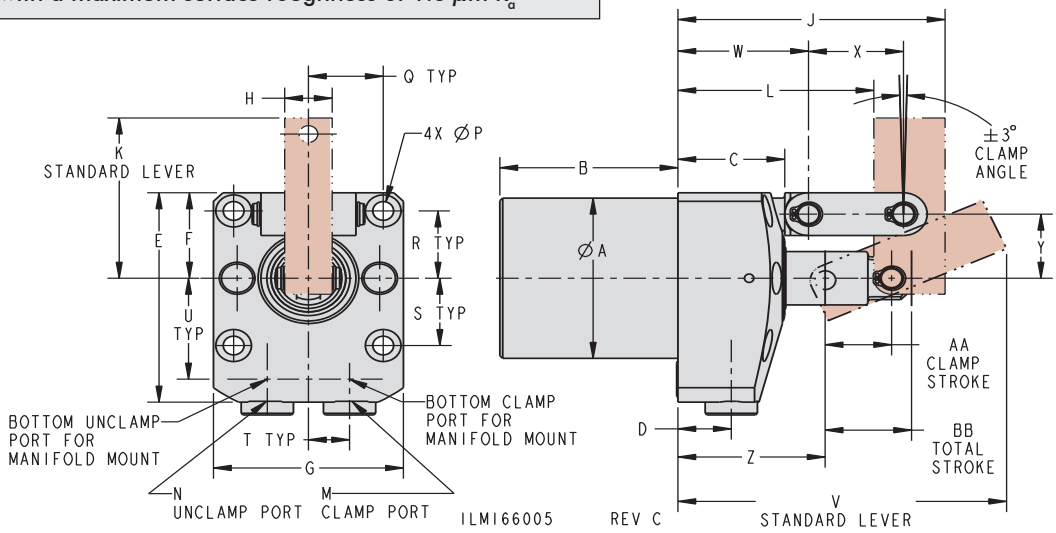
*** To insure maximum service life and trouble-free operation, restrict fluid flow to the above flow ratings when clamping. If you are unable to measure flow rates, the devices should be positioned in no less than 1/2 second. These recommendations apply when using the standard lever. When using the optional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

Levers sold separately, see details on page O-12

Low Pressure Link Clamp Dimensions

For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a



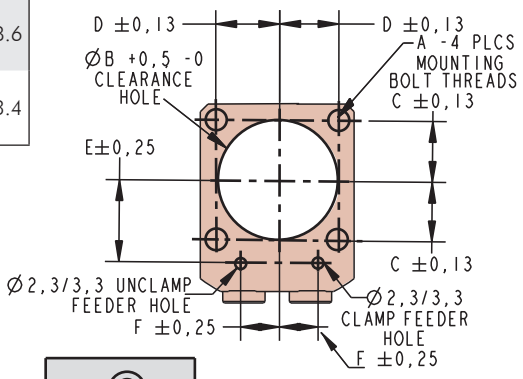
D-5

Dimensions

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R
Double Acting (D/A) Cylinders, actuated hydraulically both directions.																
41-6621-10 41-6621-11 41-6621-12	47.6	47.6	28.6	14.3	61.1	25.4	50.8	12.7	68.3	47.6	52.4	G 1/8	G 1/8	5.6	20.0	20.0
41-6621-50 41-6621-51 41-6621-52	64.3	63.5	30.1	15.9	80.9	34.9	69.9	19.1	87.3	66.7	61.9	G 1/4	G 1/4	6.8	27.5	27.5
41-6622-10 41-6622-11 41-6622-12	74.6	69.9	36.5	15.9	94.5	42.5	84.9	22.2	104.8	78.6	73	G 1/4	G 1/4	9.1	31.5	31.5

Model No.	S	T	U	V	W	X	Y	Z	AA	BB
Double Acting (D/A) Cylinders, actuated hydraulically both directions										
41-6621-10 41-6621-11 41-6621-12	20.0	11.0	30.0	85.3	34.9	25.4	19.1	37.3	19.8	23.0
41-6621-50 41-6621-51 41-6621-52	27.5	15.0	39.5	112.3	39.7	38.1	25.4	44.5	25.4	28.6
41-6622-10 41-6622-11 41-6622-12	31.5	16.0	45.0	132.9	47.6	44.5	30.2	52.4	30.2	33.4

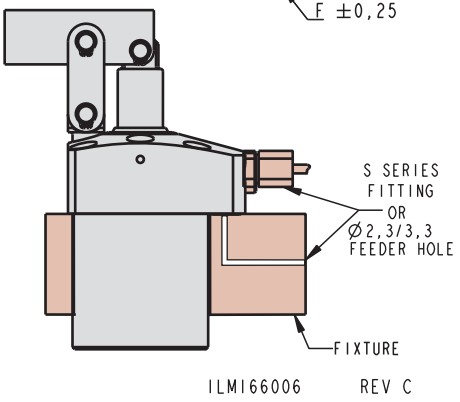
Levers sold separately
All dimensions are in mm.



Manifold Port/Mounting Dimensions

Model No.	Cylinder Capacity (kN)	A	B	C	D	E	F
Double Acting (D/A) Cylinders, actuated hydraulically both directions.							
41-6621-1X	2.5	M5 x 0.8	48	20.0	20.0	30.0	11.0
41-6621-5X	5	M6 x 1.0	65	27.5	27.5	39.5	15.0
41-6622-1X	10	M8 x 1.25	75	31.5	31.5	45.0	16.0

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



Special Use Clamps

Edge Clamp Specifications

Single Acting Standard Ported 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 an O-ring face seal for simple bolt down installation.
- Unique center hole mounting and thrust bushing make this device ideal for quick setup T-slot mounting.

Chromed and hardened steel blade grips the part while the unique design angle provides both horizontal and vertical clamp force.

Three G 1/8 fluid ports on standard model and O-ring bolt down face seal on the manifold model simplify leak-free installation.

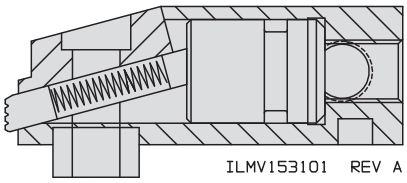
BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.

Specially designed springs run longer and require less maintenance.

Pivot locator/thrust bushing provided.

Proprietary seal designs reduce leakage for long lasting cylinders.

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

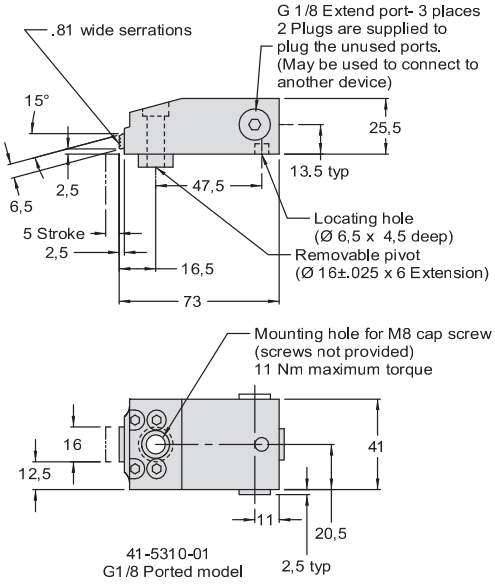


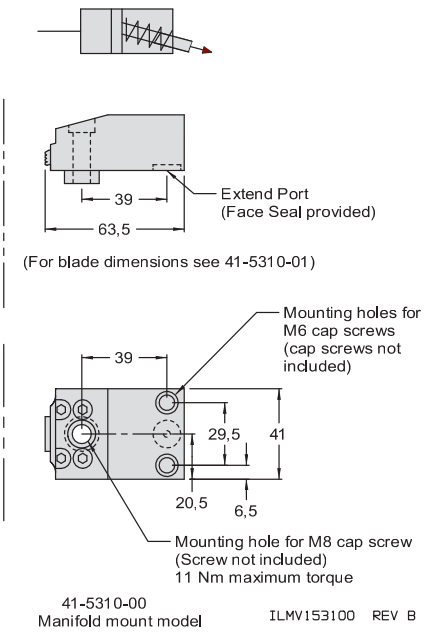
Specifications

Model No.	Type	Clamp Capacity* (kN)		Horizontal Stroke (mm)	Body Size (mm)	Minimum Length (mm)	Piston Area (cm^2)	Oil Capacity (cm^3)
		Horizontal	Vertical					
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.								
41-5310-01	Standard	8.9	2.2	5	41 x 73	73	2.9	1.4
41-5310-00	Manifold	8.9	2.2	5	41 x 63.5	63	2.9	1.4

* Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure. The output force is adjustable by varying hydraulic system pressure. To determine output force, use the following formula: Effective Piston area times Input Pressure = Angular Clamping Force. (Vertical Force= 0.2 x Angular Force) and (Horizontal Force =0.9 x Angular Force). Actual force may vary slightly due to frictional losses, seal drag, and/or return springs.

For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

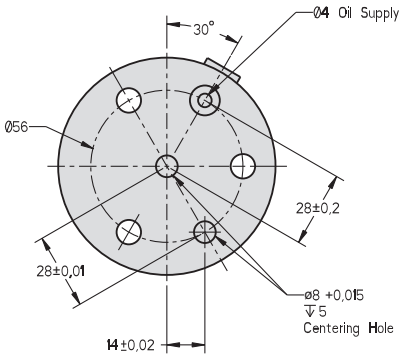




VEKTEK®

Pull-Down Clamp, Eccentric

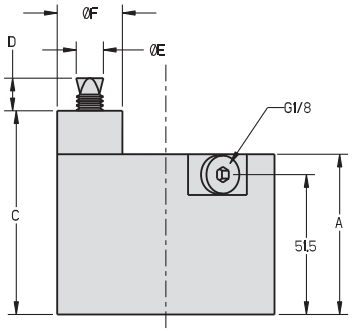
- 5-sided machining can be carried out safely without clamp interference.
- Workpiece can be loaded and unloaded by handling equipment.
- Optional oil supply through G 1/4 port or manifold connection.
- Disk spring for staged pull-down effect.

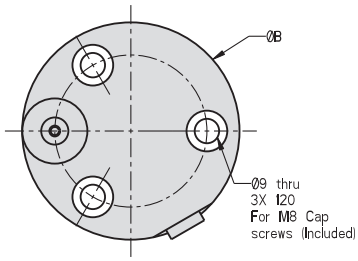


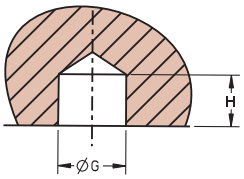
Body, sleeves and draw bar are made of nitride-hardened alloy steel for longer trouble-free life.

Clamping sleeves are segmented and serrated to form and grip the clamping hole.

These Pull-Down Clamps also serve as a support surface and "Z" locator for the workpiece.







Specifications

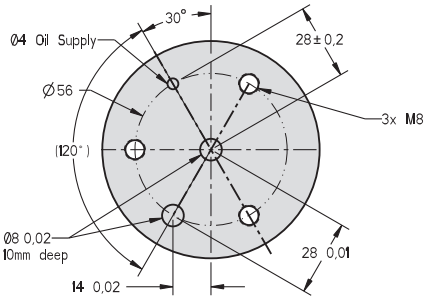
Model No.	Vertical Clamp Force (kN)	Permissable Horizontal Force (kN)	Radial Force of Sleeve Segments (kN)	Piston Dia. (mm)	Workpiece Hole Dia. (G)	Workpiece Hole Depth (H)
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.						
41-5721-07 41-5721-08	3.5	1	10	18	6.8 - 7.7 7.8 - 8.7	10
41-5721-09 41-5721-10	5.3	1.5	15	22	8.8 - 9.7 9.8 - 10.7	10
41-5721-11 41-5721-12	8.5	2.5	25	28	10.8 - 11.7 11.8 - 12.7	13
41-5721-13 41-5721-14	11.5	3.5	35	32	12.8 - 13.7 13.8 - 14.7	13

Model No.	Lateral Comp. /Clamp (mm)	Clamping Rim Hgt. Min. (mm)	Sleeve Expansion	Volume (cm^3)	Allowable Side Load (unclamp)(N)	Wgt (g)
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.						
41-5721-07 41-5721-08	+/- 0.25	6	1.4	1.0	50 50	2600 2600
41-5721-09 41-5721-10	+/- 0.25	7 7	1.4 1.4	1.5 1.5	90 90	2600 2800
41-5721-11 41-5721-12	+/- 0.25	8	1.4	2.5	120	2800 2800
41-5721-13 41-5721-14	+/- 0.25	9	1.4	3.2	150	2900

Dimensions

Model No.	A	B	C +/-0.01	D	E	F
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.						
41-5721-07 41-5721-08	59	80	75	9.5	6.6 7.5	24
41-5721-09 41-5721-10	59	80	75	9.5	8.5 9.5	24
41-5721-11 41-5721-12	59	80	75	12	10.5 11.5	24
41-5721-13 41-5721-14	59	80	75	12	12.5 13.5	24

Fixture hole pattern for oil supply and centering.



For manifold mounting, remove the M5 screw and sealing washer and insert the o-ring (included).

Maximum operating pressure 150 bar (15 MPa)
Minimum operating pressure 30 bar (3 MPa)

For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

ILMV415712 REV B

Pull-Down Clamp, Concentric Specifications

Single Acting Pull-Down Clamp, Concentric

- Five (5) side machining can be carried out safely without clamp interference.
- Workpiece can be loaded and unloaded by handling equipment.
- Optional oil supply through G 1/4 port or manifold connection.
- Disk spring for staged pull-down effect.
- Serrated grippers.

Body, sleeves and draw bar are made of nitride-hardened alloy steel for longer trouble-free life.

Clamping sleeves are segmented and serrated to form and grip the clamping hole.

These Pull-Down Clamps also serve as a support surface and "Z" locator for the workpiece.

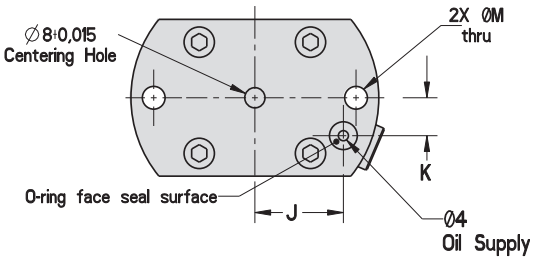
Specifications

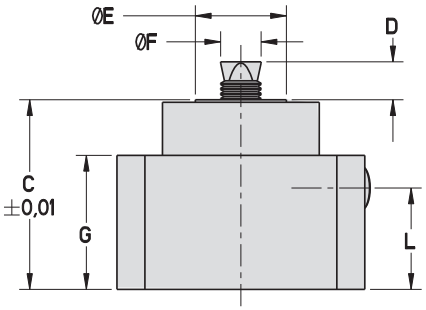
Model No.	Allow Horiz. Force (kN)	Radial Force Sleeve Segs. (kN)	Sleeve Expansion (mm)	Vol. (cm^3)	Side Load (unclamp) (N)	Piston Dia. (mm)	Vertical Clamp Force (kN)	Work Piece Hole Dia. (mm)	Work Piece Hole Depth Min. (mm)	Lateral Comp. Per Clamp (mm)	Clamp Rim Height Min. (mm)	Wgt (g)
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.												
41-5711-09 41-5711-10	1.2	12	1.4	0.5	50	28	4	8.8-9.7 9.8-10.7	10	+/- 0.25	6	2600
41-5711-11 41-5711-12 41-5711-13 41-5711-14	3	30	1.7	1.6	150	32	10	10.8-11.9 12-12.9 13-13.9 14-14.9	15	+/- 0.25	8	2600
41-5711-15 41-5711-16 41-5711-17 41-5711-18 41-5711-19	7.7	77	1.7	3.8	200	40	26	15-15.9 16-16.9 17-17.9 18-18.9 19-19.9	17	+/- 0.25	9	2800
41-5711-20 41-5711-21 41-5711-22 41-5711-23 41-5711-24 41-5711-25	7.7	77	1.7	3.8	300	40	26	20-20.9 21-21.9 22-22.9 23-23.9 24-24.9 25-25.9	17	+/- 0.25	9	2900

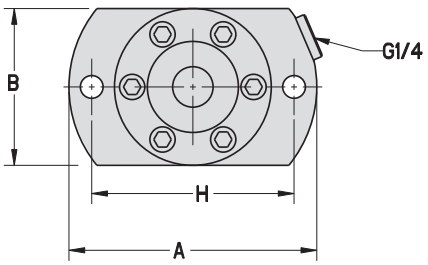
Maximum operating pressure 350 bar (35 MPa)
Minimum operating pressure 30 bar (3 MPa)

Pull-Down Clamp, Concentric Dimensions

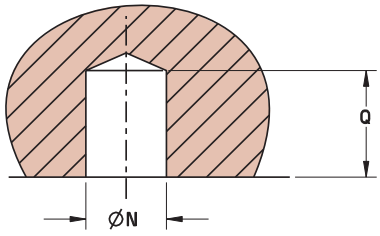
Dimensions							
Model No.	A	B	C	D	E	F	G
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.							
41-5711-09	98	62	75	9.5	36	8.5	53
41-5711-10						9.5	
41-5711-11	98	62	75	14	36	10.5	53
41-5711-12						11.5	
41-5711-13						12.5	
41-5711-14						13.5	
41-5711-15	115	62	75	16	36	14.5	53
41-5711-16						15.5	
41-5711-17						16.5	
41-5711-18						17.5	
41-5711-19						18.5	
41-5711-20	115	62	75	16	62	19.5	53
41-5711-21						20.5	
41-5711-22						21.5	
41-5711-23						22.5	
41-5711-24						23.5	
41-5711-25						24.5	
Model No.	H	J	K	L	M	ØN	Q
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.							
41-5711-09	80	31	13	40	9	8.8-9.7	10
41-5711-10						9.8-10.7	
41-5711-11	80	31	13	40	9	10.8-11.9	15
41-5711-12						12-12.9	
41-5711-13						13-13.9	
41-5711-14						14-14.9	
41-5711-15	90	35	15	40	13	15-15.9	17
41-5711-16						16-16.9	
41-5711-17						17-17.9	
41-5711-18						18-18.9	
41-5711-19						19-19.9	
41-5711-20	90	35	15	40	13	20-20.9	17
41-5711-21						21-21.9	
41-5711-22						22-22.9	
41-5711-23						23-23.9	
41-5711-24						24-24.9	
41-5711-25						25-25.9	







CLAMPING HOLE IN WORKPIECE



NOTE: For single acting clamping elements there is a risk of drawing in coolant during return stroke. In this case the clamping element has to be protected against the direct effect of coolant. The built in sinter metal breather should be covered.

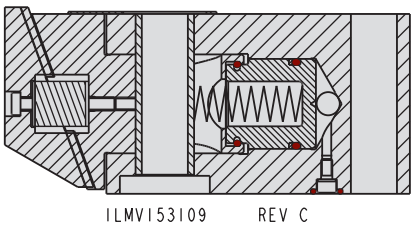
For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

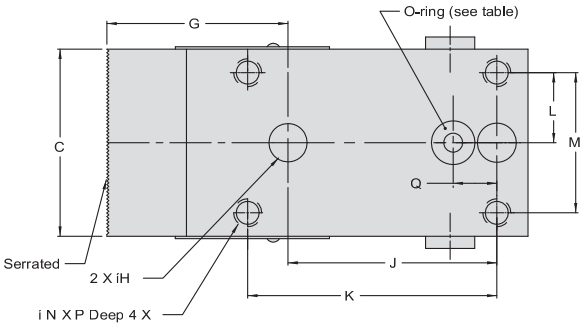
For manifold mounting, remove the M5 screw and sealing washer and insert the o-ring (included).

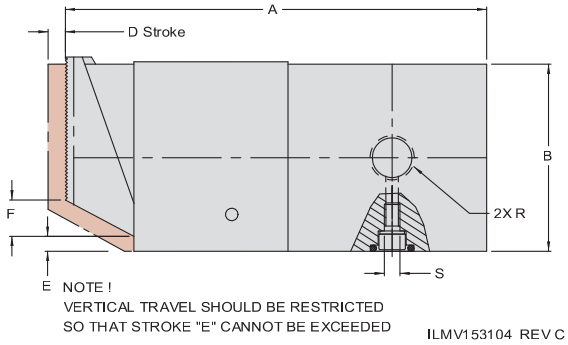
ILMV415711 REV D

Special Use Clamps

Pull-Down Clamp Manifold Mounted Specifications and Dimensions







Single Acting Pull-Down Clamp, Spring Return, Manifold Mounted

E-5

- Used whenever edge face clamping is desired.
- Generates straight clamping motion and force along with pull-down clamping force to hold and pull down parts.
- Pull-down force is approximately 1/3 of the respective clamping force.
- Standard version with serrated and hardened jaw, complete with mounting bolts (ISO). Optional jaws are available on page E-7.
- Manifold oil supply only.

Jaws and pistons are connected by a joint that avoids the introduction of a bending movement to the piston and extends clamp life.

Body of burnished tempered steel with case-hardened ground pistons for long life.

Fastened with two mounting bolts from above and four bolts from the bottom to insure maximum hold within operating limits.

Specifications

Model No.	Force at 400 bar (40 MPa) (kN)	Stroke D (mm)	Oil Volume (cm^3)	Mounting Bolt 2 pieces	Torque Maximum (Nm)	Spring Force Minimum (N)	Weight (g)
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.							
41-5311-05	4.5	5	0.57	M8 x 45	21	60	670
41-5311-20	20	8	4	M12 x 80	72	160	2500
41-5311-32	32	10	8	M16 x 100	180	210	4700
41-5311-50	50	12	15	M20 x 120	350	340	8800

Dimensions

Model No.	A	B	C	D	E	F	G +/- 0.5	H	J	K	L	M	N	P	Q	R	S
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.																	
41-5311-05	100	30	30	5	2	3	39	8.5	53	59	11	22	M5	6	13	G 1/8	M3
41-5311-20	135	50	50	8	3	14	58	12.5	67	74	18	36	M8	12	14	G 1/4	M5
41-5311-32	149.5	65	65	10	3	17	63.5	16.5	72	83	23.5	47	M10	16	17.5	G 1/4	M5
41-5311-50	180	80	80	12	3	19	71	20.5	93	104	30	60	M12	25	21	G 1/4	M5

O-ring for Manifold Mounting Included

O- Ring Model No.	Description 90 Dur. HNBR	Clamp Model No.
39-0510-43	4.6 x 2	41-5311-05
39-0510-44	9 x 2.5	41-5311-20 41-5311-32 41-5311-50

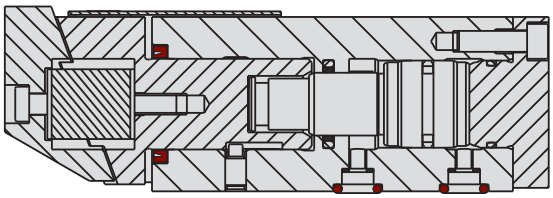
For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

All dimensions are in mm.

NOTE: Do not overstress mounting bolts. Observe maximum permissible torque.

Maximum operating pressure 400 bar (40 MPa)

Pull-Down Clamp Double Acting Specifications and Dimensions



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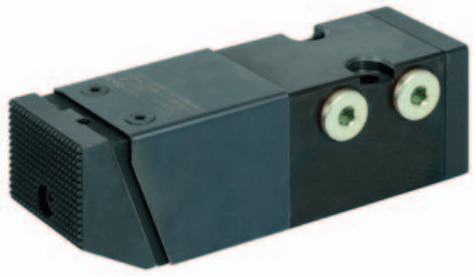
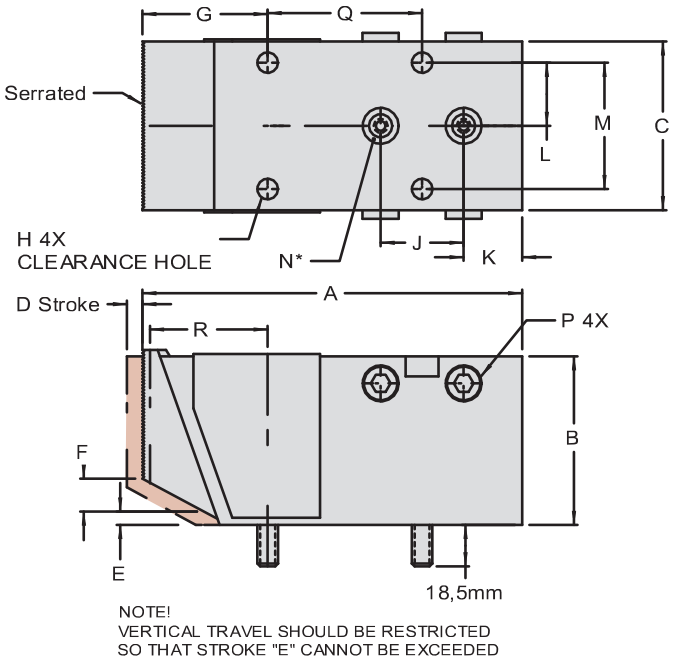


Double Acting Pull-Down Clamp

- Use whenever lateral clamping is desired.
- Body material is burnished tempered steel with case-hardened ground pistons.
- Generates straight and pull-down clamping force.
- Pull-down force is approximately 1/3 of the respective clamping force.
- The shipped version has serrated and hardened jaws, complete with mounting bolts. Other optional jaws are available on page E-7.
- To protect against contamination a wiper is installed at the clamping bolt.
- Complete with four (4) fastening screws.
- Oil supply through threaded ports or manifold.

Double acting design assures clamp release for automated or time critical operation.

Jaws and pistons are connected by a joint that avoids the introduction of a bending movement to the piston and extends clamp life.



ILMV153107 REV B

Specifications

Model No.	Force (kN) Clamp	Force (kN) Unclamp	Stroke D (mm)	Volume (cm^3) Clamp	Volume (cm^3) Unclamp	Mounting Screws 4 pieces	Torque Maximum (Nm)	Weight (g)
Double Acting (D/A) Cylinders, actuated hydraulically both directions.								
41-5320-20	20	9.6	10	4.9	2.5	M8 x 60	25	2900

Dimensions

Model No.	A	B	C	D	E	F	G +/- 0.5	H	J	K	L	M	N O-ring	P	Q	R
Double Acting (D/A) Cylinders, actuated hydraulically both directions.																
41-5320-20	156	50	50	10	3	14	56.5	8.5	30.5	24.3	18.5	37	9 x 2.5	G 1/4	60	55.5

O-ring for Manifold Mounting

O- Ring Model No.	Description	Clamp Model No.
39-0510-44	9 x 2.5, 90 Dur, HNBR	41-5320-20

For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

All dimensions are in mm.

NOTE: Do not overstress mounting bolts. Observe maximum permissible torque.

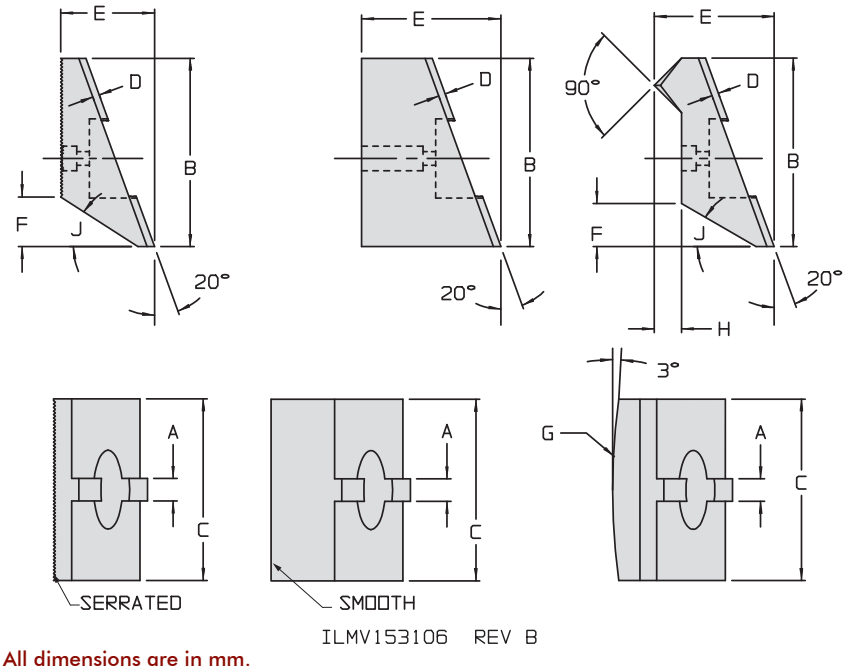
For manifold mounting, remove the M5 screw and sealing washer then insert the included O-ring.

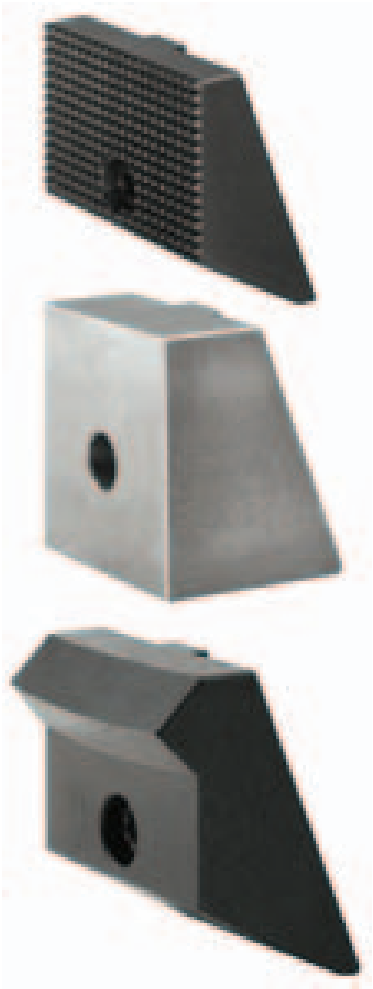
Maximum operating pressure 400 bar (40 MPa)

Pull-Down Clamp Jaws

- Hardened and tempered steel (except smooth jaws).
- Serrated Jaws can be used for all workpieces with normal clamping force.
- Smooth Jaws are not hardened and treated and can be shaped into any clamping form or ground flush for sensitive workpieces.
- Clamping Jaws with clamping edge are well suited for workpieces with hard and very uneven surfaces.

Special jaws are available in the configurations illustrated on this page (nominal extra cost). These configurations fit most special applications nearly eliminating the need for high cost, specific application special orders.





All dimensions are in mm.

Dimensions										
Jaw Model No.	Clamp Models	A	B	C	D	E ± 0.5	F	G	H	J
Serrated Clamping Jaws										
41-5320-20	41-5311-05	6	29.5	30	2.5	22	3	-	-	15°
41-5320-01	41-5311-20 41-5320-20	10	50	50	3	31.5	14	-	-	30°
41-5332-01	41-5311-32	10	65	65	3	37	17.5	-	-	30°
41-5350-01	41-5311-50	10	80	80	3	39.5	19	-	-	30°
Smooth Clamping Jaws										
41-5305-02	41-5311-05	6	29.5	30	2.7	32	-	-	-	-
41-5320-02	41-5311-20 41-5320-20	10	50	50	3	41.5	-	-	-	-
41-5332-02	41-5311-32	10	65	65	3	52	-	-	-	-
41-5350-02	41-5311-50	10	80	80	3	59.5	-	-	-	-
Clamping Jaws with Clamping Edge										
41-5305-03	41-5311-05	6	29.5	30	2.7	27	4	300	5	15°
41-5320-03	41-5311-20 41-5320-20	10	50	50	3	39.5	14	200	8	30°
41-5332-03	41-5311-32	10	65	65	3	47	17	300	10	30°
41-5350-03	41-5311-50	10	80	80	3	51	19	300	12	30°

Frequently Asked Questions

Why use them?

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

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

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

What are their intended applications? 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. Call us with questions about your application? s.

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

Most of the required information is in this catalog. The only other fact you should be aware of is that single acting cylinders are not designed to carry 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.

What choices do I have when manifold mounting block cylinders?

You have the choice between common side or rear porting and manifold porting. Recent additions to the product line give huge advantages in plumbing placement and one unit has both manifold and standard porting. By manifold mounting the fluid to your block cylinder (or any other device), you reduce the chips trapped by tubing and streamline your fixtures for high grade "chip shedding." Note: Vektek is the leader in devices with surface mount manifolds, accessories and valves helping you avoid the costly manufacture of cavities and frequent installation problems common to "cartridge" devices.

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

This will involve mounting your 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 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?

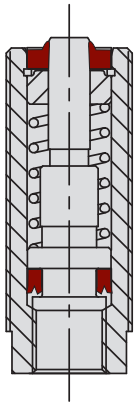
Cartridge cylinders have always required a special cylinder wall or end finish adequate to seal against. The most common sources of cartridge cylinder leakage are from bad finishes or external seals getting damaged when screwed into a poorly made cavity. This cylinder uses an easy to make upper flange 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?

The Easy Mount double acting cylinders let you hide the cylinder body and O-ring manifold mount... The best of all solutions! See page (F-16) for details.

Standard Features

- Adjust the force ranging from "minimal" to maximum cylinder capacity, by varying the input pressure.
- Vektek cylinders are designed for long life in high production applications. Don't gamble with "cheap" cylinders, which wear out prematurely.



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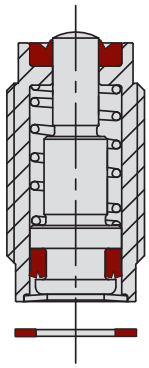


ILMV200117 REV A

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

Proprietary seal design reduces leakage and extends seal life for longer lasting, more dependable cylinders.

Threaded models use positionable, G Series fluid ports.

Cartridge models are supplied with an appropriate gasket to seal against the cavity bottom.

Chromed and hardened 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, single acting cylinders should not be run to the end of stroke.

Threaded Mini-Cylinders Specifications

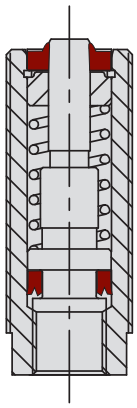
Single Acting

- Easy to use, basic hydraulic cylinders in G Series ported styles.
- A force ranging from "minimal" to maximum cylinder capacity is adjusted by tuning the input pressure.
- Designed for long life in high production applications.
- Reduce or eliminate part distortion by providing accurate 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 plague other cylinder brands.

Each cylinder capacity is available in three stroke lengths.



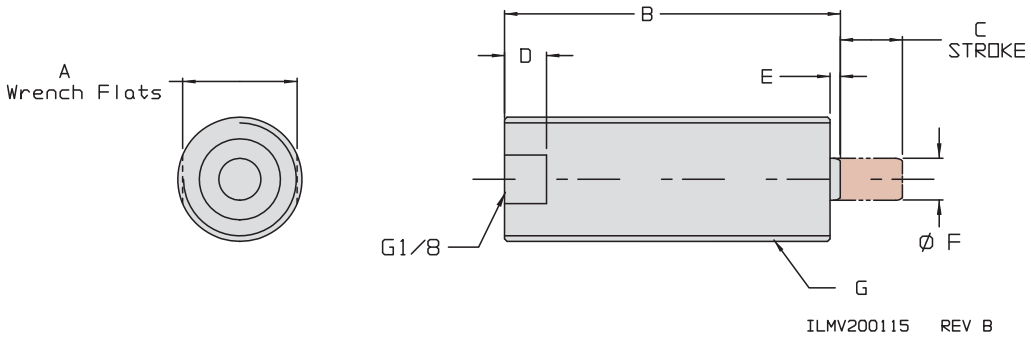
ILMV200112 REV B

Specifications

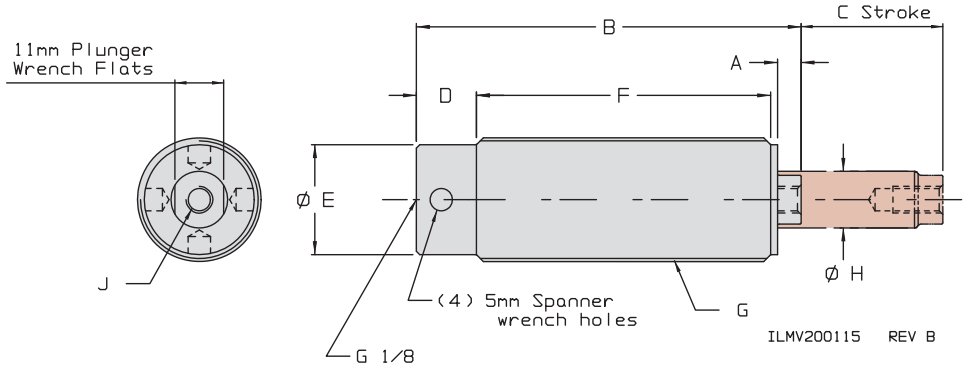
Model No.	Type	Capacity (kN)** Extend	Stroke (mm)	Body Thread	Minimum Length (mm)	Piston Area (cm^2) Extend	Oil Capacity (cm^3) Extend
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.							
42-0010-01	Threaded	4.4	9.5	M20 x 1.5	51	1.3	1.2
42-0010-10			19		66.5		2.5
42-0010-11			32		83		4.1
42-0010-02	Threaded	10.1	6.5	M28 x 1.5	56	2.9	1.8
42-0010-12			19		69		5.5
42-0010-13			32		86		9.2

** Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure. The output force is adjustable by varying the hydraulic system pressure. To determine approximate output force for your application, multiply the Piston Area times Your System Operating Pressure. Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return spring forces.

Threaded Mini-Cylinder Dimensions



Dimensions							
Model No.	A	B	C	D	E	F	G
Single Acting (S/A) cylinders, actuated hydraulically 1 direction, spring returned							
42-0010-01	16	51	9.5	6.5	1.5	6.5	M20 x 1.5
42-0010-10	16	65.5	19.0	6.5	1.5	6.5	M20 x 1.5
42-0010-11	16	83	32.0	6.5	1.5	6.5	M20 x 1.5



Dimensions									
Model No.	A	B	C	D	E	F	G	H	J
Single Acting (S/A) cylinders, actuated hydraulically 1 direction, spring returned									
42-0010-02	6.5	55.5	6.5	12.5	24.5	35.5	M28 x 1.5	12.5	M6 x 1.0 x 11
42-0010-12	6.5	68.5	19.0	12.5	24.5	48	M28 x 1.5	12.5	M6 x 1.0 x 11
42-0010-13	5	86	32.0	12.5	24.5	67	M28 x 1.5	12.5	M6 x 1.0 x 11

All dimensions are in mm.

Threaded Specifications

Single and Double Acting

- Easy to use, basic hydraulic cylinders in G 1/8 ported designs.
- Vektek cylinders are designed for long life in high production applications.
- Reduce or eliminate part distortion by providing accurate, repeatable clamping force.
- A force ranging from "minimal" to maximum cylinder capacity is adjusted by tuning the input pressure.
- Double Acting cylinders assure complete powered retraction for CNC controlled operations where time is critical or when heavy end effectors are used. Single acting cylinders should be used with small end effectors only and where retraction speed is not critical.
- Single Acting units have a coaxial spring design to extend life.

Cylinders have chromed and hardened pistons for longer life.

Leak-free G 1/8 fluid ports are common to all models.

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

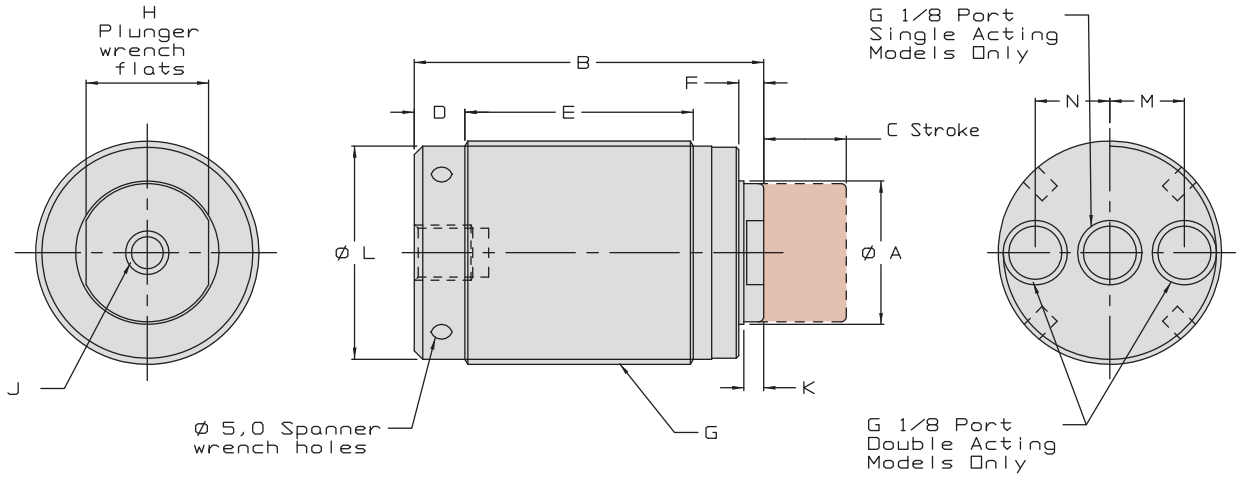
ILMV200113 REV C

Specifications

Model No.	Cylinder Capacity (kN)**		Stroke (mm)	Body Thread	Minimum Length (mm)	Piston Area (cm^2)		Oil Capacity (cm^3)	
	Extend	Retract				Extend	Retract	Extend	Retract
Single Acting (S/A) Cylinders, actuated hydraulically and spring returned.									
42-0010-03	17.8	N/A	12.5	M35 x 1.5	68	5.1	N/A	6.5	N/A
42-0010-04			25.5		80.5			13.0	
42-0010-05			51		109			26.0	
42-0010-06	39.9	N/A	12.5	M48 x 1.5	70	11.4	N/A	14.5	N/A
42-0010-07			25.5		82.5			29.0	
Double Acting (D/A) Cylinders, actuated hydraulically both directions.									
42-0020-00	17.8	5.9	25.5	M48 x 1.5	80.5	5.1	1.7	13.0	4.4
42-0020-01			51		109			26.0	8.8
42-0020-02	39.9	17.5	25.5	M65 x 1.5	82.5	11.4	5.0	29.0	12.7
42-0020-03			51		111.5			58.0	25.5

** Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure. The output force is adjustable by varying hydraulic system pressure. To determine approximate output force for your application, multiply the Piston Area times Your System Operating Pressure. Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return spring forces.

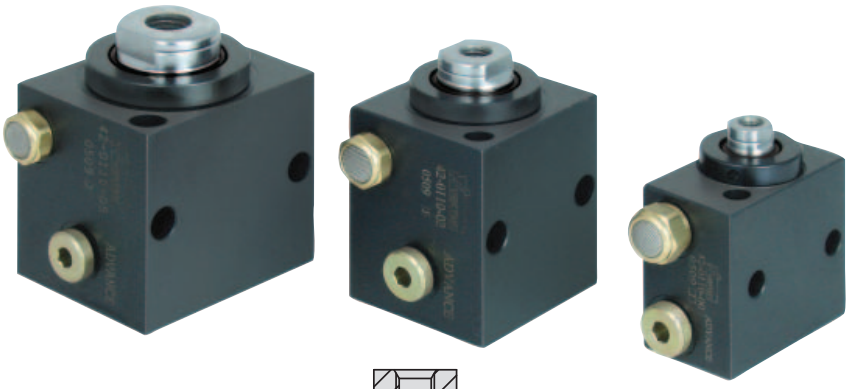
Threaded Dimensions

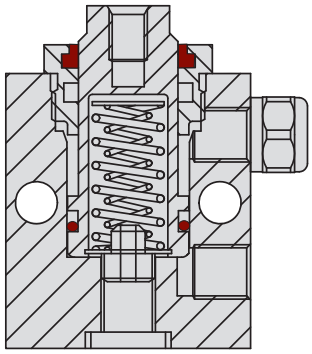


Dimensions													
Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N
Single Acting (S/A) Cylinders, actuated hydraulically and spring returned.													
42-0010-03 42-0010-04 42-0010-05	20.64	68 80.5 109	12.5 25.5 51	12.5	39.5 52.5 81	8 8.5	M35 x 1.5	17	M8 x 1.25 x 11	6.5	30.5	N/A	N/A
42-0010-06 42-0010-07	28.58	70 82.5	12.5 25.5	12.5	39.5 52.5	10	M48 x 1.5	25	M12 x 1.75 x 13	9	45	N/A	N/A
Double Acting (D/A) Cylinders, actuated hydraulically both directions.													
42-0020-00 42-0020-01	20.64	80.5 109	25.5 51	12.5	52.5 81	8	M48 x 1.5	17	M8 x 1.25 x 11	6.5	45	14.5	14.5
42-0020-02 42-0020-03	28.58	82.5 111.5	25.5 51	12.5	52.5 81	10	M65 x 1.5	25	M12 x 1.75 x 13	9	60.5	20.5	11

All dimensions are in mm.

Block Cylinder Specifications





ILMV201100 REV D

Single and Double Acting

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

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

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

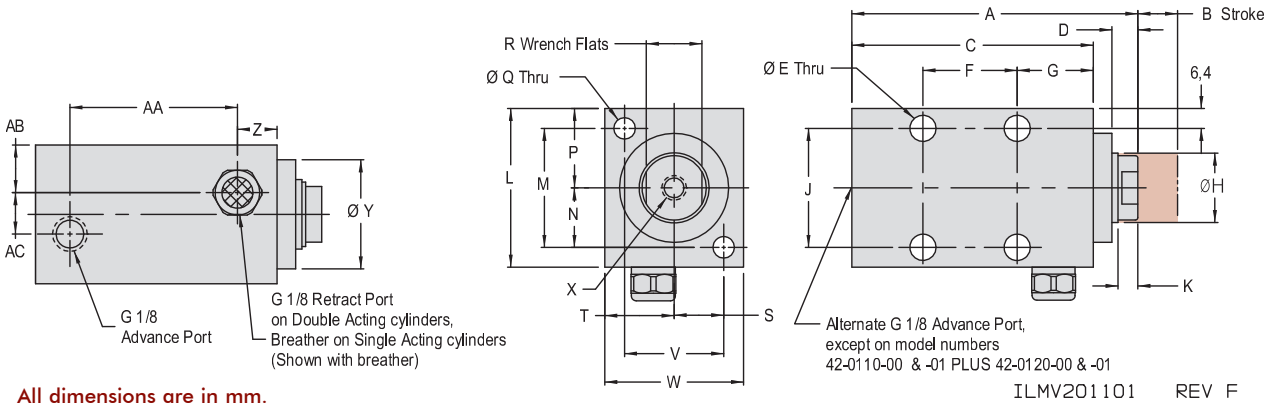
Springs are designed to return the cylinder and contact points, not intended to pull mechanisms.

Specifications

Model No.	Cylinder Capacity (kN)**		Stroke (mm)	Body Size (mm)	Minimum Length (mm)	Piston Area (cm^2)		Oil Capacity (cm^3)	
	Extend	Retract				Extend	Retract	Extend	Retract
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.									
42-0110-00	10.1	N/A	6.5	28.5 x 51	60	2.9	N/A	1.9	N/A
42-0110-01			19		79			5.7	
42-0110-02	17.8	N/A	12.5	44.5 x 51	71	5.1	N/A	6.5	N/A
42-0110-03			25.5		84			13.0	
42-0110-12			38		100			19.3	
42-0110-04			51		112.5			26.0	
42-0110-05	39.9	N/A	12.5	51 x 63.5	73	11.4	N/A	14.5	N/A
42-0110-06			25.5		86			29.0	
42-0110-13			38		98.5			43.4	
42-0110-14			51		114.5			58.0	
Double Acting (D/A) Cylinders, actuated hydraulically both directions.									
42-0120-00	10.1	5.6	6.5	28.5 x 51	60	2.9	1.6	1.9	1.0
42-0120-01			19		79			5.7	3.0
42-0120-02	17.8	5.9	12.5	44.5 x 51	71	5.1	1.7	6.5	2.2
42-0120-03			25.5		84			13.0	4.4
42-0120-08			38		100			19.3	6.6
42-0120-04			51		112.5			26.0	8.8
42-0120-05	39.9	17.5	12.5	51 x 63.5	73	11.4	5.0	14.5	6.3
42-0120-06			25.5		86			29.0	12.7
42-0120-09			38		98.5			43.4	19.0
42-0120-07			51		114.5			58.0	25.4

** Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure. The output force is adjustable by varying hydraulic system pressure. To determine the approximate output force for your application, multiply the Piston Area times Your System Operating Pressure. Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs. Actual force may vary slightly due to frictional losses, seal drag, and/or return spring forces.

Block Cylinder Dimensions



All dimensions are in mm.

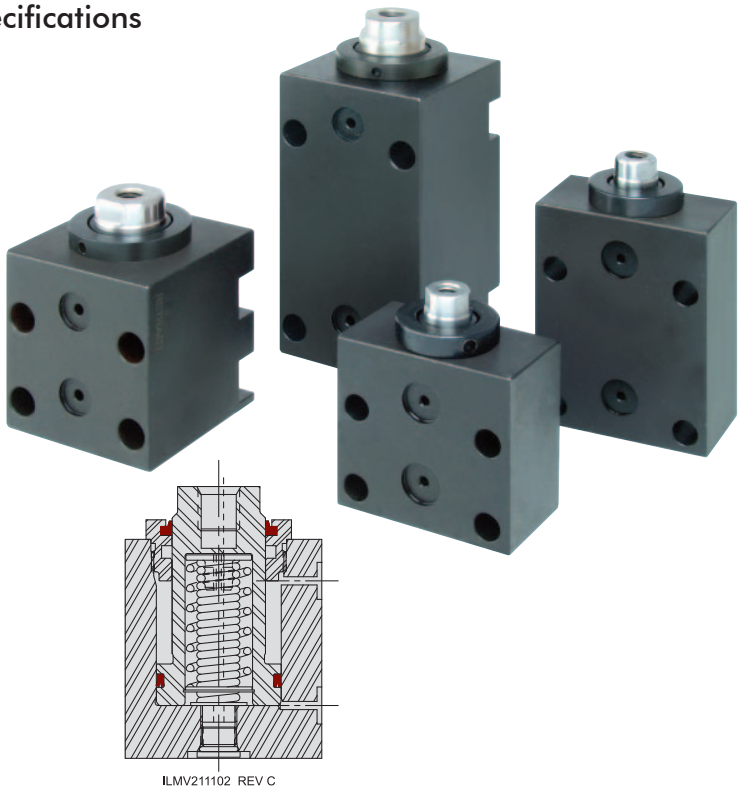
ILMV201101 REV F

Dimensions

Model No.	A	B	C	D	ØE	F	G	ØH	J	K	L	M	N	P
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.														
42-0110-00 42-0110-01	60 79	6.5 19	47 66	7.5	7.1	N/A	23.5	12.70	33.4	5.5	51	33.4	16.5	23
42-0110-02 42-0110-03 42-0110-12 42-0110-04	71 84 100 112.5	12.5 25.5 38 51	57 69.5 85.5 98.5	8	8.7	N/A 28.6 41.3	27	20.64	38.1	6.5	51	38.1	19	25.5
42-0110-05 42-0110-06 42-0110-13 42-0110-14	73 86 98.5 114.5	12.5 25.5 38 51	57 69.5 82.5 98.5	10	8.7	N/A 25.4 41.3	27	28.58	50.8	9	63.5	48.3	24	32
Double Acting (D/A) Cylinders, actuated hydraulically both directions.														
42-0120-00 42-0120-01	60 79	6.5 19	47 66	7.5	7.1	N/A	23.5	12.70	33.4	5.5	51	33.4	16.5	23
42-0120-02 42-0120-03 42-0120-08 42-0120-04	71 84 100 112.5	12.5 25.5 38 51	57 69.5 85.5 98.5	8	8.7	N/A 28.6 41.3	27	20.64	38.1	6.5	51	38.1	19	25.5
42-0120-05 42-0120-06 42-0120-09 42-0120-07	73 86 98.5 114.5	12.5 25.5 38 51	57 69.5 82.5 98.5	10	8.7	N/A 25.4 41.3	27	28.58	50.8	9	63.5	48.3	24	32

Model No.	ØQ	R	S	T	V	W	X	ØY	Z	AA	AB	AC
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.												
42-0110-00 42-0110-01	7.1	11	8	14.5	15.9	28.5	M6 x 1.0 x 11	27	9.5	28 47	9.5	0
42-0110-02 42-0110-03 42-0110-12 42-0110-04	7.1	17	16	22	31.8	44.5	M8 x 1.25 x 11	35	12.5	28.5 41 57 70	8	14.5
42-0110-05 42-0110-06 42-0110-13 42-0110-14	8.7	25	18	25.5	35.6	51	M12 x 1.75 x 13	44.5	12.5	28.5 41 54 70	8	17.5
Double Acting (D/A) Cylinders, actuated hydraulically both directions.												
42-0120-00 42-0120-01	7.1	11	8	14.5	15.9	28.5	M6 x 1.0 x 11	27	9.5	28 47	9.5	0
42-0120-02 42-0120-03 42-0120-08 42-0120-04	7.1	17	16	22	31.8	44.5	M8 x 1.25 x 11	35	12.5	28.5 41 57 70	8	14.5
42-0120-05 42-0120-06 42-0120-09 42-0120-07	8.7	25	18	25.5	35.6	51	M12 x 1.75 x 13	44.5	12.5	28.5 41 54 70	8	17.5

Manifold Mount Block Cylinders Specifications



Single and Double Acting

- No external ports or external plumbing to collect chips.
- These block cylinders reduce installation labor.
- Manifold mount block cylinders are available in the same popular sizes as our other block cylinders.

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

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

ILMV211102 REV C

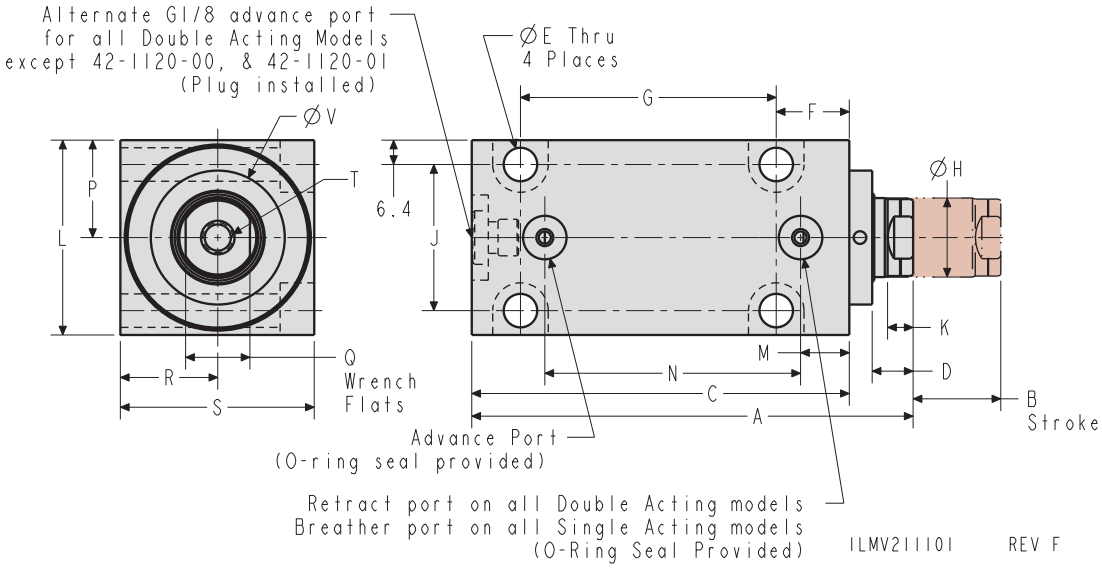
Specifications

Model No.	Cylinder Capacity (kN)*		Stroke (mm)	Body Size (mm)	Minimum Length (mm)	Piston Area (cm^2)		Oil Capacity (cm^3)	
	Extend	Retract				Extend	Retract	Extend	Retract
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.									
42-1110-00 42-1110-01	10.1	N/A	6.5 19	28.5 x 51	61 80	2.9	N/A	1.8 5.4	N/A
42-1110-02 42-1110-03 42-1110-08 42-1110-04	17.8	N/A	12.5 25.5 38 51	51 x 51	71 84 99.5 112.5	5.1	N/A	6.4 12.9 25.7 19.3	N/A
42-1110-05 42-1110-06 42-1110-09 42-1110-07	39.9	N/A	12.5 25.5 38 51	51 x 63.5	73 86 98.5 114.5	11.4	N/A	14.5 29.0 43.4 57.9	N/A
Double Acting (D/A) Cylinders,actuated hydraulically both directions.									
42-1120-00 42-1120-01	10.1	5.6	6.5 19	28.5 x 51	61 80	2.9	1.6	1.8 5.4	1.0 3.0
42-1120-02 42-1120-03 42-1120-08 42-1120-04	17.8	5.9	12.5 25.5 38 51	51 x 51	71 84 99.5 112.5	5.1	1.7	6.4 12.9 25.7 19.3	2.2 4.4 6.6 8.8
42-1120-05 42-1120-06 42-1120-09 42-1120-07	39.9	17.5	12.5 25.5 38 51	51 x 63.5	73 86 98.5 114.5	11.4	5.0	14.5 29.0 43.4 57.9	6.3 12.7 19.0 25.4

* Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure. The output force is adjustable by varying hydraulic system pressure. To determine the approximate output force for your application, multiply the Piston Area times Your System Operating Pressure. Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.

All dimensions are in mm.

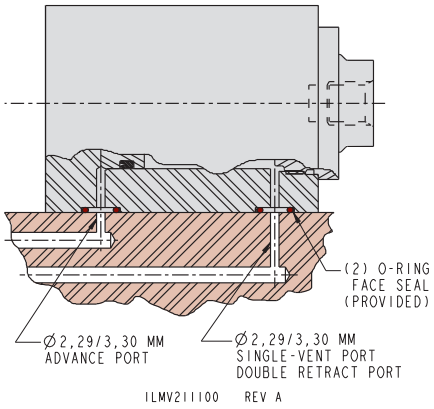
Manifold Mount
Block Cylinder Dimensions



Dimensions																			
Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	ØV
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction. spring returned.																			
42-1110-00	61	6.5	47.5	7.5	7.1	19	22.2	12.70	38.1	5.5	51	12.5	22.2	25.5	11	14.5	28.5	M6 x 1.0 x 11	27
42-1110-01	80	19	66.5				41.3						41.3						
42-1110-02	71	12.5	57	8	8.7	19	25.4	20.64	38.1	7	51	12.5	25.4	25.5	17	25.5	51	M8 x 1.25 x 11	35
42-1110-03	84	25.5	69.5				38.1						38.1						
42-1110-08	99.5	38	85.5				54.0						54.0						
42-1110-04	112.5	51	98.5				66.7						66.7						
42-1110-05	73	12.5	57	10	8.7	19	25.4	28.58	50.8	9	63.5	12.5	25.4	32	25	25.5	51	M12 x 1.75 x 13	44.5
42-1110-06	86	25.5	69.5				38.1						38.1						
42-1110-09	98.5	38	82.5				50.8						50.8						
42-1110-07	114.5	51	98.5				66.7						66.7						
Double Acting (D/A) Cylinders, actuated hydraulically both directions.																			
42-1120-00	61	6.5	47.5	7.5	7.1	19	22.2	12.70	38.1	5.5	51	12.5	22.2	25.5	11	14.5	28.5	M6 x 1.0 x 11	27
42-1120-01	80	19	66.5				41.3						41.3						
42-1120-02	71	12.5	57	8	8.7	19	25.4	20.64	38.1	7	51	12.5	25.4	25.5	17	25.5	51	M8 x 1.25 x 11	35
42-1120-03	84	25.5	69.5				38.1						38.1						
42-1120-08	99.5	38	85.5				54.0						54.0						
42-1120-04	112.5	51	98.5				66.7						66.7						
42-1120-05	73	12.5	57	10	8.7	19	25.4	28.58	50.8	9	63.5	12.5	25.4	32	25	25.5	51	M12 x 1.75 x 13	44.5
42-1120-06	86	25.5	69.5				38.1						38.1						
42-1120-09	98.5	38	82.5				50.8						50.8						
42-1120-07	114.5	51	98.5				66.7						66.7						

All dimensions are in mm.

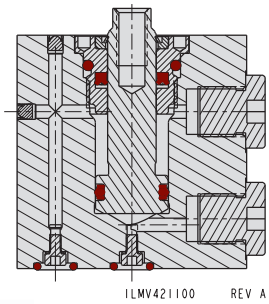
For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a



Combination Block Cylinders Specifications

Double Acting with Bottom Manifold and Standard Side Porting

- Combination block cylinders are available in 5 sizes with 2 stroke lengths each.
- Flush top design makes this cylinder ideal for use in close push or pull applications.
- Push or pull from the fixture surface using manifold ports.
- The G 1/4 side ports provide easy access to standard plumbing alternate ports.
- End manifold provides an alternative to other side manifold block cylinders.
- Stock end attachments available or make your own.

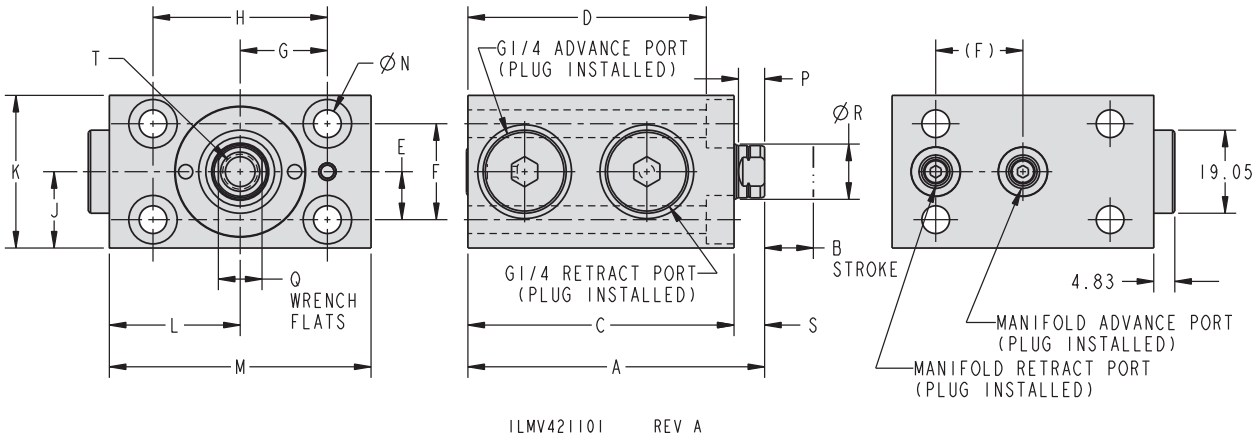


Specifications

Model No.	Cylinder Capacity (kN)*		Stroke (mm)	Body Size (mm)	Minimum Length (mm)	Piston Area (cm^2)		Oil Capacity (cm^3)	
	Extend	Retract				Extend	Retract	Extend	Retract
Double Acting (D/A) Cylinders,actuated hydraulically both directions.									
42-1121-00 42-1121-01	10	5.5	16 50	35 x 60	68 102	2.9	1.6	4.6 14.3	2.5 7.9
42-1121-02 42-1121-03	17.7	10.8	20 50	45 x 65	71 101	5.1	3.1	10.1 25.3	6.2 15.4
42-1121-04 42-1121-05	27.7	17.7	25 50	55 x 75	85 110	7.9	5.1	19.8 39.6	12.7 25.3
42-1121-06 42-1121-07	46.8	29	25 50	63 x 85	89 114	13.4	8.3	33.5 66.9	20.8 41.6
42-1121-08 42-1121-09	70.9	43.2	25 50	75 x 100	100 125	20.3	12.4	50.7 101.3	30.9 61.8

* Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure. The output force is adjustable by varying hydraulic system pressure. To determine the approximate output force for your application, multiply the Piston Area times Your System Operating Pressure. Actual force may vary slightly due to friction loss, seal and wiper drag.

Combination Block Cylinder Dimensions



ILMV421101 REV A

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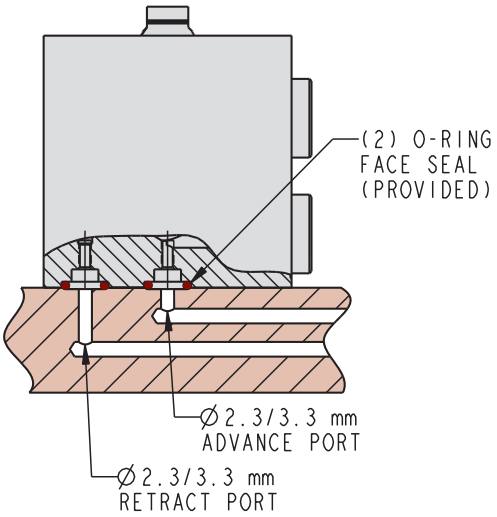
Dimensions																		
Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T
Double Acting (D/A) Cylinders, actuated hydraulically both directions.																		
42-1121-00 42-1121-01	68 102	16 50	61 95	54.6 88.6	11	22	20	40	17.5	35	30	60	6.3	6	10	12.7	7	M8 x 1.25 x 15
42-1121-02 42-1121-03	71 101	20 50	64 94	55.5 85.5	15	30	25	50	22.5	45	32.5	65	8.5	6	13	15.8	7	M10 x 1.5 x 15
42-1121-04 42-1121-05	85 110	25 50	75 100	64.5 89.5	17.5	35	27.5	55	27.5	55	37.5	75	10.5	9	16	19	10	M12 x 1.75 x 15
42-1121-06 42-1121-07	89 114	25 50	79 104	68.5 93.5	20	40	31.5	63	31.5	63	42.5	85	10.5	9	22	25.4	10	M16 x 2 x 25
42-1121-08 42-1121-09	100 125	25 50	90 115	77 102	22.5	45	38	76	37.5	75	50	100	13	9	27	31.7	10	M20 x 2.5 x 30



ILMV421102 REV A

For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

Hollow Rod Cylinders Specifications

Single And Double Acting

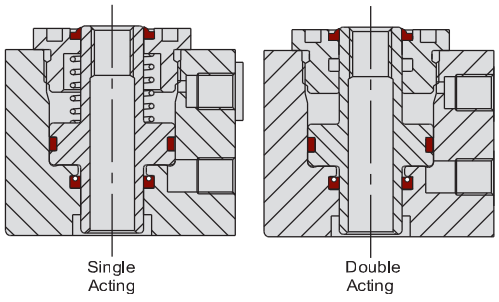
- Available in three capacities 20.6 kN, 29.7 kN and 53.2 kN clamp force at 350 bar (35 MPa)
- Also called "Power Nuts," hollow rod cylinders will draw or tighten an appropriately sized bolt to clamp or actuate remote mechanisms.
- Keyhole shaped bodies make maximum use of space. Cylinders are sized to the piston diameter with an additional bulk at 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.

F-12

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

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

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



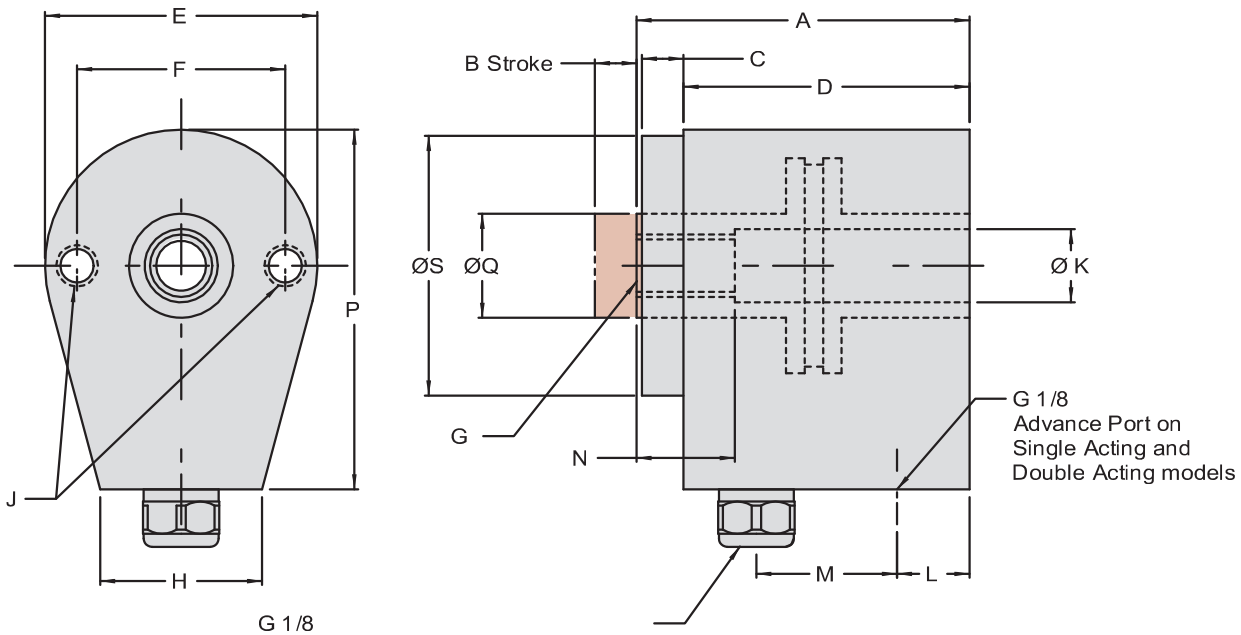
ILMV202101 REV A

Specifications

Model No.	Cylinder Capacity (kN)**	Stroke (mm)	Body Size	Minimum Length (mm)	Piston Area (cm^2)	Oil Capacity (cm^3)
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction. spring returned.						
42-0210-00	20.6	6.5	41.5 x 55	51	5.9	3.8
42-0210-01	29.7	9.5	49.5 x 62	63	8.5	8.1
42-0210-02	53.2	12.5	64.5 x 76	75.5	15.2	19.3
Double Acting (D/A) Cylinders, actuated hydraulically in both directions.						
42-0220-00	20.6	6.5	41.5 x 55	51	5.9	3.8
42-0220-01	29.7	9.5	49.5 x 62	63	8.5	8.1
42-0220-02	53.2	12.5	64.5 x 76	75.5	15.2	19.3

** Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure. The output force can be adjusted by varying hydraulic system pressure. To calculate the approximate output force for an application, multiply the Effective Piston Area by the system operating pressure. Actual force may vary slightly due to frictional losses, seal and wiper drag, and/or return spring forces.

Hollow Rod Cylinders Dimensions



Dimensions									
Model No.	A	B	C	D	E	F	G	H	
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction. spring returned.									
42-0210-00	51	6.5	7	43.5	41.5	32	M10	28.5	
42-0210-01	63.5	9.5	7	56.5	49.5	36	M12	24.5	
42-0210-02	76	12.5	9.5	66	64.5	50	M16	25	
Double Acting (D/A) Cylinders, actuated hydraulically both directions.									
42-0220-00	51	6.5	7	43.5	41.5	32	M10	28.5	
42-0220-01	63.5	9.5	7	56.5	49.5	36	M12	24.5	
42-0220-02	76	12.5	9.5	66	64.5	50	M16	25	
Model No.	J		K	L	M	N	P	Q	S
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction. spring returned.									
42-0210-00	M6 x 1.0 X 6		10.5	12	20.5	15	55	16	39.5
42-0210-01	M8 x 1.25 X 8		13.5	18	25.5	15	62	19	47.5
42-0210-02	M10 x 1.5 X 13		16.5	23	30	18	76	25.5	63.5
Double Acting (D/A) Cylinders, actuated hydraulically both directions.									
42-0220-00	M6 x 1.0 X 6		10.5	12	20.5	15	55	16	39.5
42-0220-01	M8 x 1.25 X 8		13.5	18	25.5	15	62	19	47.5
42-0220-02	M10 x 1.5 X 13		16.5	23	30	18	76	25.5	63.5

All dimensions are in mm.

Cartridge Mount Mini-Cylinders Specifications

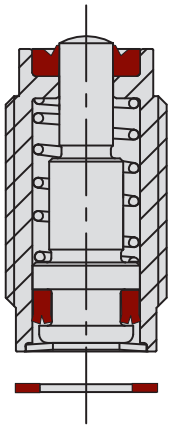
Single Acting

- Easy to use, basic hydraulic cylinders in four capacities of cartridge mount style.
- A force ranging from "minimal" to maximum cylinder capacity is adjusted by tuning the input pressure.
- Reduce or eliminate part distortion by providing accurate clamping force.
- Cartridge mounting eliminates exposed tubing for clean, compact, clutter-free fixtures.

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

Positive piston stop shoulder keeps the spring from "bottoming out", guarding against premature spring failure which can plague other cylinder brands. BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching. After years of use, cylinder removal is easier because of BHC's corrosion resistance.

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



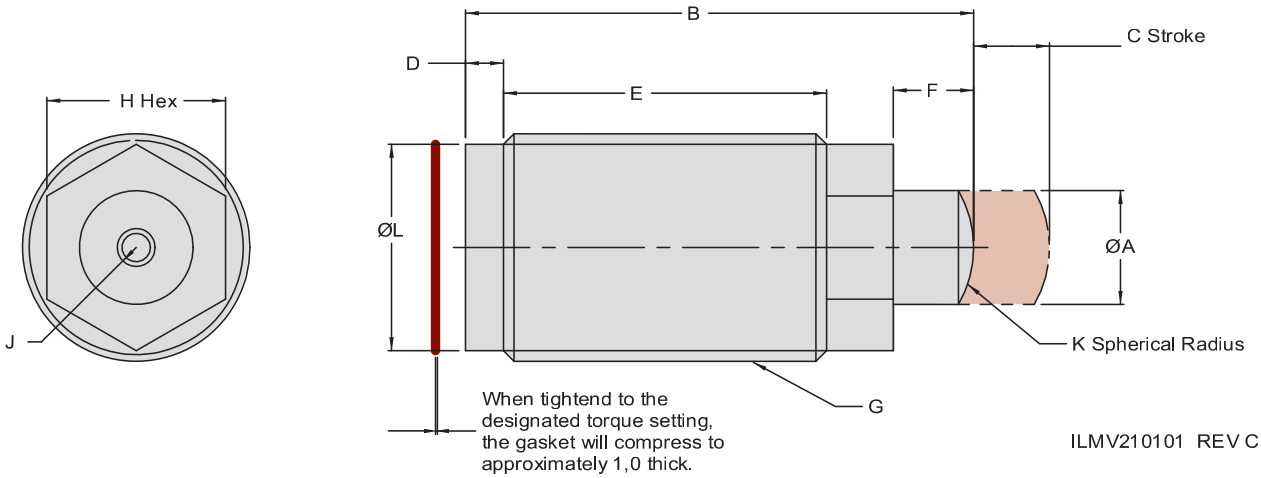
ILMV200117 REV A

Specifications

Model No.	Cylinder Capacity (kN)**	Stroke (mm)	Body Thread	Minimum Length (mm)	Piston Area (cm^2) Extend	Oil Capacity (cm^3) Extend
Single Acting (S/A) Cylinders, actuated hydraulically and spring returned.						
42-1010-00	2.4	5	M16 x 1.5	28	0.7	0.3
42-1010-01	4.4	7	M20 x 1.5	38	1.3	0.8
42-1010-02	10.1	9.5	M28 x 1.5	35	2.9	2.7
42-1010-03		19		62		5.5
42-1010-04	17.5	8	M35 x 1.5	37.5	5.1	4.0

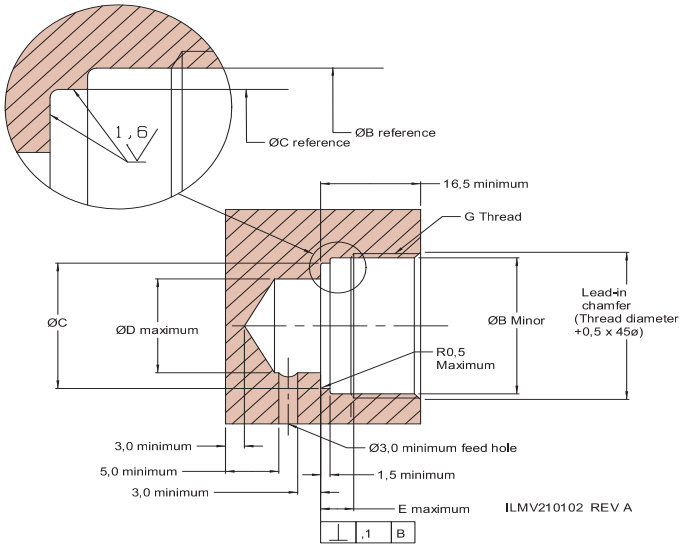
** Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure. The output force is adjustable by varying the hydraulic system pressure. To determine approximate output force for your application, multiply the Piston Area times Your System Operating Pressure. Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return springs.

Cartridge Mount Mini-Cylinders Dimensions



Dimensions											
Model No.	A	B	C	D	E	F	G	H	J	K	L
Single Acting (S/A) Cylinders, actuated hydraulically and spring returned.											
42-1010-00	4.5	28	5	5	17.5	0.5	M16 x 1.5	13	N/A	6.5	13.5
42-1010-01	6.5	37	6.5	5	25	1.5	M20 x 1.5	16	N/A	6.5	16.5
42-1010-02	12.5	34.5	9.5	8	15.5	1.5	M28 x 1.5	22	N/A	19	23
42-1010-03		61.5	19		42.5			22	M6 x 1.0 x 11	N/A	
42-1010-04	16	37.5	8	8	19	2.5	M35 x 1.5	27	M6 x 1.0 x 12.5	N/A	31

All dimensions are in mm.



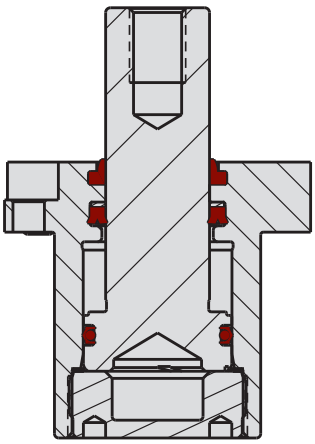
Both copper and composite gaskets are supplied. Use only one gasket of your choice.

Cavity Dimensions for Manifold Mount Threaded Mini-Cylinders							
Model No.	G	Copper Gasket Torque (Nm)	Composite Gasket Torque (Nm)	B	C	D	E
Single Acting (S/A) Cylinders, actuated hydraulically and spring returned.							
42-1010-00	M16 x 1.5	40	20	14.52 +/- 0.15	13.84 +/- 0.13	8	4.0
42-1010-01	M20 x 1.5	54	30	18.52 +/- 0.15	16.81 +/- 0.13	9.5	4.0
42-1010-02	M28 x 1.5	68	35	26.52 +/- 0.15	23.44 +/- 0.13	16	7.0
42-1010-03							
42-1010-04	M35 x 1.5	N/A	50	33.52 +/- 0.15	31.19 +/- 0.13	22	7.0

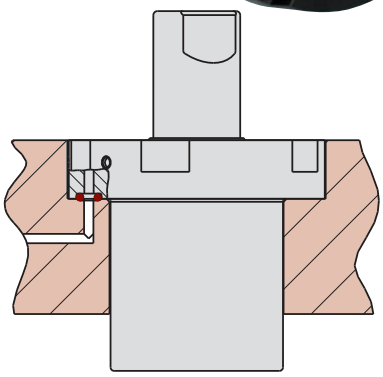
Easy Mount Cartridge Cylinder

Double Acting

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



ILMV216200 REV D



ILMV216203 REV A

Specifications

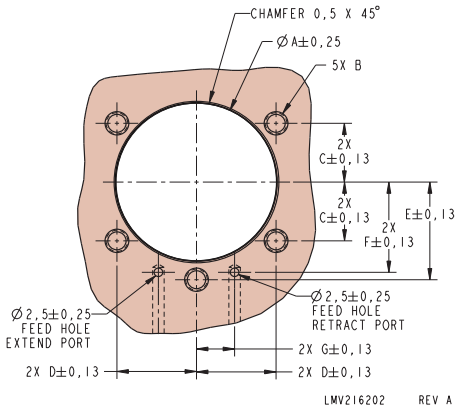
Model No.	Capacity (kN)**		Stroke (mm)	Effective Piston Area (cm^2)		Oil Capacity (cm^3)	
	Extend	Retract		Extend	Retract	Extend	Retract
Double Acting (D/A)	Cylinders actuated hydraulically both directions						
42-1621-32	27	14	15	7.9	4.1	11.9	6.1

** Cylinder capacities are listed at 350 bar (35 MPa) 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, divide the maximum cylinder force listed by 350 and multiply the result by the predetermined operating pressure. The actual force may vary slightly due to friction losses within the cylinder assembly.

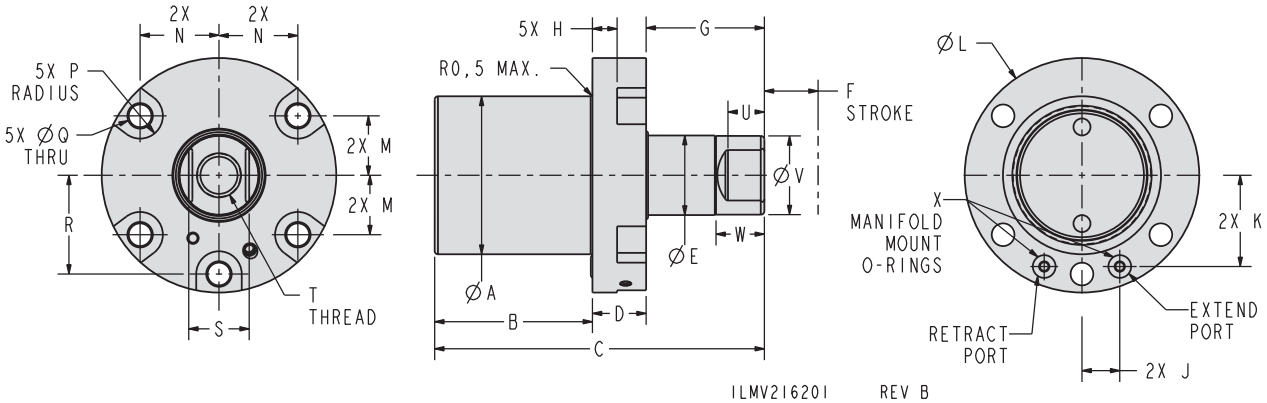
Mounting Dimensions

Model No.	Capacity	ØA	B		C
42-1621-32	27/14	44.6	M6 x 1		16.6
Model No.	Capacity	D	E	F	G
42-1621-32	27/14	22	27.6	25.5	10.5

For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a



LMV216202 REV A



ILMV216201 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												
42-1621-32	44.1	44	92	15	22.21	15	33	7	10.5	25.5	65.45	16.6	22
Model No.	P	ØQ	R	S	T				U	ØV	W	X	
Double Acting (D/A)	Cylinders actuated hydraulically both directions												
42-1621-32	6.5	6.7	27.6	17	M12 x 1.75 Depth 16				10	22	13.5	3.68 x 1.78	

Standard Features

Special wipers keep chips and contaminants out

Chromed and hardened 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 or used as a 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.

What is the intended application of these devices?

Push-Pull clamps 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 standard swing clamp pages (C-17 to C-27). Order the required swing clamp size assembled in the straight 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, just actuate your pull cylinders and draw the locator out of the way.

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

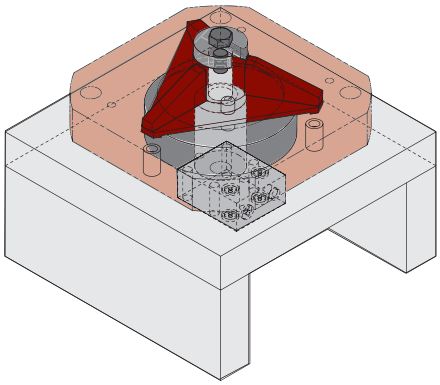
Yes, you may use single acting pull cylinders as stock crowders. Hold your part in place, then draw the cylinder away for machining. This can often be done with a single hydraulic clamping circuit making your controls very simple. Be sure to use a hardened contact point on your pull cylinder when using 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 are not 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 Cylinders

Threaded Body Specifications

Single And Double Acting

- Available in pull capacities from 2.1 kN to 24.9 kN
- Single acting plunger is spring extended, Hydraulically retracted
- Several sizes provide a wide range of adjustment
- If you need a straight-line guided model, order as a swing clamp (See page C-19)

Chromed and hardened alloy steel plungers run longer with less wear and drag than other brands.

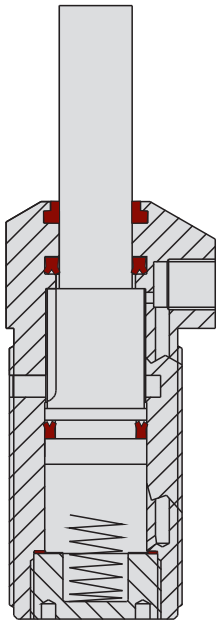
G Series porting is standard for easy access.

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.



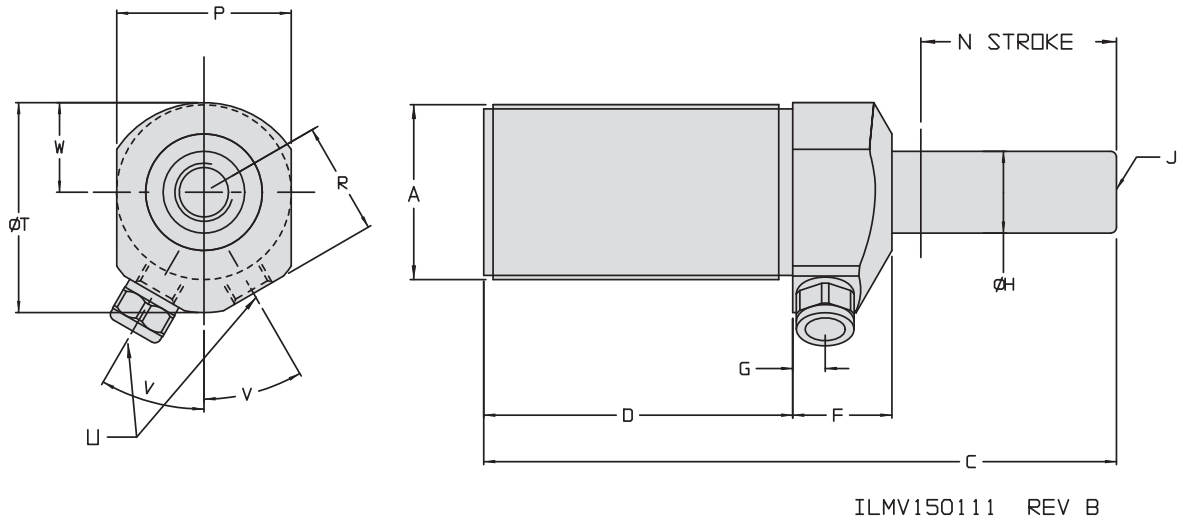
ILMV150108 REV B

Specifications

Model No.	Cylinder Capacity** (kN)		Vertical Clamping Stroke (mm)	Body Thread	Effective Piston Area (cm^2)		Oil Capacity (cm^3)	
	Extend	Retract			Extend	Retract	Extend	Retract
Single Acting (S/A) Cylinders, actuated hydraulically and spring returned.								
42-5010-51	N/A	2.1	14.5	M28 x 1.5	N/A	0.63	N/A	0.92
42-5010-91	N/A	6.2	20	M38 x 1.5	N/A	1.90	N/A	3.82
42-5011-31	N/A	13.7	29.5	M48 x 1.5	N/A	4.04	N/A	11.9
42-5018-00	N/A	24.9	42	M65 x 1.5	N/A	7.60	N/A	32
Double Acting (D/A) Cylinders, actuated hydraulically both directions.								
42-5020-51	5.3	2.1	14.5	M28 x 1.5	1.61	0.63	2.3	0.92
42-5020-91	13.3	6.2	20	M38 x 1.5	3.88	1.90	7.8	3.82
42-5021-31	27.1	13.7	29.5	M48 x 1.5	7.92	4.04	23	11.9
42-5028-00	53.3	24.9	42	M65 x 1.5	15.52	7.60	65.4	32

** Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure. The output force can be adjusted by varying the hydraulic system pressure. To calculate the approximate output force for your application, multiply the Piston Area times Your System Operating Pressure. Actual force may vary slightly due to frictional losses, seal and wiper drag, and/or return spring forces.

Threaded Body Dimensions



Dimensions							
Model No.	A	C	D	F	G	H	J
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction. spring returned.							
42-5010-51	M28 x 1.5	102	44	25.5	13	11.13	M6 X 1.0 X 7
42-5010-91	M38 x 1.5	134	60	31	13	15.88	M10 X 1.5 X 12
42-5011-31	M48 x 1.5	172	79	32	13	22.23	M12 X 1.75 X 13
42-5018-00	M65 x 1.5	236	115.5	34	13	31.71	M16 X 2.0 X 19
Double Acting (D/A) Cylinders, actuated hydraulically both directions							
42-5020-51	M28 x 1.5	102	44	25.5	13	11.13	M6 X 1.0 X 7
42-5020-91	M38 x 1.5	134	60	31	13	15.88	M10 X 1.5 X 12
42-5021-31	M48 x 1.5	172	79	32	13	22.23	M12 X 1.75 X 13
42-5028-00	M65 x 1.5	236	115.5	34	13	31.71	M16 X 2.0 X 19
Model No.	**N**	**P**	**R**	**T**	**U**	**V**	**W**
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction. spring returned.							
42-5010-51	14.5	32	20.5	38	G 1/8	25°	14
42-5010-91	20	38	26	47.5	G 1/8	35°	19.5
42-5011-31	29.5	47.5	31.5	60	G 1/4	30°	25.5
42-5018-00	42	65	37	73	G 1/4	30°	33
Double Acting (D/A) Cylinders, actuated hydraulically both directions							
42-5020-51	14.5	32	20.5	38	G 1/8	25°	14
42-5020-91	20	38	26	47.5	G 1/8	35°	19.5
42-5021-31	29.5	47.5	31.5	60	G 1/4	30°	25.5
42-5028-00	42	65	37	73	G 1/4	30°	33

All dimensions are in millimeters

Pull Cylinders

Block Pull Specifications

Single Acting

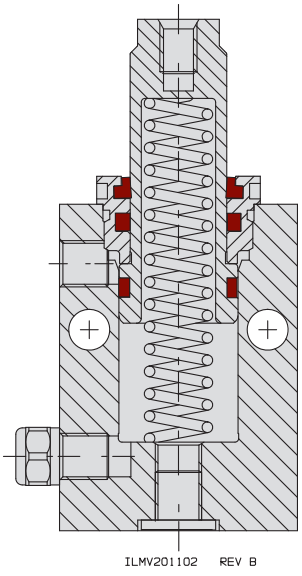
- No special mounting hardware required, secure these "draw" action cylinders by bolting in place.
- Adjustable force ranging from minimal to maximum cylinder capacity, just vary the hydraulic pressure.
- Normally extended piston provides a simple device for actuating clamping mechanisms, device manipulation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

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

Chromed and hardened 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.

Specially designed springs run longer, require less maintenance.

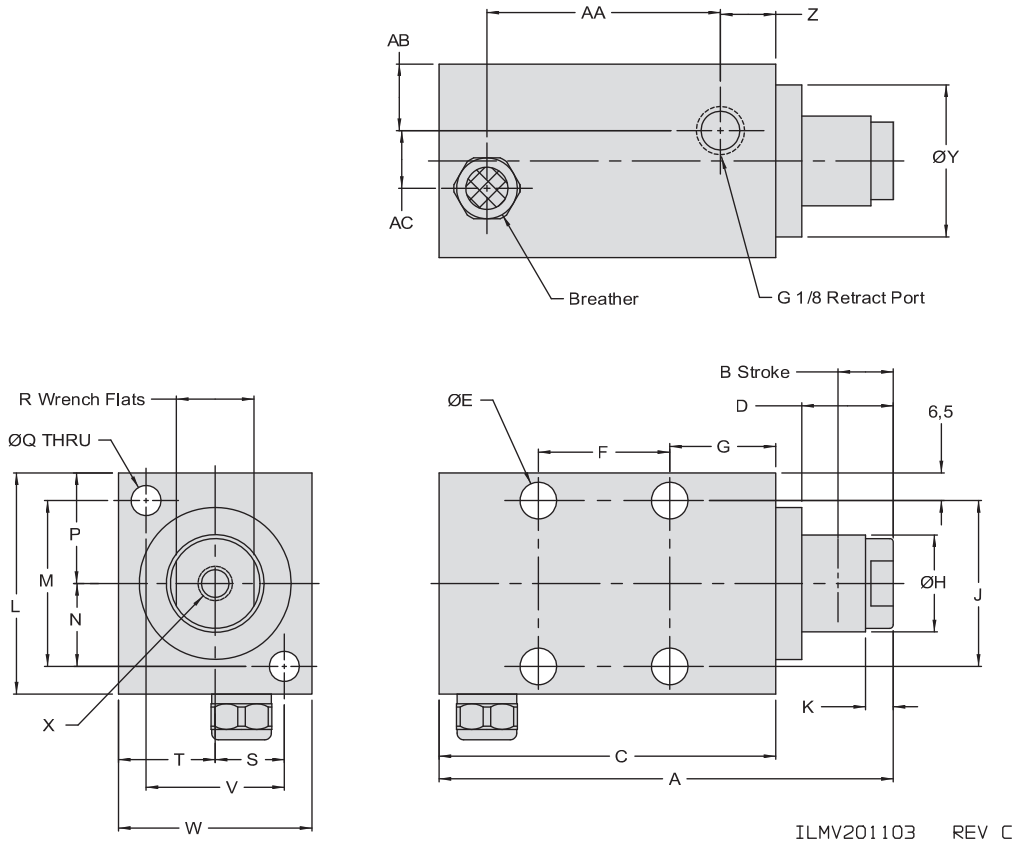


Specifications

Model No.	Cylinder Capacity** (kN) Retract	Stroke (mm)	Body Size (mm)	Extended Height (mm)	Piston Area (cm^2) Retract	Oil Capacity (cm^3) Retract
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.						
42-5111-01 42-5111-02	5.9	25.5 51	44.5 x 51	109 163.5	1.7	4.4 8.8
42-5111-51 42-5111-52	17.5	25.5 51	51 x 63.5	111 165	5.0	12.7 25.4

** Cylinder capacities are listed at 350 bar (35 MPa) maximum operating pressure. The output force is adjustable by varying the hydraulic system pressure. To determine approximate output force for your application, multiply the Piston Area times Your System Operating Pressure. Actual force may vary slightly due to friction loss, seal and wiper drag, and/or return spring forces.

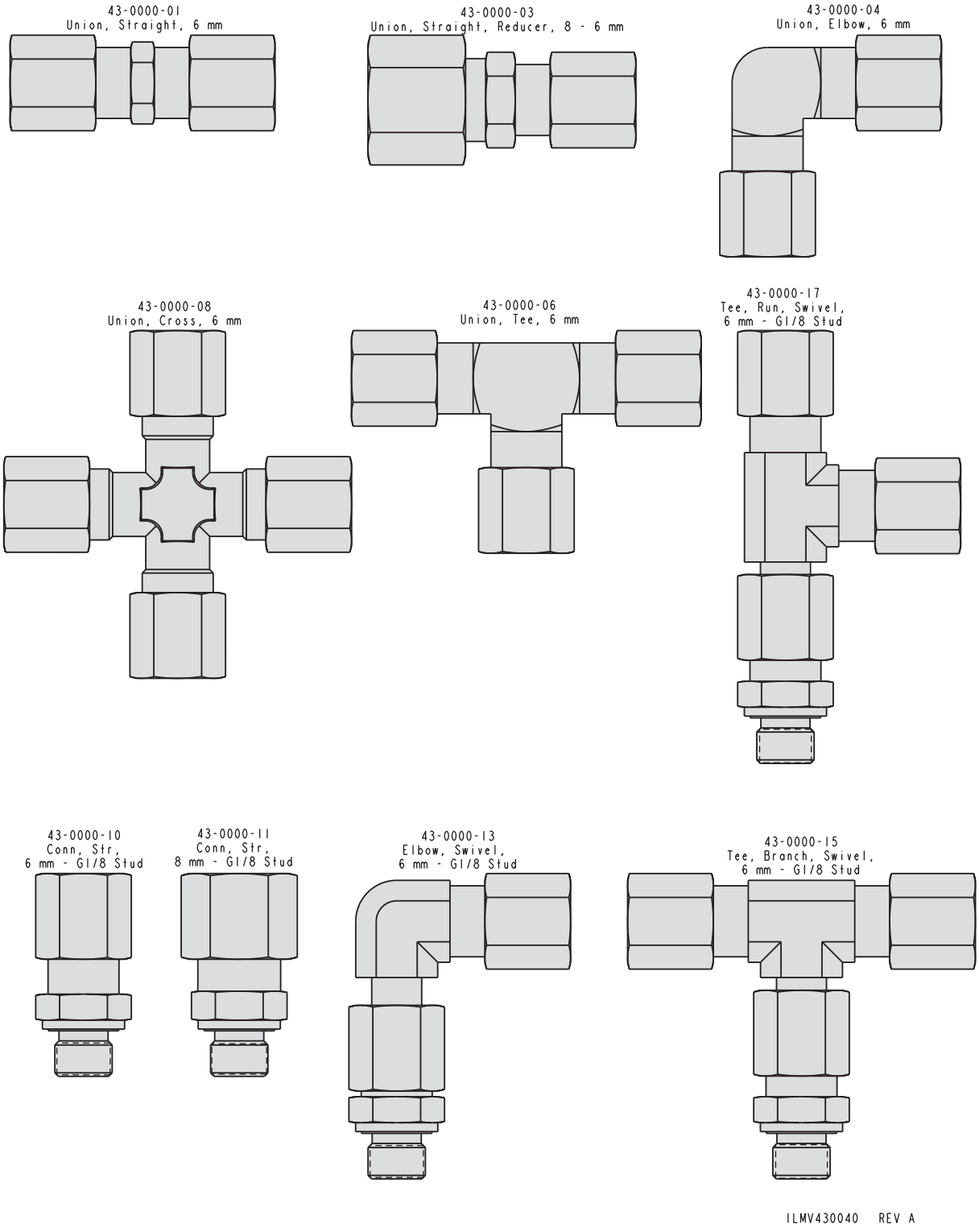
Block Pull Dimensions



Dimensions														
Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.														
42-5111-01 42-5111-02	109 163.5	25.5 51	69.5 98.5	33.5 59	8.7	N/A 41.3	27	20.64	38.1	6.5	51	38.1	19	25.5
42-5111-51 42-5111-52	111 165.5	25.5 51	69.5 98.5	35.5 61	8.7	N/A 41.3	27	28.58	50.8	9	63.5	48.3	24	32
Model No.	Q	R	S	T	V	W	X			Y	Z	AA	AB	AC
Single Acting (S/A) Cylinders, actuated hydraulically 1 direction, spring returned.														
42-5111-01 42-5111-02	7.1	17	16	22	31.8	44.5	M8 x 1.25 x 11			35	12.5	41 70	8	14.5
42-5111-51 42-5111-52	8.7	25	18	25.5	35.6	51	M12 x 1.75 x 13			44.5	12.5	41 70	8	17.5

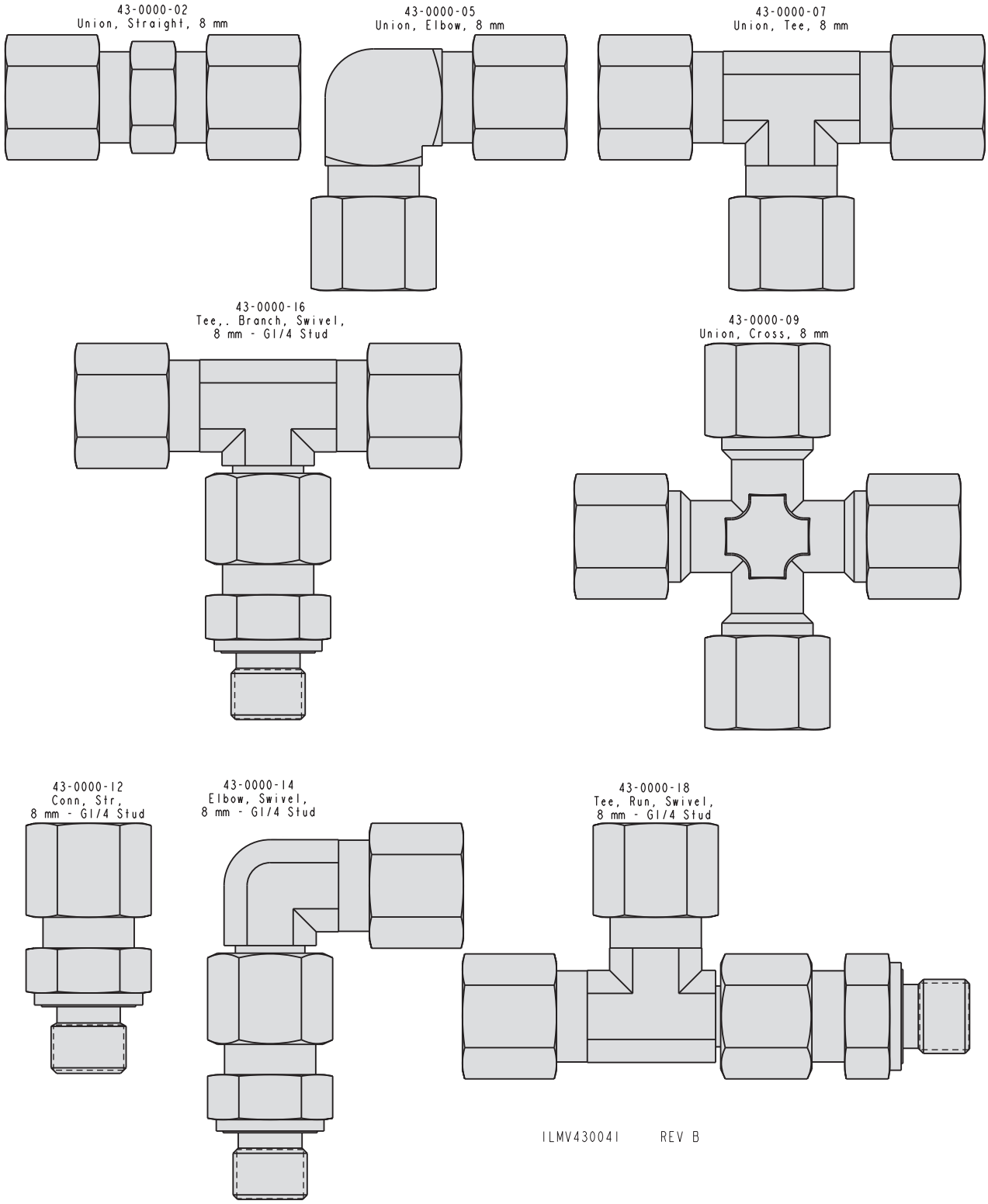
All dimensions are in mm.

6 mm Tube Fittings - Maximum Pressure 250 bar (25 MPa)

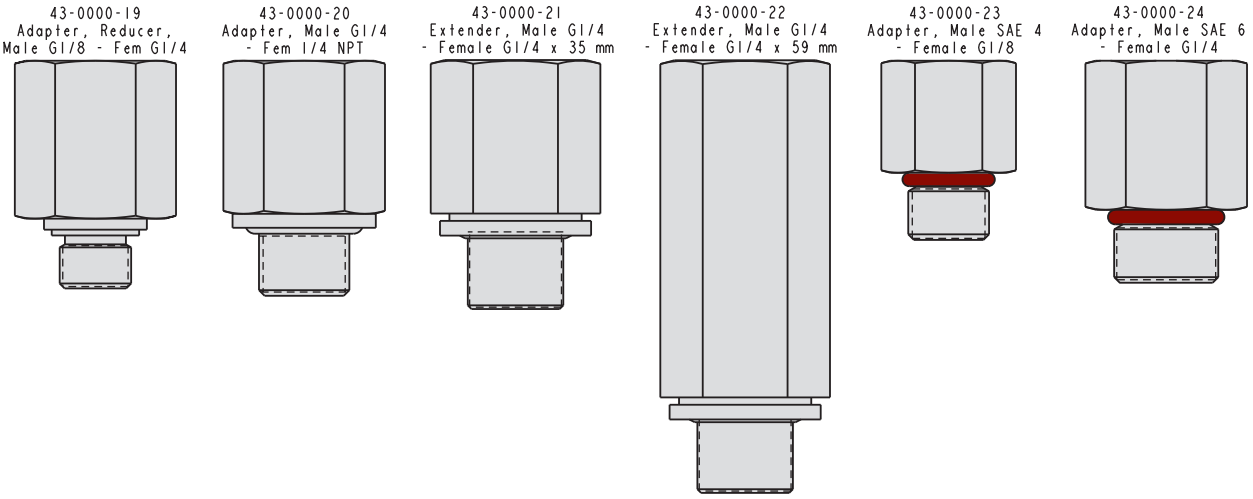


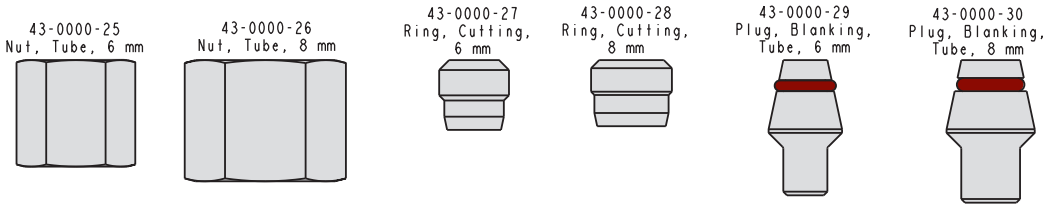
ILMV430040 REV A

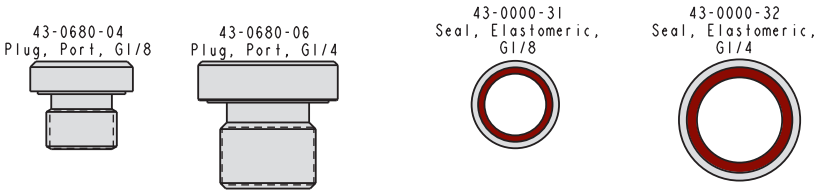
8 mm Tube Fittings - Maximum Pressure 350 bar (35 MPa)

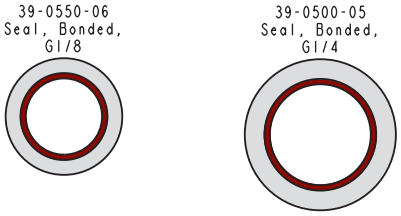


Specifications

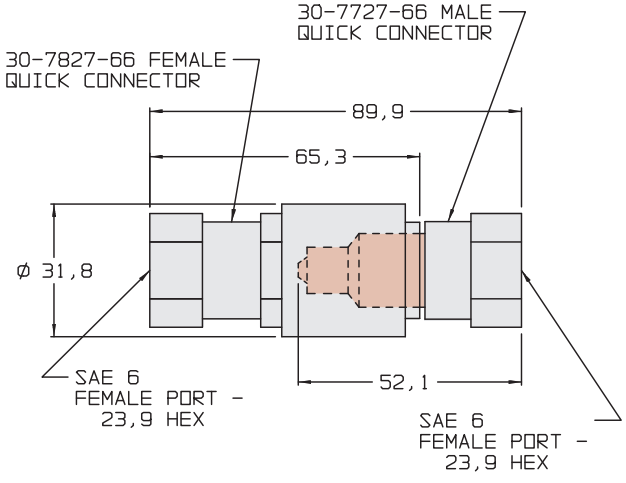








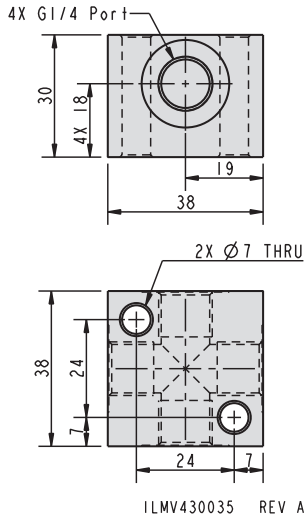
ILMV430042 REV B



ILMV307700 REV A

Hydraulic Junction Manifolds

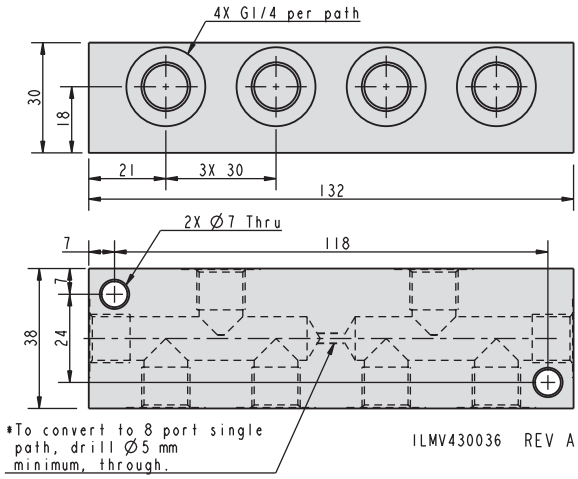
- Convenient, cost effective connection point for mounting quick connect fittings on fixtures and pallets.
- Provide a secure interface when connecting between rigid steel tubing and flexible hose.
- High strength steel, careful attention to detail in design, and extensive testing ensure reliability at working pressures up to 350 bar (35 MPa).



ILMV430035 REV A

Manifold Block

Model No.	Ports	Port No.
43-0000-35	G 1/4	4



ILMV430036 REV A

Dual Passage Manifold Block

Model No.	Ports	Port No.
43-0000-36	G 1/4	4 per Passage

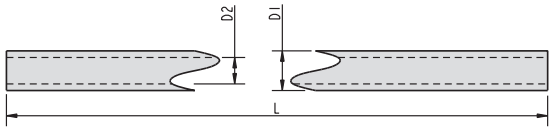
- Two separate flow paths in single manifold simplifies hydraulic connections and reduces the number of components required in double acting systems.
- Wide spacing between ports allows use with elbow and tee tube fittings.
- Can be converted to an 8 Port Single Path unit.

I-1

Hoses and Tubing

- All VektorFlo® hoses are intended to operate up to 350 bar (35 MPa) working pressure.
- Hoses are typically used to feed entire fixtures, medium size hoses are for feeding small fixtures or single devices.

Steel Hydraulic Tubing



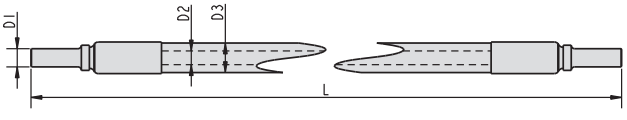
ILMV430033 REV A

Steel Hydraulic Tubing Dimensions

Model No.	D1 (mm)	D2 (mm)	L (mm)	Bend Radius
43-0000-33	6	4	1500	20 (min)
43-0000-34	8	5		25 (min)

Maximum Operating Pressure 350 bar (35 MPa)

Standpipe Connector Hose



ILMV430037 REV A

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.

Standpipe Connector Hose Dimensions

Model No.	D1 (mm)	D2 (mm)	D3 (mm)	L (mm)	Bend Radius
43-0000-37	8	4.8	9.8	500	30 (min)
43-0000-38				800	
43-0000-39				1250	

Maximum Operating Pressure	350 bar
Tube	Polyamide
Reinforcement	Steel Braid
Cover	Polyurethane

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 included in your system (especially hoses, which expand under pressure). 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 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 troubleshooting. We will try to help. Please gather information for us before you call. You should fill out the Fixture Documentation Sheet (found on page A-8) and have a schematic and bill of materials ready when you call us. We want to help, but need adequate information about your system to diagnose the problem.

Hydraulic Oil 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.

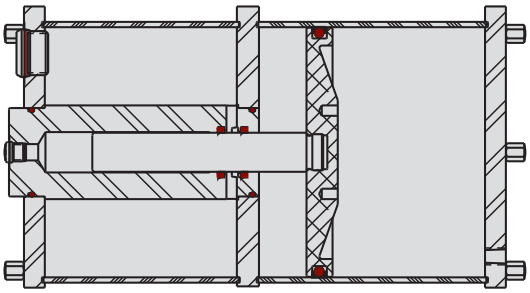
Compact Air/Hydraulic Boosters Specifications

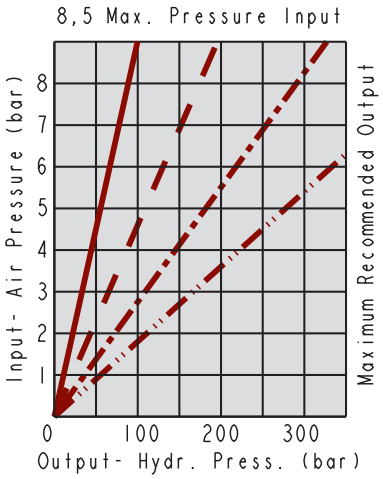
Single Acting Systems

- A booster multiplies your shop air pressure to power simple hydraulic systems without electricity.
- This booster delivers intensification ratios ranging from 11:1 to 54:1.
- Manual or electric control packages are available.

Air/hydraulic boosters are an inexpensive way to power single fixtures. Whether this is your first system or a compact "ride-along" power supply for several systems, 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.

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.



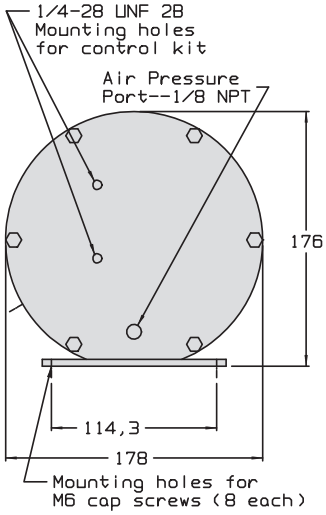


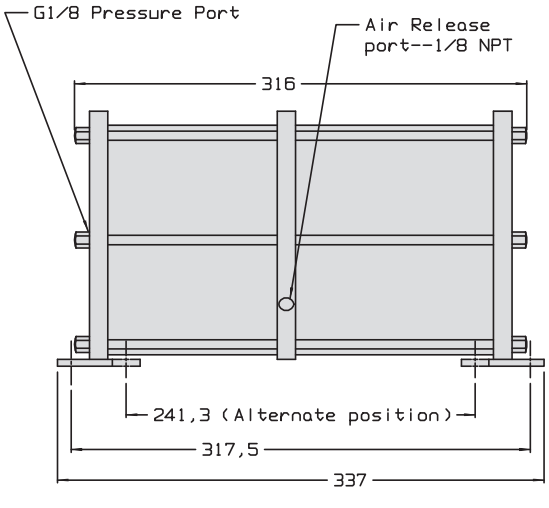
Model No.	Graph Line
45-5000-00	
45-5000-03	
45-5000-06	
45-5000-09	

ILMV550006 REV C

Specifications

Model No.	Intensification Ratio	Usable Oil Volume (cm^3)	Maximum Air Input
Air to Hydraulic Pressure Intensifiers			
45-5000-00	11:1	181.9	8.5 bar (0.85 MPa)
45-5000-03	22:1	93.4	
45-5000-06	40:1	52.4	
45-5000-09	54:1	39.3	





ILMV550001 REV B

Booster With Control Packages Specifications

Single Acting Systems

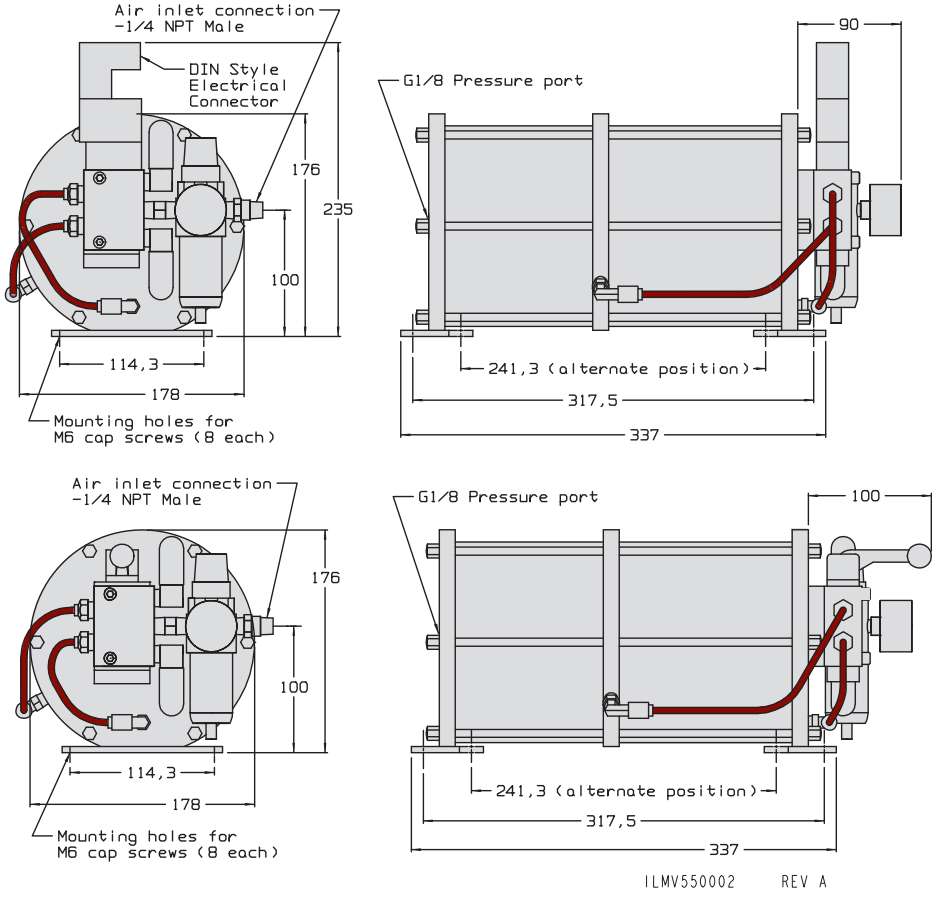
- Complete package includes everything you need to use a VektorFlo® booster, including hardware.
- Includes filter/regulator with automatic drain, gauge, check valve, control valve, mufflers and all of the fittings and tubing, ready to hook up! (Customer supplies air quick connector.)
- Booster with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

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.

Specifications

Model No.	Fluid Capacity	Intensification Ratio
Air to Hydraulic Pressure Intensifiers		
45-5000-00		11:1 Booster
45-5000-01	180 cm^3	11:1 Booster With Manual Control
45-5000-02		11:1 Booster With 24 VDC Control
45-5000-03		22:1 Booster
45-5000-04	90 cm^3	22:1 Booster With Manual Control
45-5000-05		22:1 Booster With 24 VDC Control
45-5000-06		40:1 Booster
45-5000-07	50 cm^3	40:1 Booster With Manual Control
45-5000-08		40:1 Booster With 24 VDC Control
45-5000-09		54:1 Booster
45-5000-10	40 cm^3	54:1 Booster With Manual Control
45-5000-11		54:1 Booster With 24 VDC Control

ILMV550001 REV B



ILMV550002 REV A

Medium Capacity Pump 230/380/440 VAC, 50 HZ, 3 Phase Models

- Valve control voltage is 24 VDC.
- First stage pump flow is 5.32 l/min up to 48 bar, (4.8 MPa) second stage 0.65 l/min above 48 bar (4.8 MPA).
- Porting is G 1/4.
- Maximum pressure is 350 bar (35 MPa).
- Filtration is 25 micron (replaceable).
- Up to 4 valve stack.
- Over pressure relief is 390 bar (39 MPa).
- One pendant switch is provided with valves.
- An optional machine controller cable is available, see page J-6.
- Pump can be purchased as a manifold only (no valves) or fully configured.
- Pumps are shipped without oil.
- Dry weight is 63 KG (complete pump with two 3 x 4 solenoid valves).
- Optional Return Line Filter available on page J-6.

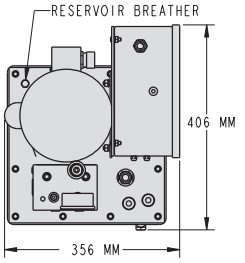
In operation, the pump turns on, builds to the preset pressure, then turns off. In the event of pressure decay, the pressure switch automatically restarts the pump to replenish system clamping pressure.* The on-demand operation of the pump reduces electrical onsumption and prevents overheating of oil which can occur in continuous running pumps.

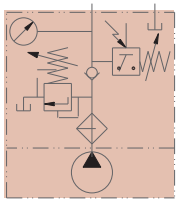
The fluid level sensor prevents the pump from running without fluid. Should oil levels run low, the pump shuts down preventing potential damage.

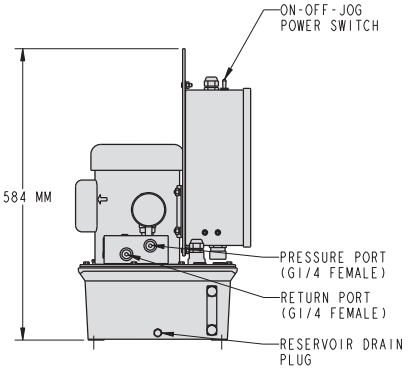
Small size and high performance allow this pump to compete favorably with many single stage pumps requiring up to 1.50 KW motors.

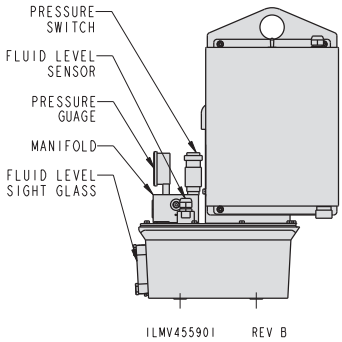
See section M of the Vektek Metric Catalog for valve information.

* Dump pump configuration drops all pressure after reaching is setting.









NOTE: Cables omitted for clarity
NOTE: Pressure and return G 1/4 ports will not be used if pump is equipped with stacking blocks

Warning: The use of spool valves invalidates the warranty on VektorFlo® pumps.

NOTE: See pump model matrix (Page J-5) for specific pump number.

J-4

Specifications

Motor	Reservoir Capacity		Pressure Switch Adjustment Range	Pressure Gauge	Application
	Gross	Usable			
1 HP, 230/380/440 VAC, 3 Phase 50 HZ, 2850 rpm	8.2 L	6.6 L	48-350 bar (4.8 -35.0 MPa)	0-690 bar Silicone filled with pressure snubber	Single and/or Double Acting depending on valve selection

Power Supplies

Medium Capacity Pump Model Matrix

Valve Configuration	No. of Valves	230 VAC 3 Phase 0.75 kw	380 VAC 3 Phase 0.75 kw	440 VAC 3 Phase 0.75 kw
Manifold Only Pumps				
Manifold Only Used as a central or remote power supply with remote control valves configured with a "P" (pressure out) and "T" (tank return flow) port only. Typically mounted behind a machine or between two machines with valves mounted on the machine closer to the application and often machine controlled. A shear seal or poppet style zero leak valve must be used.	0	45-5924-32	45-5927-32	45-5929-32
Decoupled System Pumps				
24VDC 2-Position 3-Port Normally Closed Single Acting Only Decoupled System Valve installed with a control pendant to power systems using the Self-closing Decoupler and Tombstone Top Plates. Commonly referred as a dump pump and uses a momentary contact pendant switch. When preset pressure is reached the control valve automatically shifts and dumps pressure back to tank. Operator interface is by remote pendant or can be wired into a machine controller.	1	45-5924-35	45-5927-35	45-5929-35
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	45-5924-09 45-5924-18 45-5924-24 45-5924-30	45-5927-09 45-5927-18 45-5927-24 45-5927-30	45-5929-09 45-5929-18 45-5929-24 45-5929-30
Live or Decoupled Systems				
24VDC 2-Position 3-Port Normally Closed Single Acting Systems Used with Single Acting Coupled systems and Manual Pallet Decouplers, Tombstone Top Plates and the Self-Closing (single hose) Decoupler. Operator interface is by remote pendant or can be wired into machine controller. **NOTE: All valves used in the decoupled condition are de-energized when not in use to avoid heat build-up between cycles.**	1 2 3 4	45-5924-33 45-5924-36 45-5924-37 45-5924-38	45-5927-33 45-5927-36 45-5927-37 45-5927-38	45-5929-33 45-5929-36 45-5929-37 45-5929-38
Manual 2-Position 3-Port To control a Single Acting system either coupled or decoupled. (May not be used with 2 hose Auto-Shutoff Decouplers.) Operator interface is by shifting a manual valve handle, requiring pump to be located with in operators reach.	1 2 3 4	45-5924-01 45-5924-48 45-5924-11 45-5924-49	45-5927-01 45-5927-48 45-5927-11 45-5927-49	45-5929-01 45-5929-48 45-5929-11 45-5929-49
Manual 3-Position 4-Port P-Blocked Controls double acting systems, either coupled or decoupled, when the fluid flow from the clamp and unclamp hoses needs to return to tank the valve is actuated to the "center" position. Recommended for control of Auto-Shutoff Pallet Decoupler (2 hose) systems. Operator interface is by shifting a manual valve handle, requiring pump to be located with in operators reach. This is an ideal configuration for running double acting coupled or decoupled systems. Best selection for fixture testing of all system types.	1 2 3 4	45-5924-05 45-5924-17 45-5924-23 45-5924-29	45-5927-05 45-5927-17 45-5927-23 45-5927-29	45-5929-05 45-5929-17 45-5929-23 45-5929-29
Manual 3-Position 4-Port Closed Center Used to run a continuously connected system. Not well suited for use with most decoupled systems. Operator interface is by shifting a manual valve handle.	1 2 3 4	45-5924-04 45-5924-45 45-5924-46 45-5924-47	45-5927-04 45-5927-45 45-5927-46 45-5927-47	45-5929-04 45-5929-45 45-5929-46 45-5929-47
24VDC 2-Position 3-Port Normally Open To run a single acting system usually coupled. (May not be used with Auto-Shutoff Decouplers.) Operator interface is by remote pendant or can be wired into a machine controller. If used to power a decoupled system, valves will run hot while decoupled.	1 2 3 4	45-5924-03 45-5924-14 45-5924-20 45-5924-26	45-5927-03 45-5927-14 45-5927-20 45-5927-26	45-5929-03 45-5929-14 45-5929-20 45-5929-26
24VDC 3-Position 4-Port Closed Center To run a continuously connected system. Difficult to use with most decoupled systems. Operator interface is by remote pendant or can be wired into a machine controller. Center position allows no movement of clamps when valve is de-energized.	1 2 3 4	45-5924-07 45-5924-16 45-5924-22 45-5924-28	45-5927-07 45-5927-16 45-5927-22 45-5927-28	45-5929-07 45-5929-16 45-5929-22 45-5929-28

ILMV455900 REV B

Warning: The use of spool valves invalidates the warranty on VektorFlo® pumps.

NOTE: Contact factory for custom pump configurations.

NOTE: When connecting solenoid valves to a machine controller, order Model Number 95-5342-28, machine controller cable. Plug the cable into the pump control box and follow the included instructions for connecting the four control wires to the machine controller. Each valve to be controlled by a machine controller requires one cable.

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. No wiring of control valves supplied with pump is required.

NOTE: All pumps equipped with solenoid valves are supplied with one live control pendant with a 1.8 meter cable. For additional pendants order from the following chart.

NOTE: All pumps require a 20 amp dedicated service electrical power supply for proper operation and service life.

NOTE: All pumps are shipped without oil.

Footnote	Pendant Model No.	Corresponding Valve Configuration
1	70-7407-76	3/4 closed or P-blocked center (on-off-on)
2	70-7407-77	2/3 Normally open (on-off)
3	70-7407-79*	2/3 Normally closed (off-momentary contact on)
4	70-7407-80	2/3 Normally closed (off-on)

*Note: Pendant No. 70-7407-79 is only used and shipped with Pump Model Nos. 45-5924-35, 45-5927-35, and 45-5959-35

Medium Capacity Pump Features, Optional Return Line Filter and Filter Cap

Features of Medium Capacity Electric/Hydraulic Pump Intermittent Duty Cycle with Valves And Control

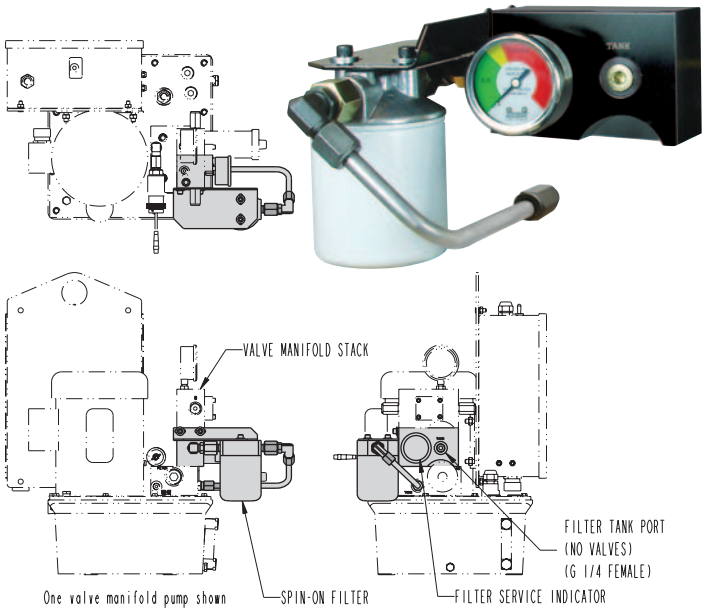
- All Vektek pumps are "on demand" pumps.
- Internal pressure relief valve directs the excess flow back to tank preventing motor stalls when flow is fully restricted. This valve serves the dual purpose of lubricating internal parts.
- Sight gauge to monitor hydraulic fluid level.
- An oil level sensor, mounted in the tank, turns the motor off to protect your pump from burning up in low oil conditions.
- Pressure line filtration of 25 microns helps protect the components on your application. (An optional return line filter is now available)
- All pumps come completely configured, assembled and ready to connect to the machine controller. When connecting solenoid valves to a machine controller order wiring kit Model No. 95-5342-28 (cable is 6 m. long) per valve.
- Directional Control Valves are located in 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-5 and buy from a price list, no custom charges or price mystery.

Optional Return Line Filter for Medium Capacity Pump

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

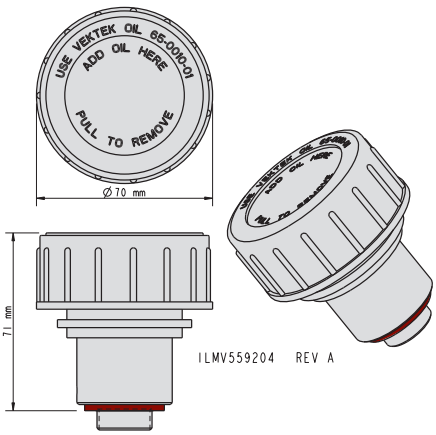
Filter Kit Model No.	Pump Valve Manifolds	Replacement Filter
46-2559-00	0	31-0500-14*
46-2559-01	1	
46-2559-02	2	
46-2559-03	3	
46-2559-04	4	

* Use Vektek replacement filter only.



J-6

Keep Systems Running Clean



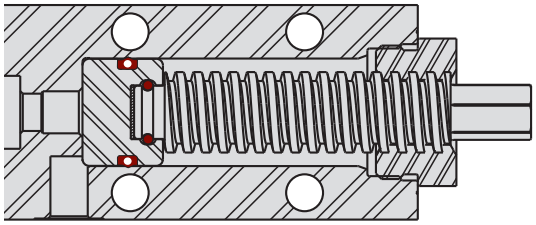
Reservoir Filter Cap /Breather Kit
Model No.
46-2559-05

VEKTEK

Screw Pumps

Threaded Body and Block Body Styles

- 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. The threaded body can be mounted through a bulkhead with the two locknuts provided.



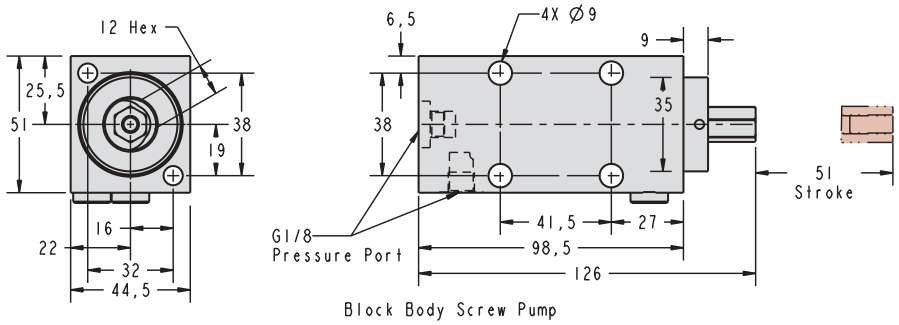
Max. working pressure	350 bar (35 MPa)
Capacity	26 cm³
Volume per revolution	2.1 cm³
Body	Black Hard Coated Steel
Screw	Hardened Acme threads

NOTE: Hoses are recommended for use on all systems using screw pumps.

Applied Torque Produces Approximate Output Pressure

Torque	Pressure
13.5 Nm	70 bar (7.0 MPa)
27.0 Nm	140 bar (14.0 MPa)
34.0 Nm	205 bar (20.5 MPa)
40.5 Nm	275 bar (27.5 MPa)
47.5 Nm	350 bar (35 MPa)

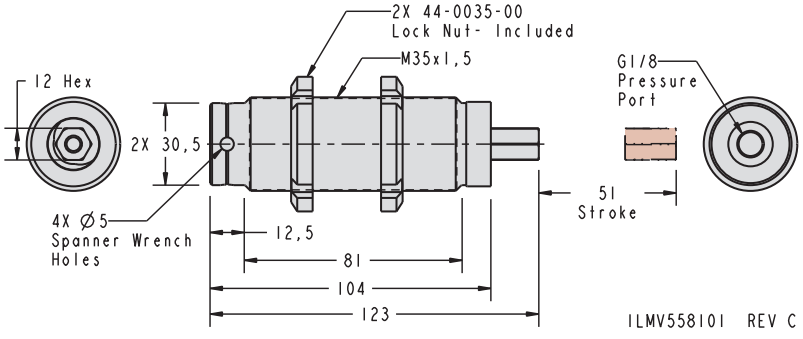
Do not exceed 50 Nm torque. Excess torque will create higher than allowed pressure which may damage downstream devices and increase the risk of personal injury to the operator.



Block Body Screw Pump

Block Body Screw Pump

Model No.
45-5890-00



Threaded Body Screw Pump
Two lock nuts (44-0035-00) are supplied with each threaded body screw pump.

Threaded Body Screw Pump

Model No.
45-5890-01

VEKTEK

Frequently Asked Questions

We are frequently asked questions, which are common to both novice and experienced users ,about pallet and tombstone clamping systems. The answers to the following questions may help users better understand palletized hydraulic systems. Contact Vektek for assistance in determining if you should use a decoupled fixture or leave the fixture connected to the pump.

What is a pallet decoupler and what is its purpose within a clamping system?

A pallet decoupler is a device which serves as the interface between the stationary pump and the moving pallet, and is the point where the hose(s) from the pump is connected and disconnected from the pallet. The decoupler "rides along" on the pallet and is the source 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 within the clamping circuit and allow the hose(s) to be disconnected from the pallet. A decoupler must also contain; coupler(s) for connecting the hose(s), filter screens to minimize the amount of contamination that enters the hydraulic circuit. An accumulator is also needed to store pressurized hydraulic fluid to maintain pressure to the clamping circuit while the pallet is in the machine. A decoupler includes ports for connecting the hydraulic circuit and may include a pressure gauge and an over-pressure relief valve.

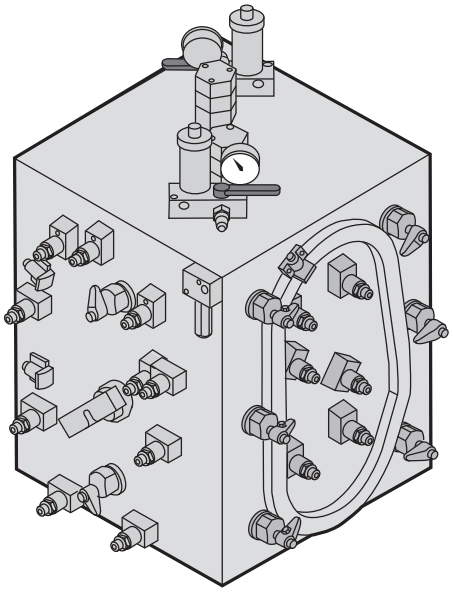
What are the basic types of pallet decouplers?

We divide pallet decouplers into two basic types based on whether the shutoff valve operates automatically or manually. In Manual Decouplers the operator closes the shutoff valve to trap pressure on the pallet (keeping parts clamped) and opens it to release pressure from the pallet (unclamp the parts). The operator must also control the pump to add and release pressure from the hose(s) for disconnection. For ease of operation, most Manual Decouplers are used with single acting clamp circuits.

Automatic Shutoff Valve Decouplers are actuated by Clamp and Unclamp pressures from the pump, which is controlled by the operator. Automatic 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 column 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 to a place on the pallet or tombstone that has more space. In addition, we can provide all the individual components required to implement a distributed decoupling system to safely conform to 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. Pumps can be configured with an automatic pressure monitoring system to assure that the pallets and tombstone are properly pressurized before entering the machine. Pumps can be configured 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. Pumps an be configured to meet your palletized system and control requirements. Contact Vektek for technical assistance.

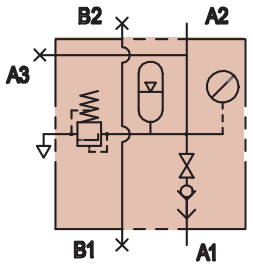
Manual Pallet Decoupler

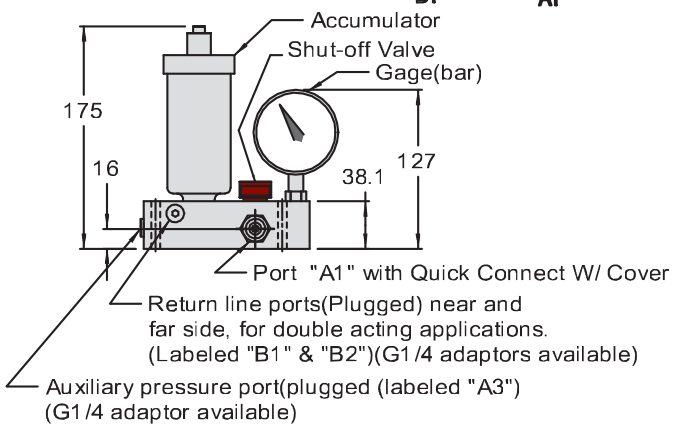
Manual Shutoff Valve Decoupler for Single Acting Systems

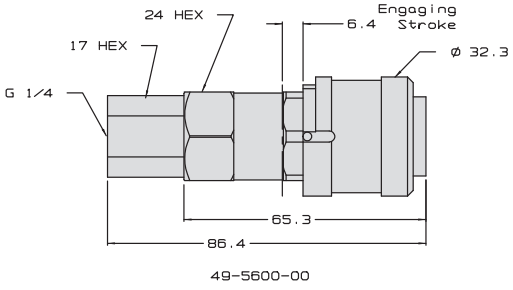
- This Decoupler is a convenient, self-contained package that includes a quick connect coupling, manual shutoff valve, accumulator (choose from horizontal or vertical arrangement), filter screen, pressure gauge, and over-pressure relief valve.
- Includes auxiliary ports that can be used for double acting pallet circuits or compressed air.
- External accumulator can be repositioned horizontally or vertically to suit the pallet layout.
- Quick Connect with female G 1/4, Model No. 49-5600-00, sold separately.

Manual Shutoff Valve Decoupler		
Model No.	System Operating Pressure	Precharged Accumulator
45-6001-01	140-350 bar (14-35 MPa)	100 bar (10 MPa)
45-6001-02	70-250 bar (7-25 MPa)	50 bar (5 MPa)

NOTE: Please check accumulator's gas pre-charge during your annual maintenance check. Consult factory if you require assistance.

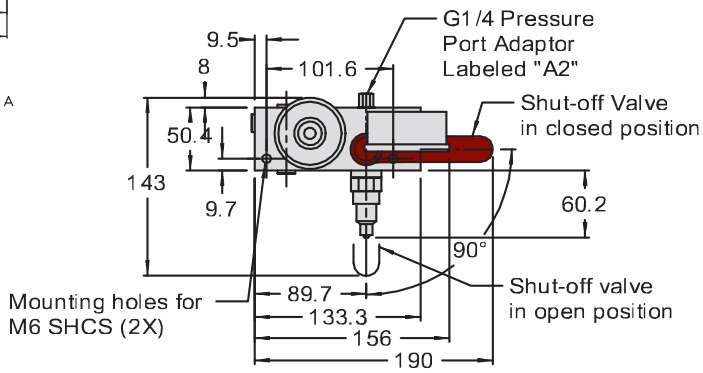






ILMV101103 REV A

Female Quick Disconnect
Model No.
49-5600-00



45-6001-01: For 140-350 bar(14-35 MPa) system with a 52 cm3 Accumulator
45-6001-02- For 70-250 bar(7-25 MPa) system with a 59 cm3 Accumulator

ILMV101101 REV B

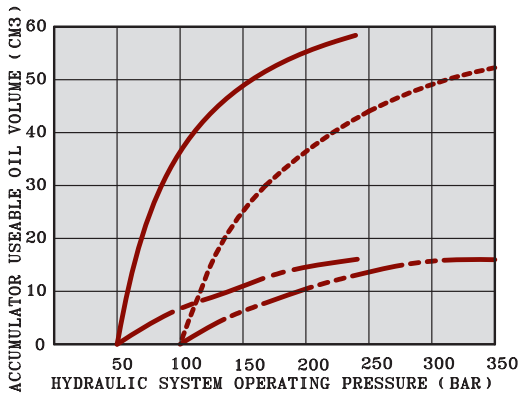
NOTE: This Manual Shutoff Valve Decoupler must be used with a suitable pump which includes a 2-position/3-port, directional control valve for operation of one single acting circuit. Contact Vektek for considerations in the use of this Manual Shutoff Decoupler to control double acting circuits.

Accumulators*

- Maintains circuit pressure while the pallet or tombstone 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.
- Up to 60 cm^3 of pressurized fluid reserve.
- G 1/4 Threads.

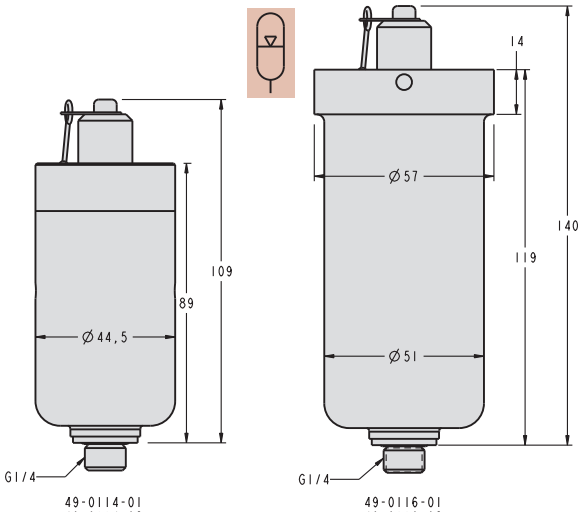
Hydraulic fluid compresses the precharged inert gas across the piston during circuit pressurization. The pressurized gas provides additional fluid to the circuit to reduce pressure changes in the event of small seeps, thermal expansion or contraction while the pallet or tombstone is in the machine. The 140 bar (14 MPa) to 350 bar (35 MPa) operating pressure model has gas precharged to 100 bar. The 70 bar (7 MPa) to 250 bar (25 MPa) operating pressure model has gas precharged to 50 bar. 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.



ILMV101102 REV B

45-6001-02 PALLET DECOUPLER or 41-0116-02 ACCUMULATOR	45-6001-01 PALLET DECOUPLER or 41-0116-01 ACCUMULATOR
49-0114-02 ACCUMULATOR	49-0114-01 ACCUMULATOR



ILMV101000 REV E

Accumulator Model No.	System Operating Pressure	Approx. Usable Volume At Max. System Pressure
49-0114-01	140 bar-350 bar (14-35 MPa)	16 cm^3
49-0114-02	70 bar-250 bar (7-25 MPa)	16 cm^3
49-0116-01	140 bar-350 bar (14-35 MPa)	52 cm^3
49-0116-02	70 bar-250 bar (7-25 MPa)	59 cm^3

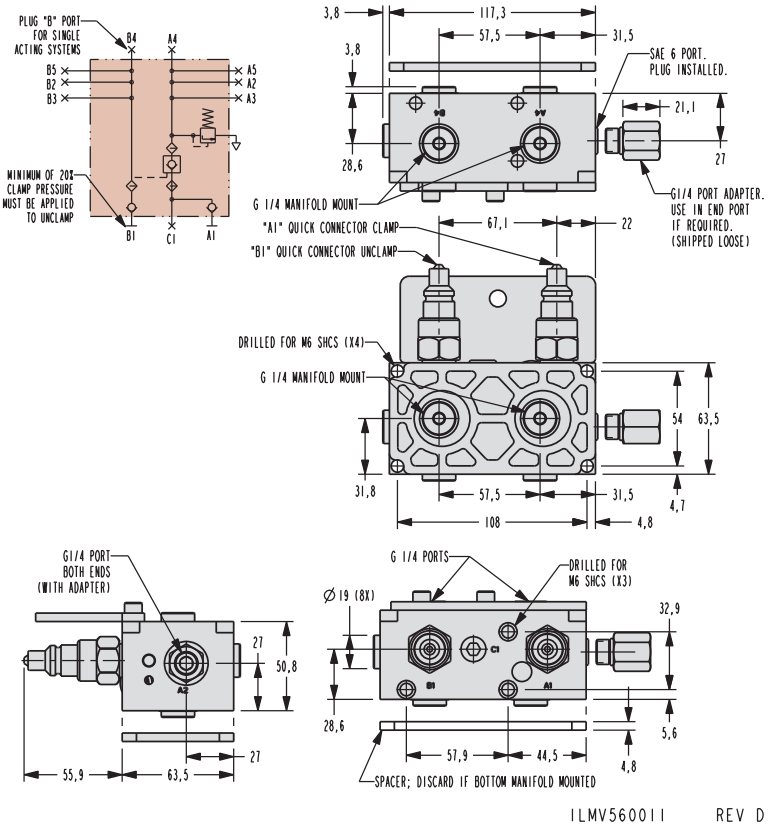
NOTE: Please check accumulator's gas pre-charge during your annual maintenance check. Consult factory if you require assistance.

Automatic Shutoff Valve Decoupler Block and Two-Handed Operating Handle

Automatic Shutoff Valve Decouplers for Single and Double Acting Systems

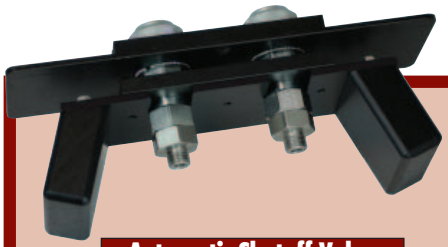
- Decouplers are a convenient, self-contained package that includes quick connect couplings, filters, over pressure relief valve, and a pilot operated check valve.
- External ports and manifold mounting connections (bottom and rear) are G 1/4 female.
- Robust pilot operated check valve with 1:5 pilot to check extends long-term reliability.
- Check valve has added protection from the internal 25 micron filter.
- 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-2.
- Optional external Accumulator, available in two pre-charge ranges, is sold separately.

Model No.	Pressure Range Bar (MPa)	Optional Accumulator	Accumulator Capacity cm^3
45-6007-03	140-350 (14-35 MPa)	49-0116-01	52
	70-250 (7-25 MPA)	49-0116-02	59



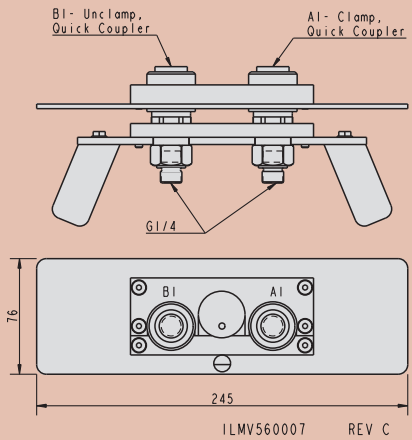
ILMV560011 REV D

NOTE: This automatic Shutoff Valve Decoupler 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 Decoupler Handle
Model No. 45-6005-04

For use with Automatic Shutoff Valve Decoupler: Model No. 45-6007-03



ILMV560007 REV C

Two-Handed Operating Handle

- Provides fast, positive connection to the Decoupler

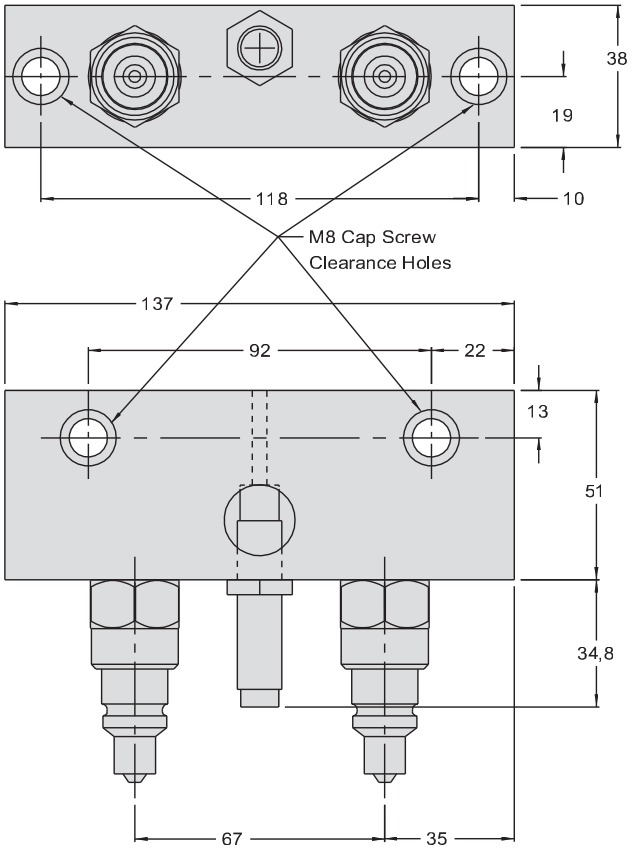
Handle Docking Module

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.

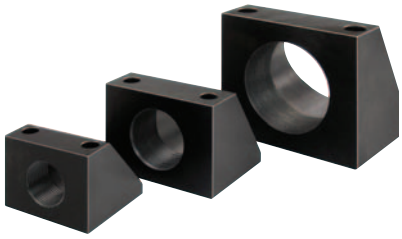
Docking Module
Model No. 45-6005-05
For use with Operating Handle Model No. 45-6005-04

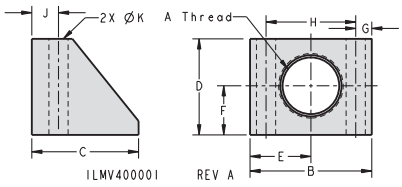


Storage Module For Dual Pallet Decoupler
With Safety Interlock
ILMV560009 REV A

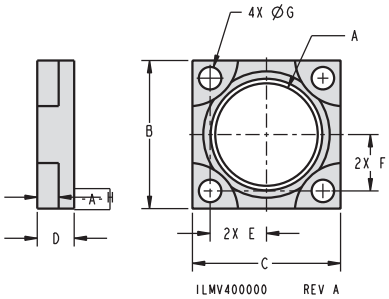
Mounting Hardware

Mounting Bracket

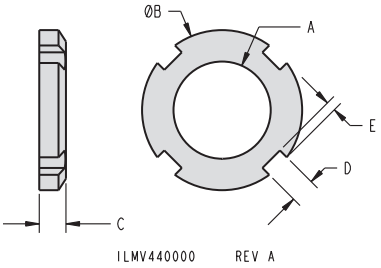




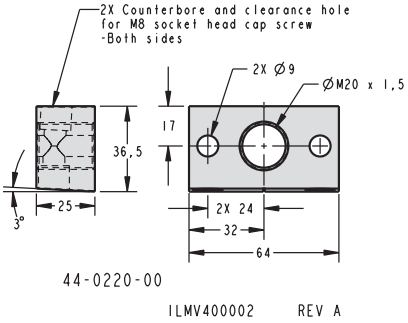
Mounting Flange



Retaining Collar



Mounting Block



Mounting Block

Model No.
44-0220-00

Mounting Bracket

Model No.	A	B	C	D	E	F	G	H	J	K
44-0228-00	M28 x 1.5	57	50	45	28.5	23	7.5	42	12.5	9
44-0235-00	M35 x 1.5	64	50	50	32	25	8	48	12.5	11
44-0238-00	M38 x 1.5	76	58	58	38	29	10	56	12.5	11
44-0248-00	M48 x 1.5	86	63	63	43	32	10.5	65	16	13.5
44-0265-00	M65 x 1.5	101	76	88.5	50.5	45	10	81	16	13

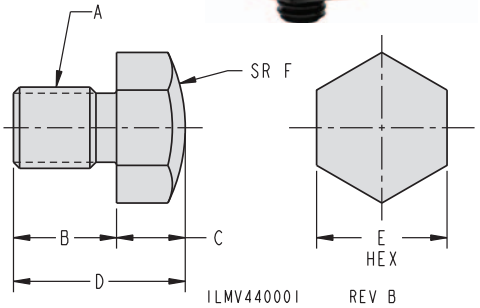
Mounting Flange

Model No.	A	B	C	D	E	F	G	H
44-0128-00	M28 x 1.5	38	38	9.5	14.5	14.5	5.8	5.5
44-0132-00	M32 x 1.5	57	57	18.5	19.8	19.8	9	8.7
44-0135-00	M35 x 1.5	48	48	18.5	18.5	18.5	7	6.5
44-0138-00	M38 x 1.5	50	50	18.5	20	20	7	6.5
44-0148-00	M48 x 1.5	63	63	25	24.5	24.5	11	10
44-0165-00	M65 x 1.5	85	85	31.5	32.5	32.5	13.5	12.5
44-0180-00	M80 x 2.0	100	100	37	40	40	15	16

Retaining Collar

Model No.	A	B	C	D	E
44-0020-00	M20 x 1.5	32	6	5.5	2.3
44-0026-00	M26 x 1.5	38	7	6.5	2.8
44-0028-00	M28 x 1.5	42	7	6.5	2.8
44-0035-00	M35 x 1.5	50	8	7	3.3
44-0038-00	M38 x 1.5	54	8	7	3.3
44-0048-00	M48 x 1.5	65	8	8	3.8
44-0065-00	M65 x 1.5	85	9	11	4.3
44-0080-00	M80 x 2.0	100	10	11	4.3

Spherical Contact Points



Spherical Contact Points

Model No.	A	B	C	D	E	F
44-2106-00	M6 x 1.00	9	8	17	10	12
44-2108-00	M8 x 1.25	10	8	18	13	16
44-2110-00	M10 x 1.50	12	10	22	17	22
44-2112-00	M12 x 1.75	15	10	25	19	25
44-2116-00	M16 x 2	20	10	30	24	50
44-2120-00	M20 x 2.5	25	10	35	30	60

Contact points are through hardened to Rc 46-50

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 5.7 l/minute. Excessive flows may cause damage or erratic behavior. General industrial products are intended for use in large flow applications (typically 7.6 l/minute +). These general industrial products do not normally work well in clamping systems.

What is the function of a pressure reducing valve? Relative to a pressure relief valve?

Pressure reducing valves limit the pressure that can pass through the valve. The valve remains open and fluid flows freely to downstream 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 sufficient downstream pressure loss, the PRV will re-open and allow flow to pass through the valve until the pressure returns to the valve set-point.

Pressure relief valves (sometimes known as pressure regulating valves) are intended to guard against excess pressure. When a circuit builds beyond the setting of a pressure relief valve, it opens and excess fluid is returned to tank through a return line. If a relief valve is set below the pressure 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.

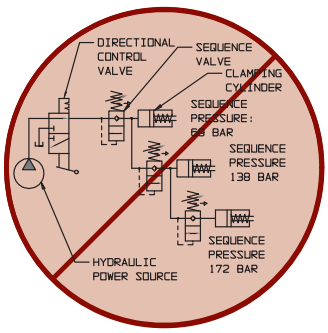
Explain why you don't want me to put a group of sequence valves in series?

When a group of sequence valves is put in sequence they have to work harder than if they are fed parallel from a single main feed line (see illustration). If they are stacked in a series, each modulates trying to maintain pressure while feeding downstream valves. This will cause premature wear. Many "series" sequence valves are in a parallel circuit stacked side by side. You may put as many sequence valves in parallel as you wish. We recommend approximately 35 bar (3.5 MPa) difference in their settings.

What is the difference between your ball valve and the "screw down" valves I can buy locally?

Our ball valves shut off 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.

DON'T



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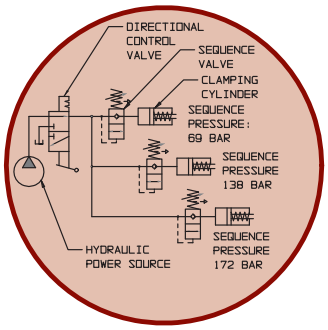


ILMVSCHAA REV A

Standard Features

Common Features: Sequence, Pressure Relief, Pressure Limiting Valves and Pressure Reducing

- Material: All cartridge components are steel, operating parts are hardened.
- Operating Media: Conventional, petroleum based, premium quality hydraulic fluid such as VektorFlo® **Model No. 65-0010-01**, see page J-1.
- Recommended Filtration: 25 Micron (NOM) / 40 Micron (ABS) (minimum).
- Adjustments: Turning adjustment screw clockwise (when viewed from adjustment end of cartridge) increases pressure setting on all three valve styles.

NOTE: Maximum system flow rate is 5.7 l/min. for all VektorFlo® special function valves.

Excess flow voids warranty.

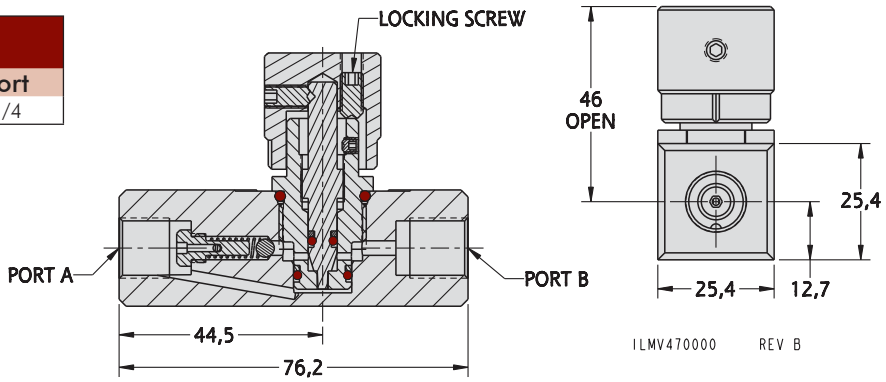
Accessory Valves

Flow Control and Check Valves

Precision Flow Control

- Precision flow adjustment with 0.4 mm pitch needle valve.
- Protect sensitive components from excessive flow.
- For single component or system control.
- Flows up to 11.3 l/min at 350 bar maximum pressure.
- Check valve for reverse free flow.
- Stainless steel inner valve construction.
- Fluorocarbon seals are standard.
- Locking adjustment knob preventing change in flow.

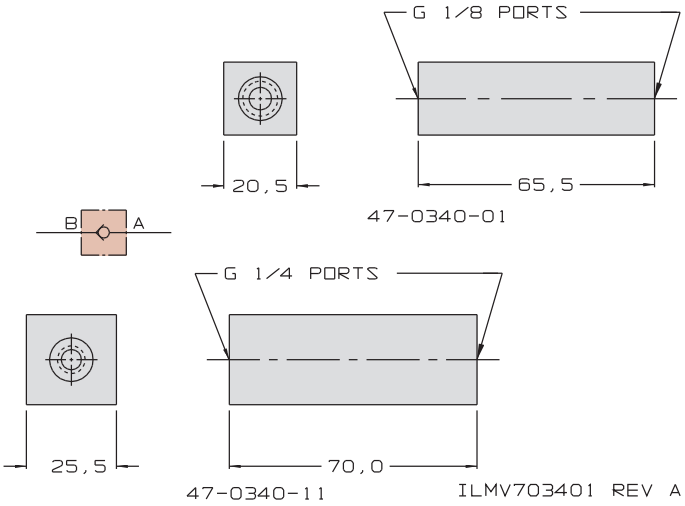
In-line Flow Control		
Model No.	A Port	B Port
47-0200-14	G 1/4	G 1/4



Check Valves

Permits flow in one direction only.
Cannot be adjusted for reverse flow.

Check Valve	
Model No.	Port
47-0340-01	G 1/8
47-0340-11	G 1/4

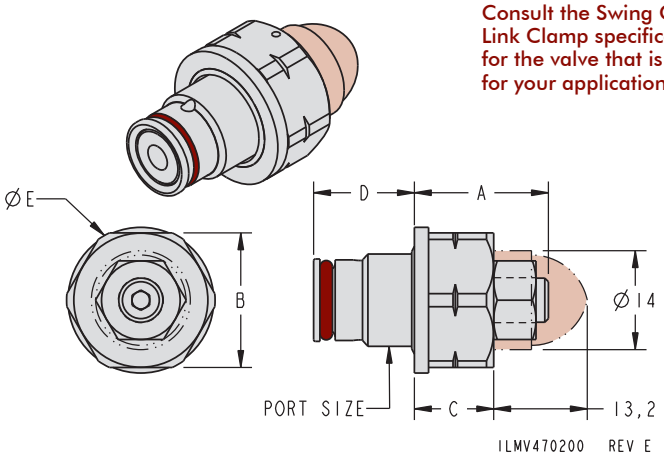


In-port Precision Flow Control

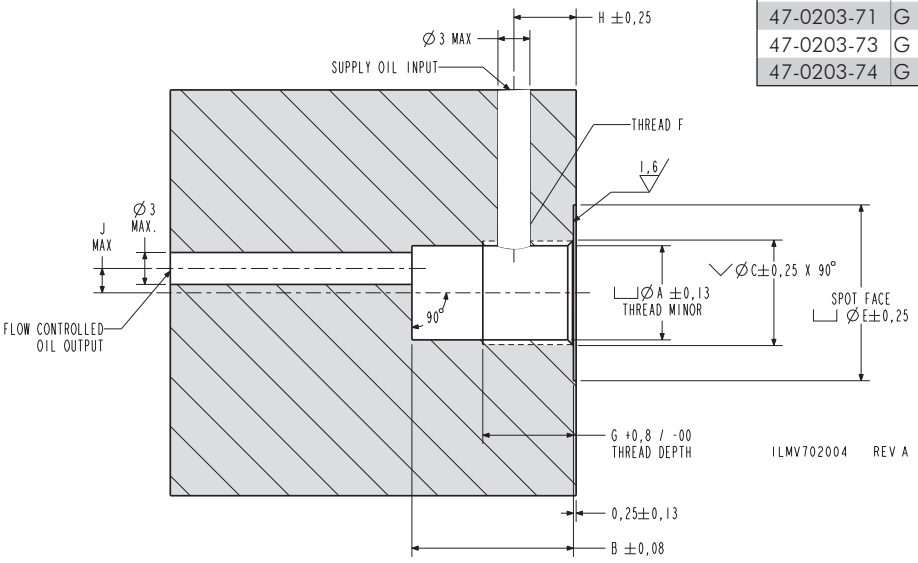
- Use with single or double acting clamps
- Reverse free flow check valve.
- Smallest high-pressure flow control valve on the market.
- Prevent component cam damage from unexpected or accidental surges in flow rate.
- Adjusting screw is positively retained and will not come out under pressure.

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.



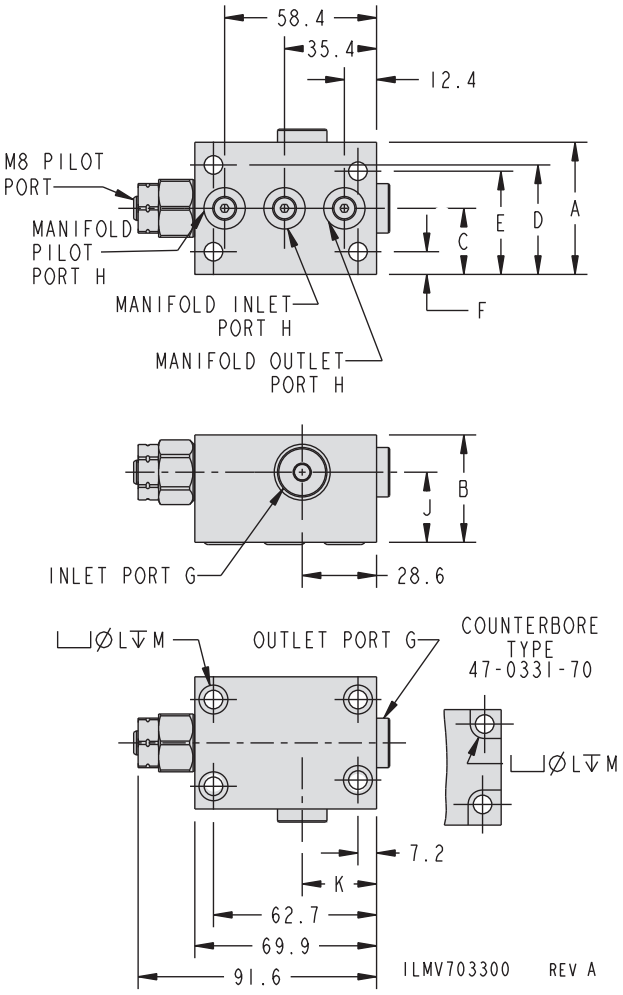
Dimensions						
Model No.	Port Size	A Max	B Hex	C Hex	D	E
47-0203-70	G 1/8	20.7	14	11.1	10.67	15.9
47-0203-71	G 1/8	20.7	14	11.1	15.16	15.9
47-0203-73	G 1/4	20.9	19	11.2	14.22	21
47-0203-74	G 1/4	20.9	19	11.2	18.72	21



In-Port Flow Control Cavity									
Model No.	Port Size	A	B	C	E	F	G	H	J
47-0203-70	G 1/8	8.84	10.67	9.9	16.5	1/8 - 28 BSPP	8.5	5.84	2.29
47-0203-71	G 1/8	8.84	15.16	9.9	16.5	1/8 - 28 BSPP	8.5	5.84	2.29
47-0203-73	G 1/4	11.89	14.22	13.3	21.5	1/4 - 19 BSPP	12.5	8.41	3.81
47-0203-74	G 1/4	11.89	18.72	13.3	21.5	1/4 - 19 BSPP	12.5	8.41	3.81

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 5.67 l/min at 350 bar maximum pressure.
- Stainless steel inner valve construction.

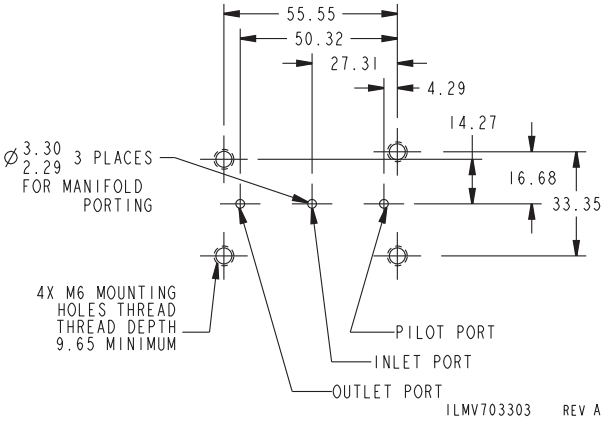
M-4

Dimensions

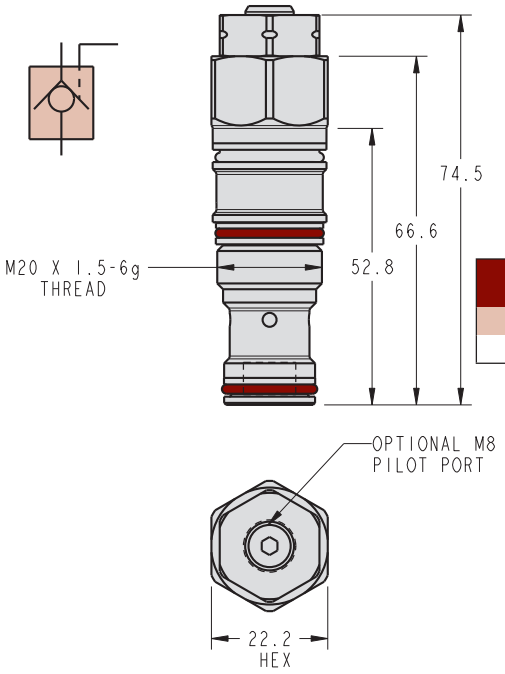
Model No.	A	B	C	D	E	F	G	H	J	K	L	M
47-0331-71	50.8	41.3	25.4	42.1	39.7	8.7	G 1/4	M8 Plug	26.9	28.6	7.1	11.1
47-0331-70	44.5	38.1	22.2	38.9	36.5	5.5	N/A	N/A	23.8	N/A	7.1	11.1

For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

Mounting Dimensions for Pilot Operated Check Valves 47-0331-70 and 47-0331-71



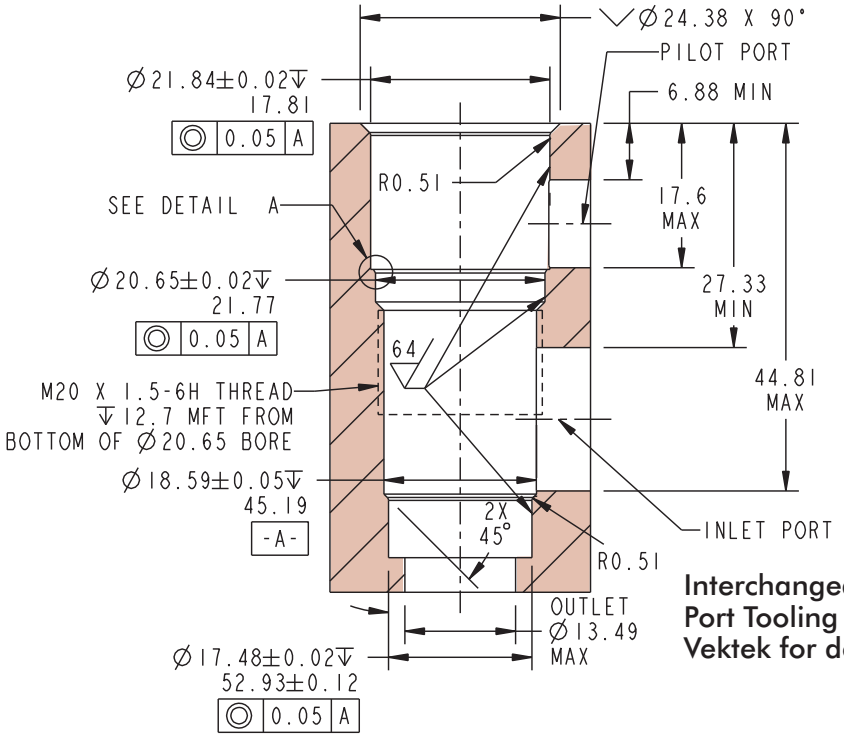
Cartridge Mount Pilot Operated Check Valve

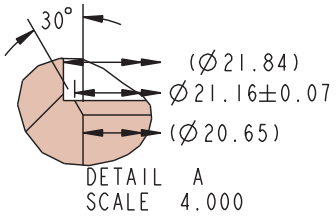


PO Cartridge
Model No.
47-0333-70

ILMV703301 REV A

Cartridge Mount Pilot Operated Check Valve Cavity Dimensions*





Interchangeable with Standard Cavity Port Tooling Available . Contact Vektek for details.

ILMV703302 REV A

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

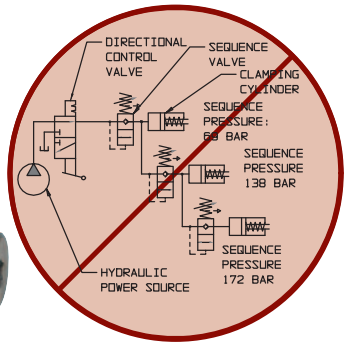
Accessory Valves

Sequence Valves

Sequence Valve

- Valve is 100% stainless steel construction and resists the corrosion which can cause other styles to "misfire."
- Direct acting poppet style, adjustable cartridge type construction.
- The cartridge may be installed directly into your manifold.
- Pressure adjustment range is: 51.7 bar (5.17 MPa) to 350 bar (35 MPa).
- 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)

DON'T



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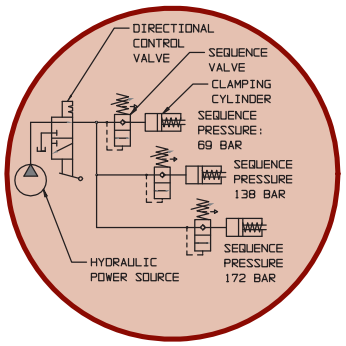


ILMVSCHAA REV A

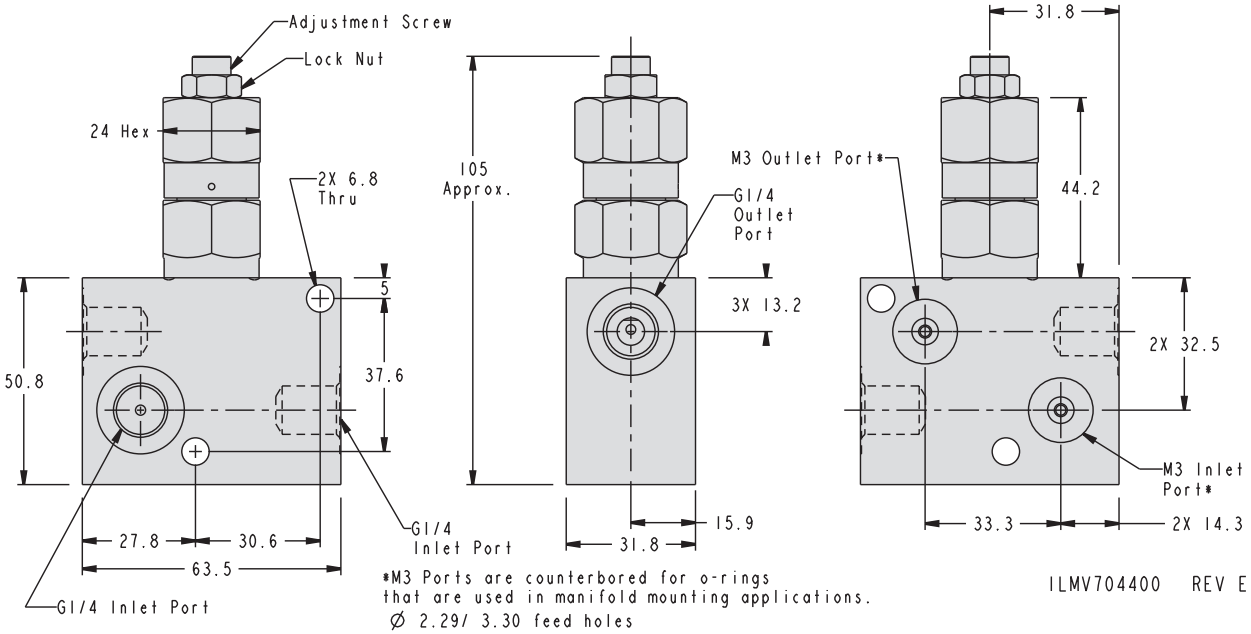
Sequence Valve	
Model No.	Description
47-0440-02	Assembly
47-0440-00	Cartridge Only

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 upstream of the valve have moved into position and pressure begins to increase, the increasing pressure overcomes the spring force holding the valve closed, forcing the poppet off its seat allowing fluid flow through the valve. After downstream devices have positioned and clamped, and pressure has increased to equal upstream pressure, the entire system pressure rises to the maximum level 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 valve to return to the power unit reservoir.

NOTE: Maximum system flow rate is 5.7 l/min. for all VektorFlo® special function valves.

Excess flow voids warranty.

For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 μm R_a

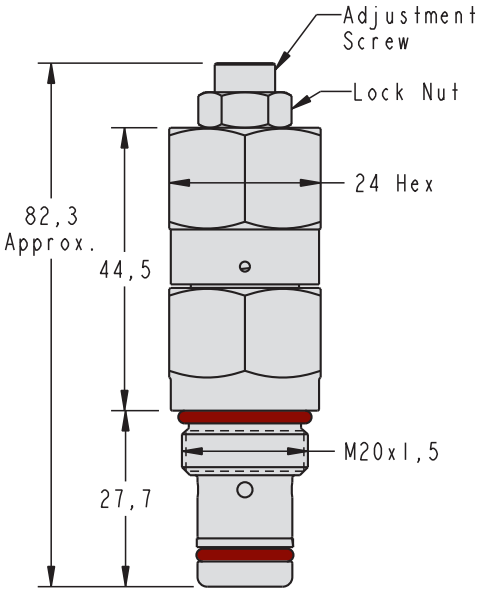


*M3 Ports are counterbored for o-rings that are used in manifold mounting applications.
Ø 2.29/ 3.30 feed holes

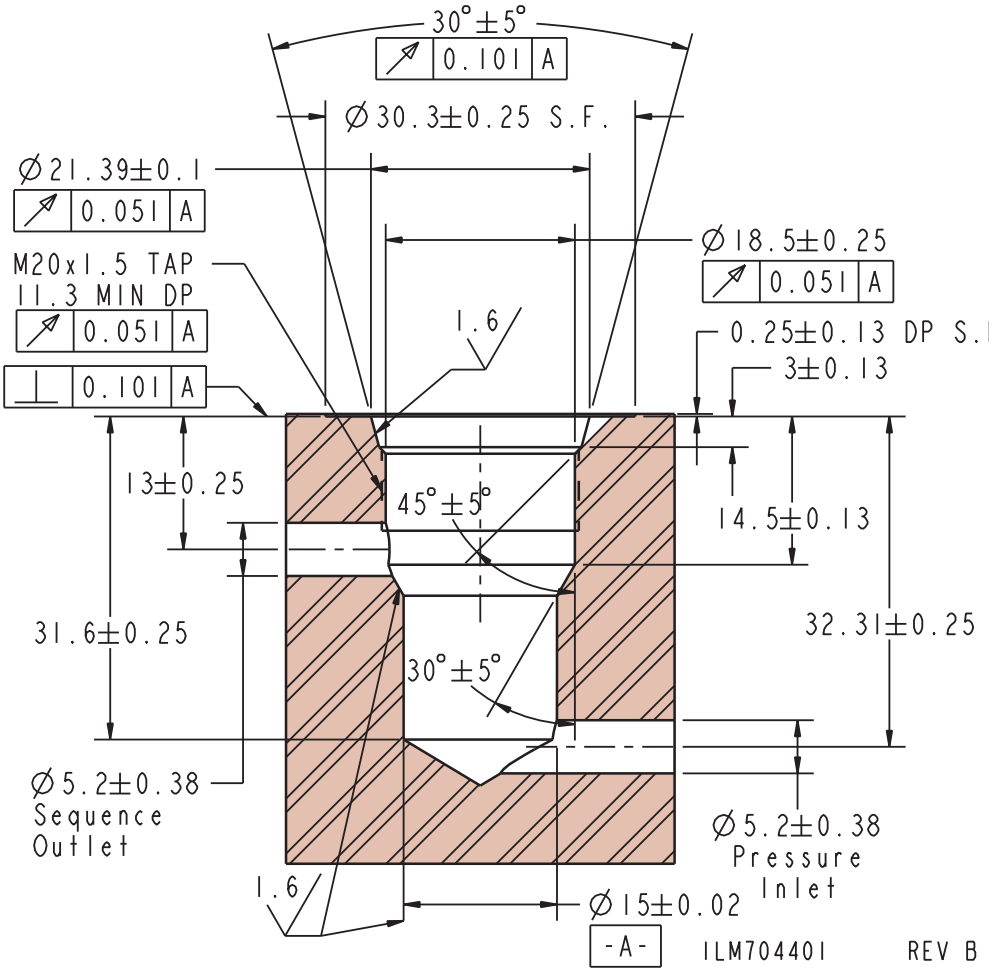
ILMV704400 REV E

Sequence Valve Cavity

Sequence Valve	
Model No.	Description
47-0440-00	Cartridge



Sequence Valve Cartridge
ILMV470440 REV B



Sequence Valve Cartridge Cavity

Accessory Valves

Pressure Reducing Valve

U. S. Patent Nos.
6,581,628
5,931,182

Pressure Reducing Valve:

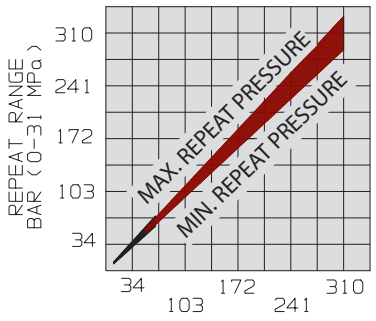
- Use this valve in double or single acting systems.
- Direct acting, poppet style, adjustable, cartridge construction.
- Cartridge construction is the adjustable, direct acting, poppet style.
- Model 47-0540-01 set the pressure range from 52 bar (5.2 MPa) to 310.3 bar (31 MPa) . Repeatability ± 7%.
- Model 47-0540-03 set the pressure range from 10 bar (1 MPa) to 62 bar (6.2 MPa). Repeatability ± 10%.
- Maximum inlet pressure is 350 bar (35 MPa).
- Two-port design eliminates the need for third fluid line to drain bypass flow (internal leakage) back to the system reservoir.
- Recommended Filtration is 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 downstream 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	Repeat	A
Manifold Mount Valve Assembly				
47-0540-01	350 bar (35 MPa)	52-310 bar (5.2 -31.0 MPa)	± 7%	148
47-0540-03	< 200 bar (20 MPa) >200 bar (20 MPa)	10 - 62 bar (1-6.2 MPa) 21-62 bar (2.1 - 6.2 MPa)	± 10%	165

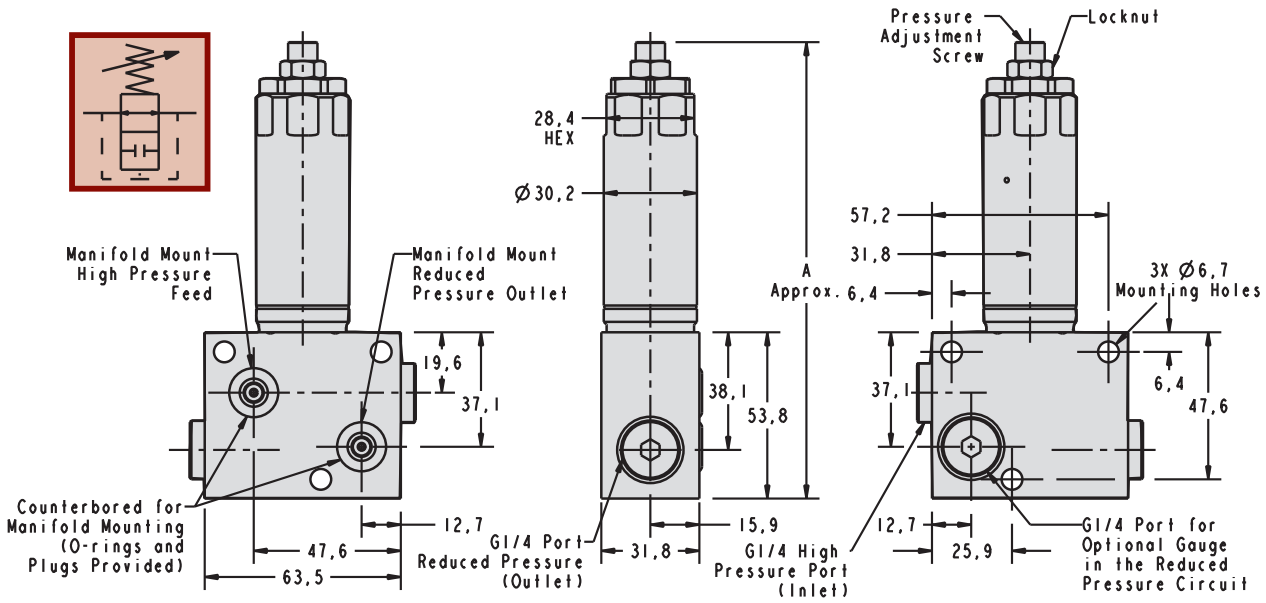
NOTE: Maximum system flow rate is 5.7 l/min. for all VektorFlo® special function valves.

Excess flow voids warranty.



ILMV705406 REV B

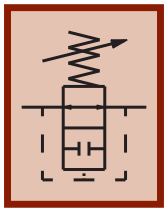
For proper sealing, the mating surface must be flat within 0.08 mm with a maximum surface roughness of 1.6 µm R_a



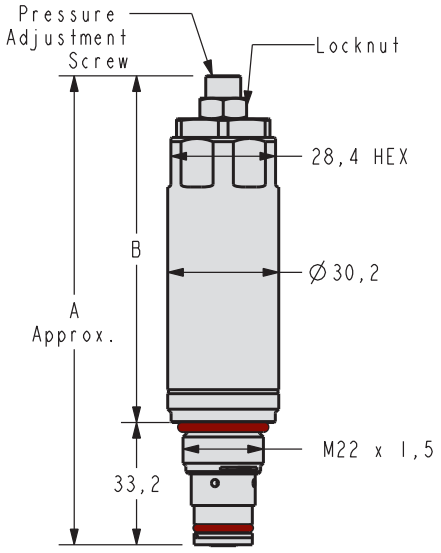
Manifold Mount Pressure Reducing Valve Assembly

ILMV705407 REV A

Pressure Reducing Valve

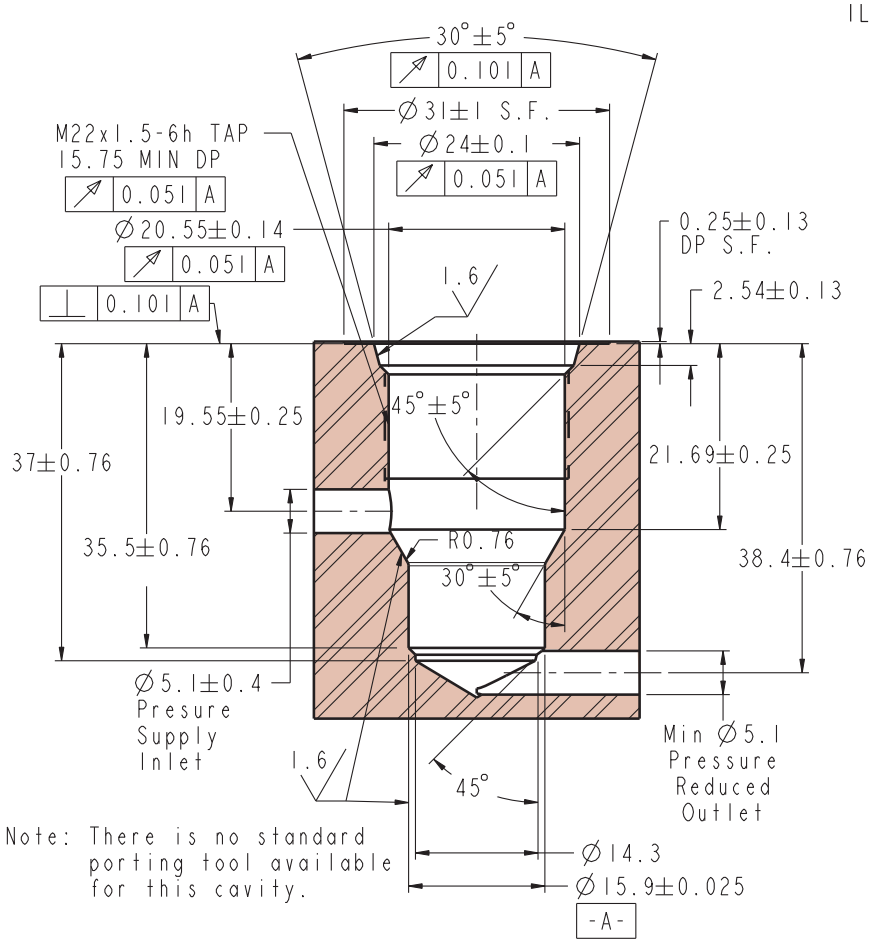


Pressure Reducing Valve					
Model No.	Inlet Pressure	Set Pressure Range	Repeatability	A	B
Cartridge Only					
47-0540-00	350 bar (35 MPa)	52-310 bar (5.2 -31.0 MPa)	± 7%	127	82.6
47-0540-04	< 200 bar (20 MPa)	10 - 62 bar (1-6.2 MPa)	± 10%	144	100.7
	>200 bar (20 MPa)	21-69 bar (2.1 - 6.2 MPa)			



Pressure Reducing Valve Cartridge

ILMV705408 REV A



ILMV705402 REV C

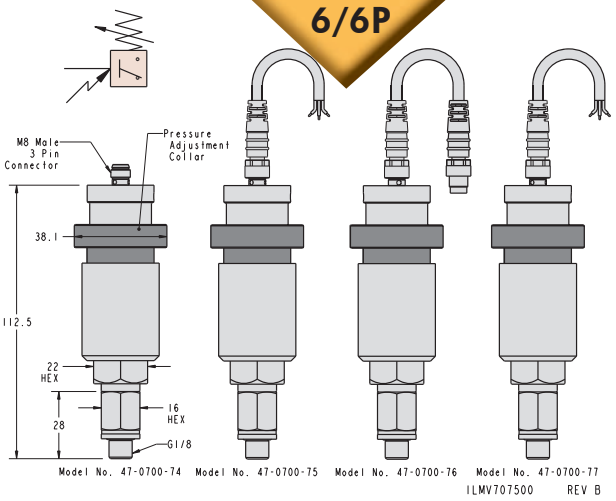
IP-67, NEMA Rating 6/6P

Pressure Switch

Heavy Duty

Waterproof Pressure Switch

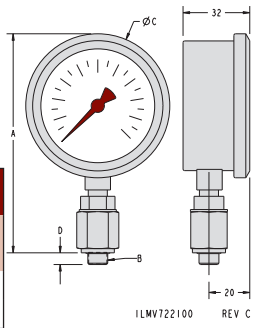
- Switch tested over 1,000,000 cycle lifetime.
- New sealed collar and micro-switch design guard against leaks; making this switch ideal for use in wet environments.
- M8 connectors afford more standard wiring options.
- Superior reinforced cable connections that withstand stress, seal securely and are easily changed or serviced.
- Pressure range between 55 bar (5.5 MPa) to 350 bar (35 MPa).
- Electrical Rating
  - 1 amp @ 28 VDC resistive
  - 5 amp @ 125/250 VAC
- Reset deadband : approximately 5% of the set pressure.
- Sealed switch for operating in high moisture environments. (Complies with IP 67)



Pressure Switch			
Model No.	Pressure Range	Electrical Connection	Wiring Instructions
47-0700-74	55 bar (5.5 MPa) to 350 bar (35.0 MPa)	M8 Male Connection only	N/A
47-0700-75		Part No. 27-6424-03 cordset, 1 m long with female M8 connector and bare ends	Brown ... N/O Black ... N/C Blue ... Common
47-0700-76		Part No. 27-7424-00 cordset, 0.5 m long with M8 male and female connections.	N/A
47-0700-77		Part No. 27-6424-00 cordset. 5 m long with M8 female connector and bare ends.	Brown ... N/O Black ... N/C Blue ... Common

Standard Gauges

- Liquid filled gauges up to 700 bar (70 MPa) analog readouts.
- Conform to ANSI standard B40.1 Grade B.
- G 1/8 or G 1/4 connections

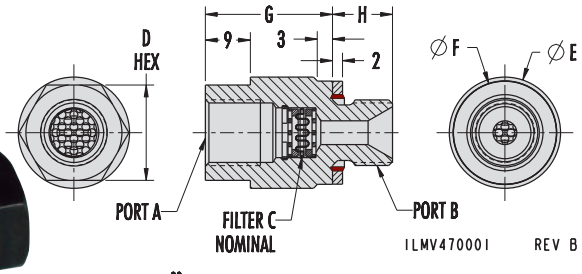


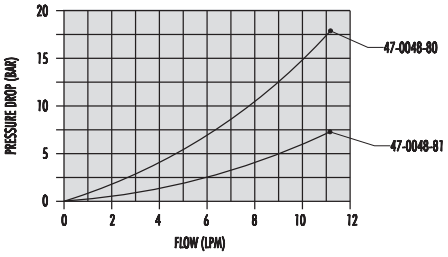
Gauges					
Model No.	Pressure Range	A	B	ØC	D
47-2210-00	0-350 bar	107	G 1/8	69	4.7
47-2210-01	0-700 bar				
47-2210-02	0-350 bar	106	G 1/4	69	11
47-2210-03	0-700 bar				

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

In-line Filter

- Available in 2 filter ratings; 10 and 25 Micron.
- Filters at 350 bar (35 MPa) in either flow direction.
- Compact in-line design for maximum flexibility.
- Serviceable for cleaning or filter replacement.
- Maximum flow of 11.3 l/minute.
- Maximum ambient temperature of 93° C.





In-line Filters								
Model No.	A	B	C	D	E	F	G	H
47-0048-80	G 1/4	G 1/4	10 Micron	19	22.2	18.8	25.4	11.9
47-0048-81	G 1/4	G 1/4	25 Micron	19	22.2	18.8	25.4	11.9

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 4-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 "crosstalk" 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 ensure that there is no movement during a 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?

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 an 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.

All VektorFlo® directional control valves are rated at 350 bar (35 MPa) working pressure. They typically incorporate international standard mounting and fluid flow patterns. 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 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.

NOTE: Maximum system flow rate is 5.7 L/minute for all VektorFlo® special function valves.

Excess flow voids warranty.

CETOP 3 Valves

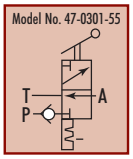
Single and Double Acting

- Maximum Operating Pressure 500 bar (50 MPa).
- Minimum Operating pressure 10 bar (1 MPa).
- CETOP 3 adaptation.

Model No. 47-0301-55
2-Position, 3-Port

Seat Valve

- Manually Operated.
- For Single Acting cylinders.

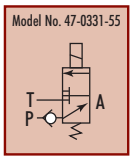


Specifications				
Model No.	Nominal Size	Type	Nominal Flow	Weight (g)
47-0301-55	6	Seat Valve	12 L/m	444

Model No. 47-0331-55
2-Position, 3-Port

Seat Valve

- Solenoid Operated.
- For Single Acting cylinders.

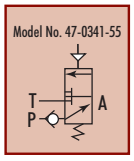


Specifications				
Model No.	Nominal Size	Type	Nominal Flow	Weight (g)
47-0331-55	6	Seat Valve	12 L/m	740

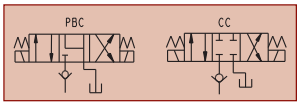
Model No. 47-0341-55
2-Position, 3-Port

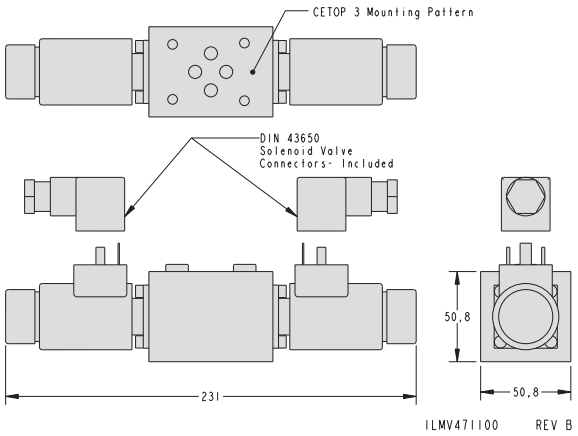
Seat Valve

- Pneumatically Operated.
- For Single Acting cylinders.



Specifications				
Model No.	Nominal Size	Type	Nominal Flow	Weight (g)
47-0341-55	6	Seat Valve	12 l/min	459





3-Position, 4-Port Solenoid

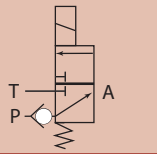
- Provide improved control of clamping circuits with true poppet design.
- Multiple coil voltages available.
- Internal design promotes improved service life..
- Narrow width allows mounting of multiple valves.
- All valves have built-in P-Block check for fail safe multi-valve operation.
- Coils can be easily replaced.

Specifications					
Model No.	Function	Valve Connector Part No.	Solenoid Voltage	Power Usage (watts)	Duty Rating
47-1123-21	Closed Center	85-5342-91	24V DC	27.6	100%
47-1123-40	P-Blocked Center	85-5342-91	24V DC	27.6	

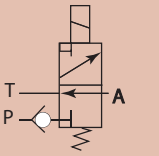
Seat Valve 2-Position 3-Port Valve

- Solenoids work with or without a shift lever and are designed and checked to VDE 0580.
- Seat valve has a manual emergency actuator.
- A check valve is incorporated in channel "P".
- Seat valve has complete hydraulic pressure compensation and negative switching.
- Position of installation is optional.

Model No. 47-1112-52



Model No. 47-1112-53



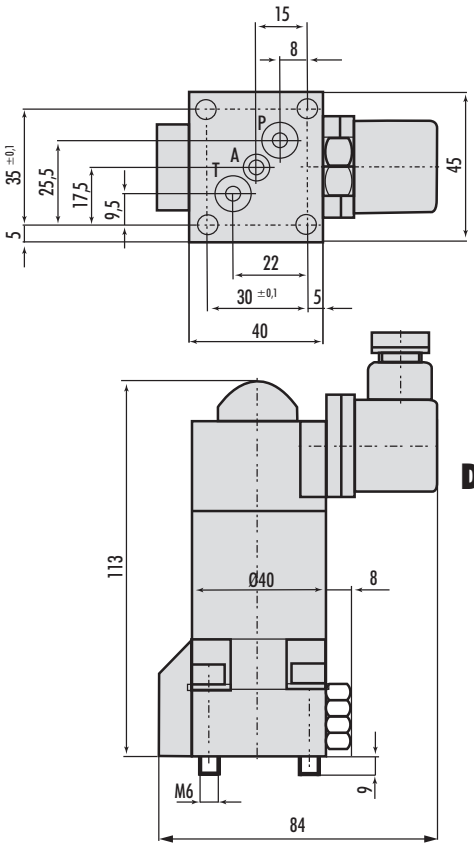
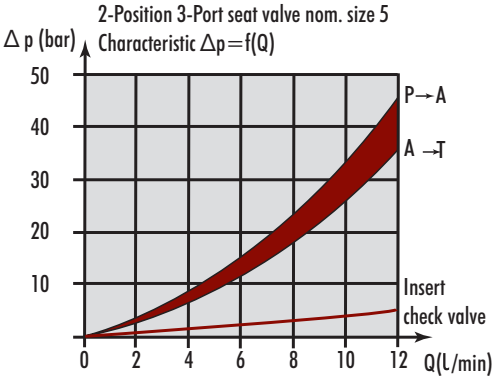


Diagram:



Specifications

Model No.	Nom. Size	Valve Type	Connection	Max.Oper. Pressure (bar) (MPa)	Nom. Flow (l/min.)	Viscosity (c St)	Ambient Temp. (C°)
47-1112-52 47-1112-53	5	Seat	Manifold	500 bar (50 MPa)	12	10-500	-40 to +80

Model No.	Actuating Element						Wgt. (g)
	Ust (VA)	P (VA)	Switch Time (ms)	Relative Duty Cycle (%)	Switching Frequency/ Hr.	Code Class	
47-1112-52 47-1112-53	24=	20	100 on 50 off	100 (to 35° C)	2000	IP 54	710

NOTE: The flow direction must be the direction of the arrow according to the symbol. The position of installation is optional.

Seat Valve 2-Position 3-Port

Seat Valve 2-Position 3-Port Valve

- The ball, being the essential control element, is pressed either by a magnet or a spring onto the hardened ball seats.
- Seat valve has a manual emergency actuator.
- A check valve is incorporated in channel "P".
- Seat valve has complete hydraulic pressure compensation and negative switching.
- Position of installation is optional.

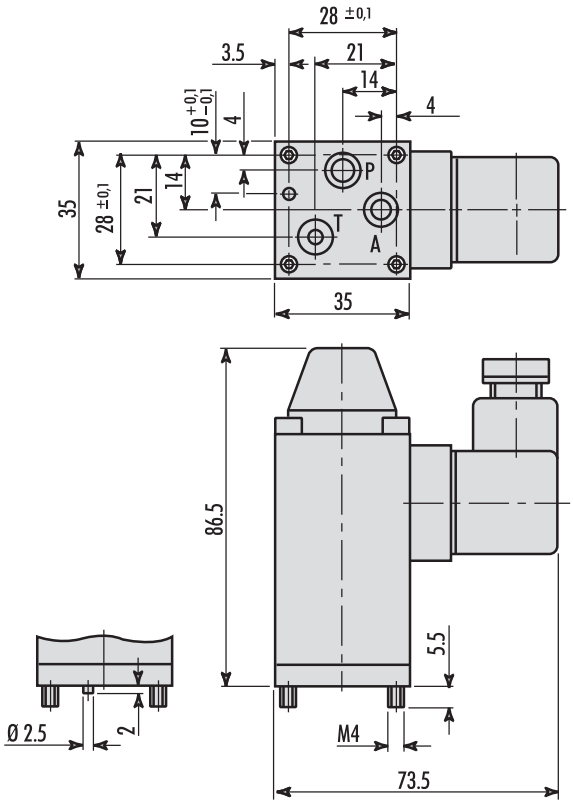
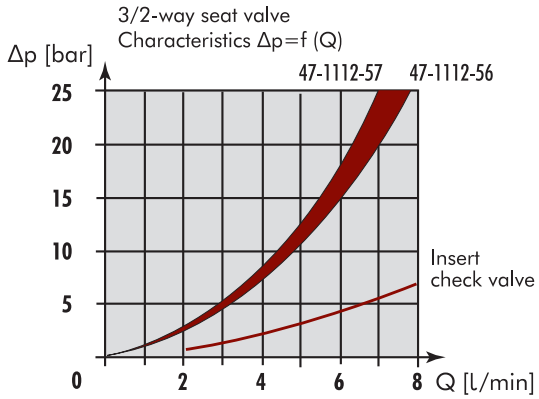
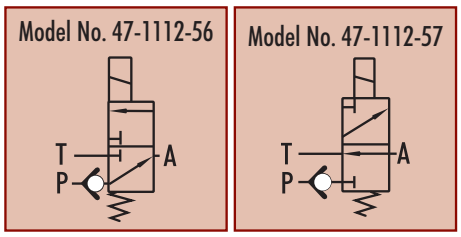


Diagram:





N-4

Specifications

Model No.	Nom. Size	Valve Type	Connection	Maximum Oper. Pressure (bar) (MPa)	Nom. Flow (l/min.)	Viscosity (c St)	Ambient Temp. (C°)
47-1112-56 47-1112-57	4	Seat	Manifold	450 bar (45 MPa)	8	10-200	-40 to +80

Model No.	Actuating Element						Weight (g)
	Ust (VA)	P (VA)	Switch Time (ms)	Relative Duty Cycle (%)	Switching (Freq/ Hr.)	Code Class	
47-1112-56 47-1112-57	24=	24	70 on 50 off	100 (to 40° C)	2000	IP 65	600

NOTE: The flow direction must be the direction of the arrow according to the symbol. The position of installation is optional.

Manual Seat Valve 2-Position 2-Port and 2-Position 3-Port

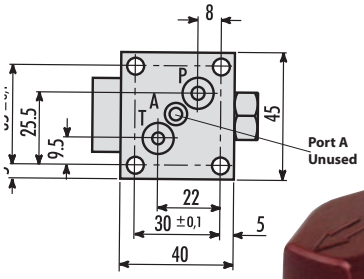
Manual 2-Position 2-Port Seat Valve

Manual 2-Position 3-Port Seat Valve

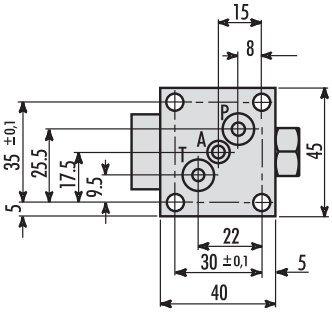
- Oil channel can be closed or open by means of a manual 2-Position 2-Port seat valve.
- Manual 2-Position 3-Port seat valve allows determination of oil flow direction.
- Seat valve has complete hydraulic pressure compensation and negative switching.
- Position of installation is optional.

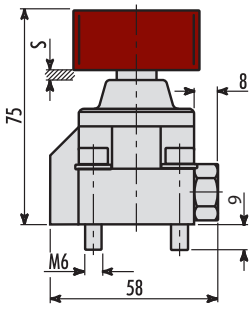
NOTE: The flow direction must be the direction of the arrow according to the symbol. The position of installation is optional.

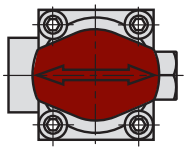
Model No. 47-0301-56



Model No. 47-0301-57







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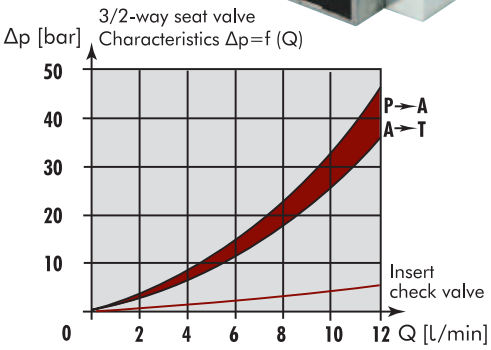
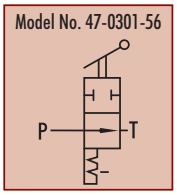
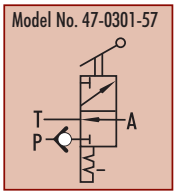


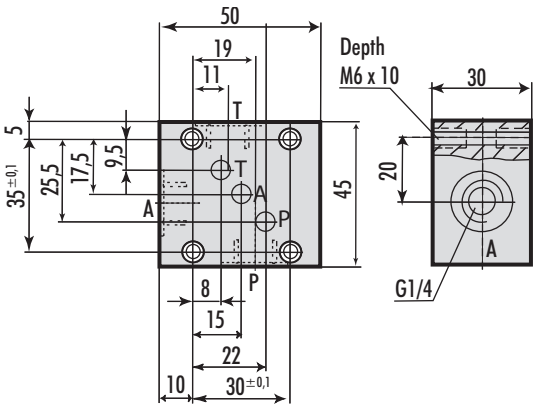




Specifications

Model No.	Nom. Size	Valve Type	Connection	Maximum Oper. Pressure (bar) (MPa)	Nom. Flow (l/min.)	Viscosity (c St)
47-0301-56 47-0301-57	5	Seat	Plate	500 bar (50 MPa)	12	10-500

Model No.	Ambient Temp. (C°)	Actuation Type	Switching Torque (N cm)	Switching Stroke (mm)	Switching Angle	Wgt. (g)
47-0301-56 47-0301-57	-40 to +80	Control Knob	63	3.5	90°	400



Specifications

Model No.	Dimensions	Connection	Weight (g)
47-0941-57	50 x 45 x 30	3 x G 1/4	450

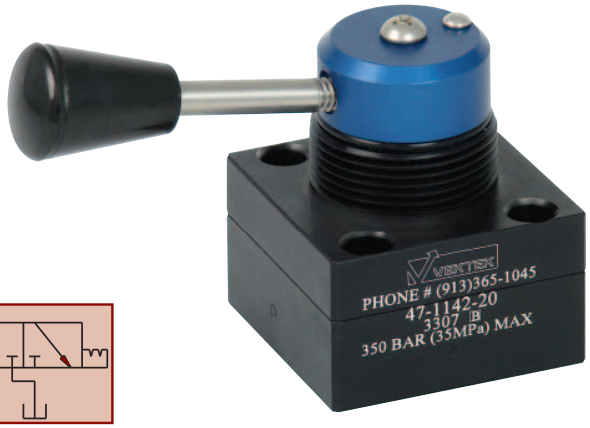
For pipe connection in combination with:

- 3/2-way Seat Valve Model No. 47-1112-52
- 2/2-way Manual Seat Valve Model No. 47-0301-56
- 3/2-way Manual Seat Valve Model No. 47-0301-57

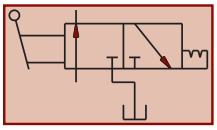
2 Position 3-Port

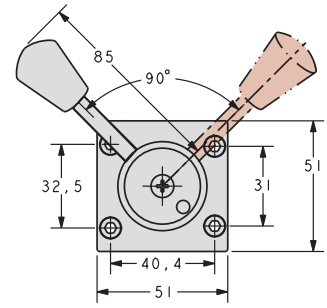
Control Valves: 2 Position 3-Port

- Available as either manual or solenoid operated.
- Efficient control solutions for single-acting systems.
- 2-Position 3-Port manual valve is equipped with colored onnet to differentiate it from the 3-Position 4-Port.
- Shear style valve design features hardened steel poppets and cast steel body.



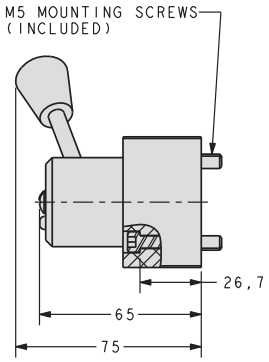
2-Position 3-Port
Model No.
47-1142-20
Manual - CETOP Mounting



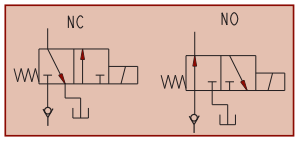


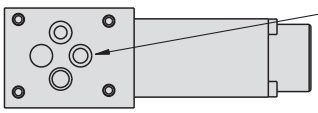
HANDLE/BONNET MAY BE REPOSITIONED EVERY 90° FROM POSITION SHOWN

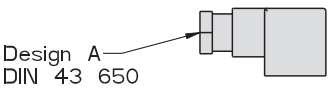
47-1142-20 CETOP 3 MOUNTING PATTERN

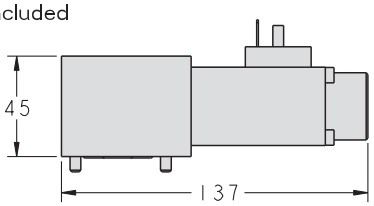


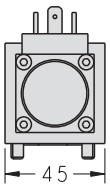
ILMV711402 REV D



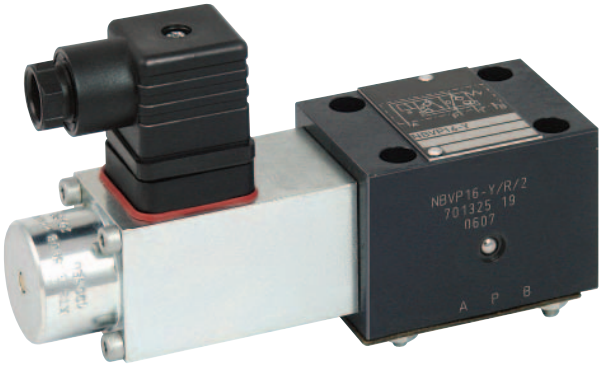








ILMV711103 REV C



* WARNING: Supplied with a rectified connector that must be used to insure proper valve function. The use of any other connector will void product warranty.

NOTE: The maximum system flow rate is 5.7 L/m for all VektorFlo® Metric valves.

Excess flow rates will void product warranties.

Specifications

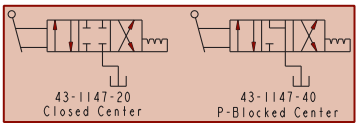
Model No.	Function	Solenoid Voltage	Power Consumption	Duty Rating	Maximum Cycle Rate
47-1112-54	Normally Open	24VDC	28 Watts	100%	2000/hr
47-1112-13	Normally Open	115VAC*	29 Watts		
47-1115-03	Normally Closed	24VDC	28 Watts		
47-1115-05	Normally Closed	115VAC*	29 Watts		

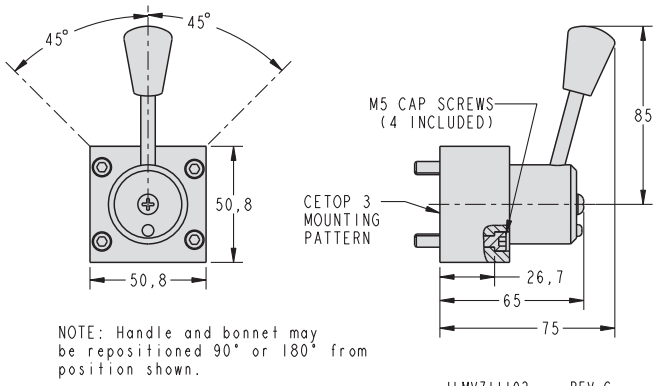
Control Valves: 3-Position 4-Port

- 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 shears and poppets are spring and pressure loaded against hardened steel wear surfaces to provide positive fluid control for hundreds of thousands of cycles.
- Operates with rotary handle motion. Detented internal rotor snaps into position ensuring accurate alignment of internal flow passages.
- Extensive use of anti-friction rotary bearings allows for low effort handle rotation even when operating at 350 bar (35 MPa).
- All valves incorporate lightweight aluminum alloy bodies and are furnished with required standard length mounting bolts.

NOTE: Maximum system flow rate is 5.7 l/minute for all VektorFlo® special function valves.

Excess flow voids warranty.

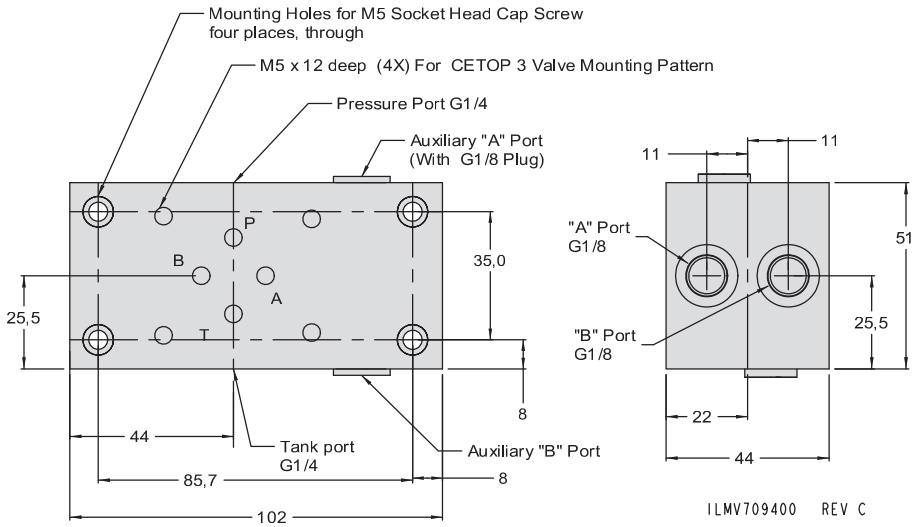




Specifications					
Model Nos.	Center	Seals	Fluid Temp. Maximum	Fluid Flow Maximum	Tank Port Pressure
43-1147-20	Closed Center	NBR PTFE	70° C	5.7 l/min	17 bar (1.7 MPa)
43-1147-40	P-Blocked Center	NBR PTFE	70° C	5.7 l/min	17 bar (1.7 MPa)

D03 Sub-plate

Model No.
47-0941-10



For use with the following valves:
2-Position 3-port Valve Manual, Model No. 47-1142-20
2-Position 3-Port Valves Solenoid Model Nos. 47-1112-54, 47-1112-13, 47-1115-03, 47-1115-05
3-Position 4-Port Valves Manual Model Nos. 43-1147-20 and 43-1147-40
3-Position 4-Port Valves Solenoid Model Nos. 47-1123-21 and 47-1123-40

Frequently Asked Questions

I need to make my own arms, what information do I need?

The information that you need is detailed on page O-5 or O-10. 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 0.5 mm 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 the 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 set screws 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. Easily modify any standard arm you purchase. We recommend this because our original design for the cross bolt orientation mechanism is the most secure, dependable and versatile orientation method available. Many customers and competitors have tried to copy it, some with limited success. We welcome you to use our method also. Please be sure to put in the 0.5 mm 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 satisfactorily.

Can I pin the arm to hold orientation?

Yes, it is possible to add a set screw or pin to the arm and plunger end to ensure orientation retention. 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 11 kN swing clamp still the same?

No. First of all, the 11 kN 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 13.5 kN. 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 (two).

I want to clamp two parts, with each double ended swing clamp arm. Do I need a fixed or pivoting arm?

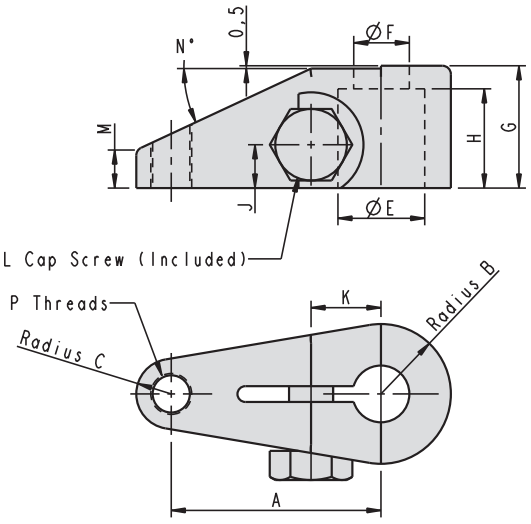
If your parts do not vary in size (clamped height) you can probably get by with a fixed clamp arm. If your parts vary by as little as 0.1 mm you may get significant variations in clamp force with a fixed arm (higher force on the taller part, lighter force on the shorter one). If your parts vary or the clamp force is crucial, we recommend a pivoting arm so that the force is equalized on both parts. (Remember, 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.

Standard Length and Upreach Dimensions



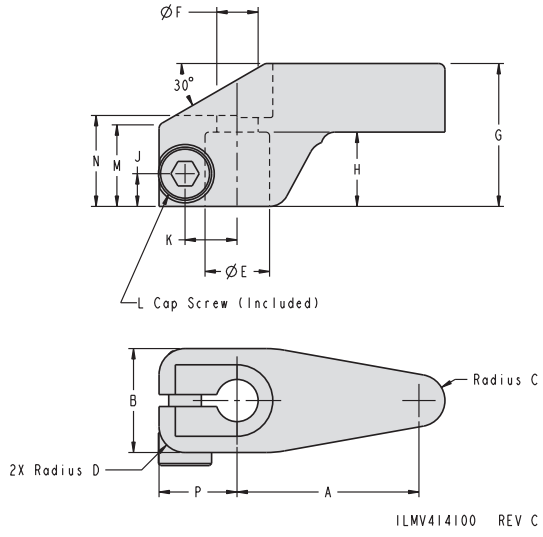
ILMV410100 REV E

NOTE: See page C-27 for suggested clocking feature tapped hole location.

Standard Arm Dimensions

Model No.	Capacity (kN)	A	B	C	E	F	G	H	J	K	L	M	N	P
44-1011-00	2	27	9.5	4.5	11.13-11.18	7	16	12.5	7	9.5	M6 x 1	6.5	22°	M6 x 1
44-1015-00	4.9	38	12.5	6.5	15.89-15.94	10.5	22	18	8	12.7	M8 x 1.25	7.5	25°	M8 x 1.25
44-1022-00	11.5	51	17.5	9.5	22.24-22.29	13.5	32	25.5	9.5	16.6	M10 x 1.25	12	25°	M10 x 1.5
44-1031-01	22	63.5	25.5	14.5	31.75-31.80	16.5	44.5	36.5	12.5	24.6	M16 x 1.5	16	25°	M12 x 1.75

All dimensions are in mm.



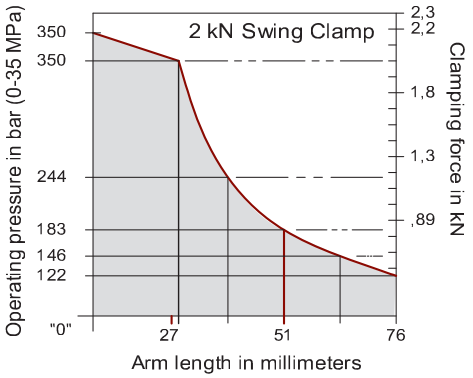
ILMV414100 REV C

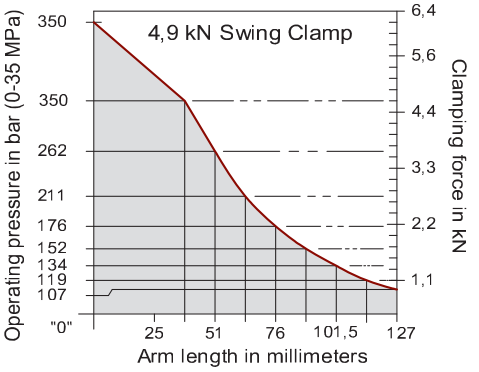
Upreach Arm Dimensions

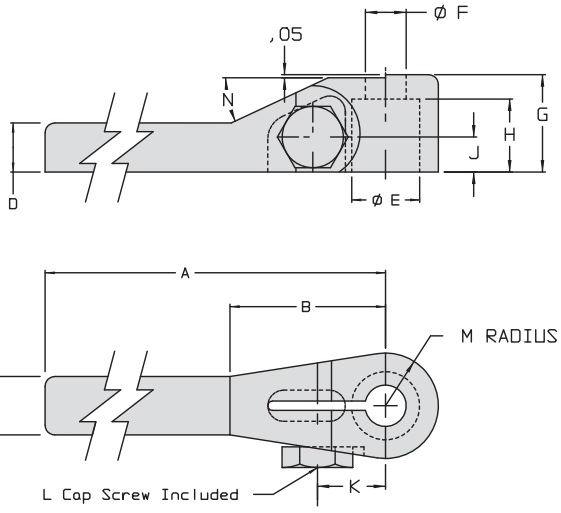
Model No.	Capacity (kN)	A	B	C	D	E	F	G	H	J	K	L	M	N	P
44-1411-00	2	32	19	5	5	11.13-11.18	7	25.5	12.5	6.5	9.5	M6 x 1	12.5	16	16
44-1415-00	4.9	44.5	25.5	6.5	6.5	15.89-15.94	10.5	35	18	8	12.5	M8 x 1.25	19	22	19
44-1422-00	11.6	63.5	35	9.5	9.5	22.24-22.29	13.5	51	25.5	9.5	16.5	M10 x 1.25	26.5	32	26
44-1431-01	22	76	51	14.3	14.3	31.75-31.80	16.7	70	36.6	13.5	24.6	M16 x 1.5	38	44.5	38

Swing Clamp Arms

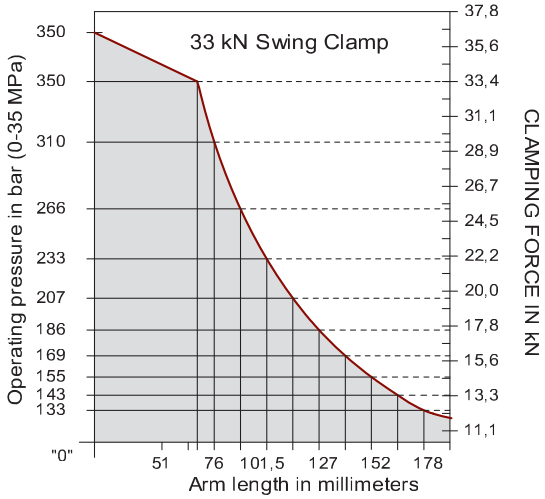
Arm Length Pressure Limitations Extended Arm Dimensions







ILMV411100 REV D



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

ILMV415100 REV B

All dimensions are in mm.

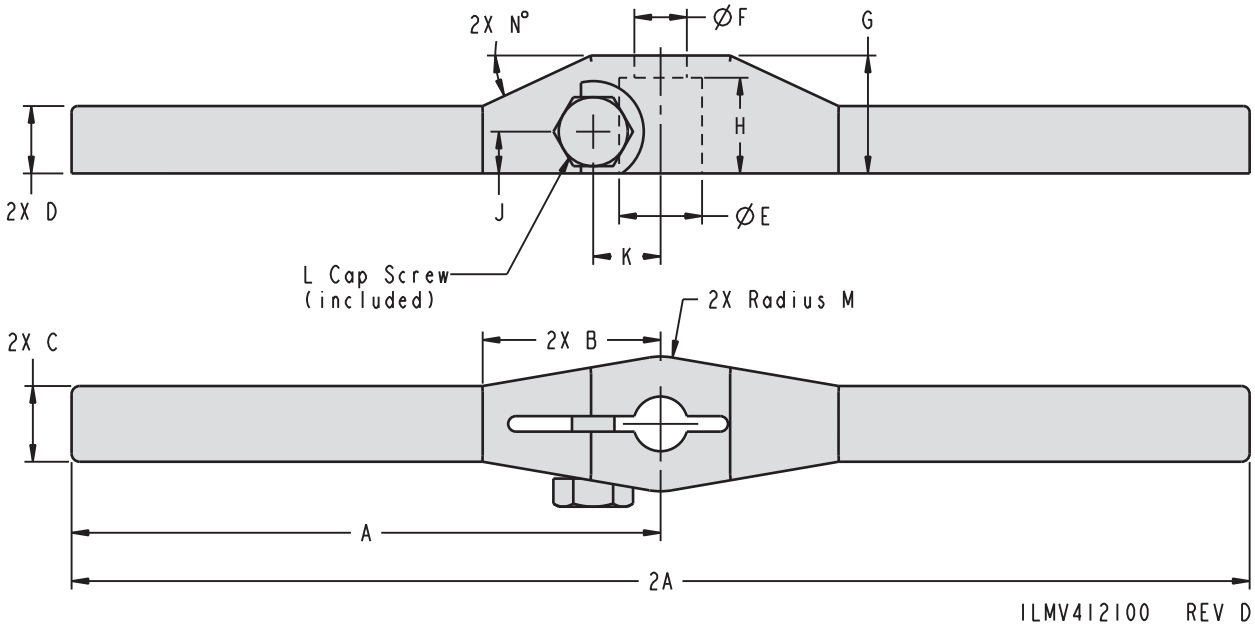
NOTE: Follow arm length limitations above.

Clocking feature tapped hole location detail is on page C-2 for TuffCam™ and on C-27 for Standard Swing Clamps.

Extended Arm Dimensions

Model No.	Capacity (kN)	A	B	C	D	E	F	G	H	J	K	L	M	N
44-1111-00	2	82.5	26	10.5	8.5	11.13-11.18	7	16	12.5	7	9.5	M6 x 1.00	9.5	22°
44-1115-00	4.9	136.5	33	14.5	12.5	15.89-15.94	10.5	22	18	8	12.7	M8 x 1.25	12.5	25°
44-1122-00	11.6	162	50.5	19	16	22.24-22.29	13.5	32	25.5	9.5	16.6	M10 x 1.25	17.5	25°
44-1131-01	22	165	70.5	28.5	19	31.75-31.80	16.5	44.5	36.5	12.5	24.6	M16 x 1.50	25.5	25°

Double Ended Arm Dimensions



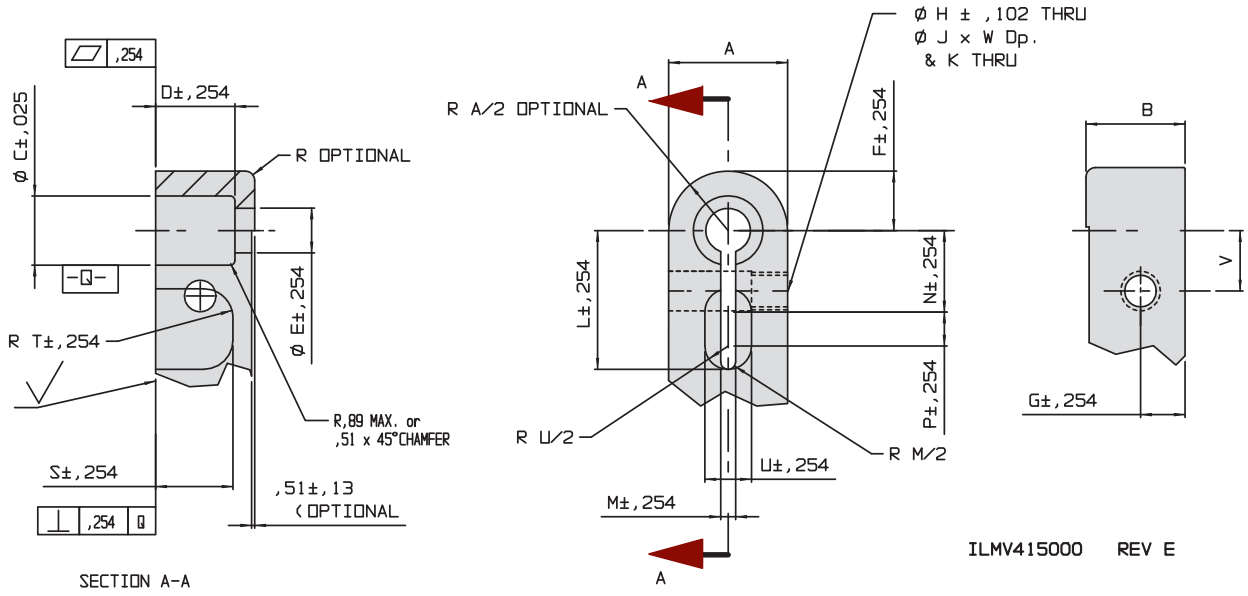
Double Ended Arm Dimensions															
Model No.	Capacity (kN)	A	2A	B	C	D	ØE	F	G	H	J	K	L	M	N
44-1211-00	2	70	140	26	10.5	8.5	11.13-11.18	7	16	12.5	7	9.5	M6 x 1	9.5	22°
44-1215-00	4.9	111	222	33	14.5	12.5	15.89-15.94	10.5	22	18	8	12.7	M8 x 1.25	12.5	25°
44-1222-00	11.6	136	272	50.5	19	16	22.24-22.29	13.5	32	25.5	9.5	16.6	M10 x 1.25	17.5	25°
44-1231-01	22	140	280	70.5	28.5	19	31.75-31.80	16.5	44.5	36.5	12.5	24.6	M16 x 1.5	25.5	25°

All dimensions are in mm.

Swing Clamp Arms

Recommended Machine Dimensions for Self-produced Standard Swing Clamp Arms

CUSTOMER PRODUCED ARM DIMENSIONS

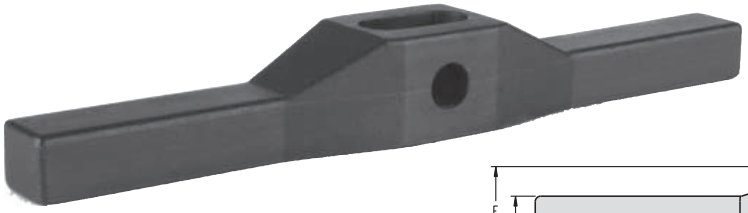


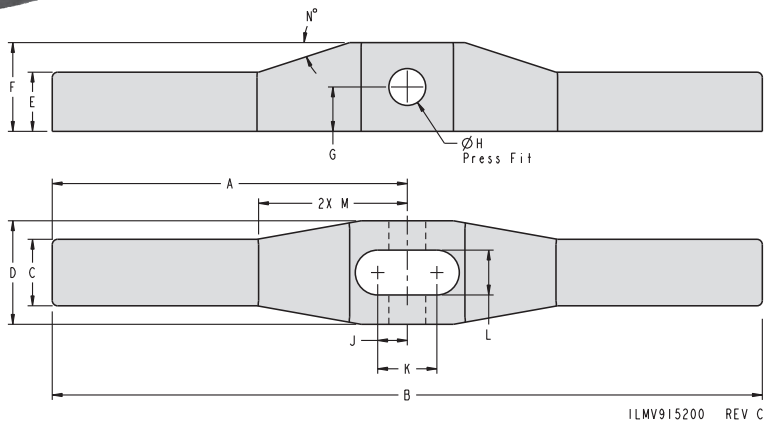
Customer Produced Arm Dimensions																				
Arm Series.	Capacity (kN)	A	B	ØC	D	ØE	F	G	ØH	ØJ	K	L	M	N	P	S	T	U	V	W
Recommended Machining Dimensions for Self-produced Clamp Arms.																				
44-1011-00 44-1111-00 44-1211-00 44-1411-00	2	19	16	11.151	12.7	7	9.5	7	5	6.4	M6 x 1-6H	22	2.4	11	8	13	4	6.4	9.5	12.7
44-1015-00 44-1115-00 44-1215-00 44-1415-00	4.9	25.5	22	15.913	18.03	11	12.7	7.8	6.8	8.5	M8 x 1.25-6H	29	2.9	15	9.4	18.8	4	8.2	16.5	16.8
44-1022-00 44-1122-00 44-1222-00 44-1422-00	11.6	35	32	22.263	25.4	13.5	17.5	9.4	8.8	10.5	M10 x 1.25-6H	38	2.9	18.7	15.2	28	4	8.2	19	21.6
44-1031-01 44-1131-01 44-1231-01 44-1431-01	22	51	44.5	31.775	36.5	17	25.4	12.7	14.5	16.5	M16 x 1.50-6H	53	2.9	25.5	20.5	41	4	13	27	32

All dimensions are in mm.

NOTE: Follow arm length limitations on page O-3

Doubled Ended and Assembly Dimensions



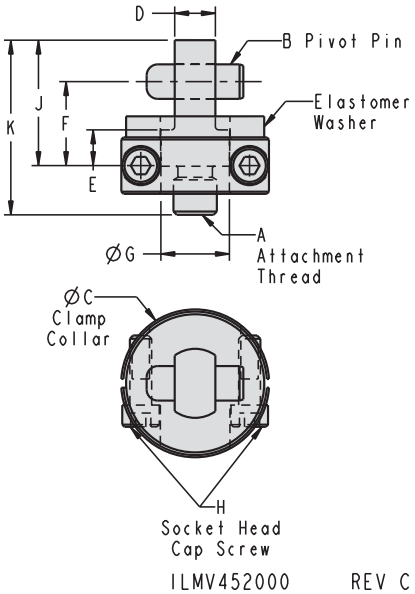


Rocker Arm Dimensions

Model No.	Capacity (kN)	A	B	C	D	ØE	F	G	H	J	K	L	M	N
44-5205-08	2	54	108	10.4	15.9	8.7	11.7	5.8	6.4	4.6	9.1	6.4	29.7	13°
44-5209-08	4.9	76.2	152.5	14.3	22.2	12.7	19.1	9.5	7.9	6.4	12.7	9.5	44	18°
44-5213-08	11.6	108	216	19.1	31.8	15.9	28	14.3	11.1	8.9	17.8	13.5	62.7	25°

All dimensions are in mm.

NOTE: Follow arm length limitations on page O-3

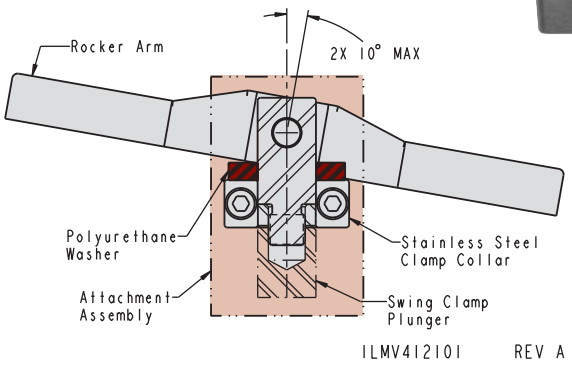


Rocker Arm Attachment Assembly Dimensions

Model No.	Capacity (kN)	A	B	ØC	D	E	F	ØG	H	J	K
44-5205-09	2	M6 x 1	Ø 6.4 x 15.9	24	6.2	6.6	14.7	11.2	M4 x 12	20.6	27
44-5209-09	4.9	M10 x 1.5	Ø 7.9 x 22.2	33.5	9.4	8.4	19.3	15.9	M5 x 16	29	41.1
44-5213-09	11.6	M12 x 1.75	Ø 11.1 x 31.8	41.5	13.3	7.6	26.7	22.2	M6 x 16	40.4	53.1

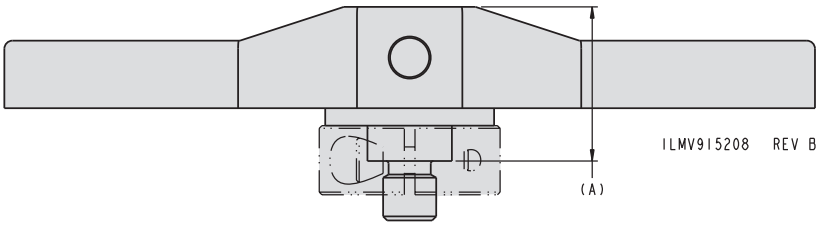
Swing Clamp Arms

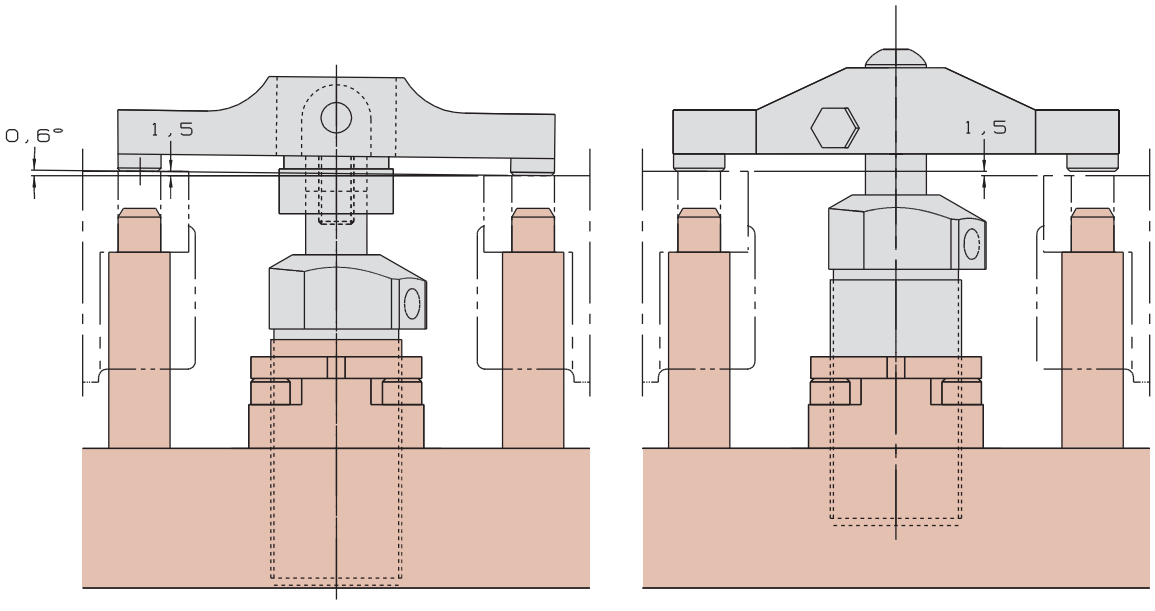
Assembled Double Ended Rocker Arm and Application



NOTE: To order the double ended rocker arms already assembled to the attachment, please use the numbers in the table to the left, otherwise parts will be shipped separately.

Dimensions	
Model No.	A
44-5205-10	20.57
44-5209-10	28.96
44-5213-10	40.39

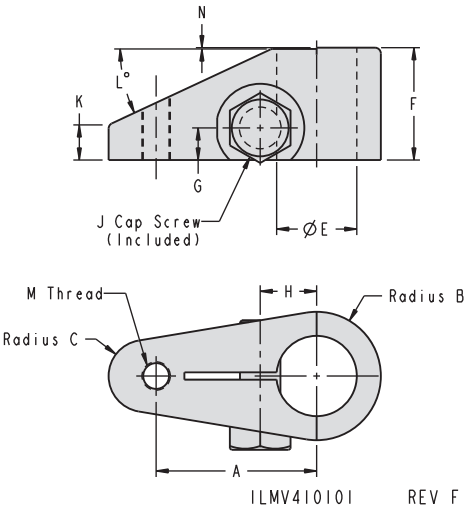




The double ended rocker arm illustrated on the left will provide equal clamping force at both ends.

The fixed double ended arm on the right will transmit more force on the taller part.

TuffCam™ Low Profile Swing Clamp Arms



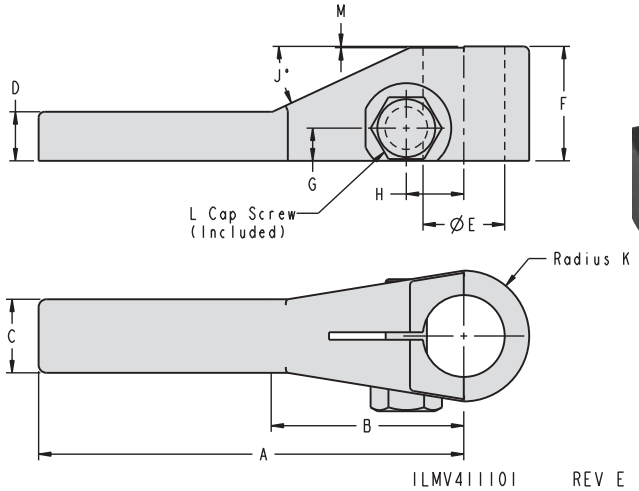
Low Profile Standard Arm Dimensions

Model No.	Capacity (kN)	A	B	C	ØE	F	G	H	J	K	L	M	N	Weight (g)
44-1031-00*	22	63.5	25.5	14.5	31.75-31.80	44.5	12.5	22.5	M16 x 1.5	16	25°	M12 x 1.75	0.5	801
44-1032-00**	33	68	35	14.2	38.11-38.16	44.5	14.2	25.6	M16 x 1.5	16.4	25°	M16 x 2	N/A	1134

* For use with Low Profile Swing Clamp Models
41-5622-XX, 41-5222-XX, 41-5022-XX, 41-4622-XX, 41-4222-XX
For an arm without a tapped hole order 91-5218-11

** For use with Low Profile Swing Clamp Models
41-5633-XX. 41-5233-XX, 41-5033-XX, 41-4633-XX, 41-4233-XX
For an arm without a tapped hole order 91-5221-06

NOTE: Replacement Cap Screw for 44-1031-00 and 91-5218-11 is Model No. 21-5000-24
Replacement Cap Screw for 44-1032-00 and 91-5221-06 is Model No. 21-5000-28



All dimensions are in mm.

NOTE: Follow arm length limitations on page O-3

Low Profile Extended Arm Dimensions

Model No.	Capacity (kN)	A	B	C	D	ØE	F	G	H	J	K	L	M	Weight (g)
44-1131-00*	22	165	70.5	28.5	19	31.75-31.80	44.5	12.5	22.5	25°	25.5	M16 x 1.5	0.5	1161
44-1132-00**	33	180.3	44.9	30.2	33.8	38.11-38.16	44.5	14.2	25.6	25°	35	M16 x 1.5	N/A	1996

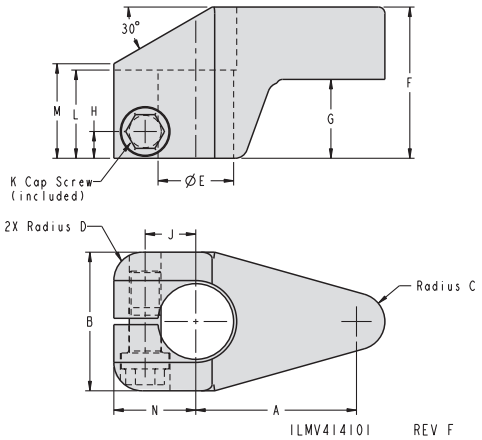
* For use with Low Profile Swing Clamp Models
41-5622-XX, 41-5222-XX, 41-5022-XX, 41-4622-XX, 41-4222-XX

** For use with Low Profile Swing Clamp Models
41-5633-XX. 41-5233-XX, 41-5033-XX, 41-4633-XX, 41-4233-XX

NOTE: Replacement Cap Screw for 44-1131-00 is Model No. 21-5000-24
Replacement Cap Screw for 44-1132-00 is Model No. 21-5000-28

Swing Clamp Arms

TuffCam™ Low Profile Swing Clamp Arms



Low Profile Upreach Arm Dimensions

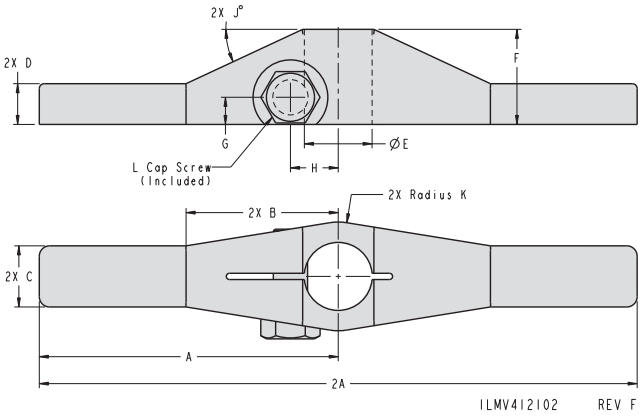
Model No.	Capacity (kN)	A	B	C	D	ØE	F	G	H	J	K	L	M	N	Weight (g)
44-1431-00*	22	76	51	14.5	14.5	31.75-31.80	70	36.5	13.5	22.5	M16 x 1.5	38	44.5	38	1580
44-1432-00**	33	81	69.9	14.3	14.3	38.11-38.16	76.2	39.6	13.5	25.6	M16 x 1.5	45	44.5	41.3	2313

* For use with Low Profile Swing Clamp Models
41-5622-XX, 41-5222-XX, 41-5022-XX, 41-4622-XX, 41-4222-XX

** For use with Low Profile Swing Clamp Models
41-5633-XX. 41-5233-XX, 41-5033-XX, 41-4633-XX, 41-4233-XX

NOTE: Replacement Cap Screw for 44-1131-00 and 44-1432-00 is Model No. 21-5000-25

All dimensions are in mm.



Low Profile Double Ended Arm Dimensions

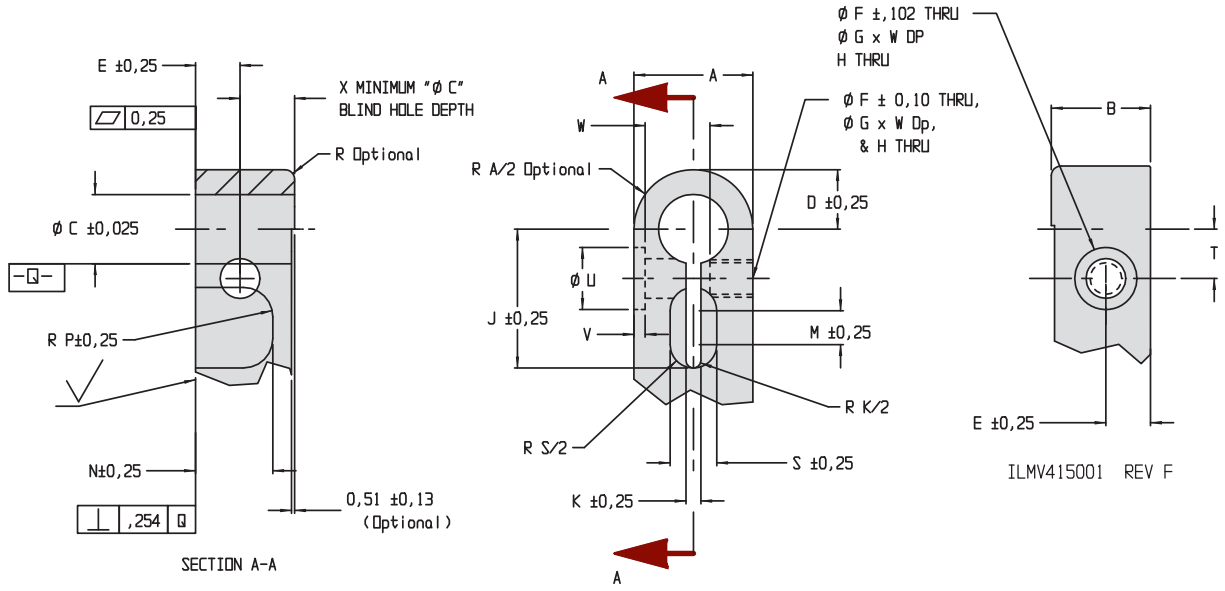
Model No.	Capacity (kN)	A	2A	B	C	D	ØE	F	G	H	J°	K	L	Weight (g)
44-1231-00*	22	140	280	70.5	28.5	19	31.75-31.80	44.5	12.5	22.5	25°	25.5	M16 x 1.50	1869
44-1232-00**	33	180.3	360.7	44.6	30.2	33.8	38.11-38.16	44.5	14.2	25.6	25°	35	M16 x 1.50	3311

* For use with Low Profile Swing Clamp Models
41-5622-XX, 41-5222-XX, 41-5022-XX, 41-4622-XX, 41-4222-XX

** For use with Low Profile Swing Clamp Models
41-5633-XX. 41-5233-XX, 41-5033-XX, 41-4633-XX, 41-4233-XX

NOTE: Replacement Cap Screw for 44-1231-00 is Model No. 21-5000-24
Replacement Cap Screw for 44-1232-00 is Model No. 21-5000-28

Recommended Machine Dimensions for Self-produced TuffCam™ Low Profile Swing Clamp Arms



Recommended machining dimensions for custom made low profile swing clamp arms

Customer Produced Low Profile Arm Dimensions																				
Arm Series	Capacity (kN)	A	B	ØC	D	E	ØF	ØG	H	J	K	M	N	P	S	T	ØU	V	W	X S/A	X D/A
Recommended Machining Dimensions for Self-produced Clamp Arms.																				
44-1031-00 44-1131-00 44-1231-00	22	51	44.5	31.78	25.4	12.7	14.5	16.5	M16 x 1.50-6H	53	2.9	20.5	41	4	13	22.5	35	6.2	25.7	43.2	32.8
44-1032-00 44-1132-00 44-1232-00	33	70	44.5	38.14	35	14.2	14.5	16.3	M16 x 1.50-6H	59	3.2	N/A	41	4	14.3	25.6	35	9.6	25.5	50.8	31.0

All dimensions are in mm.

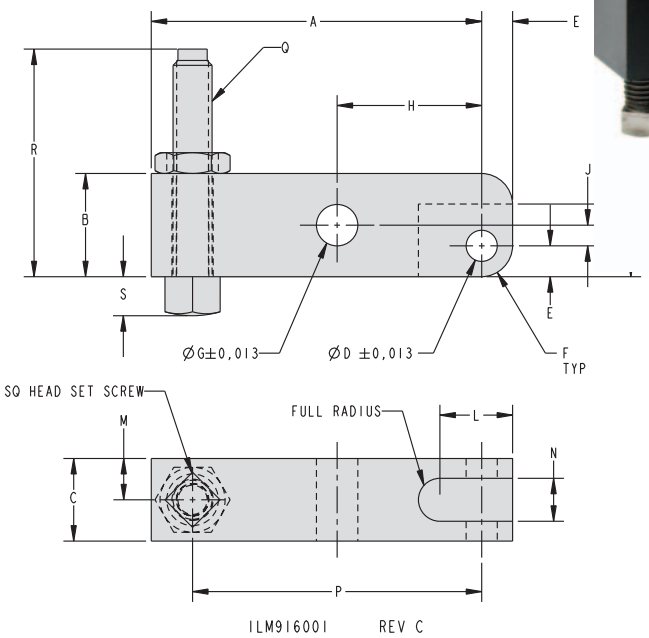
NOTE: Follow arm length limitations on page O-3

Hex Head Cap Screw for use with low profile standard, extended, and double ended arms series:

44-1031-00, 44-1131-00, and 44-1231-00 use 21-5000-24
44-1032-00, 44-1132-00, and 44-1232-00 use 21-5000-28

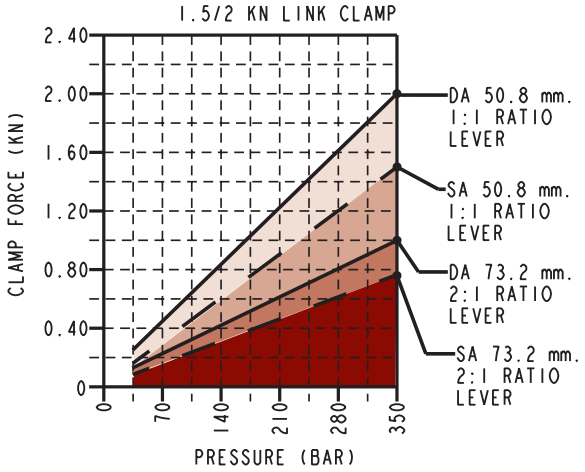
Link Clamp Levers

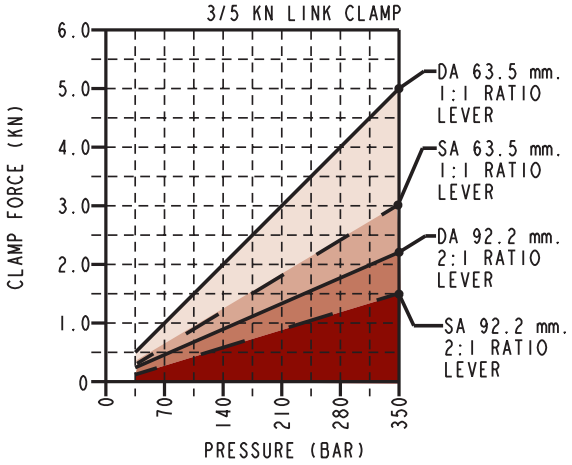
Link Clamp Lever Dimensions

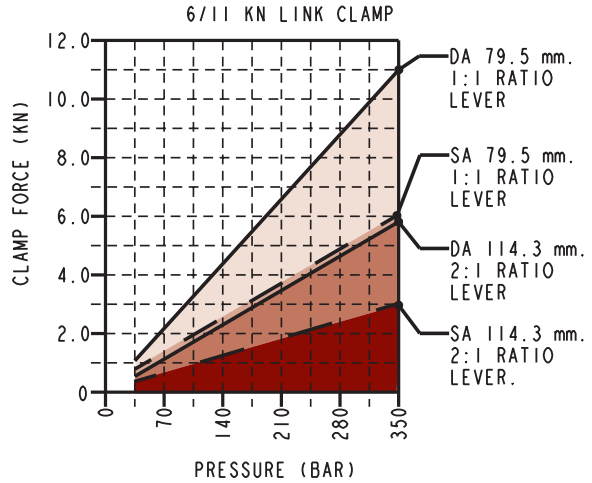


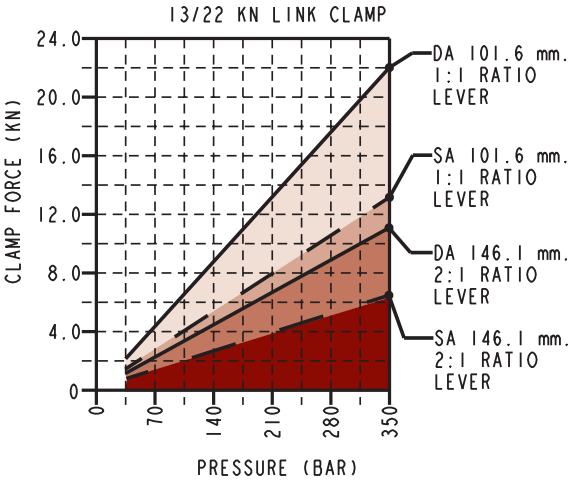
Dimensions											
Model No.	Cap. SA (kN)	Cap. DA (kN)	A	B	C	D	E	F	G	H	J
Standard Length Lever. 1:1 Ratio											
91-6004-03	1.5	2	50.8	16.0	12.7	4.788	4.8	4.8	6.363	22.2	3.2
91-6006-03	3	5	63.5	22.4	16.0	6.388	6.4	6.4	9.538	28.6	3.2
91-6009-03	6	11	79.5	31.8	25.4	9.563	9.5	9.7	12.713	34.9	4.7
91-6014-03	13	22	101.6	44.5	31.8	12.738	12.7	12.7	15.888	44.5	6.4
Extended Length Lever without Tapped Hole 2:1 Ratio											
91-6004-02	1.5	2	73.2	16.0	12.7	4.788	4.8	4.8	6.363	22.2	3.2
91-6006-02	3	5	92.2	22.4	16.0	6.388	6.4	6.4	9.538	28.6	3.2
91-6009-02	6	11	114.3	31.8	25.4	9.563	9.5	9.7	12.713	34.9	4.7
91-6014-02	13	22	146.1	44.5	31.8	12.738	12.7	12.7	15.888	44.5	6.4
Model No.	Cap. SA (kN)	Cap. DA (kN)	K	L	M	N	P	Q		R	S
Standard Length Lever. 1:1 Ratio											
91-6004-03	1.5	2	11.2	11.2	6.4	6.6	44.5	M6 x 1		36.8	6.0
91-6006-03	3	5	14.2	14.2	7.9	8.1	57.2	M8 x 1.25		42.3	8.0
91-6009-03	6	11	20.6	20.6	12.7	13.0	69.9	M10 x 1.50		62.8	10.0
91-6014-03	13	22	30.2	30.2	16.0	16.0	88.9	M12 x 1.75		83.3	12.0
Extended Length Lever without Tapped Hole 2:1 Ratio											
91-6004-02	1.5	2	11.2	11.2	6.4	6.6	N/A	N/A		N/A	N/A
91-6006-02	3	5	14.2	14.2	7.9	8.1	N/A	N/A		N/A	N/A
91-6009-02	6	11	20.6	20.6	12.7	13.0	N/A	N/A		N/A	N/A
91-6014-02	13	22	30.2	30.2	16.0	16.0	N/A	N/A		N/A	N/A

Link Clamp Lever Output Curves









DOUBLE ACTING (DA) ——————

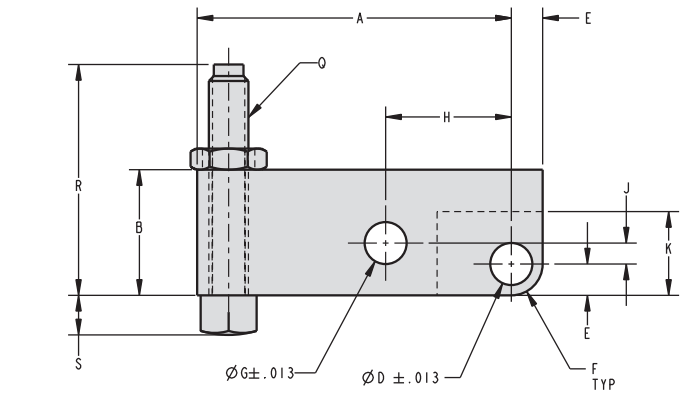
SINGLE ACTING (SA) — — —

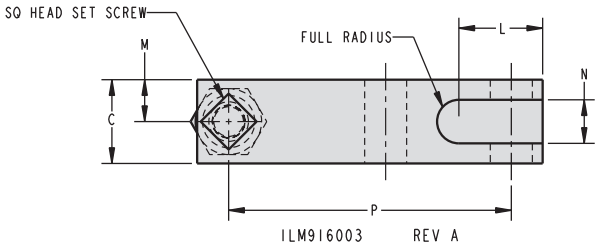
ILM916002 REV B

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

Link Clamp Levers

Low Pressure Link Clamp Lever Dimensions

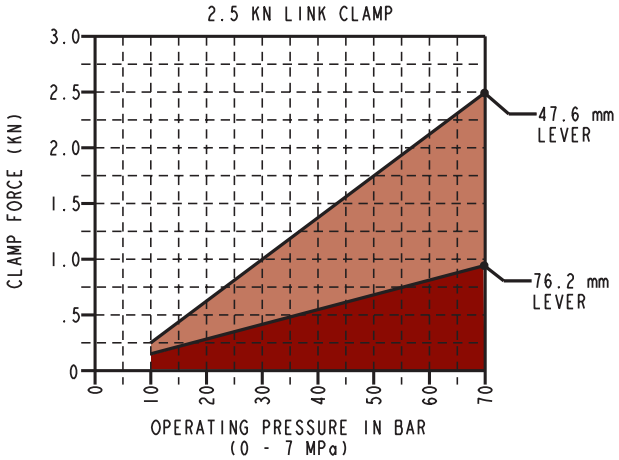


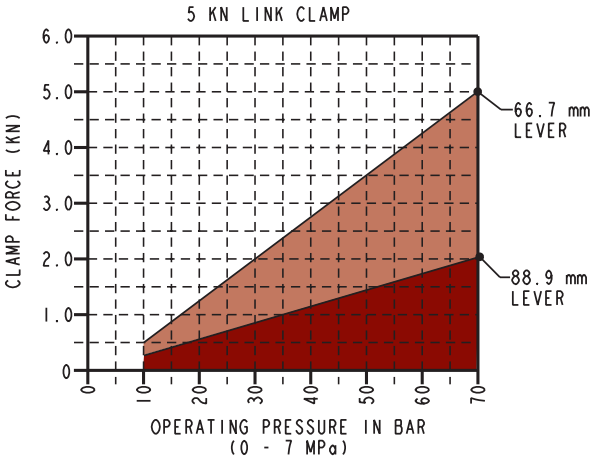


Dimensions										
Model No.	Cap. kN	A	B	C	D	E	F	G	H	J
Standard Length Lever										
91-6011-01	2.5	47.6	19.1	12.7	6.375	4.7	4.7	6.363	19.1	3.2
91-6015-01	5	66.7	25.4	19.1	9.550	7.9	7.9	9.538	25.4	7.9
91-6021-01	10	78.6	31.8	22.2	12.738	9.5	9.5	12.713	30.1	9.5
Extended Length Lever without Tapped Hole										
91-6011-02	2.5	76.2	19.1	12.7	6.375	4.7	4.7	6.363	19.1	3.2
91-6015-02	5	88.9	25.4	19.1	9.550	7.9	7.9	9.538	25.4	7.9
91-6021-02	10	101.6	31.8	22.2	12.738	9.5	9.5	12.713	30.1	9.5
Model No.	Cap. kN	K	L	M	N	P	Q		R	S
Standard Length Lever										
91-6011-01	2.5	12.7	12.7	6.4	6.6	42.8	M6 X 1.00		35	6.0
91-6015-01	5	19.1	17.4	9.5	9.8	57.2	M10 X 1.50		60	10.0
91-6021-01	10	23.8	22.2	11.1	11.4	68.2	M12 X 1.75		80	12.0
Extended Length Lever without Tapped Hole										
91-6011-02	2.5	12.7	12.7	N/A	6.6	N/A	N/A		N/A	N/A
91-6015-02	5	19.1	17.4	N/A	9.8	N/A	N/A		N/A	N/A
91-6021-02	10	23.8	22.2	N/A	11.4	N/A	N/A		N/A	N/A

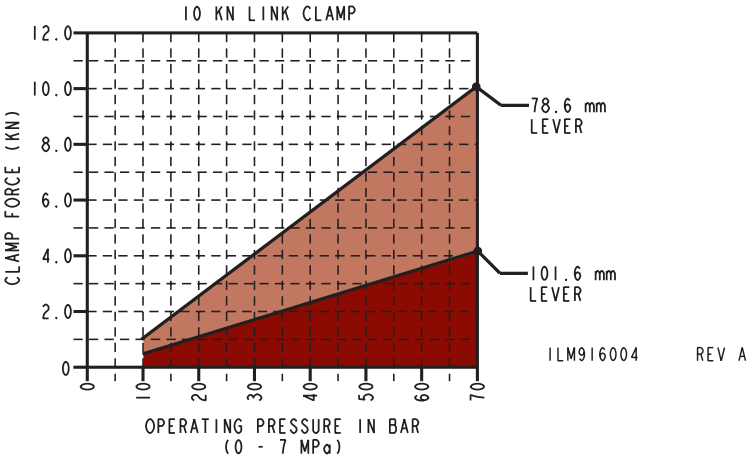
Low Pressure Link Clamp Lever Dimensions

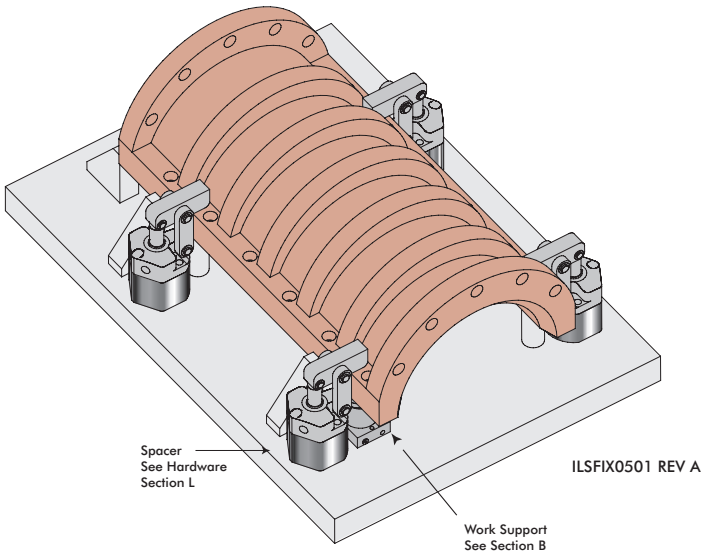
Link Clamp Lever Output Curves





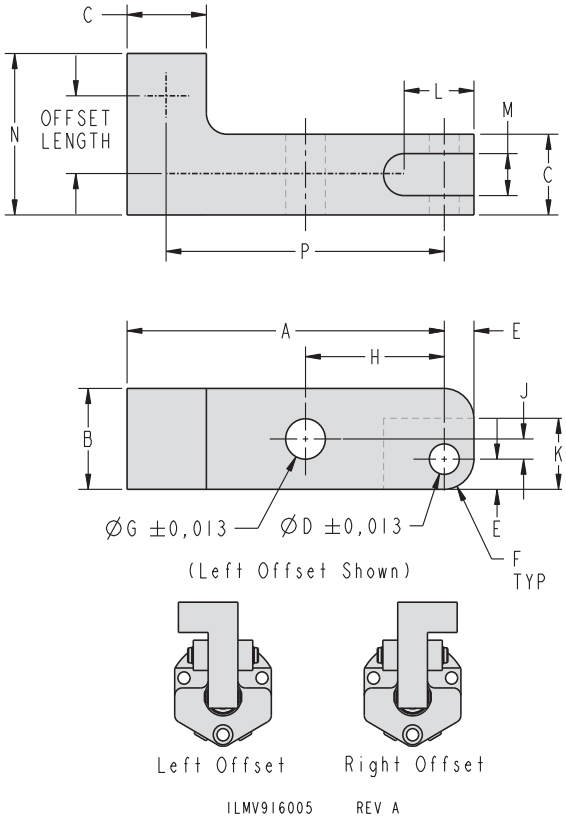
NOTE: Modifications to levers that result in clamp ratios below that of the standard lever are not in the safe operating zone for the corresponding link clamp and could result in premature failure.

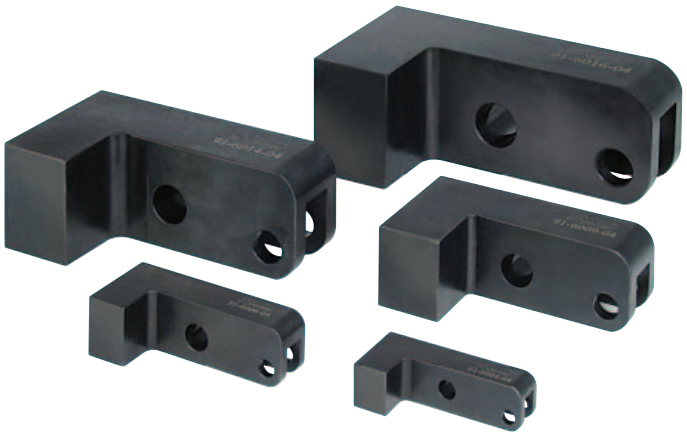




Link Clamp Levers

Offset Link Clamp Lever Dimensions





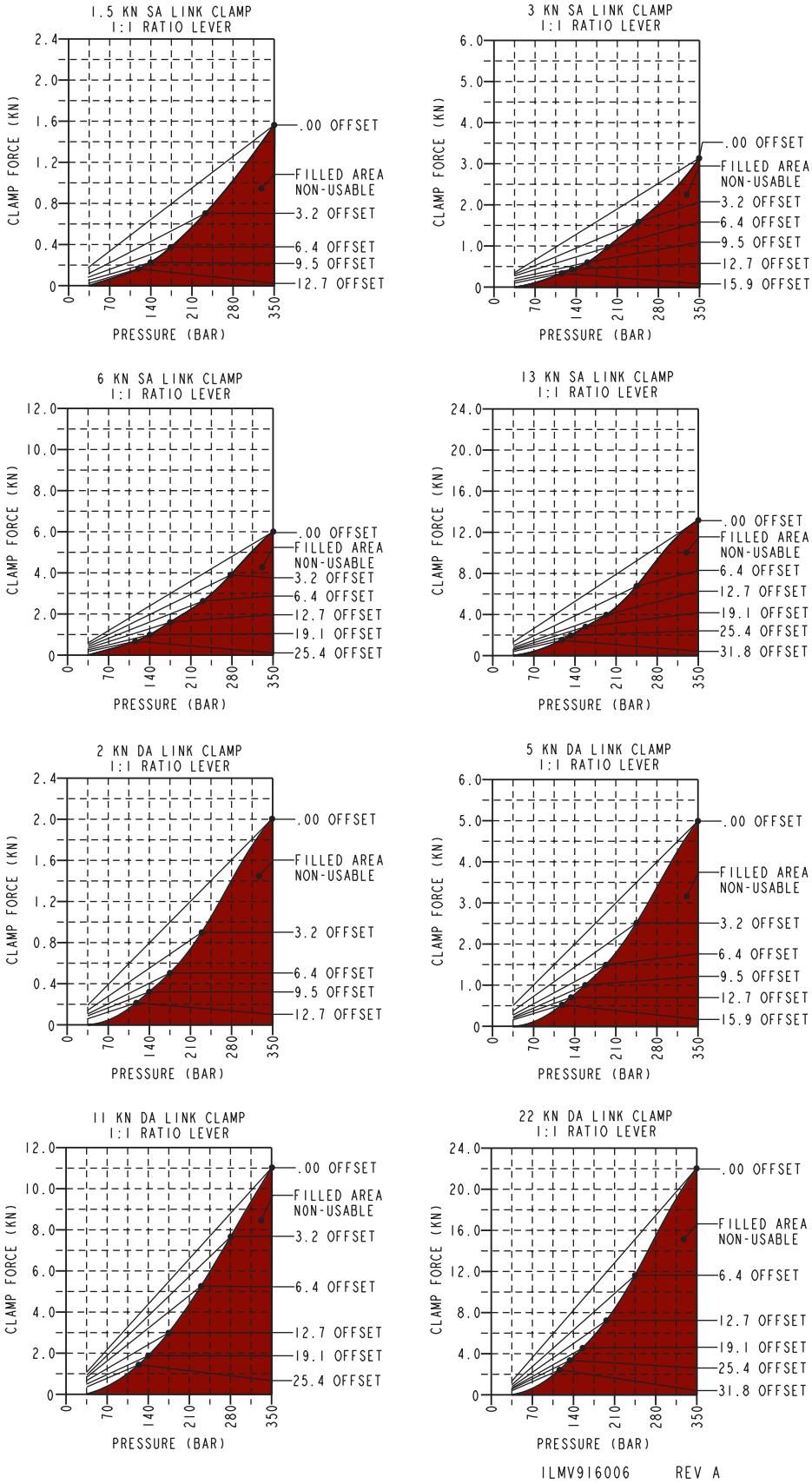
Dimensions									
Model No.	Cap. S/A kN	Cap. D/A kN	A	B	C	D	E	F	G
Left Offset Lever. 1:1 Ratio									
91-6004-04	1.5	2.0	50.8	16.0	12.7	4.788	4.8	4.8	6.363
91-6006-04	3.0	5.0	63.5	22.4	16.0	6.388	6.4	6.4	9.538
91-6009-04	6.0	11.0	79.5	31.8	25.4	9.563	9.5	9.7	12.713
91-6014-04	13.0	22.0	101.6	44.5	31.8	12.738	12.7	12.7	15.888
Right Offset Lever. 1:1 Ratio									
91-6004-05	1.5	2.0	50.8	16.0	12.7	4.788	4.8	4.8	6.363
91-6006-05	3.0	5.0	63.5	22.4	16.0	6.388	6.4	6.4	9.538
91-6009-05	6.0	11.0	79.5	31.8	25.4	9.563	9.5	9.7	12.713
91-6014-05	13.0	22.0	101.6	44.5	31.8	12.738	12.7	12.7	15.888

Model No.	Cap. S/A kN	Cap. D/A kN	H	J	K	L	M	N	P
Left Offset Lever. 1:1 Ratio									
91-6004-04	1.5	2.0	22.2	3.2	11.2	11.2	6.6	25.4	44.5
91-6006-04	3.0	5.0	28.6	3.2	14.2	14.2	8.1	31.8	57.2
91-6009-04	6.0	11.0	34.9	4.7	20.6	20.6	13.0	50.8	69.9
91-6014-04	13.0	22.0	44.5	6.4	30.2	30.2	16.0	63.5	88.9
Right Offset Lever. 1:1 Ratio									
91-6004-05	1.5	2.0	22.2	3.2	11.2	11.2	6.6	25.4	44.5
91-6006-05	3.0	5.0	28.6	3.2	14.2	14.2	8.1	31.8	57.2
91-6009-05	6.0	11.0	34.9	4.7	20.6	20.6	13.0	50.8	69.9
91-6014-05	13.0	22.0	44.5	6.4	30.2	30.2	16.0	63.5	88.9

All dimensions are in mm.

Offset Link Clamp
Lever Output Curves

Offset Link Clamp Lever Output Curves



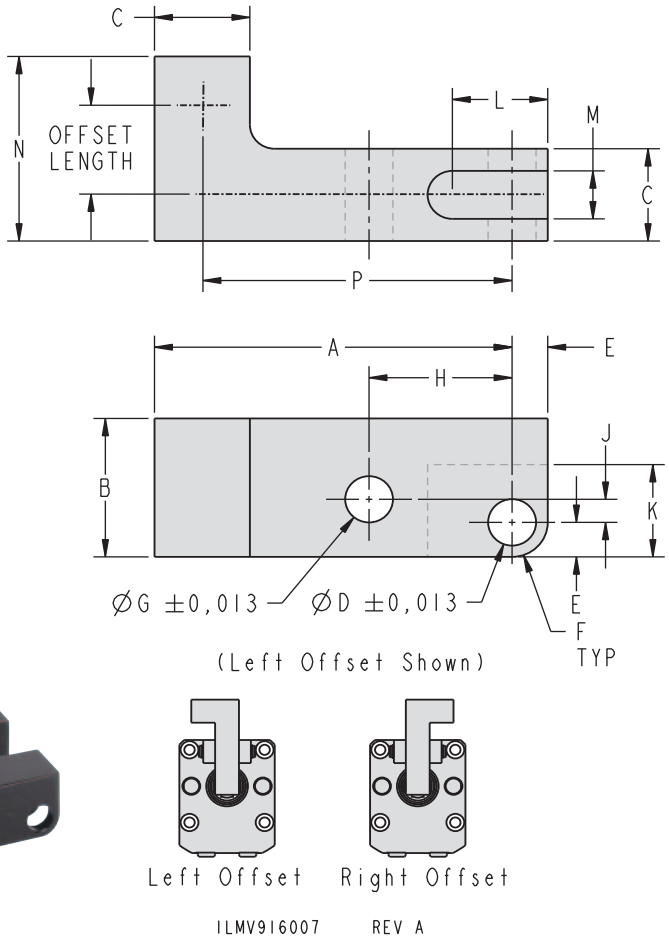
ILMV916006 REV A

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

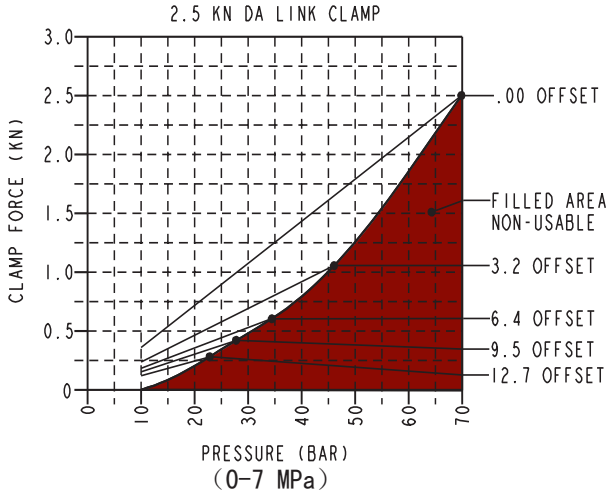
Low Pressure Offset Link Clamp Lever Dimensions

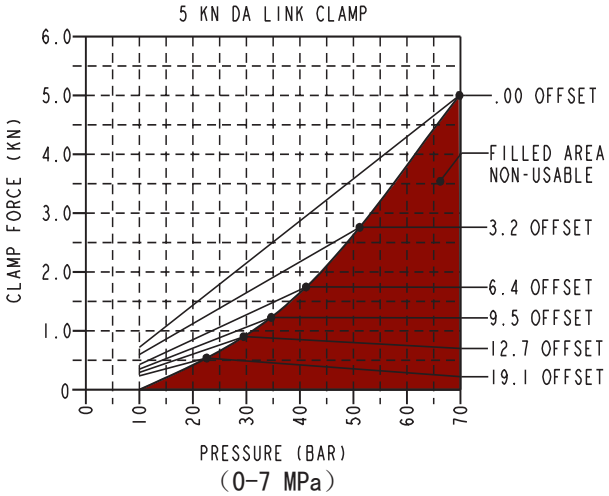


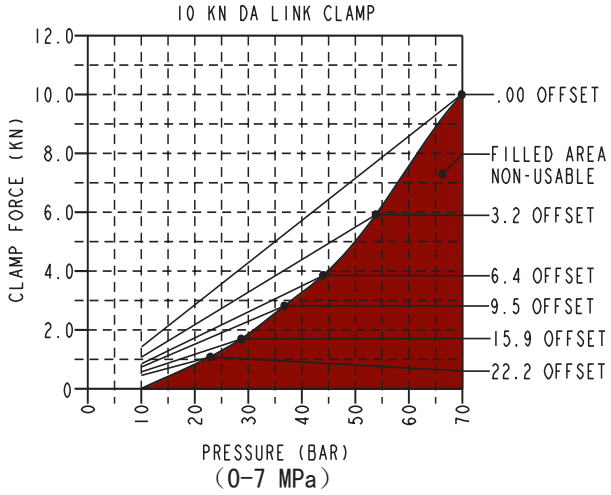
Dimensions								
Model No.	Cap. kN	A	B	C	D	E	F	G
Left Offset Lever. 1:1 Ratio								
91-6011-04	2.5	47.6	19.1	12.7	6.388	4.7	4.7	6.363
91-6015-04	5.0	66.7	25.4	19.1	9.563	7.9	7.9	9.538
91-6021-04	10.0	78.6	31.8	22.2	12.738	9.5	9.5	12.713
Right Offset Lever. 1:1 Ratio								
91-6011-05	2.5	47.6	19.1	12.7	6.388	4.7	4.7	6.363
91-6015-05	5.0	66.7	25.4	19.1	9.563	7.9	7.9	9.538
91-6021-05	10.0	78.6	31.8	22.2	12.738	9.5	9.5	12.713
Model No.	Cap. kN	H	J	K	L	M	N	P
Left Offset Lever. 1:1 Ratio								
91-6011-04	2.5	19.1	3.2	12.7	12.7	6.6	25.4	42.8
91-6015-04	5.0	25.4	7.9	19.1	17.4	9.8	38.1	57.2
91-6021-04	10.0	30.1	9.5	23.8	22.2	11.4	44.5	68.2
Right Offset Lever. 1:1 Ratio								
91-6011-05	2.5	19.1	3.2	12.7	12.7	6.6	25.4	42.8
91-6015-05	5.0	25.4	7.9	19.1	17.4	9.8	38.1	57.2
91-6021-05	10.0	30.1	9.5	23.8	22.2	11.4	44.5	68.2

Low Pressure Offset Link Clamp Lever Dimensions

Low Pressure Offset Link Clamp Lever Output Curves







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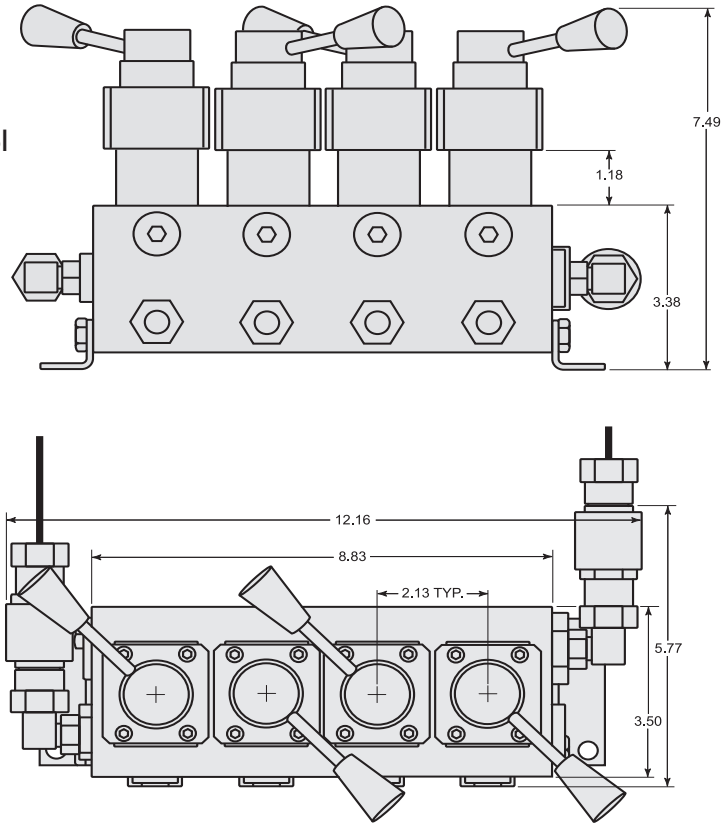
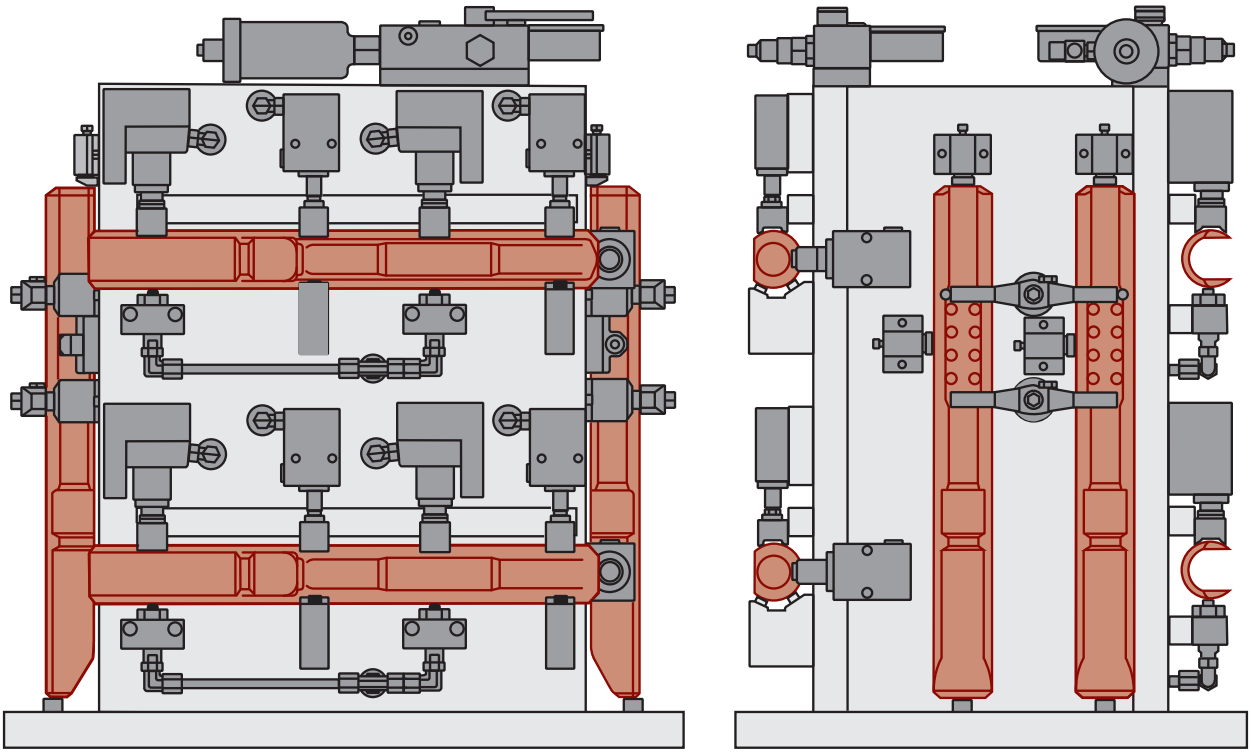
NOTE: Modifications to levers that result in clamp ratios below a 1:1 ratio are not in the safe operating zone for the corresponding link clamp and could result in premature failure.

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

Fixture Layouts

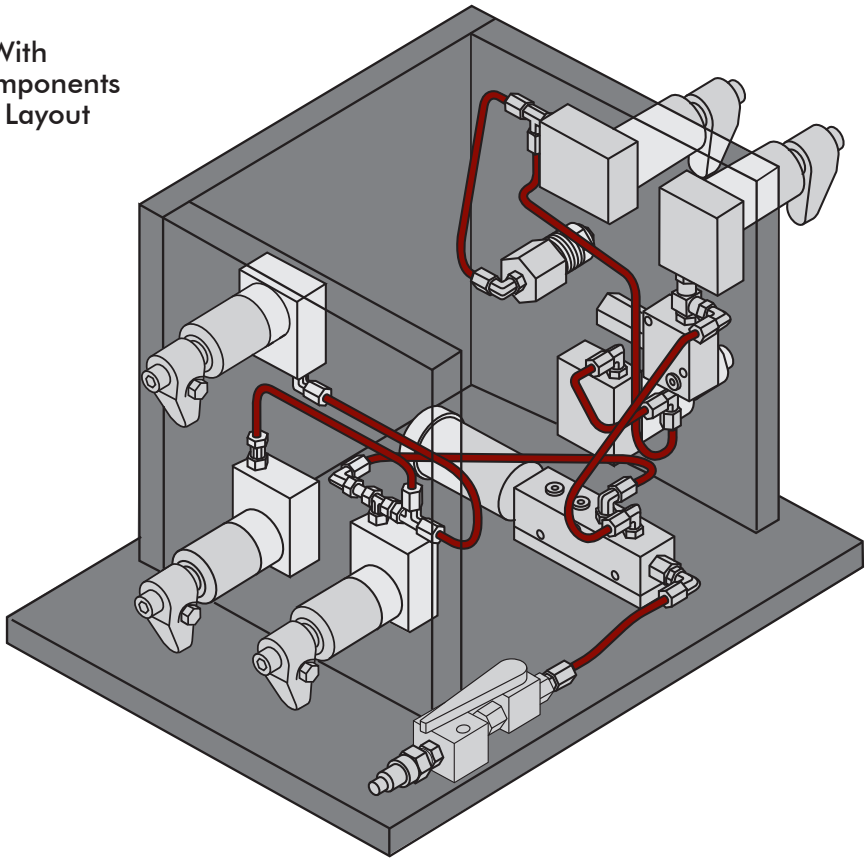
4 Valve Control Layout

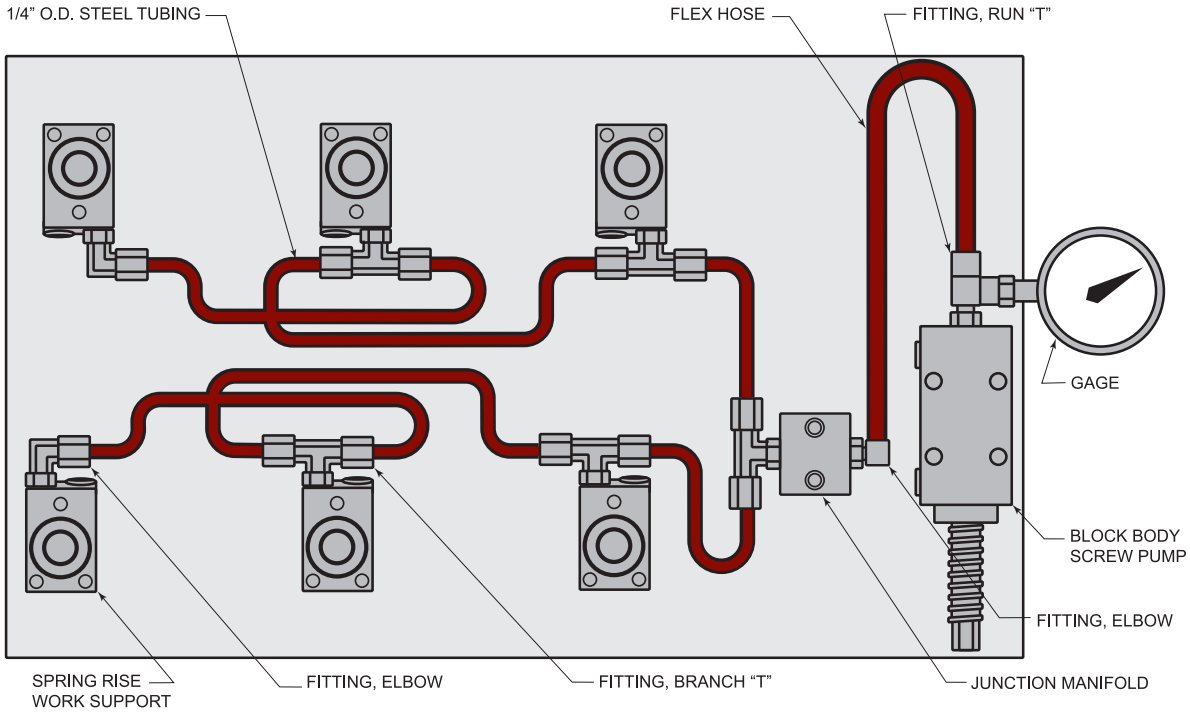




Pallet Fixture With Multiple Part Orientations

Pallet Fixture With
Decoupler Components
And Plumbing Layout

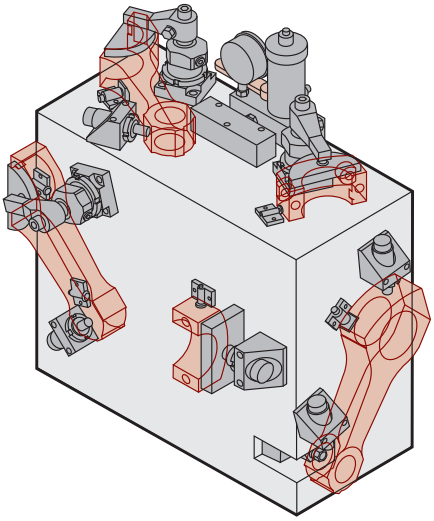


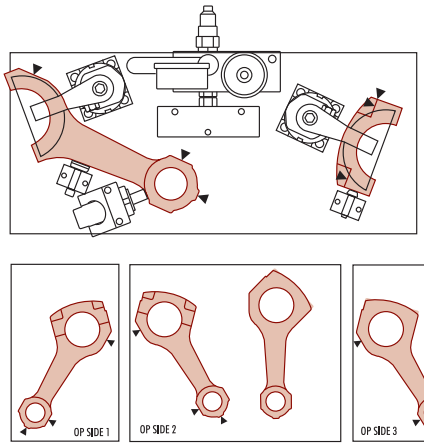


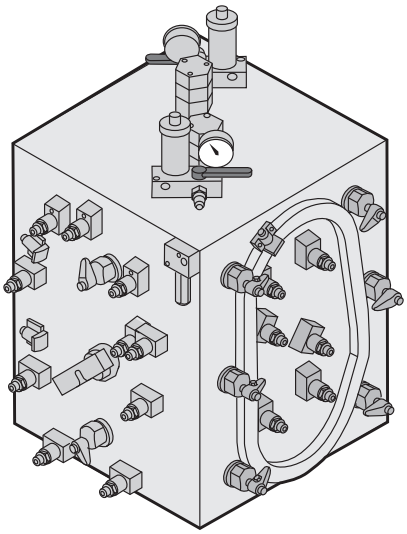
Screw Pump And Work Support
And Plumbing Layout

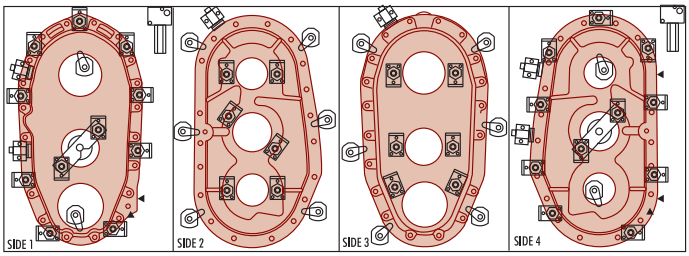
Concepts

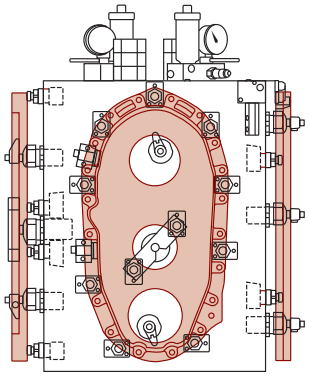
Pallet Fixture











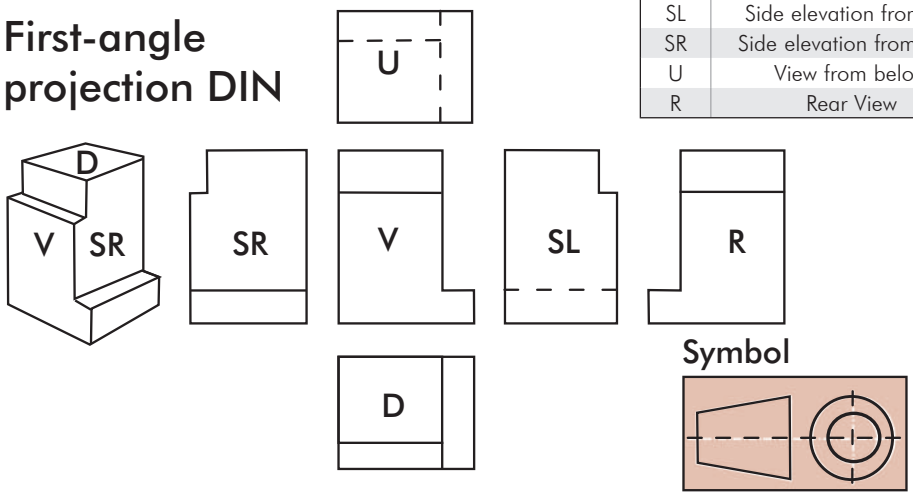
Conversion and Drawing Information

Force Conversion Factors			
Pressure	MPa (Megapascal)	bar	psi (lbs/sq. in)
1 MPa	1	10	145.04
1 bar	0.1	1	14.504
1 psi	0.00689	0.0689	1

Temperature			
Pressure	K (Kelvin)	°C (Celsius)	°F (Fahrenheit)
K	1	°C + 273.15	(°F-459.67) x 5/9
°C	K-273.15	1	(°F-32) x 5/9
°F	K x 9/5 +459.67	°C + 32	1

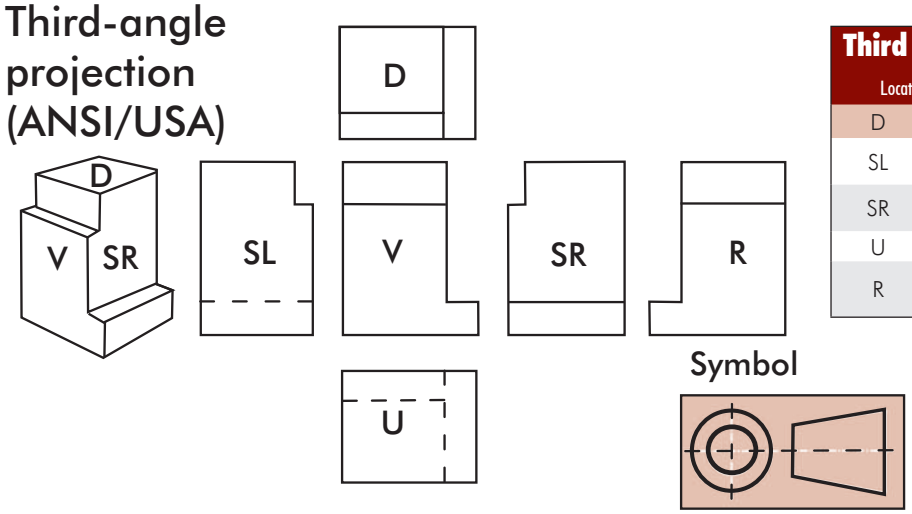
Length Conversion Factors		
Length	mm	inch
1 inch	25.399	1
1 mm	1	0.0393

First-angle projection DIN



First Angle Projection DIN Location of other views in relation to front elevation V		
D	Plan View	Below V
SL	Side elevation from left	To the right of V
SR	Side elevation from right	To the left of V
U	View from below	Above V
R	Rear View	To the left or right of V

Third-angle projection (ANSI/USA)



Third Angle Projection ANSI/USA Location of other views in relation to front elevation V		
D	Plan View	Above V
SL	Side elevation from left	To the left of V
SR	Side elevation from right	To the right of V
U	View from below	Below V
R	Rear View	To the left or right of V

Model Number Index

Model Number Index

Model Number Index

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, setup and enforce work rules that help avoid human injury and damage to equipment. Be sure every operator knows his equipment and develops good work habits. An operator should always make sure valves are in the correct position before he starts a hydraulic pump. Keep hands clear during clamping operations. And use judgment in positioning the workpiece. Be sure the workpiece is properly positioned before clamping forces are applied. Watch for kinked hoses. Monitor gauges to see that system pressures are within limits. Swing clamps must be able to rotate freely through 90° into clamping position before force is applied. Caution: Be sure to keep clear of swing clamp pinch points. Each "new" setup should be carefully planned and checked.

Follow good maintenance practices.

A clean, well-cared-for workplace is a safer workplace. Make daily inspections for damaged hose, bent tubing and leaks. Repair or replace anything that shows signs of wear or damage before minor problems become big ones.

We design and build your components with durability, performance, and safety in mind. Properly selected, installed and maintained, they will serve you long and well. The best hydraulic components embodied in properly designed circuitry can be expected to perform properly only if it is thoroughly cleaned before it is activated. Dirt is the number one enemy of hydraulics!

As an integral part of system design, care must be taken to select the proper devices and accessories ensuring proper integration with your operations and equipment. Sufficient safety measures must be taken to avoid the risk of personal injury and property damage from your application or system.

Vektek, Inc. cannot be responsible for injury or damage caused by unsafe use, maintenance or application of its products.

Please write the Vektek office including specifics for guidance when you are in doubt as to proper safety precautions regarding design, installation or operation in your particular application.

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for everything you need in workholding. We have the equipment you need and the expertise to help you put it to work... fast. So when you want a single-source supplier you can count on, call on us.

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